Managing System Services in Oracle® Solaris 11.2

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- **Audience** – System administrators who manage system services
- **Required knowledge** – Experience administering Oracle Solaris systems

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♦ ♦ ♦ CHAPTER 1

Introduction to the Service Management Facility

The Oracle Solaris Service Management Facility (SMF) framework manages system and application services. SMF manages critical system services essential to the working operation of the system and manages application services such as a database or Web server. SMF improves the availability of a system by ensuring that essential system and application services run continuously even in the event of hardware or software failures.

SMF replaces the use of configuration files for managing services and is the recommended mechanism to use to start applications. SMF replaces the `init` scripting start-up mechanism, `inetd.conf` configurations, and most `rc?.d` scripts. SMF preserves compatibility with existing administrative practices wherever possible. For example, most customer and ISV-supplied `rc` scripts still work the same way they worked without SMF.

SMF Capabilities

The SMF framework is always active on an Oracle Solaris 11 system. SMF provides the following capabilities:

- Boot faster. SMF speeds booting of large systems by starting services in parallel according to the dependencies of the services.
- Restart failed services. SMF services have well defined dependency relationships with other services. If a service fails, SMF reports any affected dependent services. SMF automatically attempts to restart failed services in dependency order.
- Inspect services. View the relationships between services and processes. View the values of service properties.
- Manage services. Enable, disable, and restart services. These changes can persist through upgrades and reboots, or you can specify temporary changes.
- Configure services.
  - Change the values of service properties.
  - Add and delete custom properties.
- Audit service changes. SMF writes Solaris audit records for every administrative change to a service or its properties. SMF can show whether a property value or service state was set by an administrator.

- Securely delegate tasks to non-root users, including the ability to modify properties and enable, disable, or restart services.
- Create new services. Easily create a new instance of an existing service, copy and modify an existing service, or use a service creation tool.
- Debug service problems. Easily display an explanation for why an enabled service is not running or why a service is preventing another service from running.
- Configure how you will be notified of particular software events or hardware faults.
- Convert `inetd.conf` configurations to SMF services.
- Convert SMF service properties to configuration files. This mechanism provides a bridge for services that are managed by SMF but interact with applications that still require configuration files.

New Features in This Release

The following SMF features are new in this release:

Synchronous restart and refresh operations

A new `-s` option for the `restart` and `refresh` subcommands of the `svcadm` command specifies synchronous operation similar to the existing `-s` option for the `enable` and `disable` subcommands.

Show log files

A new `-L` option for the `svcs` command shows the complete log file, the last few lines of the log file, or the full path name of the log file for the specified service instance.

Batch operation on a set of service instances

New `libscf`(3LIB) function calls allow common administrative operations to be grouped and executed in a batch either synchronously or asynchronously. You can enable, disable, restart, refresh, mark, clear the maintenance or degraded state, and transition between milestones for a set of service instances.

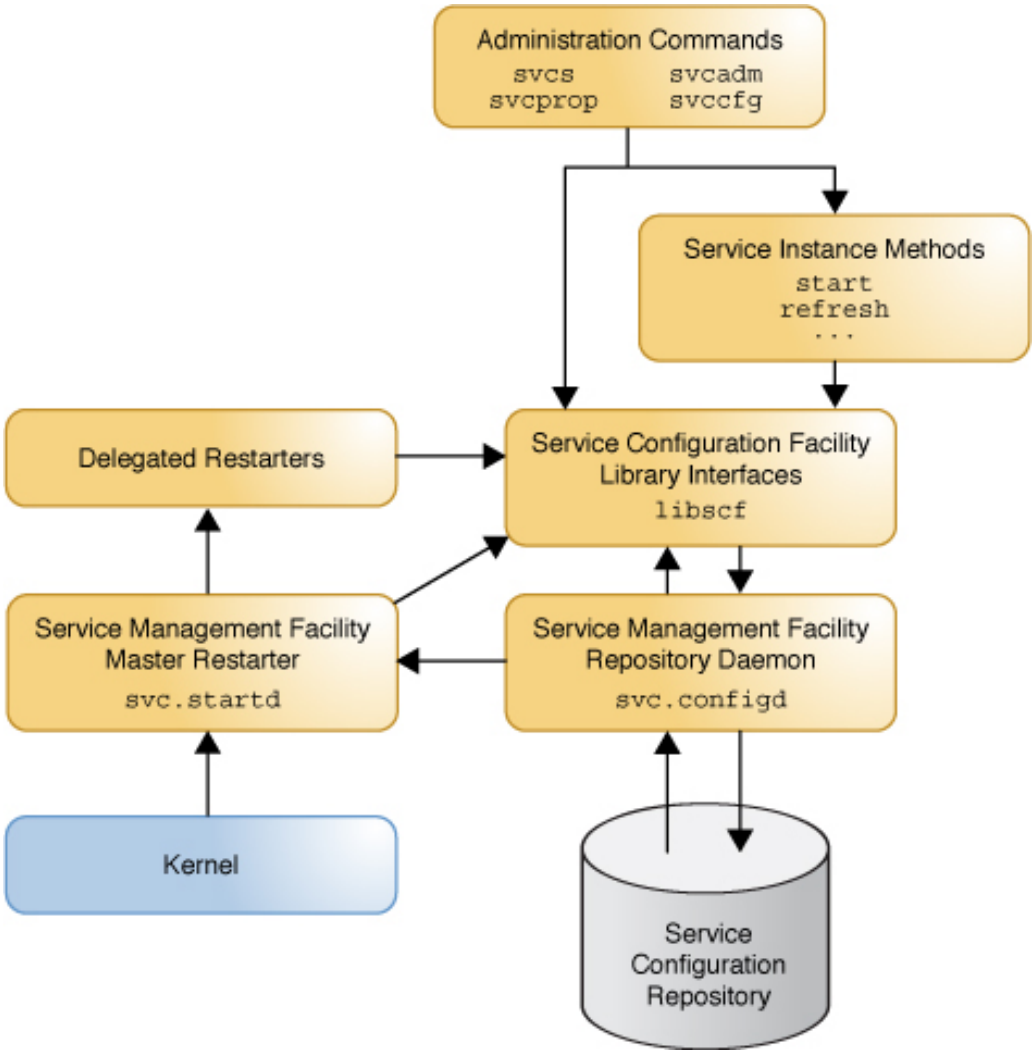
Conversion of SMF service properties to configuration files

For services that are managed by SMF but interact with applications that still require configuration files, a new stenciling capability creates and updates a configuration file from property values defined for the service in the service configuration repository. A new file called a stencil file contains the structural definition of the configuration file that will be created by SMF. A new `svcio` utility generates the configuration file from the definitions in the stencil file and properties in the SMF service. This feature enables you to take advantage of SMF configuration management with minimal change to the existing application.

SMF Concepts and Components

This section defines terms that are used in the remainder of this guide. The following figure shows the primary components of the SMF framework. When you boot an image, SMF updates the service configuration repository if necessary, reads the repository data, and starts service instances that are enabled. In the following figure, `libscf` is the library interface that the restarters use to interact with the service configuration repository. Interaction between the service configuration repository and `libscf` library interfaces is managed by the `svc.configd` daemon. The `svcs`, `svcprop`, `svcadm`, and `svccfg` commands are the interface that administrators use to interact with the service configuration repository.

FIGURE 1-1 Service Management Facility Framework



SMF Service

An SMF *service* is a persistently running application that represents a system entity such as the following:

- Application services such as a database or a Web server
- Essential system services
- The software state of a device
- Kernel configuration information
- Milestones that correspond to a system `init` state

A *service instance* is a child of a service and provides capabilities and dependency relationships to applications and other service instances. Only instances have a state and can be started and stopped. If an instance fails for any reason, such as a hardware or software fault, SMF automatically detects the failure and restarts the instance and any dependent instances.

Instances of a service allow multiple configurations of a service to run simultaneously. Service instances inherit and customize common service configuration. For example, you can define a Web server service with one instance configured to listen on port 80 and another instance configured to listen on port 1008. Most services have a `default` instance. A few services do not have instances, such as some services that use SMF to store configurations but not to run programs. For example, the `x11/x11-server` service does not have any instances.

An SMF service is described in a file called a service *manifest*. The manifest describes service instances, dependencies, configuration properties, and methods. Service *methods* start, stop, and refresh service instances. A method can be a daemon, other binary executable, or an executable script. A service *profile* file enables you to customize an existing service, primarily by adding properties and adding and overriding property values. The new properties and values are layered over the values assigned in the manifest, as described in “Repository Layers” on page 25. See “Service Bundles” on page 24 for more information about manifests and profiles. A profile is also an excellent tool for applying the same custom configuration to multiple systems, as described in “Configuring Multiple Systems” on page 77.

Service information is stored in the *service configuration repository*, which is also called the *SMF database*. The service configuration repository stores the current state of each service instance on the system and the configuration data for each service and service instance. The data is stored in *layers* according to how values were modified, as described in “Repository Layers” on page 25.

SMF provides *actions* that you can invoke on a service instance, including enable, disable, refresh, and restart. Each service instance is managed by a *restarter*, which performs these administrative actions. In general, restarters perform actions by executing *methods* to move the service instance from one state to another state. For more information about restarters, see “Service Restarters” on page 22.

A *milestone service* is a special type of service that represents a level of system readiness. A milestone is a service that other service instances depend on to start. For example, run levels are represented by milestone services such as `svc:/milestone/multi-user-server`. Milestones also can be used to indicate the readiness of a group of services, such as `svc:/milestone/devices`, `svc:/milestone/network`, or `svc:/milestone/name-services`.

Service Models

SMF services are one of the following three models:

Transient service

The service does some work and then exits without starting any long running processes.

Child or wait service

The service is restarted whenever its child process exits cleanly. A child process that exits cleanly is not treated as an error.

Contract or daemon service

The service starts a long running daemon or starts several related processes that are tied together as part of a *service contract*. The contract service manages processes that it starts and any dependent services and their start order. You only need to manage the high-level service.

Service Names

Each service and service instance is represented by a Fault Management Resource Identifier (FMRI). The full FMRI for a service instance has the following format:

`svc:/`*service_name*`:`*instance_name*

The *service_name* is a hierarchical name such as `network/dns/client` or `application/pkg/server`. Components of the *service_name* that precede the final forward slash character (/) are the *category* of the service. Categories such as `application`, `device`, `milestone`, `network`, and `system` help identify the purpose of the service.

The `site` category is reserved to help you avoid name conflicts when you create your own SMF services. For example, a site-specific service named `svc:/site/`*tool* will not conflict with an Oracle Solaris service named `svc:/`*tool*.

Service instance names are appended to the parent service name after a colon character. For example, `svc:/system/identity:node` and `svc:/system/identity:domain` are instances of the `svc:/system/identity` service.

In scripts, best practice is to use the full service instance name. Interactively, names can be shortened to the rightmost portions of the name that result in a unique name. For example, `svc:/system/identity` can be shortened to `identity`, and `svc:/system/identity:domain` can be shortened to `identity:domain`. Instance names must be preceded by some portion of the service name, followed by a colon character.

Service States

At any particular time, an SMF service instance is in one of the following states:

- `degraded` – The instance is running or available to run, but is functioning at a limited capacity.
- `disabled` – The instance is not enabled and is not running or available to run.
- `maintenance` – The instance is enabled but not able to run. The instance might be transitioning through the `maintenance` state because an administrative action has not yet completed. Otherwise, administrative action is required to resolve the problem.
- `offline` – The instance is enabled but not running or available to run. For example, if the dependencies of an enabled service are not satisfied, the service is kept in the `offline` state.
- `online` – The instance is enabled and running or available to run. The `online` state is the expected operating state for a correctly configured service instance with all dependencies satisfied.
- `uninitialized` – This state is the initial state for all services.

A service instance transitions between states depending on conditions such as administrative actions or the state of its dependent services. For example, when you enable an instance that was in the `disabled` state, the newly-enabled instance first transitions into the `offline` state, and transitions into the `online` state when all of its dependencies are satisfied. See the `smf(5)` man page for more information about these service states and about how service instances transition through these states.

Service Dependencies

A service can have a *dependency* on a service, a service instance, or a file. Service dependencies define relationships between services.

Dependency relationships determine when a service starts and automatically stops. When dependencies of an enabled service are not satisfied, the service is in the `offline` state. When dependencies of an enabled service are satisfied, the service is started. If the service start is successful, the service transitions to the `online` state.

Service dependencies are reevaluated as services transition through states. Service dependencies that are satisfied can later become not satisfied. File dependencies are evaluated only one time.

Dependencies can be required or optional. Service dependencies can be required to be running or disabled. A dependent service can be configured to restart or not when one of its service dependencies is stopped or refreshed.

Dependency relationships allow the following capabilities:

- Scalable and reproducible initialization processes
- Faster system startup on machines that have parallel capabilities by starting independent services in parallel
- Precise fault containment and fault recovery by restarting only services that are directly affected by a fault, and restarting those services in correct dependency order

Service Restarters

Each SMF service instance is managed by a *restarter*. The restarter retrieves instance configuration and provides an execution environment. See `smf_restarter`(5) for information common to all restarters.

Master Restarter Daemon

The `svc.startd` daemon is the *master restarter* daemon for SMF and the *default restarter* for all service instances. The `svc.startd` daemon manages states for all service instances and their dependencies. As dependencies are satisfied when instances move to the online state, the master restarter invokes start methods of other instances or directs the delegated restarter to invoke the start method. The master restarter stops a service instance when the dependencies of the instance are no longer satisfied. The restarter attempts to restart an instance if the instance fails. Because an instance cannot be online until all of its dependencies are satisfied, the dependencies of an instance help determine the restart behavior of the instance. Properties set on each dependency declaration define whether that dependency is required and in what cases the instance will be restarted if the dependency is restarted.

Among other tasks, the `svc.startd` daemon starts the appropriate `/etc/rc*.d` scripts at the appropriate run levels, which is work that was previously done by `init`.

The following example shows that `svc.startd` is the restarter for the `network/ipmp:default` service instance. Other output has been omitted from this example.

```
$ svcs -l ipmp:default
restarter   svc:/system/svc/restarter:default
```

If the `restarter` property is empty or set to `svc:/system/svc/restarter:default`, the service instance is managed by `svc.startd`. For more information about the `svc.startd` daemon, see the `svc.startd`(1M) man page.

Delegated Restarters

Some services have a set of common behaviors on startup. A *delegated restarter* can provide a specific execution environment and application-specific restarting behavior for these services.

An example of a delegated restarter is `inetd`, which can start Internet services on demand, rather than having the services always running. The `inetd` restarter provides its service instances with an environment composed of a network connection as input and output file descriptors. For more information about the `inetd` daemon, see the `inetd`(1M) man page. The following example shows that `inetd` is the restarter for the `cups/in-lpd:default` service instance. Other output has been omitted from this example.

```
$ svcs -l cups/in-lpd:default
restarter   svc:/network/inetd:default
```

The delegated restarter specified by the `restarter` property is responsible for managing the service instance once that restarter is available.

Service Properties and Property Groups

Information about services, including dependencies, methods, state, and application data, is stored in the service configuration repository as a set of *properties*. Properties can be defined on either the service or an instance of the service. Properties that are set on the service are inherited by all instances of that service. Properties that are set on an instance are used only by that instance. Service instances can customize the values of inherited properties and can define additional properties that are not defined for the parent service.

Properties are organized into *property groups*. Some common property groups include:

- `general` – Contains information such as whether the instance is enabled
- `restarter` – Contains runtime information that is stored by the restarter for the service, including the current state of the instance
- `start`, `refresh`, `stop` – Contains information such as which program to execute to start, refresh, or stop the service
- `config` – Used by service developers to hold application data.

See the `smf`(5) man page for more information about properties and property groups.

Service Configuration Repository

Information about each service is stored in the *service configuration repository*, which is also called the *SMF database*. The service configuration repository stores information such as the

current state of each service instance on the system and the properties of each service and service instance.

The repository stores persistent configuration information as well as SMF runtime data for services.

- Persistent configuration information is stored in layers according to the source of the data. See "Repository Layers" on page 25.
- Runtime data, or non-persistent configuration information, is not preserved across reboot, and the repository does not store layer information for non-persistent data. Non-persistent data generally hold an active program state.

The repository also stores service template data, such as types, value constraints, and descriptions of properties. Template data is defined in the service manifest. See the `smf_template`(5) man page for more information about template data.

The service configuration repository can only be manipulated or queried by using SMF interfaces. Use the `svcs`, `svcprop`, `svcadm`, and `svccfg` commands or the Service Configuration Facility library functions listed in the `libscf`(3LIB) man page. You can read and write property values and show property values in specified layers and snapshots. For information about layers, see "Repository Layers" on page 25. For information about snapshots, see "Repository Snapshots" on page 26. You can show only the properties of the selected service instance or parent service, or you can show a *composed* view of properties. In a composed view, both properties set on the parent service and properties set on the service instance are shown; values shown are the values set on the service instance.

Service Bundles

A service bundle is an XML file that contains the information that is stored in the service configuration repository for a service or service instance. Information provided in service bundles is stored in the service configuration repository and can be exported from the repository. Service bundles in standard locations are imported into the repository during system boot.

The two types of service bundles are manifests and profiles.

Manifests	Manifests contain the complete set of properties associated with a specific set of services or service instances.
Profiles	Profiles typically provide customization of a service or service instance that augments or overrides information provided in the manifest. Examples of customizations include additional properties and changed property values.

The *standard location* for manifests is `/lib/svc/manifest`. The standard location for profiles is `/etc/svc/profile`.

When the system is booted or the manifest import service is restarted, manifests are imported and profiles are applied if they are new or changed. An IPS package that delivers a service bundle can specify that the manifest import service should be restarted when the package is installed.

Local customizations can be provided in profile files with an `.xml` suffix in the `/etc/svc/profile/site` directory. If the same property in the same repository layer for the same service or instance is defined by multiple manifests or profiles, SMF cannot determine which value to use. When this type of conflict is detected, the instance is placed in the maintenance state. See "Repository Layers" on page 25 for more information about layers.

In addition to delivering services into Oracle Solaris, service bundles can also deliver custom configuration across a variety of systems.

A system profile, `/etc/svc/profile/generic.xml`, is applied during installation. Do not change this profile. Any changes made to this system profile will be overwritten on upgrade. See the `smf_bootstrap`(5) man page for more information.

Repository Layers

The service configuration repository can store different values for a single property. The repository stores data in *layers* according to the source of the data. The source can be manifests, system profiles, site profiles, and customizations made by using SMF commands and library interfaces. You can view values in different layers to understand the source of the value in the running configuration: whether a value was assigned in the manifest, in a profile, or was changed by an administrator.

Configuration changes made by using SMF commands and library interfaces appear only in the `admin` layer. Configuration in other layers is defined in profile and manifest files in standard locations. When a property is added to the repository from a file, the information about that property includes the name of that file.

Layer	Content
`admin`	Any changes that are made by using the SMF commands or library interfaces, by an administrator or by an application. The `admin` layer also includes any changes that are made by importing a manifest or applying a profile from a non-standard location. See "Importing and Applying Manifests and Profiles" on page 77 for caution about the use of non-standard locations.
`site-profile`	Any values from profile files in the `/etc/svc/profile/site` directory or the legacy `/etc/svc/profile/site.xml` and `/var/svc/profile/site.xml` profiles. Note that `/var/svc/profile` is deprecated as a standard location and should not be used for new profiles.
`system-profile`	Any values from the `/etc/svc/profile/generic.xml` and `/etc/svc/profile/platform.xml` system profiles.

Layer	Content
`manifest`	Values from manifests in the `/lib/svc/manifest` and `/var/svc/manifest` directories. Note that `/var/svc/manifest` is deprecated as a standard location and should not be used for new manifests.

Property conflicts are not permitted within any layer. A conflicting property in the `admin` layer overwrites the previous property. If the same property is delivered by multiple files in any other layer, and is not set at a higher layer, the instance is tagged as in-conflict and is not started until the conflicting definition is removed or the property is set at a higher layer.

You can specify the layer of configuration data to view and therefore identify which data are administrative customizations and which data were delivered with the software. When a client does not specify the layer from which to retrieve configuration data, the topmost layer data is provided. The topmost layer is determined by the following priority order from top to bottom: `admin` layer, `site-profile` layer, `system-profile` layer, `manifest` layer. If a property has a value in the `admin` layer, that is the value that the repository delivers. In this way, local customizations are preferred over the values that were provided when the system was installed.

