



WebStart Flash

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Sun BluePrints™ OnLine - November 2001



<http://www.sun.com/blueprints>

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Part No.: 816-3635-10
Revision 1.0, 11/12/01
Edition: November 2001

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WebStart Flash

Editor's Note – This article was taken from the entire eighth chapter of the Sun BluePrints™ book, "JumpStart™ Technology: Effective Use in the Solaris™ Operating Environment" by John S. Howard and Alex Noordergraaf (ISBN 0-13-062154-4.), which is available through www.sun.com/books, amazon.com, fatbrain.com and Barnes & Noble bookstores.

The Solaris™ Operating Environment (Solaris OE) Flash installation component is introduced in Solaris 8 4/01 (Update 4) OE and extends JumpStart™ technology by adding a mechanism to create a system archive, a snapshot of an installed system, and installation of the Solaris OE from that archive. Flash, the new mechanism for installing the Solaris OE, enables the specification and creation of archive contents and servers. This chapter describes the following Flash topics:

- Overview
- Identifying the master machine
- Creating and administering archives
- Changing profile keywords or keyword values to support Flash
- Using Flash in a complete example installation

Overview

WebStart Flash provides a mechanism by which a specific or reference installation of the Solaris OE is archived. That archive can then be used to install the Solaris OE. The reference installation is created from the on-disk Solaris OE, which includes all installed software. This system is designated as the master machine. The reference installation can be a Solaris OE installed by any means, for example, with JumpStart software, from CD, or by an interactive installation.

After the master machine is identified, the reference installation is captured in a Flash archive. A central feature of Flash, this archive is essentially a point-in-time snapshot of the Solaris OE, software patches, and applications on the master machine.

The Flash extensions enable administrators to install the archive from an NFS server or an HTTP server, in addition to installing from a traditional JumpStart server. Additionally, the archive can be accessed from a disk device (including CD-ROM) or tape device local to the installation client. The Flash archive is transmitted over the network to the installation client and written to the disk. After the archive is written to the installation client's disk, any necessary archive modifications are performed. For example, configuration files, such as `/etc/nsswitch.conf`, on the installation client may need to vary from the file on the master machine. The Flash mechanism enables automation of modifications and allows for differences in kernel architecture or device differences between the master machine and the installation client.

Additionally, Flash enables automatic resolution of partitioning differences between the master machine and the installation client. For example, if the Flash archive was created on a system with a single root (`/`) partition and the installation client has separate `/` and `/var` partitions, the Flash archive automatically customizes itself to the installation client. Remember, the installation client partitioning must be correctly specified in the JumpStart software profile.

The Flash archive is a snapshot of a system and, as such, includes all specified files on that system. If a Flash archive is created from a system in use, some files need to be cleaned up or zeroed out after the Flash archive is installed. Examples of these types of files include log files, such as those found in `/var/adm` and any files in the `/var/tmp` directory. Log files can be easily zeroed out from a finish script after installation. In the case of temporary directories, such as the `/var/tmp` directory, it is recommended that they be excluded when the Flash archive is created.

The Flash archive should be created after all software has been installed but before the system has gone into production. And, depending on the software installed and the intended use for the system, the Flash archive may need to be created after the software is installed but before the software has been configured. For example, a database server or LDAP server should have its archive created after the database management software has been installed but before the databases have been created and populated.

Note – An initial installation must be done when a Flash installation is performed. Flash cannot be used to upgrade a system.

Installation of the Solaris OE with a Flash archive can be dramatically faster than with other mechanisms, depending on factors such as network traffic and disk speeds.

Identifying the Master Machine

Before a Flash installation can be performed, a master machine must be identified. The master machine is the system that serves as the template to be copied onto the installation clients. All software and files on the master machine, unless specifically excluded, become a part of the Flash archive and are installed on the client.

Usually, the master machine is not the JumpStart server. However, the JumpStart server is an ideal system to act as a repository for Flash archives. The recommended `/jumpstart` directory hierarchy used throughout this book should have a `/jumpstart/FlashArchives` directory added and the Flash archives should be placed in that directory.

