

RLM Reference Manual

RLM v14.0

November, 2019



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V14.0

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RLM contains software (the GoAhead WebServer) developed by GoAhead Software, Inc. (<http://www.goahead.com>)

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The *rlmid1* devices are manufactured by Aladdin Knowledge Systems, Inc. (then SafeNet, Inc., now Gemalto)

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Section 1 – License Management

Introduction

This section of the manual contains the information which applies to most license managers. If you are new to License Management, we suggest you review these two chapters first.

Introduction to License Management

If you have used other license management products, you can skip this chapter. If you are new to license management, however, we have included an overview of how license management products operate.

The purpose of a license manager is to allow a software vendor (ISV) to flexibly price and license their product(s) for delivery to their customers. At their most basic level, license managers like RLM allow an ISV to deliver concurrent-use (floating) or fixed (node-locked) licenses to their customers. In the case of node-locked licenses, no license server is needed with RLM and other advanced license managers. Most license managers offer/_ many other license types for delivery to customers, and these vary from license manager to license manager. The next chapter, License Models, describes the various way you can license your software with RLM.

License managers differ from Copy Protection because license managers give advantages to the ISV's customers as well. License managers allow your customer's organization to know that they are using purchased software within the license limits set by you, their ISV. In addition, license managers collect usage information (at the customer's option) for later reporting and analysis. If your license manager is open and transparent, this usage information is provided in a fully-documented report log format.

First, a few definitions

Term	How used in this manual
license manager	a software component which keeps track of the right to use a software product
product	Your software
product name	The name used by the product to request it's license
license	The right to use a product, incorporated into a short text description. Referred to by the product name
check out	The act of requesting a license for a product
check in	The act of releasing the license for a product
node-locked (license)	A license which can be used only on a particular specified computer
floating (license)	A license which can "float" on a network, in other words, one which can be used by anyone who can access the license server
license server	Part of the license manager which controls access to licenses. The License Server is an optional component, typically only required when floating licenses are used
ISV	Independent Software Vendor, i.e., your company
Hostid	An identification for a particular computer used by the license manager to either node-lock a particular application, or to specify where the license server can run.

License Manager Overview

License managers control the allocation of licenses to use software products. They do this by allowing a product to *check out* and *check in* a named license. The license manager keeps track of which users and computers can use these licenses, and, if the license is a *floating license*, the license manager keeps track of how many copies of the license are in use.

Most license managers provide APIs with calls to control many of the aspects of licensing behavior. In addition, license managers provide license administration options to control the behavior of the license servers. These options are specified in server option files or via command-line or web-based administration tools.

First-generation license managers (such as *FLEXlm* and *NetLS*) took the approach of providing extremely complex APIs and internal license server options to control license policy, with relatively less control contained in the licenses themselves.

Unlike the first-generation license managers, the design philosophy of RLM is to preserve the simplicity of the system for both ISVs and license administrators by avoiding all unnecessary options in the client library and the license servers and moving as many of these options to the license file as possible, where they are visible and understandable by everyone.

In general, even when API calls are available to control it, it is good practice to keep license policy out of the application and the license server, and place it into the license itself, to the extent that the license manager allows this to be done. This makes for a more understandable licensing system for both ISVs and license administrators. This results in much more standard behavior of application licensing from ISV to ISV. The Reprise team learned this the hard way when we supported thousands of *FLEXlm* customers in the past, and we applied these lessons to the design of RLM.

License Types and Attributes

Commercial license managers will allow an ISV to control the use of their licenses using various License Types. The most popular license types are:

- node-locked (runs on a specified node only)
- floating (available anywhere on a network, up to a concurrent usage limit)
- token or package-based

Another common license type is *metered* (i.e. a limited number of executions or limited time of execution).

In addition, most licenses will contain various attributes which further restrict their use. Some common attributes are:

- expiration date
- highest available software version
- start date
- named-user (i.e., the license can only be used by a particular user)
- allowed platform for the application.

License Manager Components

Most commercial license managers consist of 3 components:

- A client library (or wrapper)
- A license server, and
- A license description repository (typically a license file)

RLM is similar in structure to most popular license managers. RLM uses the client library, rather than the wrapper approach. The RLM license servers consist of a pair of servers – the generic rlm server along with an ISV-specific server. Finally, RLM uses a license file as the repository for license descriptions.

While some license managers require the license server in all cases, RLM node-locked licenses do not require a license server – only your application and the license file.

How To Deliver Licenses To Your Customer

Typically, licenses are delivered in text form to license administrators. Long ago, this was done via phone/fax/magnetic media. Today, the most common license delivery mechanism is the internet, either via email or automatic activation from an activation server at the ISV site.

RLM licenses are always 100% ascii text, and can be delivered by any convenient means, however email and activation are by far the most common delivery mechanisms.

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License Models

In the previous chapter we talked about *License Types* and *Attributes*. The *license types* and *attributes* which are supported by your license manager are the building blocks which you use to create the *License Models* your company will use. These *License Models* are what you will then use to price and deliver your software.

The most important thing you will do when selecting a license manager is to pick one with a sufficiently rich set of license types and attributes in order to allow you to create the License Models you need, not only for today, but for the future. If your license manager isn't sufficiently flexible, then your marketing department will become increasingly frustrated because they will not be able to offer your software with the terms and conditions which can lead to increased sales.

What exactly is a *License Model*?

Put most simply, a *License Model* is a set of terms and conditions which your license manager enforces. For any given set of terms and conditions (i.e., the particular *License Model*), your company has a set of pricing guidelines for the sale of the product.

Let's take a simple example. Your company may sell your software in two different ways – a floating (concurrent use) license for \$3000, and a node-locked license for \$1200. In this case, the *License Model* could be called either floating or node-locked.


But your *License Model* can (and often is) much more complicated. For example, you might sell a floating license which works only in certain timezones. You might also sell a more unrestricted floating license, which operates in any timezone. In this case, both *License Models* are of the basic floating type, but the other restrictions define the differences in the *License Models*. Your company might now call these “Floating-timezone-restricted” and “Floating-unrestricted”.

It is important to your development organization that changes to the license model do not result in code changes. This is also important to sales and marketing, who will want to try different License Model offers without having to wait for a new software release.

We will discuss a number of common License Models in the remainder of this chapter, and with each one, we will list the RLM license attributes that are used to implement it. Don't worry if you do not understand the RLM nomenclature, this will make more sense after you read the chapter describing The License File on page 44.

Floating License

The floating license is what made license managers famous. All license managers support this. The idea is that some specified number of independent instances of the application can be run anywhere on your customer's network so long as that number does not exceed a predefined limit (the limit in the license file).

In RLM  every license has a *count*, and if the count is non-zero, this is a floating license for that many instances of the application. The license itself has no associated *hostid*, meaning that it will run anywhere. The license server (specified by the *HOST* and *ISV* lines) keeps track of the # of instances in use.

Node-locked License

A node-locked license is a license grant which allows the software to be used on a particular computer, and on that computer only. Most typically, this license is uncounted, meaning that if the software is running on the specified computer, any number of instances are allowed to execute.

In RLM → set the *count* field of the license to “uncounted” or “0”, and specify the *hostid* of the computer in the actual license. Typically, node-locked uncounted licenses do not require a license server, so they are very simple to deploy.

Node-locked, Limited License

A variant of the node-locked uncounted license, it is sometimes desirable to allow only a limited number of instances of the software to run on a particular computer. This is a counted license which is also node-locked.

In RLM → set the *count* field of the license to a non-zero value (or *single*), and specify the *hostid* of the computer in the actual license. This license requires a license server (HOST and ISV lines), unless you use a *single* license.

Shared Floating License

Sometimes it is desirable to modify the behavior of a floating license so that all invocations of your product on a single computer use only one license. Or all invocations by the same user. Or all invocations from a particular process tree. In this case, license managers provide a method of sharing a particular license among multiple instances of the product.

In RLM → Use a floating license and specify the *share=* attribute in the actual license. *share=u* will cause all invocations from a particular user to share the license. *share=uh* will cause all invocations from a particular user on a particular machine to share the license. The optional (:count) at the end of the share specification will allow you to share a license only among a certain number of instances; the next instance will require an additional license. (e.g, *share=u:4* will allow a particular user to run 4 copies using a single license, but the 5th copy will use an additional license.) This license requires a license server (HOST and ISV lines).

Named-User License

A named-user license allows a limited number of users access to a floating license. This allows you to sell a number of instances of your software to a subset of users at the customer site, without having to identify the users at the time you create the license.

In RLM → Use a floating license and specify the *named_user* or *named_user=n* attribute in the actual license. If you specify *named_user*, then your customer can assign as many users as there are licenses available. Specifying *named_user=n* will allow you to set a lower (or higher) limit for the number of users. This license requires a license server.

Metered License

A metered license allows you to allocate usage and consume the allocation as something happens in your software. For example, you could meter the number of times your program is run (as opposed to the *concurrent limit of execution* in a floating license). Or you could count the number of pages printed in a word-processing application. Metering also allows you to create a license which will run for a predetermined amount of running time (program running time, as opposed to an expiration date – expiration dates are usually available for all license types).

In RLM → set the *count* field of the license to *meter*, and specify the metering parameters in the actual license. The metering parameters control how usage is consumed when you call *rlm_checkout()* and subsequently as the application continues to run. This license requires a license server (HOST and ISV lines), unless you use a *single* license.

Token-Based License

A token-based license defines the license you request in terms of other licenses (called the *primary license* or *licenses*) which were issued to your customer. This can be used for several different purposes:

- Allows you to define several licenses in terms of a single, common primary license. Your customer can purchase many copies of the primary license, then they are allowed to run whatever products are defined to use that license. A big advantage is as you release new products which use the same primary license, your customer can use these products immediately, creating more contention for the licenses, and additional sales for you.
- Allows you to create product *bundles* or *packages*.
- Allows you to provide a mapping from a particular license request to one or several equivalent licenses. Typically, ISVs are happy to allow more expensive licenses to be used to satisfy the request of a lower-cost product. This allows your customers to keep working while increasing contention for the higher-priced licenses.

In RLM → set the *count* field of the license to *token*, and specify the primary license(s) which are used to satisfy the request for the product. The token license is generally the same for all your customers, and you issue licenses of the *primary* license when they purchase your software. This license requires a license server.

“Maintenance-Thru-Date” License

Many ISVs wish to issue a license to their customer which allows the customer to run (forever) any version of the software which is released through a particular date, e.g. one year into the future. If the ISV releases a new version in 11 months, the customer can use this version as well, but no version which is released more than 12 months later. This is accomplished by what we call a “date-based” version.

In RLM → set the *version* field of the license to *a date, in the format yyyy.mm*, and specify the version in your call to *rlm_checkout()* in the same release date format. When you issue licenses, issue them with a version number corresponding to the expiration of their support. So, for example, if you want to issue one-year supported licenses, in May of 2013, you would issue licenses of version 2014.05. When you release your software in December of 2013, you would request version 2013.12. Note that while it is possible to use other date formats, the format above is used by RLM Activation Pro.

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Section 2 – RLM Basics

This section of the manual contains the information you need to license and deploy your application using the RLM license manager.

Welcome

Welcome to RLM, the newest license manager brought to you by the people who developed FLEXlm®. The RLM documentation is divided into 7 manuals:

Standard RLM Components

- *RLM Embedded Getting Started Guide* - an introduction to the basic concepts of license management and RLM Embedded
- *RLM Getting Started Guide* - an introduction to the basic concepts of license management and RLM
- *RLM Reference Manual (this manual)* - the complete reference to all core RLM components
- *RLM License Administration Manual* - The License Administration manual, suitable for shipment to your customers

Optional RLM Components

- *RLM Activation Pro Getting Started Guide – An Introduction to the RLM Activation Pro software*
- *RLM Activation Pro Manual* - Reference for the Optional RLM Activation Pro software

All five manuals are available at the Reprise Website:

http://www.reprisesoftware.com/kits/RLM_Getting_Started_Guide.pdf

http://www.reprisesoftware.com/kits/RLM_Reference.pdf

http://www.reprisesoftware.com/RLM_License_Administration.html

http://www.reprisesoftware.com/kits/RLM_Activation_Pro_Getting_Started_Guide.pdf

http://www.reprisesoftware.com/kits/RLM_Activation_Pro.pdf

http://www.reprisesoftware.com/kits/RLM_Embedded_Getting_Started_Guide.pdf

Integrating RLM into your product

As an ISV you integrate RLM by adding calls from the RLM client library into your application. Only if you plan to ship concurrent-use (floating) licenses will you also configure and build a license server. You then ship your product plus a few additional components of the RLM license system, as required. You can accomplish the engineering portions of these tasks in less than an hour – the hardest work is deciding what to license, and what license rights to grant to your customers. Once you integrate RLM, the additional components you ship are:

If you provide only Fixed (node-locked) licenses to your customers:

- a license file to describe your customer's rights to the product (custom-generated for each of your customers)
- the rlm utilities (rlmutil) provided by Reprise Software.
(Note: NO SERVERS NEEDED)

If you provide Concurrent-use (floating) licenses to your customers:

- a license file to describe your customer's rights to the product (custom-generated for each of your customers)
- the rlm utilities (rlmutil) provided by Reprise Software.
- the rlm (generic) license server provided by Reprise Software.
- your custom license server (Built from components from Reprise Software with a minimum of configuration)

Except for the license file, the components are the same for every one of your customers. The actual license file, which describes your customer's rights to the product, will (in almost all cases) be different for every one of your customers.

When deployed to support concurrent-use (floating) licenses, RLM is a client-server system, with license requests transmitted over TCP/IP from the client (your application) to the license server that controls license usage rights. When deployed to support node-locked licensing, no network connection nor license server processes are needed.

In all cases, all components, except the license file, are the same for every one of your customers. The actual license file, which describes your customer's rights to the product, will (in almost all cases) be different for every one of your customers.

What sets RLM apart?

RLM was designed from the start to emphasize *openness*, *transparency*, and *simplicity*.

RLM is *open* because we publish the format of our report log file, so that you, or your license administrators can always examine and generate usage reports on licensing activity from the RLM servers.

RLM is *transparent* in the sense that we do not allow "back doors" which lead to unique behaviors from one ISV to another. In addition, we have removed policy from the application code, and placed it into the license key itself, so that your license administrators will be able to understand the license terms without having to understand your implementation.

RLM is *simple* because we include functionality like truly automatic selection of license servers from a set of multiple, independent servers. In older license management systems, the ISV ends up writing much code to manage multiple license servers. This is handled by RLM itself.

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What's New in RLM v14.0

RLM v14.0 has new features for both software publishers and your customers. This section lists the new features along with pointers to the relevant sections in the manual. New license administration features are described in the License Administration manual.

What's new

- ***RLM clients can now communicate with RLMCloud using HTTPS.*** See Using RLM with HTTPS on page 159 for more information.
- ***You can now disable certain hostid types in your application*** with the `rlm_isv_cfg_disable_hostids()` call in `rlm_isv_config.c`. See Appendix E – RLM Hostids on page 251 for more information.
- ***Prior to RLM v14.0, there were several license keywords which could not be set to a 0 value:*** `client_cache`, `hold`, `host_based`, `max_roam`, `min_checkout`, `min_timeout`, `named_user`, `soft_limit`, and `user_based`. Setting any of these to 0 would cause a syntax error in the license generator. These parameters can now all be set to 0 (which is the default, and if set to 0, the keyword doesn't appear in the license.) This is useful in Activation Pro, in case you want to have a non-zero default value in the product definition and override that to 0 (the RLM default) in the activation key.
- ***ASH licenses now support a 4th checktype: “6hour”.*** The activation server is checked every 6 hours with this type. This type operates identically to “daily”, except the check is done every 6 hours after server startup, rather than at midnight. See Alternate Server Hostids on page 145 for more information.
- ***The rlm web interface “display license usage” screen now also displays the license pool status*** for all license pools.

New License Keywords

- None

API additions

- ***rlm_isv_cfg_disable_hostids()***. See Appendix E – RLM Hostids on page 251 for more information.

API changes

- The RLM Web services API now supports reservation type/string/seconds, and authentication username/password. See the [RLM web services API documentation](#) for details.

Activation changes

- RLM Activation Pro has many new features. Please see the Activation Pro manual for details.

License Administration Options file changes

- None

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Installing RLM

To install RLM, follow these steps:

- **First, Download the kit from the Reprise website**

To download RLM, go to the [Reprise Website Download area](#), enter your username and password, and select the kit(s) you want to download. Save these on your system, then uncompress and (on unix) extract the binaries with the *tar xvf* command.

Each kit has a descriptive name on the website. The file names of the kits follow Reprise Software's platform naming conventions, with ".tar.gz" (Unix) or ".exe" (Windows) appended:

Platform	Platform Name	Kit file name
HP-UX on PA-Risc	hp_h1	hp_h1.tar.gz
HP-UX 64-bit on PA-Risc	hp64_h1	hp64_h1.tar.gz
IBM AIX 32-bit	ibm_a1	ibm_a1.tar.gz
IBM AIX 64-bit	ibm64_a1	ibm64_a1.tar.gz
Linux on Intel X86	x86_11, x86_12	x86_11.tar.gz, x86_12.tar.gz
Linux 64-bit on Intel	x64_11	x64_11.tar.gz
Mac on Intel X86	x86_m1	x86_m1.tar.gz
Mac on PPC	ppc_m1	ppc_m1.tar.gz
Solaris 32-bit on Intel	x86_s1	x86_s1.tar.gz
Solaris 64-bit on Intel	x64_s1	x64_s1.tar.gz
Solaris on Sparc	sun_s1	sun_s1.tar.gz
Solaris 64-bit on Sparc	sun64_s1	sun64_s1.tar.gz
Windows on Intel X86 (visual C 2010, 2012, 2013)	x86_w3	rlm.vX.YBLZ-x86_w3.exe
Windows 64-bit on Intel X86 (visual C 2010, 2012, 2013)	x64_w3	rlm.vX.YBLZ-x64_w3.exe
Windows on Intel X86 (visual C 2015+)	x86_w4	rlm.vX.YBLZ-x86_w3.exe
Windows 64-bit on Intel X86 (visual C 2015+)	x64_w4	rlm.vX.YBLZ-x64_w3.exe
Java for Unix (requires x86_12, x64_11, or x86_m1 kit. x86_12 only prior to RLM v6)	java_unix	java_unix.tar.gz

Note: When downloading Unix or Mac kits using Internet Explorer on Windows XP systems, the files are incorrectly named as 'platform.tar.tar', rather than 'platform.tar.gz', once downloaded. This is a browser issue - after transfer, please rename the file before installation.

- **Next, unpack the kit and install**

- For the majority of cases using a C-compiler, follow the instructions in this section.
- For information on using RLM with Java, see Using RLM with Languages other than C/C++ on page 87.
- For information on using RLM in a cross-development environment, see Building the RLM kit using a cross-compiler on page 19.

To unpack the kit and perform the installation, follow these steps:

At the shell prompt on Unix:

```
% gunzip platform.tar.gz
% tar xvf platform.tar
% ./INSTALL
% # update src/license_to_run.h if required
% # Your license for RLM comes via email from Reprise Software.
% # RLM kits are pre-built with demo licenses valid for
% # approximately two months from date of release.
% cd platform
% make
```

Note: RLM requires a license to operate from Reprise Software.

On Windows, the kit is in a Windows installer executable. Run the installer, whose name is `rlm.vver-platform.exe`, where **ver** is the RLM version and **platform** is the RLM platform name. For example, `rlm.v13.0BL1-x86_w4.exe` is the installer for v13.0BL2 on the x86_w4 (Windows 32-bit, VS2015 and above) platform. The installer asks where you would like to install RLM - the default is in your *My Documents* folder. The installer will create the folder `Reprise\rlm.vver-platform` (where **ver** and **platform** are as above) in your My Documents folder if you take the default.

You have the option in the Windows installer to specify that you would like the installer to copy your key pair from another RLM installation into the new installation area. This is useful if you are upgrading your RLM version or installing RLM on another system at the same release level, and wish to use the same key pair so as to have compatible license signatures across the installations. If you do not wish to specify the location of another key pair, leave the box blank.

RLM kits are pre-built for ISV "demo", with licenses that expire in 30-60 days after the release date. If your demo license has expired, you will need to put the new license you received from Reprise Software into the file `src\license_to_run.h`. If you have purchased RLM, you will need to edit `src\license_to_run.h` to replace the license there with your permanent license, and you will also need to edit `src\rlm_isv_config.c` and the makefile in the binary directory (x86_w* or x64_w*) to change your ISV name. If you plan to use the example license file `example.lic` in the platform directory, edit the file, and change all instances of "demo" to your ISV name.

Note: RLM requires a license to operate from Reprise Software.

You have 2 options for building RLM on Windows - you can either use a Visual Studio or Visual C++ Project, or a Command Window. Each method has the same outputs; choose the method you're more comfortable with.

To build using Visual Studio/Visual C++:

1. The platform directories (x86_w* and x64_w*) contain Microsoft Visual Studio or Visual C++ project and workspace files. Double-click on the appropriate file to launch Visual Studio/Visual C++. In x86_w3, double-click on `x86_w3.vcproj`. In x64_w4, double-click on `x64_w4vcproj`, etc.
2. When the development environment comes up, click on the Build menu and select "Rebuild All" (Visual C++) or "Build Solution" (Visual Studio). When the build is done, the output window should indicate 0 errors and warnings.

You may be prompted to allow Visual C++ to convert the project to a later version. Allow it to do so, then proceed.

To build using a Command Window:

1. Create a command window with the Visual C++ environment set up
 - Create a command window and run a batch file provided by Microsoft to set up your command window for the next step. The batch file is Program Files [(x86)]\Microsoft Visual Studio <version>\VC\vcvarsall.bat
 - OR-
 - Create a command window via the Start->MS VisualStudioxxx or Start->MS Visual C++ menu. The specific sub-menu items vary with version but the target is "Visual Studio Comand Prompt".
2. cd to the platform directory of the SDK, for example
cd x86_w3
3. Type nmake

A note about OpenSSL

Note: as of RLM v12.0 on Linux and v12.2 on Windows, RLM uses a private name space for the OpenSSL routines, so the need to remove those modules from the RLM library to avoid conflicts with other OpenSSL implementations that you link into your application has gone away, and you can ignore the remainder of this paragraph. If you are using an earlier version of RLM and wish to build a client library on Unix systems which does not contain any of the OpenSSL library routines, execute the **make rlm_noss1.a** command after installing your kit. The resulting library can be used to link your application if you use OpenSSL as part of your application and you use a different OpenSSL version.

Building the RLM kit using a cross-compiler

On certain platforms (e.g. arm_11 and xpi_11), the rlm kit must be cross-compiled on a host system which doesn't run the target instruction set. For these platforms, follow the directions here (Note: these directions are for Unix systems only, to do cross-development on Windows, you are on your own. See the makefile):

To unpack the kit and perform the installation, follow these steps:

At the shell prompt on Unix:

```
% gunzip platform.tar.gz
% tar xvf platform.tar
% ./INSTALL
% # update src/license_to_run.h if required
% # Your license for RLM comes via email from Reprise Software.
% # RLM kits are pre-built with demo licenses valid for
% # approximately two months from date of release.
% cd platform
```

At this point, on a "normal" RLM platform, you would simply type "make". However, in a cross development environment, the make process is split into 4 or 5 steps. In these instructions, we will refer to the two systems as the *host* (the system with the cross-development tools), and the *target* - the target system which does not have development tools.

1. First, on the *host* system (the one with the cross-development tools):

```
% make step1
```
2. Next, copy rlmgenkeys to the *target*; run rlmgenkeys; copy rlm_privkey.c and rlm_pubkey.c back to the *host* system into the src directory.
3. Next, on the *host* system:

```
% make step3
```
4. Next, copy the kit (the whole directory, e.g. arm_l1) to the *target*
5. Next, on the *target*: (optional, only if you have a full client-server RLM kit).

```
% make step5
```

Your kit is now built on the target and ready to use.

Note: skip steps 1 and 2 if you have a key pair from another rlm platform, and put the keys into the src directory on the *host* system; start from step 3 above. Skip step 5 if you have a client-only kit, or if you do not care about creating an ISV.set settings file.

RLM kit layout

Each RLM kit (for a particular platform) is contained in 3 or 5 subdirectories:

- Machine-independent subdirectory (src)
- Machine-independent examples subdirectory (examples)
- Machine-dependent subdirectory (name varies for each platform)

In addition, on Windows, there is an additional directory:

- a directory of .NET support files called "dotnet".

Java support is contained in an independent directory called either "java_unix" or "java_win".

The platform names for RLM follow the convention:

```
arch_[os][ver]
```

where:

- *arch* is the Reprise Software name for the processor/chip architecture
- *os* is the Reprise Software identifier for the operating system, and
- *ver* is the Reprise Software identifier for our version of rlm OS support (note: this is NOT the operating system version)

Current RLM platform names are:

Platform	Directory Name	Notes
HP-UX on PA-Risc	hp_h1	
HP-UX 64-bit on PA-Risc	hp64_h1	
IBM AIX 32-bit	ibm_a1	
IBM AIX 64-bit	ibm64_a1	
Linux on ARM	arm_l1	Client-only kit
Linux on Intel X86	x86_l2	
Linux (64-bit) on Intel	x64_l1	

Linux on PPC	ppc_11, ppc64_11	
Linux on Xeon PI coprocessor	xpi_11	Client-only kit
MAC on Intel X86	x86_m1	
MAC (64-bit) on X86	x64_m1	
MAC on PPC	ppc_m1	
NetBSD on Intel	x86_n1	
Solaris (32-bit) on Intel	x86_s1	
Solaris (64-bit) on Intel	x64_s1	
Solaris on Sparc	sun_s1	
Solaris (64-bit) on Sparc	sun64_s1	
Windows 32-bit	x86_w3	Visual Studio 2010-2013
Windows 32-bit	x86_w4	Visual Studio 2015 and later
Windows 64-bit	x64_w3	Visual Studio 2010-2013
Windows 64-bit	x64_w4	Visual Studio 2015 and later

RLM Kit Contents

The Machine Independent (src) directory contains:

File	Contents
license.h	rlm include file
license_to_run.h	License for RLM itself
rlm_admin.h	Admin API include file (optional product)
rlm_isv_config.c	Configuration data for ISV server
RELEASE_NOTES	Release notes for this version of RLM
RLM_Reference.txt	Pointer to RLM documentation on website
VERSION	RLM kit version information (not on client-only kits)

The Machine Independent (examples) directory contains:

File	Contents
act_api_example.c	Sample client-side activation code
activation_example.html	Sample HTML page for activation
actpro_demo.c	Demo program for activation pro
detached_demo.c	Sample code to implement a Detached Demo [™] .
example.opt	Example license administration option file
integrate_older.c	Example code for integrating RLM alongside an older LM
rehost_example.c	Example for using rehostable hostids and revoking them
rlm_transfer.c	Example ISV-defined server transfer code
rlmclient.c	Example rlm application program
roam_example.c	Example code to implement license roaming
unsupportd	Directory of unsupported example programs (fortran interface, python interface)

Each Unix Platform-dependent directory contains (before executing "make"):

File	Contents	Notes
example.lic	Example license file	Created by INSTALL
librlm.a	Symbolic link to rlm.a	
makefile	Makefile	
rlm	The generic rlm server	Not on client-only kits
rlm.a	RLM library	
rlmanon	RLM logfile anonymizer	Not on client-only kits
rlmmains.a	RLM main() functions for misc programs	
rlmutil	RLM utilities	

The Windows Platform-dependent directory contains (before executing "nmake"):

File	Contents
example.lic	Example license file
isv_main.obj	main() for ISV server
isv_server.lib	library for ISV server
makefile	Makefile
rlc.obj	main() for Activation administration (rlc)
rlm.def	RLM DLL export definitions
rlm.exe	The generic rlm server
rlm.res	RLM version resource file
rlm_genlic.obj	License generator object
rlm_mklic.obj	main() for Activation license generator
rlmact.obj	rlc object file
rlmanon.exe	RLM logfile anonymizer
rlmclient.lib	RLM client library
rlmclient_md.lib	RLM client library - compiled with /Md
rlmclient_mdd.lib	RLM client library - compiled with /Mdd
rlmclient_mtd.lib	RLM client library - compiled with /Mtd
rlmgen.obj	rlc license generation module
rlmgenkeys.obj	main() for rlmgenkeys utility
rlmsign.obj	main() for rlmsign utility
rlmutil.exe	RLM utilities
rlmverify.obj	main() for RLM log file authentication utility
x86_w*.vcproj, x64_w*.vcproj	Visual Studio/Visual C++ project for building the SDK

The Java directory (java_unix, java_win) contains:

File	Contents
------	----------

docs	Directory of HTML documentation
makefile	Makefile
rlmVVRB.jar	Java Library (VV=ver, R=rev, B=build)
RlmClient.java	Example rlm application program
INSTALL	Java kit installation script (Unix only)
VERSION	RLM kit version information

The dotnet directory (RLM .NET support – Windows only) contains:

File	Contents
Reprise	Visual Studio 2005 Project Directory for RLM .net support
RLMTest	Visual Studio 2005 Project Directory for RLM .net Test program

Table of Contents

Integrating RLM Into Your Product

OVERVIEW - Software License Management Basics

If you have used other license management products, you can skip this section. If this is your first time, however, we have included an overview of how license management products operate.

RLM is similar in structure to most popular license managers. RLM consists of 3 major components:

1. a client library
2. a license server (RLM has 2 license servers - a generic server called *rlm* and an ISV-specific server.)
3. a text file which describes the licenses granted (the *license file*).

Your application is linked with the client library which provides access to the license management functions.

The license server is used for floating licenses and logging of usage data. Your license administrators also have the ability to control certain aspects of the license server's operations by specifying options in The ISV Options File in the License Administration manual.

The RLM client library (linked into your application) and the license server are both controlled by license authorizations stored in a text file called the *license file*.

Most license managers provide APIs with calls to control many of the aspects of licensing behavior, as well as options within the license servers to control licensing behavior. The design philosophy of RLM is to preserve the simplicity of the system for both ISVs and license administrators by avoiding all unnecessary options in the client library and the license servers and moving all these options to the license file, where they are visible and understandable by everyone. In general, license policy should be kept out of the application and the license server, and placed into the license itself. This makes for a more understandable licensing system for both ISVs and license administrators. The API is simpler, and the license server performs in a more standard way from ISV to ISV. This prevents license management confusion in license administrators. We learned this the hard way when we supported hundreds of customers in the past, and applied these lessons to the design of RLM.

INTEGRATING RLM Into Your Product - The 6 Steps

In order to add license management capabilities to your product, there are 6 main steps:

1. Decide on your Licensing Strategy
2. Create your Keys (public/private key pair)
3. Add RLM API calls to your application
4. Configure and build your RLM Kit
5. Package your software for shipment
6. Create licenses for your customers

These steps are described in the following sections.

1. Decide on your Licensing Strategy

RLM allows you to request and release *licenses* for *products*. The *license* for a product has certain attributes, which are described in the license grant itself (which is contained in the license file). The most basic license attributes are:

- ISV name (you pick this when you purchase RLM)
- Product name
- Highest Version supported
- Node-locked or floating (if node-locked, the node identification)
- Expiration date

Before you integrate RLM into your application, you must decide which products you wish to license and select the *product* names for the licenses. It is generally recommended that you choose names that correspond very closely to the name which your customer purchases - it makes license administration much more straightforward for your customers if the name of the *product* in the license is the same as what they purchased. Note that the *product* name must be less than 40 characters.

In addition, each license request will specify a *version*. The two main strategies for selecting versions are either (a) make the version number match the major version of your software, in which case a new license would be required by your customers for each major release of your product or (b) only change the version in the license request occasionally, when you want to force your customers to purchase a new license.

So, before you start to integrate the code into your application, you should decide:

- Where do you want to request and release licenses
- What is the name of the license(s)
- What license version to request.

(Note: There is more information about these issues in the chapter on Creating Licenses.)

Generally, the first two decisions will stay the same over the life of the software product, while you will update the license checkout version from time to time.

2. Create your Keys (public/private key pair)

Before you use RLM, you need to create a *public-private key pair*. **You should only do this one time**, since the key pair will affect the licenses you create, and you want to be able to process older license keys with newer versions of your software. Note that you should do this once, **not** once per platform you install.

To create your key pair, run the *rlmgenkeys* utility. *rlmgenkeys* creates a pair of files:

- *rlmpubkey.c* - your public key - this gets built into your application and your ISV server
- *rlmprivkey.c* - your private key - this gets built into *rlmsign* to create your license keys

To run *rlmgenkeys*:

```
% cd kit-dir
% cd src
% ../platform-dir/rlmgenkeys
```

Where:

- *kit-dir* is the directory where the RLM kit resides, and
- *platform-dir* is the RLM binary directory for the machine on which you are running.

If you do not share *src* directories on your various platforms, run *rlmgenkeys* once and copy the resulting files to all the other *src* directories you use. Once you have created your key pair and installed it in the *src* directories in all your RLM kits, do a "make" in each kit to update the *rlm.a* library.

You should be *very careful* with these two files. **DO NOT LOSE THEM. Do not allow your private key file (or *rlmsign*) outside your company.** If your private key file (or *rlmsign*) becomes compromised, others will be able to make licenses for your products. Once you generate these files, you should copy them to a safe place where they will not be lost, and where they will be secure.

When you upgrade to a newer version of RLM, you will be asked for the location of these two files, so that the new version will generate compatible keys with your older versions.

3. Add RLM API calls to your application

Everything you need for most applications is contained in the 8 functions in the RLM core API.

These functions are described in Appendix A – you can follow the links in the following table:

```
rlm_init() - initialize licensing operations with RLM.
rlm_close() - Terminate licensing operations with RLM.
rlm_checkout() - Request a license.
rlm_checkin() - Release a license.
rlm_errstring() - Format RLM status into a string.
rlm_stat()- Retrieve RLM_HANDLE status.
rlm_license_stat() - Retrieve RLM_LICENSE status.
rlm_get_attr_health() - Check license status by checking server.
```

If you have special licensing needs that are not addressed by these functions, see [Appendix A – RLM API](#) on page 164 which lists all RLM API functions.

4. Configure and build your RLM Kit

There are 4 configuration items you must complete before you build your RLM kit:

- Install your RLM license.
- Create your public/private key pair, which is done one time only and which was done in step #2, above. (See Create your Keys on page 25).
- Configure your RLM parameters.
- Modify the makefile to change the ISV name "demo" to your ISV name (if you previously installed a demo kit). Note: you can skip this last step if you have an evaluation kit.

To install your RLM license, first retrieve the license from our activation server at <https://hostedactivation.com/reprise-activation/rlm-activation.html> using the activation key given to you when you purchased RLM (keep this key handy, it will not change across versions of RLM or when you buy new platforms). Next, cut and paste the output into the file `src/license_to_run.h` (Note: RLM kits are pre-built with demo license keys which expire in approximately 2 months from the date of kit release, so you may be able to skip this step if you are evaluating RLM).

An example `license_to_run.h` file is shown here (this is a demo license which expired on 1-jul-2007):

```

/*****
        COPYRIGHT (c) 2007-2011 by Reprise Software, Inc.
        This software has been provided pursuant to a License Agreement
        containing restrictions on its use.  This software contains
        valuable trade secrets and proprietary information of
        Reprise Software Inc and is protected by law.  It may not be
        copied or distributed in any form or medium, disclosed to third
        parties, reverse engineered or used in any manner not provided
        for in said License Agreement except with the prior written
        authorization from Reprise Software Inc.

        *****/
/*
   Description:   License to use RLM
   *
   *   Replace the RLM license on the four lines after:
   *
   *       #define RLM_LICENSE_TO_RUN      \
   *
   *   with the license you received from Reprise Software.
   *
   */

#ifdef RLM_LICENSE_TO_RUN
#undef RLM_LICENSE_TO_RUN
#endif

#define RLM_LICENSE_TO_RUN \
    "1-jul-2007 \
    sig=\"c2N250Z4hGt2HCMWNcye*Xe35YI8LGZf0ihLbEfJ8Bfe~zS0IFwu7R78Iyelao\""

#define RLM_ISV_NAME "demo"

```

Your applications and your ISV license server are built from components supplied by Reprise Software. You need to provide 2 custom inputs for the build:

- Your Public Key, for license key verification - `rlm_pubkey.c` - (This was done in step #2, above. See Create your Keys on page 25).
- A file of RLM customizations called `rlm_isv_config.c` (this file is contained in the `src` directory on the kit)

`rlm_pubkey.c` is created by the `rlmgenkeys` utility. You should run this **only once** to create your public/private key pair. Once you create these files, save them - if you lose one of these files, you will no longer be able to generate license keys compatible with older versions of your software.

Customizing RLM with `rlm_isv_config`

`rlm_isv_config.c` contains calls to:

- set up your ISV name
- install your RLM license (do not change this call)
- specify the oldest server your application can use
- specify the range of servers your settings file works with
- enable the server to run on virtual machines
- enable roaming on servers that use transient hostids
- create “single” licenses when licenses are roamed, instead of uncounted
- disable the RLM clock windback detection for expiring licenses
- create a FLEXlm-compatible lock file
- enable or disable Windows disk serial numbers which require admin access to use
- enable disconnected license transfer
- enable or disable client-side broadcast to find the license server
- disable the use of the generic license server
- enable license client-side caching
- enable license server security checks
- register ISV-defined hostids
- include or exclude code for optional hostids (e.g., dongles, etc)
- specify the types of hostids which Activation Pro will accept
- specify the URL of your activation server (for Alternate Server Hostids)
- disable the file id check and native hostid check for rehostable hostids
- enable the remote time extension of roaming licenses.
- Define isv-defined encryption handshake for the rlm web services API
- specify the promise interval for HTTPS communications.
- Specify hostid types that are disabled.

Edit this file before compiling your *isv* server, license generator, or applications.

NOTE: your ISV name is, in general, case-insensitive. The *ONLY EXCEPTION* to this rule is in the case of FLEXlm-compatible lock files. Since FLEXlm uses case-sensitive ISV names, the lockfile name must be case-sensitive. Therefore, if you are creating a FLEXlm-compatible lockfile, you should enter your ISV name in the *exact case* as in FLEXlm. The case of the name will affect the lockfile name, but only the lockfile name. Everywhere else in RLM, your *isv* name will be converted to lowercase.

Once you have created these 2 files you create your ISV server by typing "make" in the kit directory, and you are ready to link your applications with the RLM libraries.

An example `rlm_isv_config.c` file is shown here:

```

/*****

    COPYRIGHT (c) 2005, 2017 by Reprise Software, Inc.
    This software has been provided pursuant to a License Agreement
    containing restrictions on its use.  This software contains
    valuable trade secrets and proprietary information of
    Reprise Software Inc and is protected by law.  It may not be
    copied or distributed in any form or medium, disclosed to third
    parties, reverse engineered or used in any manner not provided
    for in said License Agreement except with the prior written
    authorization from Reprise Software Inc.

*****/

    COPYRIGHT (c) 2005, 2017 by Reprise Software, Inc.
    This software has been provided pursuant to a License Agreement
    containing restrictions on its use.  This software contains
    valuable trade secrets and proprietary information of
    Reprise Software Inc and is protected by law.  It may not be
    copied or distributed in any form or medium, disclosed to third
    parties, reverse engineered or used in any manner not provided
    for in said License Agreement except with the prior written
    authorization from Reprise Software Inc.

*****/

/*
 *   Description:      rlm_isv_config.c - configuration data for ISV
 *
 *   M. Christiano
 *   11/25/05
 */

#include "license.h"
#include "license_to_run.h"

/*
 *   Define "INCLUDE_RLMID1" to include support for RLMID1 dongles.
 *   Comment out to remove aladdin dongle support.
 *
 *   Note: The RLMID1 dongle code is always included in
 *   your license server.  This setting is only for your applications, and
 *   only needs to be set if you are issuing licenses that are nodelocked
 *   to a dongle.
 *
 *   Including the RLMID1 dongle code increases the size of
 *   your applications by approx 900Kb on 32-bit windows, plus involves
 *   a small delay at application startup time, even if you are not using
 *   a dongle.
 *
 *   If you are not planning to issue licenses which are node-locked to
 *   rlmid devices, Reprise Software recommends leaving these options turned
 *   off (ie, leave the "#if 0" on the next line).
 */

#if 0
#define INCLUDE_RLMID1
#endif

#ifdef INCLUDE_RLMID1
extern void _rlm_gethostid_type1(RLM_HANDLE, L_HOSTID);
#endif

void
rlm_isv_config(RLM_HANDLE handle)
{
/*
 *   Set ISV name
 *
 *   NOTE: IF you are evaluating RLM, DO NOT change the ISV
 *   name, or your license keys will no longer work.
 *   For eval kits, the name on the next line MUST
 *   be "demo".
 *
 *   NOTE: Your ISV name is, in general, case-insensitive.
 */

```

```

*      The ONLY exception to this is when it is used as
*      a lockfile name using a FLEXlm-compatible lockfile.
*      In this case (and this case only), the case of the
*      name you enter here is important. Note that even in
*      this case, ONLY THE LOCKFILE NAME uses the exact case
*      you enter - every other place in RLM uses a lowercase
*      version of this name.
*
*      Beginning in RLM v7.0, your ISV name is contained in
*      "license_to_run.h". If you need to alter the case of the
*      name for a compatible FLEXlm lockfile, you should do it there
*      and leave the next line as it is.
*/
    rlm_isv_cfg_set_name(handle, RLM_ISV_NAME);

/*
*      Set RLM license - do not modify this line
*/
    rlm_isv_cfg_set_license(handle, RLM_LICENSE_TO_RUN);

/*
*      Set oldest allowed server version.
*
*      The next setting controls the oldest RLM license server
*      version with which your application will work.
*
*      The 3 parameters are rlm version, revision, and build (in
*      that order).
*
*      If you leave this set to 0, 0, 0, your application will
*      attempt to work with the oldest available RLM server.
*
*      You should only set this if you are concerned with an older
*      server in the field which has been hacked, otherwise, you should
*      leave it set to 0, 0, 0.
*
*      (Note: Do not set this to anything between 0,0,0, and
*      9,0,0). Servers older than v9.0 will appear to be v0.0)
*/
    rlm_isv_cfg_set_oldest_server(handle, 0, 0, 0);

/*
*      Set ISV server settings file compatibility
*
*      The next setting controls what versions of RLM your
*      ISV server settings file will work with. You can enable
*      it for all earlier versions (> v6), or later versions or both.
*      The 2nd parameter enables earlier versions if non-zero, the
*      3rd parameter enables later versions if non-zero. Note that
*      "earlier" and "later" are relative to the version of your
*      settings file. So, if you create the settings file with RLM v8,
*      "earlier" means v6 and v7, while "later" means v9 and above.
*
*      default is: rlm_isv_cfg_set_compat(handle, 0, 1); - sets compatibility
*                  with later versions, but not earlier ones.
*/
    rlm_isv_cfg_set_compat(handle, 0, 1);

/*
*      Setup virtual machine enable/disable.
*
*      By default (if you do not modify the following call), RLM
*      will refuse to run a license server on a virtual machine.
*      If you want license servers to run on virtual machines, set the 2nd
*      parameter of the next call to a non-zero value.
*/
    rlm_isv_cfg_set_enable_vm(handle, 0);

/*
*      Beginning in RLM v10.0, roaming is disabled for servers that
*      use transient hostids (ie, dongles, or ISV-defined transient hostids).
*      If you want to enable roaming on these servers, set the 2nd

```

```

*      parameter of the next call to 1.
*/
    rlm_isv_cfg_set_enable_roam_transient(handle, 0);

/*
*      Beginning in RLM v10.0, you have the option of turning ROAMED
*      licenses into "single" licenses. Prior to RLM v10.0, all ROAMED
*      licenses were nodelocked, uncounted.
*      If you want your roamed licenses to be "single" licenses, set the
*      second parameter of the next call to 1.
*/
    rlm_isv_cfg_set_roam_single(handle, 0);

/*
*      Beginning in RLM v10.0 it is possible to disable the clock windback
*      check. In previous versions it was always enabled. Passing a 1 in
*      the second argument of the following function call disables the
*      windback check; passing 0 leaves it enabled (the default).
*/
    rlm_isv_cfg_disable_clock_windback_check(handle, 0);

/*
*      FLEXlm(R)-style lockfile compatibility.
*
*      Set to non-zero to use a FLEXlm-style lockfile. For windows
*      systems, a value of 1 uses the 'C' drive always, whereas a
*      value > 1 will use the system drive. FLEXlm (up to version
*      10.3, at least) puts the lockfile on the 'C' drive.
*
*      Reprise Software recommends setting this to 1 if you want to
*      use FLEXlm-compatible lockfiles.
*/
    rlm_isv_cfg_set_use_flexlm_lockfile(handle, 0);

/*
*      The Windows disk serial number hostid code can return hostids
*      that are usable only by processes running with admin rights if
*      running with admin privileges. If an application is installed
*      and a license activated by an admin user, it's possible that
*      a non-admin user will not be able to use the application because
*      it can't read the disk serial number. Beginning in RLM v10.0,
*      you can disable the use of disk serial number hostids that are
*      usable by admins only. If you want to do so, change the second
*      parameter of the next function to 0.
*/
#ifdef _WIN32
    rlm_isv_cfg_set_use_admin_disksns(handle, 1);
#endif

/*
*      Beginning in RLM v10.0, RLM's license transfer capability also
*      allows for disconnected operation on the destination server.
*      This capability only requires that an "rlm_roam" license be
*      present on the destination server. You can ship an rlm_roam
*      license to your customer and have them install it on every
*      destination server, or you can simply put it into the next
*      call, in which case, no separate license file will be needed
*      on the destination license server.
*
*      To enable this, set the 2nd parameter of the next call to a valid,
*      signed rlm_roam license (enclosed in "<>") in place of the
*      last argument. This license should be a static string
*      which is available for the lifetime of the server.
*
*      This license MUST have the following parameters:
*          version: "1.0"
*          exp: "permanent"
*          count: "uncounted"
*          hostid: "any"
*          NO other parameters
*
*      for example:
*
*      rlm_isv_cfg_set_server_roam(handle, "<LICENSE your-isvname rlm_roam 1.0
uncounted hostid=any sig=xxxxxxx>");
*/
    rlm_isv_cfg_set_server_roam(handle, (char *) 0);

```

```

/*
 * Beginning in RLM v10.0, RLM can broadcast to find a license
 * server as a last resort, if all the normal methods to find
 * the server fail. This capability is enabled by default.
 *
 * To disable this, set the 2nd parameter of the next call to 1.
 */
rlm_isv_cfg_disable_broadcast(handle, 0);

/*
 * Beginning in RLM v11.0, the client can specify that
 * it will not use a generic license server.
 * If you want to disable generic servers, set the 2nd
 * parameter of the next call to 1.
 * If you disable generic servers and your application
 * attempts to connect to a generic server, it will
 * receive an RLM_EH_SERVER_REJECT error upon connection
 * or an RLM_EL_SERVER_REJECT upon license checkout.
 * The text error message is "Server rejected client".
 *
 * Pre-v11 clients will get a "Communications error with
 * license server (-17), Connection refused at server (-111)"
 * error in this case.
 *
 * Reprise Software does not recommend disabling the generic server.
 */
rlm_isv_cfg_disable_generic_server(handle, 0);

/*
 * Beginning in RLM v10.1, licenses can be cached on the client
 * side with the use of the "client_cache" license attribute.
 * This capability must be enabled with the following call.
 * If the 2nd parameter is 1, client caching is enabled, if 0,
 * caching is disabled.
 * Note: this call has no effect on HP systems.
 */
rlm_isv_cfg_enable_client_cache(handle, 1);

/*
 * Beginning in RLM v10.1, license servers can return one
 * valid license to the application which is then verified on
 * the client side. This check helps ensure that the license
 * server hasn't been modified. To enable this checking set
 * the second parameter of the next call to 1. If you enable
 * this, please read the section titled "Server Integrity Checking"
 * in the "Securing Your Application" section of the Reference
 * Manual so that you understand the errors which can be generated
 * as a result of this call and how you should proceed.
 */
rlm_isv_cfg_enable_check_license(handle, 0);

/*
 * Beginning in RLM v11.0, you can specify which types of
 * hostids that Activation Pro will accept from an activation
 * request. Prior to v11.0, the only 6 types of acceptable
 * hostids were: rehostable, isv-defined, rlmid, ethernet,
 * disk serial numbers and native 32-bit hostids.
 * In the following call, you can set the default hostids that
 * your Actpro server will accept. To get the pre-v11 behavior,
 * (plus alternate server hostids) set the 2nd parameter as shown.
 * Hostid type definitions are in license.h
 *
 * Note: RLM_ACTPRO_ALLOW_ISV is the old ISV-defined hostid.
 * RLM_ACTPRO_ALLOW_ISVDEF is the isv-defined string as a hostid.
 *
 * The default for any RLM version going forward is defined
 * in license.h/RLM_ACTPRO_ALLOW_DEFAULT
 */
#if 0
{
  int allowed_types = RLM_ACTPRO_ALLOW_REHOST | RLM_ACTPRO_ALLOW_ISV |
                    RLM_ACTPRO_ALLOW_RLMID | RLM_ACTPRO_ALLOW_ETHER |
                    RLM_ACTPRO_ALLOW_DISKSN | RLM_ACTPRO_ALLOW_32 |
                    RLM_ACTPRO_ALLOW_ASH;

```



```

        rlm_isv_cfg_actpro_allowed_hostids(handle, allowed_types);
    }
#endif

/*
 * Beginning in RLM v11.2, license servers can utilize
 * Alternate Server Hostids. These hostids are activated
 * from Activation Pro by the ISV server, which needs to
 * know the URL of the activation server.
 * If you use Reprise's hosted activation service, the default
 * (hostedactivation.com) is correct. For all others, set your
 * activation server url here. Note that this URL pointer must
 * remain valid as long as the RLM_HANDLE is in use.
 */
/** rlm_isv_cfg_set_url(handle, "hostedactivation.com"); **/

/*
 * Rehostable hostids do two checks at verification time which
 * fail on certain systems. These checks are:
 * - checking the file ID of each file in the rehostable hierarchy, and
 * - checking the native hostid of the system
 *
 * The file ID check fails on Windows systems if drives are added or
 * removed from the controller.
 * We have seen the native hostid change on Centos systems when the
 * network cable is unplugged.
 *
 * Beginning in RLM v12.3, you can disable one or both of these
 * checks by setting the second parameter of the two following
 * calls to 1. The default behavior remains the same as in
 * previous versions of RLM.
 */
rlm_isv_cfg_disable_windows_fileid_check(handle, 0);
/* 0 -> check, <0 -> no check */
rlm_isv_cfg_disable_reference_hostid_check(handle, 0);
/* 0 -> check, <0 -> no check */

/*
 * If you want to add ISV-defined hostids to the ISV server,
 * use code similar to the following for each new hostid type
 * you would like to add.
 *
 * Note: beginning in RLM v11.3, Reprise Software recommends
 * using the isv-defined string as a hostid rather than integrating
 * ISV-defined hostid code into your application and license server.
 * This preserves your ability to use the ISV server settings file
 * and the Activation Pro license generator settings file rather than
 * building custom binaries for these two programs.
 */

/*
 * Roam extension is a new feature in RLM v12.3, and it is disabled
 * by default. If you enable it, be aware that the max_roam setting
 * from your rlm_roam license will NOT be honored for a roam extension,
 * only the max_roam setting of the license which is roaming. This means
 * that if you use max_roam on the rlm_roam license to limit roaming
 * duration on your licenses, it will not be effective for any roam
 * extension. The default max_roam on any license is 30 days, so this
 * may or may not be an issue for you.
 *
 * To enable roam extensions, set the 2nd parameter of the next call
 * to 1. If you use a server settings file, you must re-generate the
 * settings file with your v12.3 kit, otherwise, the roam extension will
 * not appear in the RLM web interface.
 */
rlm_isv_cfg_enable_roam_extend(handle, 0);set

/*
 * New in v12.4, the RLM web services API (used with RLMcloud) has an
 * isv-defined server handshake function. To use this, specify the 2
 * parameters to the server-side of the algorithm here. P1 and P2 are
 * any 32-bit non-zero positive numbers, ie, > 0 and <= 0x7fffffff
 * Avoid long sequences of 0's or 1's in P1.
 *
 * This handshake algorithm is separate from the normal RLM client-

```

```

*      server handshake, and these parameters will not affect non-web-
*      services handshakes.
*
*      NOTE: CHANGE THE DEFINITIONS of P1/P2 that appear here.
*/
#define P1 0x39a74d25
#define P2 0xa9d75
    rlm_isv_cfg_set_isv_handshake(handle, P1, P2);

/*
*      In RLM v14.0, transport to the license server can be over HTTPS.
*      If you are enabling this capability (available on RLMCloud only),
*      you need to set the "promise" value that is used on the RLMCloud
*      helper which connects to the license server. You can make this
*      call here, and anywhere in your application. The default is
*      set to 10 minutes here, which means you need to send heartbeats
*      to the server every 5-7 minutes to avoid the license being
*      reclaimed automatically. The promise value is in minutes.
*/
    rlm_isv_cfg_set_http_promise(handle, 10);

/*
*      Beginning in RLM v14.0, you can disable certain RLM hostid types.
*      In the following call, you can set the hostids that your product
*      (or license server) will NOT accept. If the 2nd parameter of this
*      call is 0, all RLM hostids are allowed.
*
*      OR the values of the hostids you want to disable into a single
*      integer and pass this as the 2nd argument. For example:
*
*          int disable = RLM_DISABLE_H_USER | RLM_DISABLE_H_HOST;
*          rlm_isv_cfg_disable_hostids(handle, disable);
*
*      The bitmasks for Hostid Types that can be disabled are (in license.h also):
*          RLM_DISABLE_H_32BIT   RLM_DISABLE_H_STRING   RLM_DISABLE_H_ETHER
*          RLM_DISABLE_H_USER    RLM_DISABLE_H_HOST     RLM_DISABLE_H_IP
*          RLM_DISABLE_H_ANY     RLM_DISABLE_H_DEMO     RLM_DISABLE_H_SN
*          RLM_DISABLE_H_RLMID1  RLM_DISABLE_H_RLMID2   RLM_DISABLE_H_GC
*          RLM_DISABLE_H_DISKSN  RLM_DISABLE_H_IPV6     RLM_DISABLE_H_UUID
*/
    {
        int disable = 0; /* Disable nothing, ie, pre-v14 behavior */
        rlm_isv_cfg_disable_hostids(handle, disable);
    }

#if 0
    stat = rlm_add_isv_hostid
    (
        handle, /* RLM_HANDLE passed in */
        "keyword here", /* Hostid keyword you chose */
        YOU_DEFINE_HOSTID_TYPE, /* Your hostid type (int)
                                > RLM_ISV_HID_TYPE_MIN */
        transient, /* (int) == 0 if hostid does not
                    change.
                    Non-zero if it does change, e.g., if
                    your hostid is a dongle, it can
                    change if someone unplugs it, so
                    you should set transient non-zero */
        get_type_hostid /* Your function to determine the
                          hostid value */
    );
    if (stat)
    {
        printf("ERROR: add hostid type returns %d\n", stat);
    }
#endif

/*
*      To include RLMID1 dongle code, be sure INCLUDE_RLMID1 is defined above.
*/

#ifdef INCLUDE_RLMID1
    rlm_isv_cfg_set_use_hostid(handle, RLM_HOSTID_RLMID1,
                               _rlm_gethostid_type1);
#endif
}

```

5. Package your software for shipment

With RLM, you specify nearly all licensing options in the actual license that you ship to your customers. However, there are a few issues that you need to consider before you ship your application:

- Review the RLM API calls you make in your application to be sure that you use product names that are suitable (we strongly recommend using the name of the product that is in general use), and that the version numbers are correct. If you intend for your customers to be able to use old licenses from your product, be sure that the version number in the *rlm_checkout()* call is appropriate.
- If we have provided you with special debug libraries, make sure you use the non-debug libraries from the standard kit for your release.
- Review the options you used to Build Your License Server.
- Ensure that you have included The rlm Server, Your ISV Server, and the RLM License Administration Tools (*rlmutil*, *rlmhostid*, *rlmread*, *rlmswitch*, etc) in your distribution kit.
- If you use the optional rlmID1 hardware keys with your product, make sure you ship the Aladdin utilities with your distribution kit. See Appendix F – Optional Hostid Installation Instructions on page 256 for more details.
- Review the Best Practices for RLM Integration section and ensure that your product and installation are well-behaved.

6. Create licenses for your customers

When you ship your product to your customers, it will require a license to run. Generally, you want to grant different license rights to each customer. In order to do that, you create a unique *license file* for each customer.

Format of the license file

The license file consists of lines of readable text which describe the license server node, some parameters of the license server binaries, and the actual license grants to your customers. For a complete description of the license file format, see *The License File* on page 44.

Types of Licenses

While there is a single format for the license file, the licenses you create can have many different meanings. For more details, see *Creating Licenses* on page 68.

License creation tool

RLM is shipped with a license creation tool called *rlmsign* which can be integrated into your fulfillment process. This tool reads a template license file and computes the *license key* for each license contained in the file. This license key authorizes the license and prevents tampering with the other license parameters. For more information on *rlmsign*, see *Creating Licenses* on page 68.

License creation API

In some cases, it is more convenient to build the license in-memory and sign that license directly before it is written to a file. In general, it is better to create the licenses in a file and use *rlmsign* to sign the licenses, however an API call, *rlm_sign_license()*, is available for cases where this is not practical. For details on the usage of *rlm_sign_license()*, see *Appendix A - RLM API* on page 164.

NOTE: Do not call *rlm_sign_license()* in an application or utility that ships to customers. Doing so will cause your private key to be included in the application executable or binary, which could expose it to hackers, possibly enabling them to create counterfeit licenses for your product.

License creation GUI

In addition to *rlmsign* and *rlm_sign_license()*, RLM provides a GUI for license generation, *rlmgen*. The *rlmgen* program is described in *Creating Licenses – rlmgen* on page 71.

Internet Activation

RLM Activation Pro allows the ISV to give a customer an *activation key* which then allows the customer to retrieve their license from the ISV website at a later time. The *activation key* is a short string (resembling a credit-card number) which can be generated in advance. Once the customer knows the system where they wish to use the software, the RLM activation software creates the license and transmits it to the user, creating the license file for them. Details of RLM activation are in the RLM Activation Pro manual. RLM Activation Pro is an optional product.

Reserved Product Names

In general, your product names need only be unique to your company. However, any product name beginning with the 4 characters "rlm_" is reserved. Currently, the following Product Names are in use:

- *rlm_demo* - This product name is used by RLM to enable ***Detached Demo***TM licenses for your products.
- *rlm_failover*, *rlm_failover_server* - This product name is used by RLM to enable failover license servers on a customer-by-customer basis.
- *rlm_roam* - This product name is used by RLM to enable license roaming for your products.
- *rlm_server* - This product name is used by RLM to create alternate hostids for license servers. Also note that the *rlm_server* license will not be visible in status requests, or in *rlm_products()* calls.
- *rlm_server_enable_vm* - This product name is used by RLM to enable license servers to operate on a particular virtual machine. (Note that you can enable your server to work on all virtual machines by calling *rlm_isv_cfg_set_enable_vm()* with the second parameter set to a non-0 value.) Also note that the *rlm_server_enable_vm* license will not be visible in status requests, or in *rlm_products()* calls as of RLM v9.0.
- *rlm_no_server_lock* - This product name is used to configure your ISV server so that multiple copies can be run on a single system. This should be done for in-house use of your ISV server only, for example, when supporting cloud computing with a number of your customers. Note that the *rlm_no_server_lock* license will not be visible in status requests or in *rlm_products()* calls. The reason this is for in-house use only is because if an license

administrators could run multiple copies of your ISV server he could serve the same license file from each copy, thus multiplying the number of licenses you intend for him to run.

Note also that license *replace* processing uses the single-character product name '*' to indicate all licenses, so you should avoid a product name of "*".

The first 5 steps are done once or perhaps once per release of your software. The final step is done each time you sell your software to a customer. You might also want to take a look at the RLM Example Client Program, in appendix C.

Using RLM with the Visual Studio GUI

If you use the Visual Studio GUI interface on Windows, the procedure to configure the RLM libraries is as follows:

- In a command window, build the RLM SDK as specified in Installing RLM. You need do this only once per release of RLM.
- In your project settings / properties in Visual Studio:
 - Under C/C++, add **<RLM SDK path>\src** to the Additional Include Directories (where **<RLM SDK Path>** is the path to the installed RLM SDK)
 - Under the Link/Input/Additional Dependencies or Additional Library Path, add **<RLM SDK path>\<platform>\rlmclient.lib** (where **<platform>** is **x86_w3, x86_w4, x64_w3, or x64_w4**.)
 - Under the Link Command Line or Project Options section, make sure the following libraries are included:
 - ws2_32.lib
 - Advapi32.lib
 - Gdi32.lib
 - User32.lib
 - winhttp.lib
 - netapi32.lib
 - kernel32.lib
 - oldnames.lib
 - shell32.lib
 - wbemuuid.lib
 - commsupp.lib
 - ole32.lib
 - oleaut32.lib
 - libcmt.libIn addition, include these libraries if you're using VC++ 2015 or later:
 - libvcruntime.lib
 - libucrt.lib

Then you will be able to use RLM in your project without leaving the GUI.

