Solaris™ PC NetLink 1.2 High Availability Guide

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Contents

Preface

This document describes how to set up Solaris™ PC NetLink[1] 1.2 software on a Sun™ Cluster.

Before You Read This Book

Before attempting to set up PC NetLink software on a Sun Cluster, you should have a thorough understanding of high availability and the maintenance and recovery procedures of a Sun Cluster.

You should also understand the purpose of PC NetLink software and the administration it requires, as described in the *Solaris PC NetLink 1.2 Administration Guide*.

How This Book Is Organized

Chapter 1 provides a general overview of what is involved in setting up PC NetLink software on a Sun Cluster.

Chapter 2 provides step-by-step instructions for installing the necessary software packages and configuring the cluster to recognize the PC NetLink service.

Chapter 3 describes the maintenance operations on the Sun Cluster that can affect PC NetLink, and what remedies to take.

1. PC NetLink software incorporates AT&T's Advanced Server for UNIX Systems.

Appendix A describes the PC NetLink product and provides installation instructions for the PC NetLink software.

Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type `rm` *filename*.

Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

Additional sources of information are available to guide you through installing, configuring, and administering the system. The following table describes these sources and how to access them.

- *Solaris PC NetLink 1.2 Installation Guide* provides a general overview of the product and step-by-step instructions for installing it.
- PC NetLink Server Manager Online Help guides you through system administration and configuration tasks.
- *Solaris PC NetLink 1.2 Administration Guide* explains critical concepts and describes how to administer a PC NetLink system. It is available in PDF and HTML formats.

TABLE P-1 Sources of Related Online Information

What's Available	How to Access From the Solaris Operating Environment	How to Access From the Microsoft Windows Operating Environment
Solaris PC NetLink 1.2 Installation Guide	Load the PC NetLink CD-ROM, then use Adobe Acrobat Reader to open `/cdrom/pcnl_1_2/doc/en/install_guide.pdf`	Load the PC NetLink CD-ROM, then use Adobe Acrobat Reader to open *drive-letter*:`\pcnl_1_2\doc\en\install_guide.pdf`, where *drive-letter* is the letter of your CD-ROM drive.
	After installation, use Adobe Acrobat Reader to open `/opt/lanman/doc/en/install_guide.pdf`	*After installation*, use Adobe Acrobat Reader to open `C:\Program Files\Sun Microsystems\PC NetLink Server Manager\doc\en\install_guide.pdf` If you did not install PC NetLink Server Manager in the default location, edit the portion of the path before `\doc` accordingly.
Solaris PC NetLink Server Manager Online Help	*After installation*, start PC NetLink Server Manager using this command: `% /opt/lanman/sbin/slsmgr &` Then, click the Help Topics button in the lower right part of the PC NetLink Server Manager window.	*After installation*, click on Start, select PC NetLink Server Manager from the Programs submenu, and then select PC NetLink Server Manager. Then, click the Help Topics button in the lower right part of the PC NetLink Server Manager window.

TABLE P-1 Sources of Related Online Information *(Continued)*

What's Available	How to Access From the Solaris Operating Environment	How to Access From the Microsoft Windows Operating Environment
Solaris PC NetLink 1.2 Administration Guide		
In PDF format	Load the PC NetLink CD-ROM, then use Adobe Acrobat Reader to open `/cdrom/pcnl_1_2/doc/en/admin_guide.pdf`	Load the PC NetLink CD-ROM, then use Adobe Acrobat Reader to open *drive-letter*`:\pcnl_1_2\doc\en\admin_guide.pdf`, where *drive-letter* is the letter of your CD-ROM drive.
	After installation, use Adobe Acrobat Reader to open `/opt/lanman/doc/en/admin_guide.pdf`	*After installation*, use Adobe Acrobat Reader to open `C:\Program Files\Sun Microsystems\PC NetLink Server Manager\doc\en\admin_guide.pdf` If you did not install PC NetLink Server Manager in the default location, edit the portion of the path before `\doc` accordingly.
In HTML format	*After installation*, point your browser to `file:/opt/lanman/doc/en/admin_guide.htm`	*After installation*, point your browser to `C:\Program Files\Sun Microsystems\PC NetLink Server Manager\doc\en\admin_guide.htm` If you did not install PC NetLink Server Manager in the default location, edit the portion of the path before `\doc` accordingly.

Accessing Sun Documentation Online

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```
http://docs.sun.com
```

Ordering Sun Documentation

Fatbrain.com, an Internet professional bookstore, stocks select product documentation from Sun Microsystems, Inc.

For a list of documents and how to order them, visit the Sun Documentation Center on Fatbrain.com at:

