

IT Service Management

S9 Migration Concepts

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Abstract:

ITSM has developed a standard process for migrating Sun SPARC systems running older versions of the Solaris Operation Environments to the current release of the Solaris OS. The following report explains the approach, mechanisms, and requirements to begin this transition. The guide assumes user familiarity with Solaris Live Upgrade and Flash Archive features. For more information, please refer to:

Related ITSM Reference Documents:

- *S9 Migration Process – Summary*
- *S9 Migration Process Guide*

Other Sun Related Reference Documents:

- *Solaris 9 Installation Guide*

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Who Should Read this Document ?

This document is intended to describe S9 Migration Process and give additional details on topics and tools included in the process. It is recommended that any individual planning to execute the S9 Migration Process review this document for further process details or anyone one who wants addition background on the process outlined by its-PAR.

1 S9 Migration Review

1.1 Introduction

One of the SunIT's FY03 goals is to run 100% of its business application servers at Solaris 8 or higher version of Solaris Operating Environment, with a target to upgrade all or most of the datacenter application servers in the SWAN network, to the Solaris 9 (S9) Operating Environment. ITSM-PAR has defined a process allowing server migration to Solaris 9 with minimal downtime for the applications running on the server as well as enabling dual boot capability for the server.

The ITSM-PAR S9 Migration Process will define standards, processes, procedures and tools for upgrading SunIT application servers to the Solaris 9 Operating Environment. At the same time, S9 Migration Process will make use of the Live Upgrade functionality in conjunction with Flash Archive Install mechanism of Solaris 9 for carrying out the

1.2 Overview

Traditional application server upgrades in Sun datacenters would involve significant downtime for applications and significant System Administrator (SA) resources / time. A standard OS upgrade could take up to several hours per server. Additionally, testing applications on a new installation of Solaris would require additional servers to be setup with the new OS, which is expensive and time consuming.

ITSM has developed a process that for migrating a SPARC operating environment with an older Solaris OS to the latest release (Solaris 9) . The process makes use of several sun technologies that will allow for the continued the availability to the target server during the migration process and allow the owner to keep the previous version of the operating environment available for dual boot capability and fallback.

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The ITSM-PAR Solaris 9 Migration Process for application servers provides many advantages over previous methods:

- Make S9 Upgrade process seamless and less resource consuming
- Ability to retain previous Solaris OS of the server
- Ability to fallback to previous Solaris OS
- When needed, server can be booted with previous Solaris OS (Test Environment)
- Remove the need for additional server for testing application on Solaris 9

With the ability to retain and boot previous Solaris OS on the server, most applications can be tested on their Integrated String Test or UAT or Beta Environment. These Test Environment servers can provide “dual” boot capability, to run either S9 or previous OS, therefore removing the need for another special Test Environment for testing applications on Solaris 9 Operating Environment. Also, where needed, this platform can be used for reproducing and reporting of a vendor software problem running on “vendor certified”

2 S9 Migration Process

2.1 Migration vs. Upgrade: What's the difference ?

A common question ask is what is the difference when someone says “..the system is going to be upgraded.” as opposed to “...migrated.” A system that is being **upgraded** is taking the existing target hardware and install a new Operation System in place of the current one. This will leave only the new Operation Environment with all the system files and synchronized. When a system is **migrated** it too has taking the existing target hardware and install a new Operation System, but it has left the original Operation System in place. The two now coexist with the ability to dual boot between them. File synchronization must be done largely manually.

2.2 Key Process Requirements

Before the migration process can begin, there are several key requirements that one should take note of, the biggest of which being that the S9 Migration Process makes use of existing internal storage of the target server to install the Solaris 9 Operation Environment. Most servers following the high availability model make use of some type of volume manager for disk mirroring. This is especially true when it comes to the root disk. (see section titled **Volume Managers**) It is this architecture that the S9 Migration Process will make use of by breaking the root disk mirroring of a target system and use the available device as the target for installing the alternate boot environment. This is the default functionality of the process but there is also option to use any available disk on the target system. Although the S9 Migration Process validates all minimum requirements, there are some key requirements that are core to the use and execution of the process:

- Target servers (to be migrated) are running one of the following Operating Environment: Solaris 2.6, Solaris 7 or Solaris 8.
- A standard Solaris 9 base OS can be installed to all application servers in PSCs.
- Current OS disks are mirrored (to break the mirror and use 2nd disk for S9) **OR** Minimum 2 OS disks (one for current Solaris release and one for new Solaris 9).
- Servers have minimum 2 x 4GB or higher OS disks.

