

NavisRadius, Version 4.3

Quick Start Guide

Lucent Technologies
Bell Labs Innovations



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NavisRadius, Version 4.3 Quick Start Guide

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Contents

Understanding Platform and System Requirements	Platform Support	5
	Java Environments	5
	Server Memory	6
	Server Storage	6
	Hardware Requirements	6
Preparing Your System for Installation	Downloading the Right Java Version	7
	Downloading the Current NavisRadius Version	8
	Getting a Valid License	8
	Using a ZIP/TAR Utility	9
	Checking Patch Levels of Operating Systems	9
Installing and Learning NavisRadius	Installing on UNIX	11
	Installing on Windows NT/2000	12
	Installing the Server Management Tool	13
	Learning NavisRadius	14
	Using Web Resources	15
	Technical Support	15
Removing NavisRadius	Uninstalling from UNIX Platforms	17
	Uninstalling from Windows NT Platforms	18
Determining Hardware Needs	Basic AAA Load Calculations	19
	Server Sizing	21
	Scaling Your Network	22
	Load Distribution	23
	Other Considerations	23

Understanding Platform and System Requirements

Welcome to NavisRadius 4.2, the most flexible set of AAA tools available today for remote access services. This release builds on the flexible and extensible Java-based PolicyFlowSM plug-in architecture by adding support for Extensible Authentication Protocol (EAP). This release also includes improved interaction between the NavisRadius Server and the Universal State Server, increasing performance and simplifying configuration. The graphical interface, the Server Management Tool (SMT), has been enhanced for usability and the PolicyAssistant has been updated, enabling you to provide NavisRadius AAA services in no time.

This guide provides information to help you understand system and platform requirements, install NavisRadius, and estimate hardware needs.

Platform Support

NavisRadius supports the following platforms (refer to the current release notes for changes to this list).

- Sun Solaris 2.6 through 2.8 (SPARC and x86)
- Microsoft Windows: NT/2000 and XP (Workstation/Professional and Server versions)
- HP-UX B.11.00 and later
- OSF/Tru64 UNIX
- Red Hat Linux 6.2 and 7.x

You can also install the Server Management Tool (SMT) on the following platforms:

- MacOS X
- Microsoft Windows 95/98

Note: NavisRadius works on most UNIX systems, including other releases of Linux. However, other platforms are not officially supported and some features might not be available.

Java Environments

NavisRadius requires a minimum JDK of 1.3.1 to run on the following platforms:

- Solaris SPARC and x86 platforms
- Microsoft Windows 2000/95/98/NT
- HP-UX B.11.00
- OSF1
- Red Hat Linux 6.2, 7.0, and 7.1
- MacOS X

Contact the operating system vendor or www.javasoft.com for information on the latest version of Java for your computer. It is important that the operating system and Java environment are kept at current patch levels.

Server Memory

The server must have at least 128 MB of memory. However, for most applications it is recommended that you have a minimum of 256 MB. Memory use is affected by many factors: server configuration, User File size (when used), and whether the Universal State Server or the Server Management Tool runs on the same platform as the NavisRadius server.

Server Storage

The server must have at least 40 MB of free disk space for installation.

Note: The storage requirement listed above is for installation only. For daily operations you must also allow storage space for accounting data and log files. The actual amount of disk space needed for logs and accounting records depends on many factors such as logging level and accounting detail as well as the length of time data is retained.

Hardware Requirements

For a discussion of estimating system hardware requirements, refer to “Determining Hardware Needs” on page 19.

Preparing Your System for Installation

To ensure a complete installation, there are several system and server requirements that must be met.

Downloading the Right Java Version

Before you install NavisRadius, the Sun Java Virtual Machine (JVM) must be installed on your system. Java is now commonly installed on most operating systems, but you should check that you have the appropriate version of Java for NavisRadius. This application is typically called the Java Runtime Environment (JRE) or Java Development Kit (JDK).

Note: JDK has been renamed SDK (Software Development Kit). Sun changed the name of this component between the release of 1.2 and 1.3. The most current versions are referred to as SDK.

If you are not sure of your version, refer to “Checking the Current Java Version” on page 7 for more information. If your server does not have the correct Java version installed, refer to “Downloading the Right Java Version” on page 7 for information about updating Java.