Using optional RLMID hostids

RLM supports a number of optional hostid choices. These are generally called *rlmidN*, e.g. *rlmid1*. Each of these optional hostids has individual requirements when you build your software and when you ship it.

RLM currently supports one optional hostid choice:

- *rlmid1* - a hardware key manufactured by Aladdin Knowledge Systems (now SafeNet, Inc.)

Each optional hostid has specific requirements both when you build your product and when you ship it. In addition, each optional hostid is available only on certain platforms.

Your license server (and the generic server) will be pre-built to support all *rlmid* devices on all supported platforms, so you are already enabled to use *rlmid1* hardware keys as a server hostid. This means that if you only want to use *rlmid1* devices to lock your license server, there is nothing more to do.

In your application, however, you need to enable the various *rlmid* hostids should you choose to use the particular hostid for nodelocked licenses.

Platform Support

The following table lists the first RLM version in which support is available for the particular *rlmid* device. Only the listed platforms are supported.

platform	rlmid1
x86_l2	v11.1
x64_l1	v11.1
x86_w1	v5
x86_w2	v5
x86_w3	v9
x86_w4	v12.0
x64_w2	v5
x64_w3	v9
x64_w4	v12.0

Startup Delay

Adding support for *rlmid* devices will cause your application to experience a short delay at startup time. We tested the following scenarios, using a loop of 2000 iterations which does *rlm_init()*, *rlm_checkout()*, *rlm_checkin()*, and *rlm_close()* of an uncounted license, on a 3GHz AMD desktop system:

Scenario	Total time	loops/second	seconds/loop
no <i>rlmid</i> support, license locked to ANY	30 seconds	66.67	0.015
<i>rlmid1</i> + <i>rlmid2</i> support, license locked to ANY	37 seconds	55.55	0.018
<i>rlmid1</i> + <i>rlmid2</i> support, license locked to <i>rlmid1</i>	40 seconds	50	0.02

rlmid1

The `rlmid1` devices are manufactured by SafeNet (formerly Aladdin Knowledge Systems). They are a small purple USB hardware key containing an internal serial number. The `hostid` is printed on the outside of the key as "`rlmid1=xxxxxxx`" where `xxxxxxx` is the serial number (`hostid`) of the key.

Enabling `rlmid1` devices in your application

Windows kits contain everything required to use the optional `rlmid` `hostids`, and support is configured into the ISV server by default - no additional installation steps are required. However, client-side support is not included by default, and you must follow these instructions to add support for using `rlmid1` devices in your application.

Proceed as follows:

In order to enable `rlmid1` devices for nodelocking in your application, locate the following 3 lines in `rlm_isv_config.c`:

```
#if 0
#define INCLUDE_RLMID1
#endif
```

and change the first line from "`#if 0`" to "`#if 1`". Re-build your `rlm` client library (by typing "`make`" on Unix, or "`nmake`" on Windows).

When you re-link your application, you will need to include the library `rlmid1.lib` (on Windows) or `rlmid1.a` (on Linux) from the RLM binary directory.

At this point, your application is enabled to use `rlmid1` devices. You will notice that your application grows by approx 900kb on Windows, and there will be a short delay the first time you request a license, when RLM attempts to determine the ID of any `rlmid1` devices connected to the local system.

For information on shipping your product with `rlmid1` devices, see Appendix F – Optional `Hostid` Installation Instructions on page 256.

Advanced API Functions

There are some options you can set within your application. Generally, the defaults will work, but if you want more control, you can look at Appendix A for a description of all the available RLM API functions.

Clock Tampering Detection

RLM will attempt to check for system clocks that have been set back when it checks out a license that expires. This check will happen in the license server for floating licenses or in the client for node-locked licenses. This check is automatic; you do not need to modify your application in any way to effect this check.

RLM `hostids`

RLM supports several different kinds of identification for various computing environments, as well as some generic identification which are platform-independent.

RLM's host identification (hostid) types are:

hostid type	meaning	example	Notes
ANY	runs anywhere	hostid=ANY	
DEMO	runs anywhere for a demo license	hostid=DEMO	
32	32-bit hostid, native on Unix, non X86 based platforms	hostid=10ac0307	Volume serial number on windows, not recommended
disksn (See note below)	Hard disk hardware serial number	hostid=disksn=WD-WX60AC946860	Windows only
ip (or internet)	TCP/IP address	hostid=ip=192.156.1.3	always printed as "ip="
ether	Ethernet MAC address	hostid=ether=00801935f2b5	always printed without leading "ether="
uuid	BIOS uuid	uuid=699A4D56-58BF-1C83-D63C-27A8BEB8011A	Windows only
user	User name	hostid=USER=joe	
host	Host name	hostid=host=melody	

To determine the hostid of a machine, use the hostid type from the table above as input to the *rlmhostid* command:

```
rlmutil rlmhostid hostid type
```

For example:

```
rlmutil rlmhostid 32
or
rlmutil rlmhostid internet
```

When an application requests a license from a license server, it will transmit the hostid information from the local machine to the license server, so that the server can process node-locked licenses without additional queries to the application. The application will transmit a maximum of 25 different hostids:

- one 32-bit hostid, if present on this platform
- one Disk serial number (windows only)
- one IP address
- up to 8 ethernet MAC addresses (ether=)
- a minimum of 3 ISV-defined hostids (usually more, but guaranteed to be at least 3)

A Note about Windows disksn hostids

Some disk serial numbers on Windows are only accessible to a process running with admin privileges. To disable use of disk serial numbers that only admins can use, see the call to *rlm_isv_cfg_set_use_admin_disksns()* in *rlm_isv_config.c*".

Note: Beginning in RLM v3.0, IP address hostids can contain the wildcard (*) character in any position to indicate that any value is accepted in that position.

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Best Practices for RLM Integration

Our experience supporting thousands of FLEX lm ISVs and license administrators has taught us that certain design decisions can cause long-term support problems. While we have made every effort to remove options from RLM which cause license administrator confusion with little corresponding benefit, there are still things that you can do to make things easier for your customer's installation and support.

In this section, we attempt to provide a framework for how *well-behaved* applications use RLM. Adherence to these guidelines, while not strictly mandatory, will be greatly appreciated by your license administrators who will see more consistent implementations from ISV to ISV. This will also translate into support savings for you, as applications from different ISVs will behave in a more consistent fashion.

Product names

The name you use to check out a license for a product should be as close to the name of the product you sell as possible. Fewer checkouts per product are generally better from an license administrator support and understanding standpoint. In the early days of license management, companies literally "went crazy" adding checkout calls to smaller and smaller pieces of their application, which resulted in several licenses required to run one product. Resist the temptation to do this. If your product is a schematic editor, you probably don't need checkout calls to license the code that reads and writes the data files. You might, but probably not.

Reprise Software considers it best practice to:

- **Use the name from your price list** in the `rlm_checkout()` call, or a name as close to this as possible.
- **Use as few `rlm_checkout()` calls as possible** to accomplish your licensing strategy. Why? See Use Few Checkout Call, below
- **AVOID THE USE of license text fields** (such as customer, contract, etc) to control how your application behaves, other than presenting this data to the user.
- **DO NOT USE the `rlm_license_xxxx()` calls** (other than `rlm_license_akey()`, `rlm_license_count()` and `rlm_license_stat()`) to do anything beyond displaying information to your user.

Installation of your product and finding the licenses for it to operate

When you integrate RLM into your product there are issues concerning delivery of your product and the licenses for it to operate. As you already know from the chapters on Integrating RLM Into Your Product, and The License File, there are a few ways that your application and license server can locate the licenses they need to operate:

- licenses present in your product's binary directory, and
- options you provide to your user to specify a license location, and
- RLM_LICENSE (or <ISV>_LICENSE) environment variable

Reprise Software considers it best practice to:

- **AVOID using RLM_LICENSE or <ISV>_LICENSE** as part of your installation scripts or adding definitions of these variables to your user's environment. If you want to set a default license file, you should do this by locating the license file (or a link to the license file) in the directory with your binaries, or by using the optional license location in the first parameter to `rlm_init()`.

- **ALWAYS** leave `RLM_LICENSE` and `<ISV>_LICENSE` environment variables unset - so the license administrator can override any defaults you have specified.
- **ALWAYS** provide the path to your binary as the second parameter to `rlm_init()`. In this way, your license administrators will know that they can put the license file (or a link) in this directory and it will be the "last resort" license file to be used.
- If you are not using an ISV-defined `hostid`, *ship the ISV server settings file* rather than the `isv` server binary. Using the settings file means that your server side executables are completely generic, and your customers can upgrade RLM versions and get bug fixes via a download from Reprise, and you have no ISV server build-test-release cycle to go through.
- **Include a folder for licenses in your installed product folder tree.** In this folder, if you ship floating licenses, you would create a license file with a single `HOST` line similar to the following:

```
HOST myservers any 5053
```

(Note that this `HOST` line does not need a valid `hostid`, only a correct `port#` and `hostname`). At runtime, your application passes the path to this directory as the first argument to `rlm_init()`. Then any license you ever issue - an expiring demo license, a production `nodelocked` license, or a license file simply containing a `HOST` line as described above - goes in one or more `.lic` files in that licenses folder. Given that you have passed the path to that directory to `rlm_init()`, your application will always be able to find the licenses.

Use Few Checkout Calls

The recommendation to use as few checkout calls as possible is made in response to our experience in talking with many license administrators. In general, the more fragmented into separate license domains an application becomes, the less license administrators understand the licensing behavior and the less satisfied they are. In an ideal world (from the license administrator's point of view), an application would need to check out 1 license in order to run, and the name of that license would be the name of the application.

In practice, it's often quite reasonable for ISVs to use multiple license names in an application - just keep it within reason. A good rule of thumb is to use distinct licenses for things you charge extra money for. It seems obvious, but many ISVs have gone far, far beyond that - to the dissatisfaction of their customers.

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The License File

The license file contains information which configures the license servers and describes all the licenses granted from the ISV to your customer. There are 4 basic license types:

- **counted**
- **uncounted**
- **token**, and
- **metered**

Everything else in the license file is a modification of one of these 4 basic license types. For example, if a counted license has a *hostid* associated with it, it becomes a ***nodelocked, counted*** license. If the counted license has no *hostid*, it is a ***floating*** license. The various attributes modify the basic license types. For example, if a counted license has a *share=* attribute, then multiple application instances can use a single license. If the license file has counted or metered licenses, it requires a license server, so a *HOST* and *ISV* line must be present. If the license file has only uncounted licenses, the *HOST* and *ISV* lines are not required.

License Files have 6 types of lines:

1. *HOST* Lines that specify the license server host (*SERVER* is an alias for *HOST* – see *HOST* Line on page 47)
2. *ISV* Lines which specify the ISV's license server information (*DAEMON* is an alias for *ISV* – see *ISV* Line on page 48)
3. *LICENSE* Lines which describe license grants from the ISV to your customer (*FEATURE* is an alias for *LICENSE* – see *LICENSE* Line on page 49)
4. *UPGRADE* lines which upgrade the version number of some or all *LICENSE*s, (see *UPGRADE* Line on page 64)
- 5.. *CUSTOMER* lines (for RLMCloud only) (see: *CUSTOMER* line on page 66)
6. Comment lines (see next section)

Applications, License Servers, and License Administration Tools locate the license file using The License Environment.

NOTE: RLM does not support byte order markers (BOMs) in license files. If a BOM is present in a license file, RLM will not recognize the content.

Comments in license files

Lines beginning with '#' are treated as comments and not interpreted by RLM. Comments may be added to a license file without invalidating the signatures of licenses, but should not be added between the lines of a multiple-line license. Here is an example:

```
#
# Licenses served by host gt2
#
HOST gt2 0000a74f88ce 5053
ISV reprise
#
# Original license for v3.0 (10 seats)
#
LICENSE reprise joe 3.0 permanent 10 _ck=f81efcf79a
sig="60PG451KTXVQ0WYBX785XAKTDKUCHB7T683Y2MG22M088S8UAFR0VKPMFGPKH
4XW4H5QQ8JSFFJG"
#
# v4.0 license (5 additional seats)
#
LICENSE reprise joe 4.0 permanent 5 _ck=3blefcd48c
```

```
sig="60P045145JSKEJSR48V3GXCX29S8TM5TKE91TS022HW0XAEWH82DRTCJB830AW
EV62MUE2N7C"
```

Note that prior to RLM v9.3, the comment character was not strictly required on comment lines. With improved error checking in 9.3 however, the comment character is required.

Special License Names

Any product name beginning with "rlm_" is reserved to Reprise Software.

The product name *rlm_roam* is treated specially by RLM. *rlm_roam* indicates that roaming has been enabled by an ISV. If an ISV issues an *rlm_roam* license, then roaming is enabled on any computer which is able to check out the *rlm_roam* license while in a disconnected state.

Legal characters in the license file

In general, all license file fields are white-space delimited, meaning that no data item can contain embedded spaces, tabs, newlines or carriage returns. In addition, the following six characters are illegal in data items in the license (and options) file except as noted below: "<", ">", "&", single quote ('), back-quote (') and double-quote ("). ISV license names cannot begin with the characters "rlm_". As of RLM v12.2, "<", ">", "&", single quote(') and back quote(') are legal characters in the customer field.

Note that all lines in license files as well as option files (RLM or ISV) **must** be shorter than 1024 characters. Anything over 1024 characters will be truncated.

Everything in the license file is case-insensitive, with the following three exceptions:

- *isv-binary-pathname* on ISV lines [Note: case-sensitive on Unix systems only]
- *options-file-filename* on ISV lines [Note: case-sensitive on Unix systems only]
- short (~62-character) license keys (keys with bits/character of 6 - see Creating Licenses)

Note: any time RLM processes a *username*, it will replace any white space in the name with the underscore '_' character. This is true for *usernames* used as hostids, in server option files, or passed between client and server. Also note that *usernames* are case-insensitive – they are converted to all lowercase in the license server.

The following sections describes each of the three types of license file lines (HOST, ISV, and LICENSE).

Order of lines in the license file

In general, the order of lines in the license file does not matter, with the following exceptions:

- for an ISV/DAEMON line which specifies a password, all LICENSE/FEATURE lines following the ISV/DAEMON line which do not specify a password will use the password of the ISV/DAEMON line which precedes it. If the ISV/DAEMON line follows the LICENSE/FEATURE line, the password will not apply to that LICENSE/FEATURE.
- LICENSE/FEATURE lines are processed in the order they appear in the license file. This means that you can bias the selection of licenses by the order they appear in the license file. For example, if you have licenses for product ABC versions 1.0 and 2.0, and your software requests version 1.0, the license you receive will depend on the order: if the 2.0 license appears first in the license file, and it is available, your application will receive a v2.0 license. If the v1.0 license appears first and it is available, you will receive a v1.0 license.

HOST Line

HOST *hostname hostid* [tcp/ip port #]

The HOST line specifies which computer the license server is to run on. There is only one HOST line per license file. Note that if a license file contains only nodelocked-uncounted licenses, a HOST line is not required.

The *hostname* is the standard TCP/IP hostname for the system. This name is not an input to the license key signature algorithm, and thus can be changed at any time.

The *hostid* is RLM's idea of the computer's identification. The *hostid* is an input to the license key signature algorithm, so it cannot be changed. All licenses in the license file have this *hostid* as input to their license signatures, so it is important to avoid moving LICENSE lines from one license file to another, as this invalidates them. Note that while RLM v5.0 allows a list of hostids in a LICENSE line, only a single hostid is allowed in a HOST line.

The tcp/ip port number is the port which rlm attempts to use for communications. This number can be changed to any available port.

For a description of the various hostids that RLM supports, see RLM hostids in the *Integrating RLM into your Product* chapter.

Example:

HOST melody 80b918aa 2700

In this example, the license servers run on host "melody" at TCP/IP port # 2700.

Note: The keyword "SERVER" can be used instead of "HOST".

ISV Line

Old Format:

ISV *isvname* [*isv-binary-pathname* [*options-file-filename* [*port-number*]]]

New (RLM v9+) Format:

ISV *isvname* [*isv-binary-pathname* [*options-file-filename* [*port-number*]]] [*binary=isv-binary-pathname*] [*options=options-file-filename*] [*port=port-number*] [*password=password-text*]

The ISV line specifies an ISV's license server. There is one ISV line in the license file for every *isvname* which has licenses in that file. Note that if a license file contains only nodelocked-uncounted licenses for a particular *isv*, an ISV line is not required for that *isv*.

The *isvname* is the name assigned to the ISV and does not change.

The *isv-binary-pathname* is the filesystem location of the ISV's license server binary. This can be any accessible location. The *isv-binary-pathname* is not an input to the license key signature algorithm, so it can be changed at any time. Starting in RLM v3.0, the ISV pathname can be omitted if the *isv* server is located in the same directory as the *rlm* binary.

The third (optional) parameter specifies whether an options file is to be used for this license server. If you would like to specify options (see The ISV Options File in the License Administration manual), either specify the location of the file containing these options here, or name the ISV options file *isvname.opt* and place it in the directory which contains the license file which the server reads.

The fourth (optional) parameter specifies the port # which the ISV server will use. This should normally be omitted, but can be used if you need to access the ISV server across a firewall and the firewall needs to be configured to allow access to the port.

The fifth (optional) parameter (new in RLM v9.2) specifies a license password to be applied to all LICENSE or FEATURE lines which **follow** the ISV line in the license file. If an individual LICENSE/FEATURE line has a password, the password from the LICENSE/FEATURE line is used.

In the old format, the parameters are strictly positional, and, for example, to specify a port #, the ISV server binary and options file must both be specified. However, in the new format, any of the optional parameters can be specified by themselves. Also note that any number of the positional parameters can be specified, and optional parameters can be added after the positional parameters.

Note that, in the new format, if you specify the same parameter both as a positional parameter and as a keyword=value parameter, the value of the keyword=value parameter will be used.

Examples:

ISV *reprise* /home/reprise/reprise /home/reprise/reprise.opt (old format)

ISV *reprise* options=/home/reprise/reprise.opt binary=/home/reprise/reprise (new format)

ISV *reprise* /home/reprise/reprise port=8765 (new format)

ISV *reprise* /home/reprise/reprise binary=/a/b/reprise

In these examples, the license server for ISV *reprise* is located at /home/reprise/reprise and (in the first 2 examples) an options file is located at /home/reprise/reprise.opt. In the 3rd example an ISV server port # is specified. In the fourth example, the ISV server binary name /a/b/reprise will be used instead of /home/reprise/reprise.

Note: The keyword "VENDOR" can be used instead of "ISV".

LICENSE Line

Format:

LICENSE *isv product version exp-date count* [sig=*license-key*] [optional parameters]

The LICENSE line defines the usage rights to a *product*. All fields in the license line are case-insensitive (with the exception of short, ie, less than 62-character, license keys), and none may be modified by the license administrator, with the exception of the parameters whose names begin with the underscore (“_”) character.

Note: Prior to RLM v9.3, the license file parser did not reject optional keywords which were unknown – rather, it silently ignored them. Beginning in RLM v9.3, the parser will reject unknown keywords, so that more errors can be detected at license generation time rather than later. This means that some license templates which worked correctly pre v9.3 will no longer work. A couple of examples of this are:

LICENSE *isv product v1.0 1-jan-2014 uncounted* hostid=*any key*

(in this case, “key” is interpreted as an optional parameter and it is rejected. To fix this, change “key” to “sig”).

Another example is a license in a string passed to `rlm_init()`. This license previously worked:

<valid license, without terminating '>' : <second license>

This will no longer work, as the parser interprets the ':' path separator character as an options field, which it rejects. To fix this, insert the trailing '>' character after the first license.

Fixed (positional) parameters

The first 6 parameters are required on every license, and are present in the order shown above.

- *isv* is the name of the ISV granting the rights.
- *product* is the name of the product for which license rights are being granted.
- *version* is the highest-numbered product version supported by this license, in the form "N.M". For example, 1.0, 2.37, or 2006.12. Each RLM license has a version number, of the form "*major.minor*". The version in the `rlm_checkout()` call must be less than or equal to the version in the license for the checkout to succeed. (Note: This comparison is done in the "normal" way, ie, 1.2 is greater than 1.10).

The version can be used in a number of ways:

You could make all your software ask for version 1.0 with all your licenses issued for version 1.0, and the version would never be an issue, unless and until you wanted to obsolete all the old licenses on a new release.

You could put your product's version number in the `rlm_checkout()` call, then licenses for an older version of your product will not work with a newer version of the product.

You can use a date-based version. To do this, you might put the year and month of release into the `rlm_checkout()` call in your application, then when you issue licenses, issue them either for this year and month when your customer's maintenance period ends.

This allows your customer to use products released on or before the date in the license. Bear in mind that you would need to use the leading 0 in the month, since 2006.2 is greater than 2006.11, which might not be what you intend.

- *exp-date* is the date the license expires, in the form dd-mmm-yyyy, for example, 1-jul-2007. All licenses have a *expiration date*. If you prefer for your licenses to not expire, you can use the special expiration date of **permanent**, which never expires (any date with a year of 0 is also non-expiring, e.g. 1-jan-0).

RLM uses a proprietary algorithm which does not access any other computers, and has been used in RLM since version 1.0. It is fast but sometimes returns false positives.

- *count* is the number of licenses granted. **The count field defines the license type.** See the License Models chapter on page 9 for a discussion of license types and modifiers. The *license type* is one of:

- A positive integer indicates a **counted license**.
- 0 or “uncounted” indicates an **uncounted license**.
- “single” means a node-locked, single-use license. single is a special case of a **counted license**, but it is different from “1”. A license with a count of 1 is a regular counted license, and requires a license server. A license with the keyword “single” is a single-use, nodelocked license. This license does not require a license server, and in fact license servers will not process this license. single licenses are a convenient way to issue single-use licenses without the license administrator having to configure a license server.
- token, token_bound, and token_unlocked are used to specify a **Token-Based License**; this license must also have the token=... optional parameter (see Token-Based Licenses pn page 104). The only optional parameter on a *token-based* license which is used by RLM is the start date. All other optional parameters are ignored.
- Meter indicates a **metered license**. See Metered Licenses on page 100 for a complete description of metered licenses.

- *license-key* is a digital signature of all the license data, along with the hostid on the HOST line, if present. If a license has a non-zero count, it always requires a HOST line. An uncounted license does not require a HOST line, and even if there is a HOST line, the hostid of the license server is not used in computation of its *license-key*. The *license-key* will have "sig=" prepended after the license has been signed by the *rlmsign* utility.

Note that if the *license-key* is preceded by *sig=*, it can be present after any or all of the optional parameters.

In addition to the standard license attributes above, licenses can have the following optional license modifier attributes:

- **Locking: Node-locked** (counted or uncounted), **Username-locked** (counted or uncounted), or **Floating licenses**.

RLM can lock a license in a variety of ways:

-
- A license can be *node-locked*. A node-locked license can only be used on a single node, as specified by the *hostid* of the license. For a description of the available hostids in RLM, see RLM
-

hostids in the *Integrating RLM into your Product* chapter. Starting in RLM v5.0, the *hostid* in a license can be a *hostid list*, which means that the license is usable on *any* of the specified hostids.

❑ A node-locked license can be either *counted*, *uncounted*, or “*single*”. If it is *uncounted* or *single*, then the software only need verify that it is executing on the correct computer, and no license server is required. If it is counted, however, a *license server* is required to maintain a count of licenses currently in use. (Note: while *uncounted nodelocked* licenses can be served by a license server, *single* licenses cannot.)

❑ To create a node-locked license, add the keyword **hostid=.** at the end of the license line. See the description of the LICENSE Line for more information.

❑ A license can be locked to a user. This is a special case of a *node-locked* license, and is accomplished using the *hostid user=...* Note that any white space in a username is converted to the underscore ('_') character. Also note that usernames are case-insensitive.

❑ A license can be *floating*. This license will work anywhere on the network that can communicate with the *license server*. To specify a *floating* license, do not put a **hostid=** keyword on the license.

- ***hostid=hostid-string (used for license locking)***

The optional *hostid* at the end of the line specifies that the licenses can only be used on the specified host. Uncounted licenses always require a *hostid*. Counted licenses generally do not have a *hostid*, but it could be present, in which case we would call this license a "node-locked, counted" license. (For a description of the various *hostids* that RLM supports, see Appendix E – RLM *Hostids*, on page 251.

Starting in RLM v5.0, the *hostid* on a LICENSE line can be a *hostid list*. The *hostid list* is a space-separated list of valid *hostids*, enclosed in double-quotes. The license can be used on *any* of the *hostids* in the list. The list can contain at most 25 *hostids*, and can be no longer than 200 characters.

For example, this *hostid list* would allow the license to be used in any of the 4 specified environments:

```
hostid="ip=172.16.7.200 12345678 rlmid1=83561095 user=joe"
```

- **Activation Key used to create this license**

```
akey=activation-key
```

When requested in RLM Activation Pro, the license generator will include the *akey=* keyword with the activation key used to fulfill the license. *akey=* first appeared in RLM v11.0. The maximum length of the activation key is 40 characters, including the “*akey=*” part.

- **Caching Licenses on the Client Node**

```
client_cache=seconds
```

When specified, the license will be held by the license server for “seconds” seconds, in exactly the same way as a “*minimum_checkout*” attribute would. However, on the client side, license data will be cached which can be used by subsequent checkout requests. The maximum cache time is one hour (3600 seconds). Note that the client-side caching will be ineffective if not enabled with `rlm_isv_cfg_enable_client_cache()` in `rlm_isv_config.c`, however the server will still hold the license checked-out in this case.

You can think of this as a very short-term, automatic, roam.

You should note that only licenses which have a sharing attribute will be usable as cached licenses. In other words, if the license has a "share=u" attribute, and the same user attempts a checkout, the cached license can be used. If the "share=" attribute is missing, no checkouts of the cached license will be possible. Also note that the host attribute is matched automatically, by definition, since the license is being used on the same computer.

Your customer can modify the value of `client_cache` between 0 and 2x the value you specify with the license administration `CLIENT_CACHE` option. See the License Administration manual for more details.

`client_cache` first appeared in RLM v10.1

● Disable Computing Environment

`disable="computing-environment-list"`

disable= specifies that clients running in the appropriate computing environment cannot use this license.

computing-environment-list is a list of different computing environment descriptions; if the application is running in any of these environments, the license will not be usable.

computing-environment-list is a space-separated list of the following environments (Note: put the list in quotes if more than one item is specified):

- **TerminalServer** - disable use on Windows Terminal Server and Remote Desktop.
- **TerminalServerAllowRD** – disable use on Windows Terminal Server but allow use via Remote Desktop
- **VM** - disable use on Virtual Machines.

Disabling `TerminalServer` is most useful for node-locked, uncounted licenses, if you do not want to allow multiple network users running remote sessions to make use of a single license. Note that you can't disable both `TerminalServer` and `TerminalServerAllowRD` – they are mutually exclusive.

Disabling `Virtual Machines` is useful for node-locked, uncounted licenses in order to prevent these licenses from being used on multiple virtual machines with the same `hostid`.

Example:

disable=TerminalServer

● Hold time

A "held license" is a license that remains checked-out on the license server after the application exits or checks the license back in via `rlm_checkin()`. By specifying *hold=N* in the license, the license will be held for N seconds after checkin. *hold* is typically used in the case of licenses that have a very short duty-cycle, in order to provide a "fairer" measure of concurrent usage.

hold and *min_checkout* both perform this function in slightly different ways. *hold* always keeps the license checked out for the specified amount of time, whereas *min_checkout* keeps the license checked out for an additional time only if the license was checked back in by the application before the specified minimum time.

Note that both *hold* and *minimum_checkout* time specifications are ignored for any license which is roaming. Also note that hold time is processed by the license server, so it has no effect on unserved nodelocked licenses.

- **License ID**

Any License Administrator can add *_id=nnn* to a license. “nnn” is a positive integer, less than 2**31, which is used to identify the license. If no *_id=* keyword is present, the id of the license is 0. The id of a license can affect license pooling as follows:

A license that doesn't specify an id (or specifies 0), will pool with any other license that it would normally pool with. However, a non-zero id will only pool with the same same ID# (assuming all the other attributes make it eligible to pool).

In addition, beginning in RLM v12.0 licenses are sorted (within a license file) in the order of the *_id* keyword. Licenses without *_id* keywords will remain unsorted (in their original order) at the end of all the licenses with *_id* keywords, which are sorted in increasing numerical order. This sort is done prior to REPLACE processing.

Other than license pooling and sorting, the id can be used to select which licenses to apply an option (such as RESERVE). The id is not used in the computation of the license signature, and as such can be added or changed by the License Administrator.

- **License Issue Date**

If *issued=dd-mmm-yyyy* is specified in the license, this license issue date will be used in the computation of license replacement. If no issue date is present, the license start date is used. If neither is present, then this license will be replaced by any license specifying a *replace=* keyword with this license's product name.

- **Minimum Checkout Time**

min_checkout=n

min_checkout specifies that a license is to be "held" checked-out by the license server after the application performs a checkin call or exits, only if the license did not remain checked out for the minimum interval specified by *n*. *n* must be a positive integer, greater than 0. The license will remain checked-out such that the total checkout time is *n* seconds. *min_checkout* is typically used in the case of licenses that have a very short duty-cycle, in order to provide a "fairer" measure of concurrent usage.

hold and *min_checkout* both perform this function in slightly different ways. *hold* always keeps the license checked out for the specified amount of time, whereas *min_checkout* keeps the license checked out for an additional time only if the license was checked back in by the application before the specified minimum time.

Note that both *hold* and *minimum_checkout* time specifications are ignored for any license which is roaming. Also note that *hold* and *minimum_checkout* time are processed by the license server, so they have no effect on unserved nodelocked licenses.

- **Maximum Roam Count**

max_roam_count=num

A Roaming license is a license that is checked out from the license server and used on a disconnected system. During this time, the license server holds the license checked-out just as if the system were still connected to the license server. Roaming licenses are only allowed if you issue your customer an *rlm_roam* license that is valid on the disconnected system.

If you do not specify *max_roam_count* in an individual license, RLM allows the total number of

licenses to be roamed. Setting *max_roam_count* to a number less than the total number of licenses will cause the server to only allow that number of licenses to roam. To disable roaming on a particular license, set *max_roam_count* to 0 for that license.

Note that the ISV-supplied *max_roam_count* attribute is equivalent to the license administrator MAX_ROAM_COUNT option, except that *max_roam_count* in the license is always enforced, rather than being optional.

- **Maximum Roam Days**

max_roam=days

If you do not specify *max_roam* in an individual license, RLM limits the maximum number of days that a license can roam to 30 days. To disable roaming on a particular license, set *max_roam* to -1 for that license.

Also note that if you specify *max_roam* on the *rlm_roam* license itself, this *max_roam* specification will potentially lower the *max_roam* of all products. The effective *max_roam* is the minimum of the value specified in the license itself (or the default value) and the value in the *rlm_roam* license. So, for example, if you set *max_roam* on the *rlm_roam* license to 20, then all licenses without a *max_roam* will be limited to 20 days. If you set *max_roam* on the *rlm_roam* license to 40, then only individual licenses with *max_roam* set to greater than 40 days will be affected.

- **Metered licenses**

Metered licenses are described in detail in Metered Licenses on page 100. Metered licenses use the following 4 keywords:

meter_counter=counter#
meter_dec=decrement_amount
meter_period=period_in_minutes
meter_period_dec=periodic_decrement_amount

- **Named User licenses**

named_user[=num] or
named_user="num min_hours"

Named User Licenses allow the ISV to require that a list of users be created who can use the license(s). The number of users in the list can be less than, equal to, or greater than the number of licenses available. Once a user is added to the list, they can be deleted, but once deleted, they must remain off the list for a minimum number of hours (24 hours by default).

To create a **named user** license, add the **named_user** keyword to the LICENSE:

named_user - to require the same # of users as there are licenses

or

named_user=n - to require **n** users to be named

or

named_user="n min_hours" - to require **n** users, and specify the minimum number of hours

With a **named_user** license, the license server can construct the list of users automatically as license checkouts occur, or the list can be entered via the RLM web interface by the license administrator. If entered manually, either individual users or GROUP names (as defined in the ISV server options file) can be used.

named_user licenses utilize the INCLUDE functionality of the license server, and do not need the entire list of **num** users specified before the licenses can be used. In fact, no users need to be specified since the license server will add users who do not appear on the list if the current list size is less than the number of allowed named users.

Once a user is added to the list, they can be removed at any time. However, once removed, a user cannot be placed back on the list until they have been off the list for **min_hours** hours (default: 24 hours).

Note:

- different **named_user** licenses will never be combined by the license server into one license pool, even if all other license parameters match.
- since **named_user** utilizes the INCLUDE list in the server, any INCLUDE specification for this license will be ignored.
- **named_user** is processed by the license server, so it has no effect on unserved nodelocked licenses.
- usernames in RLM are case-insensitive, so user “Joe” is the same as user “joe”.

● License Options

options = options_list

The *options* specification is used to encode options for the product license. The options field is a string (up to 64 characters in length) which is completely defined by the ISV. The options are used to calculate the license signature, but otherwise are unused by RLM. You can retrieve the options from a license with either the *rlm_product_options()* or the *rlm_license_options()* call. Note that if the string contains embedded white space, it must be enclosed within double quotes.

Beginning in RLM v12.0, you can specify a required substring in the options field with the *rlm_set_attr_req_opt()* call. See *rlm_set_attr_req_opt()* on page 226 for more information.

● License Password

_password = password-string

If specified, a license password restricts access to this license to requests which have specified the same password-string. The password-string is specified either with the *rlm_set_attr_password()* call, or (for the command-line utilities) with the RLM_LICENSE_PASSWORD environment variable, or in the RLM web interface. The password string must be <= 32 characters.

Note that the license password does not factor into the license signature, and hence can be changed at any time after the license is signed. Also note that license passwords only work with served licenses, not nodelocked, uncounted or single licenses in local license files.

If a request (checkout or status) is made for a license which contains a password, and the request does not specify a matching password, the license server will return RLM_EL_NO_SERV_SUPP (for a checkout request) or no data (for a status request). This prevents a user from knowing that a license exists and attempting to guess the password.

Note that in RLM v9.2, the license password can be specified on the ISV line with the password=password-text optional field. If specified on the ISV line, the password applies to all LICENSE or FEATURE lines which **follow** the ISV line in the license file. If any individual LICENSE/FEATURE line specifies a password, the password from the LICENSE/FEATURE line is used.

● **Platform Restrictions**

platforms=platform_list

RLM allows you to specify one or more platforms on which the application must be running. If a *platforms=platform-list* specification is contained in the license, the computer on which the application is running must be one of the specified platforms.

To specify one or more platforms, create a list of platform names. The *platform-list* consists of a list of RLM-defined platform names, which consist of a machine architecture and an operating system version/revision. Specify *platforms=* as a space-separated list of platform names with the trailing OS revision removed, as shown in the following table. Note that if you specify more than one platform, enclose the entire string in double quotes, e.g., *platforms="sun_s x86_w sun64_s"*. Also note that while you can include the trailing revision number, it will not be used by RLM in any comparisons, so including it may lead to confusion.

Platform	RLM Platform name	string to use in <i>platforms=</i>
HP-UX on PA-Risc	hp_h1	hp_h
HP-UX 64-bit on PA-Risc	hp64_h1	hp64_h
IBM AIX 32-bit	ibm_a1	ibm_a
IBM AIX 64-bit	ibm64_a1	ibm64_a
Linux on Intel X64	x86_l2	x86_l
Linux 64-bit on Intel	x64_l1	x64_l
MAC on Intel X86	x86_m1	x86_m
MAAC on Intel (64-bit)	x64_m1	x64_m
MAC on PPC	ppc_m1	ppc_m
Solaris 32-bit on Intel	x86_s1	x86_s
Solaris on Sparc	sun_s1	sun_s
Solaris 64-bit on Sparc	sun64_s1	sun64_s
Windows on Intel x86	x86_w3, x86_w4	x86_w
Windows 64-bit on Intel	x64_w3, x64_w4	x64_w

● **Replacement Licenses**

replace[=product_list]

In order to render ineffective one or more licenses which you have already issued, use the *replace[=product-list]* option in the new license. *replace=* causes RLM to ignore the "replaced" license(s). Beginning in RLM v11.0, if *product_list* is the single character '*', all licenses will be replaced.

Note: If you specify *replace*, you must also specify either *start=* or *issued=*.

***replace* operates as follows:**

- licenses from the *product_list* will be replaced (all licenses if *product_list* is '*'). If *product-list* is not specified, then the product name of the license containing the *replace* keyword will be the only product to be replaced.
- if the license with the *replace* keyword specifies an *issued=* date, then this is the "*replacement date*".
- if the license with the *replace* keyword does not have an *issued* date, then the "*replacement date*" is the *start* date of the license.
- if the license contains neither an *issued* date nor a *start* date, no licenses will be replaced.
- Any license in the list of products with an *issued* date prior to the *replacement date* will be replaced.
- Any license in the list of products which does not have an issued date, but which has a *start* date prior to the *replacement date* will be replaced.
- Finally, any license in the list of products with neither an *issued* nor a *start* date will be replaced.
- EXAMPLE: To replace products "a" and "b", use: *replace="a b"* in the license.

● **Effective Start Date.**

If *start=dd-mmm-yyyy* is specified in the license, the license cannot be used before the specified date.

● **License Soft Limits.**

soft_limit=n

A license can have a *soft_limit* that is lower than its count of available licenses. Once usage exceeds the *soft_limit*, checkout requests will return the RLM_EL_OVERSOFT status instead of a 0 status.

Note that when the license server pools separate licenses into a single license pool, the *soft_limit* of each license is added to obtain the pool's *soft_limit*. Also note that licenses which do not specify a *soft_limit* use the license *count* as their *soft_limit*.

Also note that soft limits are processed by the license server, so they have no effect on unserved nodelocked licenses.

● **Sharing of licenses between different processes.**

share=UHI[:nnn]

Licenses can be shared between separate running processes. To do so, use a *share=* specification in the license. A license can be shared between processes with the same username, hostname, or ISV-defined data, or any combination of these. Specify *share=UHI* where the keywords 'U', 'H', and 'I' indicate that the Username, the Hostname, or the ISV-defined fields must match. If more than one is specified, all specified must match in order to share the license.

For example, if *share* is specified as *share=UH*, then both the username and the hostname of a request must match an existing checked-out license in order to share that existing checked-out license. If *share* is specified as *share=u*, then only the usernames must match on two processes in order for them to share the license. Note that usernames and hostnames in RLM are case-

insensitive – all usernames and hostnames are converted to all lowercase in the license server.

The `share=` keyword accepts an optional maximum process count which can share the license. To specify a maximum process count for a license that is shared by user, use:

`share=U:nnn`

where `nnn` is the number of processes which can share this license. The `nnn+1`st request will consume an additional license.

If the `:nnn` specification is omitted, any number of processes can share the license.

Note that once a shared license is in use, it will continue to be in use until all the processes sharing the license check it back in. In other words, if 2 processes are sharing one license, and a 3rd process consumes a 2nd license (in the case where `n==2`), 2 licenses will continue to be in use until either (a) the 3rd process checks in its license, or (b) BOTH the first and second processes check in their licenses. In other words, there is no dynamic re-combination of shared licenses done at license checkin time.

Also note that `share` is processed by the license server, so it has no effect on unserved nodelocked licenses.

- **User- or Host-based licenses.**

`user_based[=n]`

`host_based[=n]`

User-based licenses allow the ISV to require that the specified number of licenses (or all licenses) must be reserved to users (with `RESERVE` lines) in the options file. Note that the special user `'*` does not count as being reserved. If fewer than the required number of licenses are reserved, the license server will log an error and discard the license. Also note that licenses reserved to a `GROUP` are not counted, otherwise the license administrator could simply bypass the intent of this license by creating a `GROUP` consisting of all their users. Thus, all reservations must be to individual users.

Similarly, host-based licenses allow the ISV to require that the specified number of licenses (or all licenses) must be reserved to hosts (with `RESERVE` lines) in the options file. Note that the special host `'*` does not count as being reserved. If fewer than the required number of licenses are reserved, the license server will log an error and discard the license. Also note that licenses reserved to a `HOST_GROUP` are not counted, otherwise the license administrator could simply bypass the intent of this license by creating a `HOST_GROUP` consisting of all their hosts. Thus, all reservations must be to individual hosts.

To create either user-based or host-based licenses, add the appropriate keyword to the `LICENSE`:

`user_based[=nnn]` - for user-based licenses

or

`host_based[=nnn]` - for host-based licenses

If the optional `"=nnn"` is specified, only `"nnn"` of the total number of licenses need to be reserved. If omitted, all licenses must be reserved

Note that `user_based` and `host_based` are processed by the license server, so they have no effect on unserved nodelocked licenses.

- **Timezone Restrictions**

timezone=timezone-spec

RLM allows you to specify one or more timezones in which the applications must be running. If a *timezones=timezone-spec* specification is contained in the license, the computer on which the application is running must be set to one of the specified timezones.

To specify one or more timezones, create a bitmask of the desired timezones, expressed as hours west of GMT:

Bit 0 - GMT
Bit 1 - 1 hour west of GMT
Bit 2 - 2 hours west of GMT
...
Bit 23 - 23 hours west of GMT (or 1 hour east of GMT)

This bitmask should be represented as a hex number. So, for example, to allow your application to run in the GMT timezone only:

timezone=1

To allow your application to run in timezone 8 (PST):

timezone=100

To allow your application to run in timezones 5-8 (continental USA):

timezone=1E0

● **Minimum Timeout specification**

min_timeout=n

A license administrator can specify a TIMEOUT value for any idle license. If the license remains idle (ie. does not communicate with the license server) for this amount of time, the license server performs an automatic checkin of the license and informs the application (if it is still running).

min_timeout=n specifies the lowest value a license administrator can set for the timeout value for a license. If not specified in the license, the RLM default minimum of 3600 seconds (1 hour) is used.

Note that *timeout* is processed by the license server, so it has no effect on unserved nodelocked licenses.

The following fields are not used by RLM, but are present to identify licenses, or can be used in your application to present to the user:

- *contract=contract-info*
contract= is meant to hold the customer's purchase order or software agreement number. This can be used to display to the user to validate a support contract, etc. It is not used by RLM. Maximum of 64 characters.
- *customer=who*
customer is to identify the customer of the software. This can be an added incentive to keep honest users honest, as it is unlikely that Mega South-East Airlines would want to use a license that was issued to Main St. Bank., for example. *customer* is not used by RLM. Maximum of 64 characters.
- *issuer=who*

issuer= is used to identify the organization which issued the license. It is not used by RLM. Maximum of 64 characters.

- *_line_item="descriptive_text"*

The *_line_item* field is used to map a particular product to the item purchased. This field will be logged into the report log at the start when all products supported are logged, so that a report writer can generate reports based on purchased products, as opposed to product names used for licensing purposes. If the descriptive text contains spaces, it should be enclosed in double-quote (") characters. The contents of the *_line_item* field can be modified (or the field can be added) without invalidating the license signature. Maximum of 64 characters.

- *type=type-spec*

type= is used to identify the type of license. *type-spec* is a string containing one or more of the values:

- "beta"
- "demo"
- "eval"



(For example, *type="beta eval"* or *type="eval"*. The contents of the license *type* field are retrieved by the *rlm_license_type()* call (see *rlm_license_XXXX()*). *type* is not used by RLM.)

The maximum length and types of license fields are as follows:

Field	Type	max data length (excluding keyword=) or value range
isv	string	10 characters
product	string	40 characters
version	string, in the form nnn.mmm	10 characters
exp-date	string of the form dd-mmm-yyyy	11 characters
count	positive integer	2**31 - 1
hold	positive integer - seconds	2**31 - 1
host_based	int	2**31 - 1
hostid (single)	string	75 characters
hostid (list)	space-separated, quoted string	200 characters, max of 25 hostids
hostname	string	64 characters
issued	string of the form dd-mmm-yyyy	11 characters
_line_item	string – license administrator defined	64 characters
max_roam	non-negative integer - days	2**31 - 1
max_roam_count	non-negative integer - count	2**31 - 1
min_checkout	positive integer - seconds	2**31 - 1
min_remove	integer - seconds (-1 for no remove available)	2**31
min_timeout	positive integer - seconds	2**31 - 1
options	string	64 characters
password	string	32 characters
platform	string	80 characters
share	enumerated	3 ("uhi") + :integer
soft_limit	int	2**31 - 1
start	string of the form dd-mmm-yyyy	11 characters
timezone	int	bitmap with bits 0-23 set
user_based	int	2**31 - 1
contract	string – unused by RLM	64 characters
customer	string – unused by RLM	64 characters
issuer	string – unused by RLM	64 characters
type	string - consisting of "demo" "eval" and/or "beta"	14 characters

Valid LICENSE Option Configurations

Only certain combinations of license types and options are valid. The following table indicates which options are valid for various license types. An X in a cell indicates that the attribute on the left is valid with the main license type in the column; empty cells indicate unsupported option configurations. All license administrator editable options (beginning with “_”) can be added to any license type.

Main License Type  Attributes 	Counted			Uncounted	Token	Metered
	Floating	Nodelocked	Single			
HOST/ISV line	required	required	ignored	X	X	required
UPGRADE-able	X	X	X	X		
contract	X	X	X	X	X	X
customer	X	X	X	X	X	X
disable	X	X	X	X	X	X
hold	X	X		when served		
host_based	X					
hostid		required	required	required	X	X
issued	X	X	X	X	X	X
issuer	X	X	X	X	X	X
max_roam	X					
max_roam_count	X					
min_checkout	X	X				
min_timeout	X	X			X	X
named_user	X	X				
options	X	X	X	X	X	X
platforms	X	X	X	X	X	X
replace	X	X	X	X	X	X
start	X	X	X	X	X	X
soft_limit	X	X				
share	X	X				
timezone	X	X	X	X	X	X
type	X	X	X	X	X	X
user_based	X	X				

Examples

```
LICENSE reprise write 1.0 permanent uncounted 987435978345973457349875397345  
hostid=IP=172.16.7.3
```

```
LICENSE reprise calc 1.0 1-aug-2008 5 987435978345973457349875398749587345987345
```

In the first example, the *write* product is licensed to a host with an IP address of 172.16.7.3. This is a non-expiring, node-locked, uncounted license. The second example is for 5 licenses of product *calc* which expire on the first of August 2008. The first license would not require a HOST line, whereas the second one would.

Note: The keyword "FEATURE" can be used in place of "LICENSE".

Note: Licenses are always additive, in other words, the counts on 2 license lines of the same product/isv/version/hostid would be added together by the license server and the total number of licenses would be available.

UPGRADE Line

Format:

UPGRADE *isv product from-version to-version exp-date count* [sig=]*upgrade-key* [optional parameters]

The UPGRADE line defines an upgrade from an older version (*from-version* or higher) to a newer version (*to-version*) of an existing *product*. All fields in the upgrade line are case-insensitive (with the exception of short, ie, less than 62-character, license keys), and none may be modified by the license administrator with the exception of the parameters whose names begin with an "_" character.

We refer to the license specified by the UPGRADE line as the *upgrade license*, and the license it operates on as the *base license*.

An UPGRADE license will convert *count* licenses of *product* of version *from-version* or higher into *to-version*. Note that an UPGRADE license will never operate on a base license that is \geq *to-version*.

In order for the upgrade to be performed, certain parameters of the *upgrade license* must match the parameters of a *base license* in order for that license to be eligible to be **upgraded**.

Certain licenses can never be upgraded. In particular, token-based licenses (the token definitions themselves) will never be upgraded. Also, named-user and metered licenses are not eligible for upgrades.

In order for a license to be upgraded, the following parameters must match on the *base license* and the *upgrade license*:

- License Disable specification
- License Options
- License Sharing specification (share and max_share)
- License Timezone specification
- License Platform list
- Both licenses must have the same counting type: *counted*, *uncounted*, or *single*
- License node-locked hostid
- Both licenses must be user-based or host-based (or neither)

Note that this list is the same as the criteria for a license server combining multiple licenses into a license pool.

If the license is eligible for an upgrade, *count* licenses of the *base license* will be transformed into *to-version* licenses. An **upgrade** can be performed on multiple *base licenses*, until the *count* on the *upgrade license* is exhausted.

Note that license "replace" processing is done (both in client and server) before upgrade processing. This means that an upgrade license should not specify replacement of the *base license* which it is going to upgrade, because the *base license* will no longer exist when the upgrade is done.

There are 3 upgrade cases:

- fewer *base licenses* than *upgrade licenses* - in this case, the extra *upgrade licenses* are "wasted", and the license server issues a warning. All *base licenses* are upgraded.
- same number of *base licenses* and *upgrade licenses* - all *base licenses* are upgraded.
- fewer *upgrade licenses* than *base licenses* - in this case, *count* licenses are upgraded, and the remaining *base licenses* remain at their old version.

Note that the 3rd case above is the most useful - if you are upgrading all instances of an existing license, a *replace* option on a new license will do this just as well. The only advantage to the *upgrade license* in the first two cases is that the *base license* is required, ie, the *upgrade license*, by itself, grants no rights.

When a license is **upgraded** by the license server, the new licenses will have their parameters modified as follows. All other license parameters will be the same as the *base license*:

Field	Result for Served <i>counted</i> (or <i>uncounted</i>) licenses	Result for Unserved <i>single</i> or <i>uncounted</i> licenses
exp-date	earlier date is used	earlier date is used
hold	maximum of the 2 values	- undefined -
max_roam	minimum of the 2 values	- undefined -
min_checkout	maximum of the 2 values	- undefined -
min_remove	maximum of the 2 values	- undefined -
min_timeout	maximum of the 2 values	- undefined -
soft_limit (upgrading all)	larger of 2 deltas from license count is used	- undefined -
soft_limit (partial upgrade)	upgrade soft limit is preserved for the new version, base license soft limit <i>delta</i> is preserved (minimum value 0) for the old version	- undefined -
user_based, host_based (upgrading all)	If licenses have a specification, the value closest to the license count is used	- undefined -
user_based, host_based (partial upgrade)	If licenses have a specification, upgrade spec is preserved for the new version; base license spec <i>delta</i> (count-user_based) is preserved (minimum value 1) for the old version	- undefined -
contract	if <i>base license</i> is empty, use <i>upgrade license</i> . On partial upgrade, if <i>upgrade license</i> is empty, use value from <i>base license</i> for the new version.	if <i>base license</i> is empty, use <i>upgrade license</i> .
customer	if <i>base license</i> is empty, use <i>upgrade license</i> On partial upgrade, if <i>upgrade license</i> is empty, use value from <i>base license</i> for the new version.	if <i>base license</i> is empty, use <i>upgrade license</i> .
issuer	if <i>base license</i> is empty, use <i>upgrade license</i> On partial upgrade, if <i>upgrade license</i> is empty, use value from <i>base license</i> for the new version.	if <i>base license</i> is empty, use <i>upgrade license</i> .
type	if <i>base license</i> is empty, use <i>upgrade license</i> On partial upgrade, if <i>upgrade license</i> is empty, use value from <i>base license</i> for the new version.	if <i>base license</i> is empty, use <i>upgrade license</i> .

Fixed (positional) parameters

The first 7 parameters are required on every upgrade line, and are present in the order shown above.

isv is the name of the ISV granting the rights.

product is the name of the product for which license rights are being upgraded.

from-version is the lowest-numbered product version which is eligible for an **upgrade**, in the form "N.M". For example, 1.0, 2.37, or 2006.12

to-version is the highest-numbered product version supported by the license once it is **upgraded**, in the form "N.M". For example, 1.0, 2.37, or 2006.12

exp-date is the date the upgrade expires, in the form dd-mmm-yyyy, for example, 1-jul-2007. A non-expiring upgrade can be specified with either a year of "0" (ie, "1-jan-0"), or simply the word "permanent".

count is the number of licenses to be upgraded. **0** or **uncounted** means an uncounted, node-locked license is to be upgraded. **uncounted** and **0** are 100% equivalent.

single means a node-locked, single-use license is to be upgraded. **single** is different from **1**. See the LICENSE Line above for more information.

token, **token_locked**, **token_bound** and **token_unlocked** are not allowed in an UPGRADE license. All other optional parameters are ignored.

upgrade-key is a digital signature of all the upgrade data, along with the hostid on the HOST line, if present. If an upgrade license has a non-zero count, it always requires a HOST line. An upgrade to an uncounted license does not require a HOST line, and even if there is a HOST line, the hostid of the license server is not used in computation of its **upgrade-key**. The **upgrade-key** will have "sig=" prepended after the license has been signed by the *rlmsign* utility.

Note that if the **upgrade-key** is preceded by *sig=*, it can be present after any or all of the optional parameters.

Optional Parameters

Optional parameters are sometimes present in a license, and can be present in any order. Optional parameters are allowed only once in an UPGRADE line. The syntax and meaning of optional parameters for the UPGRADE line are identical to the same parameters for the LICENSE line. Note that **token** and **named_user** are not allowed on an UPGRADE line. See the LICENSE Line above for information on the optional parameters.

Example:

```
LICENSE reprise write 1.0 permanent 5 sig=.....  
  
UPGRADE reprise write 1.0 2.0 1-aug-2015 5 sig=.....
```

In this example, the 5 licenses of the *write* product have been upgraded from v1.0 to v2.0. Note that this license file would require a HOST line, since the licenses are counted.

CUSTOMER line

CUSTOMER *customer-name* *isv=isvname* *server=server-name* *port=port#* *password=yourpw*

The CUSTOMER line, use for the client side of RLMCloud-served licenses only, is used to identify the correct license server for a particular customer.

customer-name is your customer's assigned Customer name

isvname is your ISV name

server-name is the fully-qualified hostname of the RLMCloud license server machine

port# is either 5053 for normal RLM communications, or for HTTPS transport, 443).
yourpw is your assigned password for this server

Note that HTTPS support is new in RLM v14.0, and must be enabled by your ISV to be effective. Please consult with your ISV to see if HTTPS support is available.

Example:

```
CUSTOMER yourco isv=reprise server=ls423.rlmcloud.com port=5053 password=xyz
```

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Creating Licenses

When you ship your product to your customers, it will require a license to run. Generally, you want to grant different license rights to each customer. In order to do that, you create a unique *license file* for each customer.

Format of the license file

The license file consists of lines of readable text which describe the license server node, some parameters of the license server binaries, and the actual license grants to your customers. For a complete description of the license file format, see [The License File](#) chapter on page 44.

NOTE: every time you generate an RLM license, it gets a unique signature. Since RLM detects “duplicate” licenses by comparing the license signature, a newly-generated license will appear to be unique. This means that if you re-generate a license for your customer, even if it has the same parameters, it will add incremental licenses. If you need to regenerate licenses, Reprise Software strongly recommends that you use the issue date and the replace attribute.

License creation tools

There are 4 ways to create licenses using RLM:

- `rlmsign` – command-line tool to sign a template license file
- API call – `rlm_sign_license()`
- RLM Activation Pro (an optional product)
- `rlmgen` – GUI license generator

rlmsign

RLM is shipped with a license creation tool called *rlmsign* which can be integrated into your fulfillment process. This tool reads a template license file and computes the *license key* for each license contained in the file. This license key authorizes the license and prevents tampering with the license parameters.

If you have a back-office sales tracking system, *rlmsign* is the easiest way to integrate license fulfillment. Create an unsigned license file for the sales order, then run *rlmsign* with this license file as its first parameter. *rlmsign* will sign the license file and make it ready to ship to your customer.

`rlmsign` reads *license_file*, computes the license keys for all the included licenses that specify your ISV name, and re-writes the file with the updated license keys.

Using rlmsign on Unix

```
% rlmsign license_file [bits-per-character] [-bits bits-per-character] [-maxlen len]
```

Using `rlmsign` on Windows

```
c> rlmsign license_file [bits-per-character] [-bits bits-per-character] [-maxlen len]
```

The optional parameter *bits-per-character* is one of 4, 5, or 6, and specifies the character encoding of the resulting license key. If not specified, *bits-per-character* defaults to 5.

- *bits-per-character* of 4 results in license keys consisting of hexadecimal numbers only. The resulting key is approximately 92 characters in length.
- *bits-per-character* of 5 (the default) results in license keys consisting of uppercase letters and numbers only. The resulting key is approximately 74 characters in length.
- *bits-per-character* of 6 results in license keys consisting of upper and lowercase letters, numbers, and the 4 special characters ('*', '=', '+', and '~'). The resulting key is approximately 62 characters in length.

You can specify *bits-per-character* positionally as the 2nd argument, or you can use the *-bits bits-per-character* argument any place after the *license_file* parameter.

The optional *-maxlen len* parameter tells *rlmsign* to set the maximum length of LICENSE lines to the length specified. If this parameter is not specified, the default value of 70 is used. Any field on a license line which would cause the line to go over the maximum length will be placed on a continuation line. If a field can be split across lines (e.g. for fields that are quoted strings), then the field will be split when the maximum length is reached. The maximum length must be between 20 and RLM_MAX_LINE (1024) characters.

License creation API - *rlm_sign_license()*

In some cases, it is more convenient to build the license in-memory and sign that license directly before it is written to a file. In general, it is better to create the licenses in a file and use *rlmsign* to sign the licenses, however an API call is available for cases where this is not practical.

RLM also supplies the *rlm_sign_license()* API call to sign a license line in-memory. For details on the *rlm_sign_license()* API call, see Appendix A.

NOTE: Do not call *rlm_sign_license()* in an application or utility that ships to customers. Doing so will cause your private key to be included in the application executable or binary, which could expose it to hackers, possibly enabling them to create counterfeit licenses for your product.

RLM Activation Pro

RLM Activation Pro allows the ISV to give a customer an *activation key* which then allows the customer to retrieve their license from the ISV website at a later time. The *activation key* is a short string (resembling a credit-card number) which can be generated in advance. Once the customer knows the system where they wish to use the software, the RLM activation software creates the license and transmits it to the user, creating the license file for them. RLM Activation Pro is an optional product, and details of RLM Activation Pro are in the RLM Activation Pro manual.

RLM Activation Pro is intended to support most common activation scenarios, but in the event that your needs are more complex, or you need help integrating RLM activation with CRM systems, Reprise Software recommends a relationship with one of our Partners. See our website [Partner Page](#) for more information on our Fulfillment Partners.

`rlmgen` – GUI license generator

The rlmgen license generator can be used to create licenses interactively. rlmgen is a binary which contains an embedded web server – the UI is presented in your browser. For details on using rlmgen, see the next chapter - [Creating Licenses – rlmgen](#) on page 71.

Reserved Product Names

In general, your product names need only be unique to your company. However, any product name beginning with the 4 characters "rlm_" is reserved. Currently, there are two Reprise Product Names in use:

- *rlm_demo* - This product name is used by RLM to enable *Detached Demo[™]* licenses for your products.
- *rlm_failover*, *rlm_failover_server* - This product name is used by RLM to enable failover license servers on a customer-by-customer basis.
- *rlm_roam* - This product name is used by RLM to enable license roaming for your products.
- *rlm_server* - This product name is used by RLM to create alternate hostids for license servers. Also note that the *rlm_server* license will not be visible in status requests, or in *rlm_products()* calls.
- *rlm_server_enable_vm* - This product name is used by RLM to enable license servers to operate on a particular virtual machine. (Note that you can enable your server to work on all virtual machines by calling *rlm_isv_cfg_set_enable_vm()* with the second parameter set to a non-0 value.) Also note that the *rlm_server_enable_vm* license will not be visible in status requests, or in *rlm_products()* calls as of RLM v9.0.

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Creating Licenses – rlmgen

rlmgen is a GUI tool for use by ISVs to create one-off licenses based on stored product definitions.

rlmgen is a web-based application which allows you to create and edit product definitions for fulfillment, then create individual licenses for in-house or customer use.

rlmgen uses RLM licensing to control access to the two main functions:

- editing the product definition database (*rlm_act_admin* license)
- creating product licenses (*rlm_gen_license* license)

The use of these licenses will be described later in this section.

Running rlmgen

Usage: **rlmgen** [optional port#]

Run **rlmgen** from the command line. **rlmgen** uses a web interface which runs on port 6600 by default. If you specify the optional port#, **rlmgen** will use this port number in place of 6600.

Once **rlmgen** is running, point your web browser to "hostname:6600" (<http://hostname:6600/home.asp>) where hostname is the name of the machine where you run **rlmgen** (or "hostname:alternate port#" if you specified an alternate port#).

rlmgen creates data files for product definitions in the same directory as the binary. It also expects these data files to be in the same directory when it attempts to read them.

rlmgen Licensing and Access Control

rlmgen uses 2 licenses to control access to back-office license operations:

- *rlm_act_admin* license - this license enables the creation and editing of product definitions.
- *rlm_gen_license* license - this license enables the creation of individual licenses using the "Create License" button.