2.3 Process Definition

The S9 Migration Process will provide both the methodology for migrating a target system to the Solaris 9 Operation Environment and automated mechanisms for executing the process in a manner that is consistent. The process is divided into three modules , each with automated tools, that will take the installer through the entire process and provide suggestions for common issues faced when migrating a solaris system.

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2.3.1 Verification Module

This is the initial phase of the S9 Migration Process that will be a module that will validate the target system to determine if it meets the minimum system requirements. All validation that are not met will be returned to the installer in the form of a report that can be used to bring the system up to a migration readiness state. After all validation are meet, this process will perform any necessary disk maintenance required on the target install device including the breaking of any mirrored root devices and auto-partitioning of the available target install device. (see ***Sun IT Migration Tools*** in documents for more detailed description on functionality)

2.3.2 Migration Module

The next phase of the process starts with the migration. The phase will make use of the Live Upgrade Software as well as Flash Archives (see ***S9 Migration Technologies***). During the migration module the solaris image (from a Master Flash Archive) will be installed on the target system. This will use the alternate physical target install device for the installation. Once the installation is complete this module will conclude by performing critical system configuration synchronization and cleanup. (see ***Sun IT Migration Tools*** for more detailed description on functionality)

2.3.3 Synchronization and Analysis Module

The final module will generate analysis reports showing the various differences between the two boot environments. This information is provided as a tool so that an system administrator can make informed decisions about additional systems synchronization that needs to be done between the two environments. The module does included some generic file synchronizations of key solaris files and packages. (see ***Sun IT Migration Tools*** in this document for more detailed description on functionality)

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2.4 Identified Risk

Several risk have been identified with this process, that should be considered based on the requirements associated with the target server and its host applications.

- Root / OS partitions will be un-mirrored in Test Environment servers, until all ISV software version running on the server is supported on the Solaris 9.
- Root / OS partitions will be un-mirrored in Production server for fallback duration. Typical fallback capability duration (FCD) is one week, during which OS partitions on the server will not be mirrored.
- Initial releases of S9 Migration Process will not support Internet build servers
- Some post-OS-install steps would need to be carried out per server requirement .This activity is assumed to be carried out by datacenter staff.

3 S9 Migration Technologies

The following technologies are core to the S9 Migration Process developed by ITSM_PAR for upgrading to the latest release of the Solaris Operating Environment.

3.1 Solaris Live Upgrade

Solaris Live Upgrade software provides the mechanism for migrating that substantially reduces the usual system outage time associated with an operating system upgrades. You can duplicate your current running boot environment (also know as cloning) or install a separate solaris image using a Solaris Flash archive , all while the original boot environment continues to run. The original system configuration remains functional until you choose to activate the alternate boot environment. When the target system is then rebooted, the active boot environment will begin running and the inactivate boot remains available in the case that you want to switch back.

3.1.1 Benefits of Live Upgrade

Solaris Live Upgrade enables you to create copies of a boot environment without affecting the currently running system. Solaris Live Upgrade enables you to create and install a Flash Archives (see section ***Solaris Master Flash Archive*** in this document) of a Master System on multiple target systems, thus greatly reducing the amount of time required to install and migrate a Solaris OS.

3.1.2 Live Upgrade OS Package Requirements

Several OS packages should be present or applied on the target server before us Installing Live Upgrade Software. Without the required OS packages the S9 Migration Process can fail. A list of packages required to support the Live Upgrade software can be found in the ***S9 Migration Process***,. Please review the the requirements for your specific OS version and verify that all packages are present.