To get the current Java version:

For Windows, Solaris, or Linux platforms search the Sun Web site: <http://www.java.sun.com>

For platforms other than Windows, Solaris, or Linux the Java SDK might be found at the following URL or directly from the platform specific link: <http://www.java.sun.com/cgi-bin/java-ports.cgi>

- HP-UX: <http://www.unix.hp.com/java/>
- OSF1/True64: <http://www.compaq.com/java/>
- MacOS (for OS 9 and OS X versions the Java SDK is included as a standard application):
<http://www.devworld.apple.com/java/>

Checking the Current Java Version

You must have the correct JRE/JDK working before installing NavisRadius.

To check your Java version:

Enter the following at the command prompt:

```
java -fullversion
```

Correct versions produce results similar to the following:

```
java full version "Solaris_JDK_1.4.0_01"    or    java full version "1.4.0_01-b03"
```

Downloading the Current NavisRadius Version

Before installing NavisRadius, verify that you have the latest installation bundle available for your purchased product.

To get the latest version:

1. Using a web browser go to: <http://www.lucentradius.com/> and select **Latest Build** from the menu on the left.
2. Select the file format for your operating system:

If you are using a system that supports the ZIP file format, such as Windows NT/2000 with WinZip 7.0 installed, click the file with the **.zip* extension.

If you are using a system, such as UNIX, that supports the TAR file format, click the file with the **.tar* extension.

3. Save the file to a temporary directory.

Getting a Valid License

NavisRadius requires a valid license file for installation. If you are using a demonstration copy, you need an evaluation license (valid for 30-days). Permanent licenses are specific to a single major version such as 3.x or 4.x. Upgrading NavisRadius point releases (for example, 4.1 to 4.2 or 4.2 to 4.2.1) does not require a different license. If performing a major version upgrade (for example, from 3.x to 4.x), a new license is required. Contact your Lucent Technologies sales or support representative for more information on version upgrades.

NavisRadius Temporary Evaluation License

After completing the download request form and downloading a NavisRadius evaluation copy, you will receive a license by email. The license is sent as a zip file attachment to the email address entered on the download request form.

To get an evaluation license:

1. Using a web browser go to: <http://www.lucentradius.com/>
2. Click **Download Evaluation**. The NavisRadius Software Evaluation Request page displays.
3. Read the Evaluation Software License Agreement. If you accept the evaluation terms, click **I Accept**. The Download Request page displays.
4. Complete the required information. Make sure you enter a valid email address. Your evaluation license is sent to this address.
5. Click **Continue**. The NavisRadius Evaluation Request Completed page displays containing links to download the latest version. Verify that you have the latest version.

Save license file to a temporary directory on your computer. The installation process asks for the location of the license file.

NavisRadius Permanent License

When you purchase NavisRadius you should receive a product serial number. You must register each serial number to receive a permanent license. Permanent licenses are version specific. For example, when upgrading from 3.x to 4.x, you must purchase and register a new permanent license. New licenses are not required for point releases, such as an upgrade from 4.1 to 4.2.

Note: To update your license, it is only necessary to unzip the license file and place the new file in the run directory. Replacing the license file will not change your existing data files. Restart the server to activate the new file.

To get a permanent license:

1. Make sure you have the product serial number.
2. Using a web browser go to <http://www.lucentradius.com/register>. The NavisRadius Registration page displays.
3. Click **Start Registration**. The NavisRadius Registration form displays.
4. Carefully follow the instructions and answer all required questions. You will receive a license file by email when you complete and send the registration form.
5. Save the license file on your computer.

Using a ZIP/TAR Utility

You must have a file extraction utility for the NavisRadius archive type you download—typically *.tar for UNIX platforms and *.zip for Windows platforms.

Checking Patch Levels of Operating Systems

It is important that operating systems are at their current patch level. Failure to install required patches can significantly impact the operation of NavisRadius. For information on the patches available for your server contact the operating system vendor or representative or visit their support Web site. You should also verify that all applicable patches have been applied to your Java environment as well.

Check the NavisRadius Web site for more information on operating system patches.

Installing and Learning NavisRadius

This section provides the steps required to install NavisRadius on a UNIX or a Windows platform.