Repository Snapshots

The repository captures a read-only *snapshot* of each service each time the service is successfully started. These snapshots enable you to easily return to a previous working state if necessary. The following snapshots might be available for any given instance:

`initial` Initial configuration when the service and its instances were imported for the first time. An `initial` snapshot is not created if a profile starts the service or instance before manifest import.

`previous` Current configuration captured when a manifest import is performed for a service that has already been delivered. The service could have already been delivered by the manifest being imported or by another manifest.

`running` The running configuration of the service instance. When you change configuration data, use the `svcadm refresh` or `svccfg refresh` command to promote the new values to the running snapshot.

`start` Configuration captured during a successful transition to the `online` state.

Repository Backups

SMF automatically takes the following *backups* of the service configuration repository:

- The `boot` backup is taken immediately before the first change to the repository is made during each system startup.
- The `manifest_import` backups occur before `svc:/system/early-manifest-import:default` or `svc:/system/manifest-import:default` completes, if the service imported any new manifests or ran any upgrade scripts.

Four backups of each type are maintained by the system, with the oldest backups deleted as necessary.

You can restore the repository from one of these backups. See "How to Restore a Repository From Backup" on page 108.

Configuration Files and SMF Services

SMF is the recommended mechanism to use to start applications. In most cases, SMF replaces the use of configuration files for managing services. This section describes how some common legacy configuration scripts and files are handled.

`/etc/rc?.d` scripts

The `/etc/rc?.d` directories, where `?` represents a run level, contain legacy initialization and termination scripts for managing services that execute on run level transitions. Most services that were formerly implemented by `/etc/rc?.d` scripts are managed by SMF. Some `/etc/rc?.d` scripts are retained to enable you to use third-party applications that expect these services as `/etc/rc*.d` scripts. These scripts are hard linked to files in the `/etc/init.d` directory. For information about `/etc/rc?.d` scripts and about run levels, see the `/etc/init.d/README` file, the `README` files in the `/etc/rc?.d` directories, and the `inittab`(4) man page. For instructions to convert a run control script, see "How to Convert a Run Control Script to an SMF Service" on page 92. After you convert an `rc?.d` script, rename the script from `S`*script* to `s`*script* to effectively remove the script.

`/etc/init.d` scripts

The `/etc/init.d` directory contains initialization and termination scripts for changing `init` states. Some of these scripts are hard linked to scripts in the `/etc/rc?.d` directories. For information about `/etc/init.d` scripts, see `/etc/init.d/README` and the `init.d`(4) man page.

Legacy `init.d` run control scripts are represented with SMF FMRIs that begin with `lrc` instead of `svc`. For example, the `/etc/rc2.d/S47pppd` PPP configuration script is represented by the `lrc:/etc/rc2_d/S47pppd` service. The state of these `lrc` services is `legacy_run`. As shown in the following example, you can list names and start times of legacy services, but you cannot administer these services by using SMF.

```
$ svcs lrc:\*
STATE          STIME    FMRI
legacy_run      9:34:54  lrc:/etc/rc2_d/S47pppd
legacy_run      9:34:54  lrc:/etc/rc2_d/S89PRESERVE
$ svcs -l lrc:/etc/rc2_d/S47pppd
svcs: Operation not supported for legacy service 'lrc:/etc/rc2_d/S47pppd'
$ svccfg -s lrc:/etc/rc2_d/S47pppd listprop
svccfg: Operation not supported for legacy service 'lrc:/etc/rc2_d/S47pppd'
```

`/etc/inittab` entries

Entries in the `/etc/inittab` file control process dispatching by `init`. Do not edit the `/etc/inittab` file directly. Instead, modify SMF services. See "How to Modify a `ttymon` Property Value" on page 68 for an example of how to modify a parameter passed to `ttymon`.

For information about the format of `/etc/inittab` file entries, see the `inittab`(4) man page. For information about run levels, see the `inittab`(4) man page and `/etc/init.d/README`.

`/etc/inetd.conf` file

Services that were formerly configured by using the `inetd.conf` file are now configured by using SMF. Configurations in the `inetd.conf` file must be converted to SMF services to be available for use. See "Converting `inetd` Services to SMF Services" on page 114. For `inetd` services that are already converted to SMF services, see "Modifying Services that are Controlled by `inetd`" on page 79.

`/etc/nscd.conf` file
`/etc/nsswitch.conf` file
`/etc/resolv.conf` file

Do not edit these files. Edits will be lost. These files are automatically generated from SMF data for backward compatibility with applications that might parse the file. Use the `svccfg setprop` command to modify property values as shown in "Setting Property Values" on page 66.

The function of the `nscd.conf` file is replaced by the `svc:/system/name-service-cache` SMF service. See the `nscd.conf`(4) man page to see which `name-service-cache` properties to configure instead of editing the `nscd.conf` file.

The function of the `nsswitch.conf` file is replaced by the `svc:/system/name-service/switch` SMF service. See the `nsswitch.conf`(4) man page to see which `name-service/switch` properties to configure instead of editing the `nsswitch.conf` file.

The function of the `resolv.conf` file is replaced by the `svc:/network/dns/client` SMF service. See the `resolv.conf`(4) man page to see which `dns/client` properties to configure instead of editing the `resolv.conf` file.

These files are examples of configuration files that you should not edit. Other such files exist. In a few cases, editing a configuration file is the correct way to modify configuration,

as described in “Modifying Services that are Configured by a File” on page 81. Before editing any configuration file, read any comments in the file and any associated man page to ensure that editing the file is the correct way to modify the configuration for the related service.

Service Management Privileges

Modifying service state and configuration requires increased privilege. Use one of the following methods to gain the privilege you need. See “Securing Users and Processes in Oracle Solaris 11.2 ” for more information about authorizations, profiles, and roles, including how to determine which profile or role you need and how to assign privileges.

Authorizations

See the `smf_security`(5) man page for detailed information about authorizations required for SMF operations. You can also inspect a particular service for properties such as `action_authorization`, `modify_authorization`, `read_authorization`, and `value_authorization`.

Rights profiles

Use the `profiles` command to list the rights profiles that are assigned to you. The Service Management rights profile grants you the `solaris.smf.manage` and `solaris.smf.modify` authorities and enables you to use the `svcadm` and `svccfg` commands. The Service Operator rights profile grants you the `solaris.smf.manage` and `solaris.smf.modify.framework` authorities.

Roles

Use the `roles` command to list the roles that are assigned to you. If you have the `root` role, you can use the `su` command to assume the `root` role.

sudo command

Depending on the security policy at your site, you might be able to use the `sudo` command with your user password to execute a privileged command.

♦ ♦ ♦ CHAPTER 2

Getting Information About Services

This chapter shows how to get information about services such as the following:

- Service state, dependencies, and other property values
- Processes started by a contract service
- Log file location for troubleshooting
- FMA event and service transition event notification settings

Listing Services on the System

The `svcs` command is the primary command for listing service instance states and status.

Showing Service State

See "Service States" on page 21 for descriptions of the states shown in these examples.

EXAMPLE 2-1 Listing All Enabled Services

With no options or arguments, the `svcs` command lists all service instances that are enabled on this system, as well as instances that are temporarily disabled.

Service instances in the `disabled` state in this listing will be enabled on the next boot of the system. Instances in the `legacy_run` state are not managed by SMF. See "Configuration Files and SMF Services" on page 27 for more information about these legacy services. See "Getting More Information About Service States" on page 39 if you have services in the `maintenance`, `degraded`, or `offline` states.

The STIME column shows the time the instance entered the listed state. If the instance entered this state more than 24 hours ago, the STIME column shows the date.

```
$ svcs
STATE          STIME    FMRI
legacy_run     Sep_09   lrc:/etc/rc2_d/S47pppd
```

```
legacy_run      Sep_09   lrc:/etc/rc2_d/S81dodatadm_udaplt
legacy_run      Sep_09   lrc:/etc/rc2_d/S89PRESERVE
disabled        Sep_09   svc:/system/vbiosd:default
online          Sep_09   svc:/system/early-manifest-import:default
online          Sep_09   svc:/system/svc/restarter:default
...
```

EXAMPLE 2-2 Listing All Installed Services

To list all service instances that are installed on this system, including `disabled` instances that will not be enabled automatically on next boot, use the `svcs -a` command.

```
$ svcs -a
```

An asterisk (*) is appended to the state for service instances that are transitioning from the listed state to another state. For example, `offline*` probably means the instance is still executing its start method.

A question mark (`?`) is displayed if the state is absent or unrecognized.

EXAMPLE 2-3 Listing All Instances of a Service

With a service name specified, the `svcs` command lists all instances of a service. See “Showing Selected Service Information” on page 33 for information about the `-o` option.

```
$ svcs -Ho inst identity
node
domain
```

Showing More Information About Services

The `svcs -l` command shows a long listing for each specified service instance including more detailed information about the instance state, paths to the log file and configuration files for the instance, dependency types, dependency restart attribute values, and dependency state. The following example shows that all of the required dependencies of this service instance are online. The one dependency that is disabled is an optional dependency. For information about dependency types and restart attribute values, see “Showing Service Dependencies” on page 34. In `svcs -l` output, states other than those described in “Service States” on page 21 are possible for dependencies. See the `svcs`(1) man page for descriptions. The following example also shows that the specified service instance is temporarily enabled, is online, and the service is a contract type service. See “Service Models” on page 20 for definitions of service types. If the state value has a trailing asterisk, for example `offline*`, then the instance is in transition, and the next state field shows a state value instead of `none`. The `state_time` is the time the instance entered the listed state.

```
$ svcs -l net-snmp
fmri         svc:/application/management/net-snmp:default
```

```
name         net-snmp SNMP daemon
enabled      true (temporary)
state        online
next_state   none
state_time   September 17, 2013 05:57:26 PM PDT
logfile      /var/svc/log/application-management-net-snmp:default.log
restarter    svc:/system/svc/restarter:default
contract_id  160
manifest     /etc/svc/profile/generic.xml
manifest     /lib/svc/manifest/application/management/net-snmp.xml
dependency   require_all/none svc:/system/filesystem/local (online)
dependency   optional_all/none svc:/milestone/name-services (online)
dependency   optional_all/none svc:/system/system-log (online)
dependency   optional_all/none svc:/network/rpc/rstat (disabled)
dependency   require_all/restart svc:/system/cryptosvc (online)
dependency   require_all/restart svc:/milestone/network (online)
dependency   require_all/refresh file://localhost/etc/net-snmp/snmp/snmpd.conf (online)
dependency   require_all/none svc:/milestone/multi-user (online)
```

EXAMPLE 2-4 Showing Processes Started by a Contract Service

Use the `svcs -p` command to show the process IDs and command names of processes started by a contract service instance. The `net-snmp` service manages the `/usr/sbin/snmpd` SNMP agent that collects information about a system through a set of Management Information Bases (MIBs).

```
$ svcs -p net-snmp
STATE          STIME    FMRI
online         17:57:26 svc:/application/management/net-snmp:default
               17:57:26     5022 snmpd
```

EXAMPLE 2-5 Showing a Contract Service Restarting Automatically After Process Stop

Contract service instances are automatically restarted if the contract empties. SMF also attempts to restart processes associated with a contract service instance as part of automatic recovery from hardware or software failure events. The following example shows that after the `/usr/sbin/snmpd` process is killed, it is automatically restarted with a new process ID. The `net-snmp:default` instance is still online and has a new start time.

```
$ kill 5022
$ svcs -p net-snmp
STATE          STIME    FMRI
online         17:57:59 svc:/application/management/net-snmp:default
               17:57:59     5037 snmpd
```

Showing Selected Service Information

Output from the `svcs` command can be very useful for piping to other commands or using in scripts. The `-o` option of the `svcs` command enables you to specify the columns of information

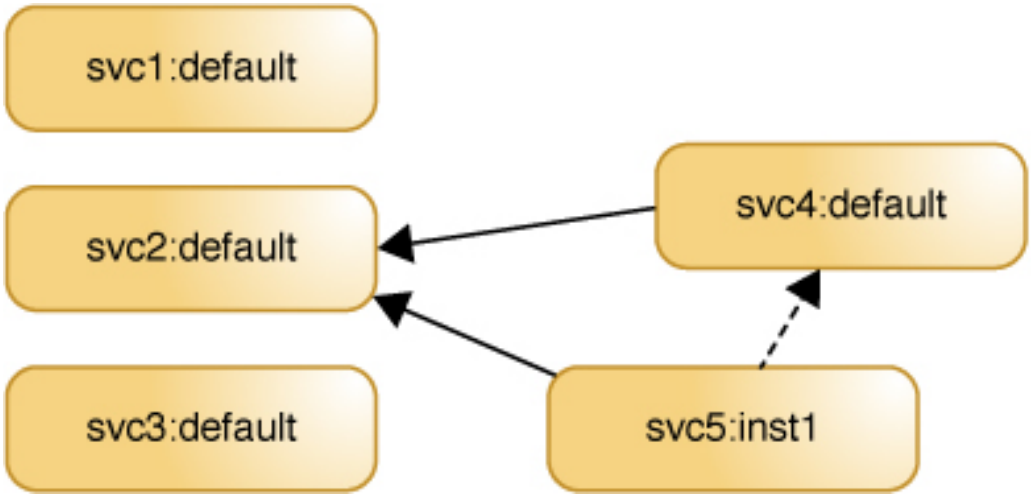
you want and the order of the columns. You can output the service name and instance name in separate columns, the current state and next state of the service, and the contract ID, for example. With the `-s` and `-S` options, you can specify the sort order of the output for one or more columns.

Showing Service Dependencies

Dependency relationships govern service instance state transitions. See "Service Dependencies" on page 21 for a high-level description of dependencies. See Chapter 5, "Using SMF to Control Your Application" for detailed descriptions and how to specify different kinds of dependencies.

In the following figure, the `svc1:default`, `svc2:default`, and `svc3:default` service instances do not require any other services or any files or other resources to start. These instances can start in parallel, execute their start methods, and move to the online state without waiting on any other resources. The `svc4:default` instance cannot execute its start method until the `svc2:default` instance is online. The `svc5:inst1` instance needs both `svc2:default` resources and `svc4:default` resources. The dependency that `svc5:inst1` has on `svc4:default` is an optional dependency and is satisfied if `svc4:default` is in one of the following states: enabled and online, disabled, or not present. The `svc5:inst1` instance must wait until `svc2:default` is online, and if `svc4:default` is present and enabled, `svc5:inst1` must also wait until `svc4:default` is online. If `svc4:default` is present and disabled or is not present, `svc5:inst1` does not need to wait for `svc4:default`.

FIGURE 2-1 Service Dependency Relationships



Dependency Groupings

Each dependency is assigned to one of the following groupings. The grouping defines how dependencies in that grouping are satisfied.

`require_all` This dependency is satisfied when both of the following conditions are met:

- All of the service dependencies in this grouping are running, either `online` or `degraded`.
- All of the file dependencies in this grouping are present.

`require_any` This dependency is satisfied when either of the following conditions is met:

- At least one of the service dependencies in this grouping is running, either `online` or `degraded`.
- At least one of the file dependencies in this grouping is present.

`optional_all` This dependency is satisfied when all of the service dependencies in this group meet either of the following conditions:

- The service is running, either `online` or `degraded`.

- The service requires administrative action to run. The service is not present, is incomplete, is `disabled`, is in `maintenance`, or is `offline` waiting for dependencies that require administrative action to start.

File dependencies in this group can be present or not present.

This dependency is not satisfied if the service instance is in transition and does not require administrative intervention to start. In this case, the dependent service waits for this dependency to start or waits for the determination that the dependency cannot start without administrative action.

`exclude_all` This dependency is satisfied when both of the following conditions are met:

- All of the service dependencies in this grouping are `disabled`, in `maintenance`, or not present.
- All of the file dependencies in this grouping are not present.

Listing Instances That a Service Depends On

The `svcs -d` command lists the service instances that a given service depends on.

This example shows the service instances that the `system-repository` service depends on:

```
$ svcs -d system-repository
STATE          STIME    FMRI
online         Sep_09   svc:/milestone/network:default
online         Sep_09   svc:/system/filesystem/local:default
online         Sep_09   svc:/system/filesystem/autofs:default
```

The `svcs -l` command also lists the services that a given service depends on. In addition to the name and state of the dependency, the `-l` option output shows the type, or grouping, of the dependency and the value of the `restart_on` property of the dependency. In this example, two of the dependencies are required and one is optional. See "Dependency Groupings" on page 35 for descriptions of how dependencies in these groupings affect the dependent service. See "Dependency Groupings" on page 35 for descriptions of how different values of the `restart_on` property of the dependency affect the dependent service.

```
$ svcs -l system-repository
fmri         svc:/application/pkg/system-repository:default
name         IPS System Repository
enabled      false
state        disabled
next_state   none
state_time   Mon Sep 09 18:42:28 2013
restarter    svc:/system/svc/restarter:default
manifest     /lib/svc/manifest/application/pkg/pkg-system-repository.xml
```

```
dependency   require_all/error svc:/milestone/network:default (online)
dependency   require_all/none svc:/system/filesystem/local:default (online)
dependency   optional_all/error svc:/system/filesystem/autofs:default (online)
```

You can also use the `svcprop` command to list these dependencies. This form shows the grouping and `restart_on` values of the dependency on separate lines, and does not show the state of the dependency.

```
$ svcprop -g dependency system-repository:default
network/entities fmri svc:/milestone/network:default
network/grouping astring require_all
network/restart_on astring error
network/type astring service
filesystem-local/entities fmri svc:/system/filesystem/local:default
filesystem-local/grouping astring require_all
filesystem-local/restart_on astring none
filesystem-local/type astring service
autofs/entities fmri svc:/system/filesystem/autofs:default
autofs/grouping astring optional_all
autofs/restart_on astring error
autofs/type astring service
```

Listing Instances That Depend on a Service

The `svcs -D` command lists the service instances that depend on a given service.

This example shows the service instances that depend on the `system-repository` service:

```
$ svcs -D system-repository
STATE          STIME    FMRI
online         16:39:30 svc:/application/pkg/zones-proxyd:default
```

The following command confirms that `zones-proxyd` depends on `system-repository`.

```
$ svcs -do svc,desc zones-proxyd
SVC                              DESC
application/pkg/system-repository IPS System Repository
system/filesystem/minimal         minimal file system mounts
milestone/network                 Network milestone
```

The following command shows more information about how `zones-proxyd` depends on `system-repository`. The last line of this output shows that the `zones-proxyd` service requires the `system-repository` service to be running and shows that `system-repository` is currently running. This output also shows that the `zones-proxyd` service will be restarted if the `system-repository` service is refreshed.

```
$ svcs -l zones-proxyd
fmri         svc:/application/pkg/zones-proxyd:defaulr
name         Zones Proxy Daemon
enabled      true
state        online
```

```
next_state   none
state_time   January 6, 2014 04:39:30 PM PST
restarter    svc:/system/svc/restarter:default
manifest     /lib/svc/manifest/application/pkg/zoneproxyd.xml
dependency   require_any/none svc:/system/filesystem/minimal (online)
dependency   require_any/error svc:/milestone/network (online)
dependency   require_all/restart svc:/application/pkg/system-repository (online)
```

Showing Whether a Service Will Automatically Restart

A running service can be configured to restart when one of its dependencies is stopped or refreshed. If dependencies of a running service (`online` or `degraded` state) are not satisfied, the service transitions to the `offline` state. If a service restarts after a dependency stop or refresh, dependencies might again be satisfied and the dependent service transitioned back to a running state.

The following factors determine whether a service is restarted after a `require_all`, `require_any`, or `optional_all` dependency is stopped or refreshed:

- Whether the dependency was stopped or refreshed. If stopped, whether the dependency was stopped because of an error such as a hardware error or a core dump or for some other reason such as an administrative action.
- The value of the `restart_on` attribute of the dependency. Possible values are `none`, `error`, `restart`, and `refresh`.

As shown in the following table, if the value of the `restart_on` attribute of the dependency is `none`, the dependent service is not restarted when the dependency is stopped or refreshed. If the value of the `restart_on` attribute of the dependency is `refresh`, the dependent service is always restarted when the dependency is stopped or refreshed. If the value of `restart_on` is `error`, the dependent service is only restarted if the dependency stopped because of an error. If the value of `restart_on` is `restart`, the dependent service is only restarted if the dependency was refreshed.