```
http://www1.fatbrain.com/documentation/sun
```

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Please include the part number (8xx-xxxx-xx) of your document in the subject line of your email.

CHAPTER 1

Solaris PC NetLink Software on a Sun Cluster

This chapter provides general information about using Solaris PC NetLink software on a Sun™ Cluster. It contains the following sections:

Overview of PC NetLink 1.2 Software

PC NetLink 1.2 software enables Solaris servers to perform local area network (LAN) administrative tasks for Microsoft Windows and Windows NT clients. When the software is installed on a Solaris server connected to the LAN, the Solaris server looks like a native Windows NT server to both the PC users and the LAN's other NT servers.

PC Netlink 1.2 provides the following Windows NT Server 4.0 services:

- Windows NT primary domain controller (PDC), backup domain controller (BDC), or member server
- Windows Internet Name Service (WINS)
- Microsoft remote procedure calls (RPCs)
- Windows NT Directory Services (NTDS)
- Windows NT Registry
- Microsoft NTFS-compatible file Access Control Lists (ACLs)
- Event logging

The PC NetLink software does not emulate an NT server. By incorporating networking technology from Microsoft into the Solaris operating environment, it provides true Windows and NT file and print services.

About Administering a LAN That Includes PC NetLink 1.2 Software

Administration of a LAN that includes a Solaris server running PC NetLink is similar to adminstration of a pure NT LAN. You continue to carry out routine NT administrative tasks with the usual NT administrative tools, but in addition you must administer the Solaris server and the PC NetLink service.

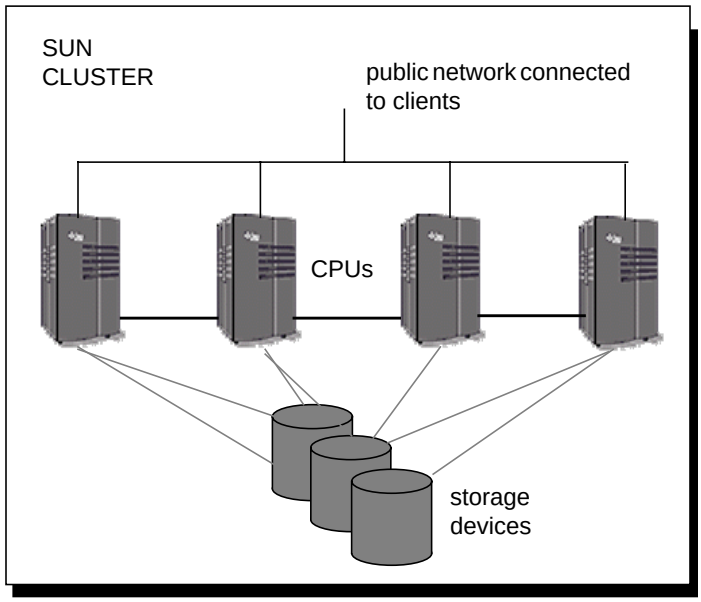
Sometimes you must also coordinate services provided by the two platforms. For instance, to make a printer available to the PCs on the network, you must perform administrative tasks in *both* the Solaris and Windows NT environments.

In the Windows NT environment, you can perform administrative tasks with the standard NT administrative tools such as User Manager and Server Manager. In the Solaris environment, you can use either the command line or the PC NetLink Server Manager GUI.

Detailed information about administrative tasks and instructions are provided in the *Solaris PC NetLink 1.2 Administration Guide*.

Overview of Sun Clusters

A Sun Cluster is a group of computer components, such as CPUs, network interfaces, and storage devices, that are connected in a way that lets them work as a single, redundant system.



A group of computer components that work as a single, redundant system

Since there are more than one of each component, when a component fails, another one can immediately take its place. For instance, if a storage device failed, the other storage devices in the cluster would take over its functions because they have been storing it redundantly. If a CPU failed, the other CPUs would immediately take over its processing duties. In either case, the virtual system created by the combination of individual components would continue to operate.

The Sun Cluster software automatically detects failure, isolates failed components, and initiates recovery procedures. It can also monitor events other than failovers, such as high CPU workloads, slow networks, or failed database processes, and restore them if necessary. Recovery is much quicker on average, since failover is limited to the smallest component, function, or process necessary to resume normal operation.

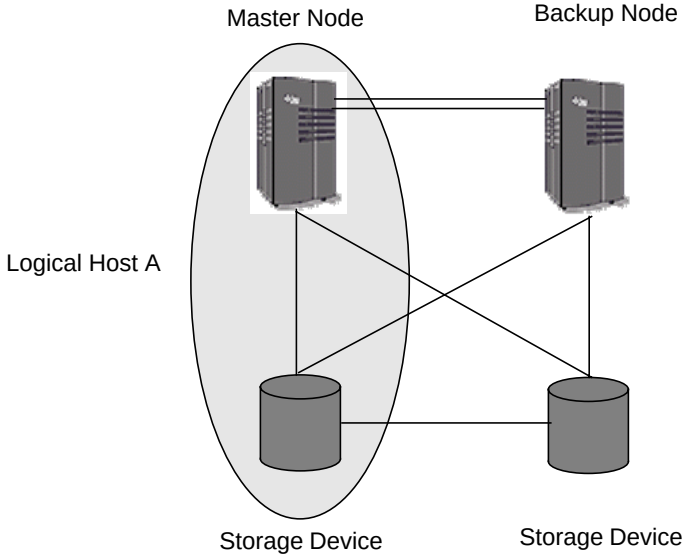
The programs hosted by Sun Clusters are referred to as *data services*. PC NetLink, when installed on a Sun Cluster instead of an individual Solaris server, is considered one of the cluster's data services, and is sometimes referred to as the *high availability* (HA) version of PC NetLink.

The Process of Failover and Recovery

The purpose of a Sun Cluster is to provide computing resources for services such as web hosting that need to remain available to their customers at all times. Because of its failover capabilities, a Sun Cluster composed of two servers and two storage devices is far more reliable than two separate servers with associated storage devices connected over a network. The redundant technology makes a cluster better than the sum of its parts.

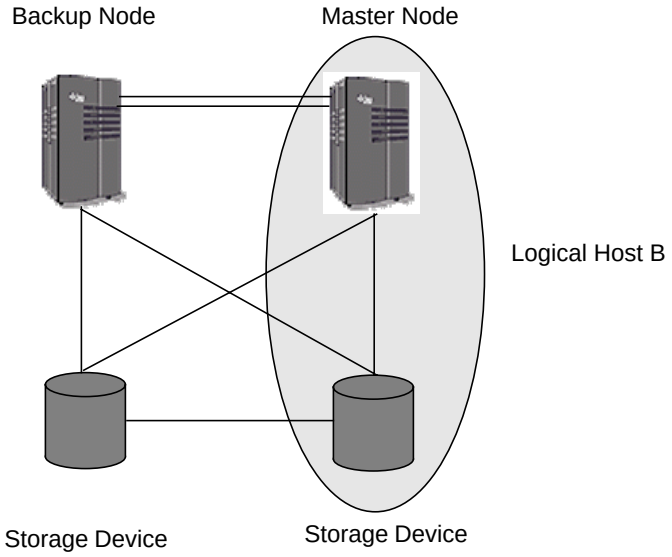
Sun Clusters provide high availability by employing the notion of *logical hosts*. A logical host is a device that exists only in name. Its processing, database, and networking duties are carried out by the physical nodes and storage devices that are assigned to “host” it. The logical hosts are meant to exist “above” individual nodes or storage devices so that if a node or storage device fails, the logical host continues operating.

A logical host is assigned its own name and address. One node in the cluster is designated the *master* node of the logical host, and the remaining nodes become its *backup* nodes.

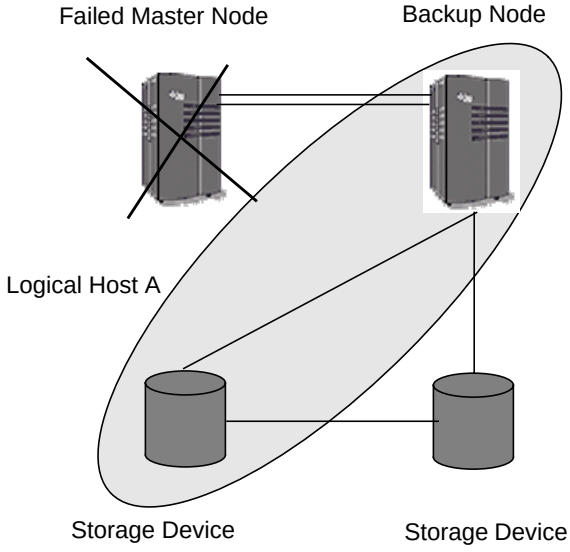


When a data service is installed and configured on a cluster, it is assigned to one of the cluster’s logical hosts.

A cluster can have several logical hosts. The nodes assigned to them can act as each other's backup nodes.