Installing on UNIX

To install NavisRadius on UNIX:

1. Before you begin, make sure you have a valid license file for the NavisRadius software version you are installing.
2. Open a terminal window.
3. Extract the NavisRadius (*.tar) file to a temporary directory.
4. Change to the directory where you unpacked the NavisRadius archive file.
5. Type `./setup.sh` and press **Enter**. (You may also run the Setup program using a graphical user interface. To use the graphical interface specify the `-gui` option). The following output displays:

```
Lucent NavisRadius Setup, Version 4.2
Copyright (c) 1998-2002 Lucent Technologies Inc. All Rights Reserved.
```

```
You are about to install NavisRadius.
```

```
Using Java version: 1.3.1 from '/opt/JRE/1.3'
```

```
Enter 'X' at any prompt to exit the setup program.
```

```
To continue, you must agree with the license agreement.
```

```
Enter Y to agree or any other key to view the license agreement: y
```

6. Enter **Y** to accept the license agreement and press **Enter**. The following prompt appears.

```
Enter the directory for NavisRadius [/opt/Lucent/NavisRadius]
```

7. This is the default directory. Accept the default or enter another location and press **Enter**. The following prompt appears if the directory does not exist:

```
The directory "/opt/Lucent/NavisRadius" does not exist.
```

```
Do you want to create it? [Y | N (Default)]
```

8. To accept the location, enter **Y** or enter a different location and press **Enter**. The following prompt appears:

```
Install NavisRadius Server [Y (Default) | N]:
```

Installing and Learning NavisRadius

9. To install the NavisRadius Server, press **Enter**. The following prompt appears if you downloaded NavisRadius with the database.

```
Install Sybase SQL Database [Y (Default) | N]:
```

10. Press **Enter** to install the bundled database. The following prompt appears if the license file is not in the installation directory:

```
Enter path that contains the license file: [/usr/local/tmp:]
```

11. Press **Enter** to accept the default path, or change the path to reflect the location of your license file and press **Enter**. The following prompt appears:

```
Enter the administrator's user name:
```

12. Enter the administrator's username and press **Enter**.

```
NavisRadius Administrator User [admin]: XXXX
```

The following prompt appears (write your username and password here for future reference):

```
NavisRadius Administrator Password: YYYY
```

13. Enter the administrator's password and press **Enter**. The following output displays:

```
Setting up for reading entries
Unzipping installation files to '/opt/Lucent/NavisRadius'
Updating Server Properties
Copying License File
Installation Completed Successfully
```

14. Once installation is complete, you are ready to configure the servers.

Installing on Windows NT/2000

The Windows NT/2000 NavisRadius Setup program steps you through a series of interactive panels that contain information about configuring the NavisRadius installation. As you progress through the panels you are asked to make several decisions. Read each panel and carefully follow the instructions.

To install NavisRadius on Windows NT/2000:

1. Before you begin, make sure you have a valid license file for the NavisRadius software version you are installing unzipped into a temporary directory.
2. Extract the NavisRadius (*.zip) file to a temporary directory.
3. Navigate to the location of the unzipped NavisRadius files and double-click **Setup.exe**. The NavisRadius Setup program appears.
4. Click **Next**. The Software License Agreement panel displays.

5. If you agree to the licensing terms, select **Accept License Agreement Terms** and click **Next**. The Choose Installation Location panel displays.
6. If you want to use the default installation location click **Next**, or click **Browse** and select an optional location. The Choose Installation Type panel displays. Depending on the version you are installing, this panel can present two or three installation options.
 - Install NavisRadius Server—This option installs all the NavisRadius Servers necessary to begin processing RADIUS requests, including the Server Management Tool, and a database for user records. This option lets you configure NavisRadius from the local machine where NavisRadius is installed.
 - Install Server Management Tool—This option installs only the Server Management Tool. Use this option to install the configuration tool on a remote system. Refer to “Installing the Server Management Tool” on page 13 for a discussion of this option.
 - Install Sybase SQL Database—This option is available if you downloaded the database with NavisRadius.
7. Once you have selected your installation type, click **Next**. The License File Location panel displays.
8. Follow the instructions listed on the panel to specify the location of the license file and click **Next**. The Administrator Configuration panel displays.
9. Follow the instructions listed on the panel to specify the user information and click **Next**. The Installing NavisRadius Files panel displays.
10. NavisRadius is installed in the location you selected. When complete, the Installation Complete panel displays.
11. Click **Finish** to close the installation program, or **Click Run Server Management Tool** to start the SMT to configure and manage your servers.