TABLE 2-1 Automatically Restarting a Service After a Dependency Stop

`require_all`, `require_any`, or `optional_all` Dependency	**Value of Dependency `restart_on` Attribute**			
Stop or Refresh Event	**`none`**	**`error`**	**`restart`**	**`refresh`**
Stop due to error	No restart	Restart	No restart	Restart
Other stop	No restart	No restart	No restart	Restart
Refresh	No restart	No restart	Restart	Restart

"Listing Instances That a Service Depends On" on page 36 shows that the `system-repository` service has two `require_all` dependencies and one `optional_all` dependency. The following command shows that the `system-repository` service will be restarted if the `milestone/network` service or the `system/filesystem/autofs` service stops due to an error but not if they stop for any other reason or are refreshed. The `system-repository` service will not be restarted if the `system/filesystem/local` service is refreshed or stopped for any reason.

```
$ svccfg -s system-repository:default listprop -o propname,propval '*restart_on'
network/restart_on          astring     error
filesystem-local/restart_on astring     none
autofs/restart_on           astring     error
```

Getting More Information About Service States

With no arguments, the `svcs -x` command gives explanatory information about the following service instances:

- Instances that are enabled but not running.
- Instances that are preventing other enabled services from running.

If all enabled services are running, the `svcs -x` command produces no output.

In the following example, the `pkg/depot` service is in the `maintenance` state because its start method failed.

```
$ svcs -x
svc:/application/pkg/depot:default (IPS Depot)
 State: maintenance since September 11, 2013 01:30:42 PM PDT
Reason: Start method exited with $SMF_EXIT_ERR_FATAL.
   See: http://support.oracle.com/msg/SMF-8000-KS
   See: pkg.depot-config(1M)
   See: /var/svc/log/application-pkg-depot:default.log
Impact: This service is not running.
```

The output suggests a Predictive Self-Healing knowledge article from My Oracle Support, a man page, and a log file to reference to determine why the start method failed. See "Viewing Service Log Files" on page 40 for information about different ways to view log files. See "Repairing an Instance That Is Degraded, Offline, or in Maintenance" on page 103 for information about how to fix a service that is in the `maintenance` state.

In the following example, the `print/server` service has dependent services that are not running. The dependent services cannot run because the `print/server` service has been disabled.

```
$ svcs -x
svc:/application/print/server:default (LP print server)
 State: disabled since Fri Mar 08 14:42:32 2013
Reason: Disabled by an administrator.
```

```
   See: http://sun.com/msg/SMF-8000-05
   See: lpsched(1M)
Impact: 2 dependent services are not running.  (Use -v for list.)
$ svcs -xv
svc:/application/print/server:default (LP print server)
 State: disabled since Fri Mar 08 14:42:32 2013
Reason: Disabled by an administrator.
   See: http://sun.com/msg/SMF-8000-05
   See: man -M /usr/share/man -s 1M lpsched
Impact: 2 dependent services are not running:
        svc:/application/print/rfc1179:default
        svc:/application/print/ipp-listener:default
$ svcs -D print/server
STATE          STIME    FMRI
online         Mar_08   svc:/milestone/multi-user:default
offline        Mar_08   svc:/application/print/ipp-listener:default
offline        Mar_08   svc:/application/print/rfc1179:default
```

If an argument given to the `svcs -x` command does not meet the criteria stated at the beginning of this section, the output does not show any reason for the instance state but still shows resources for more information.

```
$ svcs -x smb
svc:/network/smb:default (SMB properties)
 State: online since Thu Sep 12 19:16:56 2013
   See: smb(4)
   See: /var/svc/log/network-smb:default.log
Impact: None.
```

Viewing Service Log Files

SMF records information about significant restarter actions, method standard output, and standard error output to `/var/svc/log/`*service*`:`*instance*`.log` for each service instance. Hyphens are substituted for forward slashes in the *service* name in the log file name. The `svcs` command with the `-L`, `-l`, or `-x` option shows the full path name of the log file for the specified service instance. The `svcs -xL` command shows the last few lines of the log file and tells you to use the `svcs -Lv` command to view the complete log file. The `svcs -Lv` command displays the complete file, which could be quite long. If you prefer to view the log file in an editor or view just the last *n* entries, for example, operate on the output of the `svcs -L` command.

The following example shows how to use the log file to investigate why the service shown in the `svcs` listing is temporarily disabled.

```
$ svcs
STATE          STIME    FMRI
legacy_run     Sep_09   lrc:/etc/rc2_d/S47pppd
legacy_run     Sep_09   lrc:/etc/rc2_d/S81dodatadm_udaplt
legacy_run     Sep_09   lrc:/etc/rc2_d/S89PRESERVE
disabled       Sep_09   svc:/system/vbiosd:default
```

```
online         Sep_09   svc:/system/early-manifest-import:default
online         Sep_09   svc:/system/svc/restarter:default
...
$ svcs -x vbiosd
svc:/system/vbiosd:default (BIOS call emulation)
 State: disabled since Mon Sep  9 18:42:37 2013
Reason: Temporarily disabled by service method: "vbiosd is not supported on UEFI systems."
   See: http://support.oracle.com/msg/SMF-8000-1S
   See: vbiosd(1M)
   See: /var/svc/log/system-vbiosd:default.log
Impact: This service is not running.
$ svcs -xL vbiosd
svc:/system/vbiosd:default (BIOS call emulation)
 State: disabled since Mon Sep  9 18:42:37 2013
Reason: Temporarily disabled by service method: "vbiosd is not supported on UEFI systems."
   See: http://support.oracle.com/msg/SMF-8000-1S
   See: vbiosd(1M)
   See: /var/svc/log/system-vbiosd:default.log
Impact: This service is not running.
   Log:
[ Sep  9 18:42:27 Enabled. ]
[ Sep  9 18:42:37 Executing start method ("/lib/svc/method/svc-vbiosd start"). ]
[ Sep  9 18:42:37 Method "start" exited with status 101. ]
[ Sep  9 18:42:37 "start" method requested temporary disable: "vbiosd is not supported on UEFI
 systems"
 ]

   Use: 'svcs -Lv svc:/system/vbiosd:default' to view the complete log.
$ svcs -L vbiosd
/var/svc/log/system-vbiosd:default.log
$ view `svcs -L vbiosd`
```

Other log files that you might find useful include the log for the master restarter daemon and the system log. To see the log file name and view the log file for the `svc.startd` restarter daemon, use the service name `restarter` with the `svcs` command. To view the log file for the `syslogd` system log daemon, use the service name `system-log`.

See “Specifying the Amount of Startup Messaging” on page 110 for instructions to change the amount of messaging you see on system boot. See “Configuring Notification of State Transition and FMA Events” on page 59 for instructions to configure services to notify you when they transition into or out of a service state or when an FMA event occurs.

Inspecting Service Configuration

Service configuration is expressed in properties that are set on services and service instances and stored in layers in the service configuration repository. Properties that are set on a service are inherited by all instances of that service. Properties that are set on an instance are used only by that instance. Service instances can customize the values of inherited properties and can define additional properties that are not defined for the parent service.

This section shows how to retrieve property values and how to identify whether the value is global for the service, is specific to an instance, was delivered with the software, or is an administrative customization.

Showing Descriptions of Properties and Property Groups

The `svccfg describe` command displays a description of the property groups and properties of a service, including the current values of properties. With no operands, `describe` shows descriptions of all property groups and properties of the selected service or service instance. Use the `-v` option to show more information, including a description of the current value and a list of possible values. Use the `-t` option to show template information.

```
$ svccfg -s pkg/server describe network/restart_on
network/restart_on astring     none
    Determines whether to restart the service due to a dependency refresh, restart, or failure.
$ svccfg -s pkg/server describe -v network/restart_on
network/restart_on astring     none
    type: astring
    required: true
    Determines whether to restart the service due to a dependency refresh, restart, or failure.
    visibility: readwrite
    minimum number of values: 1
    maximum number of values: 1
  value: none
    value description: Never restart due to dependency refresh, restart, or failure.
  value constraints:
    value name: none
    value name: error
    value name: restart
    value name: refresh
```

Showing Service and Instance Property Values

The examples in this section describe how to view service and instance properties and property groups in different views, layers, and snapshots.

EXAMPLE 2-6 Listing Instance and Inherited Properties Currently in Use

By default, the `svcprop` command shows the values assigned to properties in the running snapshot, which are the values currently being used. By default, the `svcprop` command shows properties in the *composed view* of the running snapshot, which means that both instance-specific properties and inherited properties are shown. If the value of an inherited property is

customized in the instance, the value set in the instance is shown. The output lists one line for each property, showing the property group and property name separated by a forward slash character, the data type of the property value, and the property value. If no property or group name is specified, all property values in the running snapshot are shown.

If the FMRI or pattern operand does not specify an instance, properties set only on the service are shown. Properties set only on an instance are not shown. The following command shows properties such as service dependencies, the type of the service, and the paths of the profile and manifest files.

```
$ svcprop svc:/system/identity
```

When you specify an instance, you see the composed view of properties customized for that instance and properties inherited from the parent service. The following command lists all the properties in the running snapshot for the specified instance, including properties inherited from the parent service and properties specific to this instance. For inherited properties whose value is customized for this instance, the customized value is shown. This example shows properties such as additional dependencies, the path to the executable that starts this instance, the path to the log file for this instance, and information about the state of this instance.

```
$ svcprop svc:/system/identity:domain
```

EXAMPLE 2-7 Listing Specified Properties or Property Groups Currently in Use

Use the `-p` option to show specific properties or all properties in a specific property group.

```
$ svcprop -p pkg/port pkg/server
svc:/application/pkg/server:oss:properties/pkg/port count 82
svc:/application/pkg/server:s11:properties/pkg/port count 81
svc:/application/pkg/server:default:properties/pkg/port count 80
$ svcprop -p pkg pkg/server:s11
pkg/inst_root astring /export/ipsrepos/Solaris11
pkg/port count 81
...
pkg/ssl_cert_file astring ""
pkg/ssl_key_file astring ""
...
```

EXAMPLE 2-8 Listing Service and Instance Values in the Editing View

With options, the `svcprop` command can show the *editing* view instead of the running snapshot. The editing view shows the most recent changes. The changes in the editing view might or might not have been committed into the running snapshot by refreshing or restarting the instance. The following commands illustrate the difference between the running snapshot and the editing view. The `oss` and `s11` instances have just been created and property values have been changed, but the instances have not yet been refreshed. The first command shows the composed view of the running snapshot. Because these instances have not been refreshed since they were customized, the values shown are values from the `pkg/server` service. The `-c` option shows the composed view of the editing values. The `-C` option shows the editing values without

composition. Because this is not a composed view, no value is found for the instance that has not been customized.

```
$ svcprop -p pkg/port pkg/server
svc:/application/pkg/server:oss/:properties/pkg/port count 80
svc:/application/pkg/server:s11/:properties/pkg/port count 80
svc:/application/pkg/server:default/:properties/pkg/port count 80
$ svcprop -c -p pkg/port pkg/server
svc:/application/pkg/server:oss/:properties/pkg/port count 82
svc:/application/pkg/server:s11/:properties/pkg/port count 81
svc:/application/pkg/server/:properties/pkg/port count 80
$ svcprop -C -p pkg/port pkg/server
svc:/application/pkg/server:oss/:properties/pkg/port count 82
svc:/application/pkg/server:s11/:properties/pkg/port count 81
svcprop: Couldn't find property 'pkg/port' for instance 'svc:/application/pkg/server:default'.
```

The `svccfg` command displays the editing property values by default, not the values in the running snapshot. You can force `svccfg` to display values in the running snapshot by using the `selectsnap` subcommand as shown in “Showing Values in a Specified Snapshot” on page 47.

The `svccfg` command only shows values for the parent service when you specify a parent service and only shows values for an instance when you specify an instance. If you receive no output from the `svccfg listprop` command, the property you specified might not be set on the parent service or the instance that you specified. If the property was deleted, use `listcust -M` to view the masked value, as shown in “Showing Configuration Customizations” on page 47.

The following command lists all editing property values for the specified service because no property group or property name is specified. In addition to the output shown by the `svcprop svc:/system/identity` command, this output includes property group names and types and template data.

```
$ svccfg -s svc:/system/identity listprop
```

The following command lists all editing property values for the specified service instance. Because this command does not show the composed view, this output does not show the paths to the profile and manifest files, for example.

```
$ svccfg -s svc:/system/identity:domain listprop
```

EXAMPLE 2-9 Listing Specified Properties or Property Groups in the Editing View

The following command lists all editing property values in the specified property group for the specified service instance. The `-o` option enables you to select the columns to display. See the `svccfg`(1M) man page for the list of valid column names.

```
$ svccfg -s pkg/server:s11 listprop pkg
pkg                 application
```

```
pkg/inst_root       astring      /export/ipsrepos/Solaris11
pkg/port            count        81
$ svccfg -s pkg/server:s11 listprop -o propname,value pkg
inst_root      /export/ipsrepos/Solaris11
port           81
```

Showing Properties in a Property Group Type

In addition to showing property values by property name or property group name, you can also show property values by property group type.

EXAMPLE 2-10 Showing Property Groups and Their Types

The `listpg` subcommand of the `svccfg` command shows the name and type of each property group.

```
$ svccfg -s pkg/server listpg
pkg             application
pkg_bui         application
pkg_secure      application
fs              dependency
autofs          dependency
ntp             dependency
network         dependency
general         framework
manifestfiles   framework
start           method
stop            method
tm_common_name  template
$ svccfg -s pkg/server:s11 listpg
pkg        application
general    framework
restarter  framework              NONPERSISTENT
```

Non-persistent property groups generally hold an active program state. Values of properties in non-persistent property groups are cleared during system boot.

Specify a property group name to show the type of only that property group.

```
$ svccfg -s pkg/mirror listpg config
config  application
```

EXAMPLE 2-11 Listing Properties of a Property Group Type

Use the `-g` option of the `svcprop` command to show properties in a specific property group type. Property group types include `application`, `dependency`, `method`, `framework`, and `template`.

```
$ svcprop -g method pkg/server:s11
start/exec astring %{pkg/pkg_root}/lib/svc/method/svc-pkg-server\ %m
start/timeout_seconds count 0
start/type astring method
stop/exec astring %{pkg/pkg_root}/lib/svc/method/svc-pkg-server\ %m %{restarter/contract}
stop/timeout_seconds count 30
stop/type astring method
$ svcprop -g method -p exec pkg/server:s11
start/exec astring %{pkg/pkg_root}/lib/svc/method/svc-pkg-server\ %m
stop/exec astring %{pkg/pkg_root}/lib/svc/method/svc-pkg-server\ %m %{restarter/contract}
```

Showing the Layer Where a Value Is Set

The service configuration repository stores property data in layers according to the source of the data. Both the `svcprop` and `svccfg` commands can show the layer that is the source of a property value. The `-l` option of the `svcprop` and `svccfg` commands requires an argument to specify the layer for which you want information. Argument values are `manifest`, `system-profile`, `site-profile`, and `admin`. The output indicates whether a specific property value was set in the service manifest, a profile, or by an administrator. See "Repository Layers" on page 25 for descriptions of the layers. The keyword `all` is an alias for all layers. If the layer you specify is not the source of the property values you request, no output is shown.

The following command shows that some property values come from the service manifest, some were set by an administrator, and some properties have values in more than one layer. The `pkg/readonly` property has a value set in the service manifest, and an administrator also set that same value. Values from different layers could be different.

```
$ svcprop -l all -p pkg pkg/server:s11
pkg/port count admin 81
pkg/inst_root astring admin /export/ipsrepos/Solaris11
pkg/address net_address manifest
pkg/cfg_file astring manifest ""
...
pkg/readonly boolean manifest true
pkg/readonly boolean admin true
...
```

The `-l` option of the `svccfg listprop` command can also take the argument `current`. Using `current` as the `-l` argument shows the same property values that are shown when you do not use the `-l` option. The only difference in the output is that the name of the layer is also shown. The non-persistent data does not show a layer name (the third column displays <none>) because the service configuration repository does not store layer information for non-persistent data. Non-persistent property groups generally hold an active program state, and values of properties in non-persistent property groups are cleared during system boot.

```
$ svccfg -s pkg/server:s11 listprop -l current
pkg                              application admin
pkg/inst_root                    astring     admin     /export/ipsrepos/Solaris11
pkg/port                         count       admin     81
```

```
general                            framework   admin
general/complete                   astring     manifest
general/enabled                    boolean     admin     true
restarter                          framework   <none>       NONPERSISTENT
restarter/logfile                  astring     <none>    /var/svc/log/application-pkg-
server:default.log
restarter/contract                 count       <none>    121
restarter/start_pid                count       <none>    1055
restarter/start_method_timestamp   time        <none>    1379605275.329096000
restarter/start_method_waitstatus  integer     <none>    0
restarter/auxiliary_state          astring     <none>    dependencies_satisfied
restarter/next_state               astring     <none>    none
restarter/state                    astring     <none>    online
restarter/state_timestamp          time        <none>    1379605275.332259000
```

Showing Values in a Specified Snapshot

The following command lists the snapshots that are available for this service instance. Use these snapshot names with either `svcprop` or `svccfg` to show the values of properties that were set in that snapshot. Only instances have snapshots. Services do not have snapshots. See “Repository Snapshots” on page 26 for information about snapshots of the service configuration repository.

```
$ svccfg -s pkg/server:default listsnap
initial
previous
running
start
$ svccfg -s pkg/server:s11 listsnap
previous
running
start
```

The following commands show that the value of the `pkg/inst_root` property was different in the previous snapshot.

```
$ svcprop -s previous -p pkg/inst_root pkg/server:s11
/var/share/pkg/repositories/solaris
$ svccfg -s pkg/server:s11
svc:/application/pkg/server:s11> selectsnap previous
[previous]svc:/application/pkg/server:s11> listprop pkg/inst_root
pkg/inst_root astring     /var/share/pkg/repositories/solaris
[previous]svc:/application/pkg/server:s11> exit
```

Showing Configuration Customizations

The `svccfg listcust` command displays customizations at the `admin` layer for the specified service. Use the `-L` option to also show customizations in the `site-profile` layer. The

following command shows that the `pkg/port` and `pkg/inst_root` properties of the `pkg/server` service have been customized by an administrator.

```
$ svccfg -s pkg/server:s11 listcust
pkg                              application admin
pkg/port                         count       admin     81
pkg/inst_root                    astring     admin     /export/ipsrepos/Solaris11
general                           framework   admin
general/complete                 astring     manifest
general/enabled                  boolean     admin     true
```

The following `svcprop` command shows that the definition of the property `config/nodename` is provided at the `manifest` layer, but the value `solaris` is set at the `admin` layer.

```
$ svccfg -s identity:node describe config/nodename
config/nodename astring     solaris
    Network name of the computer
$ svcprop -p config/nodename -l all svc:/system/identity:node
config/nodename astring manifest ""
config/nodename astring admin solaris
```

The `svccfg listcust` command also displays all *masked* entities. Use the `-M` option to list only masked entities. Before you use the `svccfg delcust` command, use the `svccfg listcust` command to verify what will be deleted. See “Deleting Property Groups, Properties, and Property Values” on page 72 and the `smf`(5) man page for a description of masked entities.

Showing Event Notification Parameters

The `svcs -n` command displays the FMA events notification parameters, system wide SMF state transition notification parameters, and service instance state transition notification parameters. See “Notification Parameters” in the `smf`(5) man page for information about these parameters.

```
$ svcs -n
Notification parameters for FMA Events
    Event: problem-diagnosed
        Notification Type: smtp
            Active: true
            reply-to: root@localhost
            to: root@localhost

        Notification Type: snmp
            Active: true

        Notification Type: syslog
            Active: true

    Event: problem-repaired
        Notification Type: snmp
```

```
            Active: true

    Event: problem-resolved
        Notification Type: snmp
            Active: true

System wide notification parameters:
svc:/system/svc/global:default:
    Event: to-maintenance
        Notification Type: smtp
            Active: true
            to: sysadmins@example.com

svc:/application/pkg/mirror:default:
    Event: to-maintenance
        Notification Type: smtp
            Active: true
            to: installteam@example.com
```

Three FMA events are shown: `problem-diagnosed`, `problem-repaired`, and `problem-resolved`. Notification parameters can also be configured for a fourth event: `problem-updated`.

For the system wide state transition notification setting, the service that stores these global settings is also listed. This system wide setting is a custom setting. System wide, or global, values apply to all service instances that do not have custom values set.

The last setting shown is a custom setting for a particular service instance.