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3.1.3 Live Upgrade Patch Requirements

Several patches are required to support the Live Upgrade software and are therefore need to use the S9 Migration Process. For a complete listing of the required patches please review the document ***S9 Migration Process Guide*** . As of version 1.3.1 of the all patches required to support the S9 Migration Process will be hosted on the AI Servers of each participating PSC. A standard location has been established to store the patch requirements for the Live Upgrade software. For a complete listing of the required patches and the default storage location please review the document ***S9 Migration Process Guide*** .

3.2 Solaris Master Flash Archives

The Solaris Flash Archive installation feature allows you to install your custom Solaris image onto an available target system using Live Upgrade software. The Flash Archive is based on the configuration that you install on a Master System (see section ***Master System Creation*** in this document). After you install and configure your Master System, you can create a Solaris Master Flash Archive that can now be installed on any available target system. Using this installation method, you can efficiently install multiple systems with the same software configuration quickly and easily. For use with the S9 Migration Process, a standard Flash Archive image of Solaris 9 has been created for installations. For more details on the contents of the S9 Migration Process flash, please the support web-site at : http://presidents.east/itsm/s9_migration. If you will need to create your own Master Flash Archive, please read the section below titled ***Master Flash Archive Creation***.

3.2.1 Benefits of Flash Archives

Solaris Flash archives install on your system much faster than when you install each of the individual Solaris packages. Also, this installation method enables you to install many systems with the same software and configuration.

3.2.2 Concerns with Flash Archives

Flash archives are large files and require a significant amount of disk space. Also, after you create a Solaris Flash archive, you cannot change the archive.

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3.2.3 Master Flash Archive Creation

After installing and configuring your Master System (see section **Master System Creation**) , you are now ready to create your own Flash Archive. This will require the installation of the Live Upgrade software as well as advanced knowledge of the Live Upgrade Flash Archive creation command and options. Please review the ***Solaris 9 Installation Guide*** for additional details on using Live Upgrade software for creating archives.

Additionally, the S9 Migration Process has been configured to install any Master Flash Archive that meets defined naming and staging location standards. Please review the ***S9 Migration Process Guide*** for guidelines on naming standards for Master Flash Archives used in this process. This will insure compatibility with the all releases of the S9 Migration Process.

4 S9 System Requirements

The following system requirements will be verified by the S9 Migration Process on the target server in order to migrate to the latest release of the Solaris Operating Environment using **Solaris Live UpgradeV2.0**. If the target system does not meet all of the minimum requirements, the process will exit with information on which requirement needs attention. It is a good practice to make sure your servers meet these requirements before starting to minimize delays later.

4.1 Validate OS Level Requirement

The S9 Migration Process can only support the migration of target systems with the following Operating Environment: Solaris 2.6, Solaris 7 or Solaris 8.

4.2 Validate Memory Requirement

To upgrade the latest release of the Solaris Operating Environment 128MB is recommended. (See the **Solaris 9 Installation Guide** for further details)

4.3 Validate Disk Space Requirement

To support the standard upgrade process to the latest Solaris release, in addition to the current disk space on the target server, an additional 4GB free disk or higher is suggested for the Solaris 9 install.

4.4 Solaris 9 Image Recommendation

The S9 Migration process uses the latest Solaris build [2/02 U2] with the “Entire Distribution + OEM” as the base image for Solaris 9 installation on target systems. To view the exact contents of the S9 Migration Process image please go to the support web-site at : http://presidents.east/itsm/s9_migration

4.5 System Architecture Requirement

The current release of the S9 Migration Process [v1.2] will support only the **sun4u** architecture. If your system architecture is different please contact support at: itsm-s9-support@sun.com for options.

5 Volume Managers

Sun datacenters currently support the use of both VxVM and SDS volume managers. Because of this dual support, the S9 Migration Process provides automated mechanisms for migrating a target system using either volume manager to the alternate boot environment running Solaris 9.

It is important to note that the S9 Migration Process does not migrate between volume managers, it will only maintain the volume manager in use on the target.