When a logical host's master node fails, the logical host is automatically moved to another working node and continues operating.



A failover follows this sequence of events:

1. The backup node reserves all the disk groups associated with all the logical hosts on the master server.
2. The backup node checks the consistency of all the file systems associated with the diskgroup and mounts them.
3. The backup node initiates recovery procedures and restarts all the data services associated with all the logical hosts on the master server.
4. The backup node assumes the IP address of the logical host and resumes the fault monitoring process.

Although the physical components that constitute the logical host have changed, the logical host's name, IP address, and availability to its data services have not.

Recovery Times

The services running on a Sun Cluster experience failover under three principal conditions:

- The hardware fails.
- The cluster software is stopped on the primary node.
- An individual data service is manually switched over from the master to the backup node.

The time a cluster takes to recover from a failover depends on several factors:

- Total storage
- Storage layout (number and size of disk volumes)
- Number of logical hosts
- Dirty region logging (Veritas File System volumes)
- Type and size of operation in progress during failover

Sun has run several tests to measure recovery time under different conditions. Descriptions of the tests are available in *The Sun Enterprise Cluster Failover White Paper*, available from the Sun Microsystems web site, `http://www.sun.com`.

For your convenience, the results of the tests are summarized below. Please note that these tests were performed on a configuration of the following hardware and software:

TABLE 1-1 Configuration for Failover Tests

Cluster Nodes	Two Sun Enterprise 4000 servers, each with four 256 MHz CPUs

TABLE 1-1 Configuration for Failover Tests

Storage	Two Sun StorEdge A5000s, each with seven 9-GB drives; Veritas File System 3.2.1 and Veritas Volume Manager 2.5
Software	Solaris 2.6 sperating environment Sun Cluster 2.1 software Oracle 7.3.4 database management software

Two types of failover tests were run: HA-NFS and HA-Oracle. Each type of failover test used two different scenarios. The HA-NFS test ran under one scenario with a small number (1-7) of large disk volumes (8-GB each), and one with a large number (4-28) of small volumes (2-GB each). In both cases, storage ranged from 8-GB to 56-GB. In addition, the HA-NFS test ran with and without a large file system input/output operation in progress.

The HA-Oracle failover test ran under one scenario with a small number (1-7) of large tablespaces (8-GB each), and one with a large number (4-28) of small table spaces (2-GB each).

Here is a summary of the results:

TABLE 1-2 Summary of Recovery Times

Type of Test	Scenario	Recovery Time
HA-NFS	1 - 7 volumes of 8-GB each	21 - 35 seconds
	4 - 28 volumes of 2-GB each	34 - 59 seconds
HA-Oracle	1 - 7 tablespaces of 8-GB each	31 - 33 seconds
	4 - 28 tablespaces of 2-GB each	31 - 36 seconds

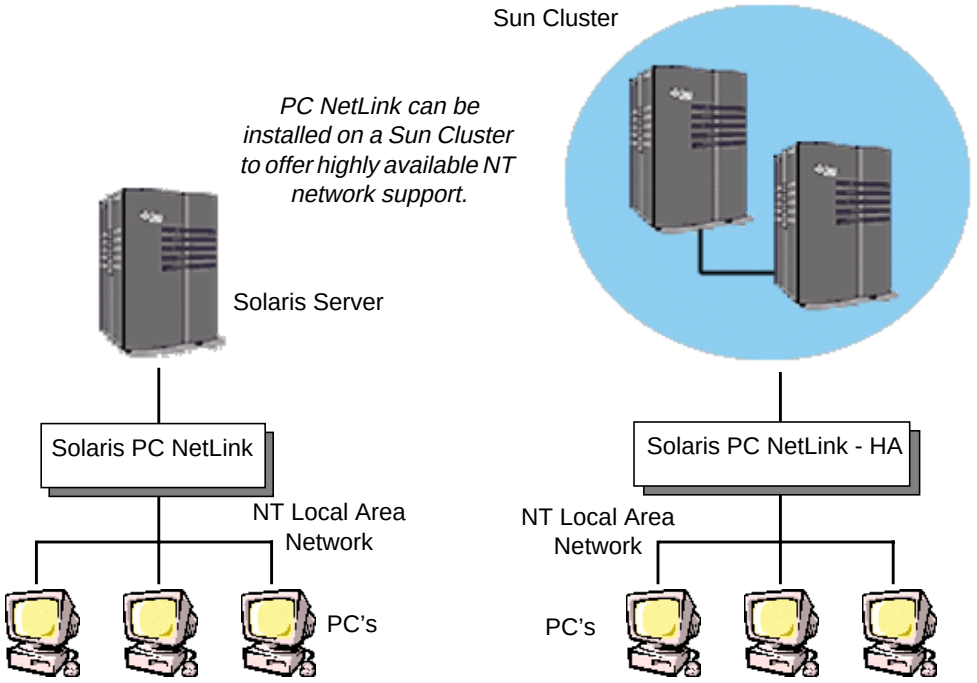
Setting Up Sun Clusters

The components of a Sun Cluster are connected into a unified, redundant system through specialized hardware and software. The administrators of the cluster must install and configure hardware components such as private networks and mirrored disk arrays. They must also install and configure the Sun Cluster software program. The administrators of the data services such as PC NetLink must install their software on the cluster and configure it for operation in a clustered environment.

Instructions for setting up and configuring a cluster's hardware and software are provided in the *Sun Cluster Software Installation Guide*, the *Sun Cluster Administration Guide,* and their related documentation. Instructions for setting up software programs are provided in each program's documentation. Instructions for setting up PC NetLink 1.2 are provided in the remaining chapters of this manual.

Using PC NetLink 1.2 Software on a Sun Cluster

When Solaris PC NetLink software is installed on a Sun Cluster, it provides high availability (HA) capabilities to the NT network being managed by PC NetLink.



It takes advantage of the cluster's redundancy and automatic failover capabilities to ensure that the NT network operates without downtime. It consists of:

- The basic set of PC NetLink packages that install the software and its management tools on all the nodes in the cluster
- One additional HA-specific package that is installed on all the nodes of the cluster
- A script, executed only on the master node of the cluster, that configures the Sun Cluster to recognize the PC NetLink service

How Is PC NetLink Software Different When Installed on a Sun Cluster?

PC NetLink installed on a Sun Cluster is different from PC NetLink installed on a single Solaris server primarily in its close integration with the HA capabilities of the Sun Cluster. PC NetLink installed on an individual Solaris server would not have these capabilities. If one component in the cluster failed, PC NetLink service would remain available to the LAN along with any other software services supported by the cluster.

Because of PC NetLink's close integration with the cluster, you might need to re-install or reconfigure the PC NetLink software after components on the cluster are replaced or added. Complete details are provided in Chapter 3.