Use the `svccfg listnotify` command to show notification parameters for only the specified event. For state transition events, use the `-g` option to show global settings. The output also shows the source of the notification parameter values.

```
$ svccfg listnotify problem-resolved
    Event: problem-resolved (source: svc:/system/fm/notify-params:default)
        Notification Type: snmp
            Active: true
$ svccfg listnotify -g to-maintenance
    Event: to-maintenance (source: svc:/system/svc/global:default)
        Notification Type: smtp
            Active: true
            to: sysadmins@example.com
$ svccfg -s pkg/mirror listnotify to-maintenance
    Event: to-maintenance (source: svc:/application/pkg/mirror)
        Notification Type: smtp
            Active: true
            to: installteam@example.com
```

See “Configuring Notification of State Transition and FMA Events” on page 59 for information about configuring event notification.

♦ ♦ ♦ CHAPTER 3

Administering Services

This chapter describes how to start, stop, and restart a service and how to reread service configuration. This chapter also describes how to configure the system to notify you of FMA events or service state transitions. These changes are `admin` level customizations as described in "Repository Layers" on page 25.

The command that changes service state is `svcadm`. The `svcadm` command operates on a service instance. If you provide a service name with no instance specified, and that service has only a single instance, `svcadm` operates on that instance. If you provide a service name with no instance specified, and that service has multiple instances, or if you specify any other pattern that matches multiple instances, `svcadm` issues an error message.

Managing SMF Service Instances

A service instance is always in one of the states described in "Service States" on page 21. This section discusses how to cause an instance to transition to a different state, how to commit updated property values to the running snapshot, and how to delete instances from normal view.

Starting a Service

A service instance that is in any of the following states is already enabled and does not need to be started: `degraded`, `maintenance`, `offline`, `online`. If the instance you want to start is in the `degraded`, `maintenance`, or `offline` state, see "Repairing an Instance That Is Degraded, Offline, or in Maintenance" on page 103. If the instance you want to start is in the `disabled` state, enable the instance as shown in the following procedure. When you enable an instance, the restarter for that instance attempts to transition the instance to the `online` state.

▼ How to Enable a Service Instance

1. **Check the instance state and dependencies.**

Check that the instance is currently disabled and that all of its required dependencies are running (in the `online` or `degraded` state).

```
$ svcs -l FMRI
```

2. **Enable the instance.**

   The restarter for the service attempts to bring the specified instance to the `online` state.

   An instance can be permanently or temporarily enabled. Permanent enable is persistent across system reboot and is the default. Temporary enable lasts only until reboot.

   - **Permanently enable the instance.**

     ```
     $ svcadm enable FMRI
     ```

   - **Temporarily enable the instance.**

     Use the `-t` option to specify temporary enable.

     ```
     $ svcadm enable -t FMRI
     ```

     If you want an instance to run now but not run on next reboot, make sure the instance is disabled, and then temporarily enable the instance. To verify that the instance is temporarily enabled, use the `svcs -l` command and check the `enabled` row:

     ```
     enabled      true (temporary)
     ```

   - **Synchronously enable the instance.**

     If you specify the `-s` option, `svcadm` enables the instance and waits for the instance to enter the `online` or `degraded` state before returning. The `svcadm` command returns when the instance reaches an online state or when it determines that the instance requires administrator intervention to reach an online state.

     Use the `-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

     ```
     $ svcadm enable -sT 10 FMRI
     ```

3. **Verify that the instance is online.**

   ```
   $ svcs FMRI
   ```

   If the instance is in the `degraded`, `maintenance`, or `offline` state, see “Repairing an Instance That Is Degraded, Offline, or in Maintenance” on page 103.

Example 3-1 Enabling a Service Instance Permanently

The following command shows that the `pkg/mirror:default` service instance is currently disabled, and all of its required dependencies are online.

```
$ svcs -l pkg/mirror
fmri         svc:/application/pkg/mirror:default
name         IPS Repository Mirror
enabled      false
state        disabled
next_state   none
state_time   September 17, 2013 07:16:52 AM PDT
restarter    svc:/system/svc/restarter:default
manifest     /lib/svc/manifest/application/pkg/pkg-mirror.xml
dependency   require_all/error svc:/milestone/network:default (online)
dependency   require_all/none svc:/system/filesystem/local:default (online)
dependency   optional_all/error svc:/system/filesystem/autofs:default (online)
dependency   require_all/none svc:/application/pkg/repositories-setup (online)
```

The following command enables the `pkg/mirror:default` instance. In this case, the `svcadm` command returns because the `pkg/mirror:default` instance is successfully enabled.

```
$ svcadm enable -sT 10 pkg/mirror:default
$ svcs pkg/mirror
STATE          STIME    FMRI
online         22:03:53 svc:/application/pkg/mirror:default
```

Example 3-2 Enabling a Service Instance Temporarily

The following command shows that the `net-snmp:default` service instance is currently disabled, and all of its required dependencies are online. The one dependency that is disabled is an optional dependency.

```
$ svcs -l net-snmp
fmri         svc:/application/management/net-snmp:default
name         net-snmp SNMP daemon
enabled      false
state        disabled
next_state   none
state_time   September 17, 2013 05:56:39 PM PDT
logfile      /var/svc/log/application-management-net-snmp:default.log
restarter    svc:/system/svc/restarter:default
contract_id
manifest     /etc/svc/profile/generic.xml
manifest     /lib/svc/manifest/application/management/net-snmp.xml
dependency   require_all/none svc:/system/filesystem/local (online)
dependency   optional_all/none svc:/milestone/name-services (online)
dependency   optional_all/none svc:/system/system-log (online)
dependency   optional_all/none svc:/network/rpc/rstat (disabled)
dependency   require_all/restart svc:/system/cryptosvc (online)
dependency   require_all/restart svc:/milestone/network (online)
dependency   require_all/refresh file://localhost/etc/net-snmp/snmp/snmpd.conf (online)
dependency   require_all/none svc:/milestone/multi-user (online)
```

After enabling the instance using the `-t` option as shown in the following example, the instance is temporarily enabled, is online, and has a contract ID because it has started the `snmpd` process, as shown by the `svcs -p` command.

```
$ svcadm enable -t net-snmp:default
$ svcs -l net-snmp
fmri         svc:/application/management/net-snmp:default
name         net-snmp SNMP daemon
enabled      true (temporary)
state        online
next_state   none
state_time   September 17, 2013 05:57:26 PM PDT
logfile      /var/svc/log/application-management-net-snmp:default.log
restarter    svc:/system/svc/restarter:default
contract_id  160
manifest     /etc/svc/profile/generic.xml
manifest     /lib/svc/manifest/application/management/net-snmp.xml
dependency   require_all/none svc:/system/filesystem/local (online)
dependency   optional_all/none svc:/milestone/name-services (online)
dependency   optional_all/none svc:/system/system-log (online)
dependency   optional_all/none svc:/network/rpc/rstat (disabled)
dependency   require_all/restart svc:/system/cryptosvc (online)
dependency   require_all/restart svc:/milestone/network (online)
dependency   require_all/refresh file://localhost/etc/net-snmp/snmp/snmpd.conf (online)
dependency   require_all/none svc:/milestone/multi-user (online)
$ svcs -p net-snmp
STATE          STIME    FMRI
online         17:57:26 svc:/application/management/net-snmp:default
               17:57:26     5022 snmpd
```

Stopping a Service

Use the `svcadm disable` command to disable an enabled or temporarily disabled service instance. A disabled instance cannot be restarted. You must first enable the instance.

▼ How to Disable a Service Instance

1. Check whether other services depend on this instance.

a. List services that depend on this instance.

```
$ svcs -D FMRI
```

b. Check whether the dependent service requires this instance.

For each result from the `svcs -D` command, use the `svcs -l` command to check whether the dependency is a required dependency.

You should not disable this instance if this instance is a required dependency of another service.

2. **Disable the instance.**

   The restarter for the service attempts to bring the specified instance to the `disabled` state.

   An instance can be permanently or temporarily disabled. Permanent disable is persistent across system reboot and is the default. Temporary disable lasts only until reboot.

   - **Permanently disable the instance.**

     ```
     $ svcadm disable FMRI
     ```

   - **Temporarily disable the instance.**

     Use the `-t` option to specify temporary disable.

     ```
     $ svcadm disable -t FMRI
     ```

     If you want an instance to be disabled now but run on next reboot, make sure the instance is running (in the `online` or `degraded` state), and then temporarily disable the instance. To verify that the instance is temporarily disabled, use the `svcs -l` command and check the `enabled` row:

     ```
     enabled      false (temporary)
     ```

   - **Synchronously disable the instance.**

     If you specify the `-s` option, `svcadm` disables the instance and waits for the instance to enter the `disabled` state before returning. The `svcadm` command returns when the instance reaches the `disabled` state or when it determines that the instance requires administrator intervention to reach the `disabled` state.

     Use the `-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

     ```
     $ svcadm disable -sT 10 FMRI
     ```

3. **Verify that the instance is disabled.**

   ```
   $ svcs FMRI
   ```

Example 3-3 Disabling a Service Instance

This example shows that the `pkg/update:default` service instance is initially online and no other services depend on this instance. The `svcadm disable` command is successful, the instance is currently in the `disabled` state, and the restart attempt fails.

```
$ svcs pkg/update
STATE          STIME    FMRI
online          7:18:17 svc:/application/pkg/update:default
$ svcs -D pkg/update:default
STATE          STIME    FMRI
$ svcadm disable pkg/update
$ svcs pkg/update
STATE          STIME    FMRI
disabled       22:51:12 svc:/application/pkg/update:default
$ svcadm restart pkg/update:default
$ svcs pkg/update
STATE          STIME    FMRI
disabled       22:51:12 svc:/application/pkg/update:default
```

Restarting a Service

The restart operation only restarts instances that are currently running (in the `online` or `degraded` state). You might need to restart a running instance because you have made a configuration change that cannot be effected while the instance is running, for example.

Restarting a service instance does not refresh configuration. The `svcadm restart` command runs the stop method of the instance and then runs the start method of the instance. The `svcadm restart` command does not commit property changes into the running snapshot and does not run the refresh method of the instance. See “Rereading Service Configuration” on page 57 for information about committing configuration changes into the running snapshot.

Restarting the `manifest-import` service is a special case. Restarting the `manifest-import` service imports any changed manifests or profiles in standard locations, commits the changes into the service configuration repository, takes a new running snapshot, and runs the refresh method of changed instances if a refresh method exists.

▼ How to Restart a Service Instance

1. Check the instance state.

The instance must be in the `online` or `degraded` state.

```
$ svcs FMRI
```

2. Restart the instance.

The restarter for the service attempts to bring the specified instance to the `online` state. Most restarters implement the restart operation as a stop operation followed by a start operation.

- **Restart the instance.**

```
$ svcadm restart FMRI
```

- **Synchronously restart the instance.**

  If you specify the `-s` option, `svcadm` restarts the instance and waits for the instance to enter the `online`, `degraded`, or `maintenance` state before returning. The `svcadm` command returns when the instance reaches one of these states or when it determines that the instance requires administrator intervention to reach one of these states.

  Use the `-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

  ```
  $ svcadm restart -sT 10 FMRI
  ```

3. **Verify that the instance is started.**

   If the restart is successful, the instance is in the `online`, `degraded`, or `maintenance` state. If the instance is in the `degraded` or `maintenance` state, see "Repairing an Instance That Is Degraded, Offline, or in Maintenance" on page 103.

   ```
   $ svcs FMRI
   ```

Rereading Service Configuration

When you change service configuration, those changes do not immediately appear in the running snapshot. Those changes are stored in the service configuration repository as current, or editing, property values. The refresh operation updates the running snapshot of the specified service instance with the values from the editing configuration.

The `svcadm refresh` and `svccfg refresh` commands both perform the following steps:

1. Create a new running snapshot to commit the editing properties into the running snapshot.
2. Run the refresh method of the instance, if a refresh method exists and the instance is in the `online` or `degraded` state. The refresh method should notify the application that changes have been made. The refresh method might reread property values from the running snapshot. Even if no refresh method exists, the configuration in the running snapshot is updated.

The `svcadm refresh` command operates on a service instance. The `svccfg refresh` command operates on a service instance or on a parent service. If a service is specified, the `svccfg refresh` command refreshes all instances of that service. While snapshots are taken only for service instances and not for parent services, parent service properties are inherited by service instances. Changed parent service properties appear in a service instance snapshot if the instance does not override those changes.

Some changes, such as dependency changes, take effect immediately. Other changes do not become effective until the service is restarted as described in "Restarting a Service" on page 56. Changes that cannot be made while the application is running require a refresh followed by a restart. Examples of changes that cannot be made while the application is running include closing or opening a socket or resetting an environment variable.

If you specify the `-s` option with the `svcadm refresh` command, `svcadm` refreshes the instance and waits for the instance to enter the `online`, `degraded`, or `maintenance` state before returning. The `svcadm` command returns when the instance reaches one of these states or when it determines that the instance requires administrator intervention to reach one of these states. Use the `-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

Deleting a Service

The `svccfg delete` command does not remove a service instance from the system. Instead, the `svccfg delete` command masks the instance. After you run the `svccfg delete` command, the service manifest still exists in `/lib/svc/manifest`. SMF keeps the service configuration repository in sync with file system content. Since the manifest still exists on the file system in a standard location, that service information is still stored in the repository and is only masked from normal view. Any administrative customizations are deleted from a masked instance. See the `smf`(5) man page for a description of masked entities.

Files that support a service instance are updated when you use `pkg` commands, even if that service instance is masked. When files that support a service instance are updated by `pkg` commands, the SMF data store is updated even though the service is still masked from view. If the service instance is unmasked, that service instance is already updated from the files delivered by `pkg` with no further intervention needed. To unmask a service instance, see "How to Undo Deletion of a Service Instance" on page 59.

▼ How to Delete a Service Instance

1. **Check the dependents of the instance to be deleted.**

   Use the `svcs -D` command to show instances that depend on this instance. After you delete this instance, dependent instances might not be able to run. Use the `svcs -l` command to check whether this instance is a required dependency of the dependent instance.

2. **Mask the instance.**

Use the `svccfg delete` command to mask the instance from normal view. Use the `svcs` command to show the state of the instance. If the instance is running (is in the `online` or `degraded` state), use the `svccfg delete -f` command to mask the instance from normal view.

```
$ svcs -H my-svc
disabled       7:25:37 svc:/site/my-svc:default
$ svccfg delete svc:/site/my-svc:default
```

3. Verify that the instance is masked.

Use the `svccfg listcust -M` command to confirm that the instance is masked. Commands such as `svcs` should display an error message that no matching instance is found.

```
$ svccfg listcust -M
svc:/site/my-svc:default manifest MASKED
  general                      admin    MASKED
  general/complete astring     admin    MASKED
  general/enabled  boolean     admin    MASKED true
$ svcs -H my-svc
svcs: Pattern 'my-svc' doesn't match any instances
```

▼ How to Undo Deletion of a Service Instance

1. Confirm that the instance is masked.

Use the `svccfg listcust -M` command as shown in the previous procedure.

2. Unmask the instance.

```
$ svccfg -s svc:/site/my-svc:default delcust
 Deleting customizations for instance: default
```

Reimporting the manifest does not remove a mask.

3. Verify that the instance is unmasked.

Use the `svccfg listcust -M` command to confirm that the instance is not masked. The `svcs` command should display the state of the instance.

Configuring Notification of State Transition and FMA Events

You can configure the system to notify you when a service changes state or when an FMA event occurs. You can specify either Simple Mail Transfer Protocol (SMTP) or Simple Network Management Protocol (SNMP) notification.

By default, SNMP traps are sent on maintenance transitions. If you use SNMP for transition notification, you can configure additional traps for other state transitions.

The following examples show how to set notification parameters for SMF and FMA events and how to delete notification parameters.

EXAMPLE 3-4 Configuring a Global Notification for a Service State Event

The following command creates a notification that sends email when services go into the `maintenance` state.

```
$ svccfg setnotify -g to-maintenance mailto:sysadmins@example.com
```

`-g` The `-g` option sets this notification parameter for all service instances that do not have custom values set. All modified service instances are refreshed. The `-g` option can only be used when setting notification for service state transitions, not with FMA events.

`to-maintenance` The `to-maintenance` argument is a state transition event as described in "Notification Parameters" in the `smf(5)` man page. Specifying only the state name includes both `to-`*state* and `from-`*state* transitions. This event could also be a comma separated list of transitions.

`mailto:` The `mailto` argument specifies the notification you want to receive for the specified event. This argument could also specify `snmp`. An `snmp` notification value must be either `snmp:active` or `snmp:inactive`. A `mailto` notification value can be either `mailto:active` or `mailto:inactive`, in addition to the form shown in this example. Setting a notification parameter overwrites any existing value for that event. The `active` and `inactive` settings do not overwrite existing values but toggle whether the existing notification is in effect for the specified event.

EXAMPLE 3-5 Configuring a Notification for a Specified Service Instance

The following command creates a notification that sends email when the `pkg/mirror` service transitions into the `maintenance` state.

```
$ svccfg -s pkg/mirror setnotify to-maintenance mailto:installteam@example.com
```

The following command creates a notification that sends email when the `http:apache22` service transitions out of the `online` state.

```
$ svccfg -s http:apache22 setnotify from-online mailto:webservices@example.com
```

EXAMPLE 3-6 Configuring a Notification for an FMA Event

The `problem-diagnosed` argument is an FMA event. This argument can be a comma separated list of FMA events. See the list of FMA events in "Notification Parameters" in the `smf(5)` man page.

```
$ svccfg setnotify problem-diagnosed mailto:IT@example.com
```

EXAMPLE 3-7 Deleting Notification Settings

The following commands delete the notification settings set in the previous examples.

```
$ svccfg delnotify -g to-maintenance
$ svccfg -s pkg/mirror delnotify to-maintenance
$ svccfg setnotify problem-diagnosed mailto:root@localhost
```

♦ ♦ ♦ CHAPTER 4

Configuring Services

SMF stores configuration data in the service configuration repository. Configuring SMF services means modifying the data in the configuration repository and then committing the modifications into the running snapshot. This chapter describes how to modify the data in the configuration repository. For viewing data in the configuration repository, see “Inspecting Service Configuration” on page 41. For committing configuration modifications into the running snapshot, see “Rereading Service Configuration” on page 57.

Each service and service instance stores configuration data in properties, which are organized into property groups. Modifying the data in the configuration repository includes modifying service property values, creating custom property groups and properties, creating new instances of a service, and applying a profile. Modifying configuration also includes deleting customizations and reverting repository snapshots.

This chapter also shows how to modify an `inetd` service.

SMF configuration changes can be logged by using the Oracle Solaris auditing framework. Refer to “Configuring the Audit Service (Task Map)” in *Managing Auditing in Oracle Solaris 11.2* for more information.

Using the Service Configuration Command

The `svccfg` command manipulates data in the service configuration repository. Changes made with the `svccfg` command are recorded in the `admin` layer. See “Repository Layers” on page 25 for information about layers. Changes made with the `svccfg` command are stored in the service configuration repository as current, or editing, property values, and do not immediately appear in the running snapshot. When you change configuration data, use the `svcadm refresh` or `svccfg refresh` command to commit the new values into the running snapshot.

Keeping newly changed data separate from the running snapshot enables you to make multiple changes, and then commit all the changes to the running snapshot together. While you are in the process of making multiple changes, some property values might be incompatible or inconsistent, but the running snapshot is unmodified. When you are finished making changes, perform a refresh.

You can use the `svccfg` command in any of the following ways:

- Use the `svccfg editprop` command to invoke an editor on the property groups and properties of the currently selected entity.
- Enter a full `svccfg` command on the command line, specifying subcommands such as `setprop`.
- Enter only `svccfg` or `svccfg -s` *FMRI* on the command line to start an interactive session.
- Specify the `-f` option to read `svccfg` commands from a file.

Invoking a Property Editor

Invoking the `svccfg` command as shown in the following example opens an editor on the properties of the selected entity. This form of the `svccfg` command can be very fast and convenient for modifying several property values. For the `editprop` subcommand, you must specify an entity with the `-s` option.

```
$ svccfg -s pkg/server:s11 editprop
```

A file of `setprop` commands for the current values of each property of the specified entity opens in the editor specified by the `VISUAL` environment variable. If `VISUAL` is not defined, the editor specified by `EDITOR` is opened. If neither `VISUAL` nor `EDITOR` is defined, the property file is opened in `vi`.

Each line of the file is preceded by a comment character. To change the value of a property in the `svccfg` editing configuration, remove the comment character, change the value, and save the file. To change the value of a property in the running snapshot, remove the comment character from the last line of the file, which is the `refresh` subcommand.