When you install the RLM kit, nodelocked-uncounted licenses (locked to hostid ANY) are created for both of these licenses so that you can get started. If you do not care about access control to **rlmgen**, you need do nothing further. On the other hand, if you do care about access control to these functions, you should edit the licenses created during the install procedure to limit access to **rlmgen**. In any case, you should make sure that the license file is present in the same binary as the **rlmgen** binary if you move **rlmgen** to a different directory.

Since **rlmgen** is a web-based application, you will need to issue licenses for *rlm_act_admin* and *rlm_gen_license* for the IP addresses of the machines you would like to be able to perform these activities. Edit these licenses for your particular network.

Using rlmgen

There are 2 main activities you will perform with **rlmgen**:

- initial setup of your product definitions
- generating individual licenses

When you run **rlmgen**, the application will start a web server on port 6600 (or an alternate port if you specify on the **rlmgen** command line). Next, point your browser at port 6600 on the machine where you ran **rlmgen**.

Your browser will display a page that has a title area at the top, along with a column of command buttons along the left, and a main display area on the bottom right hand side. The startup screen is shown below:

The screenshot shows the RLM License Generator web interface. On the left is a vertical sidebar with the Reprise License Manager logo and a list of command buttons: "Choose a command from the list below", "Create Product Definition", "Setup License Generator", "Create License", "View Product Definitions", "View System Info", and "About rlmgen...". The main content area has a blue header with "RLM License Generator" and "Copyright (c) 2006-2010, Reprise Software, Inc. All Rights Reserved.". Below the header, it says "RLM License Generator, v9.0" and provides instructions on how to run the application, including the default port (6600) and how to specify a different port. It also lists the company's contact information: Reprise Software, Inc., 1530 Meridian Ave, Suite 290, San Jose, CA 95125, with website and email links. At the bottom, it includes a GoAhead Software, Inc. copyright notice and a logo.

The command buttons are arranged in 3 groups, top to bottom:

- setup commands - "Create Product Definition" and "Setup License Generator"
- license generation commands - "Create License", and
- Database viewing/updating commands - "View Product Definitions", "View System Info", and "About rlmgen..."

Each of these commands will be described in the sections which follow.

Setup Commands

The 2 setup commands are:

- **Create Product Definition**
- **Setup License Generation**

These commands are used to set up the database for license generation. Everything in `rlmgen` is driven from *product definitions*, so you should create at least one product definition first. Product definition allows you to specify a name for the "product" which is then associated with a license product name, version, and several other license parameters.

The **Setup License Generation** form allows you to specify which optional RLM license parameters will be presented in the GUI for specification. Any parameters checked on this form will appear in the license creation screens. If you specify some of these parameters as part of the product definition (in the "other license parameters" field), they will not appear in the list of checkboxes in **Setup License Generation** (since they are already specified for the product). You should leave any parameter which you do not want to put into a generated license unchecked in this form.

License Generation Commands

There is a single license generation command **Generate License**, which brings up a form that allows creation of a single license from parameters specified in the forms. The data appearing in the license creation forms is customized by both the product definition as well as the **Setup License Generation** form.

Database Viewing/Updating Commands

These commands are:

- **View Product Definitions**
- **View System Info**, and
- **About `rlmgen`..**

These commands all allow viewing of the product definition database. The first command also will allow you to edit product definitions, by pressing the "Edit" or "Disable" button at the end of the row in the display. Product definitions which are disabled are not deleted, but will appear in gray in the list, and can be re-enabled later.

View System Info displays information about the system where **`rlmgen`** is running, including the RLM platform, RLM version, and hostids for this system.

Finally **About `rlmgen`...** displays information about the `rlmgen` program itself.

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The License Server

The license server consists of at least two processes

- The generic server, called *rlm*
- At least one ISV server, named *isv*

The *rlm* server is provided by Reprise Software, and is completely generic. The ISV server is configured to contain license key validation that is ISV-specific. Beginning in RLM v6.0, the ISV server configuration is contained in a platform-independent **settings** file, rather than a different binary built for each platform.

The *rlm* server handles requests from clients and directs them to the appropriate ISV server. In addition, the *rlm* server watches for failures in ISV servers and restarts them when appropriate. The *rlm* server also provides status to the various utilities, when appropriate.

The *rlm* server initiates a reread of the license files (for itself and any ISV servers) at midnight every night.

The *rlm* server is delivered with an embedded Web Server to perform normal administration tasks.

The ISV server consists of either a **platform-specific binary file** (*isvname.exe* on Windows, or *isvname* on Unix), or a **platform-independent settings file** (*isvname.set* on either Windows or Unix). When you run the "make" command in your kit, both versions of the ISV server are created. Reprise Software recommends shipping the settings file, which is platform independent, however the older-style executable is built for you as well should you wish to ship this version instead. If you ship the settings file, not only is it platform-independent, but it is also optionally **automatically upgradable** in the field (this is the default setting in *rlm_isv_config.c*) - meaning that if your license administrator upgrades to a newer version of RLM (the *rlm* server), your ISV server will automatically be upgraded as well.

Note that if you use ISV-defined hostid code, you cannot make use of the Generic ISV server - you must build an ISV server binary on each of your supported server platforms.

RLM Embedded Web Server

The *rlm* server contains an embedded *Web Server* which can be used to perform most administration of the *rlm* server itself. The web server contains the functionality of all the *rlmXXXX* utilities except *rlmhostid*. The web server allows you to retrieve server and license status (similar to *rlmstat*), cause the servers to reread the license files (*rlmreread*), switch debug (*rlmswitch*) or report log (*rlmswitchr*) files, move the current report log file to a new name (*rlmnewlog*), or shut down the license servers (*rlmdown*). Using this web-based interface, you can administer the license servers from any platform, and you do not need to install the *rlm* utilities - you only need a web browser.

In addition, the web server allows you to edit server option files (if you have access to the **edit_options** privilege - for ISV servers, or the **edit_rlm_options** privilege - for *rlm* itself.) You can also edit license files if you have the **edit_rlm_options** privilege. Also, RLM allows you to view the recent debug log information from any of the servers if you have access to the **status** privilege. Finally, access to the **status**, **reread**, **remove**, and **shutdown** commands is controlled by the appropriate privilege as specified in the RLM Options File.

The web server is started automatically on port 5054 when *rlm* is started. To use the web server, simply point your browser to: <http://ServerHostName:5054> and select the operation you would like to perform. You will be prompted for any required information. (Note: prior to RLM v6.0, the default admin port was

9000, not 5054).

If you would like to run the web server on a different port, specify the `-ws NNNNN` command-line argument when starting `rlm`, where `NNNNN` is the desired port.

The RLM web server is 100% self-contained in the `rlm` binary; no additional html files are required for operation.

For a description of the RLM web server UI, see the RLM License Administration Manual.

rlm startup options

The `rlm` command is:

```
% rlm [-c license_file] [-dat] [-dlog [+]logfile] [-info] [-l] [-noudp]
      [-nows | -ws port] [-x [rlmdown|rlmremove]] [-v]
      [-install_service] [-service_name sname]
      [-user username -password password] [-isv_startup_delay seconds]
```

The `-c license_file` option specifies which license file to use. This option overrides the setting of the `RLM_LICENSE` environment variable. The `license_file` parameter can be a directory containing license files, all of which will be processed.

The `-dat` option specifies that license files should have the extension ".dat", rather than ".lic". If `-dat` is specified, the `rlm` server will search for all files ending in ".dat" instead of ".lic" as documented elsewhere.

The `-dlog logfile` specifies the pathname for the server debug log. If `logfile` is preceded by the '+' character, the logfile will be appended, otherwise it is overwritten.

The `-info` switch causes RLM to print information about all copies of `rlm` that are running on this computer, including copies which have run in the prior 24 hours, then exit.

The `-l` switch causes `rlm` to only process command-line utilities from the local host (v12.1+)

The `-noudp` switch causes `rlm` to not listen on it's UDP port, so that client broadcasts do not work.

The `-nows` and `-ws port` options control the operation of the embedded Web Server. The `-nows` option instructs the `rlm` server to not start the embedded web server. The `-ws port` option instructs the `rlm` server to use `port` as the port number for the web server.

The `-x [rlmdown | rlmremove]` option controls whether the `rlmdown` and/or `rlmremove` commands will be processed by the server. Specifying only `-x` will disable both commands. Specifying either command name after the `-x` will disable just that command.

The `-v` option causes RLM to print it's version and exit.

The `-install_service` and `-service_name sname` options are used to run the `rlm` server as a service under windows. See the description of running the `rlm` server as a service below.

The `-isv_startup_delay seconds` option specifies that when running as a Windows service, `rlm` should delay `seconds` seconds before starting up the ISV servers. If not specified, there is no delay. This is useful if a license file specifies a `hostid` of type `rlmid1` (hardware keys), the server is started at system boot time, and the key driver is not yet started at the time the ISV server needs to read it.

The `-user` and `-password` options:

1. Windows expects the username argument to be `<domain>\<user>`. To use the local system domain, specify `".\<username>`", eg `".\joe`". Without the `".\"` you will get a service creation failure.

2. In order to run a service, the account specified by the `-user` argument must have the "Log on as a Service" property set. For details on how to set that property on an account, see this blog: <http://blogs.msdn.com/b/ablock/archive/2008/09/18/setting-the-properties-the-log-on-as-a-service-and-allow-log-on-locally.aspx>

These options can appear in any order on the command line.

If you want to generate a report log file, specify this on an ISV-by-ISV basis in the individual ISV's options file. See the description of the REPORTLOG line in The ISV Options File (in the License Administration manual) for more information.

Note that if the *rlm* server cannot bind the web server port (5054 by default), it will exit.(Note: prior to RLM v6.0, the default admin port was 9000, not 5054).

Also note that, prior to RLM v3.0, if there was not at least one license file with the current hostname (as returned by `gethostname()`), or "localhost", the servers would not run. This condition generates a warning in RLM v3.0 and later.

Running the *rlm* server as a service on Windows

On Microsoft Windows servers, you may want to install and run the *rlm* server as a Windows service process. A service process can start automatically at boot time and remain running as long as the system is up, regardless of user logins and logouts.

You can install RLM as a service only in a command window. Once installed as a service, it remains installed until it is explicitly deleted as a service. Installing RLM as a service does not start RLM; services are started via the Windows Services control panel, and at boot time.

To install RLM as a service in a command window, use the *rlm* program itself (in a command window), with special arguments:

```
rlm -install_service -dlog [+]logfile [-service_name sname] <rlm runtime args>
```

where:

- *logfile* is the pathname for the server debug log. This parameter is required. If preceded by the '+' character, the logfile will be appended, rather than created.
- *sname* is an optional name for the installed service. If not specified, *sname* defaults to "rlm". If *sname* contains embedded whitespace, it must be enclosed in double quotes.
- <rlm runtime args> are any other command line arguments to be passed to *rlm* when it is started.

Example:

```
rlm -install_service -service_name rlm-xyz -dlog c:\logs\server.log -c c:\licenses\xyz.lic
```

This installs *rlm* as a service under the name "rlm-xyz". When started via the Services control panel or at boot time, *rlm* will be passed the "-c c:\licenses\xyz.lic" args, and it will write its debuglog information to the file `c:\logs\server.log`

Installed RLM services are also deleted with the *rlm* program. Services must be stopped via the service control panel before they can be deleted. Note that deleting a service deletes it from the Windows service database; it does not delete the *rlm* executable or associated license file(s):

```
rlm -delete_service [-service_name sname]
```

where:

- `sname` is an optional name for the installed service. If not specified, `service_name` defaults to "rlm". If `service_name` contains embedded whitespace, it must be enclosed in double quotes.

Notes:

- It is desirable to use the `-c <license file>` command line argument with RLM when installed as a service. Use of environment variables with Windows services is undesirable, as the environment passed to started services is the one in effect at boot time.
- On systems which run RLM license servers, it is a good idea to install each ISV's instance of `rlm` with a `service_name` argument which reflects the ISV or ISVs whose licenses are being served by that instance of `rlm`. For example, if a system ran two instances of RLM as services, where the first instance served license for ISVs "Blue" and "Green", and the second instance served license for ISV "Yellow", they might be installed as "rlm Blue-Green" and "rlm Yellow", respectively.
- Because the Service Controller on Windows invokes services under a special user account in a special default directory, it is necessary to use full paths:
 - for the `-c <license file>` argument on the `rlm` command line
 - in ISV daemon paths in the license file
 - in options file paths in the license file
 - in debug log paths in the ISV options file
 - in report log paths in the ISV options file
 - for the `-dlog debug_log` argument on the command line
- Beginning in RLM v8.0, when running as service, `rlm` now changes its working directory to the directory where `rlm.exe` is installed. This is so that log files will be written there instead of in `c:\windows\system32` as in prior versions (if log file paths are not specified as absolute paths.) `rlm.exe` checks to make sure that it can write to that directory before changing its working directory. If it can't be written, `rlm` leaves its working directory as `c:\windows\system32`.
- When running `rlm` as a service, it is strongly recommended that you specify a debug log location for each ISV server. This is done in the ISV Options File for each ISV server, using the `DEBUGLOG` keyword. If no location is specified for the debug log, the ISV server's debug information is lost when running as a service.
- Starting in v9.4 when you install RLM as a service, it starts and then stops the installed service. This is so that if there are any firewall issues - ports blocked that `rlm` needs to use - the warnings come at service installation time rather than when `rlm` is started for the first time.

Starting the *rlm* server at system boot time on Unix systems

On most Unix systems, system services are started at boot time, usually via startup scripts located in `/etc/rc.<something>`. For example, on Solaris, the startup script might be placed in `/etc/rc2.d/S98rlm`. On Linux systems, the script could be located in `/etc/init.d/rlm`, with a link to `/etc/rc5.d/S98rlm`. Note that you must install this startup script as root.

The startup script should *su* to a different user so that the *rlm* servers are not running as root.

The following is an example of a script which would start rlm at boot time on Unix systems. Modify the first 5 variables for the target system.

```
#!/bin/sh
#
# rlm          Start/Stop rlm
#
#-----
#-----
#-----
# NOTE:
# NOTE: Configure these 5 variables for your system
# NOTE:

# Set rlmuser to the user under which rlm will run
rlmuser=bobm

# Set rlmkdir to the directory where the rlm binary is found
rlmkdir=/home/bobm/rlm/dev/rlm

# Set rlmkdir to the directory where the rlm down binary is found
rlmdowndir=$rlmkdir

# Set licfile to the path to the license file
licfile=$rlmkdir/x.lic

# Set debuglog to the path to the debug log
debuglog=+$rlmkdir/rlm.dl
#-----
#-----
#-----

start() {
echo $debuglog
    su - $rlmuser -c "$rlmkdir/rlm -c $licfile -dlog $debuglog &"
}

stop() {
    su - $rlmuser -c "$rlmdowndir/rlm down RLM -q"
}

case "$1" in
start)
    start
    ;;
stop)
    stop
    ;;
restart)
    stop
    sleep 2
    start
    ;;
*)
    echo $"Usage: $0 {start|stop|restart}"
    exit 1
esac

exit 0
```

License Server Startup Processing

License servers use The License Environment to find their license file. In addition, any file whose name ends in **.lic** in the current directory when the *rlm* server is started (or when the *rlmreread* command is issued) is implicitly added to the end of the license file path. Finally, any file whose name ends in **.lic** in the directory where the *rlm* binary resides is added to the list of license files processed. (Note: license files in the *isv* server's binary directory are **not** processed, only the *rlm* binary directory is searched.)

License servers ignore *port@host* specifications in the License Environment. Once the list of license files is created, the license servers process all the resulting license files. The *rlm* server starts all ISV servers in all license files, and the ISV servers process and support all licenses in all license files with valid hostids.

When the *rlm* server starts, it uses the port # from the first file with the hostname on which it is running. In *rlm* v2.0 and later, the *rlm* server will attempt to use all the port #s in all the license files. It **must** be able to bind the port # in the first file. Once this is done, it attempts to use the port number from each additional file, logging either success or failure in the debug log. This means that when you receive a new product or license file, it can be installed in the application and *rlm* server directories without changing the port number in that file, which simplifies license administration.

ISV servers process all licenses in all files that have a valid *hostid* (by this we mean a *hostid* that corresponds to the computer on which the license server is running). The ISV servers attempt to combine licenses whenever possible - see the next section - and when combined the license counts add to create a single *pool* of licenses. ISV servers log (in the debug log) licenses with invalid signatures and (in RLM v2.0) licenses that will expire within 14 days. ISV servers do not process single-use (*count==single*) licenses.

Beginning in RLM v5.0, ISV servers will detect that they are running on a virtual machine, and by default will refuse to run. The decision to run or not on a virtual machine is an ISV-by-ISV decision, and is configured in *rlm_isv_config.c*

Starting in RLM v7.0, if your server is configured to refuse to run on virtual machines, you can enable it for a particular machine by issuing an **rlm_server_enable_vm** license. This license can be any license that is valid on the server host (ie, it can be either a nodelocked license or a floating license for that server), *however it CANNOT be locked to an Alternate Server Hostid*. So, for example, the following license would enable a license server (where the license is valid) to run on a virtual machine through the end of 2013:

```
LICENSE ISVNAME rlm_server_enable_vm 1.0 31-dec-2013 1 sig=xxx
```

Note that the *rlm_server_enable_vm* license will not be visible in status requests, or in *rlm_products()* calls (beginning in RLM v9.0).

Building Your ISV Server

Your ISV license server is built from components supplied by Reprise Software. You need to provide 2 custom inputs to the build of your license server:

- Your Public Key, for license key verification - *rlm_pubkey.c* – (see Create your Keys on page 25).
- A file of customizations for the server called *rlm_isv_config.c* (this file is contained in the **src** directory on the kit).

Once you have created these 2 files you create your ISV server by typing "make" in the kit directory.

NOTE: You cannot create or use a server settings file if you use ISV-defined hostids.

There are 2 variables you need to set in `isv_config.c`. One is your ISV name ("demo" for demonstration purposes), and the second is "use_flexlm_lockfile".

Only set "use_flexlm_lockfile" to a non-zero value if you want the RLM servers to lock out FLEXlm license servers and vice-versa. This would be done when you want to upgrade your customers' licenses and ensure that both license servers don't run. Note that the behavior of server locking is slightly different on Unix and Windows systems. On Unix systems, if either the RLM or the FLEXlm server is started, the other server will not run. On Windows, however, if the FLEXlm server is started first, the RLM server will run, and shortly after it starts (one to two minutes), the FLEXlm server will exit. If the RLM server is started first on Windows, the FLEXlm server will not run. This is due to the fact that the FLEXlm servers changed their locking mechanism and the new servers check the old locks for a conflict, but do not create them.

In addition, you can modify the parameters to the `rlm_set_cfg_set_compat()` call to alter the compatibility of your ISV settings file with older and newer versions of RLM. Set the 2nd parameter to a non-zero value if you wish your settings file to work with older versions of RLM than the one in which you created the settings file. Set the 3rd parameter to a non-zero value if you want your settings file to work with newer versions of RLM than the one you used to create the settings file. The default is to enable newer versions, but not older versions.

If you ship the settings file, you only need to ship one version of the file for all platforms which you support. This means that you do not need to have a supported server platform in-house in order to provide license server support for it.

ISV server open file limits

ISV servers on Unix platforms will attempt to increase their open file limit. If a server is able to increase its open file limit, a line similar to the following will appear in the debug log when the server first starts up:

```
mm/dd hh:mm (isvname) File descriptor limit increased from 256 to 65536
```

If you do not wish the ISV server to unlimit its open descriptor limit, set the `RLM_NO_UNLIMIT` environment variable in the process where you run the server:

```
% setenv RLM_NO_UNLIMIT anything
```

How Licenses are Pooled by the ISV Server

When the ISV server processes all its licenses in the license file, it combines as many as possible into single *pools* of licenses. In order for 2 licenses to be combined into a single license pool, the following license fields must match *exactly*:

- Product Name
- Product Version
- License Disable specification (first checked in v6.0)
- License Options
- License Sharing specification (share and max_share)
- License Timezone specification
- License Platform list

- License Activation key (if specified)
- Both licenses must be counted or uncounted
- License node-locked hostid
- Both licenses must be user-based or host-based (or neither)
- Neither license can be a named-user license
- License password
- License id (also, an id of 0 will pool with any prior license with non-zero id)

Once pooled, the following fields are processed as shown:

Field	Result
count	Both counts added together
exp-date	Earlier date is remembered
hold	maximum of the 2 values
max_roam	Minimum of the 2 values
max_roam_count	Minimum of the 2 values
min_checkout	maximum of the 2 values
min_timeout	maximum of the 2 values
soft_limit	Both soft_limit values added together
contract	if original is empty, use new
customer	if original is empty, use new
issuer	if original is empty, use new
type	if original is empty, use new

For all other fields, the field in the original license (ie, the first to appear in the license file) is used.

Note that in the case of the **contract**, **customer**, **issuer**, and **type** fields, once a license with a non-empty field is processed, no subsequent licenses in the license file will override this value, ie, the first non-blank value will be the value associated with the license pool.

Also note that different **named_user** licenses are *never* combined into one license pool.

The id of a license can affect license pooling as follows: A license that doesn't specify an id (or specifies 0), will pool with any other license that it would normally pool with. However, a non-zero id will only pool with the same same ID# (assuming all the other attributes make it eligible to pool).

License Server Administration

There are various administration commands that can be used to cause the license servers to reread their license files, to remove licenses from certain users, etc. For a description of these administration commands, see License Administration Tools. In addition, options can be specified for each ISV server in the ISV Options File. You can restrict access to administration commands via the RLM Options File. Both the ISV Options File and the RLM Options File are described in the License Administration manual.

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End User Installation

When your customer receives your product, they need to do a few things in order to set up the licensing. If they are familiar with popular license managers, these installation steps should be quite familiar.

The steps the license administrator needs to perform to install licensing, in addition to installing your application, are:

- Install license server binaries
- Install license file
- Start license server (if you are using floating licenses)
- Set up environment for users to find the license server when running your application.

In addition, your users would also want to know:

- Where to find the license administration tools
- How to set up an options file for the license server. This step can be accomplished by providing them with the RLM License Administration manual (or a link to the manual on the Reprise Website). If you provide a link to the Reprise website, your customers will always have the manual for the latest released version of RLM (which always includes information about all RLM versions, including which version certain features appeared).

Reprise Software's Recommended Software Installation steps

Installing your product with RLM should be very straightforward, and should require no configuration of environment variables, etc. ***NOTE that you should never install a license server as a privileged user (root or administrator).***

Overview:

On the client side, ie, on the machines where your application is going to run, place the license file in your product hierarchy. For nodelocked licenses, this should be the actual, signed license file, and nothing needs to be done to this license file. For floating, this license file will be used only to locate the license server host.

If you are using RLM v10.0 or later, and your customers are primarily running on single network segments, you do not need to install license files on the client nodes, since the client will broadcast to find the license server. Note that this will not work if the client and server are located on different sides of a router, however, for small installations, the broadcast will save you having to configure license files on all client nodes.

If you ship floating licenses, install the server binaries and license file on the server node. The server license file doesn't need to be modified.

Nothing in this set of recommendations requires the use of environment variables, and the install-time editing of license files is kept to a minimum (No editing of license files for nodelocked licenses, and only the server hostname needs to be set on the client side for floating licenses).

Details:

During development:

- establish a directory in your installed product tree for license file(s). This could be the same directory where your product is installed.

- Pass the directory from the step above as the first argument to `rlm_init()`.

When you ship a nodelocked license:

- If you are shipping uncounted or single node-locked licenses, put the actual licenses into the license file. Install in the default directory. You're done.

When you ship a floating license:

- If you are shipping floating licenses, use a single HOST line in the license file for the client side. Use the default RLM port (5053) - which means you do not need a port number in this license file, and fill in the hostname with the name of the server computer at installation time. This license file should look like this:

HOST server-hostname

(Note that you can skip this step if you ship exclusively to small customers running on single-segment networks).

- On the server node, place the `rlm` binary, your `ISVsettings` file (or `ISV server binary`), and the license file in a directory. This license file should have the real, signed licenses. The server hostname in this file can be "localhost", meaning that it doesn't have to be edited by the license administrator. The server license file's first two lines should look like this:

HOST localhost hostid
ISV your-isvname

By configuring the license file this way, it does not need to be edited by your customer. These lines tell RLM to:

- use the default port (5053)
- use the `ISV server settings` or binary from the same directory as the `rlm` binary

Of course, you would include all your signed LICENSE lines in this file as well.

- Start the `rlm` server from the directory in the step above

If your customer already has another RLM server running:

- Install your `ISV settings` or server binary and the license file in the same directory as the other product's copy of the server binaries and license files, and do a "reread" operation on the running `rlm`. That's it, ***however:***
- If your version of RLM is newer than the installed version, update the installed version to your version, then shut down the running `rlm` and start the new one.

If you ship new, additional licenses to your customer:

- Put the new license file in the same directory as the old one. If they are nodelocked licenses, put them on the client system. If they are floating licenses, put them into the directory with your other licenses and do an `rlmreread` on the license server.

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Pre-Release Checklist

With RLM, you specify nearly all licensing options in the actual license that you ship to your customers. However, there are a few issues that you need to consider before you ship your application:

- Review the RLM API calls you make in your application to be sure that you use product names that are suitable (we strongly recommend using the name of the product that is in general use), and that the version numbers are correct. If you intend for your customers to be able to use old licenses from your product, be sure that the version number in the *rlm_checkout()* call is appropriate.
- If we have provided you with special debug libraries, make sure you use the non-debug libraries from the standard kit for your release.
- Review the options you used to Build Your License Server.
- Ensure that you have included The rlm Server, your ISV Server, and the RLM License Administration Tools in your distribution kit. If you are not using an ISV-defined *hostid*, ship the settings file rather than the *isv* server binary. Using the settings file means that your server side executables are completely generic, and your customers can upgrade RLM versions and get bug fixes via a download from Reprise, and you have no ISV server build-test-release cycle to go through.
- Review the Best Practices for RLM Integration section and ensure that your product and installation are well-behaved.
- If you use the RLMID1 option, add documentation on installing and using the device:
 - Ensure that **INCLUDE_RLMID1** is defined in your *rlm_isv_config.c* file if you plan to create node-locked licenses locked to an rlmID1 device.
 - Windows update will perform the required steps for internet-connected systems. However, for your users who have licensed systems not connected to the internet, your user will need to run the driver setup utility. Include the driver installer located at: <http://www.reprisesoftware.com/drivers/rlmid1.zip>
 - On Linux, the driver installation download is at "<http://sentinelcustomer.safenet-inc.com/sentineldownloads/>". Select one of the "Sentinal HASP ... Runtime Installer" options, where the operating system in the 3rd column is Linux. The installation is available in RPM, and compressed tar formats. The installer starts the driver, and sets up rc scripts so that the driver is started when the system boots.
 - Include instructions for your license administrators to install the hardware key.
- A good practice is to include a folder for licenses in your installed product folder tree. In this folder, if you ship floating licenses, you would create a license file with a single *HOST* line similar to the following:

```
HOST myservers any 5053
```

(Note that this *HOST* line does not need a valid *hostid*, only a correct *port#* and *hostname*). At runtime, your application passes the path to this directory as the first argument to *rlm_init()*. Then any license you ever issue - an expiring demo license, a production nodelocked license, or a license file simply containing a *HOST* line as described above - goes in one or more *.lic* files in that licenses folder. Given that you have passed the path to that directory to *rlm_init()*, your application will always be able to find the licenses.

Section 3 – Advanced Topics

This section of the manual contains topics that may be of use if you are doing a more advanced implementation of licensing.

Upgrading to a New Version of RLM

If you have previously integrated RLM into your product and wish to upgrade to a new RLM version, follow these steps:

- First, Download the new RLM kit from the Reprise website - see details in the Installing RLM chapter, above.
- Then, unpack the kit and install. See details in the Installing RLM chapter, above.
- Next, copy the following 3 files from your old kit:

rc/rlm_pubkey.c - copy this file - do not use a new public/private key set from the installation
src/rlm_privkey.c - copy this file - do not use a new public/private key set from the installation
src/rlm_isv_config.c - copy this file - unless you want to change the configuration of RLM for this version

- Edit the following 2 files in the new kit:

src/license_to_run.h - modify this to install the new RLM license you received from Reprise Software
platform/makefile - modify the ISV= line to contain your ISV name (always required on Windows - this step is done as part of the INSTALL process on Unix)

- Finally, run **make** (or **nmake**) in the kit binary directory, and your RLM libraries, ISV server, rlm sign binary and activation binaries are ready to use.

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Using RLM with Languages other than C/C++

If the language you are implementing your application in can link to the RLM static library then that is the recommended approach. Other languages must use the RLM dynamic library, `rlm<vmm>.dll` on Windows or `rlm<vmm>.so` on Unix/Linux. `<vmm>` indicates RLM version, eg, the DLL for v11.0BL2 is `rlm1102.dll`.

In all cases, you will need to download the RLM SDK and build it with the correct C compiler. On Windows, you can download Microsoft Visual Studio Express for free and use it to do the RLM build.

The following sections explain how to use RLM with various languages.

Using RLM with Fortran

The `examples/unsupported` directory on the RLM SDK contains a Fortran interface for RLM.

Using RLM with Java

RLM Java is number of Java classes presenting an object interface to underlying native code. The actual work in RLM Java is done by platform-dependent code accessed via the Java Native Interface (JNI). As such, RLM Java requires that a non-Java RLM kit be installed and configured before RLM Java can be used. The functionality available to a Java program is the same as that available to a C program. The RLM Java API is completely documented in Javadoc. Open `doc/index.html` with a browser to access that documentation.

The platforms that contain support for RLM Java are as follows:

- All Windows (`x86_w3`, `x86_w4`, `x64_w3`, `x64_w4`)
- Linux Intel (`x86_l2`, `x64_l1`)
- Solaris Sparc (`sun_s1`, `sun64_s1`)
- Solaris Intel (`x86_s1`, `x64_s1`)
- Mac/Intel (`x86_m1`, `x64_m1`)

If you would like to see the Java interface in action, follow these steps, after installing RLM on one of the platforms listed above:

On Unix, Linux, Mac systems:

- download the `java_unix.tar.gz` kit from the website
- In the platform directory, run "make shared". This builds the shared object necessary for supporting RLM Java. The name of the shared object is `librlm<ver>.<shared>`, where:

`<ver>` is the major and minor version numbers and the build level.

`<shared>` is the file type of a shared library. This is "so" on all platforms except Mac where it is "jnilib".

For example, in RLM version 11.1BL2 on a Linux system the name would be "librlm1112.so"; on Mac it would be "librlm1112.jnilib".

- Download the java_unix kit - java_unix.tar.gz.- and place it in your RLM SDK directory (ie in the same directory as "src", "examples", etc).

- Perform these steps:

```
% gunzip java_unix.tar.gz
% tar xvf java_unix.tar
% cd java_unix
% ./INSTALL
```

INSTALL will ask you which platform to install if more than one of the supported platforms is present. Select the platform corresponding to the machine you are running on.

- In another window, in the platform directory, start up the RLM License server:

```
% rlm &
```

- In the java_unix window, set the environment variable that lets the Java VM find the native library:

```
On Mac: [export | setenv | etc] DYLD_LIBRARY_PATH[=]'pwd'
All others: [export | setenv | etc] LD_LIBRARY_PATH[=]'pwd'
```

- Run the example Java program:

```
% make runclient
This program, whose source code is in the java_unix directory, checks out a license from the license server and keeps it checked out until you hit enter.
```

On Windows systems:

- Start the RLM license server:

```
> cd <platform>
> rlm
```

- In another window, go into the java_win directory and configure the makefile if necessary. The makefile as shipped refers to the x86_w3 sibling directory. If you are running on a different Windows platform, edit the makefile and change the definition of "NATIVE_PLATFORM" to match the platform you're on. For example, if using 64-bit VC2010, change it to read:

```
NATIVE_PLATFORM = x64_w3
```

- Run the example Java program:

```
> nmake runclient
```


This program, whose source code is in the `java_unix` directory, checks out a license from the license server and keeps it checked out until you hit enter.

Using RLM with MinGW

You need to use the RLM dll with MinGW, as the RLM library is compiled with Visual C++ and those object modules can't coexist with MinGW object modules in the same executable. Link your application with `rlm<vmm>.lib`, and at runtime make sure that `rlm<vmm>.dll` is in your PATH. `<vmm>` indicates RLM version, eg, the DLL for v11.0BL2 is `rlm1102.dll`.

Here is a makefile example, which builds the demo client `rlmclient.exe` with MinGW. Here `rlmclient` is analogous to your application. (Note that using `gcc` to perform the link instead of `ld` means that `gcc` finds all the right system libraries rather than you having to enumerate them on the `ld` command line):

```
rlmclient.o:    ..\examples\rlmclient.c
               gcc -I..\src -o rlmclient.o -c ..\examples\rlmclient.c

rlmclient.exe:  rlmclient.o rlm1102.lib
               gcc -o rlmclient.exe rlmclient.o rlm1102.lib
```

Using RLM with Visual Basic (outside .NET)

For information on integrating RLM with Visual Basic 6 applications, see http://www.reprisesoftware.com/tutorials/Using_RLM_with_Visual_Basic.pdf. The following material covers later versions of Visual Basic.

Visual Basic provides a means to make calls to functions in a DLL. This can be used to call RLM functions in `rlmVVVV.dll`. This is done by declaring the RLM functions you need to use in Visual Basic's "Declare Function" statements, identifying the location of the DLL and how to pass each argument. There is a good technical article on how to do this at <http://support.microsoft.com/kb/106553/EN-US/> - see sections 2.0 and 2.1. (Note: VVVV signifies the RLM version, such as 943 for 9.4BL3 or 1002 for 10.0BL2)

Write Declare Function statements for the RLM functions you want to call. To figure out the mapping between basic data types and C data types, first look at `src\license.h` on the SDK, to see how each function is declared in C, the use the corresponding datatype and calling convention in Basic. Some guidelines:

- Where an RLM function returns some sort of handle, like [RLM_HANDLE](#) or [RLM_LICENSE](#), declare the function in Basic "As IntPtr"
- Where an RLM function returns an int, declare the function in Basic "As Integer"
- Where an RLM function argument is a handle type ([RLM_HANDLE](#), [RLM_LICENSE](#), etc), pass it as "ByVal ... As IntPtr"
- Where an RLM function argument is type "char *", pass it as "ByVal ... As String"
- Where an RLM function argument is type "int", pass it as "ByVal ... As Integer"

Here is a simple example Visual Basic program that checks out a license and checks it back in:

```
Module Module1
    Declare Function rlm_init Lib "rlm.dll" (ByVal path As String, ByVal appPath As String, ByVal
license As String) As IntPtr
    Declare Function rlm_stat Lib "rlm.dll" (ByVal handle As IntPtr) As Integer
    Declare Function rlm_checkout Lib "rlm.dll" (ByVal handle As IntPtr, ByVal name As String, ByVal
version As String, ByVal count As Integer) As IntPtr
```

```

Declare Function rlm_license_stat Lib "rlm.dll" (ByVal license As IntPtr) As Integer
Declare Function rlm_checkin Lib "rlm.dll" (ByVal license As IntPtr) As Integer
Declare Function rlm_close Lib "rlm.dll" (ByVal handle As IntPtr) As Integer

Sub Main()

    Dim response As String
    Dim path$ = "."
    Dim nullstring$ = ""
    Dim handle As IntPtr
    Dim license As IntPtr
    Dim product$ = "test1"
    Dim ver$ = "1.0"
    Dim stat As Integer

    handle = rlm_init(path$, nullstring, nullstring)
    stat = rlm_stat(handle)
    If stat = 0 Then
        license = rlm_checkout(handle, product, ver, 1)
        stat = rlm_license_stat(license)
        If stat = 0 Then
            Console.WriteLine("Checkout succeeded, hit CR to check in...")
            response = Console.ReadLine
            stat = rlm_checkin(license)
        Else
            Console.WriteLine("rlm_checkout error " + stat.ToString("d"))
        End If
        stat = rlm_close(handle)
    Else
        Console.WriteLine("rlm_init error " + stat.ToString("d"))
    End If

    Console.WriteLine("Hit CR to exit...")
    response = Console.ReadLine
End Sub

End Module

```

Using RLM with .NET

Overview

RLM provides a solution for .NET developers who want to use RLM to license their applications. It consists of a simple Interop layer that defines the RLM functions in .NET terms, and a DLL containing the native code. Here is the high-level overview of how to use this capability:

- Install, configure and build a Windows RLM SDK. This provides the license server, utilities, and the actual RLM code packaged in a DLL.
- Build the VS project "Reprise" in the *dotnet* folder on the SDK.
- Add calls to the RLM methods to the .NET application to be licensed.

Building the RLM .NET package

If you have VS2005 or later, simply double click on *dotnet\Reprise\Reprise.sln* to open the project in Visual Studio, then build the project. You can build Debug or Release or both. If you have a prior version of Visual Studio, then create a project for the RLM .NET code manually, copy *dotnet\Reprise\Reprise\RLMInterop.cs* into it, and build.

Running the Example Program

The example program expects the example license file from the SDK (example.lic) to be correctly signed and to be available. The example program will check out v1.0 of the license "test1". Here are the steps to run the example program::

- Open *dotnet\RLMTest\RLMTest.sln* in Visual Studio 2005 or later. If you have an earlier version of Visual Studio, create a new project for RLMTest, as described above for Reprise.
- Build the project, either Release or Debug or both, but in the same configuration(s) as you built the Reprise project.
- Copy *rlmVVVV.dll*, which contains the actual RLM code, from your platform folder (x86_w* or x64_w*) to some folder which is on your PATH, so that it can be found at runtime by the application. (Note: VVVV signifies the RLM version, such as 943 for 9.4BL3 or 1002 for 10.0BL2)
- Copy *example.lic*, which is the signed license file, from your platform folder (x86_w* or x64_w*) to the same folder containing the application.
- Run the application. It opens a command window for it's output, which will look like this if it runs successfully:

```
rlm_init successful
hostid of this machine is <your machine's hostid>

test1
version 1.0
expiration permanent
test2
version 1.0
expiration permanent
test3
version 1.0
expiration permanent
rlm_license_center
version 7.0
expiration permanent
rlm_act_admin
version 7.0
expiration permanent
rlm_act_view
version 7.0
expiration permanent
rlm_gen_license
version 7.0
expiration permanent
rlm_roam
version 1.0
expiration permanent
checkout of test1 OK
attributes of test1
expiration: permanent
days until expiration: 0
checkout of not_there failed: License server does not support this product (-18)
```

If the checkout of test1 fails, it is likely that either the license server is not running, or *rlmVVVV.dll* cannot be found.

Integrating RLM .NET into your Application

The regular RLM manual (*src\RLM_Reference.pdf*) serves as a description of the routines available for a license application to call and how they behave. Refer to *dotnet\Reprise\Reprise\RLMInterop.cs* for the argument types and return value types in the .NET world.

Include a:

```
using Reprise;
```

statement with any classes that invoke RLM, and precede RLM function names and constants with "RLM.", for example, "RLM.rlm_checkout". See the example program *RLMTest.cs* for an example.

You will need to include a reference to RLM in your application's project. The object to reference is:
`<platform>\Reprise\Reprise\bin\<Debug or Release>\Reprise.dll`

Several RLM functions are not supported in RLM .NET. They are:

- rlm_isv_cfg*
- rlm_sign_license
- rlm_add_isv_hostid
- rlm_add_isv_compare
- rlm_add_isv_multiple
- rlm_all_hostids
- rlm_auto_hb
- rlm_act_refresh

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Debugging Licensing Problems in the Field

In order to diagnose a licensing problem in the field, you will need some information from your customer. Primarily, you need to figure out whether there are any nodelocked, uncounted licenses (including roaming licenses) which are available to satisfy your checkout request, and, if not, whether the application can connect to a license server to obtain a license.

RLM v8.0 and later provide tools to help you diagnose these problems in the field. There are 2 tools to assist you:

- client-side diagnostics which show the application environment and local licenses available for checkout, and
- server-side diagnostics which show which licenses are available on the license server.

In addition, RLM v9.0 adds product debugging information.

Client-side Diagnostics

Built into every RLM v8.0 (and later) client is the ability to output environmental information about the application's use of RLM. To enable this, your customer simply sets the environment variable **RLM_DIAGNOSTICS** to the name of a file, then runs your application. Once you call `rlm_init()`, RLM will write diagnostic information to the file name specified. (Note that if you simply set **RLM_DIAGNOSTICS** without a value, the output will be sent to standard out - which may not be what you want).

The resulting output will give the following information:

- time the program was run
- working directory
- relevant environment variables
- list of RLM's idea of the hostids on the machine where the application was run (including your ISV-defined hostids)
- the license files in use, in the order RLM will use them (can be re-ordered from your normal list if `RLM_PATH_RANDOMIZE` is set).
- the parameters you used in your call to `rlm_init()`
- a list of all local licenses which can be checked out. This list will have any roaming licenses listed first if `RLM_ROAM` is set, otherwise roaming licenses will be at the end of the list. In other words, the list will be in the order which RLM attempts to check them out. Each license file will also have an indication of what license server would be contacted if no local licenses can satisfy the request. (Note that for client-cached licenses, only the highest-numbered version will appear, even if there are lower-version licenses available. And only licenses cached by the **same RLM version** will appear in this output.)

An example of this information is contained here:

```
RLM Diagnostics at 10/09/2009 15:40

Environment:

  Hostname: paradise
  Working directory: /user/matt/rlm/test
  RLM platform: x64_s1
  OS version: 5.10

  RLM_CONNECT_TIMEOUT=<not set>
```

```

RLM_EXTENDED_ERROR_MESSAGES=<not set>
RLM_LICENSE=2700@paradise:a.lic:b.lic
RLM_NO_UNLIMIT=<not set>
RLM_PATH_RANDOMIZE=<not set>
RLM_PROJECT=<not set>
RLM_QUEUE=<not set>
RLM_ROAM=1
RLMSTAT=<not set>
REPRISE_LICENSE=<not set>
HTTP_PROXY=<not set>
HTTP_PROXY_CREDENTIALS=<not set>

RLM hostid list:

    1d8bbd06 ip=172.16.7.13

License files:
    2700@paradise
    a.lic
    b.lic

rlm_init() parameters:
    1: <empty>
    2: client3
    3: <empty>

Nodelocked/roaming licenses which can be checked out

Roaming Licenses:

    test v1.0 OK

In license file a.lic
    (no server)

    test1 v1.0 OK
    test2 v1.0 error:-5
    test2 v1.0 error:-3

In license file b.lic
    (server at: 2800@host2)

<none>

```

In this example, you can see that a checkout of "test2" would not succeed with a nodelocked license in license file *a.lic*, because the first test2 license has a bad license signature (error -5, RLM_EL_BADKEY) and the second test2 license has expired (error -3, RLM_EL_EXPIRED).

You can also see that this application will attempt a checkout from the license server running on node **paradise** at port **2700**, if none of the local licenses will satisfy the checkout request.

Server-side Diagnostics

The RLM admin web interface has a new "Diagnostics" command. Pressing the "Diagnostics" button will cause RLM to obtain the diagnostic information from all ISV servers, and put this information into a file ready for your customer to attach to an email message to send to your support department.

This information contains:

- time the diagnostics were run
- working directory of rlm and the ISV servers
- relevant environment variables

- list of RLM's idea of the hostids on the machine where the license server is running (including your ISV-defined hostids)
- the license files in use, in the order RLM will use them
- the contents of all license files
- rlm status and statistics

for each isv server:

- the server status and statistics
- the license pool descriptions for all license pools
- the list of users for each license pool
- the rlm debug log file

and, for each ISV server

- the last 20kb of ISV server debug log output (or 20 lines if output is going to stdout)
- the last 20kb of report log output.

Note: for each license pool, the parameters of the pool are displayed followed by a list of users of that set of licenses. The userlist is displayed in this format: user:host:pid:isv_def:rprod:ver:normal:res:out:hold, where

- user - is the username of the person holding the license
- host - is the hostname where the license is in use
- pid - is the process ID of the process holding the license
- isv_def - is any ISV-defined data provided to RLM before checkout
- rprod - is the requested product name
- ver - is the requested version
- normal - is the number of "normal" (ie, non-reservation) licenses in use
- res - is the number of reservations in use
- out - is the checkout time
- hold - is the license hold time

An example of this information is shown here:

```
RLM Server Diagnostics at 10/20/2009 13:58

Environment:

  Hostname: paradise
  Working directory: /user/matt/rlm/rlm
  RLM platform: x64_s1
  OS version: 5.10

  RLM_CONNECT_TIMEOUT=<not set>
  RLM_EXTENDED_ERROR_MESSAGES=1
  RLM_LICENSE=2700@localhost
  RLM_NO_UNLIMIT=<not set>
  RLM_PATH_RANDOMIZE=<not set>
  RLM_PROJECT=<not set>
  RLM_QUEUE=<not set>
  RLM_ROAM=<not set>
  RLMSTAT=<not set>
  RLM_LICENSE=<not set>
  HTTP_PROXY=<not set>
  HTTP_PROXY_CREDENTIALS=<not set>

  RLM hostid list:

    1d8bbd06 ip=172.16.7.13

License files:
  a.lic
```

```

=====
LICENSE FILE: a.lic ---- contents
=====
HOST paradise ANY 2700
ISV reprise reprise.set reprise.opt
LICENSE reprise foo2 1.0 permanent uncounted hostid=ANY _ck=c91efcffc7
  sig="60P0450NFBEQT82V5DJTY7VPJSFXW70963B791R22G3TEVDBUUS8FE2MNJKHTWO
  K9DNED2D330"
LICENSE reprise test 1.0 permanent 2 _ck=13d7fcfe93 sig="60P04539JPQH1
  UHD8S4JHU55J4HTAX9371F9WSG22HRTERSDDORY5DMDE424TMEGR7GQHDGX730"

=====
Status for "rlm" on paradise (port 2700)
RLM software version v8.0 (build:1)
RLM comm version v1.1
debug log file: _stdout_

rlm Statistics --- Since Start --- Since Midnight --- Recent ---
Start time      10/20 13:58:12    10/20 13:58:13    10/20 13:58:13
Messages:       0 ( 0/sec)         0 ( 0/sec)         0 ( 0/sec)
Connections:    0 ( 0/sec)         0 ( 0/sec)         0 ( 0/sec)

ISV Servers
  Name      port    Running   Restarts
  reprise  51391    Yes       0

=====

ISV reprise status on paradise (port 51391)
reprise software version v8.0 (build:1)
reprise comm version v1.1
debug log file: _stdout_
report log file: /user/matt/rlm/rlm/reprise.rpt

  reprise Statistics --- Since Start --- Since Midnight --- Recent ---
  Start time      10/20 13:58:14    10/20 13:58:14    10/20 13:58:14
  Messages:       2 ( 2/sec)         2 ( 2/sec)         2 ( 2/sec)
  Connections:    1 ( 1/sec)         1 ( 1/sec)         1 ( 1/sec)
  Checkouts:      0 ( 0/sec)         0 ( 0/sec)         0 ( 0/sec)
  Denials:        0 ( 0/sec)         0 ( 0/sec)         0 ( 0/sec)
  License removals: 0 ( 0/sec)         0 ( 0/sec)         0 ( 0/sec)

License pool status -----
Userlist fmt: user:host:pid:isv_def:rprod:ver:normal:res:out:hold

Pool 1: foo2 v1.0 permanent 0+0 soft:0 inuse:0
        h:ANY timeout:0 share:None trans:0
Usage for pool 1
matt:paradise:16253:::1.0:1:0:10/20 14:08:None
matt:paradise:16254:::1.0:1:0:10/20 14:08:None

Pool 2: test v1.0 permanent 0+2 soft:2 inuse:0
        h: timeout:0 share:None trans:0
No Licenses in use for for pool 2

=====
RLM debug log file last 20 lines
=====
10/20 13:58 (rlm) RLM License Server Version 8.0BL1

        Copyright (C) 2006-2009, Reprise Software, Inc. All rights reserved

10/20 13:58 (rlm) License server started on paradise

```



```

10/20 13:58 (rlm) Server architecture: x64_s1
10/20 13:58 (rlm) License files:
10/20 13:58 (rlm)     a.lic
10/20 13:58 (rlm)
10/20 13:58 (rlm) Using options file rlm.opt
10/20 13:58 (rlm) Web server starting on port 5054
10/20 13:58 (rlm) Using TCP/IP port 2700
10/20 13:58 (rlm) Starting ISV servers:
10/20 13:58 (rlm)     ... reprise on port 51391
=====
End rlm debug log
=====

=====
ISV reprise debug log file last 20 lines
=====
10/20 13:58 (reprise) RLM License Server Version 8.0BL1 for ISV "reprise"
10/20 13:58 (reprise) Settings from RLM Version 8.0BL1 for ISV "reprise"
10/20 13:58 (reprise) Server architecture: x64_s1

    Copyright (C) 2006-2009, Reprise Software, Inc. All rights reserved.

    RLM contains software developed by the OpenSSL Project
    for use in the OpenSSL Toolkit (http://www.openssl.org)
    Copyright (c) 1998-2003 The OpenSSL Project. All rights reserved.
    Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com) All rights reserved.

10/20 13:58 (reprise) Using options file reprise.opt
10/20 13:58 (reprise) Report log started on /user/matt/rlm/rlm/reprise.rpt
10/20 13:58 (reprise)
10/20 13:58 (reprise) Server started on paradise (hostid: ANY) for:
10/20 13:58 (reprise)     foo2 test
10/20 13:58 (reprise)
10/20 13:58 (reprise) License files:
10/20 13:58 (reprise)     a.lic
10/20 13:58 (reprise)
10/20 13:58 (reprise) File descriptor limit increased from 256 to 65536
=====
End reprise debug log
=====

=====
ISV reprise report log file contents (/user/matt/rlm/rlm/reprise.rpt)
(last 20kb only)
=====
2 1.0 1 0 0 0 "ANY" "" "" "" "" "" "" 0 0 0 0
PRODUCT test 1.0 2 0 2 2 "" "" "" "" "" "" 0 0 0 0
10/19/2009 21:20

RLM Report Log Format 2, version 8.0, authenticated
ISV: reprise, RLM version 8.0 BL1
Logfile format Copyright (C) 2006-2009 Reprise Software, Inc.
For documentation on this format, email info@reprisesoftware.com
You are encouraged to build tools to process this data.

START paradise 10/19/2009 21:23:13
LICENSE FILE a.lic
PRODUCT foo2 1.0 1 0 0 0 "ANY" "" "" "" "" "" 0 0 0 0
PRODUCT test 1.0 2 0 2 2 "" "" "" "" "" "" 0 0 0 0
10/19/2009 21:23

.....

```

```
=====  
END ISV reprise report log file contents (/user/matt/rlm/rlm/reprise.rpt)  
=====
```

Product Debugging Information

Beginning in RLM v9.0, your application will be enabled to output diagnostic information about any or all product names. In order to do this, set the environment variable **RLM_DEBUG** as follows:

- RLM_DEBUG set to an empty value – show information about all products
- RLM_DEBUG set to a string – show information about the product specified

DO NOT SET RLM_DEBUG WHEN RUNNING THE LICENSE SERVER!

This information can be obtained from the new `rlmdebug` utility (part of `rlmutil`), or directly from your application. If the `RLM_DEBUG` environment variable is set, the debugging information will be output to stdout at the end of the `rlm_init()` call. For use of `rlmdebug` (which does not require the `RLM_DEBUG` environment variable), see the RLM License Administration Manual.

Note that the most accurate information will be obtained from your application, since the exact license file path used by the application will be available to the `rlm` debugging routines. The stand-alone utility cannot know about default license files and paths which you set in your `rlm_init()` call. Please note that `RLM_DEBUG` will only report on licenses which are present in local license files. In other words, if you have a license path like “5053@server”, `RLM_DEBUG` will report on whether the server is up, but it will not report on individual licenses served by that server.

For example, with `RLM_DEBUG` set to an empty string:

```
% setenv RLM_DEBUG
```

The following (sample) output is displayed:

```
RLM DEBUG for all products  
In license file: ../rlm/z.lic (5555@paradise):  
Product: test1, ISV: reprise, Floating  
Product: test2, ISV: reprise, Floating  
Product: test3, ISV: reprise, Floating  
Product: rlm_roam, ISV: reprise, Uncounted  
Product: testr1, ISV: reprise, Floating  
Product: testr2, ISV: reprise, Floating  
Checking server machine "paradise" ... server UP  
Checking RLM server at port 5555 ... server UP  
  
In license file: a.lic:  
Product: test, ISV: reprise, Single  
  
8 product instances found
```

On the other hand, with `RLM_DEBUG` set to the name `test`:

```
% setenv RLM_DEBUG test
```

The following (sample) output is displayed:

```
RLM DEBUG for product "test"
```

```
In license file: ../rlm/z.lic (5555@paradise):  
Checking server machine "paradise" ... server UP  
Checking RLM server at port 5555 ... server UP  
No matching products found in license file
```

```
In license file: a.lic:  
Product: test, ISV: reprise, Single
```

```
1 product instances found
```

Metered Licenses

Metered licenses are licenses that count the number of times something happens, sometimes called *consumptive licensing*. For example, you might want to license the number of pages printed in your application or the amount of time your application runs. If that is what you want, then metered licenses are for you. A metered license is like a postage meter for software – you fill the meter up, then as the application runs, it consumes the meter count. When the meter is exhausted, subsequent checkout requests fail with RLM_EL_METER_NOCOUNT.

It's important to note that you do not have to change your code to make use of metered licenses. You call `rlm_checkout()` in the normal way. When you create the license, you specify that it is a *metered* license rather than *node-locked* or *floating*, and RLM does the rest.

Note that metered license cannot roam. In fact, if a license specifies any of the following attributes, it *cannot* be metered: `hold`, `min_checkout`, `client_cache`, `max_roam`, `max_roam_count`, `soft_limit`, `user_based`, `host_based`.. Prior to RLM v12.0, shared licenses could not be metered.

Also note that meter counts are 32-bit integers, so the maximum value for a meter counter is $(2^{31})-1$.

In addition, a meter counter number is also a 32-bit integer, so the maximum counter number is $(2^{31})-1$, however, in practice it is best to keep your counter numbers in the range of small integers.

About RLM meters

RLM metering is managed by the license server, so every metered license requires a license server to operate. The RLM metering implementation is *insecure*, for two reasons: the meters themselves are stored in files on the server computer, and users with access to the RLM web interface can add count to the meters. (Note: This is not true if you use RLMCloud, since the cloud servers are under your control and your customer does not have access to the standard web interface to modify the counters.) This implementation will work for you if you use RLMCloud, run your license servers on your network to serve licenses for your customers, or if you want to give your customers the ability to meter licenses and then report on usage via the report log for post-use billing. But you cannot use RLM's metering implementation to **enforce** meter counts if your customers run their own license servers.

The license server maintains a single *meter*, which can contain any number of *meter counters*. It is the individual *meter counters* which your software will consume. An RLM metered license can specify an amount to subtract from an arbitrary meter on checkout, then an additional amount periodically while the software continues to run.

How to Specify a Metered License

In order to create a *metered* license, the count keyword is set to “meter”. In addition, there are 4 optional parameters you can set to control the metering of the license:

- `meter_counter` – the meter counter # used to meter this license
- `meter_dec` – The amount subtracted from the meter on the initial `rlm_checkout()`
- `meter_period` – The amount of time before an additional amount is subtracted from the meter
- `meter_period_dec` – The amount subtracted from the meter each *meter_period* minutes

Note that metered licenses are not specific to a SERVER's hostid; they will work anywhere that you configure the meter. In other words, the SERVER's hostid does not factor into the signature of a metered license.

If a metered license is specified with no additional options, the defaults are as follows:

```
meter_counter=1
meter_dec=1
meter_period=0
meter_period_dec=0
```

meter_counter=n

The *meter_counter* keyword specifies which counter is used for this product. Chose a positive integer less than 2**31. Smaller numbers are better for the RLM user interface.

meter_dec=n

The *meter_dec* keyword specifies the amount to be subtracted from the specified *meter_counter* when the server processes the *rlm_checkout()* request. Note that the *count* parameter of *rlm_checkout()* will multiply all the meter decrement counts. If the meter counter has insufficient count, *rlm_checkout()* will return RLM_EL_METER_NOCOUNT. Additional checkouts of a shared license will not decrement the meter.

meter_period=n

The *meter_period* keyword specifies the number of minutes before the counter is decremented again. Note that this time is approximate. The first periodic decrement will happen up to one minute earlier than the time specified. After that, the decrements will be at very nearly *n*-minute intervals. If unspecified or specified as 0, there will be no periodic decrement of the counter. Note that for shared licenses, only one of a group of shared licenses will have the meter decremented.

meter_period_dec=n

The *meter_period_dec* keyword specifies the amount to be subtracted from the specified *meter_counter* approximately every *meter_period* minutes. This is approximate because the license server does this subtraction in its periodic processing, which happens very close to once per minute. ***If the meter counter has insufficient count at the time of this decrement, the server will decrement the counter (causing it to go negative), then drop the license*** (similar to a TIMEOUT or an *rlmremove* operation), and your program will receive an RLM_EL_METER_NOCOUNT status the next time you call *rlm_license_stat()* on the license handle. The checkin status in the report log will have a reason code of 10, indicating that the checkin happened as a result of insufficient count in the meter. Note that the *count* parameter of *rlm_checkout()* will multiply all the meter decrement counts. Also note that for shared licenses, only one of a group of shared licenses will have the meter decremented.

Example metered licenses

This example creates a metered license which subtracts 1 from counter number 1 on initial checkout and no further decrements as long as the program is running:

```
LICENSE reprise test 1.0 permanent meter sig=xxxx
```

This example creates a metered license which subtracts 20 from counter number 7 on initial checkout and an additional 5 every 10 minutes as long as the program is running:

```
LICENSE reprise test 1.0 permanent meter sig=xxxx
meter_counter=7 meter_dec=20 meter_period=10
meter_period_dec=5
```

Installation of Metered licenses

When a metered license is installed and the license server is started, the server creates the meter counter if it does not exist. Once created, the counter has 0 count, so checkouts that require meter count will not work. In the rlm web interface (in the license server status section), there will be a separate section for metered licenses - separate from all other licenses, as shown below:

License pool status

Product	Pool	Ver	Expires	count	soft lim	inuse	res	timeout	share	transactions	Show License Usage
test	1	2.0	1-jan-0	0	1	0	1	0	None	0	<input type="button" value="usage..."/>
test2	2	1.0	1-jan-0	1	1	0	0	0	None	0	<input type="button" value="usage..."/>
act_test	7	1.0	permanent	1	1	0	0	0	None	0	<input type="button" value="usage..."/>

Metered License status

Product	Pool	Ver	Expires	counter	init dec.	period	periodic dec.	current count	Add Count to Meter		Show Usage
test4	4	1.0	1-jan-0	7	100	2	50	0	<input type="text" value="0"/>	<input type="button" value="Add to counter 7"/>	<input type="button" value="usage..."/>
test5	5	1.0	1-jan-0	2	1	1	1	97	<input type="text" value="0"/>	<input type="button" value="Add to counter 2"/>	<input type="button" value="usage..."/>
test100	6	1.0	1-jan-0	1	1	0	0	0	<input type="text" value="0"/>	<input type="button" value="Add to counter 1"/>	<input type="button" value="usage..."/>



Metering parameters



Meter update section

In the “Metered License Status” section, the metering parameters for each license are displayed, near the middle, along with a text box and a button to add count to the meter. Fill in the desired increment to the count in the text area, then press the “Add to counter N” button to its right. This will bring up a confirmation page, after which the meter counter is incremented.

The “Add Count to Meter” section of this form will only appear if the “edit_meter” privilege is not disabled in the rlm web interface for this user.

Reporting

When a metered license is checked out, in addition to the normal checkout record, an additional record is logged for the meter decrement. In addition, a decrement record is logged for each periodic decrement. These records are described in the RLM License Administration Manual. The reportlog can be used for post-use billing of metered licenses. The ability for your customer to control the meter count means that they have control of costs during the billing cycle.

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Token-Based Licenses

Token-Based licenses are licenses that are defined in terms of another license. For example, an application could request a license for product **write**. If this were a *normal* license, the product **write** would appear in the license file (if the request succeeds) with a license count (or *uncounted*). On the other hand, if this were a *token-based* license, the product **write** would appear in the license file without a count, but with a specification of one or more other products which are used to satisfy the request. When the license server encounters a request for a *token-based* license, it uses the other products specified in the license to satisfy the request, rather than the originally-requested product. These other licenses are called the *primary* licenses.

There are two main uses for token-based licenses. The first use of token-based licenses allows a license administrator to mix-and-match different products as their needs change. If several products are all defined in terms of a single pool of *primary* licenses, the license administrator can control license usage as needs demand. This can be a benefit to both ISVs and their customers, since as new products are introduced, if they are licensed based on the same *primary* license, all customers instantly have access to the new products without having to go through a purchase-order cycle.