The only other differences between PC NetLink on a Sun Cluster and PC NetLink on an individual Solaris server are their installation and configuration procedures. Setup on the Sun Cluster requires two additional steps. One step installs the `SUNWlzha` package on the cluster nodes. The other configures the cluster to recognize the PC NetLink service. Both steps are described in Chapter 2.

Other than its HA capabilities and the additional maintenance duties it requires, the PC NetLink on a Sun Cluster operates like, and contains the same management tools as, PC NetLink installed on an individual Solaris server.

About LAN Domain Controllers and Sun Clusters

When you install PC NetLink software on a single Solaris server, you must decide whether that server will act as a primary domain controller (PDC), backup domain controller (BDC), or member server for the NT network.

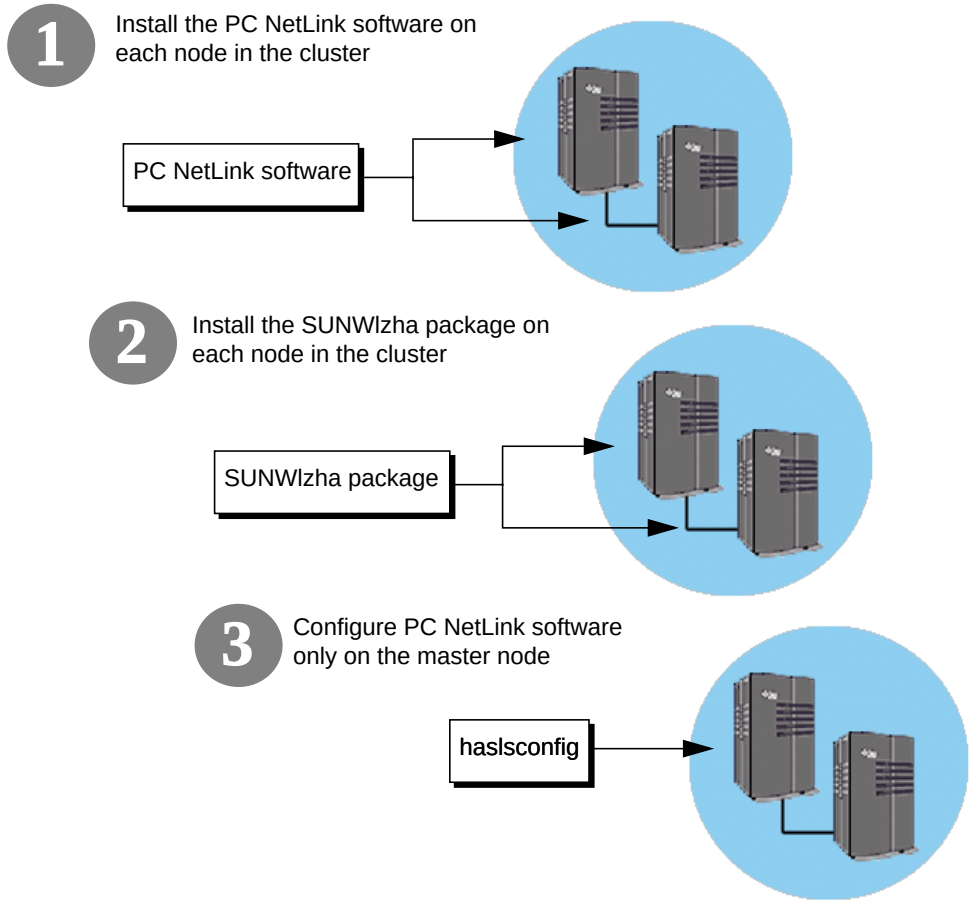
The same principle applies when you install PC NetLink software on a Sun Cluster. Although the nodes of a logical host are designed as master and backups, they do not correspond to the PDC and BDC of an NT LAN. From the perspective of the PC NetLink service, the entire cluster is a single server, and even though it may be composed of several physical nodes, it can act as only as PDC, BDC, or member server. You can select the cluster's domain controller role when you run the HA configuration script, described in Chapter 2.

You should also be aware that even though you will install the PC NetLink software and the `SUNWlzha` package on every physical node in the cluster, the PC NetLink software can only be supported by one logical host. You will select that logical host during PC NetLink configuration.

CHAPTER 2

Setting Up PC NetLink Software on a Sun Cluster

To set up Solaris PC NetLink software on a Sun Cluster, perform these three tasks:



This chapter contains instructions only for the second and third tasks, installing the SUNWlzha package and configuring the master node. Because the PC NetLink installation instructions are contained in the *Solaris PC NetLink 1.2 Installation Guide*, they are not included in this chapter. However, in case you don't have the installation guide handy, a copy of the installation instructions is included in Appendix A.

Before You Begin to Install the SUNWlzha Package on a Sun Cluster

Before you begin to install the SUNWlzha package and configure the cluster's master node, prepare for the process by reading the following sections:

- "System Requirements" on page 12
- "Gathering Information" on page 13
- "Security Prerequisites" on page 13

System Requirements

Each physical server on which you install the PC NetLink software and the SUNWlzha package must have the following configuration, as a minimum:

- Sun Ultra™ 5 system
- Solaris 2.6 or later release of the operating environment, the entire distribution
- 48 Mbytes of RAM
- 100 Mbytes of free disk space in the /opt directory
- 100 Mbytes of free disk space in the /var directory; 1024 Mbytes for a large user environment
- 100-Mbyte network interface card
- Sun Cluster software version 2.2 with RAID (disk group) software installed and configured

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Note – Although PC NetLink software 1.2 is designed to operate on Solaris 2.6, Solaris 7, and Solaris 8 operating environments, and on Sun Cluster 2.2 and 3.0 software, it has only been tested on Solaris 2.6 with Sun Cluster 2.2, Solaris 7 with Sun Cluster 2.2, and Solaris 8 with Sun Cluster 2.2 4/00 release.

Gathering Information

Before you install the SUNWlzha package and configure the master node, gather the following information:

- Name of the logical host on which you will run PC NetLink services—use `hastat(1M)` to find it
- Name of the disk group directory into which the PC NetLink software will be loaded—the directory must be in the disk group that was associated with the logical host during initial cluster configuration.
- Decide whether the cluster will act as the PDC or BDC for the NT network
- (optional) Scope ID for administering the Sun Cluster environment

Security Prerequisites

Password information must be identical for all the nodes in a cluster. The installation script for the PC NetLink software establishes the same password information on every system on which it is installed, unless it finds preexisting entries. To make sure that preexisting entries do not result in different password information between different nodes, after installing the PC NetLink software on all the nodes in the cluster but before installing the SUNWlzha package, copy these files from the first node into the other nodes in the cluster:

- `/etc/group`
- `/etc/passwd`
- `/etc/shadow`

Installing the SUNWlzha Package

Install the SUNWlzha package on every node in the cluster after:

- You have installed PC NetLink
- You have copied the `/etc/group`, `/etc/passwd`, and `/etc/shadow` files from the first node into all subsequent nodes, as described above, under “Security Prerequisites” on page 13.

Follow the instructions below.

▼ How to Install the SUNWlzha Package

1. **Insert the PC NetLink 1.2 CD into the server's CD-ROM drive.**
2. **Open a Terminal window.**
3. **Log in to the server as root.**