The following listing shows a partial example of a file created by the `editprop` subcommand:

```
##
## Change property values by removing the leading '#' from the
## appropriate lines and editing the values. svccfg subcommands
## such as delprop can also be added to the script.
##
## Property group "pkg"
## The following properties are defined in the selected instance
## (svc:/application/pkg/server:s11)

# setprop pkg/port = count: 81
# setprop pkg/inst_root = astring: /export/ipsrepos/Solaris11

## The following properties inherit from the parent service
## (svc:/application/pkg/server)

# ...
```

```
## Property group "pkg_bui"

# ...

## Property group "pkg_secure"

# ...

## Uncomment to apply these changes to this instance.
# refresh
```

As the instructions in the file state, you can add subcommands other than `setprop`. For example, you could add a `delprop` command. Some property groups, such as `framework` and `dependency`, are not displayed by default. Specify `editprop -a` to show all properties.

The uncommented commands in this temporary file are executed when you save and quit the editing session.

Invoking `svccfg` Interactively or With a File

Invoking the `svccfg` command interactively as shown in the following example can be convenient when you want to perform several configuration operations.

```
$ svccfg
svc:> select pkg/server
svc:/application/pkg/server> list
:properties
default
svc:/application/pkg/server> add s11
svc:/application/pkg/server> select s11
svc:/application/pkg/server:s11> setprop pkg/inst_root=/export/ipsrepos/Solaris11
svc:/application/pkg/server:s11> setprop pkg/port=81
svc:/application/pkg/server:s11> unselect
svc:/application/pkg/server> add oss
svc:/application/pkg/server> select oss
svc:/application/pkg/server:oss> setprop pkg/inst_root=/export/ipsrepos/SolarisStudio
svc:/application/pkg/server:oss> setprop pkg/port=82
svc:/application/pkg/server:oss> unselect
svc:/application/pkg/server> list
:properties
default
s11
oss
svc:/application/pkg/server> refresh
svc:/application/pkg/server> select pkg/mirror:default
svc:/application/pkg/mirror:default> listprop config/crontab_period
config/crontab_period astring     "30 2 25 * *"
svc:/application/pkg/mirror:default> setprop config/crontab_period="00 3 25 * *"
svc:/application/pkg/mirror:default> refresh
```

```
svc:/application/pkg/mirror:default> exit
$
```

The same commands given at the interactive prompts in the preceding example could also be provided in a file and executed with a command such as the following command.

```
$ svccfg -f cfgpkgrepos
```

Setting Property Values

The following commands set property values:

`svccfg setprop`
: Changes the value of a property.

`svccfg addpropvalue`
: Adds a value to a multi-value property.

`svccfg setenv`
: Changes the value of an environment variable for a service process execution environment.

Remember to use the `svccfg refresh` command or `svcadm refresh` command to commit configuration changes into the running snapshot.

EXAMPLE 4-1 Setting a Simple Value

In the simplest use of `setprop`, specify a *pg/name* for the selected service or instance, where *pg* is the name of the property group and *name* is the name of the property, and specify the new value after an equals symbol. If the property already exists or is templated, you do not need to specify the property type.

```
$ svccfg -s pkg/server:s11 setprop pkg/port=81
```

EXAMPLE 4-2 Setting a Value that Contains a Colon Character

If the property value contains a colon character (:), then specify the property type as shown in the following example where the type is `astring`:

```
$ svccfg -s system-repository:default setprop config/http_proxy = astring:
 https://proxyURI
```

Use the `listprop` subcommand to find the type of the property you want to set.

```
$ svccfg -s system-repository:default listprop config/http_proxy
config/http_proxy astring
```

EXAMPLE 4-3 Setting a Value that Contains Embedded Spaces

Use double quotation marks to set a value that contains embedded spaces. Depending on your shell, you might need to enclose the double-quoted string in single quotation marks.

```
$ svccfg -s pkg/mirror setprop config/crontab_period = "00 3 25 * *"
$ svccfg -s pkg/mirror setprop config/crontab_period = '"00 3 25 * *"'
```

Use quotation marks to set a value that contains double quotation marks or backslash characters, and use a backslash character to escape any double quotation marks or backslash characters.

EXAMPLE 4-4 Setting a Value that Is a Set of Values

Use parentheses to specify a set of values as a single value. Depending on your shell, you might need to enclose the value set in single quotation marks as well.

```
$ svccfg -s dns/client setprop config/nameserver = (10.0.0.1 192.168.0.1)
$ svccfg -s dns/client setprop config/nameserver = '(10.0.0.1 192.168.0.1)'
$ svccfg -s dns/client listprop config/nameserver
config/nameserver net_address 10.0.0.1 192.168.0.1
```

Use the `describe` subcommand to find the number of values allowed in the set of values.

```
$ svccfg -s dns/client describe -v config/nameserver
config/nameserver net_address 10.0.0.1 192.168.0.1
    type: net_address
    required: false
    The IP address of a DNS nameserver to be used by the resolver.
    visibility: readwrite
    minimum number of values: 1
    maximum number of values: 3
  value: 10.0.0.1
  value: 192.168.0.1
```

EXAMPLE 4-5 Adding a Value

Use the `addpropvalue` subcommand to add the given value to the specified property of the selected service or service instance. The new value is appended to the end of the existing list of property values for the property.

```
$ svcprop -p keymap/layout keymap:default
US-English
$ svccfg -s keymap:default addpropvalue keymap:layout UK-English
$ svccfg -s keymap:default listprop keymap:layout
keymap/layout astring     "US-English" "UK-English"
```

In the previous `setprop` example, all values in the set of values must be specified at once. If only one value is specified, that value becomes the new set of one value. In this `addpropvalue` example, the added values are distinct. To access these added values, you must use the `libscf`

function scf_iter_property_values() to iterate over the values. While listprop lists both values, describe lists only the first value and reports that the maximum allowed number of values for this property is one.

```
$ svccfg -s keymap:default describe -v keymap/layout
keymap/layout astring     US-English
    type: astring
    required: true
    The keyboard layout
    visibility: readwrite
    minimum number of values: 1
    maximum number of values: 1
  value: US-English
```

How to Modify a ttymon Property Value

This procedure shows how to modify parameters passed to ttymon.

1. Identify the service to modify.

The ttymon(1M) man page states that the service to modify is svc:/system/console-login. The ttymon(1M) man page also contains descriptions of the properties in the ttymon property group.

The following command shows multiple instances of the console-login service in this image and shows that the default instance is the only instance currently online:

```
$ svcs console-login
STATE          STIME    FMRI
disabled       10:49:43 svc:/system/console-login:terma
disabled       10:49:43 svc:/system/console-login:termb
online         10:50:54 svc:/system/console-login:default
```

2. Identify the property to modify.

The following command shows the name, data type, value, and a brief description of each property in the ttymon property group in the default instance:

```
$ svccfg -s console-login:default describe ttymon
ttymon                application
ttymon/device        astring     /dev/console
    The terminal device to be used for the console login prompt.
ttymon/terminal_type astring
    Sets the initial value of the TERM environment variable
```

The preceding output shows no value for the terminal_type property. The following command confirms that the value of the ttymon/terminal_type property of the console-login:default instance is currently null:

```
$ svcprop -p ttymon/terminal_type console-login:default
```

```
""
```

3. Modify the property value.

Enter the following command to change the value of the `ttymon/terminal_type` property of the `console-login:default` instance to `xterm`:

```
$ svccfg -s system/console-login:default setprop ttymon/terminal_type=xterm
```

4. Commit the new value into the running snapshot.

The following output shows that the value of the `terminal_type` property is changed in the editing configuration but not in the running snapshot:

```
$ svccfg -s console-login:default listprop ttymon/terminal_type
ttymon/terminal_type astring     xterm
$ svcprop -p ttymon/terminal_type console-login:default
""
```

After you refresh the service instance, the property value is changed in the running snapshot:

```
$ svcadm refresh console-login:default
$ svcprop -p ttymon/terminal_type console-login:default
xterm
```

▼ How to Modify an Environment Variable for a Service Process Environment

This procedure shows how to set a value for an environment variable in the environment where processes started by the service will run.

The example in this procedure shows how to modify `cron` environment variables to help with debugging.

1. Verify that the service is running.

The following output shows that the `cron` service is online and a `cron` process is running.

```
$ svcs -p cron
STATE          STIME    FMRI
online         10:24:05 svc:/system/cron:default
               10:24:05     1089 cron
```

2. Set environment variables.

The `setenv` subcommand sets an environment variable for the environment where a process started by a service or service instance will run.

Use the following command to check the current values of the environment variables you want to set:

```
$ pargs -e `pgrep -f /usr/sbin/cron`
```

The environment variables that are set in this example do not have any current values.

The following commands set the `UMEM_DEBUG` and `LD_PRELOAD` environment variables for the `/usr/sbin/cron` process started by the `svc:/system/cron:default` service instance:

```
$ svccfg -s system/cron:default setenv UMEM_DEBUG default
$ svccfg -s system/cron:default setenv LD_PRELOAD libumem.so
```

3. Refresh and restart the service.

Changing an environment variable value requires a restart as well as a refresh to take effect.

```
$ svcadm refresh system/cron:default
$ svcadm restart system/cron:default
```

4. Verify that the change has been made.

The following output shows that the service has been restarted, the process has a new process ID, and the two environment variables are set for that process environment.

```
$ svcs -p cron
STATE          STIME    FMRI
online          9:24:39 svc:/system/cron:default
                9:24:39     5601 cron
$ svcprop -g method -p environment system/cron:default
start/environment astring LD_PRELOAD=libumem.so UMEM_DEBUG=default
$ pargs -e `pgrep -f /usr/sbin/cron`
5601: /usr/sbin/cron
envp[0]: LOGNAME=root
envp[1]: LD_PRELOAD=libumem.so
envp[2]: PATH=/usr/sbin:/usr/bin
envp[3]: SMF_FMRI=svc:/system/cron:default
envp[4]: SMF_METHOD=start
envp[5]: SMF_RESTARTER=svc:/system/svc/restarter:default
envp[6]: SMF_ZONENAME=global
envp[7]: UMEM_DEBUG=default
```

See Also The `unsetenv` subcommand unsets an environment variable for a process started by a service or service instance.

Adding Property Groups, Properties, and Property Values

The following commands add properties and property groups:

`svccfg setprop`
`svccfg addpropvalue`

Adds the property whose value is being set if the property does not already exist.

`svccfg addpg`

Adds a new property group to a service or service instance.

Remember to use the `svccfg refresh` command or `svcadm refresh` command to commit configuration changes into the running snapshot.

EXAMPLE 4-6 Using `addpg` to Create a New Property Group

Use the `addpg` subcommand to add a property group to the selected service or service instance.

`svccfg -s` *FMRI* `addpg` *name type* [*flags*]

type — By convention, the value of *type* is usually `application`. See Chapter 5, "Using SMF to Control Your Application" for more information about property group types.

flags — Specify `P` for the value of *flags* to store the property group and any added properties as non-persistent. If `P` is specified, this property group and contained properties will be automatically removed on reboot, The value `P` is an alias for `SCF_PG_FLAG_NONPERSISTENT`. See the `scf_service_add_pg`(3SCF) man page.

```
$ svccfg -s svc:/site/my-svc addpg config application
$ svccfg -s my-svc listprop config
config  application
$ svccfg -s my-svc:default listprop config
$
```

In this example, the administrator added the `config` property group to the parent service, `my-svc`, but not to the instance, `my-svc:default`. The `listprop` command shows that the `config` property group does not exist in the service instance.

EXAMPLE 4-7 Using `setprop` to Create a New Property

Use the `setprop` subcommand to set a property value as described in "Setting Property Values" on page 66. If the property group does not already exist in the selected instance or service, the property group is created if the type and flags are found in the template definitions. If the property does not already exist in the selected instance or service, you must specify the property *type*.

```
$ svccfg -s my-svc:default setprop config/vendor = astring: vendora
$ svccfg -s my-svc:default listprop config/vendor
config/vendor astring     vendora
```

EXAMPLE 4-8 Using `addpropvalue` to Create a New Property

Use the `addpropvalue` subcommand to add a property value as described in "Setting Property Values" on page 66. If the property group does not already exist in the selected instance or service, the property group is created if the type and flags are found in the template definitions. If the property does not already exist in the selected instance or service, you must specify the property *type*.

```
$ svccfg -s my-svc:default addpropvalue config/vendor astring: vendorb
$ -s my-svc:default addpropvalue config/customer astring: acustomer
$ svccfg -s my-svc:default listprop config
config           application
config/vendor   astring     "vendora" "vendorb"
config/customer astring     acustomer
```

Deleting Property Groups, Properties, and Property Values

The following commands delete property values, properties, and property groups:

`svccfg setprop`
: Delete all values of a property.

`svccfg delpropvalue`
: Delete all values of the specified property that match the specified pattern.

`svccfg delprop`
: Delete a property.

`svccfg delpg`
: Delete a property group.

`svccfg delcust`
: Delete administrative customizations.

Remember to use the `svccfg refresh` command or `svcadm refresh` command to commit configuration changes into the running snapshot.

Deleting Administrative Configuration

Configuration modifications made by using `svccfg` commands or `libscf` calls modify only the `admin` layer of the service configuration repository. See "Repository Layers" on page 25

for information about layers. When you delete configuration that is only defined in the `admin` layer and does not exist in any other layer, that configuration is gone. Commands that display configuration no longer show the deleted configuration, even when you use the `-l` option to show all layers of the service configuration repository. See "Deleting Non-Administrative Configuration" on page 74 for information about deleting configuration that exists in other layers.

EXAMPLE 4-9 Deleting All Values of a Property

Use the `setprop` subcommand as described in "Setting Property Values" on page 66. To delete all values of a property, do not specify any type or value. The values are deleted, but the property still exists.

```
$ svccfg -s my-svc:default setprop config/vendor =
$ svccfg -s my-svc:default listprop config/vendor
config/vendor   astring
```

EXAMPLE 4-10 Deleting All Matching Values of a Property

Use the `delpropvalue` subcommand to delete all values of the named property that match the given pattern.

```
$ svccfg -s my-svc:default setprop config/tool = astring: '(hammer tongs wrench)'
$ svccfg -s my-svc:default listprop config
config           application
config/customer astring     acustomer
config/vendor   astring     "vendora" "vendorb"
config/tool     astring     "hammer tongs wrench"
$ svccfg -s my-svc:default delpropvalue config/vendor '*b'
$ svccfg -s my-svc:default delpropvalue config/tool 'tong*'
$ svccfg -s my-svc:default listprop config
config           application
config/customer astring     acustomer
config/vendor   astring     vendora
config/tool     astring     "hammer tongs wrench"
$ # config/tool is a single value that is a value set
$ svccfg -s my-svc:default delpropvalue config/tool '*tong*'
$ svccfg -s my-svc:default listprop config
config           application
config/customer astring     acustomer
config/vendor   astring     vendora
config/tool     astring
```

EXAMPLE 4-11 Deleting a Property

Use the `delprop` subcommand to delete the named property of the selected service or service instance.

```
$ svccfg -s my-svc:default delprop config/tool
$ svccfg -s my-svc:default listprop config
```

```
config           application
config/customer astring     acustomer
config/vendor   astring     vendora
```

EXAMPLE 4-12 Deleting a Property Group

The `delpg` and `delprop` subcommands both can delete a property group. The `delpg` subcommand deletes the named property group of the selected service or service instance. The `delprop` subcommand deletes the named property group if no property is named.

```
$ svccfg -s my-svc:default delpg config
$ svccfg -s my-svc:default listprop config
$
```

EXAMPLE 4-13 Deleting Customizations

The `delcust` subcommand deletes administrative customizations on the selected service or service instance. Before you use the `delcust` subcommand, use the `listcust` subcommand with the same pattern or option to see what will be deleted. If a pattern is given, the pattern must match a property or property group.

```
$ svccfg -s my-svc:default listcust
config                          application admin
config/customer                 astring     admin               acustomer
config/vendor                   astring     admin               "vendora" "vendorb"
config/tool                     astring     admin               "hammer tongs wrench"
$ svccfg -s my-svc:default listcust '*tool'
config/tool                     astring     admin               "hammer tongs wrench"
$ svccfg -s my-svc:default delcust '*tool'
 Deleting customizations for property: config/tool
$ svccfg -s my-svc:default listcust '*tool'
$ svccfg -s my-svc:default listcust
config                          application admin
config/customer                 astring     admin               acustomer
config/vendor                   astring     admin               "vendora" "vendorb"
```

Deleting Non-Administrative Configuration

Configuration that exists in the `site-profile`, `system-profile`, and `manifest` layers of the service configuration repository is defined in service manifests and profile files. See “Repository Layers” on page 25 for information about layers. SMF keeps the service configuration repository in sync with file system content. Any configuration that is defined in a manifest or profile file in a standard location still exists on the file system after administrative customization, including after being deleted, and is still stored in the service configuration repository. Configuration that is defined in a manifest or profile is said to have bundle support.

When you delete configuration that has bundle support, the information is not deleted from the file system but is *masked* so that it is not seen in the normal view. See the `smf`(5) man page for a description of masked entities.

Deleting configuration that has bundle support is an administrative customization. In this case, the `delcust` subcommand *unmasks* the configuration, rather than deleting anything. Use the `listcust -M` subcommand to view masked configuration. Use the `delcust -M` subcommand to unmask configuration, or undo the deletion or masking of the configuration.

EXAMPLE 4-14 Deleting Configuration that has Bundle Support

In "Deleting Administrative Configuration" on page 72, the `config` property group of the `my-svc` service only existed in the `admin` layer. The `config` property group did not exist in any manifest or profile. When those properties were deleted, they were gone from the system. This example shows the different result when you delete configuration that has bundle support.

The property is defined in the service manifest:

```
$ svccfg -s pkg/server listprop -l all pkg/inst_root
pkg/inst_root astring     admin              /export/ipsrepos/Solaris11
pkg/inst_root astring     manifest           /var/pkgrepo
$ svccfg -s pkg/server delprop pkg/inst_root
```

After deletion, the property is not displayed by using `listprop` with no options. Because the property has bundle support, the property still exists in the service configuration repository and can be displayed by using the `-l` or `-M` options with the `listprop` subcommand.

```
$ svccfg -s pkg/server listprop pkg/inst_root
$ svccfg -s pkg/server listprop -l all pkg/inst_root
pkg/inst_root astring     admin        MASKED /export/ipsrepos/Solaris11
pkg/inst_root astring     manifest     MASKED /var/pkgrepo
$ svccfg -s pkg/server listcust -M
pkg/inst_root astring     admin        MASKED /export/ipsrepos/Solaris11
```

EXAMPLE 4-15 Unmasking Configuration

When you unmask the property, both customizations are gone:

- The property is no longer masked or hidden.
- The property no longer has its customized value.

```
$ svccfg -s pkg/server delcust -M
 Deleting customizations for property: pkg/inst_root
$ svccfg -s pkg/server listprop -l all pkg/inst_root
pkg/inst_root astring     manifest           /var/pkgrepo
$ svccfg -s pkg/server listprop pkg/inst_root
pkg/inst_root astring     /var/pkgrepo
```

Adding Service Instances

Instances of a service allow multiple configurations of a service to run simultaneously. Service instances inherit and customize common service configuration.

Use the `add` subcommand to create a new entity with the given name as a child of the selected service.

```
$ svcs -Ho inst pkg/server
default
$ svccfg -s pkg/server add s11
$ svcs -Ho inst pkg/server
default
s11
```

Reverting Snapshots

Each of the following operations creates a new running snapshot:

- `svcadm restart manifest-import`
- `svcadm refresh`
- `svccfg refresh`

The `revert` subcommand reverts the administrative customizations (`admin` layer) of the instance specified by the `-s` option and its service to the values recorded in the named snapshot or the currently selected snapshot. Use the `listsnap` subcommand to view a list of possible snapshots for this service instance. Use the `selectsnap` subcommand to select a snapshot in interactive mode.

```
$ svcprop -p pkg/inst_root pkg/server:default
pkg/inst_root astring /export/ipsrepos/Solaris11
$ svccfg -s pkg/server:default listsnap
initial
previous
running
start
$ svcprop -s previous -p pkg/inst_root pkg/server:default
pkg/inst_root astring /var/pkgrepo
```

Because the `revert` subcommand reverts all administrative customizations, list all administrative customizations and examine their values before you revert.

```
$ svcprop -s previous -l admin pkg/server:default
pkg/inst_root astring /var/pkgrepo
```

```
$ svccfg -s pkg/server:default revert previous
$ svcadm refresh pkg/server:default
$ svcprop -p pkg/inst_root pkg/server:default
pkg/inst_root astring /var/pkgrepo
```

Importing and Applying Manifests and Profiles

When you restart the `manifest-import` service, manifests in standard locations are imported and profiles in standard locations are applied if they are new or changed. See "Service Bundles" on page 24 for manifest and profile standard locations. If importing a manifest or applying a profile results in the service being started or stopped, the appropriate method is executed if one exists.