Another use of token-based licenses is to allow alternate licenses to satisfy a request for a product. To use the familiar example, if product **write** checks out a *write* license, the addition of a *token-based* license for *write* mapping it to *office* would allow an *office* license to be used in the case where no *write* licenses are available. Even though the *office* license is a more expensive license, the customer is allowed to continue working by consuming the more expensive *office* license. Several *token-based* licenses can be used in this way, and the order of the licenses in the license file will determine the order that alternate checkouts are attempted.

A token-based license differs from a normal license in a few significant ways:

- The count field contains one of the 3 token keywords (**token**, **token_bound**, or **token_unlocked**) rather than an integer, **uncounted**, or **single**.
- The license has a token spec: **token="<prod ver count> ... <prodN verN countN>"**
- The only optional parameter on a token-based license which is used by RLM is the start date. All other optional parameters are ignored.
- License Administration option processing is different for *token-based* licenses. See below.
- There are a few restrictions on *token-based* licenses, especially for queuing. See below.

*(Note: prior to RLM v12.4, the keyword **token_locked** was intended to lock the token license to the server's hostid. This locking did not happen; this is our bug P501. **token_locked** was deprecated in v12.4 and replaced with **token_bound**. Licenses with **token_locked** keywords will continue to operate, but they will not be locked to the server's hostid).*

Types of *token-based* Licenses

When a product is specified as a *token-based* license, requests for that product are turned into requests for the *primary* license(s) specified in the **token=** part of the license. For example, consider this license for product **test** (*primary* license **dollars**):

```
LICENSE reprise test 1.0 permanent token sig=xxxx token="<dollars 2.0 5>"
LICENSE reprise dollars 2.0 permanent 10 sig=xxxx
```


This license is called a *simple token-based* license. Any *token-based* license that maps a checkout of one product into a (single) *primary* license is a *simple token-based* license.

A *token-based* license can map one request into multiple checkouts, however. In this case, it is called a *compound token-based* license. Using our product **test** as an example again:

```
LICENSE reprise test 1.0 permanent token sig=xxxx token="<dollars 2.0 5>
<cents 3.4 53>"
LICENSE reprise dollars 2.0 permanent 100 sig=xxxx
LICENSE reprise cents 3.4 permanent 1000 sig=xxxx
```

Now, a request for 1 license of **test** v1.0 would result in the license server checking out 5 v2.0 licenses of the product **dollars**, and 53 v3.4 licenses of the product **cents**. If **both** of these primary licenses are available, the checkout request for **test** succeeds, otherwise it fails. Note that when a *compound token-based* license is checked out, the *rlm_license_xxx* functions return information about the first license in the list only. In this example, *rlm_license_xxx* functions would return information about the *dollars* license.

Issues with roaming

When a license is roamed, only the name of the license that was requested in the checkout can be used on the roamed system. What this means, in practice, is that as long as you use the same name to attempt the checkout, the checkout will succeed. However, sometimes token-based licenses are used to migrate a product license name. For example, if v2.0 of your product checks out an “old_name” license, and v3.0 checks out a “new_name” license, and you have a token license definition to map the “new_name” checkout to “old_name”, then a roamed license created by checking out “new_name” will not work for the product that checks out “old_name”, even though the “new_name” checkout may have been satisfied by an “old_name” license. In other words, while this mapping works on the server side, it does not work for a roamed license.

The License Count Keywords

In a *token-based* license, the count keyword is one of:

- token
- token_bound
- token_unlocked

token and *token_unlocked* imply that the *token-based* license itself does not include the license server hostid in its license signature. This makes the license usable in *any* license file. Note that *token* and *token_unlocked* are 100% equivalent.

token_bound means that the *token-based* license includes the license server hostid in its signature, and is valid only in *this* license file.

The *token=* keyword

In a *token-based* license, the *token=* keyword specifies the *primary* licenses which are checked out in response to a request for the *token-based* license itself. Specify one or more licenses to be checked out. These licenses can also be *token-based* licenses themselves (in which case the *primary* license(s) will be the ultimate expansion of all *token-based* licenses). The format is:

```
token="<product1 ver1 count1>[ <product2 ver2 count2> ... <productN verN countN>]"
```

The request for the one of the original license turns into checkouts of:

- *count1* of *product1*, *ver1*
- *count2* of *product2*, *ver2*
- ...
- *countN* or *productN*, *verN*

Nesting *token-based* licenses

The definition of a token-based license can include other licenses which are token-based licenses themselves. For example:

```
LICENSE reprise test 1.0 permanent token sig=xxxx token="<t2 2.0 5>"
LICENSE reprise t2 2.0 permanent token sig=xxxx token="<dollars 2.0 5>"
```

In this example, a request for one test v1.0 license results in 25 dollar v2.0 licenses checked out.

Note that the license server uses nesting of greater than 20 levels to detect token "loops", so any licenses nested this deeply will be rejected. Also note that nesting has no effect on whether a *token-based* license is *simple* or *compound* - this is determined solely by whether a single request maps into a single checkout or not.

Restrictions on *token-based* licenses

There are a few restrictions on *token-based* licenses:

- All *token-based* licenses are processed by the license server, so there can be no uncounted, node-locked *token-based* or *primary* licenses that operate without a license server. (However, a license server can serve a node-locked, uncounted *primary* license.)
- All individual checkouts for a *compound token-based* license are satisfied by a single license server. This means that if a license turns into checkouts of *primary* licenses a, b, and c, where only a and b are available on one server and only c is available on a second server, the request will fail
- The mapping from a token-based license to its *primary* license(s) maps to a single *primary* license. This means that a single token-based license generates requests of a *single primary license pool* (for each of its *primary* licenses). So, for example, if your token-based license turned into a request for *primary* license *prim*, the first pool of *prim* licenses would be used, and other pools of *prim* licenses could not be used to satisfy this token request.
- Queuing is not allowed for *compound token-based* licenses. This would lead to license server insanity.

NOTE: Token licenses, once fully resolved, should NOT contain multiple instances of the same primary license name. If this is the case, the server can inadvertently overdraft that license while processing the token-based checkout.

The following licenses are examples of licenses which contain multiple instances of the same primary license:

```
LICENSE reprise t1 1.0 permanent token token="<x 1.0 1><x 2.0 1>" sig=...
```

or

```
LICENSE reprise t1 1.0 permanent token token="<t2 1.0 1><x 2.0 1>" sig=...  
LICENSE reprise t2 1.0 permanent token token="<x 2.0 1>" sig=...
```

The server will generate a warning about this condition similar to the following:

```
01/01 10:09 (reprise) *WARNING: token definition for t1 has multiple  
01/01 10:09 (reprise)             instances of primary license x
```

For the 2 examples above, if there is only a single license for “x”, a checkout of “t1” will cause the server to checkout 2 copies of “x” and return an RLM_EL_OVERSOFT error to the application.

rlmremove and *token-based* licenses

The *token-based* license itself cannot be removed. If any of the *primary* licenses are removed, the server will remove all *primary* licenses, and the application will notice a loss of license on the next check with the server resulting from an `rlm_get_attr_health()` call or from the heartbeats generated by `rlm_auto_hb()`. In this sense, the *token-based* license works just like a regular, non *token-based* license.

Report Log

When a *token-based* license is checked out, the name of the license requested (and its version) is logged in the checkout record for each resulting *primary* license checkout. If the check out results from the dequeuing of a previously-queued request, the requested product name/version will not appear (they appear in the queue record, but not the checkout record).

License Administration Options

The only options that apply to the *token-based* license itself are the include and exclude keywords:

- INCLUDE
- INCLUDEALL
- INCLUDEALL_ROAM
- EXCLUDE
- EXCLUDEALL
- EXCLUDEALL_ROAM

All other license administration options have no effect on the *token-based* license.

All options affect the *primary* licenses, however.

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Alias Licenses

Alias licenses are licenses that define themselves in terms of another license. You can think of an alias license as the nodelocked version of a token license.

Alias licenses are processed by the client only; they are never processed by the server. Here are some differences between token-based and alias licenses:

	Token-based license	Alias license
Where processed	Always on the server. Token-based licenses are ignored by the client.	Processed only by the client. Must be in a local license file. The server ignores alias licenses.
# of target licenses	Any number	One only
Target license(s)	Must be served	Can be nodelocked or served.
Nesting	Up to 20 levels	None allowed

For example, an application could request a license for product **write**. If this were a *normal* license, the product **write** would appear in the license file (if the request succeeds) with a license count (or *uncounted*). On the other hand, if this were an *alias* license, the product **write** would appear in the license file without a count, but with a specification of one other product which is used to satisfy the request. When the client encounters a request for an *alias* license, it uses the other product specified in the license to satisfy the request, rather than the originally-requested product. This other license is called the *primary* license. The primary license can be either another nodelocked license or a served license.

A alias license is similar in syntax to a token-based license; both differ from a normal license in a few significant ways:

- The count field contains one of the keyword **alias** rather than an integer, **uncounted**, or **single**.
- The license has an alias spec: **alias="<prod ver count>"**
- The only optional parameters on an alias license which are used by RLM are the start date, and the hostid. All other optional parameters are ignored.
- License Administration option processing is different for *alias* licenses. See below.
- There are a few restrictions on *alias* licenses, especially for queuing. See below.

Example of an *alias* Licenses

When a product is specified as an *alias* license, requests for that product are turned into requests for the *primary* license specified in the **alias=** part of the license. For example, consider this license for product **test** (*primary* license **dollars**):

```
LICENSE reprise test 1.0 permanent alias sig=xxxx alias="<dollars 2.0 5>"
LICENSE reprise dollars 2.0 permanent hostid=abcdef01 sig=xxxx
```

A request for the product “test”, v1.0 will check out “dollars”, v2.0

Issues with roaming

Since an alias license is processed by the client, it cannot roam.

The License Count Keyword

In an *alias* license, the count keyword is “alias”.

If you want the alias license usable only on a single host, include the “hostid=xxx” keyword in the alias license itself.

The *alias=* keyword

In an *alias* license, the *alias=* keyword specifies the *primary* license which is checked out in response to a request for the *alias* license itself. Specify only one license to be checked out. **Although the syntax processing is the same as for token-based licenses, only the first product specified will be used.** These licenses also cannot be *alias* licenses themselves. The format is:

```
alias="<product1 ver1 count1>"
```

The request for the one of the original license turns into a checkout of *count1* of *product1*, *ver1*

Nesting *alias* licenses

Unlike token-based licenses, which can be nested 20 levels deep, alias licenses cannot be nested.

Restrictions on *alias* licenses

There are fewer restrictions on *alias* license than on a *token-based* license:

- All *alias* licenses are processed by the client, so there can be no floating *alias* licenses, in fact, the license server completely ignores *alias* licenses.
- The mapping from an alias license to its *primary* license will attempt to find the primary license wherever it can, either node-locked, or on any license server.
- You can queue for the primary license of an alias(ed) license.

Report Log

When an alias license is checked out, if the primary license comes from a license server, the name and version of the *primary* license is logged.

License Administration Options

All options affect the *primary* licenses.

Use cases for alias licenses

There are three main uses for alias licenses, the 2nd and 3rd are the same as for token-based licenses.

Perhaps the most compelling use of an alias license is in conjunction with Activation Pro. If you sell several different product bundles, your options for doing that are either to issue independent licenses for all the products in the bundle, or to use an options= keyword in a single RLM license and decode the options in your product. The second approach has a couple of disadvantages: (1) you have to process the options yourself, and, more importantly (2) it becomes nearly impossible for your customer to select which bundle they want to check out. The first approach (separate licenses) is easier for everyone, until you get to issuing activation keys for the bundle. No one wants to issue N independent activation keys. Using alias licenses allows you to avoid this. Let's say you have 4 products: a, b, c, and d, which you sell as 3 different bundles: x, y, and z. With alias licenses, you can do the following, assuming you want a and b in bundle x, a, b, and c in bundle y, and a, b, c, and d in bundle z:

1. create static definitions of the bundles, as follows:

```
alias a to x
alias b to x
```

```
alias a to y
alias b to y
alias c to y
```

```
alias a to z
alias b to z
alias c to z
alias d to z
```

These alias definitions can be shipped with your product, or updated when you have new bundle definitions. The point is that they are the same for all your customers, and they are independent of your code.

2. When your customer purchases bundle “y” for example, issue them an activation key for product y. Now RLM will allow them to check out a, b, and c, based on those alias lines, but not d.

The second use of an alias license allows a license administrator to mix-and-match different products as their needs change. If several products are all defined in terms of a single pool of *primary* licenses, the license administrator can control license usage as needs demand. This can be a benefit to both ISVs and their customers, since as new products are introduced, if they are licensed based on the same *primary* license, all customers instantly have access to the new products without having to go through a purchase-order cycle.

A third use of an alias license is to allow alternate licenses to satisfy a request for a product. To use the familiar example, if product **write** checks out a *write* license, the addition of an *alias* license for *write* mapping it to *office* would allow an *office* license to be used in the case where no *write* licenses are available. Even though the *office* license is a more expensive license, the customer is allowed to continue working by consuming the more expensive *office* license. Several *alias* licenses can be used in this way, and the order of the licenses in the license file will determine the order that alternate checkouts are attempted.

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Post-Use Billing

Many ISVs and License Administrators prefer a licensing option which allows the software to be used in excess of a predetermined limit, and then invoiced after-the-fact for actual usage. This capability has been referred to as "*Pay-Per-Use*", or "*Metered*" or "*Post-Use Billing*".

RLM supports this license model via the authenticated report log (added in RLM v3.0).

To support *Post-Use billing*, the license administrator would generate *authenticated* report logs, by specifying the *auth* parameter on the REPORTLOG line in the ISV options file (see the REPORTLOG section of The ISV Options File in the License Administration manual for more information. Note that as of RLM v4.0, all report logs are authenticated, so this parameter is not required.) RLM will then generate authentication data within the report log. When the report log is returned to the ISV, the utility *rlmverify* is run to verify the contents of the report log. Usage is:

- *rlmverify report_log_file*

rlmverify reads the specified *report_log_file* and checks the authentication records, then indicates whether the report log is correct or whether data in various sections has been modified.

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License Roaming

RLM has the ability to allow a floating license to *roam* to a system which will subsequently be disconnected from the network for a short period of time. The resulting license can be used for the number of days specified when the license was set to roam, and is checked back in automatically at the end of this time. In addition, the customer can return the *roamed* license back to the license pool early if this is desired. Roaming is generally done with a checkout of a single license. If you request multiple licenses in a single checkout call, see the *Special Considerations with Roaming Licenses* section below.

Note that once the license is roamed to the disconnected system, the license will behave on that system as if it were a nodelocked, uncounted license. On the server system, one floating license will be assigned to the roamed system. Beginning in RLM v10.0, the behavior of the roamed license on the disconnected system can be the same as a “single” license. In order to make the roamed licenses “single” licenses, make the following call in `rlm_isv_config.c`:

```
rlm_isv_cfg_set_roam_single(handle, 1);
```

In order to roam a license, an application performs a normal checkout with the `RLM_ROAM` environment variable set to a positive number (this number is the number of days which the license will roam). If successful, this checkout will create a roamed license which is valid for the specified number of days.

If a subsequent checkout is performed with `RLM_ROAM` set to a positive number, the roam expiration date will be extended if required. The expiration date of the roam will not be truncated if the new value indicates an expiration sooner than the old expiration.

If you set `RLM_ROAM` to 0, then the client will use a roamed license if it is available, but if not, it will use a floating license.

Note that if you request both roaming and queueing, the queue request will be ignored. In other words, if both `RLM_ROAM` and `RLM_QUEUE` are set, `RLM_QUEUE` is ignored. This restriction is enforced starting in RLM v12.0.

A roamed license can be returned to the license server by setting `RLM_ROAM` to -1. When the license is checked out with `RLM_ROAM` set to -1, a successful checkout removes the roam data on the client machine and informs the server that the license is no longer roaming. *Note that, in order for this to work, the license on the license server must be the same as it was when the roamed license was originally checked out. If the license is updated on the license server, the roamed license **cannot** be returned early, and must time out normally.*

This is an important point – roamed licenses are specific to a particular license. If the license is replaced on the server side, the roamed license cannot be returned early – the roam can only time out in this situation. Roamed licenses are also version-specific – both license version and RLM version, so if your software is upgraded and either uses a newer version of RLM or requests a different version, the existing roamed license will not work.

Note: In RLM v11.2, the restrictions on the RLM version in the client have been relaxed a bit. RLM now has the notion of the “oldest compatible version/revision” for roam file data. As long as the version and revision are greater than the oldest compatible version/revision stored in the roam file itself, the roam data will work on applications compiled with different RLM

versions.

As of RLM v11.2, the oldest compatible RLM version/revision for client-side roam files is v11.0

There are some special cases for the v11.x RLM versions, however:

- a license roamed by a v11.0 client can be used by a v11.0 , v11.2 or later client (until the “oldest compatible version” changes).
- a license roamed by a v11.1 client can ONLY be used by a v11.1 client.
- A license roamed by a v11.2 client can only be used by a v11.2 or later client, until the “oldest compatible version” changes.

ISV control over license roaming

As an ISV, you control whether licenses are able to roam, and how long they can be checked-out in the disconnected state.

License Roaming is only available to systems that are able to check out an *rlm_roam* license issued by you. Note that this license must be available at all times - when the initial product checkout is done as well as when operating in a disconnected fashion. In other words, you must issue an uncounted, node-locked *rlm_roam* license. This license can, of course, be node-locked to "ANY" hostid.

The characteristics of the *rlm_roam* license also restrict how roaming can be used. For example, if the *rlm_roam* license specifies *platforms=x86_w*, then only 32-bit Windows systems would be able to check out roamed licenses. If *rlm_roam* specifies *max_roam=7*, then roamed licenses could only be checked out for 7 days. You can apply the *max_roam* attribute to any product license as well, but *max_roam* on the *rlm_roam* license creates a maximum for all products, so you only need to specify it once if you want to set a global maximum. If you do this and wish to disable roaming on an individual license, set *max_roam* to -1 for that license. You can, of course, always set an individual license *max_roam* to a value lower than the value in the *rlm_roam* license.

In addition, you can specify the *max_roam_count* attribute to any license. *max_roam_count* specifies how many of that particular license can be roamed. So, for example, to disable roaming of a particular license, specify *max_roam_count=0* on that license.

NOTE: The *hold* and *min_checkout* parameters of a license which is roaming will be ignored.

License roaming and servers locked to transient hostids

If a license server is locked to a transient hostid (usually a dongle), it is easy for the license administrator to move the server to another machine, which not only allows for extra licenses to be roamed, but also interferes with the returning of roamed licenses, if the server isn't running on the same machine as when the license was roamed. Beginning in RLM v10.0, roaming is disabled if the server is locked to a transient hostid, and the application will receive an RLM_EL_NOROAM_TRANSIENT error.

If you want to enable roaming on servers with transient hostids, modify *rlm_isv_config.c* and set the 2nd parameter to the *rlm_isv_cfg_set_enable_roam_transient()* to 1.

Example *rlm_roam* license

The following `rlm_roam` license would allow anyone to roam any of your licenses for up to 14 days. Note that you can apply `max_roam` to any individual license to override this 14-day default:

```
LICENSE isvname rlm_roam 1.0 permanent uncounted hostid=any max_roam=14 sig="xxx"
```

This license should always be available to the application which will be roaming. If you want to enable roaming for all your customers, a good way to do this is to sign the `rlm_roam` license and pass the signed license as the 3rd parameter to `rlm_init()`. If you only want to enable roaming for certain customers, then the license must always be available to the client in a local license file.

Once issued, the contents of the `rlm_roam` license, as well as the restrictions on the other product licenses will be in effect, but your customer controls roaming operation from that point on.

If you have issued an `rlm_roam` license and wish to disable roaming for a particular product license, set the `max_roam` attribute on the product license to -1. If you want an individual license to roam for only 5 days, set the `max_roam` on that license to 5. All other licenses will be able to roam for 14 days.

For a description of how roaming works from an license administrator perspective, see How to use Roaming Licenses in the RLM License Administration Manual.

Special Considerations with Roaming Licenses

Roaming licenses are attached to an *exact* license pool. This means that the licenses, once roamed, are associated with the exact LICENSE line on the server from which they were checked out. If that license is subsequently upgraded or replaced, the server will no longer have access to the roaming information. The roamed license on the client node will continue to be valid until it expires, and the server will return to its (newly upgraded) full complement of floating licenses. This also means that the server's host name and port-number must remain unchanged during the time the license is roamed. If you change either the server name or port, the roamed license cannot be returned early.

You should note that this means that a license which is roaming at the time the licenses are upgraded on the server can no longer be returned early, and, as a consequence, a new roaming license (of a potentially higher version) will not be available until the original license roam expires. This also means that during the remaining time of the license roam, there will be one additional floating license available for each unexpired roamed license of the old version.

Another consideration is that a roamed license is a unit. Generally, it is unwise to roam licenses when a checkout request specifies multiple licenses. However, if you do this (checkout multiple licenses and allow them to roam), note that **any** checkin will check all the roamed licenses back in. For example, if you do a checkout of 4 licenses and they roam, then a checkin of 2 licenses with `RLM_ROAM` set to -1 will check in **all 4** of the licenses which were checked out and roaming. In other words, the checkout you do to roam a license, **even if the count is greater than one** creates a **single** roamed license. When this license is checked in (either by setting `RLM_ROAM` to a negative value, or at the end of the roaming period), **the entire quantity** of licenses is checked back in. Put another way, a roamed license is indivisible, and it is not possible to return a subset of the license count in a roamed license.

Since you cannot have more than one roamed license of a given name on a single system, if you first request a roam of N licenses, then you make a 2nd request to roam more than N licenses, the 2nd request will be rejected with an `RLM_EL_ALREADY_ROAMING` status. Otherwise, the first roam file is destroyed and can never be returned.

RLM provides a mechanism to remove a local roaming license when the application cannot check the

license back in early. In order to unconditionally return the local roamed license, set the RLM_ROAM environment variable to -100 before performing a checkout of the license. If set to -100, the checkout processing will still attempt to return the roamed license early, but if the server cannot process the request, the client will still remove the local roaming license information.

Special note on roaming licenses from a broadcast-discovered server

Reprise Software strongly recommends that you do not attempt to use the broadcast method to locate the server if a license is to be roamed. While this will often work, there are circumstances where RLM cannot re-locate the original server which supplied the licenses, and the roamed license cannot be returned early.

If the broadcast server is the only license server on the network, RLM will be able to return these licenses starting with v11.2, however, earlier versions of RLM could not return the roamed license. If there are multiple license servers on the network, there is no guarantee that the application will find the correct server to return the licenses, even if you manually set the port and host of the server before attempting to return the license. If you know the port and host of the ISV SERVER which roamed the licenses, you can then:

- make sure the ISV server is running on the same port# (set the port # on the ISV line, if necessary)
- set RLM_LICENSE to this port and host (the ISV server, not rlm)
- set RLM_ROAM to -1 and check out the license again.

(This technique will work for earlier versions of RLM as well).

The relationship between roamed licenses, the rlm_checkout() count parameter, and rlm_isv_cfg_set_roam_single(handle, 1)

In nearly all cases, licenses will be roamed by using a checkout count of 1. However, it is possible to roam a license with a checkout count = $n > 1$. Reprise Software does not recommend this practice, but if you do it, take the following into consideration:

- n licenses will be subtracted from the license server's license pool
- once roamed, if a request is made for $\leq n$ licenses, the roamed license will satisfy this request. This is not a counted license in the normal sense, it is just that the roamed license keeps track of the count of licenses requested.
- once roamed, if a request is made for $> n$ licenses, this request will fail with an RLM_EL_ALREADY_ROAMING error. (note: prior to the fix for P477 in RLM v12.3, this second request would succeed, overwriting the original roam file and making the original “ n ” licenses unavailable for checkin before their roam expired.)
- If rlm_isv_cfg_set_roam_single() is called, only a single process will be able to check out these licenses, however that process can check out up to “ n ” roaming licenses.
- If rlm_isv_cfg_set_roam_single() is **not** called, any number of processes on the system will be able to check out up to “ n ” roaming licenses.

If you want to extend the period of the Roamed License

If your customer's plans change and they would like to keep the license until after the roaming time has expired, but cannot reconnect the system to the network, they can extend the roam by having someone on the network extend the roam in the RLM web interface. Note that this only works before the original roam period has expired, and only on a v12.3 or later server (and client).

Note that this capability must be enabled by you by calling `rlm_isv_cfg_enable_roam_extend(handle, 1)` in your `rlm_isv_config.c` file, and **re-building your ISV server or settings file** after you have done so. If you do not do this, the “Extend Roam” column shown below will not appear in the RLM web interface. Also note that if you enable this capability, the `max_roam` setting from your `rlm_roam` license will have no effect on the length of a roam extension. What this means is that the `max_roam` setting of the roamed license itself will be what limits the extension of the roam. By default, every license has a `max_roam` setting of 30 days, unless you override it. So be aware that if you enable the roam extend feature **and** you specify `max_roam`, you must do so on the product license, rather than on the `rlm_roam` license for `max_roam` to have any effect on roam extensions.

To extend the roam, someone on the network views the license status and finds the license that is roaming. This user must have the “extend_roam” privilege to see the last field. By selecting Status->License Usage for this license, they will see a screen similar to the following:

License status for ISV reprise

Product	Pool	Ver	user	host	PID	req ver	# lic	# res	Out time	In (hold) time	Click to REMOVE	Extend Roam
test	2	1.0	matt	zippy	-1	1.0	1	0	08/28 15:30	09/03 00:00	<input type="button" value="Remove"/>	<input type="button" value="Extend"/> <input type="text" value=""/> days

By entering the # of days to extend the roam in the text box on the right and pressing “Extend”, the process of extending the roam will start, and the following screen will appear:

Extend license roam duration

Extend license from user matt for product test, isv reprise, handle 42, for 5 days - are you sure?

If “Yes – Extend user's license” is selected, the roam will be extended on the server side, and the screen will display the *roam extension code*:

Sending extend message for 5 days

Roam extended by 5 days

In order to complete this roam extension, set the environment variable RLM_ROAM_EXTEND on the machine running the application to:

```
test:12-sep-2017:1234567890abcdef1234567890abcdef1234567890abcdef
```

then start the application and let it check out the license. The roam will be extended.

[Back](#)

Now, on the disconnected client, set the environment variable RLM_ROAM_EXTEND to the *roam extension code*:

```
setenv RLM_ROAM_EXTEND test:12-sep-2017:1234567890abcdef1234567890abcdef1234567890abcdef
```

and run the application which checks out the “test” product. Once the checkout happens, the roam period is extended.

If you do not record the *roam extension code* from the web interface, it is also recorded in the server's debug log as follows:

```
08/28 15:45 (reprise) ROAM EXTENDED: 5 days test v1.0 by matt@zippy
08/28 15:45 (reprise) Roam extended for product test by 5 days
08/28 15:45 (reprise) Roam extension code, place in RLM_ROAM_EXTEND
08/28 15:45 (reprise) and run client to check out license:
08/28 15:45 (reprise) test:12-sep-2017:1234567890abcdef1234567890abcdef
```

Note that if you extend the roam past a daylight-savings-time transition day, you may appear to get one hour more or less than you might expect (when viewing the RLM web interface), but the roam actually ends at midnight.

Tutorial on Roaming Licenses

The RLM kit contains an example program to help you understand how roaming licenses operate.

This example is called **roam_example**, and it is built during the normal kit installation. The example license file on the kit also contains an **rlm_roam** license, so everything is ready to go.

We suggest you follow this procedure to familiarize yourself with the operation of roaming licenses.

1. First, install the kit.
2. If you haven't done so yet, sign the example license file using the command:

```
% rlm sign example.lic
```

3. Start the license server (in a separate window on Unix, or in a command window on windows, so that it is easy to see the debug log):

```
% rlm
```

Now you are ready to run the **roam_example** program to investigate RLM roaming license behavior.

The first thing we are going to do is to set up a roaming license. To do this, run **roam_example**, and when it asks for the RLM_ROAM value, enter 1. **roam_example** will set the environment variable RLM_ROAM to 1, then contact the license server with a checkout request for the **test1** license. You will note that **roam_example** now says that it has acquired a FLOATING license. This is correct. When the initial checkout which sets up the roaming license is performed, the application checks out a normal floating license, and informs the license server that it wishes for this license to roam. When this is successful, the roaming license is installed on the system where the application is running. You will note a line similar to the following in the server debug log:

```
01/14 15:28 (demo) OUT: test1 v1.0 by username@hostname (ROAMING for 1 days)
```

Finally, enter a <CR> to exit **roam_example**. You will note now that the server does *not* log the checkin of the license. This is because the license is roaming. The checkin will be logged later when either (a) the roam time expires, or (b) the license is manually returned (we will manually return the license later in this tutorial).

Your system is now set up with a roaming license, valid for 1 day. To test this license, run **roam_example** again, and specify 1 for the RLM_ROAM value. This time, you will see no activity in the server logfile, and **roam_example** will indicate that it acquired a ROAMING license. Enter a <CR> to exit **roam_example**.

Next, run **roam_example** and enter 0 or <CR> for the RLM_ROAM value. What happens next depends on whether the license server is still running or not. If the license server is running, **roam_example** will check out a floating license from the server and you will see this reflected in the server logfile. If the server is not running, then **roam_example** will use the roaming license, since no floating license was available. Why does it operate this way? Well, since the RLM_ROAM environment variable wasn't set, RLM attempts to the checkout in the "normal" way, which means it contacts the license server and asks for a license. Only if all the normal checkout methods fail does it then attempt to use a roaming license if one exists. Note how this varies from the case above, where you set RLM_ROAM to 1 - in that earlier case, RLM attempts to use any roaming license *before* contacting the license server, and only if it cannot find a roaming license does it check out a license from the server (and as part of that process create a new roaming license on the system).

Finally, what happens if you have set up a roaming license but want to return it *early*. RLM provides for this by setting the RLM_ROAM variable to a negative value. Make sure the license server is still running (start it if it is not), and run **roam_example** again. This time, specify -1 when asked for the RLM_ROAM value. You will check out a floating license, and the server will remove the currently existing roaming license for this computer. When **roam_example** does it's checkin (actually, it simply exits), the server will log the checkin of the originally-checked-out roaming license.

At any step, you can use the rlm web interface to examine the state of the license server to see which licenses are checked out.

One thing to note about this tutorial is that it worked because we pre-installed an **rlm_roam** license in the **example.lic** license file. With this license present, both the client and the server were able to check out **rlm_roam**, which is a requirement for roaming to operate. In practice, if you wish for your customers to have the ability to use roaming licenses, you will need to ensure that a valid **rlm_roam** license exists on any computer where a roaming license is created. Since the whole point of roaming is to allow disconnected operation, the disconnected node cannot depend on getting its **rlm_roam** license from the license server, so you will need to put a small local license file on that machine. In practice, the easiest way to do this is to create the license file in the same directory as your product binaries, since this license file

only enables roaming, and should not vary from customer to customer. In other words, if you wish to enable roaming for all your customers, treat the license file with the **rlm_roam** license as a normal part of your distribution kit.

We encourage you to browse the source of **roam_example** - it is in the **examples** directory on the kit, named **roam_example.c**.

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Client-Side License Caching

Beginning in v10.1 RLM has the ability for a license to be cached on the client side, so that subsequent requests do not require communications with the license server.

You can think of this as a very short-term, automatic, roam.

To enable this functionality, you do two things: call a setup function in `rlm_isv_config.c`, and add the optional `"client_cache=xxx"` attribute to the license.

You should note that only licenses which have a sharing attribute *without a share count* will be usable as cached licenses. In other words, if the license has a `"share=u"` attribute, and the same user attempts a checkout, the cached license can be used. However, if the `"share="` attribute is missing, or the share attribute is something like `"share=u:8"`, no checkouts of the cached license will be possible. Also note that the host attribute is matched automatically, by definition, since the license is being used on the same computer.

Enabling the functionality

To enable this capability, call:

```
rlm_isv_cfg_enable_client_cache(handle, 1);
```

in `rlm_isv_config.c`

If you do not make this call, your application won't write the data required by subsequent runs to avoid communications with the license server.

There are 2 new errors: `RLM_EH_CACHEREADERR` and `RLM_EH_CACHEWRITEERR` if the local cache file cannot be read or written.

Using client_cache

Once the functionality is enabled, add the `"client_cache"` attribute to the licenses which you wish to have this capability. For example:

```
client_cache=600
```

will cause the license to be cached on the application's computer for 10 minutes. `client_cache` is specified in seconds, and the maximum time is 3600 (1 hour).

That is all you have to do. The RLM library implements client caching for you, and subsequent checkouts will use the cache file rather than attempting to contact the license server for a checkout.

rlm_license_xxx() and rlm_product_xxx() functions for use with client_cache

rlm_license_client_cache() returns the value of the `client_cache` parameter from the checked-out license.

rlm_license_cached() returns 1 if the checked-out license is a `client_cached` license, 0 otherwise.

rlm_product_client_cache() returns the value of the `client_cache` parameter from the license.

Server processing

Any license with a `client_cache` specification is treated by the license server *identically to* a license with a `min_checkout` specification. This is true whether or not you enable the client-side with `rlm_isv_cfg_enable_client_cache()`. The server does no other special processing for `client_cache`, only the `minimum_checkout` processing. Note that if you don't call `rlm_isv_cfg_enable_client_cache()` in `rlm_isv_config.c`, the server will still hold the license for the cache period, but the application won't write the cache file, so subsequent checkouts will use the license server.

Notes on License and RLM versions

Licenses of different versions can be cached, and licenses checked out by software linked with different RLM versions can be cached as well. Software linked with a particular RLM version will only see licenses that were cached by the same version. This means that if you have 2 programs, linked with different RLM versions and checking out the same license, you will see a separate checkout at the server for each program, then subsequent invocations of each program will use the corresponding cached license until expiration.

RLM_DIAGNOSTICS

Client Cached licenses will appear in RLM_DIAGNOSTICS output, however, only the highest version license enabled for any given product name will appear. And only a license which was cached by a program using the same version of RLM.

rlm_products()

Client cached licenses will never appear in the list of licenses returned by `rlm_products()`.

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ISV-defined Hostid Processing

RLM provides the ability to extend the native set of hostids by using your own routines to obtain host identification which is unique to you. There are 2 methods to do this – the older, deprecated “isv-defined hostid”, and the newer “ISV=” hostid type.

If you use the deprecated isv-defined hostid:

- You cannot use a ISV server settings file, instead, you must ship a binary, which means your customers cannot get bug fixes with a new generic rlm server.
- Your customers cannot use the generic rlmhostid tool, you must write and ship your own tool.
- You cannot use the standard Activation Pro license generator, you must build a custom generator - which may involve licensing an additional RLM platform.
- You cannot use RLMCloud servers.

Beginning in RLM v11.3, Reprise Software recommends using the new ISV= hostid type, which uses the ISV-defined string as set by the `rlm_set_envron()` call. The advantages and disadvantages of doing this, over the older ISV-defined hostid code are:

Advantages:

- no custom code to write (other than getting the string itself)
- you can use an ISV server settings file and avoid building an ISV server
- you can use an Activation Pro generator settings file and avoid building a custom generator
- you can use *RLMCloud* to provide cloud-based license servers to your customers.

Disadvantages (compared to the old isv-defined hostid):

- only one hostid of this type is supported on a system
- the hostid comparison code is always a case-insensitive `strcmp()` function
- This hostid can't be used for the license server itself, only for node-locked licenses.

To use this hostid type, do the following:

1. Determine the hostid on your system (in your application).
2. Call `rlm_set_envron(....., your-hostid)`, immediately after your call to `rlm_init()`
3. Use “isv=your-hostid”, as the hostid for your license. Note that this hostid can't be used for the license server itself.

If after reading this you still want to write code to create an isv-defined hostid, please contact Reprise Software.

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Failover License Servers

RLM provides the capability for a license server to take over the license compliment of another server which has gone down. The server whose licenses are being taken over is called the *primary server*. The server which takes over the license load of the *primary server* is called the *failover license server*. During the time that the failover server is serving the licenses, no roaming operations are permitted on the licenses.

Note: when using failover servers, there cannot be a firewall between the two servers.

Note: failover servers are not supported on HP/UX or IBM AIX systems.

The ability for a server to take over the load of another server is selected by an ISV on a customer-by-customer basis, and enabled by an *rlm_failover*, *rlm_failover_server* or *rlm_failover_server_activate* license in the license file of the server that is to take over.

The difference between an *rlm_failover* license and an *rlm_failover_server/rlm_failover_server_activate* license is whether rlm checks for the machine being down (*rlm_failover*) or the rlm process on the machine being down (*rlm_failover_server/rlm_failover_server_activate*) before serving the licenses from the *primary server*. In addition, the *rlm_failover_server_activate* license requires a license activation from an Activation Pro server before proceeding to serve the primary server's licenses. With this license, you can see in your ActPro database how often a particular customer's failover servers have been activated. *rlm_failover_server_activate* support is new in RLM v12.3.

While the *failover license server* can be serving its own compliment of licenses, Reprise Software recommends that it should have no licenses of its own, but simply be standing by, waiting for one (or more) other server(s) to fail so that it can take over. In the remainder of this chapter, we will use the term **failover license** to mean either the *rlm_failover*, *rlm_failover_server*, or *rlm_failover_server_activate* license.

In order to enable a failover license server, the ISV issues a **failover license** with the following characteristics:

- count=some non-zero value
- hostid=<hostid of the *primary server*>
- *_primary_server*=<hostname of the *primary server*> in the case of *rlm_failover* licenses OR *_primary_server*=<host or port@host of the *primary server rlm process*> in the case of *rlm_failover_server* or *rlm_failover_server_activate* licenses (Note that in RLM v12.2 and later, a *failover_server/failover_server_activate* license can specify just the hostname of the server, in that case, the default port (5053) is used. Prior to RLM v12.2, the full [port@host](#) is required)
- akey=activation-key – this is the activation key to be used to activate in the case of an *rlm_failover_server_activate* license.
- issuer=url-of-activation-server - this is the URL of the activation server to be used to activate in the case of an *rlm_failover_server_activate* license.

Special notes on *rlm_failover_server_activate* licenses

The *rlm_failover_server_activate* license requires a machine which can connect to the internet to operate. Before serving licenses, the failover server must activate its special license (an *rlm_failover_auth* license) before it will begin to serve licenses from the primary server's license file. The server will log a warning at startup if there is an *rlm_failover_server_activate* license in its license file but it cannot verify that the activation key is good (the server calls `rlm_act_keyvalid()` to validate the key).

When you create the activation key to be used with the *rlm_failover_server_activate* license, specify a product name of “*rlm_failover_auth*”, and a nodelocked, uncounted license. Your ISV server will pass the failover server's *hostid* as the *hostid* in this activation request.

Note: Reprise Software recommends setting `_primary_server` to **localhost** (or **5053@localhost**) when issuing the *failover* license. This value would be changed by the license administrator to the name of the *primary server* upon installation. Setting this to **localhost** insures that the *failover license server* will not be activated by mistake if the license is not edited.

The *failover license* must be a **counted** license; otherwise the server will not use it. (If it were not a counted license, the *failover license* could be used on any server, which could result in multiple servers taking over **at the same time** for the *primary server*.)

In order to enable the *failover license server*, the *failover license* needs to be in one of the license files it is using, and the license file(s) for the *primary server* also need to be processed by the *failover license server*.

When a license server encounters a *failover license*, it does several things:

- Starts a separate thread in the license server to periodically monitor the health of the *primary server*:
 - If the license is an *rlm_failover* license, the failover server attempts to determine whether the license server *machine* is running, by connecting to ports on that machine. If the license server machine is up but the license server is not running, the failover license server will **not** take over serving licenses.
 - If the license is an *rlm_failover_server* license, the failover server attempts to connect to the main `rlm` port on the primary server. The main `rlm` port is specified in `_primary_server` on the *rlm_failover_server* license, or defaulted to port 5053 if not specified. If the failover machine cannot connect to the `rlm` process on the primary server, the failover server takes over.
- If the *primary server* should go down, enables all licenses in license files for the *primary server* by performing the equivalent of an *rlmreread* command. In the case of an *rlm_failover_server_activate* license, the failover server will attempt to activate its license from the Activation Pro server before proceeding. If successful, it will serve the primary server's licenses, otherwise it will not.
- When the *primary server* comes back up, disables all licenses in license files for the *primary server* by performing the equivalent of an *rlmremread* command.

Note: Failover License Servers are by no means secure, and are intended to be used by trusted customers. If the `_primary_server` value is set to a non-reachable system name/server, the Failover License Server will always serve the licenses from the primary server. The new (RLM v12.3) `rlm_failover_server_activate` license at least informs you when this is happening via the fulfillment logs in ActPro.

Configuring Failover License Servers

Reprise Software recommends configuring *failover license servers* as stand-alone servers that do not serve their own compliment of licenses. In other words, Reprise recommends configuring a license server that has only **failover licenses** for the other license servers on the network. In general, one license server configured in this way should be sufficient to support failover of all other license servers on the network.

The exception would be a case where each individual license server is serving thousands of clients, in which case we recommend that you configure a *failover license server* for each one or two of the normal license servers.

Note that failover license servers do not support license roaming operations. Actually, this is determined on a license pool by license pool basis - any license pool that contains any licenses from a primary server will not support any of the roaming operations.

Example Failover License Server license file

The following license file would specify a license server that is acting as a failover server (on node **failover_host**, hostid **11111111**) for the license server on hostid **12345678** (node **primary_server**):

```
HOST failover_host 11111111 5053
ISV reprise
LICENSE reprise rlm_failover 1.0 permanent 1 hostid=12345678
    _primary_server=primary_server sig="x"

Alternate LICENSE line:

LICENSE reprise rlm_failover_server 1.0 permanent 1
    hostid=12345678 _primary_server=5053@primary_server sig="x"

Alternate for an activated failover server:

LICENSE reprise rlm_failover_server_activate 1.0 permanent 1
    hostid=12345678 _primary_server=primary_server
    issuer=hostedactivation.com akey=1234-5678-9012-3456
    sig="x"
```

Note that the hostid in the LICENSE line for the **failover license** is the hostid of the server on the node **primary_server**).

Also Note: The “`_primary_server`” keyword was called “`_failover_host`” prior to RLM v9.2. “`_primary_server`” is an alias for “`_failover_host`”, which will continue to work. However, RLM versions prior to v9.2 will only recognize the “`_failover_host`” keyword to specify the primary server name/port #.

The license file on “primary_server” should be a normal rlm license file, without the rlm_failover licenses. This license file MUST be present and readable by rlm on the failover machine as well, otherwise the failover server will not serve the licenses from the primary when it goes down. So for this example, a license file on the primary server would look something like this:

```
HOST primary_server 12345678 5053
ISV reprise
LICENSE reprise product1 1.0 permanent 3 sig=...
LICENSE reprise product2 1.0 permanent 7 sig=...
...
LICENSE reprise productN 1.0 permanent 2 sig=...
```

Installing *Failover License Servers*

When you receive the failover license file, do the following to install your *failover license server*:

1. Install *rlm*, your *ISV server* and the *primary server license files* on the *primary server*. Start *rlm*.
2. Install *rlm* and your *ISV server* on the *failover license server* node.
3. Install all license files from the *primary server* on the *failover license server* node.
4. Edit the license file with the **failover license** to put the hostname of the *primary server* in the `_primary_server=` field, and the hostname of the *failover license server* on the HOST line. (Put the port@host of the rlm process on the primary server in the `_primary_server=` field for the case of *rlm_failover_server* licenses).
5. Install any ISV options in an options file, and make it accessible to the *ISV server* either through its license file or by giving it the default options filename of *isv.opt*.
6. Ensure that *rlm* will process all the license files above, and start *rlm*.
7. Ensure that your license administrator's client software sees the failover license server's license file, i.e., put a license file with a HOST line for the failover server *where your application will find it*. If you omit this step 6, the failover license server will take over, but your application will not be able to check out a license from the failover server.

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Shipping Your Product as a Library or a Plugin

In some cases, your product might be a library/DLL/Shared Object which is linked into other programs. If these other programs use RLM as well, you will need to do something to avoid name collisions between your copy of RLM and the other program's copy of RLM (the other program may use a different RLM version, for example).

The technique for accomplishing this is a bit different for Windows and Linux systems.

Windows

Create a DLL that contains the code for your product as well as the RLM code. When you create the list of exports from the DLL, don't include any RLM functions.

If for any reason you need to keep your DLL and the RLM DLL separate, you should take these additional steps to avoid collisions with other ISVs' versions of the RLM DLL which may be present at runtime:

- Modify the makefile in the platform directory such that the name of the DLL that gets built includes your ISV name. For example, if your ISV name is "xyz", modify these lines in the makefile:

```
DLL = rlm$(VER).dll  
DLLLIB = rlm$(VER).lib
```

to read:

```
DLL = xyz_rlm$(VER).dll  
DLLLIB = xyz_rlm$(VER).lib
```

- Run `nmake` in the platform directory to build the DLL under the new name
- Change any code that references the DLL by name to reflect the new name. An example is `RLMInterop.cs` - the C# interface to RLM.
- Link your DLL against `<new DLL name>.lib`
- Update your installer to include the RLM DLL, and install it in the same location as your product's DLL.

This will ensure that at runtime even if multiple RLM DLLs are present on the machine, your code will invoke the correct RLM DLL.

Linux/Solaris

Create a shared object (`.so`) that contains the code for your product as well as the RLM code. When you link your shared object, include the following on the command line:

```
-Wl,--version-script=file
```

(Note: the character after the uppercase W in the command above is a lowercase l, as in “license” If you create the .so file with ld instead of cc, then just use the -version-script=file option.

On Solaris, replace “-Wl,--version-script=*file*” with “-D *file*”

file should contain:

```
{
    global:
        function1;
        function2;
        ...
        functionN;

    local:
        *;
};
```

function1, *function2*, etc, are your functions that can be called from outside the shared object.

The advantage of this technique is that all the RLM symbols will be redefined as local symbols in your .so file.

Alternately, you can specify the **-Bsymbolic** switch to ld, as follows:

```
ld -share -Bsymbolic your-object-files.o rlm.a
```

The -Bsymbolic option tells the loader to bind references to the global symbols in the rlm library (and any other global symbols in your object list) to the definitions within your shared object rather than using previous definitions from other shared objects. This works, however all the RLM objects will remain globals in your .so file.

MAC

On Mac, you create a dynamic library, and use the “exported_symbols_list” linker option to list the global symbols you want to export. From the MacOS ld man page:

```
-exported_symbols_list filename
```

The specified filename contains a list of global symbol names that will remain as global symbols in the output file. All other global symbols will be treated as if they were marked as `__private_extern__` (aka visibility=hidden) and will not be global in the output file. The symbol names listed in file-name must be one per line. Leading and trailing white space are not part of the symbol name. Lines starting with # are ignored, as are lines with only white space. Some wildcards (similar to shell file matching) are supported. The * matches zero or more characters. The ? matches one character. [abc] matches one character which must be an 'a', 'b', or 'c'. [a-z] matches any single lower case letter from 'a' to 'z'.

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Internet Activation

Overview of RLM Activation Pro

RLM Activation Pro allows you to deliver an **activation key** to your customer, and when they are ready to use your product, a transaction with the activation server allows the license to be fulfilled without manual intervention. When using activation, there is no need for you to get your user's hostid information - this is transmitted to the activation server automatically.

In the case of a node-locked product, a typical scenario would be that your customer runs the product on the desired machine, and if the license had not been fulfilled earlier, the product asks for an activation key. Once the activation key is supplied, the license is retrieved transparently. From this point on, the product runs with its license in place.

Floating licenses would operate in a similar manner, except that the number of floating licenses to be activated is required.

RLM Activation Pro allows you to deliver *rehostable licenses* as well, by creating a license that is locked to a hostid that can be removed from the target system when a rehost is requested.

RLM Activation Pro is an optional part of the RLM product. For complete details on RLM Activation Pro, see the *RLM Activation Pro Manual*.

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Server-Server License Transfer

RLM has the ability to transfer a set of licenses from one license server to another. This capability is described in the *Transferring Licenses to Another Server* section of the License Administration manual. Licenses are said to be transferred from a **source** license server to a **destination** license server.

The **destination** license server is *always* an RLM server. As shipped from Reprise Software, the **source** license server is an RLM license server as well. However, as an ISV, there are two things you can do to enhance the License Transfer capabilities of RLM:

1. Beginning in RLM v10.0, license transfers can be “disconnected”, which means that the destination license server acquires roaming licenses from the source license server.
2. you have the ability to extend the license transfer capability to enable transfer from a non-RLM **source** license server. This capability is useful, for example, when you are doing a transition from another license manager to RLM, to avoid the possibility of issuing your customers duplicate licenses. Note that you can define a single non-RLM license transfer extension, ie, you can only support one other license manager for license transfers.

Support for these 2 scenarios are described in the next sections.

Disconnected license transfer support

Disconnected license transfer, which is new in RLM v10.0, allows your customer to move some licenses from the source server to a destination server for a period of time, and the destination server does not need to maintain contact with the source server during that time. Internally, disconnected license transfer uses RLM's *license roaming* capability, so all the controls and restrictions of license roaming apply:

- You must issue an *rlm_roam* license to your customer to enable this capability (although we provide a means for you to do this internally in your server so that no separate license has to be shipped).
- Once a license is transferred to the destination server in this way, the license on the source server cannot be removed or upgraded or the destination license will not be able to be returned to the source server (until it automatically expires).
- Your control over the maximum roam duration influences your customers maximum time to disconnect the destination server's licenses.
- Your customer's control over ROAM_MAX_COUNT and ROAM_MAX_DAYS in the ISV server options file will limit the number of licenses the destination server can request, as well as the duration of the disconnection.
- These licenses, like all transferred licenses, are not eligible to be roamed to another system.

The description of disconnected license transfer is contained in the RLM License Administration manual, in the “Transferring Licenses to Another Server” chapter.

If you already issue *rlm_roam* licenses to your customers, then you need to do nothing further – your customer will only have to put the *rlm_roam* license in a license file which the destination server reads at

startup time, then they will be able to create license transfer definitions with “Days to hold license” (in the license transfer GUI) set to a non-zero value.

Should you wish to make the delivery of the *rlm_roam* license even easier, you can add the following call to your *rlm_isv_config.c* file, by providing a valid, signed *rlm_roam* license:

```
rlm_isv_cfg_set_server_roam(handle, "<LICENSE isvname rlm_roam 1.0 uncounted hostid=any sig=xxxxxxx>");
```

Note that this license must use the following parameters:

- version: "1.0"
- exp: "permanent"
- count: "uncounted"
- hostid: "any"
- NO other parameters

Note: If you use this call and you ship an ISV server settings file, you will need to re-generate your settings file with RLM v10.1 or later.

Note that these licenses, once roamed to the destination license server, are not available for checkout by an application on that server machine which doesn't contact the license server – they are only available for checkout by contacting the destination license server itself.

License Transfer from a non-RLM source license server

Should you wish to support a source server that is not an RLM license server in order to do a transition of your customers, you would do the following:

- Integrate RLM into your application, just as any new RLM customer would.
- ship your RLM-licensed product with new RLM licenses to all new customers, and to all existing customers who purchase additional licenses. This is exactly what an RLM customer who did not have a previous license manager would do.
- ship your RLM-licensed product, **without new licenses** to existing customers. Using license transfer, the customer can partition their existing license pool to use some licenses with new products (via the license transfer capability) and some old licenses with old products which utilize your old license manager.
- eventually, as the old versions of your product are no longer used, the need for license transfer becomes obsolete when all your customers are using new products with new (RLM) licenses.

Implementing ISV-defined license transfer

In order to enable license transfer from a different **source** license management system, you need to write the code to perform initialization, checkout, checkin, status, heartbeats, etc, from the other license management system. RLM provides a plugin interface for you to enable this in your ISV server. We call this **ISV-defined license transfer**.

In order to implement **ISV-defined license transfer**, there are 2 steps you need to take:

- Write the functions to do the transfer, and to register with the RLM ISV server.
- Link your license transfer functions into your ISV server.

There is an example of **ISV-defined license transfer** code on the kit in the **examples** directory. The code is contained in the file `rlm_transfer.c`. This module illustrates **ISV-defined license transfer** by implementing license transfer from a source RLM license server. While this code is not useful (since RLM transfer is built into RLM), it illustrates how to write the transfer functions in terms of the RLM API.

Writing your ISV-defined license transfer code

You begin by writing a source module to perform the other license manager's basic checkout/checkin operations. Reprise Software recommends using the `rlm_transfer.c` example code as a guide to writing this code. This code has been integrated and tested with RLM by Reprise Software, and is tested on each release as part of our normal QA testsuite.

In this module, you will write 9 independent functions for your license manager "xxx":

- `check_auth_xxx()`
- `fillin_auth_xxx()`
- `update_status_xxx()`
- `open_xxx()`
- `checkout_xxx()`
- `hb_xxx()`
- `checkin_xxx()`,
- `close_xxx()`, and
- `rlm_ix_enable()`

These 9 functions are described in the sections which follow.

Reprise recommends that you put all source into a single source file, and make all the functions static/private with the exception of `rlm_ix_enable()`, which must be a public function. You must define all 9 functions.

Once you write this source module, include the object in the makefile to link your ISV server. So, for example, if you name your module "my_xfer.c", and the other license manager's libraries are named "other_lm.lib", modify the makefiles as follows:

Change the lines:

```
ISV_XFER_SRC =  
ISV_XFER_OBJ =  
ISV_XFER_LIBS =
```

to:

```
ISV_XFER_SRC = my_xfer.c  
ISV_XFER_OBJ = my_xfer.obj  
ISV_XFER_LIBS = other_lm.lib
```

In addition, you may need a special rule to build "my_xfer.obj" from "my_xfer.c". Create this rule here as well.

Parameters for all transfer functions:

type	name	description
(void *)	auth	RLM license auth handle (used only to pass through to other RLM functions)
int	count	# licenses transferred
(void *)	license_handle	the license manager's license handle
(void *)	lm_handle	the license manager's (job) handle
(void *)	ls	RLM license server handle (used only to pass through to other RLM functions)
(char *)	product	product name transferred
(char *)	server	server where transfer originated
int	status	checked-out license status on update
(char *)	ver	version of product to transfer

check_auth_xxx() - check parameters of transferred license

*int check_auth_xxx(void *ls, char *product, void *lm_handle, void *license_handle)*

This function verifies that a checked-out license is valid for a transfer. Several things could make it invalid - e.g. if it is a user- or host- based license, we don't want to transfer it. Returns 0 if the license is OK, or -1 if it is invalid.

For RLM licenses, we make sure the license is not a user-based, host-based, named-user, or token-based license.

For other license managers, other types of license may be ineligible for transfer. You can decide what is, and what is not transferred by accepting or rejecting it here.

- product: product name
- lm_handle: lm handle (RLM_HANDLE for rlm, cast to void *)
- license_handle: license handle (RLM_LICENSE for rlm, cast to void *)

If you return -1, your checkin and close function will be called by RLM (checkin_xxx()).

fillin_auth_xxx() - fill in RLM license parameters for transferred license

*void fillin_auth_xxx(void *ls, void *lm_handle, void *license_handle, void *auth, void *product, int count)*

This function fills in a license authorization from the checked-out license. License parameters are contained in "lm_handle", and/or "license_handle".

Some other license managers (e.g. FLEXlm) don't have a license handle but use the lm handle along with the product name to identify the checked-out license.

update_status_xxx() - update the status of a transferred license

*int update_status_xxx(void *ls, char *server, int status, void *lm_handle, int *passes_to_check)*

This function updates the transfer status if a checkout fails.

Returns 0 if the checkout can be attempted again, or 1 if it will never succeed.

Also, `passes_to_check` should be updated with the number of passes before another checkout should be attempted. Each pass is one minute later. So, for example, if the license server is down, we wait 10 passes (10 minutes) before attempting the checkout again in the standard RLM license transfer code.

open_xxx() - open the other license manager

*int open_xxx(void *ls, char *lmname, char *host, void **lm_handle, int *unavailable)*

This function creates the license manager's handle that will be used for the license checkout, and sets any required attributes in that handle.

Returns the handle in the "lm_handle" parameter. So, in the example RLM code, this returns an RLM_HANDLE in the "lm_handle" parameter.

checkout_xxx() - check out the product from the other license manager

*int checkout_xxx(void *ls, void *lm_handle, char *product, char *ver, int count, void **license_handle)*

This function performs the license checkout of product/ver/count. The function return is the license checkout status, and the license handle (if applicable) is returned in "license_handle". If the license manager has no license handle (e.g. FLEXlm), return NULL for the license_handle.

hb_xxx() - perform a heartbeat on the other license manager

*int hb_xxx(void *lm_handle, void *license_handle)*

This function performs a heartbeat on the handle; returns status:

- 0 for good status
- LM error for error

Some license managers (e.g., RLM) require the license handle for the heartbeat, others (e.g. FLEXlm) require the license manager's (job) handle. Chose the handle appropriate for your license manager.

checkin_xxx() - check in the product and close the license handle

*int checkin_xxx(void *lm_handle, void *license_handle)*

This function performs the product checkin and closes and frees the license handle.

The license handle should be closed and freed if the license management system requires this. In RLM, for example, an `rlm_checkin()` call does the checkin and frees the license handle.

close_xxx() - Close the license manager's handle

*int close_xxx(void *lm_handle)*

This function closes and frees the license manager's handle.

The license manager's handle should be closed and freed if the license management system requires this. In RLM, for example, an `rlm_close()` call performs this function.

rlm_ix_enable() - enable ISV-defined license transfer in RLM

This function registers your ISV-defined license transfer functions.

The function name, "rlm_ix_enable" should not be changed, nor should the names of the 2nd and 3rd parameters to the call.

Call `rlm_ix_enable` as follows:

```
rlm_ix_enable( "license manager name", /* License Manager name */
              rlm_ix_transfer,         /* DON'T CHANGE THIS */
              rlm_ix_xfer_done,        /* DON'T CHANGE THIS */
              open_xxx,                /* Your handle open fcn */
              checkout_xxx,           /* Your checkout fcn */
              fillin_auth_xxx,        /* Your auth fillin fcn */
              check_auth_xxx,         /* Your license check fcn */
              update_status_xxx,      /* Your status update fcn */
              hb_xxx,                 /* Your heartbeat fcn */
              close_xxx,              /* Your checkin fcn */
              checkin_xxx);           /* Your LM handle close fcn */
```

RLM support functions

There are 2 support functions you will need when writing your ISV-defined license transfer code. These functions are used in the example, and are described here:

*rlm_ix_log(void *ls, char *errtxt)*

logs a message to the ISV server debug log.

Pass "ls", the RLM license server handle, from the calling parameters, and a string to log.

*rlm_ix_update_auth(void *ls, void *auth, int what, int ival, char *sval)*

updates the server's license "auth" data with parameters from the transferred license.

"what" is which parameter to update (see `license.h` for definitions), if the value of "what" is an integer, put the value into `ival`, if it is a string, put the pointer into `sval`. See `rlm_transfer.c` in the examples directory for examples on use of `rlm_ix_update_auth()`.

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Virtualization

RLM provides capabilities to enable and/or restrict the usage of both applications and license servers in virtual environments.

By default, RLM allows applications to run in virtual environments. Also, by default, RLM does not allow license servers to run in virtual environments.

You can restrict application usage in virtual environments by using the "disable=vm" keyword in the license. See the **disable** keyword in the LICENSE Linesection on page 49 in The License File for more information.

RLM's default behavior regarding running servers on VMs is designed to prevent accidental/uninformed/unintended use of them. It's not that we actively discourage the practice - it's more that we want you to think about your policy regarding VMs so you make an informed decision. The problem of course is that it is trivial to clone a VM image, hostid and all, and run multiple copies of it in an enterprise thus gaining multiple sets of licenses if a license server runs there.

Control over whether license servers run in a virtual environment is in two places - you set the default in `rlm_isv_config.c` with the `rlm_isv_cfg_set_enable_vm()` call. If the second parameter is 0 (the default), then your servers will not operate in virtual environments. If it is set to any non-zero value, your servers will all run on virtual machines.

If you want to enable license servers for only certain trusted customers, you can leave the default in `rlm_isv_config.c` set to disable servers on VMs, and issue an **rlm_server_enable_vm** license for the individual machine for which you want to enable. So, for example, the following license would enable a license server (where the license is valid) to run on a virtual machine through the end of 2013:

```
LICENSE ISVNAME rlm_server_enable_vm 1.0 31-dec-2013 1 sig=xxx
```

Note that the `rlm_server_enable_vm` license will not be visible in status requests, or in `rlm_products()` calls as of RLM v9.0.

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Cloud Computing

If you would like to serve your licenses in the cloud, Reprise Software recommends using our *RLMCloud* service offering. Everything is set up for you to manage your licenses on servers provisioned by Reprise with *RLMCloud*, without having to provision servers and configure the server farm yourself. While RLM can do this, the setup is tricky, which is why we created *RLMCloud* in the first place.

What is *RLMCloud*?