Installing the Server Management Tool

If you want to configure the NavisRadius Servers from a remote machine, you can install the Server Management Tool (SMT) on the remote machine and log in into the Configuration Server on the server that is running the NavisRadius servers.

To install the Server Management Tool, follow the instructions to install NavisRadius. If necessary, see the NavisRadius Windows NT/2000 or UNIX installation topics for the procedure.

When you are prompted to install either the NavisRadius Server or Server Management Tool, select Install Server Management Tool check box.

Learning NavisRadius



Lucent provides a variety of options for you to learn NavisRadius, including online Help, tool tips for the graphical interface, and reference manuals. You can also use the NavisRadius Web site to access a host of continually updated Web resources, from FAQs, technical notes, a discussion forum, documentation, technical support and training information.

Using Online Help

The NavisRadius 4.2 application includes documentation in PDF format for manuals and HTML-based help. The online Help system contains essential information on using NavisRadius commands, features, tools, and the Server Management Tool (SMT) and command line interfaces, as well as the NavisRadius plug-ins.

To start online Help:

Do one of the following:

- Click  on the SMT toolbar to access help for the active panel.
- To access the Help contents, click  on the SMT toolbar.
- Select one of the above options from the SMT **Help** menu.

Using SMT Tool Tips

The SMT tooltips display the name of tools, buttons, or controls and provide helpful information when entering data in fields.

To view tool tips:

Position the pointer over a tool, button, or control, and pause. A tool tip appears showing the name or a descriptive note for the item.

Accessing Reference Manuals

Acrobat Reader 5.0 is required to view the PDF-based manuals. To download a copy of this application, visit the NavisRadius Web site or www.adobe.com.

To view reference manuals:

Do one of the following:

- On Windows platforms: Choose **Start > Programs > NavisRadius 4.2** and select a manual from the list.
- On UNIX platforms: Start Acrobat Reader and open the appropriate *.pdf file.

Using Web Resources

You can access additional resources for learning NavisRadius at the NavisRadius Web site. These resources are continually updated. Explore the Web site for additional information about NavisRadius.

To access the Web site:

Using a browser, enter the following URL: www.lucentradius.com.

To access the Discussion Forum:

1. Using a browser, enter the following URL: www.lucentradius.com.
2. Select **Discussion Forums** from the menu on the left of the NavisRadius Web pages.
3. Follow Discussion Forum instructions for logging on and accessing content.

Technical Support

To contact Lucent for technical support, select the support channel that applies to you.

Support Channel 1: If you have purchased a NavisRadius support contract, contact Lucent Technologies World-Wide Services (LWS):

- Customers in the USA and Canada, call 1-866-LUCENT8, Prompt 3
- Customers in other international locations, call +1-510-747-2000 or +1-410-381-3484
- Lucent Online Customer Support Web Site: <http://www.lucent.com/support/>
- Send questions to: access@lucent.com



Note: If you are a first time LWS support user or if you have not yet registered your NavisRadius service contract, follow the registration instructions at <http://www.lucent.com/support/howtoreg.html> to register.

Support Channel 2: If you have purchased NavisRadius within the last 90 days, you can contact Lucent Technologies World-Wide Services (LWS) for email support:

- Send questions to: access@lucent.com



Note: If you are a first time LWS support user OR if you have not yet registered your NavisRadius service contract, contact LWS.

Installing and Learning NavisRadius

Support Channel 3: If you are evaluating NavisRadius for purchase or need sales information or technical support (but do not have a support contract), contact us for:

- Technical support questions, review the NavisRadius Discussion Forum:
<http://www.lucentradius.com/cgi-bin/dcforum/dcboard.cgi>
- Pre-sales product questions, send an email to: *tech-sales@lucentradius.com*
- Sales information, send an email to *sales@lucentradius.com*
- Queries from Lucent employees, Sales Teams, VARS and Resellers, send an email to:
radius-internal@lucentradius.com
- Other non-technical requests, send an email to: *tech-sales@lucentradius.com*

Removing NavisRadius

The following procedures describe how to remove NavisRadius from your UNIX or Windows NT/2000 systems. The uninstall process does not remove the NavisRadius configuration files from the run directory or any files you put in the NavisRadius directories. To completely uninstall NavisRadius, remove the installation directory after completing the uninstall procedures.