```
node% root
passwd: password
node#
```

4. **Use the** `cd` **command to go to the** `/cdrom/PCNL/sparc` **directory.**

   That's the directory that contains the `SUNWlzha` package.

```
node# cd /cdrom/PCNL/sparc
```

5. **Use the** `pkgadd` **command to install the** `SUNWlzha` **package.**

```
node# pkgadd -d . SUNWlzha

Processing package instance <SUNWlzha> from /cdrom/PCNL/sparc

Solaris (TM) PC NetLink HA (sparc)
1.2,REV=RR
Copyright 2000 Sun Microsystems, Inc. All rights reserved.
Using </> as the package base directory.
## Processing package information.
## Processing system information.
4 package pathnames are already properly installed.
## Verifying package dependencies.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/getuid programs.
```

6. **Verify that you want to continue with the installation.**

   When the following question appears, type `y` for Yes.

```
This package contains scripts which will be executed with super-
user permission during the process of installing this package. Do
you want to continue with the installation of <sunwlzha>?[y,n] y
```

7. **Verify that the package was installed correctly.**

   Check the output of the script for the words "`Installation of <SUNWlzha> was successful`."

```
Installing Solaris(TM) PC NetLink HA as <SUNWlzha>

## Installing part 1 of 1.
/opt/lanman/lib/ha/ha_1paddclass
/opt/lanman/lib/ha/ha_1paddprinter
.
.
.
/opt/lanman/sbin/halpsetup
/opt/lanman/sbin/haslsconfig
/opt/lanman/sbin/hauninstall
[verifying class <none>]

Installation of <SUNWlzha> was successful.
```

8. **Repeat for subsequent nodes.**

Configuring PC NetLink Service

You can configure PC NetLink service on a Sun Cluster only after you have:

- Installed PC NetLink on every node in the cluster
- Installed the `SUNWlzha` package on every node in the cluster

You only need to configure the PC NetLink service once, from the master node. Follow the instructions below.

▼ How to Configure PC NetLink Services

1. **Use the** `hastat` **command to verify that the cluster is running on all nodes.**

   Keep the output of the `hastat` command open in a Terminal window. You will need some of the information it supplies. Here is a partial output of the command. For detailed description of the command, see the Sun Cluster documentation:

```
nodem# hastat

Getting Information from all the nodes ......
              HIGH AVAILABILITY CONFIGURATION AND STATUS
              -----------------------------------------

LIST OF NODES CONFIGURED IN <serengeti> CLUSTER
      wgs40-04 wgs40-80

CURRENT MEMBERS OF THE CLUSTER

     wgs40-04 is a cluster member
     wgs40-80 is a cluster member

CONFIGURATION STATE OF THE CLUSTER

     Configuration State on wgs40-04: Stable
     Configuration State on wgs40-80: Stable
```

2. **Log in to the cluster's master node as root.**

```
nodem% root
passwd: password
nodem#
```

3. **Use the** `cd` **command to go to the** `/opt/lanman/sbin` **directory.**

   That directory contains the configuration script.

```
nodem# cd /opt/lanman/sbin
```

4. **Invoke the configuration script.**

```
nodem# ./haslsconfig
```

5. **Verify that you want to execute the script.**

   When the following question appears, type `y` for Yes.

```
PC NetLink 1.2 HA Configuration Utility

Executing this script will configure a specified logical host in
a Sun Cluster with a highly available version of PC NetLink.

Do you wish to continue [y/n]? y

Solaris (TM) PC NetLink daemons have been stopped.

NetBIOS shutdown complete.
```

6. **If this error message appears, ignore it.**

   The error appears because the script was unable to stop the PC NetLink service. It was unable to stop the service because it was not running.

```
Error when trying to stop Solaris(TM) PC NetLink.
Solaris (TM) PC NetLink processes were not running.
```

7. **When prompted, type the name of the logical host on which you will install PC NetLink.**

   You can find the prompt in the output of the `hastat` command.

```
Enter the logical host to be used for clustered installation:
logical-host-name

The name of the logical host you entered was: logical-host-name
```

8. **Type the disk group directory into which the PC NetLink will be installed.**

   The directory must be part of the disk group that was associated with the Sun Cluster during the cluster's initial configuration.

```
Enter the directory path to be used for clustered installation:
directory-path

The path of the shared directory you entered was: directory-path

Configuring logical host nodem for PC NetLink HA ...
```

9. **Confirm that you want to configure the selected NetBIOS LAN adapter over the network interface that is indicated by the script.**

   The network interface indicated by the script is the logical network interface that was associated with the logical host during initial configuration of the Sun Cluster. Type `y` for Yes.

```
Do you want to configure NetBIOS lan-adapter-n over Network interface:
network-interface-number? (default=y)[y/n]? y
```

10. **Enter the scope ID that will be used to administer the PC NetLink service.**

    A scope ID limits administrative access to the cluster's components and services. If you created one for the PC NetLink service, enter it now. If you did not create one, press Enter.

```
Enter SCOPE_ID for NetBIOS lan-adapter-n or press Enter to skip: Press
Enter
```

11. **Confirm the name of the logical host.**

    The script asks you whether you want to change the name of PC NetLink server to something different than the logical host. Type y for Yes and enter the new name at the prompt, or type `n` for No.

```
Solaris (TM) PC NetLink provides a NETLOGON service which
simplifies the administration of multiple servers. A single user
accounts database can be shared by multiple servers grouped
together into an administrative collection called a domain. Within
a domain, each server has a designated role. A single server,
called the primary domain controller, manages all changes to the
user accounts database and automatically distributes those changes
to other servers, called backup domain controllers, within the same
domain. You must now supply a server name (the name by which this
server will be known on the network), the role that this server
will perform in that domain (primary, backup, or member), and the
domain name.

The current name of this server is (nodem).
Would you like to change this name now [y/n]? n
```

12. Type the role (PDC, BDC, or member) that the logical host will play.

```
Enter role (‘primary’, ‘backup’, or ‘member’): role

This server will become a role
```

Note – The following steps will vary with the role you enter, primary, backup, or member. We use primary as an example, and assume you don’t want to change the domain name. You can, of course, select a different role and change the domain name. The screens are slightly different for each case, but they all lead to Step 17.

---

13. Confirm the logical host’s domain name.

The script asks you whether you want to change the domain name. Type n for No.

```
The domain that this server will join is named (domain-name).
Would you like to change this domain name now [y/n]? n
```

14. Confirm your previous three selections.

Type y for Yes.

```
Confirm choices    server name : nodem
                   role        : primary
                   domain      : my_dom
Is this correct [y/n]? y
```

15. Type and re-type your administrator’s password for the domain’s PDC.

```
Enter the password for the Administrator: password
Re-enter password: password
```

16. Confirm that you want to continue with the configuration.

The purpose of this confirmation is to make you aware that continuing with the operation will erase all existing user account information in the backup servers and replace it with the information existing on the master.

If you want to make a copy of that information before you lose it, you can type `n` for No, which will halt the configuration process. You can then return later and begin the configuration process when you are ready to have those files overwritten.

If you are ready now to have those files overwritten, type `y` for Yes.

```
You have not made any changes to the server name, server's role or
domain.  If you continue, the user accounts database and associated
files will be re-initialized.  All data currently in those files
will be replaced.
Do you want to continue [y/n]? y
```

17. Examine the script output.

If the last line does not say "success," perform steps 18, 19, and 20.

```
Creating Solaris (TM) PC NetLink accounts database.
Halting PC NetLink services on nodem...
Solaris (TM) PC NetLink daemons have been stopped.

NetBIOS shutdown complete.

PC NetLink services on nodem halted.

date ... Service pc-netlink is registered
HA service pc_netlink has been successfully registered.

date ... Service pc-netlink successfully turned on
HA service pc_netlink started successfully on nodem.
Success.
```

18. (Optional) Re-register the service with NetBIOS.

Perform this step only if the PC NetLink service was not started successfully.

```
nodem# ./opt/hme0/SUNWlzha/sbin/reconfig -netbios

Do you want to configure NetBIOS lan-adapter-n over Network interface:
network-interface-number? (default=y)[y/n]? y

Enter SCOPE_ID for NetBIOS lan-adapter-n or press Enter to skip: Press
Enter
```

19. (Optional) Start NetBIOS.

Perform this step only if the PC NetLink service was not started successfully.