RLMCloud is a hosted license server farm, managed by Reprise Software. With *RLMCloud*, you provision software license servers and deploy licenses to your customers which do not require any installation by your customer's administrators. Since you deploy *both the license servers and the licenses in RLMCloud*, there is no need for Activation Software such as RLM's *Activation Pro* if you are using *RLMCloud*.

When you use *RLMCloud* to run your license servers, there is never an issue of customers wanting to move a license server or rehost an application. All the licenses are under your control in *RLMCloud*. Issues related to license servers running on virtual machines, dongles to lock license servers, spoofed hostids, and other issues related to license servers being under the control of your customers all go away with *RLMCloud*.

How *RLMCloud* Works

In *RLMCloud*, you manage a set of *license server hosts* which run the *license server processes* for your customers. The management software is called *RLMCloud*, and it is a web-based application, hosted on Reprise servers. *RLMCloud* is a pure Software-as-a-Service offering - there is no software for you or your customers to install.

One thing to note is that there is nothing special about the license server processes that run in *RLMCloud* – they are standard RLM servers. What this means is that your applications, built using RLM, will operate equally well with the traditional on-premises license servers or with *RLMCloud*. This also means that you can deploy a mixture of on-premises and *RLMCloud* servers, as your customer requirements dictate. You should note that there are some special management interfaces in the copy of the rlm server that runs *RLMCloud*, but your ISV server is identical.

Requirements for using *RLMCloud*

While *RLMCloud* uses the standard RLM servers, support for *RLMCloud* in the license file is required. This means that your application must use RLM v12.0BL2 or later, and RLM v12.1BL2 or later is recommended.

Please contact your Reprise Software Salesperson for more information.

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Disconnected Operation

Sometimes it is necessary to support many thousands of clients connected to the license server. If your customers generally will have more than 5000-10000 client applications using licenses at the same time, you might want to use RLM's *disconnected operation* capabilities. Reprise does not recommend using *disconnected operation* if your customers generally have a relatively small number of clients in use at any one time.

To utilize RLM *disconnected operation*, call the alternate initialization routine `rlm_init_disconn()` in place of `rlm_init()`. `rlm_init_disconn()` takes 4 parameters – the first 3 are the same as `rlm_init()`, and the fourth is a promise of how often you will contact the server by calling `rlm_get_attr_health()`. The `rlm_init_disconn()` call is described with the `rlm_init()` documentation on page 207.

RLM *disconnected operation* works much the same as permanent connections up to the point of the first checkout. Once the license is checked out, however, RLM will disconnect the client from the license server. Each subsequent call to `rlm_checkout()`, `rlm_checkin()` or `rlm_get_attr_health()` will re-establish the connection to the server, send the appropriate message, read the response, then disconnect again.

There are several considerations to keep in mind if you use *disconnected operation*:

- heartbeats are slower. In normal operation, the first heartbeat is sent immediately after the first checkout, then each call to `rlm_get_attr_health()` reads the heartbeat response, which should be waiting to be read, then sends the next heartbeat. In this way, the client never has to wait for a round trip to the server. With *disconnected operation*, however, the client must establish a new TCP/IP connection to the server, send a message, and read the reply.
- A handle set to *disconnected operation* cannot be later set to use permanent connections. If you require a permanent connection to the license server, call `rlm_init()` and create a new handle.
- A handle using *disconnected operation* cannot use any of the optional RLM admin API functions. If you attempt to call these functions, you will receive an RLM_EH_NODISCONN (-165) error.
- Since the client is disconnected, the RLM server cannot send reverse heartbeats to the client, and does not receive notification if the client exits from TCP/IP. This means that the license will be held on the server side for the *promise* interval from the last time the client contacted the server, even if the client has exited. The license server will also time out the disconnected client and clean up their data structures if it has not heard from the client within the *promise* interval.
- Since *disconnected operation* is used by ISVs with large numbers of connected clients, the minimum interval at which you can contact the server is larger. Whereas for connected handles, the minimum heartbeat interval is 30 seconds, for *disconnected operation*, it is 10 minutes. This also means that the minimum *promise* interval is 10 minutes. (Note: Reprise Software recommends setting *promise* to at least 20 minutes to avoid unintended license removal by the license server).
- Pay particular attention to the relationship between the minimum heartbeat interval and your *promise*: `rlm_get_attr_health()` can be called as often as you like, but it will not communicate with the server if it was called less than 10 minutes earlier. So, for example, if you have a *promise* of 15 minutes, and you call `rlm_get_attr_health` every 9 minutes, you will not talk to the

server for 18 minutes (since the first call will not communicate, and the 2nd will happen 18 minutes after the last call that did communicate). In this example, you will have exceeded your *promise*, and the server **may** time out your application and forget about you. (We say “may” because it depends on when the server actually does the timeout processing, which is not precise, since it only does this processing every 5 minutes).

- The license server processes timed-out clients every 5 minutes. This is not synchronous with your checkout request, however, it is every 5 minutes from when the server started.
- If you plan to check any licenses in then close the handle (ie, if you are not going to use the handle after checking a license in), then you should omit the *rlm_checkin()* call, and simply call *rlm_close()* on the handle. *rlm_close()* always checks-in any licenses which are checked out on the handle, and by only calling *rlm_close()* RLM will only reconnect to the server one time for all your licenses as well as to tell the server that your are done with the handle.

Some performance notes on disconnected operation for RLM v10.0

We performed some tests on an Intel Solaris server. Our results indicate the following:

- In our testing (non-shared licenses on a 2007-vintage server machine), the license server is capable of processing ~100 transactions/second with a load of 10k clients.
- At 25k clients, the server can process 50 transactions/second,, and at 50k clients, 35-40 transactions/second.
- To first approximation, a transaction can be either a checkout or a heartbeat.

What does this mean to you when designing your product checkout/heartbeat strategy?

Let's say you have a product with an average usage time of 20 minutes (1200 seconds). If you want your server to support 50k clients, this implies a (steady-state) checkout rate of 42 checkouts/second. From the above, you can see that this is as many transactions as the server can process, leaving none for heartbeats, so this is not a realistic expectation. Also, if there is a large burst at certain times of the day, the server might well get so overloaded that client requests time out.

A more practical limit might be 25k clients or less. At 25k clients, the sustained checkout rate is 21/second. If you set the heartbeat interval to 20 minutes as well, the heartbeat rate would be 21/second (actually, it would be less, since some clients would exit before ever generating a heartbeat), making the total transaction rate at the server 42/second, which would leave the server with some headroom for slight bursts of activity. If you tried to send heartbeats every 10 minutes, however, the server could do little more than process heartbeats (at 42/second) from the 25k clients. Again, you would have to consider checkout rates at peak demand times of the day.

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Securing Your Application

No software is 100% resistant to a talented and determined hacker, but there are steps that RLM takes to thwart hackers, and there are steps your application can take as well. The best possible protection is available from 3rd party application hardening providers, who are listed on the Partners page at www.reprisesoftware.com. Short of that, here are some techniques that hackers use to circumvent licensing in applications, and some steps you can take to thwart them.

DLL / shared object spoofing

If your application uses the RLM DLL (or Unix shared object) instead of linking to the static RLM library, a hacker may substitute one of his own where *rlm_checkout()* always succeeds. You can detect this in your code by attempting a license checkout that should never succeed. For example, check out a license that your code never uses, or an impossibly high version number or quantity. If it succeeds, then there's a spoofed DLL or shared object present. You should call *rlm_set_attr_logging()* to turn off logging in the license server before attempting these checkouts, and turn logging back on afterwards. This makes it less obvious what steps your code is taking. If you detect a spoof, you can elect not to fail immediately. Set a fail flag and check it later and fail then. This makes it harder for the hacker to correlate the failure with the spoof check.

Public key injection

This is a technique whereby the hacker creates his own public-private key pair, and patches his public key in place of the ISV's public key in the application. Then the hacker can sign any license using his own key pair and have the application authenticate it correctly. There are two techniques that can be used to thwart this:

- Add extra calls to *rlm_init()* specifying NULL in the first two arguments, and passing a license in the third argument that you have signed (using your authentic key pair). Then attempt to check it out. If a different public key has been injected into the application, the checkout will fail with a bad signature (-5) error. To make it more difficult for a hacker to patch in his own license to your extra *rlm_init()* invocations, don't store the license in a single string in your code. Break it up into small bits and assemble it at runtime for passing to *rlm_init()*, or store it in an encrypted form and decrypt it on the fly.
- Verify that the public key is in fact yours. You can do this by calling *_rlm_get_pub()* in your application, which returns the bytes that make up the public key. The signature for the function and the bytes of the key are in *src/rlm_pubkey.c*. Then check some number of bytes in the key returned against what they should be.

You can use either one of these techniques or both. As with DLL spoof detection, consider delaying failure if you detect an injected public key.

Decompilation of Java and .NET, recompiling without licensing

Because the compiled format of Java and .NET is much closer to a high-level language than traditional object code, decompilers exist for those formats that produce very readable source code. With decompiled source, the hacker can see where the licensing methods are called, remove them, and recompile what amounts to a version of the application without licensing. Tools called "obfuscators" can be used by ISVs to rearrange the application's logic and obscure method and variable names such that the decompiled code

is very difficult to understand. Reprise does not recommend any particular obfuscators, but there are several available.

Server Integrity Checking

RLM v10.1 contains 2 new functions which allow you to perform additional verification of the integrity of the license server.

Check #1: Checking a license returned from the license server

When this check is enabled, the client will verify a license returned by the license server as a response to the server HELLO message. RLM v10.1 and later servers will return one of your licenses, and this call enables the RLM client library to verify this license. The check will happen on any RLM call which connects to a v10.1+ server. This is most typically the call to `rlm_checkout()`, but it can also happen on calls to `rlm_log()`, `rlm_dlog()`, and `rlm_products()`.

If you enable this check, your code should be prepared to deal with the failure return values, which are:

- `RLM_EH_BADLIC_FROM_SERVER` (-170) - the server returned a license which does not authenticate correctly.
- `RLM_EH_NO_LIC_FROM_SERVER` (-171) - the server failed to return a license.

And, starting in rlm v11.1 clients:

- `RLM_EH_LIC_WITH_NEW_KEYWORDS` (-174) – the server returned a license with keywords I don't understand.

To enable this check, insert the following call in `rlm_isv_config.c`:

```
rlm_isv_cfg_enable_check_license(handle, 1);
```

The check will not happen if you connect to a pre-v10.1 license server. Also note that if the license server has no licenses which it is serving, you will receive the `RLM_EH_NO_LIC_FROM_SERVER` status on any call that connects to the server. You should note that the server will not return any license whose name begins with "rlm_", so `rlm_roam`, `rlm_server_enable_vm`, etc. licenses will not be returned to your application, and if your server has only these licenses, you will get the `RLM_EH_NO_LIC_FROM_SERVER` error.

We suggest that if you call `rlm_checkout()` and receive either of these errors, you proceed as if the server does not support the license you requested. You might log a message that is very slightly different from your normal "no server support" message, but the difference should be subtle - just enough so that your support organization can tell the difference.

On the other hand, starting with v11.1 clients, if you get the `RLM_EH_LIC_WITH_NEW_KEYWORDS` error, you will have to decide how to proceed. The ISV server makes an effort to avoid this situation, but in the case of license files that only have the new keywords, the server has no choice but to return a license that older clients can't process.

Beginning in RLM v12.4, you can tell RLM to continue even if there is no returned license, the returned license doesn't verify, or if it has new keywords which can't be processed. In order to do this, call `rlm_isv_cfg_no_server_license_fail()` in `rlm_isv_config.c`. If you do this, you can then call `rlm_get_attr_lic_check()` (see page 203) to retrieve the status (and the license itself) later.

Check #2: Asking the server to verify a license

The second call is a call which you make in your application after you have checked out a license. You pass a node-locked uncounted license to this call (either good or bad, and you should pass both types at different times).

The call is:

```
rlm_auth_check(RLM_LICENSE lic, char *license_to_check);
```

You must pass a valid RLM_LICENSE handle in, and this handle should represent a checked-out license (from a license server). The "license_to_check" is a signed license, either valid or not.

This function will return either:

- 0 - the server authenticated the license, and it is correct
- RLM_EL_BADKEY (-5) - the license did not authenticate in the server
- RLM_EH_NOSERVER (-112) - the RLM_LICENSE handle passed in does not have a license checked-out on a license server.

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How RLM Clients Find the License Server

There are a number of ways for RLM clients to locate a license server. These include:

- a HOST (or SERVER) line in a local license file. specified by:
 - a license filename passed as argument 1 to `rlm_init()`
 - a license filename contained in a directory passed as argument 1 to `rlm_init()`
 - a license filename in the application binary directory, as passed in argument 2 to `rlm_init()`
 - a license file referenced from the `RLM_LICENSE` or `ISV_LICENSE` environment variable.
- a [port@host](#) specification contained in the `RLM_LICENSE` or `ISV_LICENSE` environment variable
- Beginning in RLM v10.0, if none of these methods work to locate a license server, the RLM client will broadcast to find a license server on the local area network.

Note that Reprise Software recommends placing your license file in the directory with your binary, and passing this directory name (usually “.”) as the 2nd argument to `rlm_init()`. If you use a license server, this license file need only contain a single HOST (or SERVER) line with the correct hostname (and port if you don't use the default port). The hostid in this license file does not matter. So, for example, if your license server is on machine *paradise* at the default port (5053), this license file can contain this single line:

```
HOST paradise any
```

Broadcasting to find the license server

Beginning in RLM v10.0, RLM clients can broadcast on the local network to find a license server. (Note that broadcasts do not travel through routers, so this is only effective for smaller networks). This can be quite useful for installations at smaller customer sites which have no fulltime IT personnel.

The broadcast has the following characteristics:

- If a license server for your ISVname is located using any other method, then the broadcast will not be performed.
- The first server to answer the broadcast will be used. Generally, since this is a small network, there will only be one.
- The broadcast will always happen on UDP port 5053, which has been assigned to Reprise Software by the Internet Assigned Numbers Authority ([iana.org](#))
- The client waits for a reply for 2 seconds. This is not configurable.
- You can disable this broadcast in your software by calling `rlm_isv_cfg_disable_broadcast()` in your `rlm_isv_config.c` file (or anytime after you call `rlm_init()` and before you check out a license).

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Wide Character Support

Because of the way Unix and Linux systems store directory and filename information, that is, in UTF-8, there has never been an issue with running RLM in wide-character environments on those systems. On Windows however, where the operating system stores path information in wide-characters, RLM has to be wide-character-aware.

Starting in v11.0, if an application passes paths to `rlm_init()` containing wide characters (`wchar_t` or `WCHAR` strings), it must first convert those paths to UTF-8 before passing them to RLM. RLM stores them internally as UTF-8, and converts back to wide characters before using them in filesystem operations. In this way, RLM clients and servers can be installed on wide character paths and work correctly.

Note that RLM does not support wide characters in the ISV options file or in debuglog and reportlog file names.

On Windows platforms, if the paths your application would pass to `rlm_init()` in the first and second parameters are Unicode wide characters (`wchar_t` or `WCHAR`), you must first convert them to UTF-8. The Win32 function `WideCharToMultiByte()` can be used for this conversion.

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Alternate Server Hostids

Overview

An Alternate Server Hostid is a method to lock a license server to a nodelocked, uncounted license, rather than directly to a hostid. The main uses for this are to lock the license server to a rehostable hostid (so your customer can revoke and re-authorized the server), or so that you can disable a license server that is in the field.

The *alternate server hostid* hostid type (license=serial#) is supported by RLM only on the HOST/SERVER line. A single ISV server can only use a single Alternate Server Hostid locked to a rehostable hostid, ie, there cannot be two different “license=xyz” hostids in 2 different license files if the two Alternate Server Hostids both use rehostable hostids. Also note that you cannot use an Alternate Server Hostid for an *rlm_server_enable_vm* license (either as it's nodelocked ID or as a floating license where the server uses an ASH hostid).

The Alternate Server Hostid capability works in conjunction with RLM Activation Pro, and is not supported when used without ActPro.

The license server, at startup time, will verify the license specified by the *alternate server hostid*, and if it is valid, will then perform the operation specified by the “check-type” parameter. The “check-type” parameter specifies whether automatic communications with the activation server are done or not, and if so, how often the activation server is checked. If “check-type” is “none”, no automatic checking is done. If “check-type” is “startup”, the license server will make an *rlm_act_keyvalid()* call to the activation server at license server startup time. If “check-type” is “daily”, the license server will check at startup and again at midnight on every subsequent night. Finally, if “check-type” is “6hour”, the server checks the license on startup and again every 6 hours. Once the license is verified and any checks are done successfully, the server starts up normally. If a midnight (or 6 hour) check fails, the license server will continue to run for “tolerance-1” checks. If no successful check is done within “tolerance” days/6 hours, the server will exit.

Setting “check-type” to “startup”, “daily”, or “6hour” allows you to turn off a license server by disabling the associated activation key. If the check fails with a “key not valid” error the server will exit immediately (on startup), otherwise, the tolerance parameter specifies on how many days (or 6 hour checks) errors can occur. On the failure the “tolerance” time, the license is disabled.

The license for the *alternate server hostid* must have the following characteristics. (Note that this is the alternate server hostid license only, these restrictions do not apply to the other licenses you put in the license file.) Also note that this license is generated correctly by Activation Pro when you select the “Alternate Server Hostid” license type, so you don't have to worry about these parameters (other than setting the product name correctly), which are here for reference:

- it must be a nodelocked, uncounted license (actpro does this automatically when you select the “alternate server hostid” license type).
- product name: *rlm_server* (you must set the product name correctly)
- options string, as defined below
- serial# must be a decimal number of <= 15 digits (activation pro generates this automatically every time it creates an activation key)

- issuer=URL-of-activation-server (if you use either the startup, daily, or 6hour option, see below)
- hostid: required
- akey= required (if using “startup”, “daily”, or “6hour”)

The options string has the following format:

options=serial#:check-type:tolerance

where:

serial# - is the serial number from the license=serial# specification on the SERVER line

check-type is one of the 4 values:

- none – no check with the activation server is done by the license server
- startup – check (rlm_act_keyvalid()) with the activation server at license server startup time
- daily – check (rlm_act_keyvalid()) with the activation server on startup and every night at midnight.
- 6hour – check (rlm_act_keyvalid()) with the activation server on startup and every 6 hours subsequent to that.

tolerance – is a # of days (or number of 6 hour checks), N. Used only for the “daily” and “6hour” check-types. The server can fail it's check N-1 times in a row without any issues, N failures in a row cause the server to stop serving licenses for this hostid.

NOTE: the serial number is the part of the hostid that makes the floating licenses in the license file unique, so if you create an alternate server hostid license without Activation Pro (which is not recommended or supported) you should BE SURE to give each of your customers a different serial number. Activation Pro will do this for you automatically.

When creating the product definition for an Alternate Server Hostid license, use Actpro's “Alternate Server Hostid” License type in the product definition for this – this product definition will generate the SERVER, ISV, and nodelocked LICENSE lines required. Activation Pro also allows you to enter the check type, and tolerance in the product definition. The serial number is generated automatically when an activation key is created, and cannot be changed. You MUST, however, set the product name to “rlm_server”.

When creating your product definition, be sure to select “Yes” in the “Include Activation Key in License” parameter, and if you are using this capability to provide rehostable licenses, select only “rehostable” in the “Allowed Hostid Types” selection of either the product definition or activation key.

If you use the *alternate server hostid* on the SERVER line, a single instance of rlm can only support your isv server, it cannot support other ISV's servers.

Finally, when you create an alternate server hostid activation key, you almost certainly want to give it an activation count of 1. If you give it a count > 1, your user can create multiple

servers which have the *same* *hostid*. This means that any license you issue to this *hostid* will work on each of the servers so activated.

In all use cases for alternate server *hostids*, the plan is to activate the alternate server *hostid* first. Once this is activated, call `rlm_act_fulfill_info()` on the activation key to retrieve the server's *hostid* that was generated. (it will be of the form "license=xxx"). You can then use this *hostid* when activating your product licenses.

If you use alternate server *hostids*, you MUST set the URL in the *actpro* database in the *admin->database* tab.

Alternate Server *Hostid* Examples

*Example 1. Lock your server to a regular *hostid*, and check the license every day.*

In this example, the server will check the activation key with the activation server every time it starts, plus every night at midnight. If the check fails for 10 days in a row the server will stop serving other licenses for this *hostid*. You would use a *SERVER* line and license like this:

```
HOST localhost license=1234
```

```
LICENSE isvname rlm_server 1.0 1-jan-2025 uncounted  
hostid=12345678 issuer=http://www.hostedactivation.com  
akey=1234-5678-9999-4321  
options=1234:daily:10 signature
```

*Example 2. Lock your server to a rehostable *hostid*, and check the license only at server startup.*

For this example, you would use a *HOST* line and license like this. Note that this example uses a "rehostable" *hostid*. This allows your customer to rehost the license server, but it also allows you to disable the licenses later. In this example, the tolerance (10– the 3rd parameter in the options string) is unused.

```
HOST localhost license=1234
```

```
LICENSE isvname rlm_server 1.0 1-jan-2025 uncounted  
hostid=rehost=cc5a340f:84ca2561da285b7cbac719a916b016dcffde6434  
issuer=http://www.hostedactivation.com akey=1234-5678-9999-4321  
options=1234:startup:10 signature
```

Example 3. Lock your server to a license with no automatic activation server involvement.

For this example, you would use a *SERVER* line and license like this. In this example, your customer would activate (and deactivate) this *hostid* using *rlm*'s web interface, but the license server would not automatically contact the activation server at any time.

```
HOST localhost license=1234
```

```
LICENSE isvname rlm_server 1.0 1-jan-2025 uncounted  
hostid=rehost=cc5a340f:84ca2561da285b7cbac719a916b016dcffde6434  
options=1234:none:0 signature
```

Errors - What happens if the license server can't contact the activation server, or gets an error?

The license server attempts to automatically contact the activation server for either the “startup”, “daily”, or “6hour” check types. This check may result in an error from the activation server. Depending on when the error happens, it is handled as follows:

For the “startup”, “daily”, and “6hour” types, the license server needs to check the activation key at startup time and periodically afterwards. The errors from the activation server which are tolerated at startup time are minimal.

At startup time, the following status returns will be ignored, and the server will continue to run if the license is still valid::

```
0 (good status)  
RLM_EH_INTERNAL  
RLM_EH_NET_RERR  
RLM_EH_NET_WERR  
RLM_ACT_CANT_WRITE_FULFILL  
RLM_ACT_CANT_WRITE_KEYS  
RLM_ACT_CANTREAD_DB
```

Any other status return will cause the license server startup to fail, and the server will only process nodelocked, uncounted licenses from this license file, and no check with the activation server will be attempted in order to recover.

For “daily” or “6hour” checking, at the re-check, any errors will be tolerated, however it will be considered a failure. If the check fails with an error for “tolerance” number of checks in a row, the server will continue to run, but behave as if any served licenses were removed from the license file.

In all cases, the following errors will cause the server to immediately stop serving licenses locked to this hostid:

```
RLM_ACT_NO_KEY  
RLM_ACT_NO_PROD  
RLM_ACT_NO_KEY_MATCH  
RLM_ACT_KEY_DISABLED  
RLM_ACT_KEY_NO_HOSTID
```

Use Case #1: Using Alternate Server Hostids to support rehosting of License Servers

In order to allow your customer to rehost their license server, use the following procedure:

1. In `rlm_isv_config.c`, be sure that you have set the activation server's URL with the `rlm_isv_cfg_set_url()` call. The default URL is "hostedactivation.com", so if you use Reprise's hosted activation service, you can skip this step. Everyone else needs to set the URL here. None of this will work without the correct URL setting.
2. In `rlm_isv_config.c`, be sure to include `RLM_ACTPRO_ALLOW_ASH` in the "allowed_types" variable in the call to `rlm_isv_cfg_actpro_allowed_hostids()`.
3. Set the URL in Activation Pro, in the "Admin"/"Database"/"Activation Server URL" section. This causes the correct URL to be placed into the license.
4. Set up a product in activation pro with product name "rlm_server", license type "Alternate Server Hostid". Set the check type and tolerance interval here. Check only "rehostable" under "Allowed Hostid Types". Check "Yes" under "Include Activation Key in License". Leave the "Other RLM keyword=value pairs" field blank – Activation pro will fill this in.
5. Create an activation key for this product. Saving the activation key will cause Actpro to generate a unique serial number in the "ash_sn" column of the "keyd" table. Note that you should issue a single activation key for a single Alternate Server hostid, and you should *not delete this key if you ever want to get that serial number back again*. Leave the "Other RLM keyword=value pairs" field blank.
6. Give the activation key to your customer.
7. Your customer will need to bring up rlm with a license file that has an ISV line for your ISV server, so that your ISV server will start. They can start rlm with a license file containing these 2 lines:

```
HOST localhost ANY  
ISV your-isvname
```
8. Your customer then goes to the rlm web interface and selects "Status". At the far right-hand side of your ISV server's line, there is a button labeled "Activate" (the user must have the "edit options" privilege for this button to appear). They should click this button, then enter the activation key you supplied (from step 5, above), and press "Activate/Deactivate Alternate Server Hostid". If the operation succeeds, your ISV server will write a license file named "`rlm_your-isvname_activation_key.lic`" in the current directory. (if your customer deactivates a rehostable hostid-based license, this license file will be deleted).
9. Your customer should copy the HOST line from the new license file to their main license file for this server. This can be done with the "Edit License Files" button in the rlm web interface.
10. Next, when your customer activates licenses to be used on this server, they should use the hostid "**license=xxx**" from the HOST line in this license file. (Reprise recommends that you keep the `rlm_your-isvname_ash.lic` file separate from the file with all your regular licenses, since the Alternate Server Hostid file will be replaced on a re-activation.
11. At this point your customer can deactivate the Alternate Server Hostid license, move the license file and software to another machine, and re-activate it there.

Use Case #2: Remotely Disabling License Servers

In order to be able to disable your customer's license servers, use the following procedure:

This use case is exactly the same as Use Case #1, with the following exceptions:

- you would always use “startup”, “daily”, or “6hour” for checking, never “none”
- you can use a rehostable hostid as in Use Case #1, or you can leave the “Allowed hostid types” blank in order to use a standard hostid.

Use Case #3: What do you do if the user loses his license file(s)?

This is somewhat of a sticky situation, but you can recover as follows:

1. Get the ASH license itself:
 - Call `rlm_get_rehost()` with the product name “`rlm_server`”
 - Call `rlm_act_keyvalid_license()` with the ASH activation key and the hostid from the `rlm_server` license from the previous step.
2. Extract the license # from the ASH license:
 - Write the license from step 1 into a new license file, call `rlm_init()`.
 - `RLM_LICENSE lic = rlm_checkout(RLM_HANDLE, “rlm_server”, “1.0”, 1);`
 - `char *options = rlm_license_options(lic);`
 - `char *p = strchr(options, '.'); if (p) *p = '\0';`
 - `sprintf(ash_hostid, “license=%s”, options);`
3. With the ASH hostid, retrieve the other licenses with `rlm_act_keyvalid_license()`
4. Write the new license file for the other licenses:
 - `SERVER localhost license=ash_hostid#`
 - `ISV your-isvname`
 - `LICENSE 1`
 - `LICENSE 2`
 - ...
 - `LICENSE n`

Here's some example code:

the routine `write_license()` is assumed to write the license file with the string specified.

```
RLM_LICENSE lic;
char *options = (char *) NULL, *p = (char *) NULL;
char rehost_hostid[RLM_MAX_HOSTID_STRING+1];
char ash_hostid[RLM_MAX_HOSTID_STRING+1];
char license[RLM_MAX_LINE*10];
```

```
    i = rlm_get_rehost(rh, "rlm_server", rehost_hostid);
    if (i) { ERROR }
    i = rlm_act_keyvalid_license(rh, acthost, "activation-key-for-ASH-license",
```

```

                                rehost_hostid, license);
if ( !i )
{
    rlm_putenv("RLM_LICENSE="your-ASH-1f");
    write_license("your-ASH_1f", license);
}

#if 0 /* This was the code to use before rlm_act_fulfill_info() was available */
    rlm_close(rh);
    rh = rlm_init("", argv0, (char *) NULL);
    rlm_putenv("RLM_LICENSE=");
    lic = rlm_checkout(rh, "rlm_server", "1.0", 1);
    if (lic) options = rlm_license_options(lic);
    if (options) p = strchr(options, '!');
    if (p) *p = '\0';
    if (options) sprintf(ash_hostid, "license=%s", options);
    else ash_hostid[0] = '\0';
    rlm_act_keyvalid_license(rh, acthost, "activation-key-for-floating-licenses",
                                ash_hostid, license);
#else /* code to use post v12.1, with rlm_act_fulfill_info() */
{
    char prod[RLM_MAX_PRODUCT+1], ver[RLM_MAX_VER+1], exp[RLM_MAX_EXP+1];
    int date_based, license_type, upgrade_version, count, fulfilled, rehosts, revoked;
    /* all vars on above 2 lines unused */

    rlm_act_fulfill_info(rh, acthost, "activation-key-for-ASH-license", prod, vers, &date_based,
                        &license_type, upgrade_version, &count, &fulfilled, &rehosts,
                        &revoked, exp, ash_hostid);
}
#endif
if ( !i )
{
    char lic2[RLM_MAX_LINE*10];

    sprintf(lic2, "SERVER localhost %s\nISV reprise\n", ash_hostid);
    strcat(lic2, license);
    write_license("activation1.lic", lic2);
    reread_server();
}

```

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Alternate Nodelock Hostids

Overview

An *Alternate Nodelock Hostid* is very similar to an Alternate Server Hostid, except that it is used to lock a group of licenses to a particular node, and there is no automatic checking of the *Alternate Nodelock Hostid*. With that in mind, the remainder of this chapter is a simplified version of the Alternate Server Hostid chapter.

An *Alternate Nodelock Hostid* is a method to lock one or more individual licenses to a nodelocked, uncounted license, rather than directly to a hostid. The main uses for this are to lock the licenses to a rehostable hostid (so your customer can revoke and re-authorized all licenses with a single revoke/re-authorization request pair), or so that you can disable the licenses that are in the field. Also, this allows you to lock multiple independent versions of a particular license to a rehostable hostid, which isn't possible using a rehostable hostid directly.

The *Alternate Nodelock Hostid* hostid type, which has the same syntax as the *alternate server hostid* type (license=serial#) is supported by RLM only as a nodelock hostid on a LICENSE line. A single computer can only use a single *Alternate Nodelock Hostid* locked to a rehostable hostid, ie, there cannot be two different "license=xyz" hostids in license files if the two *Alternate Nodelock Hostids* both use rehostable hostids.

The *Alternate Nodelock Hostid* capability works in conjunction with RLM Activation Pro, and is not supported when used without ActPro.

Note: unlike an Alternate Server Hostid, there is no runtime checking to verify that the the activation key used to generate the *Alternate Nodelock Hostid* is still valid. If you want this checking, you will need to call `rlm_act_keyvalid()` at the appropriate time(s).

The license for the *Alternate Nodelock Hostid* must have the following characteristics. (Note that this is for the *Alternate Nodelock Hostid* license only, these restrictions do not apply to the licenses which are locked to the *Alternate Nodelock Hostid*.) Also note that the options string is generated correctly by Activation Pro when you select the "*Alternate Nodelock Hostid*" license type, so you don't have to worry about that part of the license:

- it must be a nodelocked, uncounted license (actpro does this automatically when you select the "*Alternate Nodelock Hostid*" license type).
- product name: `rlm_nodelock` (you must set the product name correctly in actpro)
- options string, as defined below (set automatically by activation pro)
- serial# must be a decimal number of <= 15 digits (activation pro generates this automatically every time it creates an activation key)
- hostid: required
- akey= recommended if you want to call `rlm_act_keyvalid()`
- set issuer to the URL of the activation server (recommended if you want to call `rlm_act_keyvalid()`)

The options string has the following format:

```
options=serial#
```

where:

serial# - is the serial number from the license=serial# specification on the product's LICENSE line

NOTE: the serial number is the part of the hostid that makes the nodelocked licenses in the license file unique. Activation Pro will give each of your customers a different serial number automatically (actually, it gives each activation key a unique serial number, so you should only generate a single Alternate Nodelock Hostid from one activation key).

When creating the product definition for an *Alternate Nodelock Hostid* license, use Actpro's "Alternate Nodelock Hostid" License type in the product definition for this – this product definition will generate the LICENSE line required. The serial number is generated automatically when an activation key is created, and cannot be changed. You MUST, however, set the product name to "rlm_nodelock".

When creating your product definition, be sure to select "Yes" in the "Include Activation Key in License" parameter if you are going to call rlm_act_keyvalid() later, and if you are using this capability to provide rehostable licenses, select only "rehostable" in the "Allowed Hostid Types" selection of either the product definition or activation key.

The following code sample will create the alternate nodelock hostid, assuming the activation key "anh-key" is an activation key with the properties above:

```
RLM_ACT_HANDLE act_handle;

act_handle = rlm_act_new_handle(rh);
rlm_act_set_handle(act_handle, RLM_ACT_HANDLE_REHOST, (void *) 1);
i = rlm_activate(rh, althost1, "anh-key", 1, license, act_handle);
rlm_act_destroy_handle(act_handle);
```

Once you have activated the ANH license and written "license" to a local license file, you can get the hostid to use in the other licenses with code like the following:

```
RLM_HANDLE rh;
RLM_LICENSE lic;
char *options;
char *hostid[RLM_MAX_HOSTID_STRING];

strcpy(hostid, "invalid");
rh = rlm_init(...);
lic = rlm_checkout(rh, "rlm_nodelock", "1.0", 1);
if (!rlm_license_stat(lic))
{
    options = rlm_license_options(lic);
}
if (options) sprintf(hostid, "license=%s", options);
```

If you use alternate nodelock hostids, you MUST set the URL in the actpro database in the admin->database tab.

Alternate Nodelock Hostid Example

Example: Four product licenses locked to an *Alternate Nodelock Hostid*.

For this example, we show the *Alternate Nodelock Hostid* license and the four product licenses in separate boxes. In practice, you should put the *Alternate Nodelock Hostid* license in a separate license file so that you can easily copy the product licenses to a 2nd machine and abandon the old *Alternate Nodelock Hostid* license when you revoke and re-authorize it with a new one.

```
LICENSE isvname rlm_nodelock 1.0 1-jan-2025 uncounted
hostid=rehost=cc5a340f:84ca2561da285b7cbac719a916b016dcffde6434
options=1234 akey=1234-5678-abce-efgh
issuer=http://hostedactivation.com signature
```

```
LICENSE isvname product1 1.0 1-jan-2025 uncounted
hostid=license=1234 signature
LICENSE isvname product2 1.0 1-jan-2025 uncounted
hostid=license=1234 signature
LICENSE isvname product3 1.0 1-jan-2025 uncounted
hostid=license=1234 signature
LICENSE isvname product4 1.0 1-jan-2025 uncounted
hostid=license=1234 signature
```

Use Case #1: Using Alternate Nodelock Hostids to support rehosting of a group of product Licenses

In order to allow your customer to rehost a group of nodelocked licenses, use the following procedure:

1. In `rlm_isv_config.c`, be sure to include `RLM_ACTPRO_ALLOW_ASH` in the “allowed_types” variable in the call to `rlm_isv_cfg_actpro_allowed_hostids()`.
2. Set the URL in Activation Pro, in the “Admin”/“Database”/“Activation Server URL” section. This causes the correct URL to be placed into the license. While this step is optional, the generation of the Alternate Nodelock Hostid will have the issuer=URL keyword in the license, which you can use if you want to call `rlm_act_keyvalid()`.
3. Set up a product in activation pro with product name “`rlm_nodelock`”, license type “*Alternate Nodelock Hostid*”. Check only “rehostable” under “Allowed Hostid Types”. Check “Yes” under “Include Activation Key in License”. Leave the “Other RLM keyword=value pairs” field blank – the Activation pro license generator will fill this in.
4. Create an activation key for this product. Saving the activation key will cause Actpro to generate a unique serial number in the “ash_sn” column of the “keyd” table. Note that you should issue a single activation key for a single *Alternate Nodelock Hostid*, and you

should *not* delete this key if you ever want to get that serial number back again. Leave the “Other RLM keyword=value pairs” field blank.

5. Give the activation key to your customer.
6. Your customer then activates this license using your activation utility. Store this license in license file #1.
7. Your customer can then activate any nodelocked product licenses using the hostid “license=xyz”, where xyz is the serial number of the license generated in step 6. It is best practice to keep these licenses in a different license file from the one created in step 6, since the *Alternate Nodelock Hostid* license file will be replaced on a re-activation.
8. At this point your customer can deactivate the *Alternate Nodelock Hostid* license, move the license file and software to another machine, and re-activate it there. The individual product licenses do not need to be re-activated.

Use Case #2: Remotely Disabling Nodelocked Licenses

In order to be able to disable your customer's nodelocked licenses, use the following procedure:

This use case is exactly the same as Use Case #1, with the following exceptions:

- your code would call `rlm_act_keyvalid()` to verify that the activation key was not disabled. When you want to disable the licenses, disable the activation key in `actpro`.
- For this case, you can use a rehostable hostid as in Use Case #1, or you can leave the “Allowed hostid types” blank in order to use a standard hostid for the *Alternate Nodelock Hostid*.

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Dynamic Reservations

At certain times, it is desirable for one process to check out a license and ensure that a new process can get the same license. In order to accomplish this, RLM introduced the concept of a *dynamic reservation* in RLM v12.2

While there may be many use cases for this within an ISV's licensing design, the most general usage is in the case of *job schedulers*, such as IBM's LSF and Runtime Design Automation's WorkloadXelerator.

Dynamic reservations are accomplished with no changes to the RLM API - all capabilities are controlled via the environment variables RLM_RESERVE and RLM_RECLAIM. Of course, these variables can be set with the RLM API call `rlm_setenv()`. The reason we use environment variables for this capability is so that the job scheduler can set the environment before launching the ultimate application, and each ISV does not have to write code to specifically handle the dynamic reservation. Once linked with RLM v12.2, every RLM-licensed application is enabled to use this capability.

To use a dynamic reservation, we will refer to the two processes as the reserving process – ie, the process which creates the reservation, and the reclaiming process – the process which reclaims the license which was previously reserved.

How to use Dynamic Reservations

Creating the Reservation

In the reserving process, set RLM_RESERVE to:

isvname:#secs:string

where:

isvname – is the name of the ISV which “owns” the license. If left blank, the current ISV name is used. If specified and different from the current ISV, then the checkout request will not perform encryption handshaking with the license server.

#secs – is the number of seconds to “hold” the reservation after the license is checked back in by the reserving process.

string – is the string, or handle, that the reclaiming process must use to reclaim this license. (max 32 bytes)

Once the license is checked out, the reserving process should check it back in, and start the reclaiming process within *#secs* seconds. Note that if the license itself specifies a hold time or a `minimum_checkout` time that time will apply to the checkout *if the isvname is blank or the same as the current ISV. If the isvname is different from the current ISV, no hold time or minimum_checkout time will apply to the checkout itself.*

If the ISV requesting the dynamic reservation is the same as the ISV that “owns” the licenses:

RESERVED, OUT and IN will all be logged in the debug log

the new DYNRES line, OUT and IN will be logged in the report log.

If the ISV requesting the dynamic reservation is different:

only the RESERVED line will be logged in the debug log

only the DYNRES line will be logged in the report log

Other notes for dynamic reservations:

1. dynamic reservations are only supported on a license server (ie, not for node-locked, unserved licenses)
2. If you ask to reserve N licenses, the server must have N free licenses available. Shared licenses do not count in this number, and other (non-dynamic) reservations do not count, either. In other words, the server does not consider licenses available for sharing or any reservations when computing the number of free licenses.
3. You cannot QUEUE for dynamic reservations.
4. Dynamic reservations do not work with Roaming or client caching.
5. if both RLM_RESERVE and RLM_RECLAIM are set, RLM_RECLAIM takes precedence, in other words, the reservation will not be created.

Reclaiming the Reserved Licenses

In the reclaiming process, set RLM_RECLAIM to:

isvname:#secs:string

where:

isvname – is the name of the ISV which “owns” the license. This will normally be blank, but in the case of a job scheduler which needs to cancel a reservation it created earlier, is will be filled in. If left blank, the current ISV name is used. If specified and different from the current ISV, then the checkout request will not perform encryption handshaking with the license server.

#secs – is the number of seconds to “hold” the reservation after the license is checked back in by the reclaiming process.

string – is the string, or handle, to reclaim the license.

Once the license is checked out, the reclaiming process can use it as normal, and at the end, the reservation will be released in #secs seconds. The license checkout is subject to the same rules as for the reserving process, ie, if the license itself specifies a hold time or a minimum_checkout time that time will apply to the checkout *if the isvname is blank or the same as the current ISV. If the isvname is different from the current ISV, no hold time or minimum_checkout time will apply to the checkout itself.*

The reservation created by the reserving process will be independent of all the license restrictions specified in the license itself. So, for example, if that license is shareable by user/host, then the reclaiming process will be able to share the resulting license with other processes started on the same user/host. In this case, only the first process needs to present the handle to the server, the others can share that license without setting the RLM_RECLAIM environment variable.

Also note that once the reservation is created, multiple sequential processes can reclaim the same reservation with the RLM_RECLAIM environment variable. The last process which is going to use the reservation should set #secs to 0, so that the reservation goes away at that point. If a job scheduler creates a reservation then later discovers that the jobs cannot continue to run, the scheduler can remove the reservation by setting RLM_RECLAIM with #secs set to 0.

Some notes and restrictions:

1. dynamic reservations are only supported on a license server (ie, not for node-locked, unserved licenses)
2. you cannot QUEUE for dynamic reservations
3. dynamic reservations do not work with ROAMING
4. if both RLM_RESERVE and RLM_RECLAIM are set, RLM_RECLAIM takes precedence.
5. License sharing is never considered when creating dynamic reservations.

NOTE: Dynamic reservations are not supported on solaris.

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Using RLM with HTTPS

Beginning in RLM v14.0, your RLM-enabled application can communicate with an RLMCloud license server using HTTPS, rather than the native RLM socket protocol. You will need to ensure that you can handle the new RLM_EH_WEBS_NOSUPP status return, which will be returned on certain RLM API functions that are not supported with web services. See the last section in this chapter for more information.

If your company does not use RLMCloud servers, you can ignore this chapter.

Why did we do this?

That is a good question. It seems that some administrators, primarily in large companies, view TCP/IP traffic that doesn't go thru HTTPS as inherently insecure and therefore bad, and not allowed. Of course, that is why there are firewalls, to enable traffic on certain ports, like the RLM port, 5053 and the port used by the ISV server. Reprise Software does not believe that sending RLM traffic over a regular TCP/IP socket presents any more danger than using web services as a transport, but some customers refuse to allow non-HTTP traffic, so we support it. Many people think that this insistence on HTTPS is simply “security theater”, or in other words, just something for show. We have never heard any coherent explanation as to why this makes *anything* more secure.

A second reason is because, by using HTTPS, your customer does not have to open ports in their firewall, because virtually everyone has port 443 (HTTPS) enabled.

How to use HTTPS with RLMCloud

First of all, HTTPS transport is only supported in the linux, Mac and Windows versions of RLM. Any other platform will return RLM_EH_WS_NOSUPP when web services is specified in the license file .

To include HTTPS support in your application, follow these instructions:

- Be sure to set the appropriate value in the `rlm_isv_cfg_set_promise()` call contained in `rlm_isv_config.c`. By default, this is 10 minutes, which means you need to call `rlm_get_attr_health()` every 5-7 minutes.
- Call `rlm_isv_cfg_set_isv_handshake()` in `rlm_isv_config.c` with an appropriate set of P1 and P2 parameters (please do not use the defaults values in `rlm_isv_config.c`).
- **For Linux and Mac:**
 - link your RLM application with the web services http module `rlm_msgs_http.o`. Place this object file before the rlm library in your link line. Consult the build rules for `rlmclient_http` in the makefile for an example.
 - You must ensure that every system where your application runs has the CURL libraries installed. (These libraries are always installed in our experience on Mac). If the libraries are not installed, you will get a message similar to this when you run your application on linux:

```
your-program-name: error while loading shared libraries: libcurl.so.4: cannot
open shared object file: No such file or directory
```

On Ubuntu linux, this is solved with the following command:

```
% sudo apt-get install libcurl-openssl-dev
```

- **For Windows:**

- link your RLM application with the web services http module *rlm_msgs_http.obj*. There are 4 different variants of *rlm_msgs_http.obj* for Windows, corresponding to the 4 different object formats (/MD, /MT, /MDd, and /MTd). They are *rlm_msgs_http_md.obj*, etc. When building your application, select the appropriate one for the style of build you're doing and place it on your LINK command line *before* the RLM library. See the build rule for *rlmclient_http.exe* in the makefile for an example.
- Unlike on Linux, using the HTTPS capability in RLM does not require any external library dependencies. All the low-level CURL/HTTPS support is in the RLM client library. Of course it is linked into your application only if you use *rlm_msgs_http_*.obj*.
- RLM HTTPS support on Windows does not work on Windows/XP and Windows Server 2003. We believe it will work on Windows/Vista and Windows Server 2008 but we have not tested it. We have tested on Windows 7 and later. If you run an HTTPS-enabled application on XP/Server 2003 machine, you will get the RLM_EH_WS_NOSUPP error when the app tries to contact an RLMCloud server.

Once your application is built with the correct support, and the CURL libraries are installed on the target system, using HTTPS is simply a matter of changing the normal RLMCloud CUSTOMER line to use the HTTPS port. So, for a normal RLMCloud license file, there would be a CUSTOMER line like the following:

```
CUSTOMER customer-name isv=isvname server=lsN.rlmcloud.com port=5053 password=XXX
```

To use the HPPTS transport, simply change the port number from 5053 to 443:

```
CUSTOMER customer-name isv=isvname server=lsN.rlmcloud.com port=443 password=XXX
```

That's all there is to it. Everything else remains the same; the RLM client library switches to use HTTPS transport.

What if I use RLMCloud and don't build in web services support

If you use RLMCloud and don't build in web services support, you must be prepared to receive the RLM_EH_WS_NOSUPP error from various RLM functions. If your customer changes the RLM CUSTOMER line to use port 443, any requests you make thru the RLM client library will return RLM_EH_WS_NOSUPP.

If you use web services, you might get a RLM_EL_BADHANDSHAKE error if a checkout succeeds and the handshake is bad. In this case, you should be sure to check the license back in, otherwise it will remain checked out on the server until the promise interval expires. Note that calling rlm_checkin() after a failed checkout is always a fine thing to do.

Some notes on MacOS

Earlier versions of MacOS have a bug in the CURL libraries and HTTPS will not work. What we know for sure at this point is that 10.5..8 (Leopard) and earlier do not work, and that 10.12 (Sierra) and presumably later do work.

Unsupported functions with web services

When using the HTTPS transport, there are RLM API functions which are not supported, and if you call any of these, your code should be prepared to receive an RLM_EH_WEBS_NOSUPP error. These functions continue to work for local license files, and license files which specify a server that does not use web services, they just don't work on any license file in your path that specifies web services access to the server. These functions are:

- rlm_act_xxxx() - all activation functions, since there isn't an activation server on RLMCloud systems
- rlm_products(), and associated functions. (note that rlm_products() will still return product listings from all local license files as well as non-web-services rlm servers, but you will receive no product information from RLMCloud servers.)
- Licenses cannot be roamed when using web services..
- You cannot queue for licenses with web services – RLM_QUEUE is ignored.
- All Admin API functions are unsupported.
- rlm_auth_check() - used to detect a hacked server, which is not an issue for RLMCloud.
- Dynamic reservations can only be created/reclaimed for the same ISV name. This means that if you want a job scheduler to create dynamic reservations for you, you will have to write a small utility program to create the reservation and use non-HTTPS transport.

Performance Metrics

We have run tests on both native and web services based versions of RLM, from various locations (always to an RLMCloud license server in the Dallas datacenter). The test performs 100 rlm_init()/rlm_checkout()/rlm_checkin()/rlm_close() calls and takes the average time (all in milliseconds). The “location” column indicates where the client software is running. The results are summarized in this table:

Client Location	Checkout time, native	Checkout time, web services
Dallas (same as server)	10-20 msec	280 msec
San Francisco	570 msec	610 msec
New York	280 msec	460 msec
London		

And using a loop of 100 checkout/checkins (without `rlm_init()/rlm_close()`):

Client Location	Checkout time, native	Checkout time, web services
Dallas (same as server)	< 10 msec	270 msec
San Francisco	330 msec	600 msec
New York	190 msec	
London		

Performance Comparison

If you want to understand why web services is so much slower, this section will give you an idea. With the native comm package, the following happens when you check out a license:

1. send a message to RLM on the server host, get the address of the ISV server (this is done once per customer name on a particular client machine, and the result cached).
2. Send a “hello” message to the ISV server and read the response.
3. Send a “checkout” message to the ISV server and read the response.
4. Send a heartbeat message to the ISV server, and read the response later.

With web services, there are a lot more moving parts and it's a lot more complicated:

1. Your program makes an HTTPS request to the license server on the server host.
2. The apache web server on that host starts a php program to process the request.
3. The php program starts a helper program – which is a lot like your program would have been if you used the normal comm package - via another http request to the web server, which then:
 - sends a hello message to the ISV server, reads the response.
 - Sends a “checkout” message to the ISV server, reads the response.
 - Sends a heartbeat message to the ISV server, it will read the response later.
 - Formats the response back to the php program that started it.
4. Now, the php program re-formats that data in json and returns it, via the apache web server, to the web services client (ie, your program)
5. Your program parses the json and returns the status to you.
6. Next, when you call `rlm_get_attr_health()`, you repeat steps 1-5 again, rather than just reading a response that was already waiting on a socket that was already open.

This brings up another important point. In the normal RLM comm package, heartbeats are “primed” and the response is not checked until later, so the application *never* waits for a round-trip to the server for a heartbeat. In web services, the heartbeat is *always* synchronous, so the whole round-trip overhead is incurred on each heartbeat. So don't do them too often.

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Section 4 – Reference Material

Appendix A – RLM API

This appendix lists all the RLM API calls in alphabetical order.

To call any of the functions in the RLM API, you need to include the RLM header file “license.h”:

```
#include "license.h"
```

RLM_HANDLE

RLM_HANDLE is the main handle in RLM. Your program needs to call *rlm_init()* to get a handle; this only needs to be done once. This handle (or an RLM_LICENSE handle) is passed to all the RLM api calls.

RLM_LICENSE

RLM_LICENSE is the license handle in RLM. This handle is returned from the *rlm_checkout()* call, and is passed to the *rlm_license_stat()*, *rlm_get_attr_health()* and *rlm_checkin()* calls.

N.B. RLM_LICENSE is also the name of the environment variable for specifying the license file path.

Core API – these 8 functions provide all basic licensing operations needed for most applications:

```
rlm_init() - initialize licensing operations with RLM.  
rlm_close() - Terminate licensing operations with RLM.  
rlm_checkout() - Request a license.  
rlm_checkin() - Release a license.  
rlm_errstring() - Format RLM status into a string.  
rlm_stat() - Retrieve RLM_HANDLE status.  
rlm_license_stat() - Retrieve RLM_LICENSE status.  
rlm_get_attr_health() - Check license status by checking server.
```

Advanced API – most applications will need few, if any, of these calls:

```
rlm_act_request()  
rlm_activate()  
rlm_act_destroy_handle()  
rlm_act_fulfill_info()  
rlm_act_info()  
rlm_act_keyinfo()  
rlm_act_keyvalid()  
rlm_act_new_handle()  
rlm_act_refresh()  
rlm_act_revoke()  
rlm_act_set_handle  
rlm_add_meter_count()  
rlm_auth_check()  
rlm_auto_hb()  
rlm_add_meter_count()
```

```
rlm_checkout_product()
rlm_detached_demo()
rlm_detached_demox()
rlm_errstring_num()
rlm_get_attr_lfpath()
rlm_get_rehost()
rlm_hostid()
rlm_all_hostids()
rlm_all_hostids_free()
rlm_license_XXXX()
rlm_log()
rlm_dlog()
rlm_products()
rlm_putenv()
rlm_set_active()
rlm_set_envron()
rlm_set_attr_keep_conn()
rlm_set_attr_logging()
rlm_set_attr_password()
rlm_set_attr_req_opt()
rlm_set_attr_reference_hostid()
rlm_set_auto_hb_isvdata()
rlm_sign_license()
rlm_skip_isv_down()
```

Namespace

- All RLM client library functions have names beginning with `rlm_` or `_rlm_`.
- All defined constants in `license.h` begin with `RLM_`

All the RLM API functions are described (in alphabetical order) on the following pages.

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rlm_act_request() - Request license activation from the internet

Note: new code should use the *rlm_activate()* call instead of *rlm_act_request()*. *rlm_act_request()* will be supported in the future, but all new options will be added only to *rlm_activate()*.

```
#include "license.h"
RLM_HANDLE rh;
int stat;
const char *url;
const char *isv;
const char *akey;
const char *hostid_list;
const char *hostname;
int count;
const char *extra; /* Note: added in RLM v4.0 */
char license[RLM_ACT_MAX_LICENSE+1];

rh = rlm_init(...);
stat = rlm_act_request(rh, url, isv, akey, hostid_list, hostname, count, extra, license);
```

rlm_act_request() requests a license activation from the server at *url* for ISV name *isv*. The activation key *akey* and license count *count* are sent to the server. Note that if the license count is ≤ 0 , a count of 1 is used. Beginning in RLM v9.0, a count of 0 has a special meaning for *NORMAL* activation fulfillments of *floating* licenses – a count of 0 requests that all remaining licenses be fulfilled for this request. In this way, your activation code does not need to supply the number of licenses ordered during fulfillment time. Note that a request of 0 will not retrieve an already-activated license - in order to re-retrieve an already-activated license, you must specify the number of licenses actually generated. If either the *akey* or *extra* parameter contains an embedded newline, *rlm_act_request()* will return RLM_EL_BADPARAM.

Beginning in RLM v9.4, the ISVNAME_ACT_URL environment variable will override the *url* parameter to this call. This allows you to change the URL of the activation server without rebuilding your software. For example, if your ISV name is “demo”, the environment variable would be named “DEMO_ACT_URL”, and you would set it to the URL to use for activation if the *url* parameter in this call is no longer correct.

Note that the URL should *always* be http, *never* https. *rlm_act_request()* encrypts the request independent of the webserver.

hostid_list is a space-separated list of RLM standard hostids. If *hostid_list* is NULL or empty, the hostid list from the current machine is used. Note that ethernet addresses should be exactly 12 hex characters (without the leading "0x"), and 32-bit hostids should be hex numbers without the leading "0x". RLM will select a hostid from this list for use in the license, as described in the next paragraph.

Prior to v11.0, rlm would only activate licenses with rehostable, non-zero RLM_HOSTID_32BIT, RLM_HOSTID_ETHER, RLMIDn, RLM_DISKSN, or ISV-defined hostids. Any other hostid will return an RLM_ACT_BAD_HOSTID_TYPE status from *rlm_act_request()*. (Note: ISV-

defined hostids were added to the list of legal hostids in RLM v4.0). Beginning in v11.0, you can specify exactly the hostids you will accept with the `rlm_isv_cfg_actpro_allowed_hostids()` call in `rlm_isv_config.c`, then either re-building your license generator or creating a new generator settings file. See Customizing RLM with `rlm_isv_config` on page 28 for more details.

The priority is (assuming the particular hostid type is enabled):

- rehostable hostid
- ISV-defined hostid
- ISV string hostid
- rlmid hostid
- Disk Serial Number
- ethernet address
- uuid
- 32-bit hostid
- ip address hostid
- user-based hostid
- host-based hostid
- serial number hostid
- string hostid
- DEMO hostid
- ANY hostid

If none of the hostid types above are present (or enabled), the activation software will return `RLM_ACT_BAD_HOSTID_TYPE`. Beginning in RLM v11.2, if `RLM_ACT_BAD_HOSTID_TYPE` is returned, the “license” parameter will contain the decimal representation of the list of valid hostids (as defined in `license.h`, in the `RLM_ACTPRO_ALLOW_xxx` definitions). This parameter is a string which represents a decimal number containing a bitwise OR of the allowed hostid types. To decode the allowed hostid types from the license string, use code similar to this:

```
allowed = atoi(license);
```

Beginning in RLM v9.0, the `hostid_list` parameter can contain a list of hostids for use in nodelocked licenses. This is specified with the following syntax:

```
list:list-of-hostids
```

For example:

```
list:user=joe host=sam ip=192.16.7.23 3f902d8b0027
```

If a list is supplied, note the following:

- The activation software uses the hostids in the list as you specified, even if they are not “secure”.
- If the license to be activated is a served license (floating), only the first hostid in the list is used.
- The number of available activations on the activation key is decremented by 1 regardless of the number of hostids in the license created.
- The hostid list must be less than `RLM_ACT_MAX_HOSTID_LIST` characters long (205) including the “list:” prefix.

- The hostid list can contain no more than RLM_MAX_HOSTID_LIST (25) hostids.

This capability can be used to create a license which works on 2 (or more) systems, e.g. to create a license for a primary and a backup system. It can also be used to pass a hostid of a less secure type to be used, e.g. the *hostid-list* "list:ip=172.16.7.12" will cause the activation software to use the IP address as a hostid without returning RLM_ACT_BAD_HOSTID_TYPE.

If *hostname* is NULL or empty, the hostname of the current machine is used.

extra is a string containing extra "keyword=value" license attributes. These must be valid RLM license syntax, not just any keyword=value pair. Note that the *extra* string should not contain characters illegal in license files, and most particularly, it should not contain the '&' character, which is illegal in a license file and also is the cgi separator in web requests. If you put space-separated strings into the *extra* parameter, be sure to enclose them in quotes. For example: set extra to "customer=\"Your Customer Name Here\"" in order to put your customer name into the generated license, or set it to "customer=\"Your Customer Name Here\" min_timeout=100" to set your customer name and the minimum timeout.

The parameter *license* must be an allocated string of length RLM_ACT_MAX_LICENSE+1. If *rlm_act_request()* succeeds, the activated license is returned in this string. For certain errors, the *license* string will contain MySQL error information, otherwise it will be an empty string.

Status returns ≥ 0 indicate success, < 0 are failure status.

Status	Meaning
0	license was activated, first request, activation count consumed
1	license previously activated. Activation count is not consumed; the prior license is returned. This status indicates that a duplicate activation key/count/hostid was sent to the server.
RLM_ACT_BADPARAM	Bad parameter to activation function
RLM_ACT_NO_KEY	No Activation key supplied
RLM_ACT_NO_PROD	No product definition (internal database error)
RLM_ACT_CANT_WRITE_KEYS	Cannot write activation keys (admin tool)
RLM_ACT_KEY_USED	Activation key used already (no count remaining)
RLM_ACT_BAD_HOSTID	Missing hostid
RLM_ACT_BAD_HOSTID_TYPE	Invalid hostid type
RLM_ACT_BAD_HTTP	Bad HTTP transaction
RLM_ACT_CANTLOCK	Cannot lock activation database
RLM_ACT_CANTREAD_DB	Cannot read activation database
RLM_ACT_CANT_WRITE_FULFILL	Cannot write fulfillment (licf) table
RLM_ACT_CLIENT_TIME_BAD	Time difference too great from server->client system
RLM_ACT_BAD_REDIRECT	Bad http Redirect
RLM_ACT_TOOMANY_HOSTID_CHANGES	Too many hostid changes for redirect
RLM_ACT_BLACLISTED	Domain on blacklist
RLM_ACT_NOT_WHITELISTED	Domain not on whitelist
RLM_ACT_KEY_EXPIRED	Activation Key expired

RLM_ACT_NO_PERMISSION	HTTP request denied
RLM_ACT_SERVER_ERROR	HTTP internal server error
RLM_ACT_BAD_GENERATOR	Bad or missing license generator file
RLM_ACT_NO_KEY_MATCH	No matching activation key found in database
RLM_ACT_NO_AUTH_SUPPLIED	No proxy authentication credentials supplied
RLM_ACT_PROXY_AUTH_FAILED	Proxy authentication failed
RLM_ACT_NO_BASIC_AUTH	Activation supports only BASIC proxy authentication
RLM_EH_CANTCONNECT_URL	Cannot connect to specified URL
RLM_ACT_GEN_UNLICENSED	Activation generator unlicensed
RLM_ACT_DB_READERR	Activation DB read error (MySQL)
RLM_ACT_GEN_PARAM_ERR	Generating license - bad parameter
RLM_ACT_UNSUPPORTED_CMD	Unsupported command to generator

If you are using Activation Pro, you should consult the Activation Pro manual for troubleshooting tips and additional error returns.