Uninstalling from UNIX Platforms

To uninstall from UNIX platforms:

1. Open a command window and change directory to the temporary directory that contains the *.tar file. If you installed using a CD, insert the CD and change to that drive.
2. To uninstall NavisRadius, you run the Setup program: type `./setup.sh -uninstall` and press **Enter**. The following output appears:

```
Lucent NavisRadius Setup, Version 4.2
Copyright (c) 1998-2002 Lucent Technologies Inc. All Rights Reserved.
```

```
You are about to remove NavisRadius.
```

```
Are you sure you want to continue? [Y | N (Default)]
```

3. Type **Y** to confirm the uninstall and press **Enter**. The following output appears:

```
Enter the directory for NavisRadius: [/opt/Lucent/NavisRadius]:
```

4. Press **Enter** to accept the default, or change the location of the program directory and press **Enter**. The Setup program removes NavisRadius from your system, and the following output appears:

```
Removing from: /opt/Lucent/NavisRadius
```

```
Setting up for reading entries
```

```
Removing installation files...
```

```
Uninstall of NavisRadius complete.
```

Uninstalling from Windows NT Platforms

You can uninstall NavisRadius from the Windows Control panel or from a command prompt.

To uninstall using the Control Panel:

1. Click Start > Settings > Control Panel > Add/Remove Programs.
2. Select **NavisRadius 4.2** and click **Remove**.

To uninstall from a Command Prompt.

1. Open a command prompt and change to the temporary directory that contains the extracted ZIP file. If you installed using a CD, insert the CD and change to that drive. Note: If you deleted the unzipped version, unzip again to use the next step.
2. To uninstall NavisRadius you run the Setup program: type `setup -uninstall` and press **Enter**. The NavisRadius Setup program appears. Follow the instructions to uninstall NavisRadius.

Determining Hardware Needs

One question often asked about installing NavisRadius is, “How much hardware will I need?” While this may seem to be a simple question, there are many things to consider. This discussion addresses the major issues involved in planning a NavisRadius server implementation. This section covers the basic sizing calculations, two sample scenarios, implementation considerations and additional recommendations to help you estimate your system needs.

The performance of the NavisRadius software depends on a variety of factors, see the list below. Consult with your appropriate Lucent support channel to determine the hardware necessary to run the NavisRadius server in your production environment.

- How complex is your PolicyFlow (configuration)?
- What peak usage and average session times can you expect?
- Where do you store subscriber information, such as SQL Database (Oracle or Sybase) or an LDAP directory (Sun One Directory)?
- What hardware is currently in use, such as Sun Servers or Intel Based server (number of CPUs, Memory)?
- How many subscribers or ports will your system require?
- What type of connection services are available, such as dial-in, DSL, VPN, 802.11 Wireless LAN(802.1x), or 3G-1X Data?
- What operating system does the customer prefer, such as Sun Solaris, Windows/Intel, Linux?
- What is the layout of the physical network, such as the location of RADIUS clients?

Basic AAA Load Calculations

To determine the system hardware requirements, start by making a few preliminary calculations to establish the maximum AAA load your system can handle. Before you begin your calculations, you need to understand some basic definitions for commonly used terms.

AAA Session—AAA is the standard measurement of a load created by a single user session that generates one access request, two accounting records (one START record and one STOP record).

AAA load—The AAA load is typically expressed as AAAs per second (AAA/sec).

Peak Busy Hour—Also called “The Peak Hour” is the hour of the day when the greatest number of users access the network.

Maximum Simultaneous Sessions (MSS)—The total number of concurrent sessions during the Peak Hour. This is usually equal to the total number of occupied ports.

Determining Hardware Needs

Peak Hour Load—The NavisRadius implementation must be designed to handle the load during the “Peak Hour.” In order to estimate the Peak Hour Load it is necessary to know:

- The network MSS
- The expected average length of a session started during the Peak Busy Hour

The number or percentage of ports not used is subtracted from the total ports on the network during the Peak Hour ($MSS = \text{total ports} - \% \text{ of ports not used}$). For example, in a network with 100,000 ports and an expected Peak Hour vacancy factor of 5%, the estimated MSS total at Peak would be $100,000 - 5,000 = 95,000$ (or 95% of 100,000).

In many cases it may be sufficient to simply use the maximum possible number of sessions as the MSS.