Each system type in your datacenter should have a corresponding archive created to install additional systems of that type. For example, identify an archetypal database server, web server, backup server, etc., and then create Flash archives of those systems to use when new systems need to be deployed.

Store Flash archives offsite, on tape, or on CD-ROM, to prepare for business continuity in the event of a disaster. You can then use these Flash archives at a remote site or disaster recovery site to rapidly deploy software-identical, but not necessarily hardware-identical, replacement systems. See Chapter 11, "System Cloning," for details and procedures of the tape deployment of Flash archives and system cloning.

Creating and Administering Archives

The following `flarcreate` command creates an archive, named `S8-web.archive`, of a Solaris 8 OE 4/01 production web server (excluding the `/var/tmp` directory) with an archive creator string of `"j.s.howard@Sun.COM"`:

```
www06# pwd
/var/tmp/FlashArchives
www06# flarcreate -n "Solaris 8 web server image" \
> -a "j.s.howard@Sun.COM" \
> -R / \
> -x /var/tmp \
> /var/tmp/FlashArchives/S8-web.archive
Determining which filesystems will be included in the archive...
Determining the size of the archive...
The archive will be approximately 446.45MB.
Creating the archive...
Archive creation complete.
```

The `-R` option specifies to recursively descend from the specified directory, and the `-x` option excludes the specified directory. See the `flarcreate(1M)` man page for details on these and other options.

Flash archives can be accessed through NFS or HTTP. Additionally, Flash archives can be written to disk, CD, or tape and subsequently accessed during installation from the disk, CD-ROM, or tape drive local to the client.

Flash archives can be compressed with the `-c` option to the `flarcreate` command. Compressed archives are automatically uncompressed before installation after being transferred to the installation client. See the `flarcreate(1M)` man page for additional details.

Use the `flar` command to extract information from a specified archive, for example, to determine how an archive was created:

```
www06# flar -i S8-web.archive
archive_id=04291958b038020b87b749ee62085654
files_archived_method=cpio
creation_date=20010326223306
creation_master=www06
content_name=Solaris 8 workgroup server image
files_compressed_method=none
files_archived_size=468105216
content_author=j.s.howard@Sun.COM
content_architecture=sun4u
```

The `flar` command also provides options to split or combine archives. Consult the `flar(1M)` man page for additional details on archive usage.

Additional Profile Keywords

Installation of Flash archives is supported by addition of `flash_install` as a valid value for the `installation_type` keyword.

Note – Specifying a Flash installation type restricts the number of keywords that can be specified in the profile. See the “Adding the Installation Client” on page 1 for specific details.

The `archive_location` profile keyword has also been added. The `archive_location` profile keyword specifies the retrieval method and location, specific to the retrieval method, of the archive:

```
archive_location retrieval_type location_specifier
```

where *retrieval_type* can be any one of the following:

- *nfs*
- *http*
- *local_tape*
- *local_device*
- *local_file*

These retrieval types and the location specifier are explained in the following several sections.

Remote Archive Location Specifiers

The *nfs* and *http* retrieval types specify the location of the Flash archive on a JumpStart server, NFS server, or HTTP (Web) server. This specification must be provided in one of the following, syntactically equivalent, ways:

archive_location nfs server:/fully/qualified/path/filename

or:

archive_location nfs://server/fully/qualified/path/filename

Where:

server is the name of the JumpStart server or the NFS server.

The archive must be shared from the NFS server with options that enable the path to be readable by the client. Additionally, the permissions on the archive file must be such that the file can be read by the client.

The *http* retrieval type uses the following syntax:

archive_location http server:port_number /URL/to/file opts

Where:

- *server* is the HTTP server name.
- *port_number* is the optional port number that the HTTP daemon is listening on (defaults to port 80).
- */full/path/filename* is the fully qualified path to the Flash archive file.
- *opts* are the optional keywords
 - *auth basic username password* specifies the user name and password to access a password-protected HTTP server.