6 Master System Creation

A Master System is a separate system built with the desired software and configurations that will be copied to a target machine during the Migration Module of the S9 Migration Process. The Master System, used in conjunction with the Live Upgrade software, is the host that your Master Flash Archive is created. The resulting Flash Archive can then be used in the S9 Migration Process to install your desired Solaris OS image (see section **Master Flash Archive**). Before creating a Master Flash Archive, first, you will need to install your Master System with the configuration exactly the same as you would want for any target clone systems. The Master System and the clone systems must have the same kernel architecture. For example, you can only use an archive that was created from a master system and has a sun4u architecture to install clones with a sun4u architecture. You can use any of the Solaris installation methods to install an archive on the master system. The installation can be a subset or a complete installation of the Solaris operating environment. Once installation is completed, you can add or remove software or modify any configuration files. Below are important points to keep-in-mind while installing the master system.

- Solaris Packages and Patches that you require on the master system and the clone systems.
- The software that you want to install on the clone systems.
- Peripheral devices that are connected to the master system and the clone systems.
- The architecture of the master system and the clone systems should be identical.

After you install the Solaris operating environment on the Master System by using any of the Solaris installation methods, you can add or delete software and modify system configuration information as necessary.

7 Sun IT S9 Migration Tools

A key element to the S9 Migration Process is the automated tools used for executing end-to-end tasks associated with performing an S9 Migration with minimal user (SA) interaction. These tools wrap all the system validation, migration, and system analysis execution modules into a hand-full of components that can speed the entire migration process. For the *S9 Migration Process* to be successful, all task must be done using the automated tools.

The following is detailed review of the automated components and their functions. Please familiarize yourself with the components if you will be performing the S9 Migrations Process steps. You can download and install the Sun IT S9 Migration Tools from:

Download Location: http://presidents.east/itsm/s9_migration/

Once you have downloaded the ITSMs9mig package, install the package on your target system as the root user. The package is installed to /opt/ITSMs9mig directory. Disk space used by the package is approximately 200KB (under /opt directory).

7.1 Common Tool Kit Components

All tools described in the Sun IT S9 Migration Tools kit use one or more of the *Common Tool Set Components*. The components are available for all the tools used and defined many of the key default behaviors of the S9 Migration Process. All of the *Common Tool Set Components* can be found in the /opt/ITSMs9mig/etc upon installing the S9 Migration Package.

Table 1: Common Tool Set Components included with version – 1.3.1

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Component	Override	Type	Description
set_migration_env	Manual	static	Core config file for all steps
set_prepare_env	Manual	static	Config file for premigration
s9_<hostname>.env	None	dynamic	Host based config file for migration
s9_adminfile	Manual	static	Config file for package installation
s9_exclude_dir	Manual	static	Exclusion list for postmigration
s9_break_mirror.kl	None	static	Functions used by Tool Kit
s9_chk_partitions.kl	None	static	Functions used by Tool Kit
s9_postmig_file_copy	Manual	static	List used for file syconization
s9_system_params	Manual	static	List of configured /etc/system variables
s9_sysidcfg	Manual	static	
s9_system_params.tmp	None	dynamic	

The ITSM S9 Migration group does not recommend editing common component config files. However, in some cases it may be necessary to customize various establish defaults to handle special needs. Changes made to the defaults can cause the automated process to fail, thereby causing severe damage to your target system. Please see *Editing Common Tool Set Components* in this section for more details.

7.2 Editing Common Tool Set Components

Although the established defaults used in the configuration file should suit most installation requirements, there may be cases where you will want to edit the default settings. As of version 1.3, the S9 Migration Process provides a mechanism to allow the installer to edit the default object location settings. The installer will be presented with a prompt when running the s9_premigration module that will take input for all default settings. Below is a list and brief description of the default object location settings that the installer will be prompted to confirm or edit. In the case that either the default or the edited setting does not exist, the process will be unable to continue. **Please make sure your object location settings are present.**

Default Location Settings:

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AI Install Server – Server path to ai3 server that contains the Solaris Image. These servers are available by domain.

Confirm AI server [] :

Solaris Top Directory - Directory path to the primary Solaris installation e location.

Confirm AI top directory[] :

Solaris Media Product - Directory path to the Solaris Media Product in the Solaris Media Release path. This is the location of all the default packages included with a release of the Solaris OS.