```
nodem# /etc/init.d/netbios start

NetBIOS Network Initialization Start...
Loading WINS configuration
NetBIOS WINS setting succcessfully applied.
NetBIOS transport is set to Broadcast Mode.
WINS resolution is disabled.
Loading WINS configuration complete.

Loading Local IP to NetBIOS Name Mapping from Database...
NetBIOS Network Initialization Complete.
```

20. (Optional) Start the PC NetLink service.

Perform this step only if the PC NetLink service was not started successfully.

```
nodem# /etc/init.d/ms_srv start

Starting Solaris (TM) PC NetLink daemons ...
```

CHAPTER 3

Restarting the PC NetLink Service After Interruption or Failure

Sun Clusters are designed to provide uninterrupted service even when individual components fail. However, when entire systems fail or when the entire cluster is undergoing maintenance, PC NetLink service may be unavailable.

This chapter explains what you must do to reinstate PC NetLink service after it has been interrupted either by cluster maintenance operations or failure. It has two sections:

Causes of PC NetLink Service Interruption

As described in Chapter 1, a Sun Cluster can have multiple logical hosts, but you install PC NetLink software on only one of them. As a result, if the logical host on which PC NetLink software is installed fails or is shut down by cluster maintenance, even if the cluster as a whole continues to operate, PC NetLink service is interrupted.

In some cases, as when the logical host is placed in maintenance mode, PC NetLink service is automatically restarted. In some cases, however, as when a logical host is removed or has its IP address changed, you need to reinstall and reconfigure the PC NetLink service. TABLE 3-1 lists the types of interruptions and remedies.

TABLE 3-1 Causes of Service Interruption and Remedies

Cause of Interruption	Remedy
PC NetLink's logical host is placed in maintenance mode.	When the logical host is taken out of maintenance mode, the service will restart automatically.
Logical host unrelated to PC NetLink is removed from or added to the cluster.	No action required; does not affect PC NetLink services.
PC NetLink's logical host fails.	Restore these directories from backup media after the logical host has been replaced: • `../var/opt/lanman` • `../etc/opt/lanman` They are in the directory you specified during configuration.
IP address on PC NetLink's logical host is changed.	1. Unconfigure PC NetLink on master node. 2. Reconfigure PC NetLink on master node.
Network interface is added or removed.	1. Unconfigure PC NetLink on master node. 2. Reconfigure PC NetLink on master node.
Failed node that was supporting PC NetLink's logical host is replaced.	1. Unconfigure PC NetLink on master node. 2. Install PC NetLink on replacement node. 3. Install SUNWlzha on replacement node. 4. Reconfigure PC NetLink on master node.

Instructions for Recovery of PC NetLink Service

This section provides step-by-step instructions for these tasks:

▼ How to Unconfigure PC NetLink Service

1. **Log in to the master node as root.**

```
master% root
passwd: password
master#
```

2. **Type the** `hauninstall` **command.**

```
# /opt/lanman/sbin/hauninstall

/var/opt/lanman/profiles
/var/opt/lanman/regfiles/perf009.regadm
/var/opt/lanman/regfiles/reg.default
.
.
.
/var/opt/lanman/.LCK.ctrl
/var/opt/lanman/.LCK.ep
/var/opt/lanman/.
4011 blocks
/export/lanman/.
0 blocks
/etc/opt/SUNWlznb/boards
/etc/opt/SUNWlznb/netbios.conf
/etc/opt/SUNWlznb/nbconfig
/etc/opt/SUNWlznb/.
7 blocks
/var/opt/SUNWlznb/fnbwins.info
/var/opt/SUNWlznb/.
1 blocks
```

3. **Remove the** `SUNWlzha` **package from each node in the cluster.**

   Follow the instructions under “How to Remove the SUNWlzha Package” on page 26.

4. **Remove the PC NetLink software from each node in the cluster.**

   Follow the instructions “How to Remove PC NetLink Software” on page 27.

▼ How to Remove the SUNWlzha Package

1. **Log in to the node as root.**

```
node1% root
passwd: password
node1#
```

2. **Use the `cd` command to change to the directory in which you installed the package.**

   A typical path is `/opt/lanman/lib/ha`.

```
node1# cd /opt/lanman/lib/ha
```

3. **Use the `pkgrm` command to remove the package.**

```
# pkgrm SUNWlzha

The following package is currently installed:
SUNWlzha Solaris (TM) PC NetLink HA
(sparc) 1.2,REV=beta09
```

4. **Confirm that you want to remove the package.**

   Type `y` at the prompt.

```
Do you want to remove this package? y

## Removing installed package instance <SUNWlzha>

This package contains scripts which will be executed with super-
user permission during the process of removing this package.
```

5. **Confirm that you want to continue with the removal of the package.**

   Type `y` at the prompt.

```
Do you want to continue with the removal of this package [y,n,q]? y
## Verifying package dependencies.
## Processing package information.
## Executing preremove script.
## Removing pathnames in class <none>
/opt/lanman/sbin/hauninstall
/opt/lanman/sbin/haslsconfig
/opt/lanman/sbin/halpsetup
/opt/lanman/sbin <shared pathname not removed>
/opt/lanman/lib/ha/netlink_stop_net
/opt/lanman/lib/ha/netlink_start_net
/opt/lanman/lib/ha/netlink_check_mastered
/opt/lanman/lib/ha/netlink_check_configured
/opt/lanman/lib/ha/ha_lpaddprinter
/opt/lanman/lib/ha/ha_lpaddclass
/opt/lanman/lib/ha
/opt/lanman/lib <shared pathname not removed>
/opt/lanman <shared pathname not removed>
/opt <shared pathname not removed>
## Updating system information.

Removal of <SUNWlzha> was successful.
```

▼ How to Remove PC NetLink Software

1. **Log in to the node as root.**

```
node1% root
passwd: password
node1#
```

2. **Use the `uninstall` command to remove the PC NetLink packages.**