Port Use Factor—Once the MSS has been determined, it is necessary to determine the Port Use Factor. That is, how many times a port will be used during the Peak Hour. For example, in a network where an average Peak Hour user session lasts 30 minutes then each port could be used twice during the hour.

The formula for this calculation is $\text{minutes in an hour} / \text{average call length in minutes}$. If the total ports in use is 60 and the average call length in minutes is 30, the Port Use Factor is 2 ($60/30 = 2$). For an average session length of 20 minutes, the Port Use factor is 3 ($60/20 = 3$).

Peak Hour User Sessions—Using the Port Use Factor, multiply the MSS by the Port Use Factor to calculate the expected number of Peak Hour User Sessions. Continuing with the previous example information: 100,000 ports @ 5% vacancy factor at Peak Hour calculates to an estimated MSS of 95,000. Multiply this value by the Port Use Factor of 2 (Peak Sessions = $95,000 \times 2 = 190,000$). If you have a Port Use Factor of 3, there would be 285,000 Peak Hour sessions ($95,000 \times 3 = 285,000$).

AAA Load—As the final step, it is necessary to convert the Peak Hour Sessions to AAAs per second.

Since there are 3,600 seconds in an hour ($60 \text{ minutes} \times 60 \text{ seconds}$), you divide the Peak Hour Sessions by 3,600 seconds to arrive at AAA/sec, remembering that each user session is expected to produce one AAA transaction. The formula for calculating the Peak Hour AAA/second load is $(\text{AAA per sec total ports in use} \times 60)$, average call length in seconds is 3,600 seconds.

Simplify this to: Peak Hour AAA/sec Load = Peak Hour User Sessions average call length in seconds.

Using the data from the first example, substitute 190,000 for Peak User Sessions and 1,800 seconds for the average 30 minute call length (Peak Hour AAA per sec Load = 52.7 AAA/sec). The second example of 20 minutes per session ($285,000 / 1,200$) results in 79.1 AAA/sec. Since these are estimates, round these AAA figures up to 55 and 80 respectively.

Server Sizing

To estimate server requirements it is necessary to know your server's maximum AAAs/sec capacity. This number can be affected by a number of factors:

- System speed—Number of processors and processor speed
- Hardware shared with other applications, for example the Server Management Tool
- Number of methods in the PolicyFlow
- Interaction with the Universal State Server
- Whether the server accesses a database or directory
- How the server handles accounting records, such as writing to disk or entering into a database

Estimating server size requires learning how the access servers select and balance the load between AAA servers. Some access servers can switch between up to three AAA servers while others can only switch between two. For this example, assuming the following factors:

- A peak hour load of 25 AAA/sec
- Access servers that can switch between two RADIUS servers
- Two NavisRadius servers that can handle 30 AAA/sec each
- The two AAA servers use the IP Addresses 10.0.1.11 and 10.0.1.12

Configure the access servers so the first choice server, RADIUS #1, is equally divided between the access servers. Half of the access servers list the RADIUS servers in this order:

RADIUS #1 = 10.0.1.11
RADIUS #2 = 10.0.1.12

The other half reverse the preference and list the RADIUS servers in this order:

RADIUS #1 = 10.0.1.12
RADIUS #2 = 10.0.1.11

With this configuration, expect the Peak Load 25AAA/sec total load to be equally divided between the two RADIUS servers—each server processes 12.5 AAA/sec in the Peak Busy Hour.

Now, assume that one of the two RADIUS servers becomes unavailable (for example, the network experiences an outage or power failure). The entire load of 25 AAA/sec falls to the remaining RADIUS server that is still safely under its maximum rating of 30 AAA/sec.

As this example demonstrates, in cases where access servers can select between two RADIUS servers, it is important to distribute the load so that in normal operation no RADIUS server handles more than 50% of its rated capacity. This ensures a reserve capacity in the event of server failure.

Scaling Your Network

The second example assumes the network has grown from a Peak Hour load of 25 AAA/sec to a load of 36 AAA/sec.

In normal operation, the NavisRadius servers can handle 18 AAAs/second (1/2 the load). If one server fails, the remaining server has to handle all 36 AAA/sec, which it cannot do. In this case, a failure requires a third NavisRadius server to handle the load.

Assuming our example now has three NavisRadius servers each with a 30 AAA/second capacity. The following IP addresses 10.0.1.11, 10.0.1.12 and 10.0.1.13 have been assigned to the servers. Configure the servers so that RADIUS #1 is equally divided between the three servers.