Proxy Server Support

RLM activation has support for proxy servers. To use a proxy server, there are 2 environment variables which must be set:

HTTP_PROXY- set to the **hostname:port** of the proxy server. For example, if your proxy server is on port **8080** on host **proxy_host**:

```
% setenv HTTP_PROXY proxy_host:8080
```

If your proxy server uses authentication, you can use the HTTP_PROXY_CREDENTIALS environment variable to pass the credentials to the proxy server:

HTTP_PROXY_CREDENTIALS - the username and password to authenticate you to the proxy server, in the format **user:password**. For example, if your username is "joe" and password is "joes_password":

```
% setenv HTTP_PROXY_CREDENTIALS joe:joes_password
```

Note that RLM activation supports only the BASIC authentication type.

You can either set these environment variables before running your application, or use `putenv()` (or `rlm_putenv()`) to set them inside your application before calling `rlm_act_request()`.

Starting in RLM v9.0, `rlm_act_request()` encrypts the data sent to the activation server. Beginning in RLM v9.1, if `RLM_ACT_NO_ENCRYPT` is set in the environment, `rlm_act_request()` will not encrypt the data sent to the activation server.

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rlm_activate() - Request a license activation from the internet

```
#include "license.h"
RLM_HANDLE rh;
int stat;
const char *akey;
int count;
char license[RLM_ACT_MAX_LICENSE+1];
RLM_ACT_HANDLE act_handle;

rh = rlm_init(...);
stat = rlm_activate(rh, url, akey, count, license, act_handle);
```

rlm_activate() is the preferred call to request license activation from the internet. *url* is the location of the activation server (without the trailing /cgi-bin/ISV_mklic) The activation key *akey* and license count *count* are sent to the server. Note that if the license count is ≤ 0 , a count of 1 is used. Beginning in RLM v9.0, a count of 0 has a special meaning for *NORMAL* activation fulfillments of *floating* licenses – a count of 0 requests that all remaining licenses be fulfilled for this request. In this way, your activation code does not need to supply the number of licenses ordered during fulfillment time. Note that a request of 0 will not retrieve an already-activated license - in order to re-retrieve an already-activated license, you must specify the number of licenses actually generated. If the *akey* parameter contains an embedded newline, *rlm_act_request()* will return RLM_EL_BADPARAM.

Beginning in RLM v9.4, the ISVNAME_ACT_URL environment variable will override the *url* parameter to this call. This allows you to change the URL of the activation server without re-building your software. For example, if your ISV name is “demo”, the environment variable would be named “DEMO_ACT_URL”, and you would set it to the URL to use for activation if the *url* parameter in this call is no longer correct.

Note that the URL should *always* be http, *never* https. *rlm_activate()* encrypts the request independent of the webserver.

Prior to v11.0, rlm would only activate licenses with rehostable, non-zero RLM_HOSTID_32BIT, RLM_HOSTID_ETHER, RLMIDn, RLM_DISKSN, or ISV-defined hostids. Any other hostid will return an RLM_ACT_BAD_HOSTID_TYPE status from *rlm_act_request()*. (Note: ISV-defined hostids were added to the list of legal hostids in RLM v4.0). Beginning in v11.0, you can specify exactly the hostids you will accept with the *rlm_isv_cfg_actpro_allowed_hostids()* call in *rlm_isv_config.c*, then either re-building your license generator or creating a new generator settings file. See Customizing RLM with *rlm_isv_config* on page 28 for more details.

The priority is (assuming the particular hostid type is enabled):

- rehostable hostid
- ISV-defined hostid
- ISV string hostid
- rlmid hostid
- Disk Serial Number
- ethernet address
- uuid
- 32-bit hostid
- ip address hostid
- user-based hostid

- host-based hostid
- serial number hostid
- string hostid
- DEMO hostid
- ANY hostid

If none of the hostid types above are present (or enabled), the activation software will return RLM_ACT_BAD_HOSTID_TYPE. Beginning in RLM v11.2, if RLM_ACT_BAD_HOSTID_TYPE is returned, the “license” parameter will contain the decimal representation of the list of valid hostids (as defined in license.h, in the RLM_ACTPRO_ALLOW_XXX definitions). This parameter is a string which represents a decimal number containing a bitwise OR of the allowed hostid types. To decode the allowed hostid types from the license string, use code similar to this:

```
allowed = atoi(license);
```

You can override RLM's notion of the hostid by calling *rlm_act_set_handle()* with the RLM_ACT_HANDLE_HOSTID_LIST parameter. The *hostid_list* parameter can contain a list of hostids for use in nodelocked licenses. This is specified with the following syntax:

```
list:list-of-hostids
```

For example:

```
list:user=joe host=sam ip=192.16.7.23 3f902d8b0027
```

If a list is supplied, note the following:

- The activation software uses the hostids in the list as you specified, even if they are not "secure".
- If the license to be activated is a served license (floating), only the first hostid in the list is used.
- The number of available activations on the activation key is decremented by 1 regardless of the number of hostids in the license created.
- The hostid list must be less than RLM_ACT_MAX_HOSTID_LIST characters long (205) including the “list:” prefix.
- The hostid list can contain no more than RLM_MAX_HOSTID_LIST (25) hostids.

This capability can be used to create a license which works on 2 (or more) systems, e.g. to create a license for a primary and a backup system. It can also be used to pass a hostid of a less secure type to be used, e.g. the *hostid-list* "list:ip=172.16.7.12" will cause the activation software to use the IP address as a hostid without returning RLM_ACT_BAD_HOSTID_TYPE.

If *act_handle* is NULL, no optional parameters are specified. If *act_handle* is passed to *rlm_activate()* as a non-NULL handle, other, lesser-used parameters can be specified:

- *isvname* – if different from your ISV name.
- *hostid* – if you do not want to use the default hostid.
- *hostname* – if you want to change the notion of your hostname

- extra – any extra license parameters
- log – information to log to the activation server (Activation Pro only).

These other parameters are passed in by calling *rlm_act_new_handle()* and *rlm_act_set_handle()*

The parameter *license* must be an allocated string of length RLM_ACT_MAX_LICENSE+1. If *rlm_activate()* succeeds, the activated license is returned in this string. For certain errors, the *license* string will contain MySQL error information, otherwise it will be an empty string.

Status returns ≥ 0 indicate success, < 0 are failure status.

Status	Meaning
0	license was activated, first request, activation count consumed
1	license previously activated. Activation count is not consumed; the prior license is returned. This status indicates that a duplicate activation key/count/hostid was sent to the server.
RLM_ACT_BADPARAM	Bad parameter to activation function
RLM_ACT_NO_KEY	No Activation key supplied
RLM_ACT_NO_PROD	No product definition (internal database error)
RLM_ACT_CANT_WRITE_KEYS	Cannot write activation keys (admin tool)
RLM_ACT_KEY_USED	Activation key used already (no count remaining)
RLM_ACT_BAD_HOSTID	Missing hostid
RLM_ACT_BAD_HOSTID_TYPE	Invalid hostid type
RLM_ACT_BAD_HTTP	Bad HTTP transaction
RLM_ACT_CANTLOCK	Cannot lock activation database
RLM_ACT_CANTREAD_DB	Cannot read activation database
RLM_ACT_CANT_WRITE_FULFILL	Cannot write fulfillment (licf) table
RLM_ACT_CLIENT_TIME_BAD	Time difference too great from server->client system
RLM_ACT_BAD_REDIRECT	Bad http Redirect
RLM_ACT_TOOMANY_HOSTID_CHANGES	Too many hostid changes for redirect
RLM_ACT_BLACLISTED	Domain on blacklist
RLM_ACT_NOT_WHITELISTED	Domain not on whitelist
RLM_ACT_KEY_EXPIRED	Activation Key expired
RLM_ACT_NO_PERMISSION	HTTP request denied
RLM_ACT_SERVER_ERROR	HTTP internal server error
RLM_ACT_BAD_GENERATOR	Bad or missing license generator file
RLM_ACT_NO_KEY_MATCH	No matching activation key found in database
RLM_ACT_NO_AUTH_SUPPLIED	No proxy authentication credentials supplied
RLM_ACT_PROXY_AUTH_FAILED	Proxy authentication failed
RLM_ACT_NO_BASIC_AUTH	Activation supports only BASIC proxy

	authentication
RLM_EH_CANTCONNECT_URL	Cannot connect to specified URL
RLM_ACT_GEN_UNLICENSED	Activation generator unlicensed
RLM_ACT_DB_READERR	Activtion DB read error (MySQL)
RLM_ACT_GEN_PARAM_ERR	Generating license - bad parameter
RLM_ACT_UNSUPPORTED_CMD	Unsupported command to generator

If you are using Activation Pro, you should consult the Activation Pro manual for troubleshooting tips and additional error returns.

Proxy Server Support

RLM activation has support for proxy servers. To use a proxy server, there are 2 environment variables which must be set:

HTTP_PROXY- set to the **hostname:port** of the proxy server. For example, if your proxy server is on port **8080** on host **proxy_host**:

```
% setenv HTTP_PROXY proxy_host:8080
```

If your proxy server uses authentication, you can use the HTTP_PROXY_CREDENTIALS environment variable to pass the credentials to the proxy server:

HTTP_PROXY_CREDENTIALS - the username and password to authenticate you to the proxy server, in the format **user:password**. For example, if your username is "joe" and password is "joes_password":

```
% setenv HTTP_PROXY_CREDENTIALS joe:joes_password
```

Note that RLM activation supports only the BASIC authentication type.

You can either set these environment variables before running your application, or use `putenv()` (or `rlm_putenv()`) to set them inside your application before calling `rlm_activate()/rlm_act_request()`.

Starting in RLM v9.0, `rlm_activate()/rlm_act_request()` encrypts the data sent to the activation server. Beginning in RLM v9.1, if `RLM_ACT_NO_ENCRYPT` is set in the environment, `rlm_act_request()` will not encrypt the data sent to the activation server.

Note: unless you are doing offline activation, all `rlm_actXXX()` calls (except `rlm_act_XXX_handle()`) require internet access.

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rlm_act_keyinfo2() - Get the most info about an activation key

rlm_act_fulfill_info() - Get info about key and latest fulfillment.

rlm_act_info() - Get info about an activation key from the server.

rlm_act_keyinfo() - Get info about an activation key from the server.

```
#include "license.h"
RLM_HANDLE rh;
const char *url = "your activation server URL here";
char *akey = "activation-key-desired";
char product[RLM_MAX_PRODUCT+1];
char version[RLM_MAX_VER+1];
char upgrade_version[RLM_MAX_VER+1];
char exp[RLM_MAX_EXP+1];
char keyexp[RLM_MAX_EXP+1];
char hostid[RLM_MAX_HOSTID_STRING+1];
int date_based;
int license_type;
int status;
int count, fulfilled, rehosts, revoked, allowed_hostids, sub_interval, sub_window;
```

```
rh = rlm_init(...);
```

```
status = rlm_act_keyinfo2(rh, url, akey, product, version, &date_based, &license_type,
upgrade_version, &count, &fulfilled, &rehosts, &revoked, exp, hostid, keyexp,
&allowed_hostids, &sub_interval, &sub_window);
```

(note: `rlm_act_keyinfo2()` returns a superset of the information from all the other calls, and it is the preferred call).

```
status = rlm_act_info(rh, url, akey, product, version, &date_based, &license_type,
upgrade_version);
```

```
status = rlm_act_keyinfo(rh, url, akey, product, version, &date_based, &license_type,
upgrade_version, &count, &fulfilled, &rehosts, &revoked);
```

```
status = rlm_act_fulfill_info(rh, url, akey, product, version, &date_based, &license_type,
upgrade_version, &count, &fulfilled, &rehosts, &revoked, exp, hostid);
```

The `rlm_act_info()` call presents the activation key *akey* to the server at *url* and retrieves information about the license which would be generated by this key.

The `rlm_act_keyinfo()` returns everything that `rlm_act_info()` returns, plus some fulfillment information about the activation key.

The `rlm_act_fulfill_info()` returns everything that `rlm_act_keyinfo()` returns, plus the actual expiration date and hostid from the most recent fulfillment on the activation key. If no fulfillments have been made (i.e. `fulfill == 0`), the return values `exp` and `hostid` are undefined.

Note that the URL should *always* be `http`, *never* `https`. `rlm_act_info()` encrypts the request independent of the webservice.

NOTE: Prior to RLM v11.0, `rlm_act_info()` returned the information for disabled activation keys. Beginning in RLM v11.0, `rlm_act_info()` will return `RLM_ACT_KEY_DISABLED` with no further information for disabled activation keys.

The `rlm_act_info()` call returns 0 for success, or an RLM error code otherwise.

The returned information is passed back in the last 5 parameters:

- `product` – the product name in the license that would be generated from this activation key.
- `version` – the version in the generated license. If `date_based` is non-zero, this is a string representing an integer number of months; the version is a date-based version of the form `yyyy.mm` for this number of months after license generation. If `date_based` is 0, the actual license version is returned in this parameter.
- `date_based` – non-zero indicates that the version string is the number of months after license generation for a date-based version.
- `license_type` – this is the type of license that will be generated. These types are defined in `license.h`:

```
#define RLM_ACT_LT_FLOATING 0 /* Floating */
#define RLM_ACT_LT_F_UPGRADE 4 /* Floating UPGRADE */
#define RLM_ACT_LT_UNCOUNTED 1 /* Nodelocked, Uncounted */
#define RLM_ACT_LT_NLU_UPGRADE 5 /* Nodelocked, Uncounted UPGRADE */
#define RLM_ACT_LT_SINGLE 3 /* Single */
#define RLM_ACT_LT_S_UPGRADE 7 /* Single UPGRADE */
```

- `upgrade_version` – the version eligible for an upgrade for UPGRADE type licenses. This is always a fixed string (ie, it is never date-based). For non-upgrade licenses, this will be an empty string.

In addition to the above information, `rlm_act_keyinfo()` returns fulfillment information:

- `count` – the allowed fulfillment count (0 = unlimited)
- `fulfilled` – the # already fulfilled
- `rehosts` – the number of rehost operations allowed
- `revoked` – the number of revocations already performed

Note that when `revoked==rehosts`, no additional license revocations will be allowed.

In addition to the above information, `rlm_act_fulfill_info()` returns recent fulfillment information:

- `exp` – the actual expiration date of the latest fulfillment.
- `hostid` – the hostid from the latest fulfillment.

Note: unless you are doing offline activation, all `rlm_actXXX()` calls (except `rlm_act_XXX_handle()`) require internet access.

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rlm_act_keyvalid(), rlm_act_keyvalid_license() - Verify that an activation key still has a valid license on this hostid from the activation server.

```
#include "license.h"
RLM_HANDLE rh;
const char *url = "your activation server URL here";
char *akey = "activation-key-desired";
char hostid[RLM_MAX_HOSTID+1];
char license[RLM_ACT_MAX_LICENSE+1];
int status;

rh = rlm_init(...);
status = rlm_act_keyvalid(rh, url, akey, hostid);
status = rlm_act_keyvalid_license(rh, url, akey, hostid, license);
```

The *rlm_act_keyvalid()* call presents the activation key *akey* and *hostid* to the server at *url* and retrieves status of fulfilled licenses on this hostid for this activation key. This call is intended to be used for nodelocked licenses only. If you want to invalidate a floating license, use Alternate Server Hostids (see page 152).

Note that the URL should *always* be http, *never* https. *rlm_act_keyvalid()* encrypts the request independent of the webserver.

The *rlm_act_keyvalid()* call returns:

- 0 for success, ie, a non-revoked license has been generated on this hostid for this activation key.
- RLM_ACT_KEY_DISABLED if the activation key itself is disabled.
- RLM_ACT_KEY_NO_HOSTID if there is no fulfilled license matching this hostid for this activation key, or
- RLM_ACT_KEY_HOSTID_REVOKED if the only fulfilled license(s) for this hostid on this activation key have been revoked, or
- RLM_EH_ACT_OLDSERVER or RLM_ACT_UNSUPPORTED_CMD if the activation server is too old to process this request.

There is no other returned information.

The *rlm_act_keyvalid_license()* call performs the same operation with the same return as *rlm_act_keyvalid()*, but in addition, it returns the license if the status return is 0. Note that in the case of a floating license which has had multiple fulfillments, the license returned will be one of the licenses generated with this activation key (in general, the first license generated). If the status return is non-zero, the contents of *license* are undefined. *rlm_act_keyvalid_license()* is new in RLM v11.1, and requires an RLM v11.1 activation pro server to return the license.

Note: unless you are doing offline activation, all *rlm_actXXX()* calls (except *rlm_act_XXX_handle()*) require internet access.

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rlm_act_new_handle(), rlm_act_destroy_handle() - Create/destroy handle to pass activation parameters.

```
#include "license.h"
RLM_HANDLE rh;
RLM_ACT_HANDLE act_handle;

rh = rlm_init(...);
act_handle = rlm_act_new_handle(rh);
(void) rlm_act_destroy_handle(act_handle);
```

rlm_act_new_handle() creates a blank handle to pass optional activation parameters to *rlm_activate()*. *rlm_act_new_handle()* returns a NULL handle on error.

Call *rlm_act_new_handle()* before calling *rlm_act_set_handle()*. After activation is complete, call *rlm_act_destroy_handle()* to free the memory associated with the handle.

Note: unless you are doing offline activation, all *rlm_actXXX()* calls (except *rlm_act_XXX_handle()*) require internet access.

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rlm_act_set_handle() - Set data in activation handle.

```
#include "license.h"
RLM_ACT_HANDLE act_handle;
int stat;
int what;
void *val;
```

```
stat = rlm_act_set_handle(act_handle, what, val);
```

rlm_act_set_handle() sets various options in an activation handle in order to pass these activation parameters to *rlm_activate()*. *rlm_act_new_handle()* returns 0 for success, RLM_EH_BADPARAM on error (no handle supplied, no value supplied, or bad “what” value).

Call *rlm_act_set_handle()* after calling *rlm_act_new_handle()*. After activation is complete, call *rlm_act_destroy_handle()* to free the memory allocated in the handle.

“what” values:

All values for the “what” parameter are defined in license.h:

- **RLM_ACT_HANDLE_DISCONN:** (int val)

If set to 1, *rlm_activate()* will create a rehostable hostid, then return data in the “license” parameter. Take this data to an internet-connected system, pass the data back into *rlm_activate()* in the *hostid_list* parameter when requesting the activation (again with RLM_ACT_HANDLE_DISCONN set). See the “License Rehosting” appendix in the Activation Pro manual for details on how to make these calls.

- **RLM_ACT_HANDLE_EXTRA:** (const char * val)

This parameter is used to pass extra license options to the activation server. *val* is a string containing extra “keyword=value” license attributes. These must be valid RLM license syntax, not just any keyword=value pair. Note that the *val* string should not contain characters illegal in license files, and most particularly, it should not contain the ‘&’ character, which is illegal in a license file and also is the cgi separator in web requests. If you put space-separated strings into the *extra* parameter, be sure to enclose them in quotes. For example: set extra to “customer=“Your Customer Name Here”” in order to put your customer name into the generated license, or set it to “customer=“Your Customer Name Here” min_timeout=100” to set your customer name and the minimum timeout.

- **RLM_ACT_HANDLE_HOSTID_LIST:** (const char * val)

This parameter is used if you want to pass a particular hostid (other than the default) or a list of hostids to the activation server.

the *hostid_list* parameter can contain a list of hostids for use in nodelocked licenses. This is specified with the following syntax:

list:list-of-hostids OR list-of-hostids

For example:

```
list:user=joe host=sam ip=192.16.7.23 3f902d8b0027
OR
user=joe host=sam ip=192.16.7.23 3f902d8b0027
```

What is the difference between using “list:” and not?

- With a leading “list:”, the hostid list is used without checking whether the hostids are allowed or not. For nodelocked licenses, the whole list will be in the license, meaning the license will work on any hostid in the list.
- Without the leading “list:”, each hostid in the list will be checked against the allowed hostid types, and the “most secure” one present will be used. This is the default way that RLM passes client hostids to the activation server if you do not set RLM_ACT_HANDLE_HOSTID_LIST.

If a list is supplied with a leading “list:”, note the following:

- The activation software uses the hostids in the list as you specified, even if they are not "secure".
- If the license to be activated is a served license (floating), only the first hostid in the list is used.
- The number of available activations on the activation key is decremented by 1 regardless of the number of hostids in the license created.
- The list will not be accepted by the server if encryption of the request is turned off with RLM_ACT_NO_ENCRYPT

This capability can be used to create a license which works on 2 (or more) systems, e.g. to create a license for a primary and a backup system. It can also be used to pass a hostid of a less secure type to be used, e.g. the *hostid-list* "list:ip=172.16.7.12" will cause the activation software to use the IP address as a hostid without returning RLM_ACT_BAD_HOSTID_TYPE.

- **RLM_ACT_HANDLE_HOSTNAME:** (const char * val)

This parameter is used for the (rare) case where you want to pass a specific hostname to the activation server.

- **RLM_ACT_HANDLE_LOG:** (const char * val)

This parameter is used to pass a string to be logged in the activation server database. This parameter will override any setting of the RLM_ACT_LOG environment variable. (*Note: the use of the RLM_ACT_LOG environment variable is deprecated, and is not guaranteed to work in all future versions of RLM. Setting logging using the rlm_act_set_handle() call is preferred.*)

RLM Activation Pro allows you to log an arbitrary string to the database every time you fulfill a license. This string can be up to 80 characters in length and it will appear in the 'log' column in the *licf* table. Note that this string cannot contain the '>', '<', or '&' characters.

- **RLM_ACT_HANDLE_ISV:** (const char * val)

This parameter, which takes a (char *) value, is used to set the ISVname, if it is different from your ISV name. This will not normally be used. It is used, for example, in the rlm web interface to request an activation from a specified ISV's activation server.

- **RLM_ACT_HANDLE_PRODUCT:** (char * val)

This parameter, which takes a (char *) value, is used to set the product name when you are preparing to do activation of a rehostable hostid on a disconnected system. This will not normally be used. RLM_ACT_HANDLE_DISCONN should also be set when the product name is set. See the Activation Pro manual for more information.

- **RLM_ACT_HANDLE_REHOST:** (int val)

If set to 1, rlm_activate() will create a rehostable hostid, then activate the license using that rehostable hostid. If the hostid already exists for the product associated with the activation key, rlm_activate() will return RLM_EH_REHOST_EXISTS and will not proceed with the activation. Once created, the contents of the rehostable hostid directory ***CANNOT BE TOUCHED, MODIFIED, DELETED, or RESTORED from a BACKUP without invalidating the hostid.*** ***NOTE: REHOSTable hostids can be used with nodelocked, uncounted, and SINGLE licenses only.***

Note: prior to RLM v12.4, the creation of a rehostable hostid changed the working directory during the time of the call (this would be during the rlm_activate() call when RLM_ACT_HANDLE_REHOST is non-zero). This caused problems with multi-threaded applications, specifically plugins to Adobe products. In RLM v12.4, the working directory is not changed during this call. There are no changes to the API or the file layout of rehostable hostids, so no changes to your product are needed.

- **RLM_ACT_HANDLE_CONTACT:** (char * val)
- **RLM_ACT_HANDLE_COMPANY:** (char *val)
- **RLM_ACT_HANDLE_EMAIL:** (char *val)
- **RLM_ACT_HANDLE_STATE:** (char *val)
- **RLM_ACT_HANDLE_COUNTRY:** (char *val)
- **RLM_ACT_HANDLE_U1:** (char *val)
- **RLM_ACT_HANDLE_U2:** (char *val)

These 7 parameters, all of which take a (char *) value, are used to set the contact and company of the person doing the activation. If any of these parameters are set, CONTACT and COMPANY must both be set, otherwise you will receive an RLM_AT_CONTACT_BAD error from rlm_activate(). Upon activation, this information will populate the contact and company tables.

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rlm_act_refresh() - Request refreshing of all refreshable licenses

Note: *rlm_act_refresh()* is deprecated in RLM v9.3, in favor of the new rehostable licenses.

```
#include "license.h"
RLM_HANDLE rh;
char *isv;
void (*callback)(char *licfile, char *license, int status);
```

```
rh = rlm_init(...);
error_count = rlm_act_refresh(rh, isv, callback);
```

rlm_act_refresh() requests refreshing of all the refreshable licenses known to rlm through the paths supplied to *rlm_init()* when *rh* was created, plus licenses pointed to by the RLM_LICENSE and <isv>_LICENSE environment variables, if set. The act of refreshing the license involves a transaction with the activation server.

isv is your ISV name. *callback* is a function supplied by the ISV that is called after each individual license refresh is attempted. *licfile* is the name of the license file containing the rehostable license, *license* is the name of the license on which a refresh was attempted, and *status* is the status of the refresh attempt. Values of *status* are as for *rlm_activate()/rlm_act_request*, except that a status of 1 means that the license was refreshed earlier the same day. *callback* may be specified as NULL. If specified, *callback* is invoked for each successful license refresh as well as unsuccessful ones. *error_count* is the number of licenses where the refresh attempt failed.

Note: REFRESH-type activations are deprecated in RLM v9.3.

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rlm_act_revoke() - revoke a rehostable license

rlm_act_revoke_reference() - revoke a rehostable hostid by “reference” hostid.

rlm_act_revoke_disconn() - revoke a disconnected rehostable license

```
#include "license.h"
RLM_HANDLE rh;
char *url;
char *product, *param;
char retval[RLM_ACT_MAX_LICENSE+1];
int stat;

rh = rlm_init(...);
stat = rlm_act_revoke(rh, url, product);

stat = rlm_act_revoke_reference(rh, url, product);

stat = rlm_act_revoke_disconn(rh, url, param, retval);
```

rlm_act_revoke() causes RLM to revoke a rehostable hostid by taking the following actions:

- contacts the activation server at *url* and tells it to revoke all activations performed for the revokable hostid for product *product*.
- removes the hostid for *product* from the system

If *rlm_act_revoke()* cannot contact the activation server, or no fulfillments have been made using rehostable hostids for *product*, or the rehostable hostid for *product* does not exist, *rlm_act_revoke()* will return a non-zero error status. Otherwise, *rlm_act_revoke()* returns a 0 status to indicate success.

Note that the URL should *always* be http, *never* https. *rlm_act_revoke()* encrypts the request independent of the webserver.

Once a license is revoked with *rlm_act_revoke()*, it will no longer work on the system, and activation count associated with the fulfillment to this system will be returned to the activation server so that your customer can re-activate the license on another system.

rlm_act_revoke_reference() performs the same operation as *rlm_act_revoke()*, but it will work even when the rehostable hostid is bad or missing on the system. You must decide if you are willing to revoke the license in this case, and you should only call *rlm_act_revoke_reference()* after *rlm_act_revoke()* fails with an RLM_EH_CANT_GET_REHOST or RLM_EL_NOTTHISHOST status.

rlm_act_revoke_disconn() is used to perform a rehostable hostid revocation on a system which is not connected to the internet. For the usage of this function, see the “License Rehosting” appendix in the RLM Activation Pro manual.

Note that *rlm_act_revoke()* will return RLM_ACT_REVOKE_TOOLATE (-1029) if the license associated with the rehostable hostid has expired, and you have not enabled “Revocation of expired rehostable hostids” in the Database section of the Admin tab in RLM License Center. This error means that no count was returned to the activation

key, however, the rehostable hostid was deleted in this case. If there is sufficient count in the activation key, or if a different activation key is used, a new rehostable activation will succeed.

The most likely scenario where you would see this is as follows:

1. user attempts to check out license, gets RLM_EL_EXPIRED status.
2. user then attempts to re-activate the license, gets RLM_EH_REHOST_EXISTS
3. user then attempts to revoke the activation, gets RLM_ACT_REVOKE_TOOLATE

at this point, the rehostable hostid is gone, and the user can re-activate successfully.

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rlm_add_meter_count() - Add count to a specified meter

```
#include "license.h"
int status;
RLM_HANDLE rh;
RLM_PRODUCTS product;
int counter, count;

status = rlm_add_meter_count(rh, product, counter, count);
```

rlm_add_meter_count() is used by an application to add *count* to a server's meter *counter*.

The *rlm_add_meter_count()* call requires a connection to a license server which was created with *rlm_init()* (NOT *rlm_init_disconn()*). The license server connection is specified in one of 2 ways:

- If a product is specified via the product and rh parameters, this connection is used.
- If no product is specified, the connection from the supplied RLM_HANDLE is used. This connection must have been established prior to the call to *rlm_add_meter_count()* via an *rlm_checkout()* call.
- If neither a product or an RLM_HANDLE is specified, RLM_EH_NOHANDLE is returned to the caller.
- If the specified product or RLM_HANDLE does not have a server associated, RLM_EH_NOSERVER is returned to the caller.

Given a server as specified above, this call will add *count* to the specified meter *counter*.

Example (add 100 to counter for “your-product-name”):

```
int status, counter, count_to_add;
RLM_PRODUCTS products;

products = rlm_products(rh, "your-product-name", "");
if (products && rlm_product_ismetered(products))
{
    counter = rlm_product_meter_counter(products);
    count_to_add = 100;
    status = rlm_add_meter_count(rh, products, counter, count_to_add);
}
```

alternately:

```
int status, counter, count_to_add;
RLM_LICENSE lic;

lic = rlm_checkout(rh, "your-product-name", "1.0", 1);
if (!rlm_license_stat(lic) && rlm_license_ismetered(lic))
{
    counter = rlm_license_meter_counter(lic);
    count_to_add = 100;
    status = rlm_add_meter_count(rh, (RLM_PRODUCTS) NULL, counter, count_to_add);
}
```


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rlm_auth_check() - Ask the server to verify a license

```
#include "license.h"
int status;
RLM_LICENSE license;
char *license_to_check;

status = rlm_auth_check(license, license_to_check);
```

rlm_auth_check() is used by an application to verify the integrity of the license server. This call is not required by RLM, and is used only as an additional check that the license server has not been modified.

The *rlm_auth_check()* call asks the license server to verify a signed license (*license_to_check*) after you have checked out some other license. You pass a node-locked uncounted license to this call as the *license_to_check* parameter. This license can be either a good or a bad license, and you should pass both types at different times to make spoofing this call harder. **Note: Do not include *HOST* or *ISV* lines in this license, only the *LICENSE* line. Also note that these licenses must be node-locked, uncounted (or *SINGLE*) licenses, and do not enclose the license in angle brackets - "<" and ">".**

You must pass a valid RLM_LICENSE handle in, and this handle should represent a checked-out license from a license server. *license_to_check* is a signed license, either valid or not.

This function will return either:

- 0 - the server authenticated the license, and it is correct
- RLM_EL_BADKEY (-5) - the license did not authenticate in the server
- RLM_EH_NOSERVER (-112) - the RLM_LICENSE handle passed in does not have a license checked-out on a license server.

See Securing Your Application on page 140 for more information on how to secure your application and license server.

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rlm_auto_hb(), rlm_set_auto_hb_isvdata() - Enable Automatic Heartbeats

```
#include "license.h"
RLM_HANDLE rh;
int period;
int auto_reconnect;
void (*notify)(RLM_HANDLE, RLM_LICENSE, int, void *);
const void *isv_data;

status = rlm_auto_hb(rh, period, auto_reconnect, notify);
rlm_set_auth_hb_isvdata(rh, isv_data);
```

With RLM, you must either manually send heartbeats to the license server by calling *rlm_get_attr_health()* periodically in your code, or tell RLM to do this for you. *rlm_auto_hb()* is the function that sets up automatic heartbeats. Note that you should call *either* *rlm_get_attr_health()* or *rlm_auto_hb()*, but not both. Also note that while this is not strictly a **requirement**, you need to send heartbeats to the server if you want to detect license loss. On the other hand, if your application runs for less than a minute or so, there is no real need to send heartbeats to the license server and you can safely ignore heartbeats.

You can call *rlm_auto_hb()* any time after calling *rlm_init()*. If *rlm_auto_hb()* returns a 0 status, the handler was installed without error, otherwise, status contains the RLM error code.

The first parameter is the handle on which to perform automatic heartbeats. RLM will perform heartbeats on all checked-out licenses on this handle. Note that you can call *rlm_auto_hb()* any time after the *rlm_init()* and before the *rlm_close()* call. In practice, you should call *rlm_auto_hb()* within 30 seconds or so of your first license checkout, but it can be called before any checkouts if you wish.

The second parameter, **period**, is the period at which the heartbeat thread runs. **period** must be at least 2 seconds (and is set to 2 if specified as a lower value). Note that RLM will not send heartbeats any more often than once every 30 seconds even if you set **period** to a value less than 30, however, when the license is lost, *rlm_auto_hb()* will attempt to re-acquire it every **period** seconds. Also note that there is an interaction between the **period** you pick and the minimum heartbeat interval. For example, if you set **period** to 25 seconds, the heartbeat will not be sent the first time requested (since it is less than 30 seconds), but it will be sent the 2nd time – in other words, after 50 seconds. So setting **period** to a value < 30 seconds may cause the heartbeat interval to be longer than 30 seconds.

Note: The period parameter is set to a minimum of 2 seconds internally. Prior to RLM v9.1, this parameter could be any value.

The third parameter, **auto_reconnect**, is set to 0 if you do not want RLM to attempt to re-acquire lost licenses. If you would like RLM to re-acquire licenses that have been lost, set **auto_reconnect** to one. If RLM does an automatic re-acquisition of the license, your original RLM_LICENSE handle will reflect the new status of the license. *NOTE: if you have modified the isv data via a call to *rlm_set_environ()* between the time you made your original checkout and the time of the reconnection, the isv data sent on the new checkout request will be the new version of the isv data, NOT the isv data that was transmitted originally.*

The fourth parameter is a function pointer which is called when a license is lost, **after** re-acquisition is attempted. If you supply a NULL pointer in this argument, no callback is done to your code. This function is called independent of the setting of **auto_reconnect**. The *notify* handler will be called as long as the license is lost, and, if you have a reconnection handler set, one time when license re-acquisition is successful (ie, when status==0). Note that the last call will not happen if you do not have a reconnection handler installed. The function is called as follows:

*(*notify)(rh, license, lic_status, isv_data);*

The *license* parameter is the license which was lost. Note that the status may be 0 when this routine is called if you have set **auto_reconnect** to one and the license has already been re-acquired. This function is called in the context of the thread in which heartbeats are performed. The only RLM functions you can call in this routine are all the *rlm_license_xxxx()* functions with the exception of *rlm_license_stat()*. The third parameter, *lic_status*, is the status of the license (updated after the reconnection attempt). The fourth parameter, new in v12.3, is a void * that you specified in the latest call to *rlm_set_auto_hb_isvdata()* on this handle, or NULL if *rlm_set_auto_hb_isvdata()* was not called on this handle. This argument can be used to pass any data from the application to the reconnection handle.

rlm_set_auth_hb_isvdata() specifies the data item to be passed to the automatic heartbeat reconnection function, above. This call is new in RLM v12.3

If you call *rlm_auto_hb()*, heartbeats will be sent to the server whenever your application is running, whether you are actively processing or not. This means that an application which is simply waiting for user input will continue to send heartbeats, and will not appear to be inactive to RLM. If you would like your customers to be able to time-out the licenses from applications which are in such an idle state, use the *rlm_set_active()* call to inform RLM when your application is active or inactive.

Note: *rlm_auto_hb()* uses *pthreads* on Unix, and Windows threads on Windows.

If you call *rlm_auto_hb()* on Unix, you must include *-lpthreads* in your link command for your application. In addition to this, on Solaris, you must include *-lrt* to your link command. Note that on Unix systems, *rlm_auto_hb()* sets the handler for SIGPIPE to SIG_IGN in both the main thread and in the thread that generates the heartbeat.

NOTE: *If a license expires, the license server does not invalidate or remove any instances of that license which are checked out at the time of license expiration. Heartbeats on such a license will continue to succeed.*

Some additional notes on heartbeats and server status checking

Prior to RLM v10.1, when *rlm_get_attr_health()* detected an error, subsequent calls to *rlm_get_attr_health()* would return the same error without re-checking the actual status. Starting in v10.1, *rlm_get_attr_health()* will re-attempt to verify the connection to the server each time it is called. This means a few things:

- the client will be able to “re-acquire” a license that is lost due to a temporary network interruption. During the time of the interruption, *rlm_get_attr_health()* will return RLM_EL_NO_HEARTBEAT. If you are using *rlm_auto_hb()*, this is attempted 5 times, then the connection is deemed bad and it is shut down. If you are doing manual heartbeats, you control how many times you look for a heartbeat before giving up (although Reprise Software recommends that you keep this number relatively low, say 4-6 attempts).
- In *rlm_auto_hb()*, your application will not attempt to re-acquire a lost license until it has tried to verify a heartbeat 5 times. Previously, it attempted a reconnection on the initial detection of the lost heartbeat.
- In any case, if the network was interrupted and then restored, it may take more calls to *rlm_get_attr_health()* to detect a loss of heartbeat in a subsequent interruption. This is because several heartbeat responses may have been queued up for the application to read.

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rlm_checkin() - Release a license

```
#include "license.h"
RLM_LICENSE license;

rlm_checkin(license);
```

rlm_checkin() releases *license* and frees all data associated with it. After calling *rlm_checkin()*, the RLM_LICENSE *license* is no longer valid, and you should make no further calls using this handle. Do not call *rlm_checkin()* more than once on a license.

Note: you cannot call *rlm_license_stat()* on a license handle after that handle has been checked in, or if the RLM_HANDLE used to check it out has been closed. In fact, you cannot use this handle in any way. Use of the handle after an *rlm_checkin()* or *rlm_close()* will result in unpredictable behavior (including possible application crashes), since the handle you are using has been freed by RLM.

Also Note: If you plan to check any licenses in then close the handle (ie, if you are not going to use the handle after checking a license in), then you should omit the *rlm_checkin()* call, and simply call *rlm_close()* on the handle. *rlm_close()* always checks-in any licenses which are checked out on the handle, and if you are using a disconnected handle, RLM will only reconnect to the server one time for all your license checkins as well as to tell the server that your are done with the handle.

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rlm_checkout() - Request a license from RLM

```
#include "license.h"
RLM_HANDLE handle;
RLM_LICENSE license;
const char *product;
const char *version;
int count;
```

```
license = rlm_checkout(handle, product, version, count);
```

rlm_checkout requests *count* licenses of product *product* at version *version*. *count* must be a positive integer. If there are node-locked, uncounted licenses available in a license file that is specified in The License Environment, then these node-locked licenses are used. Otherwise, a request is made to each server specified by The License Environment, until either the licenses are granted, or all servers have been tried without success. *rlm_checkout()* creates *license* and returns it to its caller. The *version* string should be of the form *major* or *major.minor* where *major* and *minor* are integers. The *count* parameter must be a positive integer.

The order of license checkout attempts is as follows:

- If **RLM_ROAM** is set to a positive value, roamed licenses on the local node will be checked first,
- All node-locked, uncounted licenses in local license files (from all license files in the license file path) will be checked next
- All licenses served by servers that RLM has already connected to are checked next,
- All licenses served by servers which RLM has not previously connected to are checked next,
- Finally, if **RLM_ROAM** is not set, a check will be made for local roamed licenses.

Note that if **RLM_ROAM** is set, the setting of **RLM_QUEUE** is ignored, ie, you cannot queue for the license.

To get the status of the *rlm_checkout* call, use *rlm_license_stat(license)*. For a list of status returns, see [Appendix B – RLM Status Values](#) on page 232.

There are generally 3 "success" status returns from a license checkout request:

- 0 - license checked out normally
- **RLM_EL_OVERSOFT** - license checkout results in usage over the *soft_limit* specified, or a token-based license is misconfigured and the server is in an overdraft condition (see note in the token-based license restrictions section).
- **RLM_EL_INQUEUE** - license request is in the queue.

If you have specified a minimum server version/revision/build via the *rlm_isv_cfg_set_oldest_server()* call in *rlm_isv_config.c*, and the server is older than your specification, you will get an **RLM_EL_COMM_ERROR** error from the server and the handle will have the error status **RLM_EH_SERVER_REJECT**.

NOTE: You should always call *rlm_checkin()* when you are done with the license, even if the checkout call returns an error. Calling *rlm_checkin()* on the license frees any associated memory with the license. You can call *rlm_checkin()* even if *rlm_checkout()* returns a NULL license handle, however, you should only call *rlm_checkin()* on a non-NULL license handle once.

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rlm_checkout_product() - Request an exact license from RLM

```
#include "license.h"
RLM_HANDLE handle;
RLM_LICENSE license;
RLM_PRODUCTS product;
const char *version;
int count;

license = rlm_checkout_product(handle, product, version, count);
```

In most cases, applications use *rlm_checkout()* to check out licenses, as any license that meets the product name and version requirements is sufficient. In some other cases, an application may want to choose among multiple instances of licenses for the same product. For example, if there are several licenses present for a product but they contain different options attributes, the application may want to check out a specific instance based on the options content determined with *rlm_products()*. In that case the application would use *rlm_checkout_product()* to check out the license.

rlm_checkout_product() requests *count* licenses of version *version* of the product specified by the RLM_PRODUCTS handle *product*. *count* must be a positive integer. *rlm_checkout_product()* creates *license* and returns it to its caller. The *version* string should be of the form *major* or *major.minor* where *major* and *minor* are integers. The *count* parameter must be a positive integer.

rlm_checkout_product() operates on the RLM_PRODUCTS handle returned from *rlm_products()*. Once you have found the product you want to check out via the *rlm_product_first()* and *rlm_product_next()* calls, a call to *rlm_checkout_product()* will check out the product that is described by the current state of the RLM_PRODUCTS handle *product*.

To get the status of the *rlm_checkout_product()* call, use *rlm_license_stat(license)*. For a list of status returns, see [Appendix B – RLM Status Values](#) on page 232.

There are generally 3 "success" status returns from a license checkout request:

- 0 - license checked out normally
- RLM_EL_OVERSOFT - license checkout results in usage over the *soft_limit* specified or a token-based license is misconfigured and the server is in an overdraft condition (see note in the token-based license restrictions section).
- RLM_EL_INQUEUE - license request is in the queue.

If you have specified a minimum server version/revision/build via the *rlm_isv_cfg_set_oldest_server()* call in *rlm_isv_config.c*, and the server is older than your specification, you will get an RLM_EL_COMM_ERROR error from the server and the handle will have the error status RLM_EH_SERVER_REJECT.

NOTE: You should always call *rlm_checkin()* when you are done with the license, even if the checkout call returns an error. Calling *rlm_checkin()* on the license frees any associated memory with the license. You can call *rlm_checkin()* even if *rlm_checkout()* returns a NULL license handle, however, you should only call *rlm_checkin()* on a non-NULL license handle once.

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rlm_close() - Terminate licensing operations with RLM

```
#include "license.h"
RLM_HANDLE handle;

rlm_close(handle);
```

When you are finished with all licenses and do not intend to make any more calls to RLM, call *rlm_close()* to clean up the handle created with *rlm_init()* and free all the data associated with it.

rlm_close() does the following:

- if you have automatic heartbeats - syncs with the other thread and destroys that thread
- checks in any licenses that are still checked out - which will disconnect from all servers and shut down the connections (and on windows, calls WSACleanup() to close down Winsock).
- frees all data structures used in that handle.
- frees the handle.

Note: If you are using a DLL on Windows, you **cannot** call *rlm_close()* in the DLL unloading routine.

Note: you cannot use any license handles that were created using this RLM_HANDLE after the call to *rlm_close()*. Use of the RLM_HANDLE or any associated license handles after an *rlm_close()* will result in unpredictable behavior (including possible application crashes), since the handle you are using has been freed by RLM.

Also Note: If you plan to check any licenses in then close the handle (ie, if you are not going to use the handle after checking a license in), then you should omit the *rlm_checkin()* call, and simply call *rlm_close()* on the handle. *rlm_close()* always checks-in any licenses which are checked out on the handle, and if you are using a disconnected handle, RLM will only reconnect to the server one time for all your license checkins as well as to tell the server that your are done with the handle.

You are not strictly required to call *rlm_close()* **unless the handle is a disconnected handle**. Specifically, if your program is about to exit, *rlm_close()* is unnecessary for a connected handle, but for a disconnected handle, *rlm_close()* informs the server that you are done and allows the server to clean up data associated with your process. Of course, you can omit the *rlm_close()* call even for a disconnected handle, in which case the server will time out the licenses after your *promise* interval.

If you do not call *rlm_close()*, memory leak detectors will report leaked memory. Also note that there are some idiosyncrasies in the OpenSSL package which can cause memory leaks to be reported. In particular, if you have a license with a bad signature, OpenSSL allocates several hundred bytes of memory that doesn't normally get freed. To free it and keep leak detectors quiet, call

```
ERR_remove_state(0);
```

just before exiting your program. Do ***NOT*** call this function if you are going to continue using RLM in another handle.

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rlm_detached_demo() - Install RLM Detached Demo™ license

```
#include "license.h"
RLM_HANDLE rh;
int stat;
int days;
const char license[RLM_MAX_LINE+1];

rh = rlm_init(...);
stat = rlm_detached_demo(rh, days, license);
```

rlm_detached_demo() requests RLM to install a Detached Demo™ valid for *days*. The parameters of the demo license installed are contained in the *license* string.

days - the number of days the demo license should be valid.

license - an RLM license string.

When installing the demo license, the *license* string is parsed into its components and these are used for the license. The license should not be signed, but must have valid syntax, otherwise an RLM_EL_BADPARAM error will result. If *rlm_detached_demo()* returns a non-zero status, the status is contained in the RLM_HANDLE parameter (rh) after the call.

The *count*, *hostid*, and *expiration date* fields of this input *license* are unused. The resulting installed demo license will be a node-locked, uncounted license, valid on the machine which made the call to *rlm_detached_demo()*, **and valid for the version specified in the license only**. The expiration date will be *days* days in the future. Note that licenses are valid until midnight, local time, so a 0-day license will be valid until midnight on the day it is installed.

A Detached Demo™ license can only be installed once on a particular system for any given combination of *product* and *version*. Detached Demo™ licenses cannot be modified or re-installed. They do not require any kind of internet connectivity, however, they are not as secure as licenses created with RLM Activation Pro, which is always the preferred way to install a license which expires in a fixed number of days.

For a Detached Demo™ license to be usable, you must be able to check out an rlm_demo license. This allows you to add the code to create demo licenses into your product, but enable it only in certain situations. If you call *rlm_detached_demo()* without an rlm_demo license available, the operation will fail with an RLM_EH_NO_DEMO_LIC status. Note that the rlm_demo license must be valid, in other words, you must sign this license and it must be present *and valid* on the system where the demo is going to be installed. The rlm_demo license should be placed in the directory with your product binary, and it should be a nodelocked, uncounted license, perhaps locked to hostid *demo* or *any*, e.g.:

```
LICENSE demo rlm_demo 1.0 permanent uncounted hostid=demo
```

The following example is a call to *rlm_detached_demo()* to set up a 30-day license for v1.0 of *myproduct*:

```
RLM_HANDLE rh;
int stat;
char license[RLM_MAX_LINE+1];
```

```
rh = rlm_init(...);
sprintf(license, "LICENSE demo mylicense 1.0 permanent uncounted hostid=any _customer=%s",
customer);
stat = rlm_detached_demo(rh, 30, license);
```

To determine if a license which is checked out is a Detached Demotm license, call *rlm_license_detached_demo()* on the license handle. If it is a Detached Demotm license, *rlm_license_detached_demo()* will return 1.

Note: Detached Demotm licenses are not as secure as licenses created with RLM Activation Pro. Using internet activation to install demo licenses is always preferred, and Detached Demotm licenses should only be used when absolutely required. Also note that Detached Demotm licenses are not reported by the *rlm_products()* call.

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rlm_detached_demox() - Remove RLM Detached Demo™ license

```
#include "license.h"
RLM_HANDLE rh;
int stat;
const char product[RLM_MAX_PRODUCT+1];
const char version[RLM_MAX_VER+1];

rh = rlm_init(...);
stat = rlm_detached_demox(rh, product, version);
```

rlm_detached_demox() requests RLM to remove an installed Detached Demo™ license. The license is specified by the product name and version.

product - the name of the product license to be removed.

version – the version of product to be removed.

Since a Detached Demo™ license can only be installed once on a particular system for any given combination of *product* and *version*, *rlm_detached_demox()* gives you a way to test this functionality during development.

Note: Reprise Software STRONGLY recommends that you use this function only during development, and that you do not ship products that include *rlm_detached_demox()* calls to your customer.

Note that *rlm_detached_demox()* will only remove a Detached Demo™ license created by the same version of RLM.

rlm_detached_demox() first appeared in RLM v9.3.

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rlm_diagnostics() - Print client-side diagnostics

```
RLM_HANDLE rh;  
char *filename;
```

```
(void) rlm_diagnostics(rh, filename);
```

rlm_diagnostics() will print client-side diagnostics to the filename specified. *rlm_diagnostics()* can be called any time after a call to *rlm_init()* or *rlm_init_disconn()*. The values for the 3 *rlm_init()* parameters will be the values used in the most recent call to *rlm_init()*.

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rlm_errstring() - Format RLM status into a string

```
#include "license.h"
RLM_HANDLE handle;
RLM_LICENSE lic;
char string[RLM_ERRSTRING_MAX];
int stat;

(char *) rlm_errstring(lic, handle, string);
```

rlm_errstring() will take the latest status returns from any call in *handle* and from the latest *rlm_checkout()* call in *lic*, and format the resulting status into *string*. It is the caller's responsibility to manage the memory used by *string*. *string* should be at least RLM_ERRSTRING_MAX bytes in length. You can pass either a NULL *lic* or a NULL *handle* to *rlm_errstring()*, and only the status from the other will be returned.

Note: prior to RLM v9.1, rlm_act_errstring() was used to return a printable string corresponding to the error returned by *rlm_activate()/rlm_act_request()*. Beginning in RLM v9.1, *rlm_errstring()* prints all RLM errors, including activation errors. Thus, *rlm_act_errstring()* is no longer required and should not be used.

rlm_errstring() returns its 3rd argument, so that it can be placed directly in an output (e.g. printf()) call.

If RLM_EXTENDED_ERROR_MESSAGES is set in the user's environment, *rlm_errstring()* will output additional information (for certain errors) with suggestions for solving the problem.

The returned string consists of multiple lines of information, in the following format. If any of these errors are not present, the corresponding line will not appear in the output (e.g., if there is no RLM_HANDLE error, the 2nd line will not appear):

```
license (RLM_LICENSE) error string (error number)
handle (RLM_HANDLE) error string (error number)
communications error (comm: error number)
system error string (errno: error number)
Optional extended error messages
```

For example, if a connection attempt is made to an ISV server that is not running, the following error string might be returned. Note that this example does not contain an RLM_LICENSE error line:

```
Networking error (in msg_init()) (-103)
Cannot connect to server (comm: -4)
Transport endpoint is not connected (errno: 146)
```

If RLM_EXTENDED_ERROR_MESSAGES is set, the following lines would be added to this message:

This error usually means that:

- (1) The license server (rlm) is not running, or**
- (2) The hostname or port # in a port@host or license file is incorrect, or**
- (3) The ISV server isn't running, or**
- (4) The license server machine is down.**

Note that for certain activation errors (*rlm_act_request()* or *rlm_activate()*) additional status will be contained in the returned license string. See *rlm_activate()* for more information.

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rlm_errstring_num() - Translate RLM status value into a string

```
int error;  
char string[RLM_ERRSTRING_MAX];  
  
(char *) rlm_errstring_num(error, string);
```

rlm_errstring_num() will take any RLM status return and turn it into an error string. The *error* parameter can be the return from any RLM call which returns status (primarily *rlm_stat()* and *rlm_license_stat()*)

It is the caller's responsibility to manage the memory used by *string*. *string* should be at least RLM_ERRSTRING_MAX bytes in length.

rlm_errstring() returns its 3rd argument, so that it can be placed directly in an output (e.g. *printf()*) call.

RLM_EXTENDED_ERROR_MESSAGES has no effect on the *rlm_errstring_num()* call.

The returned string consists of a single line of error information.

Example:

```
char string[RLM_ERRSTRING_MAX];  
    rlm_errstring_max(-24 /* RLM_EL_TIMEDOUT */, string)  
    printf("RLM Error is: %s\n", string);
```

The output will be:

```
RLM Error is: License timed out by server
```

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rlm_get_attr_health() - Check license status by testing server connection

```
#include "license.h"
RLM_LICENSE license;
int status;

status = rlm_get_attr_health(license);
```

Once you have checked out a license, you need to periodically check the health of the connection to the license server by calling *rlm_get_attr_health()* on a license-by-license basis. You can make this call as often as you like; RLM ensures that communications with the license server is done at most once every 30 seconds. This communication is called a *heartbeat*.

In general, it is sufficient to call *rlm_get_attr_health()* every couple of minutes. If your product runs for less than a few minutes, you can skip this call entirely. The main function of *rlm_get_attr_health()* is to protect against a malicious user killing and restarting the license server in order to make all licenses available again. If this is not a concern, you can simply never call *rlm_get_attr_health()* in your application.

Status of 0 indicates that everything is OK, non-zero status returns are defined in *license.h*

If, after successfully checking out a license, *rlm_get_attr_health()* returns a non-zero status, you should call *rlm_checkin()* on the license to free any associated memory, and then check out the license again.

If you receive a return of RLM_EL_INQUEUE from your checkout call, you would call *rlm_get_attr_health()* until you receive a 0 status, at which point the license is checked out. In this case, if *rlm_get_attr_health()* returns anything other than 0 or RLM_EL_INQUEUE, this is an error and you should call *rlm_checkin()* on that license.

If you would like RLM to provide this checking automatically (in a separate thread), see the Advanced API Options section for a description of the *rlm_auto_hb()* function. Note that you should call *either* *rlm_get_attr_health()* or *rlm_auto_hb()*, but not both.

Some notes on heartbeats and server status checking

Prior to RLM v10.1, when *rlm_get_attr_health()* detected an error, subsequent calls to *rlm_get_attr_health()* would return the same error without re-checking the actual status. Starting in v10.1, *rlm_get_attr_health()* will re-attempt to verify the connection to the server each time it is called. This means a few things:

- the client will be able to “re-acquire” a license that is lost due to a temporary network interruption. During the time of the interruption, *rlm_get_attr_health()* will return RLM_EL_NO_HEARTBEAT. If you are using *rlm_auto_hb()*, this is attempted 5 times, then the connection is deemed bad and it is shut down. If you are doing manual heartbeats, you control how many times you look for a heartbeat before giving up (although Reprise Software recommends that you keep this number relatively low, say 4-6 attempts).
- In *rlm_auto_hb()*, your application will not attempt to re-acquire a lost license until it has tried to verify a heartbeat 5 times. Previously, it attempted a reconnection on the initial detection of the lost heartbeat.

- In any case, if the network was interrupted and then restored, it may take more calls to *rlm_get_attr_health()* to detect a loss of heartbeat in a subsequent interruption. This is because several heartbeat responses may have been queued up for the application to read.

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rlm_get_attr_lfpath() - Get license path in use by RLM

```
#include "license.h"
RLM_LICENSE license;
char *path;

path = rlm_get_attr_lfpath(license);
```

Once you have attempted a license checkout, you can determine the license path in use by RLM by calling *rlm_get_attr_lfpath()* on the license handle (note: the checkout does not need to be successful for *rlm_get_attr_lfpath()* to work). This call will retrieve the same path for any license handle passed in.

You should **NOT** free the returned string.

Note: on Windows, the path components are separated by the ';' character. On all other RLM platforms, the path components are separated by the ':' character.

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rlm_get_attr_lic_check() - Get license check information

```
#include "license.h"
RLM_LICENSE lic;
char *license;
char *hostid;
int status;

status = rlm_get_attr_lic_check(lic, &license, &hostid);
```

If you have enabled server license checking with *rlm_isv_cfg_enable_check_license()* AND you have disabled failures from this license check with *rlm_isv_cfg_no_server_license_fail()*, you can check the status of the returned license from the server with this call after you have attempted a checkout. This data will be valid after the checkout and before any other call that attempts to connect to the server.

The call will return pointers to the license and server hostid returned by the license server in the *license* and *hostid* parameters, if they are supplied as non-NULL pointers. You should **NOT** free or otherwise modify either the license or hostid strings returned from this call.

The return from the call will be one of the following values:

0	license from server verified correctly
RLM_EH_BADPARAM	either lic is NULL or the RLM_HANDLE associated with <i>lic</i> is NULL
RLM_NO_SERVER_LIC	the server did not return a license
RLM_LIC_BAD	The returned license did not verify correctly
RLM_EH_LIC_WITH_NEW_KEYWORDS	The returned license has unknown keywords

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rlm_get_rehost() - Retrieve the hostid of a rehostable license.

```
#include "license.h"
RLM_HANDLE handle;
char *product;
char *hostid[RLM_MAX_HOSTID_STRING+1];
int status;
```

```
status = rlm_get_rehost(handle, product, hostid);
```

rlm_get_rehost() will return the hostid for the specified *product* if there is a rehostable hostid on this system. If status==0, *hostid* will contain the hostid string for this *product*.

This call can be used to retrieve a rehostable hostid when the license file is lost, and then transmit this hostid to the activation server to retrieve the hostid.

Note: prior to RLM v12.4, *rlm_get_rehost()* changed the working directory during the time of the call. This caused problems with multi-threaded applications, specifically plugins to Adobe products. In RLM v12.4, the working directory is not changed during this call. There are no changes to the API or the file layout of rehostable hostids, so no changes to your product are needed.

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rlm_hostid(), rlm_all_hostids(), rlm_all_hostids_free() - retrieve the hostid of this machine.

rlm_hostid()

```
#include "license.h"
RLM_HANDLE handle;
int type;
char hostid[RLM_MAX_HOSTID_STRING];
const char *description;

description = rlm_hostid(handle, type, hostid);
```

Call `rlm_hostid()` on any open `RLM_HANDLE` to retrieve the hostid of type **type**. The hostid will be returned in the string **hostid**. Note that the value of the hostid can be the string “invalid” in certain circumstances.

The value of **type** should be one of:

```
RLM_HOSTID_32BIT
RLM_HOSTID_DISKSN (Windows only)
RLM_HOSTID_ETHER
RLM_HOSTID_UUID (Windows only)
RLM_HOSTID_USER
RLM_HOSTID_HOST
RLM_HOSTID_IP
RLM_HOSTID_RLMID1
```

or one of your ISV-defined hostid types.

Note: **type** could also be one of `RLM_HOSTID_ANY`, `RLM_HOSTID_DEMO`, or `RLM_HOSTID_STRING`, but these will always return "ANY", "DEMO", or "".

The description return value will be NULL for an error, otherwise it is a static string - do not free it. Currently it is always an empty string, but may be used in the future.

Note: You cannot retrieve a rehostable hostid with `rlm_hostid()` or `rlm_all_hostids()`. Call `rlm_get_rehost()` to retrieve a rehostable hostid for a product.

rlm_all_hostids()

The `rlm_all_hostids()` call returns a list of hostids for hostid types which allow for multiple instances on a given machine.

```
RLM_HANDLE handle;
int type;
char **list;
```

```
list = rlm_all_hostids(handle, type);
```

rlm_all_hostids() returns a pointer to an array of (char *) pointers. Each pointer points to a string which is one instance of the specified hostid type. The list is terminated with a NULL pointer.

rlm_all_hostids_free()

Free all memory allocated for the list with the *rlm_all_hostids_free()* call.

```
char **list;  
(void) rlm_all_hostids_free(list);
```

Example:

```
char **list, **list_save;  
  
list_save = list = rlm_all_hostids(handle, RLM_HOSTID_ETHER);  
while (list && *list)  
{  
    printf("Hostid: %s\n", *list);  
    list++;  
}  
rlm_all_hostids_free(list_save);
```

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rlm_init(), rlm_init_disconn() - Initialize licensing operations with RLM

```
#include "license.h"
RLM_HANDLE handle;
const char *license;
const char *argv0;
const char *license_strings;
int promise;

handle = rlm_init(license, argv0, license_strings);

handle = rlm_init_disconn(license, argv0, license_strings, promise);
```

Before any RLM operations can be done, you must call either `rlm_init` or `rlm_init_disconn` to obtain an RLM_HANDLE. This handle is then passed to the `rlm_checkout()`, `rlm_stat()`, `rlm_errstring()`, and `rlm_close()` calls. If you plan to call `rlm_init_disconn()`, please read the section on Disconnected Operation on page 138 first.

The first parameter is the license file (or directory) you would like to use. If you allow the license administrator to specify the license file, put the path to this license file here. If you do not allow specification of the license file, Reprise Software recommends searching the current directory - you do this by passing a string with a single dot (".") as the first parameter. This first parameter can be a list, starting in RLM v11.1, however it must be a single file or directory prior to v11.1 List elements are separated by a semicolon on Windows and a colon on all other platforms. This parameter can also be a **port@host** specification. Beginning in RLM v11.0, this string must have a length <= RLM_MAX_PATH bytes (1024 on Unix, 2048 on windows), otherwise an RLM_EH_BADPARAM error will be returned by `rlm_init()`. On Windows, the path components are separated by the ';' character. On all other RLM platforms, the path components are separated by the ':' character.

The second parameter should be your argv[0] invocation argument. This will cause RLM to look in the directory where your binary resides to find license files. If you do not have access to argv[0], pass a NULL or empty string as the second parameter. Using anything other than an empty/NULL string or argv[0] will result in unpredictable behavior. Beginning in RLM v11.0, this string must have a length <= RLM_MAX_PATH bytes (1024 on Unix, 2048 on windows), otherwise an RLM_EH_BADPARAM error will be returned by `rlm_init()`.