Confirm media release sub-directory [] :

Solaris Patch for install Location - Location for the Solaris patches that will be used for install during the S9 Migration process.

Confirm PATCH directory path [] :

Flash Archive storage Location - Location for the Solaris flash archive images that will be used during the S9 Migration process.

Confirm Flash Archive location [] :

7.3 Using the ITSM S9 Migration Tools

The Tool Kit is the driving force for the S9 Migration Process. You will need to make use of every component at various times during the process. To execute any component of the Tool Kit, you must use the Run_S9_migration_process.sh component. This is a korn shell script that will act as a lite-weight wrapper and log all the screen output to a file in the main log directory in */var/sadm/system/logs* under the file name of the executing component. Although each component in the Tool Kit will execute using the Run_S9_migration_process.sh , the screen log output will be unavailable. Therefore, it is recommended that you use this execution method at all times.

Tool Kit Usage Example

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```
foo# /opt/ITSMs9mig/bin/Run_S9_migration_process.sh <name_of_component >
```

Would produce a log file called <name_of_component >.log in /var/sadm/system/logs

7.4 S9 Pre-Migration Validation Tools

The S9 Pre-Migration Components are used to drive all the pre-migration activities involved in the S9 Migration process. This includes validating the target environment for migration readiness, performing any disk maintenance required for preparing the install target, and recording key parameters for use in other conditional steps. Please review this Tool Set before starting, pre-validation activities.

7.4.1 s9_premigration component

Name : s9_premigration.sh

Description : Main script for Pre-Migration Validation scripts

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_premigration.log

Key Input : None

Key Output : Creation of Dynamic Configuration File : s9_`hostname`_env

The s9_premigration.sh script is the driver for three additional child scripts s9_premigration_prepare.sh, s9_premigration_install.sh, and s9_osdisk.sh. The s9_premigration.sh script is responsible for controlling their execution sequence of all the pre-validation components. The script has no additional options and will report the current OS environment status before any migration activities are started.

7.4.2 s9_osdisk component

Name : s9_osdisk.sh

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Description : Perform disk maintenance (break-mirror , auto partitioning)

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_premigration.log

Key Input : Target physical device : example – c0t0d0 (Automatic)

Key Output : Target disk recorded into Dynamic Configuration File , automated breaking of root mirror devices , automated target disk partitioning completed.

The `s9_osdisk.sh` is called from the `s9_premigration.sh` script and uses the `s9_break_mirror.kl` , and `s9_chk_partitions.kl`. It is responsible for discovering if the target system is using a volume manager for root disk mirroring (VxVM or SDS) , or no volume manager. If VxVM SDS is being used, the script will identify whether a mirror is present and prompt the installer break the mirror . If no mirror is present or no volume manager is being used, the script will prompt the user to choose a target disk and record this in the Dynamic Configuration File. Finally the script will prompt the installer with the option to auto-partition the target install disk.

7.4.3 s9_premigration_prepare component

Name : s9_premigration_prepare.sh

Description : Use to validate the target system and record values

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_premigration.log

Key Input : None

Key Output : Critical System Information Log- /var/sadm/system/logs/s9_parfacts.out

The `s9_premigration_prepare.sh` is called from the `s9_premigration.sh` script and is responsible for all the the system validation checks used by the S9 Migration Process. The `s9_premigration_prepare.sh` will record all the validation values identified in the Dynamic Configuration File to be used by other components in the Tool Kit.

7.4.4 s9_premigration_install

Name : s9_premigration_install.sh

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Description : Use to install patches and packages

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_premigration.log

Key Input : OS Package level & OS Patch (Automatic)

Key Output : Installed packages and patches

The s9_premigration_install.sh is called from the *s9_premigration.sh* script . The s9_premigration_install.sh is responsible for installing any required patches and packages. (*Currently only supports Live Upgrade related packages and patches*).

NOTE	As of version 1.2 of the S9 Migration Process, installation support has been added for the package <i>SUNWbzip</i> .