The first third of the access servers list the RADIUS servers in this order:

```
RADIUS #1 = 10.0.1.11  
RADIUS #2 = 10.0.1.12  
RADIUS #3 = 10.0.1.13
```

The second third stagger the preference and list the RADIUS servers in this order:

```
RADIUS #1 = 10.0.1.12  
RADIUS #2 = 10.0.1.13  
RADIUS #3 = 10.0.1.11
```

The last third again stagger the preference and list the RADIUS servers in this order:

```
RADIUS #1 = 10.0.1.13  
RADIUS #2 = 10.0.1.11  
RADIUS #3 = 10.0.1.12
```

As in the previous example with two NavisRadius servers, the normal load is evenly distributed across the three NavisRadius servers. With a Peak Hour AAAs/sec rate of 36, each of the NavisRadius servers can handle 12 AAA/sec during the peak hour.

If one of the NavisRadius servers fails or otherwise becomes unavailable, the load distributes evenly across the other two servers. This leaves each with an 18 AAA/sec load, which is safely within their load capacity.

This example shows when the access server can list three AAA servers, each server can be loaded up to two-thirds of its maximum (30 AAA/sec in this example). However, a more conservative load factor of 50% should be used and an allowance must be made for simultaneous failure of two systems in situations where maximum reliability must be maintained, unreliable network links exist, or problems exist with power supplies, computing hardware or similar problems.

Load Distribution

In cases where the total Peak Hour AAA load exceeds the rated capacity of a RADIUS server, you need to develop a way to ensure that the load is evenly distributed.

For example, in the case of three NavisRadius servers and three access servers that can only list two NavisRadius servers, a scheme using three NavisRadius servers similar to the following could be used. One bank of the access servers would list the NavisRadius servers in this order:

The first group lists the RADIUS servers in this order:

RADIUS #1 = 10.0.1.11

RADIUS #2 = 10.0.1.12

The next group lists the RADIUS servers in this order:

RADIUS #1 = 10.0.1.12

RADIUS #2 = 10.0.1.13

The last group lists the RADIUS servers in this order:

RADIUS #1 = 10.0.1.13

RADIUS #2 = 10.0.1.11

The access servers are configured so the first and second NavisRadius server choices are equally divided between the three server banks.

Other Considerations

Authentication and Accounting Servers

In all the examples presented so far, the AAA servers have done both authentication and accounting. However, in many cases it may be desirable to have some servers perform only authentication and have others perform only accounting. A server performing both functions might handle around 80 AAA/sec, but a server dedicated to authentication might process 250 requests per second. This disparity exists because accounting actions typically involve writing data to the disk or databases, which takes more time, and accounting requests cannot be acknowledged until a “write” has occurred. This slows down the entire transaction cycle.

It is also important to consider that a failed or lost authentication request can result in the server failing to create a user session. However, problems in the handling of accounting records do not affect the user session. In addition, a typical modern access server can buffer accounting requests and continues to resend them at intervals long after the session has ended.

File Sources

Where and how files are stored affects system performance. Files cached to memory are accessed much faster than those retrieved from LDAP or a database thus the AAA cycle is faster.

Multi-Processors or Multiple Machines

NavisRadius provides support for systems with two or more processors. This capability brings a new consideration to the server size planning question: Should the network have a few very powerful servers or many, less powerful servers?

Ease of software configuration and hardware maintenance creates a strong case for large multiprocessor systems capable of handling several hundred AAA/sec. However, it should also be considered that large systems can be subject to some common points of failure beyond the question of server capacity. These considerations are:

- Routers and switches
- Network interface cards (NICs)
- Disk drives
- Power supplies

Recommendations

The process outlined provide a starting point to build a system. Trial and error is required to determine the correct mix of PolicyFlow methods, use of a state server, authorization and accounting processing, and file locations.

In a network that expects 500 AAA/sec, two machines with 500 AAA/sec capacity can easily handle the load. However, in the event that one of those machines goes offline, the entire load of 500 AAA/sec falls to a single server. During the time necessary to replace a power supply, the entire network is at considerable risk.

For large networks, install at least 3 servers with each server capable of carrying the entire network load. If more than 3 servers are installed, then the load distribution concepts discussed previously would apply.

Check the NavisRadius Web site for the results of typical performance tests.