Specifying a file in a standard location to the `svccfg import` command restarts the `manifest-import` service.

Recommended best practice is to put your manifest and profile files in the standard locations and restart the `manifest-import` service rather than use the `svccfg import` or `svccfg apply` commands.

```
$ svcadm restart manifest-import
```

When you restart the `manifest-import` service, the configuration in profiles and manifests in standard locations is applied to the `manifest`, `system-profile`, or `site-profile` layer of affected instances, affected instances are refreshed and validated, and a new snapshot is created.

When you import or apply profiles and manifests in non-standard locations, configuration is applied to the `admin` layer of affected instances. Using non-standard locations is strongly discouraged for default or initial configuration delivery. For making a large number of configuration changes, importing or applying from a non-standard location might be easier than issuing many commands, but you lose the benefit of the automated management mechanisms of the `manifest-import` service. To manage service delivery, the `manifest-import` service requires known locations and expected states.

Configuring Multiple Systems

To implement the same configuration on multiple systems, create an SMF profile that specifies the services you want enabled and the values of properties, and put that profile in the `site` directory on each system. As stated in "Repository Layers" on page 25, local customizations are preferred over the values that were provided when the system was installed, and customizations

in the site-profile layer are second only to customizations made by an administrator or application.

Profiles add and set properties for existing services and instances and specify new service instances. Profiles can specify almost anything that a manifest can specify.

Use one of the following methods to create a site profile:

- Use the svcbundle command with bundle-type=profile to create a new profile file.
- Use the svccfg extract command to capture profile information from an existing service.

Customize property values in the profile file, and include comments about the reason for each customization. Copy the file to /etc/svc/profile/site, and restart the manifest-import service.

How to Create a Profile by Using svcbundle

The svc:/system/rmtmpfiles service is responsible for cleaning up the /tmp directory on boot. By default, the rmtmpfiles service does not clean up /var/tmp. To clean up /var/tmp during the boot process, change the behavior of the svc:/system/rmtmpfiles service by setting the options/clean_vartmp property to true. The easiest way to achieve this behavior on multiple systems is to create a profile and place it in /etc/svc/profile/site on each system.

1. **Create the profile.**

   The following command creates a new profile in /tmp/rmtmpfiles.xml.

   ```
   $ svcbundle -o /tmp/rmtmpfiles.xml -s service-name=system/rmtmpfiles \
       -s bundle-type=profile -s service-property=options:clean_vartmp:boolean:true
   ```

2. **Make any necessary changes to the profile.**

3. **Copy the profile to the correct directory.**

   ```
   $ cp /tmp/rmtmpfiles.xml /etc/svc/profile/site/rmtmpfiles.xml
   ```

4. **Restart the manifest import service to apply the profile to the system.**

   ```
   $ svcadm restart manifest-import
   ```

Example 4-16 Automatically Installing a Profile by Using svcbundle

If you do not need to make any changes to the new profile, you can use the -i option to install the profile as soon as it is created. The svcbundle command will write the profile to /etc/svc/

profile/site/rmtmpfiles.xml and restart the manifest-import service. Any existing file with the same name in the /etc/svc/profile/site directory will be overwritten.

```
# svcbundle -i -s service-name=system/rmtmpfiles \
    -s bundle-type=profile -s service-property=options:clean_vartmp:boolean:true
```

▼ How to Create a Profile by Using svccfg

1. **Create a profile.**

   The svccfg extract command displays a service profile for the specified service or instance for the admin and site-profile layers. To extract values from other layers, use the -l option.

   ```
   $ svccfg extract -l current network/dns/client > dnsclientprofile.xml
   ```

2. **Make any necessary changes to the profile.**

   Change the name of the profile to a meaningful name. By default, the name is set to extract, as shown in the following example:

   ```
   <service_bundle type='profile' name='extract'>
   ```

3. **Copy the profile to the correct directory.**

   ```
   $ cp dnsclientprofile.xml /etc/svc/profile/site/dnsclientprofile.xml
   ```

4. **Restart the manifest import service to apply the profile to the system.**

   ```
   $ svcadm restart manifest-import
   ```

Modifying Services that are Controlled by inetd

A service that is controlled by inetd is an SMF service that was converted from a configuration in the inetd.conf file. The inetd command is the delegated restarter for these services.

The following procedure shows how to change property values of services that are controlled by inetd.

To confirm that the service you want to modify is controlled by inetd, invoke the inetadm command with no options or arguments to list all inetd controlled services. The following example shows only a partial list.

```
$ inetadm
ENABLED   STATE          FMRI
```

```
enabled   online         svc:/application/cups/in-lpd:default
...
disabled  disabled       svc:/application/x11/xfs:default
```

The `-l` option of the `inetadm` command lists all the properties of the `inetd` controlled service. In the following example, the error message indicates that the specified service is not an `inetd` controlled service. “No restarter property” means that the master restarter, `svc.startd`, manages the service instance.

```
$ inetadm -l ssh
Error: Specified service instance "svc:/network/ssh:default" has no
restarter property.  inetd is not the delegated restarter of this instance.
```

Similarly, in the following example, the message “Couldn't find property 'general/restarter'” indicates that the default restarter, `svc.startd`, manages the service instance.

```
$ svcprop -p general/restarter ssh
svcprop: Couldn't find property 'general/restarter' for instance
'svc:/network/ssh:default'.
```

If a service is controlled by `inetd`, its restarter is `inetd`, as shown in the following example.

```
$ svcprop -p general/restarter xfs
svc:/network/inetd:default
```

How to Change a Property Value for an `inetd` Controlled Service

1. **List the properties for the service.**

   Use the `-l` option of the `inetadm` command to list all the properties of the specified service. Inspect the current values of the properties.

   ```
   # inetadm -l FMRI
   ```

2. **Change a property value.**

   Use the `-m` option of the `inetadm` command to change the value of a specified property. Specific information about the properties for a service should be covered in the man page associated with the service.

   ```
   # inetadm -m FMRI property-name=value
   ```

   To delete a property value, specify an empty value.

   ```
   $ inetadm -m svc property=""
   ```

3. **Verify that the property value is changed.**

   List the properties again to make sure that the appropriate change has occurred.

```
# inetadm -l FMRI
```

4. **Confirm that the change has taken effect.**

   Confirm that the property change has the expected effect.

Example 4-17 Modifying the Command to Execute When an `inetd` Controlled Service Starts

This example shows how to add or remove an option or argument to the command line of a service that is controlled by `inetd`. The command that runs when the service starts is the value of the `exec` property.

Use the `-l` option of the `inetadm` command to list all the properties of the specified service so that you can inspect the current value of the `exec` property. This example shows the `svc:/application/x11/xfs` service, which is the X Window System font server. See the `xfs`(1) man page for more information.

```
$ inetadm -l xfs | grep exec
        exec="/usr/bin/xfs -inetd"
```

Use the `-m` option of the `inetadm` command to change the value of the `exec` property of the specified service.

```
$ inetadm -m xfs exec="/usr/bin/xfs -inetd -config /opt/site/fs/config"
```

Verify that the property value is changed.

```
$ inetadm -l xfs | grep exec
        exec="/usr/bin/xfs -inetd -config /opt/site/fs/config"
```

Modifying Services that are Configured by a File

A few SMF services that are not managed by `inetd` get some of their configuration from a file rather than from service properties. To modify this configuration, edit the configuration file and use SMF commands to restart the service. These configuration files can be changed while the service is running, but the content of the files is only read when the service is started.

Before you edit a configuration file directly, check the following conditions:

- Make sure the configuration file does not contain a message telling you not to directly edit it.
- Make sure the service does not have a property group of type `configfile`.

  ```
  $ svcprop -g configfile network/ntp
  ```

If the service has a property group of type `configfile`, modify the properties in those property groups and not the configuration file. See "Using a Stencil to Create a Configuration File" on page 93.

For example, to add a new NTP server to support your NTP clients, add a new entry for the server to the `/etc/inet/ntp.conf` file and then restart the NTP service as shown in the following command:

```
$ svcadm restart svc:/network/ntp:default
```

To enable IKEv2, modify the `/etc/inet/ike/ikev2.config` file to configure the IKEv2 daemon, and then enable the IKEv2 service as shown in the following command. To edit the `ikev2.config` file, use the `pfedit` command as a user who is assigned the Network IPsec Management profile. Editing the file in this way preserves the correct file ownership. See the `pfedit`(1M) man page for information about using `pfedit`.

```
$ svcadm enable svc:/network/ipsec/ike:ikev2
```

♦ ♦ ♦ CHAPTER 5

Using SMF to Control Your Application

This chapter discusses how to provide services support for your application, including how to use a stencil to create a configuration file if your application cannot use `libscf` library interfaces to read properties.

For additional examples of creating and delivering services to perform tasks such as application configuration, see Chapter 7, “Automating System Change as Part of Package Installation,” in “Packaging and Delivering Software With the Image Packaging System in Oracle Solaris 11.2 ” and Chapter 8, “Advanced Topics For Package Updating,” in “Packaging and Delivering Software With the Image Packaging System in Oracle Solaris 11.2 ”.

Creating an SMF Service

A service manifest contains the complete set of properties associated with a specific service, including instances, dependencies, scripts to run when the service starts and stops, and default application property values. Manifests also provide template information such as a description of the service. See the `service_bundle`(4) man page and the `/usr/share/lib/xml/dtd/service_bundle.dtd.1` service bundle DTD for a complete description of the contents and format of an SMF manifest. See also “Naming Services, Instances, Property Groups, and Properties” on page 91 for naming rules and assigning property group types.

Using the `svcbundle` service bundle generator tool is a good way to create a simple service or to start a more complex service. For more information, see the `svcbundle`(1M) man page. You can use the service bundle DTD and other service manifests to complete a more complex service.

The standard location for custom manifests is `/lib/svc/manifest/site`. Manifests stored in this location are imported into the service configuration repository by the `svc:/system/early-manifest-import:default` service during the boot process before any services start. Running the import process early ensures that the repository will contain information from the latest manifests before the services are started. Manifests stored in this standard location are also imported when the `svc:/system/manifest-import` service is restarted.

Multiple manifests can be used to describe a single service. This can be useful, for example, to define a new instance of a service without modifying the existing manifest for the service.

However, if the same property in the same layer for the same service or instance is defined by multiple manifests, SMF cannot determine which value to use. When this type of conflict is detected, the instance is placed in the maintenance state. See "Repository Layers" on page 25 for more information about layers.

Add name and description metadata to your manifests so that users can get information about this service from the `svcs` and `svccfg describe` commands. You can also add descriptions of property values. See the `value`, `values`, and `template` elements in the DTD.

Use the `svccfg validate` command to validate your service manifest file or service instance FMRI. With your manifest, method, and profile files in standard locations, restart the `manifest-import` service to install and configure your service instances. Use the `svcs` command to check the status of your service instances.

This section shows how to create custom SMF services. The `site` prefix is reserved for site-specific customizations. A service named `svc:/site/`*service-name* will not conflict with the services delivered in an Oracle Solaris release.

▼ How to Create an SMF Service Using the Service Bundle Generator Tool

This procedure shows how to create a service that uses an existing custom script as the start method.

1. **Determine the service model.**

   By default, `svcbundle` creates a `transient` service. Determine whether the start method script for this service starts any long running daemon and is a `contract` service. See "Service Models" on page 20 and the `svc.startd`(1M) man page for information about service models.

2. **Copy the script to the standard location.**

   In this example, the script that will be the start method script for this service is named `ex_svc`. Copy this script to `/lib/svc/method/ex_svc`.

3. **Create an initial manifest.**

   In this example, the service name is `site/ex_svc`. This is a transient service and does not need a stop method.

   ```
   $ svcbundle -o /tmp/ex_svc.xml -s service-name=site/ex_svc \
        -s start-method=/lib/svc/method/ex_svc
   ```

4. **Make any necessary changes to the manifest.**

Verify that the content of the `/tmp/ex_svc.xml` manifest is what you need. Add comments as needed.

5. **Verify that the manifest is valid.**

   Use the `svccfg validate` command to make sure the service manifest is valid.

6. **Copy the manifest to the standard directory.**

```
$ cp /tmp/ex_svc.xml /lib/svc/manifest/site/ex_svc.xml
```

7. **Import the manifest and start the service.**

```
$ svcadm restart manifest-import
```

Example 5-1 Automatically Installing a Generated Manifest

If you do not need to make any changes to the new service manifest, you can use the `-i` option to install the manifest as soon as it is created. The `svcbundle` command will write the manifest to `/lib/svc/manifest/site` and restart the `manifest-import` service. Any existing file with the same name in the `/lib/svc/manifest/site` directory will be overwritten.

```
# svcbundle -i -s service-name=site/ex_svc \
 -s start-method=/lib/svc/method/ex_svc
```

Creating a Service to Start or Stop an Oracle Database Instance

This example presents the following services that help manage the Oracle Database:

- A database service that starts or stops an Oracle Database instance
- A listener service that starts the listener, which is a process that manages the incoming traffic of client connection requests to the database instance

This example uses file-backed storage. An alternative to using file-backed storage is to use the Automatic Storage Management (ASM) feature. ASM is a volume manager and a file system for Oracle Database files.

The following environment variables must be set for each installation of the Oracle Database:

`ORACLE_HOME`	The location where the database is installed. In the example in this section, the location of the database installation is `/opt/oracle/product/home`.
`ORACLE_SID`	The systems ID to uniquely identify a particular database on a system.

In this example, these environment variables are set in the service manifests and then used in the method scripts.

Database Start and Stop Service

This section shows the Oracle Database instance control service manifest, `/lib/svc/manifest/site/oracle.xml`. The following are some features to note about this service manifest:

- One service instance is defined, named `svc:/site/application/database/oracle:default`. This instance is enabled by default.

  This example shows two ways to define the default instance. In this example, the default instance is defined in the `create_default_instance` element at the top of the manifest. The `instance` element at the bottom of the manifest shows the other way to do this.
- This service requires all local file systems to be mounted and all network interfaces to be initialized.

  If you are using a file-backed database, the database service should depend on the local filesystem. If you are using ASM, the database service should depend on the service that manages ASM. The database service should depend on networking to allow for remote client connections.
- The `method_environment` element in the `method_context` element defines the `ORACLE_HOME` and `ORACLE_SID` environment variables, which identify the database instance to start or stop. These values are then available for the method script to use.

  If you create multiple instances of this service (see the `instance` element at the bottom of the manifest), then each instance might need its own `method_context` element to define the unique `ORACLE_HOME` and `ORACLE_SID` values for that particular database.
- Attributes of the `method_context` element can define a resource pool in addition to the project and working directory shown in this example. You can also define either a `method_profile` or `method_credential` element in the `method_context` element. The `method_credential` element can specify `supp_groups` and `limit_privileges` values in addition to the `user`, `group`, and `privileges` values shown in this example. See the DTD for more information.
- The start/stop method script is `/lib/svc/method/oracle`. The number of seconds before the method times out is increased from the default.
- A user must be assigned the `solaris.smf.manage.oracle` authorization to enable or disable this service instance. In this example, the user `oracle` is assigned the `solaris.smf.manage.oracle` authorization.

```
<?xml version="1.0"?>

<!--
 Define a service to control the startup and shutdown of a database instance.
-->
```

```
<!DOCTYPE service_bundle SYSTEM "/usr/share/lib/xml/dtd/service_bundle.dtd.1">

<service_bundle type="manifest" name="oracle">
<service name="site/application/database/oracle" type="service" version="1">
    <create_default_instance enabled="true" />

    <!--
         Wait for all local file systems to be mounted.
         Wait for all network interfaces to be initialized.
    -->

    <dependency type="service"
        name="fs-local"
        grouping="require_all"
        restart_on="none">
        <service_fmri value="svc:/system/filesystem/local" />
    </dependency>

    <dependency type="service"
        name="network"
        grouping="require_all"
        restart_on="none">
        <service_fmri value="svc:/milestone/network:default" />
    </dependency>

    <!-- Define the methods. -->

    <method_context project=":default" working_directory=":default">
        <method_credential user="oracle" group="dba" privileges=":default" />
        <method_environment>
            <envvar name="ORACLE_HOME" value="/opt/oracle/product/home" />
            <envvar name="ORACLE_SID" value="oracle" />
        </method_environment>
    </method_context>

    <exec_method type="method"
        name="start"
        exec="/lib/svc/method/oracle start"
        timeout_seconds="120"/>

    <exec_method type="method"
        name="stop"
        exec="/lib/svc/method/oracle stop"
        timeout_seconds="120" />

    <!--
         What authorization is needed to allow the framework
         general/enabled property to be changed when performing the
         action (enable, disable, etc) on the service.
    -->

    <property_group name="general" type="framework">
        <propval type="astring"
            name="action_authorization"
            value="solaris.smf.manage.oracle" />
    </property_group>

    <!-- Define an instance of the database. -->
```

```
    <!--<instance name="default" enabled="true" />-->

    <stability value="Evolving" />
</service>
</service_bundle>
```

Add name and description metadata to the manifest so that users can get information about this service from the `svcs` and `svccfg describe` commands. See the `template` element in the DTD.

Use the `svccfg validate` command to make sure the service manifest is valid.

The following is the start/stop method script, `/lib/svc/method/oracle`, for the Oracle Database instance control service. This method calls the database `dbstart` and `dbshut` commands.

```
#!/bin/ksh -p

. /lib/svc/share/smf_include.sh

export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$ORACLE_HOME/lib
export PATH=$PATH:$ORACLE_HOME/bin

function startup
{
        dbstart $ORACLE_HOME
}

function shutdown
{
        dbshut $ORACLE_HOME
}

case $1 in
    start) startup ;;
    stop)  shutdown ;;

    *) echo "Usage: $0 { start | stop }" >&2
       exit $SMF_EXIT_ERR_FATAL
       ;;
esac

exit $SMF_EXIT_OK
```

Database Listener Service

The listener is a process that manages the incoming traffic of client connection requests to the database instance. The listener service depends on the database service instance whose client connections it is managing.

This section shows the Oracle Database instance listener service manifest, `/lib/svc/manifest/site/listener.xml`. The following are some features to note about this service manifest:

- One service instance is defined, named `svc:/site/application/database/listener:default`. This instance is enabled by default.
- This service requires the Oracle Database instance control service, `svc:/site/application/database/oracle`, to be started. If the database instance is restarted for any reason, the listener will also be restarted.
- The `method_environment` element in the `method_context` element defines the `ORACLE_HOME` and `ORACLE_SID` environment variables, which identify the database instance to start or stop. These values are then available for the method script to use.

  If you create multiple instances of this service (see the `instance` element at the bottom of the manifest), then each instance might need its own `method_context` element to define the unique `ORACLE_HOME` and `ORACLE_SID` values for that particular database.
- Attributes of the `method_context` element can define a resource pool in addition to the project and working directory shown in this example. You can also define either a `method_profile` or `method_credential` element in the `method_context` element. The `method_credential` element can specify `supp_groups` and `limit_privileges` values in addition to the `user`, `group`, and `privileges` values shown in this example. See the DTD for more information.
- The start/stop method script is `/lib/svc/method/listener`. The number of seconds before the method times out is increased from the default.
- A user must be assigned the `solaris.smf.manage.oracle` authorization to enable or disable this service instance.
- The service is `transient`. See “Service Models” on page 20.

```
<?xml version="1.0"?>

<!--
 Define a service to control the startup and shutdown of a database listener.
-->

<!DOCTYPE service_bundle SYSTEM "/usr/share/lib/xml/dtd/service_bundle.dtd.1">

<service_bundle type="manifest" name="listener">
<service name="site/application/database/listener" type="service" version="1">
    <create_default_instance enabled="true" />
    <!--<single_instance />-->

    <!-- Wait for the database to be started. -->

    <dependency type="service"
        name="oracle"
        grouping="require_all"
        restart_on="refresh">
        <service_fmri value="svc:/site/application/database/oracle" />
    </dependency>
```

```
    <!-- Define the methods. -->

    <method_context project=":default" working_directory=":default">
        <method_credential user="oracle" group="dba" privileges=":default" />
        <method_environment>
            <envvar name="ORACLE_HOME" value="/opt/oracle/product/home" />
            <envvar name="ORACLE_SID" value="oracle" />
        </method_environment>
    </method_context>

    <exec_method type="method"
        name="start"
        exec="/lib/svc/method/listener start"
        timeout_seconds="150"/>

    <exec_method type="method"
        name="stop"
        exec="/lib/svc/method/listener stop"
        timeout_seconds="30" />

    <!--
         What authorization is needed to allow the framework
         general/enabled property to be changed when performing the
         action (enable, disable, etc) on the service.
    -->

    <property_group name="general" type="framework">
        <propval type="astring"
            name="action_authorization"
            value="solaris.smf.manage.oracle" />
    </property_group>

    <!-- Make the instance transient (since it backgrounds itself). -->

    <property_group name="startd" type="framework">
        <propval name="duration" type="astring" value="transient" />
    </property_group>

    <!-- Define an instance of the listener. -->

    <!--<instance name="default" enabled="true" />-->

    <stability value="Evolving" />
</service>
</service_bundle>
```

Add name and description metadata to the manifest so that users can get information about this service from the `svcs` and `svccfg describe` commands. See the `template` element in the DTD.