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7.5 S9 Migration Tools

The S9 Migration Components are the tools used to drive the actual Solaris 9 install on the target install disk. The S9 Migration Components utilize the Sun Live Upgrade Software and Flash Archive technology for installing the S9 boot environment on the target system.

7.5.1 s9_migration component

Name : s9_migration.sh

Description : Use to install the new boot environment and configure system files

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_migration.log

Key Input : Target install disk (Automatic)

Key Output : Completed S9 boot environment install on target disk

The s9_migration.sh script is responsible for installing the S9 boot environment on the target install disk found in the Dynamic Configuration File. This script will make use of the Live Upgrade software commands and the default Flash Archive location to

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complete this process. The `s9_migration.sh` script additionally performs the following task:

- Partition validation for the target install disk
- Copying Veritas License information to new boot environment
- Editing the `/etc/system` file to remove Veritas Disk Group related information.
- Synchronization of the `/etc/vfstab` file.
- Creating `lofs` mount points
- Copying the device tree

7.6 S9 Post- Migration Tools

The S9 Post - Migration Components are the tools used to drive the Post Operation system Analysis and resulting reports used by the installer. Currently, these tools are in BETA release. The tools will provide limited functionality for filesystem synchronization and Solaris OS analysis reports.

7.6.1 s9_postmigration component

Name : `s9_postmigration.sh`

Description : Use to validate the target install disk and install the new boot environment

Tool Type : ksh script

Main log file location : `/var/sadm/system/logs/s9_postmigration.log`

Key Input : New Boot Environment name (Automatic)

Key Output : OS Report file with missing files and differences between both boot environments – `s9_os_validation_file.report`, OS Report file with package install differences between both boot environments – `s9_os_validation_pkg.report`

The `s9_postmigration.sh` script is responsible for performing the post migration system analysis and generic file synchronization between the new boot environment (*Solaris 9*) and the original boot environment. The `s9_postmigration.sh` script will create several

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reports that should be reviewed by the installer or system administrator for the target system to determine if additional file syncing , package installation , or system configuration is required before continuing. Some generic file syconization is included in this script that handles the following:

List for files synchronizd by s9_postmigration

- /etc/printers.conf
- /etc/issue
- /etc/auto.profile
- All user contabs

WARNING: Due to possible process conlisions the following contabs are not synchronized by the s9_postmigration script - **root, sys, adm, lp, uucp**. *Please handle thes manually.*

7.6.2 s9_mvpkg.sh component

Name : s9_mvpkg.sh

Description : Use to transfer packages definition directories between both boot environments

Tool Type : ksh script

Main log file location : /var/sadm/system/logs/s9_postmigration.log

Key Input : package name (Automatic)

Key Output : Pakage report file with package transfer information between both boot environments – *s9_os_validation_pkg.report*

The s9_mvpkg.sh script is responsible for performing the package definition transfers between boot environments. Call from s9_postmigration.sh, it will take the prameter of package_name and copy the package map contents from the original boot environment to the alternate boot environment . The packake_name parameter is determined automatically by the s9_postmigration.sh script when it finds package differences between the two environments.

8 Live Upgrade Synchronization Task

As part of the Live Upgrade Software functionality, additional file system synchronization

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is performed at reboot of the target system. The files represent only a fraction of what may still be required to be completed copied. Please review the following list as well as the ***Post-Migration Analysis Reports*** to determine if any further action is required for the target system.

Table 2: List for files synchronizd by Live Upgrade

Filename	Synchronization Type
/var/mail	OVERWRITE
/var/spool/mqueue	OVERWRITE
/var/spool/cron/crontabs	OVERWRITE
/var/spool/cron/crontabs	OVERWRITE
/var/dhcp	OVERWRITE
/etc/passwd	OVERWRITE
/etc/shadow	OVERWRITE
/etc/opasswd	OVERWRITE
/etc/oshadow	OVERWRITE
/etc/group	OVERWRITE
/etc/pwhist	OVERWRITE
/etc/default/passwd	OVERWRITE
/etc/dfs	OVERWRITE
/var/log/syslog	APPEND
/var/adm/messages	APPEND