The third parameter is used to pass licenses into RLM directly. This can be one license, or a list of licenses separated by the path separator (':' on Unix, ';' on Windows). Each license must be enclosed within angle brackets ('<' and '>'). This would be used, for example, when you are licensing a library and you want to give your customer a license to use the library yet you do not want to require that they use a separate license file. In this case, they would compile the license into the code and you would pass it into `rlm_init()` in this parameter. **Do not include HOST or ISV lines in this license, only the LICENSE line. Note that these licenses must be node-locked, uncounted (or SINGLE) licenses.**

NOTE: On Windows platforms, if the paths your application would pass to `rlm_init()` in the first and second parameters are Unicode wide characters (`wchar_t` or `WCHAR`), you must first convert them to UTF-8. The Win32 function `WideCharToMultiByte()` can be used for this conversion.

For example, to pass 2 licenses into rlm using the `rlm_init()` call, pass a string similar to following as the third parameter to `rlm_init()` (note – you must include the entire signed license within the angle brackets):

```
<LICENSE isv lic1 1.0 permanent 0 key hostid=xxx .sig=yyy ..>:<LICENSE isvname lic2 1.0 permanent 0 key  
hostid=xxx sig=yyy ...>
```

If you are calling `rlm_init_disconn()`, **the fourth parameter** is how often you promise to contact the server. Specify promise in minutes. If you do not contact the server every promise minutes (by calling `rlm_get_attr_health()`), your licenses will be automatically checked back in by the license server, and the server will forget about you; subsequent calls to `rlm_get_attr_health()` will return `RLM_EL_REMOVED` (or alternately `RLM_EL_NO_HEARTBEAT`, `RLM_EL_SERVER_DOWN`, or `RLM_EH_NOCLIENT`).

Note that RLM uses environment variables for a number of user-selectable options, such as queuing (`RLM_QUEUE`), license roaming (`RLM_ROAM`), project identification (`RLM_PROJECT`), etc. It is possible for you as an ISV to set these environment variables within your application, but if you wish to do this, you should do it before you call `rlm_init()`, because the environment is read and initialized at the time `rlm_init()` is called.

Retrieve the status of the `rlm_init()` call by calling `rlm_stat(handle)` and providing the *handle* returned by `rlm_init()`: For a list of status returns, see *Appendix A - RLM Status Returns* on page **232**.

```
int status;  
status = rlm_stat(handle);
```

`rlm_init()` will set up a list of licenses, port@host specifications and license files in the RLM handle. This order will determine the order in which license checkouts will be attempted. The order will be randomized if the user has set the `RLM_PATH_RANDOMIZE` environment variable to any value. The default order is:

- the contents of the `ISV_LICENSE` (if present) or `RLM_LICENSE` environment (note that if using `ISV_LICENSE`, the *ISV* part of the name must be in the same case as was entered in `rlm_isv_config.c` – generally lower case. “LICENSE” must be uppercase).
- the license specifications in the first parameter (*license*) in the `rlm_init()` call.
- the license files contained in the directory (*argv0*) in the second parameter in the `rlm_init()` call
- any licenses passed as strings in the third parameter (*license_strings*) in the `rlm_init()` call.

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rlm_license_XXXX() - Get checked-out license information.

This is a family of functions that operate on a valid license handle. These functions return status and attributes of a checked-out license. Note that in the case of token-based licenses, these data will be attributes of the license which actually satisfied the request, rather than attributes of the token-based license itself. These functions are divided into *policy* functions, which you should use to affect license policy, and *display* functions, which you should use only to display license data to your user.

WARNING: Other than the *policy* functions, be very careful using these functions. The *display* functions are intended for the application to use to determine the details of the license checked out, for the purposes of display to the user. Use of these functions to affect the behavior of the application based on the contents of the optional fields in the license is annoying and frustrating to license administrators. This is because doing so makes application behavior mysterious to them, and non-standard across all their licensed applications. For example, using `rlm_license_customer()` to display the name of the customer is reasonable. Making runtime decisions about application behavior or capability based on the data returned from `rlm_license_customer()` makes the application behavior different from other licensed applications and risks customer dissatisfaction. This violates the RLM design philosophy of "policy in the license", and is historically a sore point with license administrators of license management systems. Reprise Software urges you to take heed.

All functions operate on an `RLM_LICENSE`. Definitions for all functions are:

```
#include "license.h"
RLM_LICENSE license;
```

Note: On all of the following functions that return strings, if there is no valid checked-out license or the license handle is invalid, the function returns a NULL pointer. For functions that return int, a return value of `RLM_EL_NOHANDLE` indicates that a null or invalid handle was passed to the function.

The functions are:

Policy Functions

- **rlm_license_akey() - Retrieve activation key used to create license**

```
char *akey = rlm_license_akey(license);
```

Note: The `akey` field is only used by RLM to control license pooling in the server.

- **rlm_license_count() - Retrieve requested license count**

```
int count = rlm_license_count(license);
```

Note: The `count` is the count you requested in checkout. The sum of the counts across all processes might be larger than the total available count due to sharing.

- **rlm_license_stat() - Retrieve license status**

```
int status;  
status = rlm_license_stat(license);
```

You can retrieve the status of an *rlm_checkout()* call by calling *rlm_license_stat(license)*. *license* is the license handle returned by *rlm_checkout()*. This call does not query the license server for the status, it merely returns the status stored the last time the server was contacted. You can call this as often as you like. For a list of status returns, see [Appendix B – RLM Status Values](#) on page 232. This call, and *rlm_license_goodonce()* are the only calls in the family of *rlm_license_xxxx()* functions which you should use to affect application behavior.

Note: you cannot call *rlm_license_stat()* on a license handle after that handle has been checked in, or if the RLM_HANDLE used to check it out has been closed. This will result in unpredictable behavior (including possible application crashes), since the handle you are using has been freed by RLM. :q

- **rlm_license_goodonce() - Was checkout ever successful on this handle**

```
int status;  
status = rlm_license_goodonce(license);
```

You can determine whether a checkout was ever successful on a particular license handle by calling *rlm_license_goodonce(license)*. If *status* is 0, the checkout was never successful. If non-zero, the checkout succeeded at one time (although the license may no longer be valid). Note that a license status of RLM_EL_OVERSOFT will be considered to be a good checkout, but RLM_EL_INQUEUE is not. RLM_EL_OVERSOFT is an error if you have a misconfigured token-based license (see the note in the token-based license restrictions section).

- **rlm_license_options() - Retrieve license options**

```
char *options = rlm_license_options(license);
```

The meaning of the options string is completely determined by an individual ISV. This string is intended to encode product options for this license.

Display Functions

- **rlm_license_cached() - Is the license cached on client node?**

```
int cached = rlm_license_cached(license);  
If this is a cached license, the return is 1, otherwise 0.
```

- **rlm_license_client_cache() - returns the value of client_cache**

```
int cache_time = rlm_license_client_cache(license);
```

Returns the cache time for the license, in seconds.

- **rlm_license_contract() - Retrieve license contract string**

```
char *contract = rlm_license_contract(license);
```

Note: This license field is unused by RLM.

- **rlm_license_customer() - Retrieve license customer string**

```
char *customer = rlm_license_customer(license);
```

Note: This license field is unused by RLM.

- **rlm_license_detached_demo() - Retrieve "detached demo" status of license.**

```
int detached = rlm_license_detached_demo(license);
```

If this is a Detached Demotm license, the return is 1, otherwise 0.

- **rlm_license_exp() - Retrieve license expiration date**

```
char *exp = rlm_license_exp(license);
```

Note: For licenses checked-out from a license server, the expiration date returned by the server is the first (earliest) expiration date from all the licenses which make up the license pool used to satisfy this request. In other words, there may be other licenses for this same product which expire later than this date.

- **rlm_license_exp_days() - Retrieve the # of days until license expiration**

```
int days = rlm_license_exp_days(license);
```

Note: For licenses checked-out from a license server, the number of days to expiration is based on the first (earliest) expiration date from all the licenses which make up the license pool used to satisfy this request. In other words, there may be other licenses for this same product which expire later than this date.

Also Note: *rlm_license_exp_days()* counts today as a day. So, for example, a license which expires tomorrow at midnight will be reported as expiring in 2 days. A license which expires today at midnight will be reported as expiring in 1 day.

If days == 0, this is a permanent license. If days is < 0, there was an error.

- **rlm_license_hold() - Retrieve license hold time**

```
int secs = rlm_license_hold(license);
```

- **rlm_license_host_based() - Is license host-based?**

```
int host_based = rlm_license_host_based(license);
```

- **rlm_license_hostid() - Retrieve license hostid**

```
char *hostid = rlm_license_hostid(license);
```

License servers can serve nodelocked licenses as well as floating licenses. If you want to know if the license was checked out from a license server, call *rlm_license_server()*. If you want to know if the license is nodelocked, call *rlm_license_hostid()* - if the license is floating instead of nodelocked, this will return NULL. This call, however, returns the hostid from the LICENSE line, never the server's hostid. So for floating licenses, the return will be empty.

- **rlm_license_ismetered() - Is this license metered?**

```
int ismetered = rlm_license_ismetered(license);
```

rlm_license_ismetered() returns non-zero for a metered license, - 0 otherwise. Note that 0 is returned if the handle passed in is invalid.

- **rlm_license_issued() - Retrieve license issued date**

```
char *issued = rlm_license_issued(license);
```

(Note: this value is only correct for licenses which aren't served. Any license coming from a license server has an undefined rlm_license_issued() value.)

- **rlm_license_issuer() - Retrieve license issuer string**

```
char *issuer = rlm_license_issuer(license);
```

Note: This license field is unused by RLM.

- **rlm_license_line_item() - Retrieve license line_item string**

```
char *line_item = rlm_license_line_item(license);
```

Note: This license field is unused by RLM.

- **rlm_license_max_roam() - Retrieve maximum roam time**

```
int days = rlm_license_max_roam(license);
```

- **rlm_license_max_roam_count() - Retrieve maximum roam count**

```
int max_roam_count = rlm_license_max_roam_count(license);
```

- **rlm_license_max_share()** - Retrieve maximum # of licenses that can be shared.

```
int max_share = rlm_license_max_share(license);
```

- **rlm_license_meter_counter()** - Retrieve the meter counter for this license (if metered).

```
int counter = rlm_license_meter_counter(license);
```

- **rlm_license_min_checkout()** - Retrieve license minimum checkout time

```
int secs = rlm_license_min_checkout(license);
```

- **rlm_license_min_remove()** - Retrieve license minimum remove time

```
int secs = rlm_license_min_remove(license);
```

- **rlm_license_min_timeout()** - Retrieve license minimum timeout

```
int secs = rlm_license_min_timeout(license);
```

- **rlm_license_named_user_count()** - Retrieve license Named User Count.

```
int count = rlm_license_named_user_count(license);
```

If count == 0, this is not a named user license.

- **rlm_license_named_user_min_hours()** - Retrieve license Named User Minimum # of hours on the list.

```
int minimum_hours = rlm_license_named_user_min_hours(license);
```

The return from this call is only valid for licenses with named_user_count > 0.

- **rlm_license_platforms()** - Retrieve licensed platforms

```
char *platforms= rlm_license_platforms(license);
```

- **rlm_license_product()** - Retrieve licensed product

```
char *product = rlm_license_product(license);
```

Note that rlm_license_product() retrieves the product name which satisfied the request.

This may be different than the product requested. In the case of token-based licenses, the license requested is not the product that satisfies the license request. The actual product which satisfied the request is returned by rlm_license_product(). Also note that only the

attributes of the **first** license (in the case of a compound token-based license) is returned by these calls. The first license is the first license listed in the token definition.

- **rlm_license_roaming() - Retrieve "roaming" status of license.**

```
int roaming = rlm_license_roaming(license);
```

If this is a roaming license, the return is 1, otherwise 0. Note that when you check the license out from the server requesting the roam, this is **not** a roaming license. The license is only roaming when the system is using the local roamed license without using the license server.

- **rlm_license_server() - Retrieve license server hostname**

```
char *server = rlm_license_server(license);
```

If *license* is a license handle which has a valid checkout of a license which was granted from a license server, then the *rlm_license_server()* call will retrieve the hostname of the license server, otherwise an empty or NULL string will be returned. License servers can serve nodelocked licenses as well as floating licenses. If you want to know if the license is nodelocked, call *rlm_license_hostid()* - if the license is floating instead of nodelocked, this will return NULL.

- **rlm_license_share() - Retrieve license sharing spec**

```
int share = rlm_license_share(license);
```

share is a bitmap, with the bits defined in *license.h*:

- RLM_LA_SHARE_USER - share if username matches
- RLM_LA_SHARE_HOST - share if hostname matches
- RLM_LA_SHARE_ISV - share if the isv-defined data matches

All fields specified in the bitmap must match in order for the license to be shared.

- **rlm_license_single() - Is license a "single" type**

```
int single = rlm_license_single(license);
```

Returns 1 if the license is "single", 0 otherwise.

- **rlm_license_soft_limit() - Retrieve license soft limit**

```
int soft_limit = rlm_license_soft_limit(license);
```

NOTE: If licenses are pooled by the license server, the soft limit returned by this call is the sum of the soft limits of all pooled licenses. If some licenses do not have soft limits, the license count is used as the soft limit, thus this number could be equal to the license count.

- **rlm_license_start() - Retrieve license start date**

```
char *start= rlm_license_start(license);
```

- **rlm_license_type() - Retrieve license type**

```
int type = rlm_license_type(license);
```

The type variable has bits set for the specified license types, as defined in *license.h*:

- RLM_LA_BETA_TYPE - "beta" specified in license type keyword
- RLM_LA_EVAL_TYPE - "eval" specified in license type keyword
- RLM_LA_DEMO_TYPE - "demo" specified in license type keyword

Note: This license field is unused by RLM.

- **rlm_license_tz() - Retrieve license timezone spec**

```
int tz = rlm_license_tz(license);
```

- **rlm_license_uncounted() - Is license uncounted**

```
int uncounted = rlm_license_uncounted(license);
```

Returns 1 if the license is uncounted, 0 otherwise.

- **rlm_license_user_based() - Is license user-based?**

```
int user_based = rlm_license_user_based(license);
```

- **rlm_license_ver() - Retrieve license version**

```
char *ver= rlm_license_ver(license);
```

Note that `rlm_license_ver()` returns the actual version of the license that was used to satisfy the request. This may be different than the version requested. Also note that if the request was satisfied by a TOKEN license on the server side, the version returned will be the **greater** of the requested version and the version of the first primary license which the TOKEN license utilizes.

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rlm_log(), rlm_dlog() - Log ISV-specific data

```
#include "license.h"
RLM_HANDLE handle;
const char data[];
```

Log to report log:

```
(int) status = rlm_log(handle, data);
```

Any time after calling *rlm_init*, the *rlm_log()* function can be called to log data to the ISV server's report log (if it exists). The *rlm_log()* function will establish a connection to a license server if one does not already exist, then all subsequent *rlm_log()* and *rlm_dlog()* calls will operate with this server (until *rlm_close()* is called on the handle).

The data logged is a character string, which should not contain a newline character.
The format of the data logged to the reportlog is:

log hh:mm:ss *data from rlm_log call*

Log to debug log

```
(int) status = rlm_dlog(handle, (const char *) data);
```

Any time after calling *rlm_init*, the *rlm_dlog()* function can be called to log data to the debug log. The *rlm_dlog()* function will establish a connection to a license server if one does not already exist, then all subsequent *rlm_log()* and *rlm_dlog()* calls will operate with this server (until *rlm_close()* is called on the handle).

The data logged is a character string, which should not contain a newline character.
The format of the data logged to the debug log is:

mm/dd hh:mm (ISV name) ISV: *data from rlm_log call*

Return value:

rlm_log() and *rlm_dlog()* return 0 for success, and on failures:

RLM_EH_NOHANDLE - called without a valid RLM_HANDLE

RLM_EH_NO_REPORTLOG - *rlm_log()* called but the server does not have a reportlog.

Note: The maximum length of a logged string is RLM_MAX_LOG (currently 256). However, logging strings much longer than 60 bytes will generally create wrapped lines in the debug and report log files.

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rlm_products() - Generate list of products that can be checked out

```
#include "license.h"
RLM_PRODUCTS products;
RLM_HANDLE handle;
char *product;
char *ver;
int status;

products = rlm_products(handle, product, ver);
(void) rlm_product_first(products);
status = rlm_product_next(products);
```

NOTE: `rlm_products()` is an expensive call. If you don't absolutely need it, don't call it. If you do call it, specify a product name if you can. You should avoid calling it more than once inside an application. Why is it expensive? If called with empty product/version strings, it has to validate the license keys for all node-locked uncounted/single-use licenses in local license files, and it also goes to every server in the list and retrieves from each server a list of available licenses.

`rlm_products` generates a list of products of the specified version that can be checked out. If `product` is an empty or NULL string, all products are checked. If `ver` is empty or NULL, any version will be listed. If `rlm_products()` returns a non-null pointer, then there are products in the list. The **status** return from `rlm_product_next()` is 0 if there is another product in the list, or -1 if the list is exhausted. `rlm_products()` does not report on *Detached Demo*tm licenses.

To examine the list of products, first call `rlm_products()` to retrieve the products pointer. Next, use `rlm_product_first()` and `rlm_product_next()` to walk the list of products returned. At any point after calling `rlm_product_first()`, you can call the appropriate function below. Note: you should **not** free any data returned by any of these calls.

Prior to RLM v4.0BL2, `rlm_products()` returned the license information in the same order that the license files were present in the license file path. However, starting in RLM v4.0BL2, `rlm_products()` returns the licenses in the same order that `rlm_checkout()` will attempt checkouts. This order is:

- If **RLM_ROAM** is set to a positive value, roamed licenses on the local node first,
- All node-locked, uncounted licenses in local license files (from all license files in the license file path) will be next
- All licenses served by servers are next,
- Finally, if **RLM_ROAM** is not set, the local roamed licenses will be last.

Note that `rlm_products()` returns the list of valid roamed products on the local node, **whether or not it can check out an `rlm_roam` license.**

Note that `rlm_checkout()` first processes licenses from connected servers, then it attempts checkouts from servers that are not connected. However, `rlm_products()` will connect to all servers and get the lists from each of them. It will then close connections to all servers that have no active licenses checked out. If your software depends on the order of the licenses on license servers as returned from `rlm_products()` [NOTE: Reprise Software does not recommend this], then you **should** call `rlm_set_attr_keep_conn(handle, 1)` before calling `rlm_products()`, so that `rlm_products()` will not close any connections that it makes.

char **rlm_product_name(products)* - returns the product name.
char **rlm_product_ver(products)* - returns the product version.
char **rlm_product_exp(products)* - returns the expiration date. If this product represents a pool in a license server, the expiration date will be the *earliest* expiration of any of the licenses which were combined to create the pool.

int *rlm_product_exp_days(products)* - returns the number of days until expiration. Note that “0” indicates a permanent license; a license which expires today has a value of 1. If this product represents a pool in a license server, the expiration date will be the *earliest* expiration of any of the licenses which were combined to create the pool. *rlm_product_exp_days()* is new in RLM v10.0.

NOTE: All functions with char * returns can return NULL for cases where the data does not exist, so you must check for a NULL return. For example, *rlm_product_server()* called on an unserved license will return NULL.

char **rlm_product_akey(products)* - returns the akey= attribute. New in v11.0.
int *rlm_product_client_cache()* - returns the value of the client_cache parameter. New in v10.1*
char **rlm_product_customer(products)* - returns the customer attribute. New in v10.0.
char **rlm_product_contract(products)* - returns the contract attribute. New in v10.0.
int *rlm_product_count(products)* - returns the license count.
int *rlm_product_current_inuse(products)* - returns the license count in use.
int *rlm_product_current_resuse(products)* - returns the # of reservations in use.
int *rlm_product_hbased(products)* - returns the HOST-BASED count.
int *rlm_product_hold(products)* - returns the license hold time.
char **rlm_product_hostid(products)* - returns the license nodelock hostid, if it exists. New in v12.0.
int *rlm_product_ismetered(products)* - returns non-zero for a metered license, 0 otherwise. New in v12.4
char **rlm_product_issuer(products)* - returns the issuer attribute. New in v10.0.
int *rlm_product_max_roam(products)* - returns the maximum roam time.
int *rlm_product_max_roam_count(products)* - returns the max # of these licenses which can be roamed.
int *rlm_product_max_share(products)* - returns the max number of processes that can share this license.
int *rlm_product_meter_counter(products)* - returns the meter counter for this product (0 if not metered).
int *rlm_product_meter_cur_count(products)* - returns the meter count for this product (0 if not metered).
int *rlm_product_min_remove(products)* - returns the minimum rlmremove time.
int *rlm_product_min_checkout(products)* - returns the license minimum checkout time.
int *rlm_product_min_timeout(products)* - returns the minimum timeout time.
int *rlm_product_named_user_count(products)* - returns the named user count.
int *rlm_product_nres(products)* - returns the # of license reservations.
int *rlm_product_num_roam_allowed(products)* - returns the # of roaming licenses allowed.
char **rlm_product_options(products)* - returns the product options.
int *rlm_product_roaming(products)* - returns the # of licenses currently roaming (for roaming licenses).
char **rlm_product_server(products)* - returns the license server's hostname (from the server's license file).
char **rlm_product_start(products)* - returns the product's start date, if present.
int *rlm_product_share(products)* - returns the license share flags.
(Note: the share flags (RLM_LA_SHARE_xxx) are defined in license.h)
int *rlm_product_soft_limit(products)* - returns the license soft limit.
int *rlm_product_thisroam(products)* - returns 1 if this license is a roaming license.
int *rlm_product_timeout(products)* - returns the current license timeout.
int *rlm_product_tz(products)* - returns the license timezone specification.
int *rlm_product_tokens(products)* - if 0, this is a normal license. If non-zero, this is a token-based license.
int *rlm_product_type(products)* - returns the license type (TYPE= parameter).
(Note: the license type flags (RLM_LA__xxx_TYPE) are defined in license.h)

int *rlm_product_ubased(products)* - returns the USER_BASED count.

* Note that client-cached licenses on the client side will never be returned by *rlm_products()*. The *rlm_product_client_cache()* call returns the value of the cache time (in seconds) from the server's license.

Certain of these items will always be 0 for node-locked, uncounted licenses. These are:

- current_inuse
- current_resuse
- min_remove
- nres
- num_roam_allowed
- timeout

Note: the list of products may contain products that cannot be checked out at any given time, if all the licenses are in use, the maximum # of roaming licenses has been reached, etc. It is possible (at some time) to check out every product in the list, however. In other words, the list contains only licenses for which the license key is good, the time is past the start date and before the expiration date, the timezone is correct, and we are on the correct host if a hostid is specified.

Also note that the following licenses will *never* be returned by *rlm_products()*:

- *Detached Demotm* licenses
- reserved license names (e.g. *rlm_server*, *rlm_server_enable_vm*, *rlm_no_server_lock*)
- licenses passed in the 3rd parameter to *rlm_init()*
- Client cached licenses

The data returned by the *rlm_products()* call is dynamically allocated. Call *rlm_products_free(products)* to free this memory when you are finished with it, in order to avoid memory leaks in your program. You should only call *rlm_products_free()* once on the data returned by *rlm_products()*, and only when you are finished accessing this data.

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rlm_putenv() - Set environment variable within the application

```
#include "license.h"
RLM_HANDLE rh;
int status;
const char *nvp;

status = rlm_putenv(const char *nvp);
```

rlm_putenv() sets the specified name in to the specified value in the process's environment. The return of *rlm_putenv()* is the return of the system *putenv()* call.

Example:

```
const char *nvp = "RLM_ROAM=10";
rlm_putenv(nvp);
```

In this example, the environment value of RLM_ROAM is set to 10.

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rlm_set_active() - Inform RLM of activity status of application

```
#include "license.h"
RLM_HANDLE rh;
int active;

(void) rlm_set_active(rh, active);
```

rlm_set_active() informs RLM that the application is *active* (active=1), or inactive (active=0). This is used with *rlm_auto_hb()* in order to allow your application's license to be timed-out with the license administration TIMEOUT option. The activity state applies to all checked-out licenses on the handle.

If you call *rlm_auto_hb()*, heartbeats will be sent to the server whenever your application is running, whether you are actively processing or not. This means that an application which is simply waiting for user input will continue to send heartbeats, and will appear active to RLM. If you would like your license administrators to be able to time-out the licenses from applications which are in such an idle state, use the *rlm_set_active()* call to inform RLM when your application is active or inactive.

Note that if you use manual heartbeats the *rlm_set_active()* call is not necessary, since you would only send heartbeat requests by calling *rlm_get_attr_health()* calls when the application is active.

A call to *rlm_checkout()* will set the active flag to 1 (ie, the application is active) whether the checkout succeeds or not.

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rlm_set_attr_keep_conn() - Set “keep connection” status for RLM

```
#include "license.h"
RLM_HANDLE rh;
int conn_status;
```

```
rlm_set_attr_keep_conn(handle, conn_status);
```

When multiple checkouts are performed in a single application, RLM automatically create a new connection to a license server if the current license server cannot provide the license required. This operation is transparent to the application, and the RLM software maintains a list of connected servers which can be queried (in the order connected) for any new license request.

When a checkout request fails, RLM can either close down the connection to the license server or keep it open. If your product checks out multiple licenses, an optimization is to keep these connections open (at the expense of the TCP/IP overhead for the connection). The default is to close the connection, which will be correct for the vast majority of applications. However, if you would like to keep the connection open, you can call:

```
rlm_set_attr_keep_conn(handle, 1);
```

Please note that making this call will not affect the functioning of RLM in your application - it is an optimization only.

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rlm_set_attr_logging() - Turn server logging on or off

```
#include "license.h"  
RLM_HANDLE rh;  
int log;
```

```
rlm_set_attr_logging(handle, log);
```

By default, RLM servers log all license checkout and checkin activity.

You can call *rlm_set_attr_logging()* any time before a checkout or checkin request, and if the value of *log* is non-zero, the server will log the the checkout/checkin status in both the debug and report log files. If the value of *log* is zero, the server will not log anything about the checkout/checkin.

This is useful, for example, if you want to check out a product which should never succeed, in order to see if your license server has been compromised. The resulting checkout activity will not appear in any server log and will not confuse your customers. You should remember to turn logging back on after doing this, otherwise your license server logs will contain no checkout/checkin activity.

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rlm_set_attr_password() - Set license password-string for future operations

```
#include "license.h"
RLM_HANDLE rh;
char *password_string;

rlm_set_attr_password(handle, password_string);
```

Beginning in RLM v9.1, each license can contain a password. If the license contains a password, only processes which specify the matching password-string, will be able to use (either check out, or view) the license.

You can call `rlm_set_attr_password()` any time before a checkout or status request, and the value of the password-string can be changed for subsequent requests.

Note that the setting of the environment variable `RLM_LICENSE_PASSWORD` will be the default, but this call will override the value set in `RLM_LICENSE_PASSWORD`.

The intended use of this capability is to allow a single license server to serve licenses for several independent customers. Each customer would be given a password-string, which would enable access to all their licenses, but not the licenses of other customers.

If a license does not specify a password, calling `rlm_set_attr_password()` (or setting `RLM_LICENSE_PASSWORD`) will have no effect.

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rlm_set_attr_reference_hostid() - Set reference hostid for actpro

```
#include "license.h"
RLM_HANDLE rh;
char *reference_hostid;
```

```
(void) rlm_set_attr_reference_hostid(handle, reference_hostid);
```

Beginning in RLM v12.3, you can set the hostid which RLM uses as a reference hostid when creating a rehostable hostid. It is important that the hostid you set is a valid RLM hostid which is valid on the current host, otherwise your rehostable hostid will not work and will always return RLM_EL_NOTTHISHOST.

You can call *rlm_set_attr_reference_hostid()* any time before an *rlm_act_request()*, *rlm_activate()* or *rlm_act_revoke_reference()* call.

If you set the reference hostid when creating a rehostable hostid, you must set the same hostid before calling *rlm_act_revoke_reference()*, otherwise the rehostable hostid will not be revoked.

The hostid string you pass to this function must be <= RLM_MAX_HOSTID_STRING characters long, **and must be a valid hostid on the current host.**

Note that RLM selects a reference hostid automatically, and you should never need to make this call.

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rlm_set_attr_req_opt() - Set required substring in license options

```
#include "license.h"
RLM_HANDLE rh;
char *opts;
```

```
rlm_set_attr_req_opt(handle, opts);
```

Beginning in RLM v12.0, you can request that any license must contain a certain substring in the “options=” field.

You can call *rlm_set_attr_req_opt()* any time before an *rlm_checkout()* or *rlm_products()* call, and the value of the option substring can be changed for subsequent requests. Note that if you set **opts** to an empty string (“”), no checking of the license options will be done by *rlm_checkout()* or *rlm_products()*.

The opts parameter must be a substring in the license options, and the comparison is **CASE SENSITIVE**.

Note: once you call *rlm_set_attr_req_opt()*, you will only see licenses with the specified substring in the options field in either the *rlm_checkout()* or *rlm_products()* calls. If you want to see other licenses, call *rlm_set_attr_req_opt()* with an empty string.

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rlm_set_environ() - Set user/host/ISV-defined values for RLM

```
#include "license.h"
RLM_HANDLE rh;
char user[RLM_MAX_USERNAME+1];
char host[RLM_MAX_HOSTNAME+1];
char isv[RLM_MAX_ISVDEF+1];
```

```
rlm_set_environ(handle, user, host, isv);
```

License sharing operates by comparing user, host, and ISV fields for matches. *rlm_set_environ()* allows the ISV to override the system's notion of user and/or host, and also provides a way to set the ISV-defined data. If any of user/host/isv are passed in as NULL, the corresponding field remains unchanged.

The ISV field should be a printable string which does not contain the double-quote character (").

Note that *rlm_set_environ()* should be called after *rlm_init()* and before any *rlm_checkout()* call to which it should apply. Once *rlm_checkout()* is called, these values will persist for the life of the RLM_HANDLE in which you call *rlm_set_environ()*.

Starting in RLM v9.1, you can call *rlm_set_environ()* any time (even after the first *rlm_checkout()* call), and the new user, host, and ISV-defined parameters will apply to all subsequent checkouts, until you call *rlm_set_environ()* again. The original settings will continue to apply to *rlm_products()* calls, however.

Note that RLM always treats usernames and hostnames as case-insensitive.

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rlm_sign_license() - Sign an individual license in-memory

```
#include "license.h"
RLM_HANDLE rh;
int encode_bits;
char *hostid;
char license[RLM_MAX_LINE+1];

status = rlm_sign_license(rh, encode_bits, hostid, license);
```

rlm_sign_license runs the internal signature algorithm to compute the license key for the license string found in **license**.

rlm_sign_license() should be called with a valid RLM_HANDLE as its first parameter.

The 2nd parameter - *encode_bits* - indicates the key encoding desired. Valid values are:

- 4 - encode license key 4 bits/character - this produces HEX numbers
- 5 - encode license key 5 bits/character - this produces all UPPERCASE license keys
- 6 - encode license key 6 bits/character - this produces license keys in mixed-case

If you specify a value that is < 4 or > 6, 4 bits/character will be used.

The 3rd parameter - *hostid* - is the hostid of the license server, if this is a floating license. You should pass an empty or NULL string if this is a node-locked license.

The 4th parameter - *license* - should contain a valid RLM license, with the signature replaced with the string "sig". On successful completion, the "sig" string will be replaced with the correct license signature in this string. Note that this string should contain only the (single) LICENSE line, not the HOST and ISV lines.

A successful call to *rlm_sign_license*() will return a 0 status. Any other status return indicates an error, and the license will not be valid.

NOTE: Do not call *rlm_sign_license*() in an application or utility that ships to customers. Doing so will cause your private key to be included in the application executable or binary, which could expose it to hackers, possibly enabling them to create counterfeit licenses for your product.

Example – sign a nodelocked license:

```
#include "license.h"
RLM_HANDLE rh;
char license[RLM_MAX_LINE+1];

rh = rlm_init((char *)NULL, (char *)NULL, (char *)NULL);
if (!rh)
    -error-
else
{
    (void) strcpy(license,
        "LICENSE demo rlmclient 1.0 12-apr-2019 uncounted hostid=ANY options=xyz sig");

    status = rlm_sign_license(rh, 6, (char *) NULL, license);
}
```

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rlm_skip_isv_down() - Enable "skip" of license servers where your ISV server isn't running

```
#include "license.h"
RLM_HANDLE rh;

(void) rlm_skip_isv_down(rh);
```

RLM keeps track of which license servers in the list have your ISV server running on them.

If either:

- the client cannot connect to the server, or
- an attempt is made to check out a license from a server and the rlm server returns a status indicating that this ISV is not present,

then the server is flagged as not having your ISV server.

If you call *rlm_skip_isv_down()*, then future *rlm_checkout()* and *rlm_products()* calls will not attempt to use this license server. Note that by default, RLM will attempt all operations on all servers.

You can call *rlm_skip_isv_down()* any time after calling *rlm_init()*.

If you would like to give your user the opportunity to attempt to use these servers again, call:

```
(void) rlm_forget_isv_down((RLM_HANDLE) rh)
```

rlm_forget_isv_down() will cause RLM to attempt to use all license servers again, until it determines that your ISV server is not running.

NOTE: Prior to RLM v9.2, *rlm_skip_isv_down()* would cause RLM to skip servers which did not have an ISV line for your ISV name. In 9.2, as part of the fix for P241, RLM will attempt a connection one time to servers that don't have your ISV line in them. If the server is not up or if your ISV server isn't present, then that server won't be checked again.

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rlm_stat() - Retrieve RLM_HANDLE status

```
#include "license.h"
RLM_HANDLE handle;
int status;

status = rlm_stat(handle);
```

rlm_stat() retrieves the status of the handle created with the *rlm_init()* call. The status returned by *rlm_stat()* is only meaningful if called after *rlm_init()* or *rlm_init_disconn()* and before any other RLM function.

Let us repeat: *rlm_stat()* is intended to be called immediately after *rlm_init()* or *rlm_init_disconn()*. Calls to *rlm_stat()* after other RLM function calls return undefined results.

For a list of status returns, see [Appendix B – RLM Status Values](#) on page 232.

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Appendix B – RLM Status Values

The RLM API functions return status (via the `rlm_stat()` and `rlm_license_stat()` (see `rlm_license_XXXX()`) calls.

`rlm_stat()` returns general RLM_HANDLE errors. These are:

0	0	Success
RLM_EH_NOHANDLE	-101	No handle supplied to call
RLM_EH_READ_NOLICENSE	-102	Can't read license data
RLM_EH_NET_INIT	-103	Network (<code>msg_init()</code>) error
RLM_EH_NET_WERR	-104	Error writing to network
RLM_EH_NET_RERR	-105	Error reading from network
RLM_EH_NET_BADRESP	-106	Unexpected response
RLM_EH_BADHELLO	-107	HELLO message for wrong server
RLM_EH_BADPRIVKEY	-108	Error in private key
RLM_EH_SIGERROR	-109	Error signing authorization
RLM_EH_INTERNAL	-110	Internal error
RLM_EH_CONN_REFUSED	-111	Connection refused at server (this can also happen if you have a bad TCP/IP address in your local database)
RLM_EH_NOSERVER	-112	No server to connect to
RLM_EH_BADHANDSHAKE	-113	Bad communications handshake
RLM_EH_CANTGETETHER	-114	Can't get ethernet address
RLM_EH_MALLOC	-115	<code>malloc()</code> error
RLM_EH_BIND	-116	<code>bind()</code> error
RLM_EH_SOCKET	-117	<code>socket()</code> error
RLM_EH_BADPUBKEY	-118	Error in public key
RLM_EH_AUTHFAIL	-119	Authentication failed
RLM_EH_WRITE_LF	-120	Can't write new license file
RLM_EH_DUP_ISV_HID	-122	ISV-defined hostid already registered
RLM_EH_BADPARAM	-123	Bad parameter passed to RLM function
RLM_EH_ROAMWRITEERR	-124	Roam File write error
RLM_EH_ROAMREADERR	-125	Roam File read error
RLM_EH_HANDLER_INSTALLED	-126	Heartbeat handler already installed
RLM_EH_CANTCREATELOCK	-127	Can't create 'single' lockfile
RLM_EH_CANTOPENLOCK	-128	Can't open 'single' lockfile
RLM_EH_CANTSETLOCK	-129	Can't set lock for 'single'
RLM_EH_BADRLMLIC	-130	Bad/missing/expired RLM license
RLM_EH_BADHOST	-131	bad hostname in license file or port@host
RLM_EH_CANTCONNECTURL	-132	Can't connect to specified URL (activation)
RLM_EH_OP_NOT_ALLOWED	-133	Operation not allowed on server. The status, reread,

		shutdown, or remove command has been disabled for this user.
RLM_EH_ACT_BADSTAT	-134	Bad status return from Activation server
RLM_EH_ACT_BADLICKEY	-135	Activation server built with incorrect license key
RLM_EH_ACT_BAD_HTTP	-136	Error in HTTP transaction with Activation server
RLM_EH_DEMOEXISTS	-137	Demo already created on this system
RLM_EH_DEMOWRITEERR	-138	Demo install file write error
RLM_EH_NO_DEMO_LIC	-139	No "rlm_demo" license available
RLM_EH_NO_RLM_PLATFORM	-140	RLM is unlicensed on this platform
RLM_EH_EVAL_EXPIRED	-141	The RLM evaluation license compiled into this binary has expired
RLM_EH_SERVER_REJECT	-142	Server rejected (too old)
RLM_EH_UNLICENSED	-143	Unlicensed RLM option
RLM_EH_SEMAPHORE_FAILURE	-144	Semaphore initialization failure
RLM_EH_ACT_OLDSERVER	-145	Activation server too old (doesn't support encryption)
RLM_EH_BAD_LIC_LINE	-146	Invalid license line in LF
RLM_EH_BAD_SERVER_HOSTID	-147	Invalid hostid on SERVER line
RLM_EH_NO_REHOST_TOP_DIR	-148	No rehostable hostid top-level dir
RLM_EH_CANT_GET_REHOST	-149	Cannot get rehostable hostid
RLM_EH_CANT_DEL_REHOST	-150	Cannot delete rehostable hostid
RLM_EH_CANT_CREATE_REHOST	-151	Cannot create rehostable hostid
RLM_EH_REHOST_TOP_DIR_EXISTS	-152	Rehostable top directory exists
RLM_EH_REHOST_EXISTS	-153	Rehostable hostid exists
RLM_EH_NO_FULFILLMENTS	-154	No fulfillments to revoke
RLM_EH_METER_READERR	-155	Meter read error
RLM_EH_METER_WRITEERR	-156	Meter write error
RLM_EH_METER_BADINCREMENT	-157	Bad meter increment command
RLM_EH_METER_NO_COUNTER	-158	Can't find counter in meter
RLM_EH_ACT_UNLICENSED	-159	Activation Unlicensed
RLM_EH_ACTPRO_UNLICENSED	-160	Activation Pro Unlicensed
RLM_EH_SERVER_REQUIRED	-161	Counted license requires server
RLM_EH_DATE_REQUIRED	-162	REPLACE license requires date
RLM_EH_NO_METER_UPGRADE	-163	METERED licenses can't be UPGRADED
RLM_EH_NO_CLIENT	-164	Disconnected client data can't be found
RLM_EH_NO_DISCONN	-165	Operation not allowed on disconnected handle
RLM_EH_NO_FILES	-166	Too many open files
RLM_EH_NO_BROADCAST_RESP	-167	No response to broadcast message
RLM_EH_NO_BROADCAST_HOST	-168	Broadcast response didn't include hostname
RLM_EH_SERVER_TOO_OLD	-169	Server too old for disconnected operations
RLM_EH_BADLIC_FROM_SERVER	-170	License from server doesn't authenticate
RLM_EH_NO_LIC_FROM_SERVER	-171	No License returned from server
RLM_EH_CACHEWRITEERR	-172	Client Cache File write error
RLM_EH_CACHEREADERR	-173	Client Cache File read error

RLM_EH_LIC_WITH_NEW_KEYWORDS	-174	License returned from server has keywords I don't understand
RLM_EH_NO_ISV	-175	Unknown ISV name
RLM_EH_NO_CUSTOMER	-176	Unknown Customer name
RLM_EH_NO_SQL	-177	Cannot open MySQL database (RLMCloud only)
RLM_EH_ONLY_LOCAL_CMDS	-178	Only local command-line commands allowed
RLM_EH_SERVER_TIMEOUT	-179	Server timeout on read
RLM_EH_NONE_SIGNED	-180	rlmsign did not sign any licenses (warning)
RLM_EH_DUP_XFER	-181	Duplicate disconnected transfer
RLM_EH_BADLOGIN	-182	Bad/No login credentials to server
RLM_EH_WS_NOSUPP	-183	Function not supported with web services
RLM_EH_NOFUNC	-184	Function not available

In addition, `rlm_activate()/rlm_act_request()` will return the following errors:

RLM_ACT_BADPARAM	-1001	Unused – RLM_EH_BADPARAM returned instead.
RLM_ACT_NO_KEY	-1002	No activation key supplied
RLM_ACT_NO_PROD	-1003	No product definition exists
RLM_ACT_CANT_WRITE_KEYS	-1004	Can't write keyf table
RLM_ACT_KEY_USED	-1005	Activation key already used
RLM_ACT_BAD_HOSTID	-1006	Missing hostid
RLM_ACT_BAD_HOSTID_TYPE	-1007	Invalid hostid type
RLM_ACT_BAD_HTTP	-1008	Bad HTTP transaction. Note: unused after v3.0BL4
RLM_ACT_CANTLOCK	-1009	Can't lock activation database
RLM_ACT_CANTREAD_DB	-1010	Can't read activation database
RLM_ACT_CANT_WRITE_FUFILL	-1011	Can't write licf table
RLM_ACT_CLIENT_TIME_BAD	-1012	Clock bad on client system (not within 7 days of server)
RLM_ACT_BAD_REDIRECT	-1013	Can't write licf table
RLM_ACT_TOOMANY_HOSTID_CHANGES	-1014	Too many hostid changes for refresh-type activation
RLM_ACT_BLACKLISTED	-1015	Domain on blacklist for activation
RLM_ACT_NOT_WHITELISTED	-1016	Domain not on activation key whitelist
RLM_ACT_KEY_EXPIRED	-1017	Activation key expired
RLM_ACT_NO_PERMISSION	-1018	HTTP request denied (this is a setup problem)
RLM_ACT_SERVER_ERROR	-1019	HTTP internal server error (usually a setup problem)
RLM_ACT_BAD_GENERATOR	-1020	Bad/missing generator file (Activation Pro)
RLM_ACT_NO_KEY_MATCH	-1021	No matching activation key in database
RLM_ACT_NO_AUTH_SUPPLIED	-1022	No proxy authorization supplied

RLM_ACT_PROXY_AUTH_FAILED	-1023	Proxy authentication failed
RLM_ACT_NO_BASIC_AUTH	-1024	No basic authentication supported by proxy
RLM_ACT_GEN_UNLICENSED	-1025	Activation generator unlicensed (ISV_mklic)
RL_ACT_DB_READERR	-1026	Activation database read error (Activation Pro)
RLM_ACT_GEN_PARAM_ERR	-1027	Generating license - bad parameter
RLM_ACT_UNSUPPORTED_CMD	-1028	Unsupported command to license generator
RLM_ACT_REVOKE_TOOLATE	-1029	Revoke command after expiration
RLM_ACT_KEY_DISABLED	-1030	Activation key disabled
RLM_ACT_KEY_NO_HOSTID	-1031	Key not fulfilled on this hostid
RLM_ACT_KEY_HOSTID_REVOKED	-1032	Key revoked on this hostid
RLM_ACT_NO_FULFILLMENTS	-1033	No fulfillments to remove
RLM_ACT_LICENSE_TOOBIG	-1034	Generated license too long
RLM_ACT_NO_REHOST	-1035	Counted licenses can't be rehostable
RLM_ACT_BAD_URL	-1036	License Generator not found on server
RLM_ACT_NO_LICENSES	-1037	RLMCloud: No licenses found
RLM_ACT_NO_CLEAR	-1038	Unencrypted requests not allowed
RLM_ACT_BAD_KEY	-1039	Bad activation key (illegal char)
RCC_CANT_WRITE_FULFILL	-1040	RLMCloud: Can't write licf table
RCC_PORTAL_CANT_WRITE_FULFILL	-1041	RLMCloud: Can't write licf table
RLM_ACT_KEY_TOOMANY	-1042	Insufficient count left in activation key
RLM_ACT_SUB_BADTYPE	-1043	Subscription license not Nodelocked or Single
RLM_ACT_CONTACT_BAD	-1044	Contact information supplied is bad

***rlm_license_stat()* returns RLM_LICENSE errors and status. These are:**

Status	Value	Meaning	Full Description
0	0	Success	
RLM_EL_NOPRODUCT	-1	No authorization for product	rlm_checkout() did not find a product to satisfy your request.
RLM_EL_NOTME	-2	Authorization is for another ISV	The license you are requesting is in the license file, but it is for a different ISV.
RLM_EL_EXPIRED	-3	Authorization has expired	The only license available has expired. This error will only be returned for local license lines, never from a license server.
RLM_EL_NOTTHISHOST	-4	Wrong host for authorization	The hostid in the license doesn't match the hostid of the machine where the software is running.
RLM_EL_BADKEY	-5	Bad key in authorization	The signature in the license line is not valid, i.e. it does not match the remainder of the data in the license.
RLM_EL_BADVER	-6	Requested version	Your application tried to check out a license at a

		not supported	higher version than was available, e.g., you specified v5, but the available license is for v4.
RLM_EL_BADDATE	-7	bad date format - not permanent or dd-mm-yy	The expiration, start, or issued date wasn't understood, eg, 316-mar-2010 or 31-jun-2010. You'd probably never see this in the field unless somebody had tampered with the license file.
RLM_EL_TOOMANY	-8	checkout request for too many licenses	Your checkout request will never work, because you have asked for more licenses than are issued.
RLM_EL_NOAUTH	-9	No license auth supplied to call	This is an internal error.
RLM_EL_ON_EXC_ALL	-10	On excludeall list	The license administrator has specified an EXCLUDEALL list for this product, and the user (host, etc) is on it.
RLM_EL_ON_EXC	-11	On feature exclude list	The license administrator has specified an EXCLUDE list for this product, and the user (host, etc) is on it.
RLM_EL_NOT_INC_ALL	-12	Not on the includeall list	The license administrator has specified an INCLUDEALL list for this product, and you are not on it.
RLM_EL_NOT_INC	-13	Not on the feature include list	The license administrator has specified an INCLUDE list for this product, and you are not on it.
RLM_EL_OVER_MAX	-14	Request would go over license MAX	The license administrator set a license MAX usage option for a user or group. This checkout request would put this user/group/host over that limit.
RLM_EL_REMOVED	-15	License (rlm)removed by server	A license administrator removed this license using the rlmremove command or the RLM web interface.
RLM_EL_SERVER_BADRESP	-16	Unexpected response from server	The application received a response from the license server which it did not expect. This is an internal error.
RLM_EL_COMM_ERROR	-17	Error communicating with server	This indicates a basic communication error with the license server, either in a network initialization, read, or write call.
RLM_EL_NO_SERV_SUPP	-18	License server doesn't support this	
RLM_EL_NOHANDLE	-19	No license handle	No license handle supplied to an rlm_get_attr_xxx() call or rlm_license_xxx() call.
RLM_EL_SERVER_DOWN	-20	Server closed connection	The license server closed the connection to the application.
RLM_EL_NO_HEARTBEAT	-21	No heartbeat response received	Your application did not receive a response to a heartbeat message which it sent. This would happen when you call rlm_get_attr_health(), or automatically if you called rlm_auto_hb().
RLM_EL_ALLINUSE	-22	All licenses in use	All licenses are currently in use, and the user did

			not request to be queued. This request will succeed at some other time when some licenses are checked in.
RLM_EL_NOHOSTID	-23	No hostid on uncounted license	Uncounted licenses always require a hostid.
RLM_EL_TIMEOUT	-24	License timed out by server	Your application did not send any heartbeats to the license server and the license administrator specified a TIMEOUT option in the ISV server options file.
RLM_EL_INQUEUE	-25	In queue for license	All licenses are in use, and the user requested queuing by setting the RLM_QUEUE environment variable.
RLM_EL_SYNTAX	-26	License syntax error	This is an internal error.
RLM_EL_ROAM_TOOLONG	-27	Roam time exceeds maximum	The roam time specified in a checkout request is longer than either the license-specified maximum roaming time or the license administrator's ROAM_MAX_DAYS option specification.
RLM_EL_NO_SERV_HANDLE	-28	Server does not know this license handle	This is an internal server error. It will be returned usually when you are attempting to return a roaming license early.
RLM_EL_ON_EXC_ROAM	-29	On roam exclude list	The license administrator has specified an EXCLUDE_ROAM list for this product, and the user (host, etc) is on it.
RLM_EL_NOT_INC_ROAM	-30	Not on the roam include list	The license administrator has specified an INCLUDE_ROAM list for this product, and you are not on it.
RLM_EL_TOOMANY_ROAMING	-31	Too many licenses roaming already	A request was made to roam a license, but there are too many licenses roaming already (set by the license administrator ROAM_MAX_COUNT option).
RLM_EL_WILL_EXPIRE	-32	License expires before roam period ends	A roaming license was requested, but the only license which can fulfill the request will expire before the roam period ends.
RLM_EL_ROAMFILEERR	-33	Problem with roam file	There was a problem writing the roam data file on the application's computer.
RLM_EL_RLM_ROAM_ERR	-34	Cannot check out rlm_roam license	A license was requested to roam, but the application cannot check out an rlm_roam license.
RLM_EL_WRONG_PLATFORM	-35	Wrong platform for client	The license specifies platforms=xxx, but the application is not running on one of these platforms.
RLM_EL_WRONG_TZ	-36	Wrong timezone for client	The license specifies an allowed timezone, but the application is running on a computer in a different timezone.
RLM_EL_NOT_STARTED	-37	License start date in the future	The start date in the license hasn't occurred yet, e.g., today you try to check out a license containing start=1-mar-2030.

RLM_EL_CANT_GET_DATE	-38	time() call failure	The <i>time()</i> system call failed
RLM_EL_OVERSOFT	-39	Request goes over license soft_limit	This license checkout causes the license usage to go over it's soft limit. The checkout is successful, but usage is now in the overdraft mode. RLM_EL_OVERSOFT is also returned if you have a misconfigured token-based license and the server has gone into overdraft due to this. See the note in the token-based license restrictions section.
RLM_EL_WINDBACK	-40	Clock setback detected	RLM has detected that the clock has been set back. This error will only happen on expiring licenses.
RLM_EL_BADPARAM	-41	Bad parameter to rlm_checkout() call	This currently happens if a checkout request is made for < 0 licenses.
RLM_EL_NOROAM_FAILOVER	-42	Roam operations not allowed on failover server	A failover server has taken over for a primary server, and a roaming license was requested. Roaming licenses can only be obtained from primary servers. Re-try the request later when the primary server is up.
RLM_EL_BADHOST	-43	bad hostname in license file or port@host	The hostname in the license file is not valid on this network.
RLM_EL_APP_INACTIVE	-44	Application is inactive	Your application is set to the inactive state (with rlm_set_active(rh, 0), and you have called rlm_get_attr_health()).
RLM_EL_NOT_NAMED_USER	-45	User is not on the named-user list	You are not on the named user list for this product.
RLM_EL_TS_DISABLED	-46	Terminal server/remote desktop disabled	The only available license has Terminal Server disabled, and the application is running on a Windows Terminal Server machine.
RLM_EL_VM_DISABLED	-47	Running on Virtual Machines disabled	The only available license has virtual machines disabled, and the application is running on a virtual machine.
RLM_EL_PORTABLE_REMOVED	-48	Portable hostid removed	The license is locked to a portable hostid (dongle), and the hostid was removed after the license was acquired by the application.
RLM_EL_DEMOEXP	-49	Demo license has expired	Detached Demo [™] license has expired.
RLM_EL_FAILED_BACK_UP	-50	Failed host back up - failover server released license	If you application is holding a license from a failover server, when the main server comes back up, the failover server will drop all the licenses it is serving, and you will get this status.
RLM_EL_SERVER_LOST_XFER	-51	Server lost it's transferred license	Your license was served by a server which had received transferred licenses from another license server. The originating license server may have gone down, in which case, your server will lose the licenses which were transferred to it.