The following is the start/stop method script, `/lib/svc/method/listener`, for the Oracle Database instance listener service. This method starts or stop a listener process, `lsnrctl`. When `lsnrctl` starts, it tests the status of the database service.

```
#!/bin/ksh -p
```

```
. /lib/svc/share/smf_include.sh

export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$ORACLE_HOME/lib
export PATH=$PATH:$ORACLE_HOME/bin

function startup
{
        lsnrctl start

        # Wait for the listener to report ready.

        i=0
        while ! lsnrctl status | grep -i ready ; do
                ((i = i+1))
                if (( $i == 120 )) ; then
                        # It's been *at least* 2 minutes, time to give up.
                        echo "The listener failed to report ready." >&2
                        exit $SMF_EXIT_ERR_FATAL
                fi

                sleep 1
        done

        # Ping the database once to prove it is now available.

        if ! tnsping $ORACLE_SID ; then
                exit $SMF_EXIT_ERR_FATAL
        fi
}

function shutdown
{
        lsnrctl stop
}

case $1 in
    start) startup ;;
    stop)  shutdown ;;

    *) echo "Usage: $0 { start | stop }" >&2
       exit $SMF_EXIT_ERR_FATAL
       ;;
esac

exit $SMF_EXIT_OK
```

Naming Services, Instances, Property Groups, and Properties

Service and instance names must fit the following expression:

```
([A-Za-z0-9][_A-Za-z0-9.-]*,)?[A-Za-z0-9][_A-Za-z0-9.-]*
```

A service or instance name is case sensitive, must begin with an alphanumeric character, and can contain alphanumeric characters, the underscore (_), the hyphen (-), and the dot (.). To maintain backward compatibility, a single comma (,) is allowed between the first and last character.

Property group and property names must fit the following expression:

```
[A-Za-z0-9-._~:/?#\[\]@!$&'\(\)*+,;= %]+
```

A property group or property name is case sensitive and can contain alphanumeric characters, the hyphen (-), dot (.), underscore (_), tilde (~), colon (:), forward slash (/), question mark (?), pound character (#), square brackets ([and]), at sign (@), exclamation point (!), dollar sign ($), ampersand (&), single quotation mark ('), parentheses ((and)), asterisk (*), plus sign (+), comma (,), semicolon (;), equal sign (=), space, and percent sign (%).

In an FMRI, property group and property names are encoded according to Uniform Resource Identifier (URI) Generic Syntax RFC 3986 except that the comma character is not encoded.

A property group type is a category for this property group. Property group types include `application`, `dependency`, `method`, `framework`, `implementation`, and `template`. Additional property group types can be introduced, provided they conform to the extended naming convention in `smf`(5). Do not specify `framework`, `implementation`, or `template` as the type of your property group. Property groups of type `framework`, `implementation`, or `template` have special use in SMF. Property groups of type `application` are expected to be only of interest to the service to which this group is attached.

▼ How to Convert a Run Control Script to an SMF Service

This procedure shows how to replace a run control script with an SMF service manifest so that the run control service can be managed by SMF. To convert a run control script, use the `rc-script` name with the `-s` option of the `svcbundle` command. See the `svcbundle`(1M) man page for more information or enter `svcbundle help rc-script`.

1. Determine the service model.

By default, `svcbundle` creates a `transient` service. Determine whether this run control script starts any long running daemon and is a `contract` service. See “Service Models” on page 20 and the `svc.startd`(1M) man page for information about service models.

2. Create an initial manifest.

In this example, the service name is `ex_con` and is a contract service that runs at level 2.

```
$ svcbundle -o /tmp/ex_con.xml -s service-name=ex_con
     -s rc-script=/etc/init.d/ex_con:2 -s model=contract
```

3. **Make any necessary changes to the manifest.**

   Verify that the content of the `/tmp/ex_con.xml` manifest is what you need. Add comments as needed.

4. **Copy the manifest to the standard directory.**

   ```
   $ cp /tmp/ex_con.xml /lib/svc/manifest/site/ex_con.xml
   ```

5. **Stop the existing service.**

   ```
   $ /etc/init.d/ex_con stop
   ```

6. **Disable the run control script.**

   Remove any links to the run control script from the appropriate `rc`*n*`.d` directories.

7. **Import the manifest and start the service.**

   ```
   $ svcadm restart manifest-import
   ```

8. **List the new service.**

   Verify that the new service exists and is in the expected state.

   ```
   $ svcs ex-con
   ```

Using a Stencil to Create a Configuration File

If your application cannot use `libscf` library interfaces to read properties, you can use a stencil to create a configuration file. A *stencil service* creates configuration files by using a stencil file and property values defined in the stencil service. A *stencil file* contains a structural definition of a configuration file that is required by a service even though that service is now managed by SMF. Stencil services enable you to take advantage of SMF configuration management with no change to the existing application.

The stencil is used to generate a configuration file immediately before the service instance `start` method is executed. If you update the stenciled property values, restart the service to incorporate the changes into the configuration file before the application starts and reads the configuration file.

How to Create a Stencil Service

A stencil file contains a structural definition of a configuration file that continues to be required by a service even though that service is now managed by SMF. The `svcio` utility generates the configuration file from the definitions in the stencil file and properties in the SMF service. See the `svcio`(1) man page for more information about the `svcio` utility and the `smf_stencil`(4) man page for information about stencil file format.

1. **Create a stencil file.**

   The stencil file tells the `svcio` utility the format to use to create the configuration file. The `svcio` utility converts SMF properties into application-specific configuration files based on a template called a stencil.

2. **Add a property group to the service.**

   The stencil service property group tells the `svcio` utility the path and ownership to use to create the configuration file. SMF regenerates configuration for all stencil-aware services before running the start or refresh methods. Property groups of type `configfile` tell SMF how to generate configuration files. Each `configfile` property group describes a single configuration file for the service and tells `svcio` how to generate these files from other properties stored in the SMF repository.

   To configure a service to be stencil-aware, add a property group for each managed configuration file that contains the paths of both the stencil file to use as a template and the resulting configuration file. The property group has the following properties:

   `path` — The path to which to write the configuration file, for example `/etc/svc.conf`.

   `stencil` — The path of the stencil file to use, relative to `/lib/svc/stencils`. For example, if the value of the `stencil` property is `svc.stencil`, the `/lib/svc/stencils/svc.stencil` file will be used.

   `mode` — The mode to use for the configuration file (`path`), for example 644.

   `owner` — The owner to set for the configuration file (`path`). If this property is not set, the owner of the file is the user who invokes `svcio`.

   `group` — The group to set for the configuration file (`path`). If this property is not set, the group will be the default group for `path`.

Stencil Service Examples in Oracle Solaris

Services for Puppet and Kerberos use stencils to provide configuration files.

Puppet Stencil Service

Puppet is a toolkit for managing the configuration of many systems. On Oracle Solaris, the Puppet application is managed by SMF.

High Level View of Puppet Services

When you install the `system/management/puppet` package, you get two SMF service instances: `puppet:master` and `puppet:agent`. These instances are disabled by default.

After you enable these instances, the following command shows that both `puppet:master` and `puppet:agent` are contract services:

```
$ svcs -p puppet
STATE          STIME    FMRI
online         17:19:32 svc:/application/puppet:agent
               17:19:32     2565 puppet
online         17:19:32 svc:/application/puppet:master
               17:19:32     2567 puppet
```

The following command shows a little more information about the processes started by the contract services:

```
$ ps -o pid,args -p 2565,2567
  PID COMMAND
 2565 /usr/ruby/1.9/bin/ruby /usr/sbin/puppet agent --logdest /var/log/puppet/puppet-
 2567 /usr/ruby/1.9/bin/ruby /usr/sbin/puppet master --logdest /var/log/puppet/puppet
```

As suggested by the `ps` output, `puppet` is writing to log files in `/var/log/puppet`:

```
$ ls /var/log/puppet
puppet-agent.log  puppet-master.log
```

Initial Puppet Configuration File

Puppet expects to use a configuration file named `/etc/puppet/puppet.conf`. The `/usr/sbin/puppet` application reads configuration information from `/etc/puppet/puppet.conf` and not from properties set in the `application/puppet` service instances. To provide the required configuration file, each `puppet` instance provides a stencil file and `configfile` property group. The `configfile` property group tells the `svcio` utility to run and create the specified

configuration file. The stencil file is used to write data from service property values to the configuration file in the correct format.

The following command shows all `puppet` service properties that are in a property group of type `configfile`. This output shows that both instances of the `puppet` service have the same `configfile` properties with the same values. Each `puppet` service instance provides the path to the configuration file, the mode of the configuration file, and the path to the stencil file.

```
$ svcprop -g configfile puppet
svc:/application/puppet:master/:properties/puppet_stencil/mode astring 0444
svc:/application/puppet:master/:properties/puppet_stencil/path astring /etc/puppet/puppet.conf
svc:/application/puppet:master/:properties/puppet_stencil/stencil astring puppet.stencil
svc:/application/puppet:agent/:properties/puppet_stencil/mode astring 0444
svc:/application/puppet:agent/:properties/puppet_stencil/path astring /etc/puppet/puppet.conf
svc:/application/puppet:agent/:properties/puppet_stencil/stencil astring puppet.stencil
```

The following commands confirm that these instance properties are inherited from the parent service.

```
$ svccfg -s puppet listprop -l all puppet_stencil
puppet_stencil          configfile  manifest
puppet_stencil/mode     astring     manifest              0444
puppet_stencil/path     astring     manifest              /etc/puppet/puppet.conf
puppet_stencil/stencil  astring     manifest              puppet.stencil
$ svccfg -s puppet:agent listprop -l all puppet_stencil
$ svccfg -s puppet:master listprop -l all puppet_stencil
```

For your infrastructure, you might need `puppet:agent1` and `puppet:agent2` instances, for example. In that case, you would customize property values and add properties for each instance as shown in "Modifying the Puppet Configuration File" on page 97.

The following is the initial content of the configuration file, `/etc/puppet/puppet.conf`:

```
# WARNING: THIS FILE GENERATED FROM SMF DATA.
#     DO NOT EDIT THIS FILE.  EDITS WILL BE LOST.
#
# See puppet.conf(5) and http://docs.puppetlabs.com/guides/configuring.html
# for details.
```

Puppet Stencil File

The content of the stencil file tells you what properties and other information are written to the configuration file. The `puppet.stencil` path that is the value of the `puppet_stencil/stencil` property is relative to `/lib/svc/stencils`. The following is the content of the stencil file, `/lib/svc/stencils/puppet.stencil`:

```
# WARNING: THIS FILE GENERATED FROM SMF DATA.
#     DO NOT EDIT THIS FILE.  EDITS WILL BE LOST.
#
# See puppet.conf(5) and http://docs.puppetlabs.com/guides/configuring.html
# for details.
; walk each instance and extract all properties from the config PG
```

```
$%/(svc:/$%s:(.*)/:properties)/ {
$%{$%1/general/enabled:?
[$%2]
$%/$%1/config/(.*)/ {
$%3 = $%{$%1/config/$%3} }
}
}
```

In the stencil file, `svc:/$%s:(.*)/:properties` (or `%1`) expands to `svc:/application/puppet:agent/:properties` and `svc:/application/puppet:master/:properties`, where `.*` (or `%2`) matches every instance. The instance name is then used to label the block in the configuration file. The next occurrence of `.*` (or `%3`) matches every property in the `config` property group for the `%1` service instance. The stencil tells `svcio` to write the property name and the value of that property from the service instance to the configuration file.

Modifying the Puppet Configuration File

As you can see in "Initial Puppet Configuration File" on page 95, initially only the literal comment lines are written to the configuration file. Writing property values to the configuration file is prevented by the test of the value of the `general/enabled` property in the stencil file. The following command shows that by default, the value of the `general/enabled` property is false:

```
$ svcprop -p general/enabled puppet
svc:/application/puppet:master/:properties/general/enabled boolean false
svc:/application/puppet:agent/:properties/general/enabled boolean false
```

Using the `svcadm enable` command to enable an instance does not change the value of the `general/enabled` property. When you change the value of the `general/enabled` property to `true` and restart the instance, all the properties in the `config` property group for that instance are written to the configuration file.

```
$ svccfg -s puppet:agent setprop general/enabled=true
$ svcprop -p general/enabled puppet:agent
false
$ svcadm refresh puppet:agent
$ svcprop -p general/enabled puppet:agent
true
$ svcadm restart puppet:agent
```

The following command shows that initially the only property in the `config` property group is the path to the log file for each instance:

```
$ svcprop -p config puppet
svc:/application/puppet:master/:properties/config/logdest astring /var/log/puppet/puppet-master.log
svc:/application/puppet:agent/:properties/config/logdest astring /var/log/puppet/puppet-agent.log
```

The `config` property for the enabled instance has been added to the configuration file in a block labeled with the instance name:

```
# WARNING: THIS FILE GENERATED FROM SMF DATA.
```

```
#     DO NOT EDIT THIS FILE.  EDITS WILL BE LOST.
#
# See puppet.conf(5) and http://docs.puppetlabs.com/guides/configuring.html
# for details.

[agent]

logdest = /var/log/puppet/puppet-agent.log
```

The Puppet configuration documentation says that the configuration file can have `[main]`, `[agent]`, and `[master]` blocks. Configuration in the `[main]` block applies to both the agent and the master. For the Puppet agent, configuration in the `[agent]` block overrides the same configuration in the `[main]` block. For the Puppet master, configuration in the `[master]` block overrides the same configuration in the `[main]` block. If you want to provide a `[main]` block for configuration that is common to both the agent and master, create a `puppet:main` instance and appropriate `config` properties for that instance.

The following commands show how to add configuration to your Puppet configuration file.

```
$ svccfg -s puppet:agent
svc:/application/puppet:agent> setprop config/report=true
svc:/application/puppet:agent> setprop config/pluginsync=true
svc:/application/puppet:agent> refresh
svc:/application/puppet:agent> exit
$ svcadm restart puppet:agent
$ cat /etc/puppet/puppet.conf
# WARNING: THIS FILE GENERATED FROM SMF DATA.
#     DO NOT EDIT THIS FILE.  EDITS WILL BE LOST.
#
# See puppet.conf(5) and http://docs.puppetlabs.com/guides/configuring.html
# for details.

[agent]

logdest = /var/log/puppet/puppet-agent.log
pluginsync = true
report = true
```

Similar commands can be used to remove properties and change property values. See Chapter 4, “Configuring Services”. To add a `main` instance, use the `svccfg add` command as shown in “Adding Service Instances” on page 76.

Kerberos Stencil Service

Another example of an Oracle Solaris service that uses a stencil is Kerberos. The following command shows that the `configfile` property group is `krb5_conf`, the stencil file is `/lib/svc/stencils/krb5.conf.stencil`, and the configuration file is `/etc/krb5/krb5.conf`.

```
$ svcprop -g configfile svc:/system/kerberos/install:default
```

```
krb5_conf/disabled boolean true
krb5_conf/group astring sys
krb5_conf/mode integer 644
krb5_conf/owner astring root
krb5_conf/path astring /etc/krb5/krb5.conf
krb5_conf/stencil astring krb5.conf.stencil
```

♦ ♦ ♦ APPENDIX A

SMF Best Practices and Troubleshooting

This appendix gives some recommended best practices and shows how to troubleshoot some SMF service problems.

SMF Best Practices

Most services describe configuration policy. If the configuration you want is not implemented, modify the policy description by modifying the service. Modify the values of service properties or create new service instances with different property values. Do not disable service instances and edit configuration files that are intended to be managed by an SMF service.

Do not modify manifests and system profiles that are delivered by Oracle or third-party software vendors. These manifests and profiles might be replaced when you upgrade your system, and then your changes to these files will be lost. Instead, either create a site profile to customize the service, or use the `svccfg` command or the `inetadm` command to manipulate the properties directly. The `/lib/svc/manifest/site` and `/var/svc/manifest/site` directories are also reserved for site-specific use. Oracle Solaris does not deliver manifests into those directories.

To apply the same custom configuration to multiple systems, use the `svcbundle` command or the `svccfg extract` command to create a profile file. Customize property values in that file, and include comments about the reason for each customization. Copy the file to `/etc/svc/profile/site` on each system, and restart the `manifest-import` service on each system. See “Configuring Multiple Systems” on page 77.

When you create a site profile, make sure the configuration defined does not conflict with configuration defined in another site profile for the same service or service instance. When SMF finds conflicting configuration in the same layer of the service configuration repository, the affected service instance is placed in the maintenance state.

Do not use non-standard locations for manifest and profile files. See “Service Bundles” on page 24 for manifest and profile standard locations.

When you create a service for your own use, use `site` at the beginning of the service name: `svc:/site/`*service_name*`:`*instance_name*.

Do not modify the configuration of the master restarter service, `svc:/system/svc/restarter:default`, except to configure logging levels as described in "Specifying the Amount of Startup Messaging" on page 110.

Before you use the `svccfg delcust` command, use the `svccfg listcust` command with the same options. The `delcust` subcommand can potentially remove all administrative customizations on a service. Use the `listcust` subcommand to verify which customizations will be deleted by the `delcust` subcommand.

In scripts, use the full service instance FMRI: `svc:/`*service_name*`:`*instance_name*.

Troubleshooting Services Problems

This section discusses the following topics:

- Committing configuration changes into the running snapshot
- Fixing services that are reported to have problems
- Manually transitioning an instance to the `degraded` or `maintenance` state
- Fixing a corrupt service configuration repository
- Configuring the amount of messaging to display or store on system startup
- Transitioning or booting to a specified milestone
- Using SMF to investigate booting problems
- Converting `inetd` services to SMF services

Understanding Configuration Changes

In the service configuration repository, SMF stores property changes separately from properties in the running snapshot. When you change service configuration, those changes do not immediately appear in the running snapshot.

The refresh operation updates the running snapshot of the specified service instance with the values from the editing configuration.

By default, the `svcprop` command shows properties in the running snapshot, and the `svccfg` command shows properties in the editing configuration. If you have changed property values but not performed a configuration refresh, the `svcprop` and `svccfg` commands show different property values. After you perform a configuration refresh, the `svcprop` and `svccfg` commands show the same property values.

Rebooting does not change the running snapshot. The `svcadm restart` command does not refresh configuration. Use the `svcadm refresh` or `svccfg refresh` command to commit configuration changes into the running snapshot.

Repairing an Instance That Is Degraded, Offline, or in Maintenance

Use the `svcs -x` command with no arguments to display explanatory information about any service instances that match either of the following descriptions:

- The service is enabled but is not running.
- The service is preventing another enabled service from running.

The following list summarizes how to approach service problems:

1. Diagnose the problem, starting with viewing the service log file.
2. Fix the problem. If fixing the problem involves modifying service configuration, refresh the service.
3. Move affected services to a running state.

▼ How to Repair an Instance That Is in Maintenance

A service instance that is in maintenance is enabled but not able to run.

1. Determine why the instance is in maintenance.

The instance might be transitioning through the `maintenance` state because an administrative action has not yet completed. If the instance is transitioning, its state should be shown as `maintenance*`.

In the following example, the "State" and "Reason" lines show that the `pkg/depot` service is in the `maintenance` state because its start method failed.

```
$ svcs -x
svc:/application/pkg/depot:default (IPS Depot)
 State: maintenance since September 11, 2013 01:30:42 PM PDT
Reason: Start method exited with $SMF_EXIT_ERR_FATAL.
   See: http://support.oracle.com/msg/SMF-8000-KS
   See: pkg.depot-config(1M)
   See: /var/svc/log/application-pkg-depot:default.log
Impact: This service is not running.
```

Log in to the Oracle support site to view the referenced Predictive Self-Healing knowledge article. In this case, the article tells you to view the log file to determine why the start method failed. The `svcs` output gives the name of the log file. See "Viewing Service Log Files" on page 40 for information about how to view the log file. In this example, the log file shows the start method invocation and the fatal error message.

```
[ Sep 11 13:30:42 Executing start method ("/lib/svc/method/svc-pkg-depot start"). ]
pkg.depot-config: Unable to get publisher information:
```

```
The path '/export/ipsrepos/Solaris11' does not contain a valid package repository.
```

2. **Fix the problem.**

   One or more of the following steps might be needed.