Note – When the user name and password are stored in the JumpStart software profile, they may be readable by *all* users on the system. The use of this option may be a security risk. Therefore, the use of the `auth basic` option is *not* recommended.

- `timeout minutes` specifies in minutes the HTTP server timeout value.
- `proxy host:port` specifies the HTTP proxy server and port number.

As with the `nfs` retrieval type, specify the `http` retrieval type in the alternate syntax of:

```
archive_location http://server/URL/to/file opts
```

Local Archive Location Specifiers

Access the Flash archive from a device local to the installation client. Valid local devices are disk, CD-ROM, or tape devices. To specify a disk device, use the following location specifier:

```
archive_location local_device cXtYdZsN /full/path/filename FStype
```

Where:

- `cXtYdZsN` is the Solaris OE device specification for the disk device.
- `FStype` is the optional filesystem type, either `ufs` or `hfs`. If a filesystem type is not specified, the filesystem is first accessed as `ufs`. If that fails, `hfs` access is then attempted.

Specify a local tape device as follows:

```
archive_location local_tape tapedevice optional_position
```

Where:

- `tapedevice` is the full specification to the tape device, for example, `/dev/rmt/0h`.
- `optional_position` is the optional position, specifying the number of End Of File (EOF) marks to skip over on the tape.

Additionally, access archive files from the miniroot by using the `local_file` retrieval type:

```
archive_location local_file /full/path/filename
```

Using Flash in an Example

This section details a complete example of a Flash installation. The major steps of this procedure are these:

1. Identify the master machine and create the Flash archive.
2. Add the installation client (if necessary) on the JumpStart server and edit the appropriate `sysidcfg`, `profile`, and `rules` files.
3. Initiate the installation on the client.

Creating the Flash Archive

We create the Flash archive on `www01`, an Ultra Enterprise™ 220R server acting as a Web server, and then make it available to the JumpStart server, `server01`, by the `ftp` command.

```

www01# pwd
/var/tmp
www01# uname -a
SunOS www01 5.8 Generic_108528-07 sun4u sparc SUNW,Ultra-60
www01# flarcreate -n "Solaris 8 web server image" \
> -a "j.s.howard@Sun.COM" \
> -R / \
> -x /var/tmp \
> /var/tmp/S8-webserver.archive
Determining which filesystems will be included in the archive...
Determining the size of the archive...
The archive will be approximately 699.92MB.
Creating the archive...
Archive creation complete.
www01# ftp server01
Connected to server01.EE_Lab.Sun.COM.
220 server01 FTP server (SunOS 5.8) ready.
Name (server01:root): blueprints
331 Password required for blueprints.
Password:
230 User blueprints logged in.
ftp> cd /jumpstart/FlashArchives
250 CWD command successful.
ftp> bin
200 Type set to I.
ftp> put S8-webserver.archive
200 PORT command successful.
150 Binary data connection for S8-webserver.archive
(10.1.1.8,34653).
226 Transfer complete.
local: S8-webserver.archive remote: S8-webserver.archive
733880662 bytes sent in 67 seconds (10738.38 Kbytes/s)
ftp> quit
221 Goodbye.

```

Adding the Installation Client

We add the installation client, `www26` (a Netra™ t1 105 server) in this example, as an installation client on the JumpStart server, `server01` (`www26` has already been added to the `/etc/ethers` and `/etc/hosts` files).

```
server01# cd /jumpstart/OS/Solaris_8_2001-04/Solaris_8/Tools
server01# ./add_install_client \
> -p server01:/jumpstart/Sysidcfg/Solaris_8 \
> -c server01:/jumpstart \
> www26 sun4u
updating /etc/bootparams
```

The profile used for this example, `S8-webserver-Flash.profile`, is similar to profiles presented in previous chapters. However, with Flash, only the following profile keywords are valid:

- `install_type`
- `partitioning`, and only the keyword values of `explicit` or `existing` must be used
- `filesys`, and the keyword value of `auto` must *not* be used
- `fdisk` (valid for Intel Architecture only)