RLM_EL_BAD_PASSWORD	-52	Incorrect password for product	RLM_EL_BAD_PASSWORD is an internal error and won't ever be returned to the client - if the license password is bad, the client will receive RLM_EL_NO_SERV_SUPP
RLM_EL_METER_NO_SERVER	-53	Metered licenses require server	Metered licenses only work with a license server.
RLM_EL_METER_NOCOUNT	-54	Not enough count for meter	There is insufficient count in the meter for the requested operation.
RLM_EL_NOROAM_TRANSIENT	-55	Roaming not allowed	Roaming is not allowed on servers with transient hostids, ie, dongles.
RLM_EL_CANTRECONNECT	-56	Can't reconnect to server	On a disconnected handle, the operation requested needed to reconnect to the server, and this operation failed.
RLM_EL_NONE_CANROAM	-57	None of these licenses can roam	The license max_roam_count is set to 0. This will always be the case for licenses that are transferred to another server.
RLM_EL_SERVER_TOO_OLD	-58	Server too old for this operation	In v10, this error means that disconnected operation (rlm_init_disconn()) was attempted on a pre-v10.0 license server.
RLM_EH_SERVER_REJECT	-59	Server rejected client	Either the server is older than the oldest version allowed, or a generic server is used when the client specifies this is not allowed.
RLM_EL_REQ_OPT_MISSING	-60	Required option missing	A required option was set with the <i>rlm_set_req_opt()</i> call, and this string is not part of the license string. This error will only be reported for nodelocked licenses, the server will always report RLM_EL_NO_SERV_SUPP
RLM_EL_NO_DYNRES	-61	Reclaim can't find dynamic reservation	The license specified to be reclaimed cannot be found.
RLM_EL_RECONN_INFO_BAD	-62	Reconnection info invalid	This is generally an internal error.
RLM_EL_ALREADY_ROAMING	-63	License already roaming on this host	If you attempt to roam N licenses then later N+X licenses, you will receive this error. The original roam must be returned first.
RLM_EL_BAD_EXTEND_FMT	-64	Bad format for RLM_ROAM_EXTEND	RLM_ROAM_EXTEND format is product:date:extension_code
RLM_EL_BAD_EXTEND_CODE	-65	Bad extend code	Extension code does not verify correctly.
RLM_EL_NO_ROAM_TO_EXTEND	-66	No roaming license to extend	This is an attempt to extend a non-existent roaming license.
RLM_EL_NESTED_ALIAS	-67	Nested aliases	You cannot define an alias in terms of another alias

RLM_EL_NO_JSON	-68	No JSON in returned message	This is an internal error in web services processing with RLMCloud
RLM_EL_BAD_JSON	-69	Bad JSON in returned message	This is an internal error in web services processing with RLMCloud
RLM_EL_BADHANDSHAKE	-70	Bad handshake on web services checkout	This is an internal error in web services processing with RLMCloud
RLM_EL_HELPER_ERR	-71	rlm_helper error	This is an internal error in web services processing with RLMCloud

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Appendix C – RLM Example Client Program

This example program (rlmclient.c) is contained on the RLM kit in the *examples* directory.

```
/*
*****
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authorization from Reprise Software Inc.
*****
/*
Description: Test client for LM system
Usage: % sampleclient [product [count [version]]]
Return: None
M. Christiano
11/27/05
*/

#include "license.h"
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#ifdef _WIN32
#include <unistd.h>
#include <strings.h>
#endif /* _WIN32 */

static void printstat(RLM_HANDLE, RLM_LICENSE, const char *);

#ifdef x64_v1 /* No main on vxworks downloadable kernel modules, or argc/argv */
int sampleclient(char *product)
{
    char *argv[1];
    argv[0] = product;
    return main(1, argv);
}
#endif

int
main(int argc, char *argv[])
{
    RLM_HANDLE rh;
    RLM_LICENSE lic = (RLM_LICENSE) NULL;
    int x, stat;
    char *product, p[RLM_MAX_PRODUCT+1];
    int count = 1;
    const char *ver = "1.0";

    rh = rlm_init(".", argv[0], (char *) NULL);
    stat = rlm_stat(rh);

```

```

if (stat)
{
    char errstring[RLM_ERRSTRING_MAX];

    (void) printf("Error initializing license system\n");
    (void) printf("%s\n", rlm_errstring((RLM_LICENSE) NULL, rh,
                                      errstring));
}
else
{
/*
 *
 */
    Use the program name as the license name

    if ((product = strrchr(argv[0], (int) '/')) product++;
    else if ((product = strrchr(argv[0], (int) '\\')) product++;
    else product = argv[0];
    strncpy(p, product, RLM_MAX_PRODUCT);
    p[RLM_MAX_PRODUCT] = '\0';

/*
 *
 */
    Don't want .exe

    if ((product = strchr(p, '.')) *product = '\0';
    product = p;

/*
 *
 */
    If product name specified, override program name

    if (argc > 1) product = argv[1];
    if (argc > 2) count = atoi(argv[2]);
    if (argc > 3) ver = argv[3];
    lic = rlm_checkout(rh, product, ver, count);
    printstat(rh, lic, product);
}

(void) printf("Enter <CR> to continue: ");
x = fgetc(stdin);

if (lic)
{
#ifdef 0
/*
 *
 *
 *
 *
 *
 *
 *
 */
    rlm_checkin(lic);
#endif
    rlm_close(rh);
}
return(stat);
}

static
void
printstat(RLM_HANDLE rh, RLM_LICENSE lic, const char *name)
{
    int stat;
    char errstring[RLM_ERRSTRING_MAX];

    stat = rlm_license_stat(lic);
    if (stat == 0)
        (void) printf("Checkout of %s OK.\n", name);
    else if (stat == RLM_EL_INQUEUE)
        (void) printf("Queued for %s license\n", name);
}

```

```
else
{
    (void) printf("Error checking out %s license\n", name);
    (void) printf("%s\n", rlm_errstring(lic, rh, errstring));
}
}
```

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Appendix D – Example rlm_isv_config()

```
/*
*****
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for in said License Agreement except with the prior written
authorization from Reprise Software Inc.
*****
*/
/*
* Description: rlm_isv_config.c - configuration data for ISV
*
* M. Christiano
* 11/25/05
*
*/

#include "license.h"
#include "license_to_run.h"

/*
* Define "INCLUDE_RLMID1" to include support for RLMID1 dongles.
* Comment out to remove aladdin dongle support.
*
* Note: The RLMID1 dongle code is always included in
* your license server. This setting is only for your applications, and
* only needs to be set if you are issuing licenses that are nodelocked
* to a dongle.
*
* Including the RLMID1 dongle code increases the size of
* your applications by approx 900Kb on 32-bit windows, plus involves
* a small delay at application startup time, even if you are not using
* a dongle.
*
* If you are not planning to issue licenses which are node-locked to
* rlmid devices, Reprise Software recommends leaving these options turned
* off (ie, leave the "#if 0" on the next several lines).
*/

#if 0
#define INCLUDE_RLMID1
#endif

#ifdef INCLUDE_RLMID1
extern void _rlm_gethostid_type1(RLM_HANDLE, L_HOSTID);
#endif

void
rlm_isv_config(RLM_HANDLE handle)
{
/*
* Set ISV name
*
* NOTE: IF you are evaluating RLM, DO NOT change the ISV
* name, or your license keys will no longer work.
* For eval kits, the name on the next line MUST
* be "demo".
*/
}

```

```

*
* NOTE: Your ISV name is, in general, case-insensitive.
*       The ONLY exception to this is when it is used as
*       a lockfile name using a FLEXlm-compatible lockfile.
*       In this case (and this case only), the case of the
*       name you enter here is important. Note that even in
*       this case, ONLY THE LOCKFILE NAME uses the exact case
*       you enter - every other place in RLM uses a lowercase
*       version of this name.
*
* Beginning in RLM v7.0, your ISV name is contained in
* "license_to_run.h". If you need to alter the case of the
* name for a compatible FLEXlm lockfile, you should do it there
* and leave the next line as it is.
*/
    rlm_isv_cfg_set_name(handle, RLM_ISV_NAME);

/*
* Set RLM license - do not modify this line
*/
    rlm_isv_cfg_set_license(handle, RLM_LICENSE_TO_RUN);

/*
* Set oldest allowed server version.
*
* The next setting controls the oldest RLM license server
* version with which your application will work.
*
* The 3 parameters are rlm version, revision, and build (in
* that order).
*
* If you leave this set to 0, 0, 0, your application will
* attempt to work with the oldest available RLM server.
*
* You should only set this if you are concerned with an older
* server in the field which has been hacked, otherwise, you should
* leave it set to 0, 0, 0.
*
* (Note: Do not set this to anything between 0,0,0, and
* 9,0,0). Servers older than v9.0 will appear to be v0.0)
*/
    rlm_isv_cfg_set_oldest_server(handle, 0, 0, 0);

/*
* Set ISV server settings file compatibility
*
* The next setting controls what versions of RLM your
* ISV server settings file will work with. You can enable
* it for all earlier versions (> v6), or later versions or both.
* The 2nd parameter enables earlier versions if non-zero, the
* 3rd parameter enables later versions if non-zero. Note that
* "earlier" and "later" are relative to the version of your
* settings file. So, if you create the settings file with RLM v8,
* "earlier" means v6 and v7, while "later" means v9 and above.
*
* default is: rlm_isv_cfg_set_compat(handle, 0, 1); - sets compatibility
*             with later versions, but not earlier ones.
*/
    rlm_isv_cfg_set_compat(handle, 0, 1);

/*
* Setup virtual machine enable/disable.
*
* By default (if you do not modify the following call), RLM

```

```

*      will refuse to run a license server on a virtual machine.
*
*      You can always enable a particular virtual machine by issuing
*      an "rlm_server_enable_vm" license for that machine.
*
*      If you want license servers to run on all virtual machines, set
*      the 2nd parameter of the next call to a non-zero value.
*
*/
    rlm_isv_cfg_set_enable_vm(handle, 0);

/*
*      Beginning in RLM v10.0, roaming is disabled for servers that
*      use transient hostids (ie, dongles, or ISV-defined transient hostids).
*      If you want to enable roaming on these servers, set the 2nd
*      parameter of the next call to 1.
*/
    rlm_isv_cfg_set_enable_roam_transient(handle, 0);

/*
*      Beginning in RLM v10.0, you have the option of turning ROAMED
*      licenses into "single" licenses. Prior to RLM v10.0, all ROAMED
*      licenses were nodelocked, uncounted.
*      If you want your roamed licenses to be "single" licenses, set the
*      second parameter of the next call to 1.
*/
    rlm_isv_cfg_set_roam_single(handle, 0);

/*
*      FLEXlm(R)-style lockfile compatibility.
*
*      Set to non-zero to use a FLEXlm-style lockfile. For windows
*      systems, a value of 1 uses the 'C' drive always, whereas a
*      value > 1 will use the system drive. FLEXlm (up to version
*      10.3, at least) puts the lockfile on the 'C' drive.
*
*      Reprise Software recommends setting this to 1 if you want to
*      use FLEXlm-compatible lockfiles.
*/
    rlm_isv_cfg_set_use_flexlm_lockfile(handle, 0);

/*
*      The Windows disk serial number hostid code can return hostids
*      that are usable only by processes running with admin rights if
*      running with admin privileges. If an application is installed
*      and a license activated by an admin user, it's possible that
*      a non-admin user will not be able to use the application because
*      it can't read the disk serial number. Beginning in RLM v10.0,
*      you can disable the use of disk serial number hostids that are
*      usable by admins only. If you want to do so, change the second
*      parameter of the next function to 0.
*/
#ifdef _WIN32
    rlm_isv_cfg_set_use_admin_disksns(handle, 1);
#endif

/*
*      Beginning in RLM v10.0, RLM's license transfer capability also
*      allows for disconnected operation on the destination server.
*      This capability only requires that an "rlm_roam" license be
*      present on the destination server. You can ship an rlm_roam
*      license to your customer and have them install it on every
*      destination server, or you can simply put it into the next
*      call, in which case, no separate license file will be needed
*      on the destination license server.
*
*      To enable this, set the 2nd parameter of the next call to a valid,
*      signed rlm_roam license (enclosed in "<>") in place of the
*      last argument. This license should be a static string

```

```

*      which is available for the lifetime of the server.
*
*      This license MUST have the following parameters:
*          version: "1.0"
*          exp: "permanent"
*          count: "uncounted"
*          hostid: "any"
*          NO other parameters
*
*      for example:
*
*          rlm_isv_cfg_set_server_roam(handle, "<LICENSE your-isvname rlm_roam 1.0
uncounted hostid=any sig=xxxxxxx>");
*/
    rlm_isv_cfg_set_server_roam(handle, (char *) 0);

/*
*      Beginning in RLM v10.0, RLM can broadcast to find a license
*      server as a last resort, if all the normal methods to find
*      the server fail. This capability is enabled by default.
*
*      To disable this, set the 2nd parameter of the next call to 1.
*/
    rlm_isv_cfg_disable_broadcast(handle, 0);

/*
*      Beginning in RLM v11.0, the client can specify that
*      it will not use a generic license server (i.e., rlm + a
*      settings file).
*      If you want to disable generic servers, set the 2nd
*      parameter of the next call to 1.
*      If you disable generic servers and your application
*      attempts to connect to a generic server, it will
*      receive an RLM_EH_SERVER_REJECT error upon connection
*      or an RLM_EL_SERVER_REJECT upon license checkout.
*      The text error message is "Server rejected client".
*
*      Pre-v11 clients will get a "Communications error with
*      license server (-17), Connection refused at server (-111)"
*      error in this case.
*/
    rlm_isv_cfg_disable_generic_server(handle, 0);

/*
*      Beginning in RLM v10.1, licenses can be cached on the client
*      side with the use of the "client_cache" license attribute.
*      This capability must be enabled with the following call.
*      If the 2nd parameter is 1, client caching is enabled, if 0,
*      caching is disabled.
*/
    rlm_isv_cfg_enable_client_cache(handle, 1);

/*
*      Beginning in RLM v10.1, license servers can return one
*      valid license to the application which is then verified on
*      the client side. This check helps ensure that the license
*      server hasn't been modified. To enable this checking set
*      the second parameter of the next call to 1. If you enable
*      this, please read the section titled "Server Integrity Checking"
*      in the "Securing Your Application" section of the Reference
*      Manual so that you understand the errors which can be generated
*      as a result of this call and how you should proceed.
*/
    rlm_isv_cfg_enable_check_license(handle, 0);

/*
*      Beginning in RLM v11.0, you can specify which types of
*      hostids that Activation Pro will accept from an activation

```

```

*      request.  Prior to v11.0, the only 6 types of acceptable
*      hostids were: rehostable, isv-defined, rlmid, ethernet,
*      disk serial numbers and native 32-bit hostids.
*      In the following call, you can set the default hostids that
*      your Actpro server will accept.  To get the pre-v11 behavior,
*      set the 2nd parameter as shown.  Hostid type definitions in license.h
*
*/
#ifdef 0
{
    int allowed_types =  RLM_ACTPRO_ALLOW_REHOST | RLM_ACTPRO_ALLOW_ISV |
                        RLM_ACTPRO_ALLOW_ISVDEF | RLM_ACTPRO_ALLOW_RLMID |
                        RLM_ACTPRO_ALLOW_ETHER | RLM_ACTPRO_ALLOW_DISKSN |
                        RLM_ACTPRO_ALLOW_32 | RLM_ACTPRO_ALLOW_UUID |
                        RLM_ACTPRO_ALLOW_ASH;
    rlm_isv_cfg_actpro_allowed_hostids(handle, allowed_types);
}
#endif

/*
*      Beginning in RLM v11.2, license servers can utilize
*      Alternate Server Hostids.  These hostids are activated
*      from Activation Pro by the ISV server, which needs to
*      know the URL of the activation server.
*      If you use Reprise's hosted activation service, the default
*      (hostedactivation.com) is correct.  For all others, set your
*      activation server url here.  Note that this URL pointer must
*      remain valid as long as the RLM_HANDLE is in use.
*/
/**/ rlm_isv_cfg_set_url(handle, "hostedactivation.com"); /**/

/*
*      Rehostable hostids do two checks at verification time which
*      fail on certain systems.  These checks are:
*      - checking the file ID of each file in the rehostable hierarchy, and
*      - checking the native hostid of the system
*
*      The file ID check fails on Windows systems if drives are added or
*      removed from the controller.
*      We have seen the native hostid change on Centos systems when the
*      network cable is unplugged.
*
*      Beginning in RLM v12.3, you can disable one or both of these
*      checks by setting the second parameter of the two following
*      calls to 1.  The default behavior remains the same as in
*      previous versions of RLM.
*/
rlm_isv_cfg_disable_windows_fileid_check(handle, 0);
/* 0 -> check, <>0 -> no check */
rlm_isv_cfg_disable_reference_hostid_check(handle, 0);
/* 0 -> check, <>0 -> no check */

/*
*      Roam extension is a new feature in RLM v12.3, and it is disabled
*      by default.  If you enable it, be aware that the max_roam setting
*      from your rlm_roam license will NOT be honored for a roam extension,
*      only the max_roam setting of the license which is roaming.  This means
*      that if you use max_roam on the rlm_roam license to limit roaming
*      duration on your licenses, it will not be effective for any roam
*      extension.  The default max_roam on any license is 30 days, so this
*      may or may not be an issue for you.
*
*      To enable roam extensions, set the 2nd parameter of the next call
*      to 1.  If you use a server settings file, you must re-generate the
*      settings file with your v12.3 kit, otherwise, the roam extension will
*      not appear in the RLM web interface.
*/
rlm_isv_cfg_enable_roam_extend(handle, 0);

```



```

*      New in v12.4, the RLM web services API (used with RLMCloud) has an
*      isv-defined server handshake function.  To use this, specify the 2
*      parameters to the server-side of the algorithm here.  P1 and P2 are
*      any 32-bit non-zero positive numbers, ie, > 0 and <= 0x7fffffff
*      Avoid long sequences of 0's or 1's in P1.
*
*      This handshake algorithm is separate from the normal RLM client-
*      server handshake, and these parameters will not affect non-web-
*      services handshakes.
*
*      NOTE: CHANGE THE DEFINITIONS of P1/P2 that appear here.
*/
#define P1 0x39a74d25
#define P2 0xa9d75
    rlm_isv_cfg_set_isv_handshake(handle, P1, P2);

/*
*      Prior to RLM v12.4, if you enabled the check for server licenses
*      by calling rlm_isv_cfg_enable_check_license(handle, 1), connections
*      to the license server would fail if the license either contained new
*      keywords or was invalid.  In v12.4 and later, you can cause the
*      connection to succeed and retrieve the status later.  To do this,
*      set the 2nd parameter of the next call to a non-zero value.  After
*      connecting, you can call rlm_get_attr_checked_license() on the handle.
*      rlm_get_attr_checked_license will return 0 for success or either
*      RLM_NO_SERVER_LIC, RLM_LIC_NEW_KEYWORDS or RLM_LIC_BAD.
*/
    rlm_isv_cfg_no_server_license_fail(handle, 0);
                                     /* 0 -> check, <>0 -> no check */

/*
*      In RLM v14.0, transport to the license server can be over HTTPS.
*      If you are enabling this capability (available on RLMCloud only),
*      you need to set the "promise" value that is used on the RLMCloud
*      helper which connects to the license server.  You can make this
*      call here, and anywhere in your application.  The default is
*      set to 10 minutes here, which means you need to send heartbeats
*      to the server every 5-7 minutes to avoid the license being
*      reclaimed automatically.  The promise value is in minutes.
*/
    rlm_isv_cfg_set_promise(handle, 10);

/*
*      Beginning in RLM v14.0, you can disable certain RLM hostid types.
*      In the following call, you can set the hostids that your product
*      (or license server) will NOT accept.  If the 2nd parameter of this
*      call is 0, all RLM hostids are allowed.
*
*      OR the values of the hostids you want to disable into a single
*      integer and pass this as the 2nd argument.  For example:
*
*          int disable = RLM_DISABLE_H_USER | RLM_DISABLE_H_HOST;
*          rlm_isv_cfg_disable_hostids(handle, disable);
*
*      The bitmasks for Hostid Types that can be disabled are (in license.h also):
*          RLM_DISABLE_H_32BIT    RLM_DISABLE_H_STRING    RLM_DISABLE_H_ETHER
*          RLM_DISABLE_H_USER     RLM_DISABLE_H_HOST      RLM_DISABLE_H_IP
*          RLM_DISABLE_H_ANY      RLM_DISABLE_H_DEMO      RLM_DISABLE_H_SN
*          RLM_DISABLE_H_RLMID1   RLM_DISABLE_H_RLMID2   RLM_DISABLE_H_GC
*          RLM_DISABLE_H_DISKSN   RLM_DISABLE_H_IPV6     RLM_DISABLE_H_UUID
*/
    {
        int disable = 0;          /* Disable nothing, ie, pre-v14 behavior */
        rlm_isv_cfg_disable_hostids(handle, disable);
    }

/*
*      To include RLMID1 dongle code, be sure INCLUDE_RLMID1 is defined above.
*/

```

```
#ifdef INCLUDE_RLMID1
    rlm_isv_cfg_set_use_hostid(handle, RLM_HOSTID_RLMID1,
                                _rlm_gethostid_type1);
#endif
}
```

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Appendix E – RLM Hostids

RLM supports several different kinds of identification for various computing environments, as well as some generic identification which are platform-independent.

RLM's host identification (hostid) types are:

hostid type	meaning	example	Platform Support	# of instances in RLM client	Notes
ANY	runs anywhere	ANY	all	1	
DEMO	runs anywhere for a demo license	DEMO	all	1	
serial number	runs anywhere	sn=123-456-789	all	1	used to identify a license, equivalent to string, any string up to 64 characters long
32	32-bit hostid, native on Unix, non X86 based platforms, System Drive Volume Serial Number on Windows	10ac0307	all	1	<i>should not be used on Linux or Mac</i>
disksn (see note below)	Disk hardware serial number	disksn=WD-WX60AC946860	windows	1	<i>Introduced in RLM v9.2</i>
gc	Google Compute Engine	gc=3797742226458986650.k6qt9v5h38w2adwqgc9fdhdf3w0m761p	Linux	0	Introduced in RLM v11.1 See note below.
ip (or internet)	TCP/IP address	ip=192.156.1.3	all	5	always printed as "ip=" (wildcards allowed starting in v3.0, see notes)
ether (See note below)	Ethernet MAC address	ether=00801935f2b5	windows, mac, linux	5	always printed without leading "ether="
rlmid1	External Key or Dongle	rlmid1=9a763f21	Windows, linux	6 (total of all rlmids)	USB Dongle. Always enabled in ISV license server. See Appendix F – Optional Hostid Installation Instructions on page 256 for details on building your software as well as extra software you need to ship with your product.
uuid	BIOS uuid	uuid=699A4D56-58BF- 1C83-D63C-27A8BEB8011A	Windows, 64-bit mac	1	
user	User name	USER=joe	all	1	case-insensitive
host	Host name	host=melody	all	1	Case-insensitive (wildcards allowed starting in v9.4 – see notes)
isv	ISV-defined string	isv=abc123	all	1	The contents of the isv-defined string (as set by <code>rlm_set_envron()</code>), is used as the hostid. New in v11.3.

To determine the hostid of a machine, use the hostid type from the table above as input to the *rlmhostid* command:

rlmutil rlmhostid *hostid type*

For example:

rlmutil rlmhostid 32

or

rlmutil rlmhostid internet

Note that rlmhostid will not return a string or serial number hostid type, since these values are unrelated to any particular computer - they are simply values that the ISV creates to differentiate licenses.

When an application requests a license from a license server, it will transmit the hostid information from the local machine to the license server, so that the server can process node-locked licenses without additional queries to the application. The application will transmit a maximum of 25 different hostids:

- one 32-bit hostid, if present on this platform
- up to 5 IP addresses (ip=)
- up to 5 ethernet MAC addresses (ether=)
- up to 6 RLMID portable hostids
- a minimum of 3 ISV-defined hostids (usually more, but guaranteed to be at least 3)

A Note about Windows Ethernet hostids

Some interfaces on Windows systems have Ethernet MAC addresses which are undesirable for use as hostids because they are transient, i.e. not always available. These include wireless interfaces, virtual interfaces like VPNs, etc.

On Windows, RLM looks for keywords in the device description to decide what interfaces are undesirable. Licenses can be locked to these interfaces if necessary, as it might be that only undesirable interfaces exist on a given machine. However, When RLM generates a list of MAC addresses on a Windows machine, it orders the list such that the undesirables are at the end of the list. So the first hostid printed by rlmhostid, and the one returned by rlm_hostid() will be the best one available on that Windows system.

A Note about Windows disksn hostids

Some disk serial numbers on Windows are only accessible to a process running with admin privileges. To disable use of disk serial numbers that only admins can use, see the call to `rlm_isv_cfg_set_use_admin_disksns()` in `rlm_isv_config.c`.

A note about Google Compute Engine, and the gc= hostid type

NOTE: license servers cannot serve nodelocked licenses that are locked to gc hostids

The gc= hostid type is determined via a call to an http server. As such, RLM makes an effort to avoid the calls which could take a while to process if the application is not running on google compute engine (Note that RLM first attempts to determine that it is running on google compute engine before making the http calls, but this determination can yield a false positive). This means that RLM clients will not attempt to determine the gc hostid unless they are processing a nodelocked license that is locked to this hostid type. The practical result of this is that ***license servers cannot serve nodelocked licenses that are locked to gc hostids***, since the client will not transmit this hostid type to the server.

If the RLM algorithm to determine that it is running on google compute engine does not detect google compute engine for any reason, you can set the RLM_GOOGLE_CLOUD environment variable (to any value) to indicate to RLM that it is running on Google Compute Engine.

Misc notes:

Note: The RLMID series of hostids are optional products, and will often require other software to be installed on the system on which they are to be used. For these devices, see Appendix F – Optional Hostid Installation Instructions, on page 256.

Note: Beginning in RLM v3.0, IP address hostids can contain the wildcard (*) character in any position to indicate that any value is accepted in that position.

Note: Beginning in RLM v9.4, a wildcard may be used in the host type hostid, for example: "hostid=host=*.stanford.edu" or "hostid=host=*.reprisessoftware.com"

Disabling standard RLM Hostids

You can disable certain hostid types in your application in `rlm_isv_config.c`. *Note that `rlmsign` will sign licenses with disabled hostid types.* In your application, if this hostid type appears in a signed license file, `rlm_checkout()` will return `RLM_EL_NOTTHISHOST`. Your license server will log lines similar to these (in this case, we disabled the HOST hostid type, `RLM_DISABLE_H_HOST`):

```
06/14 14:44 (reprise) Wrong Hostid - licenses may not be available
```

```
06/14 14:44 (reprise) (expected: host=zippy, we are: invalid)
```

To disable hostids, modify `rlm_isv_config.c` as follows:

set the hostids that your product (or license server) will *not* accept. Create a bitmask of the hostid types you do *not* want to support, and pass this as the 2nd parameter to `rlm_isv_cfg_disable_hostids()`. If this parameter is 0, all RLM hostids are allowed.

For example, say that you want to disable HOST and USER hostid types:

```
int disable = RLM_DISABLE_H_USER | RLM_DISABLE_H_HOST;  
  
rlm_isv_cfg_disable_hostids(handle, disable);
```

The bitmask values for disabling various hostid types are in `license.h`, and are here:

- `RLM_DISABLE_H_32BIT`
- `RLM_DISABLE_H_STRING`
- `RLM_DISABLE_H_ETHER`
- `RLM_DISABLE_H_USER`
- `RLM_DISABLE_H_HOST`
- `RLM_DISABLE_H_IP`
- `RLM_DISABLE_H_ANY`
- `RLM_DISABLE_H_DEMO`
- `RLM_DISABLE_H_SN`
- `RLM_DISABLE_H_RLMID1`
- `RLM_DISABLE_H_RLMID2`
- `RLM_DISABLE_H_GC`

- RLM_DISABLE_H_DISKSN
- RLM_DISABLE_H_IPV6
- RLM_DISABLE_H_UUID

RLM Hostid Security

RLM hostids have varying levels of security. We describe these levels as:

- minimal (min) - the hostid works anywhere - nothing is required to run on any machine
- low - the hostid is locked, but the data it is locked to is easily changable, and in fact, the data is meant to be changed and changing it is fully documented. (in the case of Windows 32-bit hostids, which are the volume serial number, PC manufacturers often create batches of PCs with the same volume serial number).
- standard (std) - the hostid is locked to something which is not designed to be changed. Changing this requires some kind of hacking software, which may or may not be easily obtainable.

The following table shows RLM hostids and their security levels:

hostid type	security level	Notes
ANY	min	
DEMO	min	
32 (or long)	low or std	Depends on the platform, see table below
diskid	std	
gc	std	
ip (or internet)	low	
ether	std	
rlmid1	std	
user	min	
host	min	

The following table lists the security level of the 32-bit hostid type, by platform:

Platform	32-bit hostid security
hp_h1	std
hp64_h1	std
ibm_a1	std
ibm64_a1	std
x86_11, x86_12	low
ppc64_11	low
x64_11	low
x86_m1	low

Platform	32-bit hostid security
x64_m1	low
ppc_m1	low
x64_s1	std
sun_s1	std
x64_s1	std
x86_w3/4	low
x64_w3/4	low

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Appendix F – Optional Hostid Installation Instructions

Certain hostids in the RLMID family (RLMID1) require device-specific installation on the target computer. These instructions must be passed on to your customer's license administrator in order for them to use the device. The RLMid1 device is a hardware key manufactured by Aladdin Knowledge Systems (now SafeNet, Inc).

Installing RLMid1 Devices on Windows

Installation on a target system can be accomplished in two ways:

- use Windows "Found New Hardware" to automatically load the drivers (preferred), or
- use the RLMID1 driver installer (from the Reprise Software website) to do the driver installation

Installation using the Found New Hardware Wizard

In order to use Windows to automatically do the driver installation, simply plug the device into the computer, and Windows will detect the new device. You will get the "Found New Hardware" wizard which will install the drivers for the "USB Protection Device" for you, as shown below:



Next, select "Install the Software Automatically (recommended)", and click "Next". Windows will locate the driver and install it. You will then get the "Completing the Found New Hardware Wizard" shown on the right; click "Finish".

That is all there is to it.



Installation using the driver installer.

If for some reason Windows fails to update the driver automatically, or if the target system is not connected to the internet, use the driver installer located at:

<http://www.reprisesoftware.com/drivers/rlmid1.zip>

you can also download the driver directly from the SafeNet site:

ftp://ftp.aladdin.com/pub/hasp/Sentinel_HASP/Runtime_%28Drivers%29/Sentinel_HASP_Runtime_setup.zip

Unzip the installer and run it on the target system.

Note that an RLMID1 device can be used by any RLM-licensed application on the system, in other words, there is nothing ISV-specific about the device.

Installing RLMid1 Devices on Linux

To install the necessary drivers for RLMid1 devices on linux, follow these steps:

1. Browse to <http://sentinelcustomer.safenet-inc.com/sentineldownloads/>. Look for the "Sentinal HASP/LDK Rutime Installer" for Linux. There are several options, depending on Linux variant and the style of installer you want (GUI, RPM, script).
2. Download the appropriate installer and install. Note that you will have to execute the installation as root.

The runtime installer sets up a daemon that is used to access the hardware key.

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Appendix G - Release Notes

Release Notes - RLM v14.0BL1 August 30, 2019

This is the first BETA release of v14.0.

V14.0 is available on Mac, Windows, Linux (intel), and Solaris platforms.

Note: RLM is no longer supported on NetBSD, v12.1 is the last supported version.

Note: the old (file-based) internet activation product is no longer supported.

Note: The fix for P532 necessitated a change to the server's roam file name.

Roaming isn't supported between RLM versions, but sometimes worked. It will not work across pre-v14 and v14 servers.

Note: failover servers are not supported on HP/UX, AIX, or IBM Power Linux systems.

Dynamic reservations are not supported on Sparc Solaris systems.

This release fixes bugs P520-P535.

For each bug, we will indicate which RLM components need to be updated for the bug fix. This indication will be of the form:

Fix requires: server

or

Fix requires: rlm, settings

This indication will list one or more of the following:

- client - meaning you have to re-build your application.
- rlm - meaning you need a new rlm binary (ie, you have nothing to re-build)
- server - meaning you need a new rlm binary if you use the generic ISV server settings file, or a new ISV server if you use an ISV-specific server binary.
- settings - meaning you need a new ISV server settings file.
- actpro server - meaning you need a new activation pro server.

Known Issues in this release

On Windows, the Activation Pro setup procedure sometimes does not set the file modes correctly. Once your Activation Pro files are set up, follow the procedures in the "Security Considerations" section of the manual in the "Activation Pro Setup" chapter.

On Windows 7, there is an optional Skype add-on to Firefox that interferes with the operation of some TiddlyWiki pages. To ensure that the RLM documentation can be displayed properly within Firefox (on Windows 7), the Skype Add-on should not be installed.

For an up-to-date list of issues, see:

<http://www.reprisesoftware.com/publisher/licensing-software-issues.php>

Note: The documentation is contained in 5 manuals:

Standard RLM Components

* RLM Getting Started Guide - an introduction to the basic concepts of

- license management and RLM (PDF)
- * RLM Reference Manual - the complete reference to all core RLM components (PDF)
- * RLM License Administration Manual - The stand-alone License Administration manual, suitable for shipment to your customers (Wiki)

Optional RLM Components

- * RLM Activation Pro Getting Started Guide - an introduction to the RLM Activation Pro software (PDF)
- * RLM Activation Pro Manual - Reference for the Optional RLM Activation Pro software (PDF)

All manuals are in PDF format, and are available on the Reprise Website at:
http://www.reprisesoftware.com/kits/RLM_Getting_Started_Guide.pdf
http://www.reprisesoftware.com/kits/RLM_Reference.pdf

http://www.reprisesoftware.com/kits/RLM_Activation_Pro_Getting_Started_Guide.pdf
http://www.reprisesoftware.com/kits/RLM_Activation_Pro.pdf
http://www.reprisesoftware.com/kits/RLM_License_Administration.pdf

What's new

(See the reference manual for complete descriptions)

- RLM clients can now communicate with RLMcloud using HTTPS. See Using RLM with HTTPS on page 158 for more information.
- You can now disable certain hostid types in your application with the `rlm_isv_cfg_disable_hostids()` call in `rlm_isv_config.c`. See Appendix E . RLM Hostids on page 249 for more information.
- Prior to RLM v14.0, there were several license keywords which could not be set to a 0 value: `client_cache`, `hold`, `host_based`, `max_roam`, `min_checkout`, `min_timeout`, `named_user`, `soft_limit`, and `user_based`. Setting any of these to 0 would cause a syntax error in the license generator. These parameters can now all be set to 0 (which is the default, and if set to 0, the keyword doesn't appear in the license.) This is useful in Activation Pro, in case you want to have a non-zero default value in the product definition and override that to 0 (the RLM default) in the activation key.
- ASH licenses now support a 4th checktype: "6hour". The activation server is checked every 6 hours with this type. This type operates identically to `.daily.`, except the check is done every 6 hours after server startup, rather than at midnight. See Alternate Server Hostids on page 144 for more information.

New License Keywords

- None.

API additions

- `rlm_isv_cfg_disable_hostids()`. See Appendix E - RLM Hostids on page 249 for more information.

API changes

- `rlm_isv_cfg_disable_hostids()`. See Appendix E - RLM Hostids on page 249 for more information.

Options file changes

- None.

Activation changes

- RLM Activation Pro has new features. Please see the Activation Pro manual for details.

Problems fixed in this release

This release fixes bugs P520-P535.

- P520 - In Activation Pro, if any fulfillments are deleted from a subscription key, the key will be immediately re-enabled to be fulfilled. This is fixed in v13.0BL2-p2/v14.0BL1. Fix affects: actpro GUI
- P521 - If a client with a wound-back clock roams a license, it succeeds. But the roamed license is unusable due to clock windback. This is fixed in v14.0BL1. Fix affects: client
- P522 - In actpro, if an activation key is selected in the search box on the fulfillments screen, a mysql query error results if any fulfillments belong to a reseller. This is fixed in v13.0BL2-p3/v14.0BL1. Fix affects: actpro GUI
- P523 - If RLM_ROAM is set to a value > max_roam, and a license is checked out with rlm_checkout_product(), the client receive the RLM_EL ROAM_TOOLONG error (-27), but the server checks out the license, making it unusable. This is fixed in v14.0BL1. Fix affects: client
- P524 - In actpro, if an activation key has only revoked fulfillments, and "Delete keys with revoked fulfillments" is selected from the admin->database tab, the keys will not be deletable if you search for a specific key in the search box. This is fixed in v13.0BL2-p4/v14.0BL1. Fix affects: actpro GUI
- P525 - In actpro, if a portal user is created for a contact, and then the contact is subsequently deleted, the portal user can then see all activation keys (and fulfillments/etc) that have no company assigned. This is fixed in v13.0BL2-p5/v14.0BL1. Fix affects: actpro GUI
- P526 - For ASH licenses, even though there is a daily tolerance, the server will reject the license on the first midnight reread if the transaction with the activation server fails. This is fixed in v14.0BL1. Fix affects: server
- P527 - In the java API, if rlmAvailableProducts() returns > 1 product, when the RlmAvailableProducts instance is finalized it causes a double free of the underlying RLM_PRODUCTS struct. This is fixed in v14.0BL1. Fix affects: Java client
- P528 - Non-Latin characters in username do not display correctly in the rlm web interface. This is fixed in v14.0BL1. Fix affects: windows client, server
- P529 - In RLMCloud, if you edit a server (for example, to change the password or contact), you are prompted to change the server machine even though it is the same. Doing so may cause the server to disappear. This was fixed on Apr 3, 2019 in v13.0BL2-p2. Fix affects: RLMCloud GUI.

- P530 - Machines with flash drives plugged in will be falsely identified as virtual machines.
This is fixed in v14.0BL1. Fix affects: client, server.
- P531 - In activation pro, the activation key defaults form has blank entries. These blank entries aren't part of the key, however.
This is fixed in v13.0BL2-p6/v14.0BL1. Fix affects: actpro GUI.
- P532 - If a server is serving 2 separate but nearly identical license pools, and a license is roamed from one, when the server is restarted each pool has the roamed license decremented from it's count
This is fixed in v14.0BL1. Fix affects: server.
Note that the fix for P532 necessitated a change to the server's roam file name. Roaming isn't supported between RLM versions, but sometimes worked. It will not work across pre-v14 and v14 servers.
- P533 - In activation pro, duplicate entries appear in the badhost table.
This is fixed in v14.0BL1. Fix affects: actpro license generator.
- P534 - The Alternate Server Hostid "startup" check did a check every night at midnight. This is fixed in v14.0BL1. Fix affects: server
- P535 - If the license server is started without a reportlog, then a reportlog is specified and a reread is done, the new reportlog does not have INUSE records. This is fixed in v14.0BL1. Fix affects: server

Platforms Supported

Linux on X86: redhat v9 (x86_l2)
Linux on x64: 64-bit fedora core linux (x64_l1)

Solaris32 on Sparc (sun_s1)
Solaris64 on Sparc (sun64_s1)
Solaris64 on Opteron (x64_s1)

Windows 32-bit - Visual Studio 2010 (x86_w3)
Windows 32-bit - Visual Studio 2015 (x86_w4)
Windows 64-bit - Visual Studio 2010 (x64_w3)
Windows 64-bit - Visual Studio 2015 (x64_w4)

Mac OS/X intel (x86_m1)
Mac OS/X intel 64-bit (x64_m1)

RLM Build environment

arm9_l1:
gcc version 4.6.3 (Ubuntu/Linaro 4.6.3-1ubuntu5)

sun_s1, sun64_s1:
SunOS 5.9 Generic sun4u sparc SUNW,Ultra-5_10
cc: Sun C 5.8 2005/10/13

x64_l1
Linux 2.6.15-1.2054_FC5 #1 SMP Tue Mar 14 15:48:20 EST 2006 x86_64 x86_64 x86_64 GNU/Linux
gcc version 4.1.0 20060304 (Red Hat 4.1.0-3)

x64_m1:
Darwin 9.6.0 Darwin Kernel Version 9.6.0: Mon Nov 24 17:37:00 PST 2008;
root:xnu-1228.9.59~1/RELEASE_I386 i386
gcc version 4.0.1 (Apple Inc. build 5465)

x64_s1
SunOS 5.10 Generic_147148-26 i86pc i386 i86pc
cc: Sun C 5.8 2005/10/13

x64_w3

Microsoft Visual Studio 2010

x64_w4
Microsoft Visual Studio 2015

x86_i2:
Linux 2.4.20-6smp #1 Thu Feb 27 09:59:40 EST 2003 i686 i686 i386 GNU/Linux
gcc version 3.2.2 20030222 (Red Hat Linux 3.2.2-5)

x86_m1:
Darwin 8.5.3 Darwin Kernel Version 8.5.3 Fri Feb 17 15:59:40 PST 2006;
root:xnu-792.9.11.obj~1/RELEASE_I386 i386 i386
gcc version 4.0.1 (Apple Computer, Inc. build 5250)

x86_w3:
Microsoft Visual Studio 2010

x86_w4:
Microsoft Visual Studio 2015

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Appendix H - Frequently-Asked Questions

Reprise Software maintains a list of frequently-asked questions on our website. For the current list of Frequently-Asked Questions, please see our website.

For ISVs, see the FAQ at our support site at:

<http://www.reprisesoftware.com/publisher/license-management-faq.php>

For License Administrators, see the License Administrator FAQ at

<http://www.reprisesoftware.com/admin/software-licensing-faq.php>

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Appendix I - RLM version history

This section describes the various versions of RLM, and the features added in each version.

V14.0 – November, 2019

Features Added
HTTPS support for RLMCloud
<code>rlm_isv_cfg_disable_hostids()</code>
<code>client_cache</code> , <code>hold</code> , <code>host_based</code> , <code>max_roam</code> , <code>min_checkout</code> , <code>min_timeout</code> , <code>nnamed_user</code> , <code>soft_limit</code> , and <code>user_based</code> can all now be set to 0 in a license to be signed.
ASH licenses support “6hour” check type
RLM Web services API now supports reservation type/strings/seconds and username/password
RLM web interface license usage now also displays license pool status
Activation Pro features:
Fulfillments tab displays activation host name
Fulfillment tab allows selection by notes field
Product definitions now have a notes field
Activation keys can be cloned
GUI no longer accepts relative license expiration date for subscription type keys
Customer browser displays activation keys as well as customer info
Timezone can be set on <code>hostedactivation.com</code>
Support for “6hour” ASH check
<code>rlm_activate()</code> allows specification of company/contact info

V13.0 – February, 2019

Features Added
UUID support on 64-bit Mac
<code>rlmstat -f</code> option for extended information
License server authentication of clients
<code>rlm_product_named_user_count()</code> call
Hostname added to web server activation confirmation page
<code>rlm_product_meter_counter()</code> , <code>rlm_license_meter_counter()</code> calls
<code>rlm_product_start()</code> call

“Activate License” in web interface controlled by edit_options privilege.
Activation Pro features:
Reseller support
Customer portal now part of standard URL – no configuration required
Customer portal accounts can be created in the “add customer” form
Option to blank the remote_host parameter (for GDPR compliance)
Admin “check database” command creates blank entries in the keyf table so the “Unfulfilled Keys” report works correctly
Product definition/activation key forms include license start date

V12.4 - July, 2018

Features Added
Alias licenses added
token_locked deprecated, token_bound added
rlm_license_ismetered(), rlm_product_ismetered() calls added
Check server license can return status rather than failing immediately
rlm_auto_hb() has new parameter
rlm_product_meter_cur_count() call added
RLM web interface disables options and license file editing functions if logins are not enabled.
Activation Pro features:
Database queries now prevent SQL injection
User-defined reports added with auto-email capability
New “edit key” user type added
actpro_keyvalid() web services call added
rlm_act_keyinfo2() added
Sorting works correctly on first fulfill and last check fields in fulfillments
Product/activation key screens add misc parameters (several missing in 12.3)

V12.3 - Oct, 2017

Features Added
rlm_failover_server_activate failover mode
RLM report log logs the timezone
Roamed licenses can have their roam time extended when disconnected
Failover servers display a list of valid primary server licenses.

Control over the rehostable hostid checks
Set the rehostable hostid reference hostid (rlm_set_attr_reference_hostid())
Activation Pro features:
Rlmact.mysql renamed to actpro.php
Optional parameters are broken out in the GUI
Duplicate a product definition to create a new one
Activation key browser includes the contact email
Custom fields for a company can be specified as numeric to sort properly
On login, an invalid username or password displays “login incorrect”
Newlines are replaced with spaces in the license field in reports

V12.2 - Feb, 2017

Features Added
Dynamic Reservations
rlm_product_server() call
spec in rlm_failover_server license can now omit port-number
Illegal character restriction in customer= field relaxed
UUID hosids (windows)
rlmstat now accepts the “-I” switch, to display ISV-defined data
The report log INUSE records now include the share handle for shared licenses
rlm_get_attr_lfpath() returns char * rather than const char *
rlmstat -I switch (to display ISV-defined data)
Activation Pro features:
rlm_act_fulfill_info() call

V12.1 - June, 2016

Features Added
-l switch to rlm
License transfers use hostname-RLM-Transfer as username and isv string
RLM Comm protocol optimized
Server Time Jump reportlog message
Whitespace removed from user and host names
rlm_activate()/rlm_act_request() copy url and akey parameters
PURGE_REPORTLOG added
Activation Pro features:

Merge company/contact

V12.0 - December, 2015

Features Added
rlm_product_hostid() call added.
Shared license can now be metered
The install windows service menu item in the rlm web interface is removed
Licenses sorted by _id
Servers log expired licenses on startup
Alternate Nodelock Hostids
Install service command takes -user and -password
VS2015 support
rlm_product_hostid()
rlm_set_req_opt()
rlm_act_keyinfo()
SSL entry points renamed on most Unix platforms
Activation Pro features:
user_def field added to keyd table
Product choicelists now sorted alphabetically
Search added to debug log
Unencrypted requests can now be disabled
Normalized date formats
Admin function to delete keys with revoked rehostable fulfillments
Arbitrary text can be added to the license via product definition
rlm_act_keyinfo()

V11.3 - April, 2015

Features Added
RLM rejects ethernet devices named "dummy*" on linux
report log DENY records now include the process ID
In rlmstat and the rlm web interface, the field previously labeled "transactions" is now labeled "checkouts"
The contents of the ISV-defined string can now be used as a hostid
rlm_diagnostics() call
Activation Pro features:

new improved and expanded Actpro Web Services interface
For product definitions, the default for “create issued=today?” changed to “yes”
Contacts now have an associated “Contact Type”
The “About” tab now lists the activation pro license expiration date
Users with “portal” access are no longer allowed to log in on the main actpro site.
A product can now be marked “obsolete”, in addition to “inactive”
Default values can be set for the product editing and activation key editing screens
User accounts can now be edited, from the Admin->Users screen
An administrator can set the list of visible tabs for any user
The “Alternate Server Hostid” choice is added for products and activation keys

V11.2 - November, 2014

Features Added
Alternate Server Hostids
rlm_license_count() call added
The RLM version restrictions on client-side roam files have been relaxed to allow the “oldest compatible version”. As of 11.2, the oldest compatible version is 11.0
Cached licenses no longer disable roaming
Activation Pro features:
Support for Alternate Server Hostids
Audit trail for created/edited/deleted rows in the product, activation key, contact, company, and blacklist tables
The date of creation of product definitions, activation keys, and customer contacts is now displayed in the appropriate browser.
Product Definitions and Activation Keys can now specify the allowed hostid types
The “include activation key in license” option now allows you to generate licenses without akey, with akey, or both
When the actpro server returns a RLM_ACT_BAD_HOSTID_TYPE status, it now returns a decimal integer indicating which hostids are valid
The licf table now records the 1st time rlm_act_keyvalid() was called
The product, activation key, and fulfillment browsers now allow deletion of multiple items.

V11.1 - June, 2014

Features Added
RLMid1 dongles now supported on linux (x86_12, x64_11)
The first parameter of rlm_init() now takes a list of license files
Setting RLM_ROAM=today causes a roam to end today at midnight
Licenses now have an optional _id= parameter to identify for options file use
For metered licenses, the user can now decrement the counter in the rlm web interface.
RLM now supports Google Compute Engine hostids (gc=)
Activation Pro features:
Manual rehostable hostid creation and revocation are now supported, for machines with no internet connection.
New rlm_act_keyvalid_license() call returns the license for a given activation key.
Expired rehostable licenses can now be revoked.
New rlm_get_rehost() call retrieves the rehostable hostid for a given product name.
rlm_act_revoke_reference() allows revocation of a rehostable on machines where the hostid has disappeared or gone bad.
Activation Pro logs the expiration date of the license and displays in the fulfillment screen.
The Customer Portal is set up after installation, in the Admin/Portal tab.
Normal-Regen activation type added.

V11.0 - Feb, 2014

Features Added
Ipv6 support (x86_12, x64_11, x86_w3 and x64_w3 only)
Auto proxy detection on Windows
Applications can refuse to run with generic server (rlm_isv_cfg_disable_generic_server())
akey= license attribute
rlm_products_akey() and rlm_license_akey() calls added
rlm_license_uncounted(), rlm_license_single() calls added
Client caching turned off on HP systems.
Activation Pro features:
New tab-based UI
New Customer portal
Product Definitions allow multiple licenses
Auto-generate akey= license attribute
Activation Keys can override license version
rehosts controls the # of times a rehostable hostid can be revoked
Server writes debug logging to database

bulk-load of customer data
Customization of the customer table
rlm_isv_cfg_actpro_allowed_hostids() call in rlm_isv_config.c to control allowed Activation Pro hostid types
rlm_act_keyvalid() call
rlm_act_info() now returns RLM_ACT_KEY_DISABLED if appropriate

V10.1 - July, 2013

Features Added
client_cache license option added
CLIENT_CACHE license admin option added
Server logs unreadable license files
rlm_auth_check() call
rlm_isv_cfg_enable_check_license() added
License now available as search criteria in Actpro fulfilled licenses report

V10.0 - Jan, 2013

Features Added
Disconnected server-server license transfer
rlm_init_disconn() for disconnected operations
RLM will now broadcast to find a server on the local network.
Roaming is disabled if the license server uses a transient hostid
The public/private keys are now declared as "const unsigned char"
You can disable disk Serial Numbers which require admin rights
You can disable RLM's clock windback checking
Option to make roamed licenses SINGLE rather than UNCOUNTED
rlm web interface now supports user login, with access rights.
rlm web interface only displays commands which the user can execute.
rlm web interface doesn't display "Manage Windows Service" on non-Windows systems
If rlm processes multiple license files, it will attempt to find a good ISV server path
Browsers connecting on rlm's main port are redirected to the webserver port
Report log logs all licenses in use both at start and at the end.
Roamed license time extension logged in report log (and debug log)
RLM web interface allows editing license files

RLM checks that the debug log is writable when installing service
rlm_product_customer(), rlm_product_contract(), rlm_product_issuer(), rlm_product_exp_days() API calls added.
rlm_checkout_product() call
rlm_act_info() call
ISV_mklic not built by default
RLM web interface allows the Activate License command customization
INTERNET_GROUP option
actpro_demo.o removed, actpro_demo.c added w/build rules (v10.0BL3)

v9.4 - July, 2012

Features Added
ISVNAME_ACT_URL overrides url in rlm_activate()/rlm_act_request() call
actpro_demo added to RLM kit, removed from actpro kit
Hostname hostid types now accept wildcards
RLM utilities now accept the -z password option
When installing RLM as a service on Windows, the installation now starts and stops the service to trigger firewall prompts.
The hostid list for rlm_activate() has been expanded to RLM_ACT_MAX_HOSTID_LIST characters (205) - including the "list:" prefix
rlm_activate()/rlm_act_request() can now process replies from firewall and anti-virus software which splits a single message into 2 messages.
Clock windback detection checks internet time servers (if reachable)
RLM servers write heartbeat messages back to the client (for v9.3 and newer clients) in order to detect systems which have been shut down.

v9.3 – February, 2012

Features Added
license rehosting via refresh activation and rlmrefresh utility is DEPRECATED
License rehosting added with the new rehost hostid type and rlm_act_revoke() (requires Activation Pro)
x86_11 platform obsoleted
rlmsign now checks the validity of keywords in keyword=value pairs
Metered licenses added
rlm_activate() call added to replace rlm_act_request()
Activation can now create UPGRADE licenses for single and nodelocked,

unaccounted license types.
Client-side diagnostics now list all embedded string licenses in addition to other node-locked licenses.
Server-side diagnostics now output the rlm and isv server option file info.
RLM now enumerates the ethernet devices on linux rather than using eth0-7

v9.2 - September, 2011

Features Added
disksn hostid (disk hardware serial number) added on Windows
License Passwords can now be specified on the ISV line
rlc (internet activation) verifies the format of date input
rlm_license_line_item() call added
Product Definition names can be edited in rlc (Internet Activation)
Fulfillment count for refresh activations limited to 1
“_primary_server” keyword added for rlm_failover licenses
Generic rlmrefresh utility removed; replaced with ISV-specific utility
Many changes to Activation Pro

v9.1 - May, 2011

Features Added
RLM Activation Pro introduced
Passwords on individual LICENSE lines
rlm_set_attr_password() call.
disable=TerminalServerAllowRD attribute
rlm_set_attr_logging() call
rlm_add_isv_hostid() API changes (added parameter)
rlm_set_envron() call can be made any time before a checkout.
RLM_ACT_NO_ENCRYPT to prevent rlm_act_request() encryption.
rlm_auto_hb() period now set to min of 2 seconds.
rlm_errstring() now formats all errors including activation errors

v9.0 - December, 2010

Features Added
GUI license generator
Support for license server farms

rlmstat reports on expiration dates
New license checkout debugging capability/utility
rlmsign takes the optional -maxlen parameter
New rlm_failover_server license
New rlm_no_server_lock license
New keyword=value parameters on ISV line
rlm_errstring_num() API call
rlm_license_detached_demo() API call
Multiple GROUP lines now concatenate in OPTIONS files
New license administration REMOVE privilege
Activation supports SINGLE and UPGRADE licenses
rlm_act_request() allows white space in activation key
rlm_act_request accepts hostid lists
rlm_act_requests accepts a count of 0 to fulfill all remaining floating licenses
rlm_act_request() encrypts traffic to the activation server
rlm_act_request() rejects newlines in the "akey" and "extra" parameters.

v8.0 - Jan, 2010

Features Added
Optimized license sharing
client and server side diagnostics to aid solving problems in the field
When running as a service, rlm changes working directory to binary directory
rlm logs the client machine's OS to the report log
rlm logs the client's argv[0] to the report log
eval directory removed from Unix and Mac kits
rlm web interface shows all license file and log file paths
rlm web interface puts all activated license files into the directory specified with -c
single-quote and back-quote characters are now legal in license and option files
max_roam_count license keyword
custom hostid comparison routine for ISV-defined hostids
rlm_putenv() call for Windows DLLs
enforcement of legal ISV-defined hostid strings
activation: rlc adds ISV-defined notes to activation keys
activation: rlc checks for bad or missing hostids

v7.0 - June, 2009

Features Added
Server-Server license transfers

license key email from Reprise now contains ISV name
ability to return a roamed license unconditionally
rlm_isv_config() allows you to disable older license servers
Unix makefile target for no-Openssl version of library
rlm_server_enable_vm license for enabling servers on virtual machines
rlmanon is on kit (missing prior to v7)
rlmhostid no longer reports 32-bit hostids on linux, mac, or netbsd systems
rlmhostid no longer prints "known bad" 32-bit hostids (0, 0xffffffff, 0x7f0100)
RLM_EL_FAILED_BACK_UP status when failed server restarts
failover servers no longer pool licenses from failed servers
rlm_auto_hb() attempts to re-acquire the same license which was lost
license line checksum (_ck=)
rlmid3 machine fingerprinting option removed
new status parameter to notification handler for rlm_auto_hb()
rlm_license_user_based() API call
rlm_license_min_remove() API call
rlm_license_host_based() API call
reactivate and refresh activation types
license rehosting via refresh activation and rlmrefresh utility
rlc allows you to specify the activation key
rlc allows specification of additional license parameters in the activation key
whitelist and blacklist in activation
activation keys have an expiration date
activation allows RLMID devices
activation uses isv-defined, RLMID, ethernet, and 32-bit devices, in that order
activation no longer accepts "known bad" 32-bit hostids (0, 0xffffffff, 0x7f0100)

v6.0 - January, 2009

Features Added
Platform-independent ISV server settings and the Generic ISV server
rlc refresh button
rlc allows fixed expiration dates
rlmid2 hardware key
rlmid3 machine fingerprinting option
rlm_act_request() processes HTTP redirects
rlm_act_request() supports HTTP proxy servers
ISV servers increase their open file limit
ISV lockfile in C:\rlm removed
port@host can be specified as host@port
RLM_LICENSE environment and the -c option can contain directories

RLM default port # changed from 28000 to 5053
RLM admin port # changed from 9000 to 5054
UPGRADE licenses
min_checkout
rlm_detached_demo() api call

v5.0 - May, 2008

Features Added
Serial Number hostid type
rlmID1 hardware key
hostid lists
ISV servers don't exit on reread if no license file exists
RLM activation forces client clock to be within 7 days of activation server
GUI license generator
rlm_act_admin renamed to rlc
Virtual machine detection in ISV servers
disable= now accepts VM keyword to disable licenses on Virtual Machines
refresh buttons added to web interface
options= license attribute
multiple instances of a single ISV-defined hostid type allowed
license administration NOPROJECT keyword for EXCLUDE and EXCLUDEALL

v4.0 - December, 2007

Features Added	Platforms Added
report log anonymizer (rlmanon) added	PPC Linux
rlm web interface allows editing option files	
rlm web interface displays debug log	
report log detailed format adds seconds, tenths of seconds for Denials	
Automatic report log rotation	
rlm options file controls access to administration functions	
RLM web interface displays recent debug log information	
RLM web interface allows editing server options file	
RLM_ROAM no longer needs to be set on the disconnected system	
-c overrides RLM_LICENSE for rlmutil	
Named User licensing	
disable=TerminalServer license attribute	
RLM activation supports issued=today's date	
RLM activation supports arbitrary license fields (via	

rlm_act_request() call	
RLM activation allows ISV-defined hostids as a legal hostid type	
RLM on Solaris supports Solaris containers	
rlm_all_hostids(), rlm_all_hostids_free() API calls	
rlm_get_attr_lfpath() API call	
rlm_set_active() API call	
rlm_license_exp_days() API call	
rlm_license_max_share() API call	
rlm_license_named_user_count() API call	
rlm_license_named_user_min_hours() API call	
rlm_license_roaming() API call	
multiple ethernet device support on linux and mac	
ethernet address is default hostid on linux and mac	
Windows volume serial number hostid added	
Windows volume serial number is default hostid	

v3.0 - June, 2007

Features Added	Platforms Added
Internet Activation	Java Linux
rlm -dat command-line option	Java Windows
rlmtests performance tests	
rlm servers ignore hostnames in license file	
The rlm web interface now reports the Process ID (PID) of licenses in use	
rlm logs status requests in the debug log	
client node can access license server by any name	
ISV server pathname optional on ISV line	
rlm_skip_isv_down() API call	
rlm_forget_isv_down() API call	
rlm_hostid() API call	
rlm_license_goodonce() API call	
rlm_license_server() API call	
rlm_product_exp() API call	
rlm_product_max_share() API call	
rlm_sign_license() API call	
x64_11 compiled with -fPIC	
RLM_CONNECT_TIMEOUT environment variable	
RLM_EXTENDED_ERROR_MESSAGES environment variable	
maximum license share count	

_line_item license keyword	
license in a string	
improved error messages in web interface and rlmsign	
PID of process using license is displayed in web interface	
Wildcards allowed in IP addresses used as a hostid	

v2.0 - Dec, 2006

Features Added	Platforms Added
Failover License Servers	HP-UX PA-Risc 32-bit
Token-based licensing	HP-UX PA-Risc 64-bit
user/host based licenses	IBM AIX RS/6000 32-bit
Nodelocked, single-use licenses (no server)	IBM AIX RS/6000 64-bit
options to disable rlmdown and rlmremove	
RLM_PATH_RANDOMIZE environment variable	
ISV servers notify of licenses expiring within 14 days	
rlm binds all TCP/IP ports in all license files	
rlm -c license_file command-line option	
rlm runs as a service on Windows	
rlmstat -avail reports on license availability	
transient attribute on ISV-defined hostids	
System Info in rlm web interface	
min_remove license keyword	
rlm_products() API call	
rlm_log(), rlm_dlog() API calls	
PRIORITY license administration option	
TIMEZONE license administration option	
MAX accepts '*' for all users	
license administration license management by PROJECT	
MINREMOVE license administration option	

v1.1 - July, 2006

Features Added	Platforms Added
Held licenses	MAC intel 32-bit
Shared licenses	MAC PPC 32-bit
License Replacement	Linux x64 - 64-bit
License timeout	Solaris x64 - 64-bit
Roaming licenses	Windows x64 - 64-bit
Intelligent license queuing	
rlm_set_environment() call	

rlm_license_XXX() calls	
rlm_auto_hb() call for automatic heartbeats	
ISV-defined hostids	
Clock rollback detection	
contract= license attribute	
customer= license attribute	
issued= license attribute	
issuer= license attribute	
platforms= license attribute	
soft_limit= license attribute	
start_date= license attribute	
timezone= license attribute	
type= license attribute	

v1.0 - May, 2006

This version contains the basic RLM functionality:

Features	Platform Support
Node-locked licenses	linux x86
Floating licenses	sun solaris 32-bit
Expiration dates	sun solaris 64-bit
Transparent multiple server connections	windows 32-bit
Public-Key authentication	

Appendix J – Document Revision History

v14.0 – November, 2019 – v14.0 release (BL2)

v14.0 – August, 2019 – v14.0 beta release (BL1)

v13.0 – February, 2019 – v13.0 release (BL2)

v13.0 – November, 2018 – v13.0 beta release (BL1)

v12.4 – July, 2018 – v12.4 release (BL2)

v12.4 – May, 2018 – v12.4 beta release (BL1)

v12.3 – October, 2017 – v12.3 release (BL2)

v12.3 – October, 2017 – v12.3 beta release (BL1)

v12.2 – Feb, 2017 – v12.2 release (BL2)

v12.2 – December, 2016 – v12.2 beta release (BL1)

v12.1 – June, 2016 – v12.1 release (BL2)

v12.1 – April, 2016 – v12.1 beta release (BL1)

v12.0 – December, 2015 – v12.0 release (BL2)

v12.0– October, 2015 – BL1 – first v12.0 beta release

v11.3– April, 2015 – v11.3 release (BL1)

v11.2– November, 2014 – v11.2 release (BL2)

v11.2– August, 2014 – BL1 – First v11.2 beta release

v11.1– June, 2014 – v11.1 release (BL2)

v11.1– April, 2014 – BL1 – First v11.1 beta release

v11.0 – Feb 7, 2014 – v11.0 release (BL2)

v11.0– December, 2013 – BL1 – First v11.0 beta release

v10.1 – Jul 18, 2013 – v10.1 release (BL2)

v10.1– June, 2013 – BL1 – First v10.1 beta release

v10.0 – Jan 16, 2013 – v10.0 release (BL2)

v10.0– November, 2012 – BL1 – First v10.0 beta release

v9.4 – July 24, 2012 – v9.4 release (BL2)

v9.4 – June, 2012 – BL1 – First v9.4 beta release

v9.3 – February 15, 2012 – v9.3 release (BL2)

v9.3 – November 21, 2011 – BL1 – First v9.3 beta release

V9.2 – 28-Sept-2011 - v9.2 release (BL2)

v9.2 – September, 2011 - BL1 – First v9.2 beta release.

V9.1 – 2-May-2011 - v9.1 release (BL3)

v9.1 - Mar-2011 - Second v9.1 beta release (BL2) – second beta release

v9.1 - Feb-2011 - First v9.1 beta release, first release with Activation PRO (BL1)

v9.0 – Jan 5, 2011 - BL3 - release to fix bugs P218-P221.

V9.0 – 15 -Dec-2010 - v9.0 release (BL2)

v9.0 - Nov-2010 - First v9.0 beta release (BL1) – first PDF version

v8.0 - 26-Jan-2010 - v8.0 release (BL3)

v8.0 - Dec-2009 - Second v8.0 beta release (BL2)

v8.0 - Nov-2009 - First v8.0 beta release (BL1)

v7.0 - 1-Sept-2009 - BL4 - release to fix bugs P156-P168, add RLM-Embedded and ISV-defined license transfer

v7.0 - 11-Jun-2009 - v7.0 release (BL3)

v7.0 - May-2009 - First v7.0 beta release (BL2)

v6.0 - 5-Feb-2009 - BL3 - release to fix bugs P139, P140, and P142-P145, add x64_m1 platform.

v6.0 - Jan-2009 - v6.0 release (BL2)

v6.0 - 25-Nov-2008 - First v6.0 beta release (BL1)

v5.0 - Sept-2008 - BL5 - release to fix P124-P125, and P127-P129

v5.0 - 22-Aug-2008 - BL4 - release to fix P116-P119, and P121-P123

v5.0 - 1-Jul-2008 - v5.0 release (BL2)

v5.0 - 23-May-2008 - First v5.0 beta release (BL1)

v4.0 - 30-Jun-2008 - BL6 - release to fix P102, P104, P107, P109, and P115

v4.0 - 18-Jan-2008 - v4.0 release (BL4)

v4.0 - 19 December 2007 – Third v4.0 beta release (BL3). First PDF manual.

v4.0 - 11-December-2007 - Second v4.0 beta release (BL2)

v4.0 - 16-November-2007 - First v4.0 beta release (BL1)

v3.0 - 9-Nov-2007 - BL6 - patch release for P62, P67, P81, P83-P88, and P90

v3.0 - 7-Sep-2007 - BL4 - patch release for P51, P68, P71, P74-P79 and E72

v3.0 - 24-Jul-2007 - v3.0 release (BL3)

v3.0 - 28-June-2007 - Second v3.0 beta release - with activation and Java (BL2)

v3.0 - 11-May-2007 - First v3.0 beta release (BL1)

v2.0 - 18-Apr-2007 - BL9 - patch release for P44-P50, P52, P54, and P56. Added IBM AIX support.

v2.0 - 13-Feb-2007 - BL6 - patch release for P30, P34-P37

v2.0 - 12-Jan-2007 - BL5 - patch release for P25-P28

v2.0 - 13-Dec-2006 - v2.0 release (BL4)

v2.0 - 7-Nov-2006 - Second v2.0 beta release (BL2)

v2.0 - 9-Oct-2006 - First v2.0 beta release (BL1)

v1.1 - 1-Nov-2006 - v1.1 patch release - fixes for P19, P21, and P22 (BL7)

v1.1 - 12-Oct-2006 - v1.1 patch release - fix for P18 (BL6)

v1.1 - 31-Jul-2006 - v1.1 release (BL4)

v1.1 - 17-July-2006 - v1.1 beta release #3

v1.1 - 7-July-2006 - v1.1 beta release #2

v1.1 - 23-June-2006 - v1.1 beta release

v1.0 - 8-May-2006 - v1.0 release

v0.3 - 25-Apr-2006 - Fourth release of manuals, for v0.3BL3 Beta Release.

v0.3 - 27-Mar-2006 - Third release of manuals, corresponding to v0.3 Beta Release.

v0.2 - 6-Mar-2006 - Second release of manuals.

v0.1 - 12-Feb-2006 - First release of the manuals for beta-test.

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Appendix K - IPv6 Considerations

Beginning in RLM v11.0, RLM supports IPv6 on Windows and Linux.

Linux support operates correctly on all RLM builds.

Windows support, however, is limited to the x86_w3 and x64_w3 kits, since earlier versions of the compiler do not support IPv6. This can lead to some inconsistent behavior if different RLM versions are used on IPv6 networks.

Let's assume that you have an IPv6 network, and both client and server are running on IPv6-capable machines. If your ISV's application is built with one of the _w3 kits, it will attempt to communicate to an IPv6 address. However, if either rlm or the ISV server is built with the _w1 or _w2 kit, it will not be able to bind an IPv6 address, and the connection to the server will fail.

If this is the case, you can do one or 2 things:

1. Use an IPv4 address in the SERVER line in place of the hostname, or
2. Ensure that you are running _w3 versions of rlm and the ISV server.

If you have received a _w1 or _w2 version of an ISV server, you must use technique #1 above, until your ISV can supply you an ISV server built with a _w3 kit. If your ISV supplies a settings file, however, you only need to make sure that the version of the RLM binary you are running is a _w3 version.

To determine the version of the RLM kit a server was built with, you can look at the "Server Architecture:" line in the first few lines of the debug log file, as in this example:

```
05/21 14:19 (rlm) RLM License Server Version 11.0BL2
          Copyright (C) 2006-2014, Reprise Software, Inc. All rights reserved.
05/21 14:19 (rlm) License server started on aztec
05/21 14:19 (rlm) Server architecture: x86_w3
```

This example is a copy of RLM built with the x86_w3 kit, so it will operate correctly on IPv6 networks.

You can view the debug log from the ISV server to determine which RLM kit was used to build it as well.

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