```
node1# /opt/lanman/sbin/uninstall
```

APPENDIX A

Installing PC NetLink 1.2 Software

This document describes the Solaris PC NetLink 1.2 product and explains how to install PC NetLink components.

About This Appendix

If you want to learn more about the product, read the next sections, “What’s New in PC NetLink 1.2 Software” on page 30 and “PC NetLink Features Introduced in Version 1.0” on page 30.

If you want instructions for installing product components, turn to “How to Install PC NetLink 1.2 Software” on page 35.

If you plan to use PC NetLink with Legato NetWorker® or Solstice Backup™ software, follow installation instructions in “How to Install the PC NetLink 1.2 Backup Module” on page 40.

What's New in PC NetLink 1.2 Software

In addition to all of the features in the 1.0 and 1.1 releases of the product, the PC NetLink 1.2 release includes the following major new features:

- Ability to act as a Windows NT member server
- Client software to enable full backup capability
- High availability agent software
- Windows NT Service Pack 4 (SP4) bug fixes

See "New Features in PC NetLink 1.2 Software" on page 33 for a description of these features.

PC NetLink Features Introduced in Version 1.0

The following sections summarize PC NetLink features available since version 1.0.

Integration With the Solaris Operating Environment

PC NetLink software includes many features of the Solaris operating environment, including preemptive multitasking and symmetric multiprocessing. The time-sharing, multiuser model employed by the Solaris operating environment ensures file system integrity and continued server availability, even if a user's application crashes. See "Security" on page 31 for an overview of PC NetLink security features.

Interoperability With Other Systems

A server running PC NetLink software can function as a file and print server for a small, isolated community of users, or as the foundation of an enterprise networking scheme for a large network distributed over a wide area.

You can deploy a server running PC NetLink software as either a primary domain controller (PDC) or a backup domain controller (BDC) in a network composed of other servers running PC NetLink software or the Windows NT Server operating environment. (A new feature in Version 1.2 adds member server capability as well.)

You can replace existing Windows NT servers in your network with Solaris servers running PC NetLink software. You can do this gradually if you want, replacing backup domain controllers and later promoting one to primary domain controller. Your network will continue to behave as it did before, and users can benefit immediately from the new resources offered by PC NetLink software without additional training, because there is no change in the way they access network resources.

A major feature of PC NetLink software is that you can replace several smaller Windows NT servers with a single, larger server running PC NetLink software.

Security

PC NetLink software offers a logical administrative model that enables efficient management of large networks. An administrator can set up domains and trust relationships between domains to centralize user account and other security information, making the network easier to manage and use. Each user needs only one account and one password. This account can provide the user with access to resources anywhere on the network.

PC NetLink software incorporates enhanced features that support discretionary access control permissions on individual files, directories, and resources, and also includes comprehensive auditing capabilities. These features provide an administrator with a fine level of control over user and resource permissions and auditing.

Network Services

After installation, PC NetLink software starts several network services automatically so that the capabilities of the network are available as soon as you want to work with the system. You also can choose to start other network services automatically at system startup depending on your system needs.

Network Activity Tracking

PC NetLink software allows you to monitor network activity and track computer usage. For example, you can view servers and see which resources they are sharing; view which users currently are connected to any network server; see which files are open; log and view security auditing entries; keep sophisticated error logs; and specify that alerts be sent to administrators when certain events occur. You can also use Microsoft's NT Server Tools to monitor network activity.

Printing

PC NetLink software supports network printers. You can also attach a local printer to a Solaris server running PC NetLink software, and it will appear and function the same as other printers in your domain. If you attach a printer only to a Solaris system that is not running PC NetLink software, it will not be visible to other computers in the domain. See the *Solaris PC NetLink 1.2 Administration Guide* for information about installing a PC NetLink printer on a Solaris system.

Browsing

From your Microsoft Windows desktop, you can browse domains, workgroups, and computers to look for shared directories and printers. You can specify a network name to display available domains and workgroups, a domain or workgroup name to display available computers, or a computer name to display its shared directories.

Network File Sharing

PC NetLink software provides reliable and secure sharing of files and directories among Windows NT network users. Discretionary access controls and PC NetLink security on each file and directory provide the ability to specify the groups and users who can access files, to define the levels of access that each group or user is permitted, and to control auditing. Additional features include file ownership and directory replication.

User Environment Management

PC NetLink supports Windows NT user profiles, which enable administrators to control access to network resources and to manage Windows NT Workstation user desktops.

Remote Administration

PC NetLink software includes PC NetLink Server Manager software, which allows you to administer PC NetLink from the Solaris server and also from Microsoft Windows and Solaris client machines on your network. Remote administration is supported for network functions, including server management, policy management, and Solaris printer installation.

PC NetLink software can operate and be administered regardless of whether Windows NT is running on the network. In addition, you can use Microsoft network administration tools running on Microsoft Windows client computers for remote administration of Windows NT network services provided by PC NetLink software. The following Windows NT Server Tools are included in the PC NetLink kit:

- Server Manager
- User Manager for Domains
- Event Viewer
- System Policy Editor
- WINS Manager

Depending on your operating environment, some or all of these tools may be available. Sun Microsystems does not support Microsoft's Windows NT Server Tools; for assistance, refer to the online help that accompanies those tools.

Year 2000 Compliance

Sun Microsystems certifies that PC NetLink software is Year 2000 compliant. This compliance has been appropriately and adequately tested, and meets Sun's Year 2000 compliance standards.

New Features in PC NetLink 1.2 Software

PC NetLink 1.2 software introduces the following new features.

Member Server

Available at installation time (Custom installation only), the member server option enables a PC NetLink server to act as a Windows NT member server; that is, neither a primary domain controller (PDC) nor a backup domain controller (BDC). Member servers don't assist in user logon validation, so virtually all of their resources are available at all times. For example, you can use a member server as a file and print resource server, assign Administrator rights to the system, and exclude unnecessary access to the system.

You can also reconfigure a PC NetLink server as a member server after installing the product.

Backup

Included in the 1.2 release is client software that enables use of the Solstice Backup and Legato NetWorker products to back up Solaris files in shared directories, including Access Control Lists (ACLs) associated with files. After installing the PC NetLink base product, you must install the backup package `SUNWlzlb` separately on each server you plan to back up. See "How to Install the PC NetLink 1.2 Backup Module" on page 40 for installation details.

High Availability

Solaris PC NetLink 1.2 software includes agent software that takes advantage of the high availability capabilities provided by Sun Cluster software.

Service Pack 4 Bug Fixes

All bug fixes required for compatibility with Windows NT Service Pack 4 (SP4) are included in the 1.2 release.

How to Install PC NetLink 1.2 Software

PC NetLink software includes server and client components that you can install on computers running the Solaris operating environment, and a client-side administration tool that you can install on computers running Microsoft Windows operating environments. You can also install Windows NT Server Tools on Microsoft Windows clients.

On Microsoft Windows operating environments, you can preserve a previous version of the client software so that you can continue to use it to manage servers running previous versions of PC NetLink. On the Solaris operating environment, installing version 1.2 of the client software removes any previous Solaris versions of the client software.

PC NetLink 1.2 installation supports a fresh installation as well as upgrade, reinstall, and uninstall procedures.

Server System Requirements

You can install PC NetLink Solaris components on a Sun Ultra 5 system, or on a more advanced system that meets the following restrictions:

- Solaris 2.6 software or a later compatible release, entire distribution installation only.
- 100 Mbytes of free disk space in the `/opt` directory.
- 100 Mbytes of free disk space in the `/var` directory; 1024 Mbytes is recommended for a large user environment.
- 48 Mbytes of RAM is recommended for running applications.
- To test HA interoperability, you must have a second system meeting all the above requirements, an additional 100-Mbyte network interface card installed in each system, and you must have Sun Cluster software installed on both systems.
- To test backup functionality after installing the PC NetLink backup module, you must have the Solstice Backup or Legato NetWorker client component installed on each PC NetLink server that you plan to back up. You must also have one of the following versions of Legato NetWorker or Solstice Backup server software installed on a system somewhere on your network:
  - Solstice Backup 5.1.1
  - Solstice Backup 5.5.1
  - Legato NetWorker 5.5.1
  - Legato NetWorker 5.5.2

Installation Suggestion

For best performance and simplest administration, install PC NetLink software on the systems that have the local resources that you want to share within the network, such as files and printers.

Your server should preferably have enough extra local disk space to hold all the data you want to share with Microsoft Windows clients. Although you can share non-local files accessed through NFS, this will increase network load and can result in inconsistent ACL information if the same files are shared with Microsoft Windows clients by two different machines using PC NetLink software.

System Requirements for PC NetLink Server Manager

You can install PC NetLink Server Manager, the PC NetLink administration tool, on systems running the following operating environments:

- Solaris 2.6 software or a later compatible release
- Windows NT Workstation 4.0
- Windows 95
- Windows 98

Solaris systems should have a minimum of 3 Mbytes of free disk space before beginning installation. For best display results, run PC NetLink Server Manager locally, not on a remote display device.

Systems running Microsoft Windows operating environments should have at least 30 Mbytes of free disk space before beginning installation, and 48 Mbytes of memory.

▼ How to Install or Upgrade Solaris Components

To install PC NetLink Solaris components (including PC NetLink Server Manager):

1. **Log in to the server as root.**
2. **Insert the product CD-ROM into a drive.**
3. **Double-click `install` in File Manager, or execute the following command:**