The following profile specifies that Flash is used as the installation type, `flash_install`. Additionally, the profile instructs that the Flash archive is accessed through NFS, from the location specified by the `archive_location` keyword.

```
install_type    flash_install
archive_location nfs://10.1.1.8/jumpstart/FlashArchives/S8-
webserver.archive
partitioning    explicit
#
# 4GB / and 1GB swap on a 18GB disk
#
filesys         rootdisk.s0      free          /
filesys         rootdisk.s1      1:449         swap
```

Note – Since `name_service=NONE` is specified in the following `sysidcfg` file, an IP address is used for the `archive_location` in the profile.

The rules entry used for this example is as follows:

```
model SUNW,UltraSPARC-IIi-cEngine \  
- \  
  Profiles/S8-webserver-Flash.profile \  
  Finish/EE_Lab-Flash.fin
```

The sysidcfg file used is as follows:

```
system_locale=en_US  
timezone=US/Pacific  
network_interface=primary {netmask=255.255.255.0  
                           protocol_ipv6=no}  
terminal=vt100  
security_policy=NONE  
root_password=QH31loG13nnTU  
name_service=NONE  
timeserver=localhost
```

Note – A root password is specified in the `sysidcfg` file. This specification overrides the root password contained within the Flash archive in `/etc/shadow`.

After we have created or edited the preceding files, we verify the rules file, being certain to use the check script from the Solaris 8 OE 4/01 (Update 4) CD-ROM.

```
server01# cd /jumpstart  
server01# ./check  
Validating rules...  
Validating profile Profiles/S8-webserver-Flash.profile...  
The custom JumpStart configuration is ok.
```

The finish script used for this installation is:

```
#!/bin/sh
# EE_Lab-Flash.fin
# Finish script for default EE_Lab setup, JumpStart Flash

#
# clean up after flash archive install
#
for i in /a/var/adm/messages* /a/var/adm/utmpx \
        /a/var/adm/wtmpx /a/var/adm/lastlog
do
    cp /dev/null ${i}
done
mkdir /a/var/tmp
chown root:sys /a/var/tmp
chmod 1777 /a/var/tmp
```

Note – The `/var/tmp` directory needs to be created by the finish script because it was excluded when the archive was created with the `flarcreate` command.

The boot net - install command is then issued on the installation client.

```
ok boot net - install
Resetting ...

screen not found.
keyboard not found.
Keyboard not present.  Using ttya for input and output.

Netra t1 (UltraSPARC-III 360MHz), No Keyboard
OpenBoot 3.10.24 ME, 512 MB memory installed, Serial #11699811.
Ethernet address 8:0:20:b2:86:63, Host ID: 80b28663.

Executing last command: boot net - install
Boot device: /pci@1f,0/pci@1,1/network@1,1  File and args: -
install
SunOS Release 5.8 Version Generic_108528-07 64-bit
Copyright 1983-2001 Sun Microsystems, Inc.  All rights reserved.
whoami: no domain name
Configuring /dev and /devices
Using RPC Bootparams for network configuration information.
Configured interface hme0
Using sysid configuration file 10.1.1.8:/jumpstart/Sysidcfg/
Solaris_8/sysidcfg
The system is coming up.  Please wait.
Starting remote procedure call (RPC) services: sysidns done.
Starting Solaris installation program...
Searching for JumpStart directory...
Using rules.ok from 10.1.1.8:/jumpstart.
Checking rules.ok file...
Using profile: Profiles/S8-webserver-Flash.profile
Using finish script: Finish/EE_Lab.fin
Executing JumpStart preinstall phase...
Searching for SolStart directory...
Checking rules.ok file...
Using begin script: install_begin
Using finish script: patch_finish
Executing SolStart preinstall phase...
Executing begin script "install_begin"...
Begin script install_begin execution completed.

Processing default locales
- Specifying default locale (en_US)

Processing profile
- Opening Flash archive
(continued on next page)
```

(continued from the previous page)