   - **Update service configuration.**

     If fixing the reported problem required modifying service configuration, use the `svccfg refresh` or `svcadm refresh` command for any services whose configuration changed. Verify that the configuration is updated in the running snapshot by using the `svcprop` command to check property values or by other tests specific to this service.

   - **Ensure dependencies are running.**

     Sometimes the “Impact” line in the `svcs -x` output tells you that services that depend on the service that is in the `maintenance` state are not running. Use the `svcs -l` command to check the current state of dependent services. Ensure that all required dependencies are running. Use the `svcs -x` command to verify that all enabled services are running.

   - **Ensure contract processes are stopped.**

     If the service that is in the `maintenance` state is a contract service, determine whether any processes that were started by the service have not stopped. When a contract service instance is in a maintenance state, the contract ID should be blank, as shown in the following example, and all processes associated with that contract should have stopped. Use `svcs -l` or `svcs -o ctid` to check that no contract exists for a service instance in maintenance. Use `svcs -p` to check whether any processes associated with this service instance are still running. Any processes shown by `svcs -p` for a service instance in maintenance should be killed.

     ```
     $ svcs -l system-repository
     fmri         svc:/application/pkg/system-repository:default
     name         IPS System Repository
     enabled      true
     state        maintenance
     next_state   none
     state_time   September 17, 2013 07:18:19 AM PDT
     logfile      /var/svc/log/application-pkg-system-repository:default.log
     restarter    svc:/system/svc/restarter:default
     contract_id
     manifest     /lib/svc/manifest/application/pkg/pkg-system-repository.xml
     dependency   require_all/error svc:/milestone/network:default (online)
     dependency   require_all/none svc:/system/filesystem/local:default (online)
     dependency   optional_all/error svc:/system/filesystem/autofs:default (online)
     ```

3. **Notify the restarter that the instance is repaired.**

When the reported problem is fixed, use the `svcadm clear` command to return the service to the `online` state. For services in the `maintenance` state, the `clear` subcommand tells the restarter for that service that the service is repaired.

```
$ svcadm clear pkg/depot:default
```

If you specify the `-s` option, the `svcadm` command waits to return until the instance reaches the `online` state or until it determines that the instance cannot reach the `online` state without administrator intervention. Use the `-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

4. **Verify that the instance is repaired.**

   Use the `svcs` command to verify that the service that was in maintenance is now online. Use the `svcs -x` command to verify that all enabled services are running.

How to Repair an Instance That Is Offline

A service instance that is offline is enabled but not running or available to run.

1. **Determine why the instance is offline.**

   The instance might be transitioning through the `offline` state because its dependencies are not yet satisfied. If the instance is transitioning, its state should be shown as `offline*`.

2. **Fix the problem.**

   - **Enable service dependencies.**

     If required dependencies are disabled, enable them with the following command:

     ```
     $ svcadm enable -r FMRI
     ```

   - **Fix dependency file.**

     A dependency file might be missing or unreadable. You might want to use `pkg fix` or `pkg revert` to fix this type of problem. See the pkg(1) man page.

3. **Restart the instance if necessary.**

   If the instance was offline because a required dependency was not satisfied, fixing or enabling the dependency might cause the offline instance to restart and come online with no further administrative action needed.

   If you made some other fix to the service, then restart the instance.

   ```
   $ svcadm restart FMRI
   ```

4. **Verify that the instance is repaired.**

   Use the `svcs` command to verify that the instance that was offline is now online. Use the `svcs -x` command to verify that all enabled services are running.

▼ How to Repair an Instance That Is Degraded

A service instance that is degraded is enabled and running or available to run, but is functioning at a limited capacity.

1. **Determine why the instance is degraded.**

2. **Fix the problem.**

3. **Request the restarter to online the instance.**

   When the reported problem is fixed, use the `svcadm clear` command to return the instance to the `online` state. For instances in the `degraded` state, the `clear` subcommand requests that the restarter for that instance transition the instance to the `online` state.

   ```
   $ svcadm clear pkg/depot:default
   ```

4. **Verify that the instance is repaired.**

   Use the `svcs` command to verify that the instance that was degraded is now online. Use the `svcs -x` command to verify that all enabled services are running.

Marking an Instance as Degraded or in Maintenance

You can mark a service instance as being in either the `degraded` state or the `maintenance` state. You might want to do this if the application is stuck in a loop or is deadlocked, for example. The information about the state change propagates to the dependencies of the marked instance, which can help debug other related instances.

Specify the `-I` option to request an immediate state change.

When you mark an instance as `maintenance`, you can specify the `-t` option to request a temporary state change. Temporary requests last only until reboot.

If you specify the `-s` option with the `svcadm mark` command, `svcadm` marks the instance and waits for the instance to enter the `degraded`, or `maintenance` state before returning. Use the

`-T` option with the `-s` option to specify an upper bound in seconds to make the transition or determine that the transition cannot be made.

Diagnosing and Repairing Repository Problems

On system startup, the repository daemon, `svc.configd`, performs an integrity check of the configuration repository stored in `/etc/svc/repository.db`. If the `svc.configd` integrity check fails, the `svc.configd` daemon writes a message to the console similar to the following:

```
svc.configd: smf(5) database integrity check of:

    /etc/svc/repository.db

  failed.  The database might be damaged or a media error might have
  prevented it from being verified.  Additional information useful to
  your service provider is in:

    /system/volatile/db_errors

  The system will not be able to boot until you have restored a working
  database.  svc.startd(1M) will provide a sulogin(1M) prompt for recovery
  purposes.  The command:

    /lib/svc/bin/restore_repository

  can be run to restore a backup version of your repository. See
  http://support.oracle.com/msg/SMF-8000-MY for more information.
```

The `svc.configd` daemon then exits. That exit is detected by the `svc.startd` daemon, and `svc.startd` then starts `sulogin`.

At the `sulogin` prompt, enter Ctrl-D to exit `sulogin`. The `svc.startd` daemon recognizes the `sulogin` exit and restarts the `svc.configd` daemon, which checks the repository again. The problem might not reappear after this additional restart. Do not directly invoke the `svc.configd` daemon. The `svc.startd` daemon starts the `svc.configd` daemon.

If `svc.configd` again reports a failed integrity check and you are again at the `sulogin` prompt, ensure that required file systems are not full. Using the `root` password, log in either remotely or at the `sulogin` prompt. Check that space is available on both the root and `system/volatile` file systems. If either of these file systems is full, clean up and start the system again. If neither of these file systems is full, follow the procedure "How to Restore a Repository From Backup" on page 108.

The service configuration repository can become corrupted for any of the following reasons:

- Disk failure
- Hardware bug
- Software bug

- Accidental overwrite of the file

The following procedure shows how to replace a corrupt repository with a backup copy of the repository.

▼ How to Restore a Repository From Backup

1. **Log in.**

   Using the `root` password, log in either remotely or at the `sulogin` prompt.

2. **Run the repository restore command:**

   ```
   # /lib/svc/bin/restore_repository
   ```

   Running this command takes you through the necessary steps to restore a non-corrupt backup. SMF automatically takes backups of the repository as described in "Repository Backups" on page 26.

   SMF maintains persistent and non-persistent configuration data. See "Service Configuration Repository" on page 23 for descriptions of these two repositories. The `restore_repository` command only restores the persistent repository. The `restore_repository` command also reboots the system, which destroys the non-persistent configuration data. The non-persistent data is runtime data that is not needed across system reboot.

   When started, the `/lib/svc/bin/restore_repository` command displays a message similar to the following:

   ```
   See http://support.oracle.com/msg/SMF-8000-MY for more information on the use of
   this script to restore backup copies of the smf(5) repository.

   If there are any problems which need human intervention, this script will
   give instructions and then exit back to your shell.
   ```

   After the `root` (`/`) file system is mounted with write permissions, or if the system is a local zone, you are prompted to select the repository backup to restore:

   ```
   The following backups of /etc/svc/repository.db exists, from
   oldest to newest:

   ... list of backups ...
   ```

   Backups are given names, based on type and the time the backup was taken. Backups beginning with `boot` are completed before the first change is made to the repository after system boot. Backups beginning with `manifest_import` are completed after `svc:/system/manifest-import:default` finishes its process. The time of the backup is given in *YYYYMMDD_HHMMSS* format.

3. **Enter the appropriate response.**

Typically, the most recent backup option is selected.

```
Please enter either a specific backup repository from the above list to
restore it, or one of the following choices:

        CHOICE            ACTION
        ----------------  --------------------------------------------
        boot              restore the most recent post-boot backup
        manifest_import   restore the most recent manifest_import backup
        -seed-            restore the initial starting repository  (All
                            customizations will be lost, including those
                            made by the install/upgrade process.)
        -quit-            cancel script and quit

Enter response [boot]:
```

If you press Enter without specifying a backup to restore, the default response, enclosed in `[]` is selected. Selecting `-quit-` exits the `restore_repository` script, returning you to your shell prompt.

Note - Selecting `-seed-` restores the `seed` repository. This repository is designed for use during initial installation and upgrades. Using the `seed` repository for recovery purposes should be a last resort.

After the backup to restore has been selected, it is validated and its integrity is checked. If there are any problems, the `restore_repository` command prints error messages and prompts you for another selection. Once a valid backup is selected, the following information is printed, and you are prompted for final confirmation.

```
After confirmation, the following steps will be taken:

svc.startd(1M) and svc.configd(1M) will be quiesced, if running.
/etc/svc/repository.db
    -- renamed --> /etc/svc/repository.db_old_YYYYMMDD_HHMMSS
/system/volatile/db_errors
    -- copied --> /etc/svc/repository.db_old_YYYYMMDD_HHMMSS_errors
repository_to_restore
    -- copied --> /etc/svc/repository.db
and the system will be rebooted with reboot(1M).

Proceed [yes/no]?
```

4. **Type `yes` to remedy the fault.**

The system reboots after the `restore_repository` command executes all of the listed actions.

Specifying the Amount of Startup Messaging

By default, each service that starts during system boot does not display a message on the console. Use one of the following methods to change which messages appear on the console and which are recorded only in the `svc.startd` log file. The value of *logging-level* can be one of the values shown in the table below.

- When booting a SPARC system, specify the `-m` option to the `boot` command at the `ok` prompt. See "Messages options" in the `kernel`(1M) man page.

  ```
  ok boot -m logging-level
  ```

- When booting an x86 system, edit the GRUB menu to specify the `-m` option. See "Adding Kernel Arguments by Editing the GRUB Menu at Boot Time" in "Booting and Shutting Down Oracle Solaris 11.2 Systems " and "Messages options" in the `kernel`(1M) man page.
- Prior to rebooting a system, use the `svccfg` command to change the value of the `options/logging` property. If this property has never been changed on this system, then it will not exit and you will have to add it. The following example changes to verbose messaging. The change takes effect on the next restart of the `svc.startd` daemon.

  ```
  $ svccfg -s system/svc/restarter:default listprop options/logging
  $ svccfg -s system/svc/restarter:default addpg options application
  $ svccfg -s system/svc/restarter:default setprop options/logging=verbose
  $ svccfg -s system/svc/restarter:default listprop options/logging
  options/logging astring     verbose
  ```

TABLE A-1 SMF Startup Message Logging Levels

Logging Level Keyword	Description
`quiet`	Display on the console any error messages that require administrative intervention. Also record these messages in `syslog` and in `/var/svc/log/svc.startd.log`.
`verbose`	In addition to the messaging provided at the `quiet` level, display on the console a single message for each service started, and record in `/var/svc/log/svc.startd.log` information about errors that do not require administrative intervention.
`debug`	In addition to the messaging provided at the `quiet` level, display on the console a single message for each service started, and record any `svc.startd` debug messages in `/var/svc/log/svc.startd.log`.

Specifying the SMF Milestone to Which to Boot

When you boot a system, you can specify the SMF milestone to which to boot.

By default, all services for which the value of the `general/enabled` property is `true` are started at system boot. To change the milestone to which to boot a system, use one of the following methods. The value of *milestone* can be the FMRI of a milestone service or a keyword as shown in Table A-2.

- When booting a SPARC system, specify the `-m` option to the `boot` command at the `ok` prompt. See the `-m` option in the `kernel`(1M) man page.

  ```
  ok boot -m milestone=milestone
  ```

- When booting an x86 system, edit the GRUB menu to specify the `-m` option. See "Adding Kernel Arguments by Editing the GRUB Menu at Boot Time" in "Booting and Shutting Down Oracle Solaris 11.2 Systems " and the `-m` option in the `kernel`(1M) man page.
- Prior to rebooting a system, use the `svcadm milestone` command with the `-d` option. Note that with or without the `-d` option, this command restricts and restores running services immediately. With the `-d` option, the command also makes the specified milestone the default boot milestone. This new default is persistent across reboots.

  ```
  $ svcadm milestone -d milestone
  ```

  This command does not change the current run level of the system. To change the current run level of the system, use the `init` command.

  If you specify the `-s` option, `svcadm` changes the milestone and then waits for the transition to the specified milestone to complete before returning. The `svcadm` command returns when all instances have transitioned to the state necessary to reach the specified milestone or when it determines that administrator intervention is required to make a transition. Use the `-T` option with the `-s` option to specify an upper bound in seconds to complete the milestone change operation or return.

The following table describes SMF boot milestones, including any corresponding Oracle Solaris run level. A system's *run level* defines what services and resources are available to users. A system can be in only one run level at a time. For information about run levels,see "How Run Levels Work" in "Booting and Shutting Down Oracle Solaris 11.2 Systems ", the `inittab`(4) man page, and the `/etc/init.d/README` file. For more information about SMF boot milestones, see the `milestone` subcommand in the `svcadm`(1M) man page.

TABLE A-2 SMF Boot Milestones and Corresponding Run Levels

SMF Milestone FMRI or Keyword	Corresponding Run Level	Description
`none`		The `none` keyword represents a milestone where no services are running except for the master restarter. When `none` is specified, all services except for `svc:/system/svc/restarter:default` are temporarily disabled. The `none` milestone can be useful when for debugging startup problems. See "How to Investigate Problems Starting Services at System Boot" on page 113 for specific instructions.
`all`		The `all` keyword represents a milestone that depends on every service. When `all` is specified, temporary enable and disable requests are ignored for all services. This is the default milestone used by `svc.startd`.
`svc:/milestone/single-user`	s or S	Ignore temporary enable and disable requests for `svc:/milestone/single-user:default` and all services on which it depends either directly or indirectly. Temporarily disable all other services.
`svc:/milestone/multi-user`	2	Ignore temporary enable and disable requests for `svc:/milestone/multi-user:default` and all services on which it depends either directly or indirectly. Temporarily disable all other services.
`svc:/milestone/multi-user-server`	3	Ignore temporary enable and disable requests for `svc:/milestone/multi-user-server:default` and all services on which it depends either directly or indirectly. Temporarily disable all other services.

To determine the milestone to which a system is currently booted, use the `svcs` command. The following example shows that the system is booted to run level 3, `milestone/multi-user-server`:

```
$ svcs 'milestone/*'
STATE          STIME    FMRI
online          9:08:05 svc:/milestone/unconfig:default
online          9:08:06 svc:/milestone/config:default
online          9:08:07 svc:/milestone/devices:default
online          9:08:25 svc:/milestone/network:default
online          9:08:31 svc:/milestone/single-user:default
online          9:08:51 svc:/milestone/name-services:default
online          9:09:13 svc:/milestone/self-assembly-complete:default
online          9:09:23 svc:/milestone/multi-user:default
online          9:09:24 svc:/milestone/multi-user-server:default
```

Using SMF to Investigate System Boot Problems

This section describes actions to take if your system hangs during boot or if a key service fails to start during boot.

▼ How to Investigate Problems Starting Services at System Boot

If problems occur when starting services at system boot, sometimes the system will hang during boot. This procedure shows how to investigate services problems that occur at boot time.

1. **Boot without starting any services.**

   The following command instructs the `svc.startd` daemon to temporarily disable all services and start `sulogin` on the console.

   ```
   ok boot -m milestone=none
   ```

   See "Specifying the SMF Milestone to Which to Boot" on page 111 for a list of SMF milestones that you can use with the `boot -m` command.

2. **Log in to the system as `root`.**

3. **Enable all services.**

   ```
   # svcadm milestone all
   ```

4. **Determine where the boot process is hanging.**

   When the boot process hangs, determine which services are not running by running `svcs -a`. Look for error messages in the log files in `/var/svc/log`.

5. **After fixing the problems, verify that all services have started.**

   a. **Verify that all needed services are online.**

      ```
      # svcs -x
      ```

   b. **Verify that the `console-login` service dependencies are satisfied.**

      This command verifies that the `login` process on the console will run.

      ```
      # svcs -l system/console-login:default
      ```

6. **Continue the normal booting process.**

▼ How to Force Single-User Login if the Local File System Service Fails During Boot

Local file systems that are not required to boot the system are mounted by the `svc:/system/filesystem/local:default` service. When any of those file systems cannot be mounted, the `filesystem/local` service enters a maintenance state. System startup continues, and any services that do not depend on `filesystem/local` are started. Services that have a required dependency on the `filesystem/local` service are not started.

This procedure explains how to change the configuration of the system so that a `sulogin` prompt appears immediately after the service fails instead of allowing system startup to continue.

1. **Modify the `system/console-login` service.**

```
$ svccfg -s svc:/system/console-login
svc:/system/console-login> addpg site,filesystem-local dependency
svc:/system/console-login> setprop site,filesystem-local/entities = fmri: svc:/system/
filesystem/local
svc:/system/console-login> setprop site,filesystem-local/grouping = astring: require_all
svc:/system/console-login> setprop site,filesystem-local/restart_on = astring: none
svc:/system/console-login> setprop site,filesystem-local/type = astring: service
svc:/system/console-login> end
```

2. **Refresh the service.**

```
$ svcadm refresh console-login
```

When a failure occurs with the `system/filesystem/local:default` service, use the `svcs -vx` command to identify the failure. After the failure has been fixed, use the following command to clear the error state and allow the system boot to continue:

```
$ svcadm clear filesystem/local
```

Converting `inetd` Services to SMF Services

The `inetd.conf` file on your system should contain no entries. The `inetd.conf` file should contain only comments that this is a legacy file no longer directly used. If the `inetd.conf` file contains any entries, follow the instructions in this section to convert these configurations to SMF services. Services that are configured in the `inetd.conf` file but are not configured as an SMF service are not available for use. Services that are configured in the `inetd.conf` file are not restarted by the `inetd` command directly. Rather, the `inetd` command is the delegated restarter for the converted services.

During initial system boot, configurations in the `inetd.conf` file are automatically converted to SMF services. After initial system boot, entries might be added to the `inetd.conf` file by installing additional software that is not delivered by Image Packaging System (IPS) packages. Software that is delivered by IPS packages includes any required SMF manifest, and that SMF manifest instantiates that service instance with the correct property values.

If the `inetd.conf` file on your system contains any entries, use the `inetconv` command to convert those configurations to SMF services. The `inetconv` command converts `inetd.conf` entries into SMF service manifest files and imports those manifests into the SMF repository to instantiate the service instances. See the `inetconv`(1M) man page for information about command options and to see examples of using the command.

The name of the new SMF manifest incorporates the *service_name* from the `inetd.conf` entry. The entry from the `inetd.conf` file is saved as a property of the new service instance. The new SMF manifest specifies property groups and properties to define the actions listed in the `inetd.conf` entry. After running the `inetconv` command, use the `svcs` and `svcprop` commands to ensure the new service instance was created and has the correct property values.

The `inetd` command is the delegated restarter for SMF internet services. Do not use the `inetd` command directly to manage these services. Use the `inetadm` command with no options or operands to see a list of services that are controlled by `inetd`. Use the `inetadm`, `svcadm`, and `svccfg` commands to configure and manage these converted services.

The `inetconv` command does not modify the input `inetd.conf` file. You should manually delete any entries in the `inetd.conf` file after successfully running `inetconv`.

For information about configuring `inetd` services that are already converted to SMF services, see “Modifying Services that are Controlled by `inetd`” on page 79.

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