```
# /cdrom/pcnl_1_2/install
```

If you double-click `install` and the following window appears, click OK to continue. Do not enter options or arguments.

4. **Follow the prompts that appear on your screen.**

You can perform either an Express installation or a Custom installation. Express installation creates a PDC in a new domain, and installs:

- All PC NetLink server components
- PC NetLink Server Manager, the administration tool
- All necessary patches and Java™ components
- Windows NT Server Tools and other client tools

During a new Express installation, you will need to enter server, domain, and Administrator account names if you do not want to use the default names, and a password for the Administrator account. After Express installation finishes, you can run PC NetLink Server Manager or NT Server Tools to change this configuration.

Note – If you are installing PC NetLink on a Sun Cluster, select Express installation and its default values, since when you configure the service on the cluster's master server, you will overwrite any information you enter during installation.

Custom installation gives you greater control over how you install and configure PC NetLink. To perform a new Custom installation, you will need to specify:

- Which components to install—server, administration tool, or both
- If installing server components, whether the server will become a PDC, BDC, or member server
- Information about server and/or domain names and passwords
- What type of NetBIOS configuration to use
- Whether to install Windows NT Server Tools
- Whether to install client tools

Note – You must be experienced with Windows NT system administration to perform a Custom installation. Otherwise, it will be easier for you to perform an Express installation and then reconfigure the server using PC NetLink Server Manager.

About Upgrading Solaris Components

If you install PC NetLink on a system that has a previous version of the software installed, the installation removes the existing packages and replaces them with the corresponding packages attached to the installation script. Your system's current data and configuration are left unchanged. If your current installation does not include all PC NetLink components, you will have the opportunity to add additional components.

▼ How to Reinstall PC NetLink 1.2 Software

You can run the installation script to reinstall PC NetLink 1.2 software. Your system's current data and configuration are left unchanged. If your current installation does not include all PC NetLink components, you will have the opportunity to add additional components.

1. **Log in to the server as root.**
2. **Insert the product CD-ROM into a drive.**
3. **Double-click `install` in File Manager, or execute the following command:**

```
# /cdrom/pcnl_1_2/install
```

If you double-click `install` and the following window appears, click OK to continue. Do not enter options or arguments.

4. **Follow the prompts that appear on your screen.**

▼ How to Uninstall PC NetLink 1.2 Software

Uninstalling PC NetLink 1.2 software removes all PC NetLink software including any client, data, group, user, and log components that may have been created as a result of use or installation of the software. To uninstall PC NetLink 1.2 software:

1. **Log in to the server as root.**
2. **Execute the following command:**

```
# /opt/lanman/sbin/uninstall
```

3. **Follow the prompts that appear on your screen.**

▼ How to Install the PC NetLink 1.2 Backup Module

Before installing the PC NetLink 1.2 backup module on a PC NetLink server, check that the following conditions are true:

- The PC NetLink 1.2 server component is installed.
- The Solstice Backup or Legato NetWorker client package is installed.
- One of the following versions of backup software must be installed somewhere on the network:
  - Solstice Backup 5.1.1
  - Solstice Backup 5.5.1
  - Legato NetWorker 5.5.1
  - Legato NetWorker 5.5.2

Follow these steps to install the PC NetLink backup module. You should install the backup module on each PC NetLink server that you plan to back up.

1. **Log in to the server as root.**
2. **Insert the product CD-ROM into a drive.**
3. **Execute the following command:**

```
# pkgadd -d /cdrom/pcnl_1_2/PCNL/sparc SUNWlzlb
```

The backup module allows backup of files in shared Solaris directories only. Whenever you create or modify shares, you must log in as root and run the file `lmnsr.share` to enable backup for those shares. See the man page for `lmnsr.share`.

Note – Although the Solstice Backup and Legato NetWorker base products allow you to run backup commands when logged in as any user, you must log in as root before using these commands to back up PC NetLink shared directories.

▼ How to Install PC NetLink Server Manager on Microsoft Windows Clients

You can install PC NetLink Server Manager client software on a computer running one of the following operating environments:

- Windows NT 4.0
- Windows 95
- Windows 98

If you need to continue managing servers running previous versions of PC NetLink software, do not remove previous versions of PC NetLink Server Manager. Respond **No** to the installation prompt that asks if you want to remove the previous version.

To install PC NetLink Server Manager, use the PC NetLink 1.2 CD-ROM or access the `tools` share after PC NetLink software has been installed on the server computer.

▼ From the CD-ROM

Follow these steps to install PC NetLink Server Manager from the PC NetLink 1.2 CD-ROM.

1. **Quit any active Microsoft Windows programs.**
2. **Insert the product CD-ROM into a drive.**

   The install screen will appear automatically. If the install screen does not appear after a few seconds, select Run from the Start menu and enter *drive-letter*`:\mswin\intel32\setup.exe`, where *drive-letter* is the letter of the CD-ROM drive into which you loaded the product CD.
3. **Follow the prompts that appear on your screen.**

▼ From the `tools` Share

Follow these steps to install PC NetLink Server Manager from the share `/opt/lanman/shares/tools`. PC NetLink software must be installed on the server and you must be authenticated in your domain. The client computer must be on the same subnetwork as the server, or you must use WINS.

1. **Quit any active Microsoft Windows programs.**
2. **Open the `tools` share and follow the instructions in the file `readme_en.txt`.**

▼ How to Install Windows NT Server Tools on Microsoft Windows Clients

Follow these steps to install Windows NT Server Tools from the `tools` share. PC NetLink software must be installed on the server and you must be authenticated in your domain. The client computer must be on the same subnetwork as the server, or you must use WINS.

1. **Quit any active Microsoft Windows programs.**
2. **Open the `tools` share and follow the instructions in the file `readme_en.txt`.**

   Sun Microsystems does not supply localized versions of Microsoft's NT Server Tools. Check with Microsoft for availability of these tools.