- Validating Flash archive
- Selecting all disks
- Configuring boot device
- Using disk (c0t0d0) for "rootdisk"
- Configuring / (c0t0d0s0)
- Configuring swap (c0t0d0s1)

Verifying space allocation

NOTE: 1 archives did not include size information

Preparing system for Flash install

Configuring disk (c0t0d0)

- Creating Solaris disk label (VTOC)

Creating and checking UFS filesystems

- Creating / (c0t0d0s0)

Beginning Flash archive extraction

Extracting archive: Solaris 8 workgroup server image

Extracted 0.00 MB (0% of 699.88 MB archive)
Extracted 1.00 MB (0% of 699.88 MB archive)
Extracted 2.00 MB (0% of 699.88 MB archive)

.
.

output deleted for brevity

.
.

Extracted 698.00 MB (99% of 699.88 MB archive)
Extracted 699.00 MB (99% of 699.88 MB archive)
Extracted 699.88 MB (100% of 699.88 MB archive)
Extraction complete

Customizing system files

- Mount points table (/etc/vfstab)
- Network host addresses (/etc/hosts)

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Cleaning devices

Customizing system devices

- Physical devices (/devices)
- Logical devices (/dev)

Installing boot information

- Installing boot blocks (c0t0d0s0)

Installation log location

- /a/var/sadm/system/logs/install_log (before reboot)
- /var/sadm/system/logs/install_log (after reboot)

Flash installation complete

Executing JumpStart postinstall phase...

Executing finish script "Finish/EE_Lab-Flash.fin"...

Finish script Finish/EE_Lab-Flash.fin execution completed.

The begin script log 'begin.log'

is located in /var/sadm/system/logs after reboot.

The finish script log 'finish.log'

is located in /var/sadm/system/logs after reboot.

Just as with a “classic” JumpStart software installation, *after* the Flash installation completes, the specified finish script executes. If we had specified a begin script, it would have executed *before* the installation began. The Flash mechanism *does not* change the JumpStart framework, but Flash *does* change the manner in which the Solaris OE (and software) is installed. Flash *does not* do an individual installation of each software package, as `suninstall` does. The Flash mechanism simply writes the archive on the disk and then customizes the on-disk image to the hardware it was just installed on.

Also, keep in mind that the Flash archive is literally a snapshot of an installed system. If the archive was created on a system that has been in production or use, there may be additional clean-up that the finish scripts need to perform. Temporary files such as those found in `/var/tmp` and log files such as `/var/adm/messages`, `/var/adm/utmpx`, and `/var/adm/wtmpx` should be removed or zeroed out (as appropriate) after a Flash installation from an archive created on a production system. In this example, these files were zeroed out by the finish script.

Summary

This chapter introduced the WebStart Flash facility, available with Solaris 8 OE 4/01 (Update 4). A Flash overview presented the concepts of a Flash archive and recommended appropriate creation times for such an archive.

The chapter described a master machine, recommended a directory hierarchy for the master machine, and suggested storage strategies. The value of Flash archives for business continuity was also noted.

This chapter next demonstrated the use of the `flarcreate` command to create Flash archives and the `flar` command to administer Flash archives. Additionally, the changes to the JumpStart software profile necessary to support Flash installations were described. Those changes include the ability to use `nfs`, `http`, or devices local to the installation client as locations of the Flash archive during installation.

Finally, the chapter illustrated a complete example of creating a Flash archive and installing a Web server with Flash.

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John S. Howard has over 19 years experience in software engineering and systems administration. As a Senior Staff Engineer in the Enterprise Engineering group at Sun Microsystems he is currently working on projects for enhancing system availability and serviceability. Prior to his position in Enterprise Engineering, John worked as an Area System Support Engineer with Sun Enterprise Services. As an ASSE, he was responsible for providing escalation management and backline system support for problem isolation and resolution in the areas of clustered systems, the storage subsystem and the Solaris kernel. In addition to these support functions, he developed and performed Reliability, Accessibility, and Serviceability (RAS) studies of customer datacenters.

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