SMF – Solaris Service Management Facility

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What is SMF?

- Service Management Facility
- feature of Solaris 10 and successors (OpenSolaris, Solaris 11)
- 'A mechanism to define, deliver and manage long-running services for Solaris'
- '`/etc/init.d` on steroids'

What is a service?

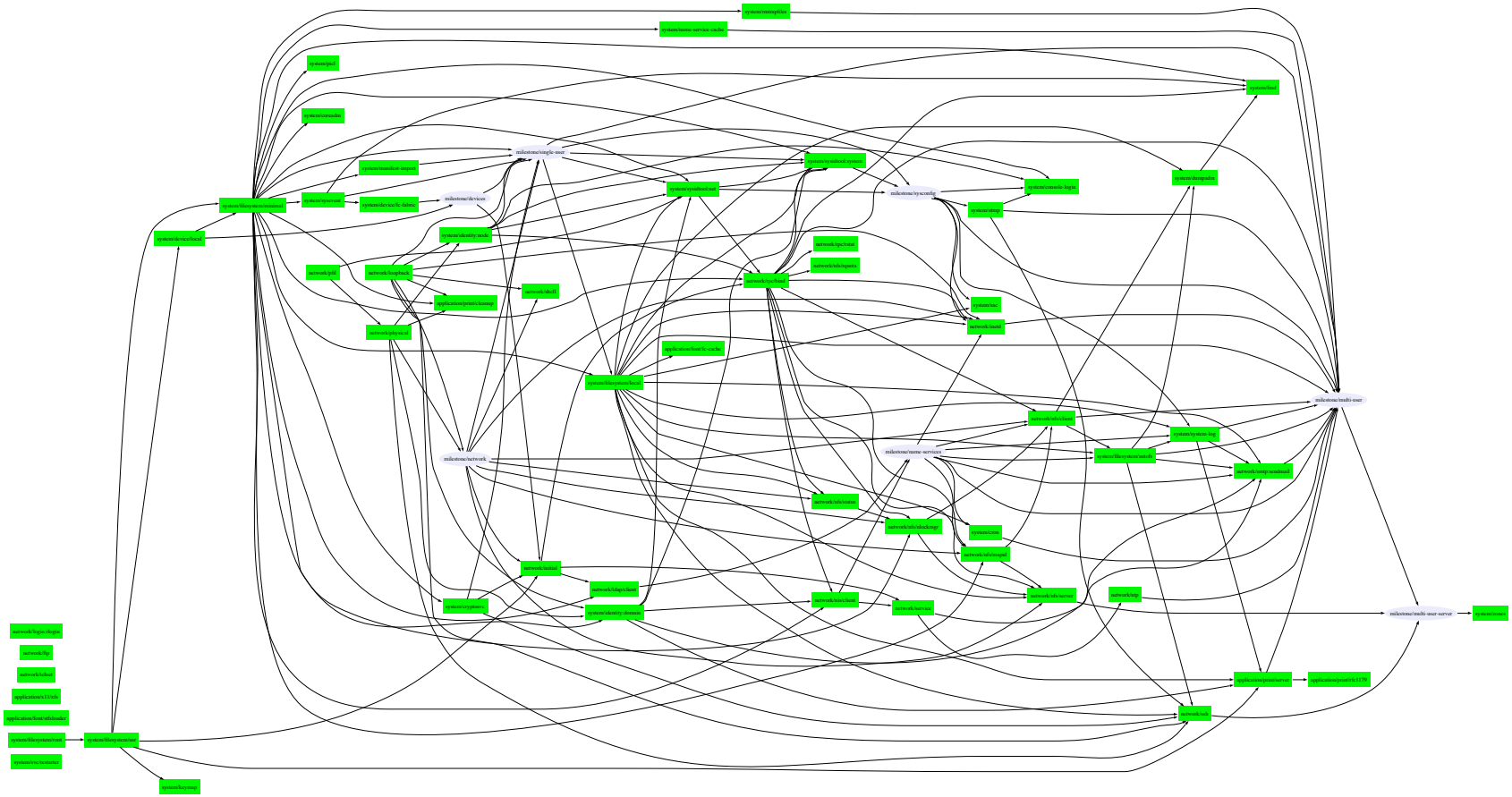
'A service is a long-lived software object with a well-defined state, error boundary, definition of start and stop, and relationships to other services. A service is often critical to operation of system or fulfillment of business objectives.'

(stolen from `http://mediacast.sun.com/share/lianep/t-smf-sane-may-2006.pdf` *)*

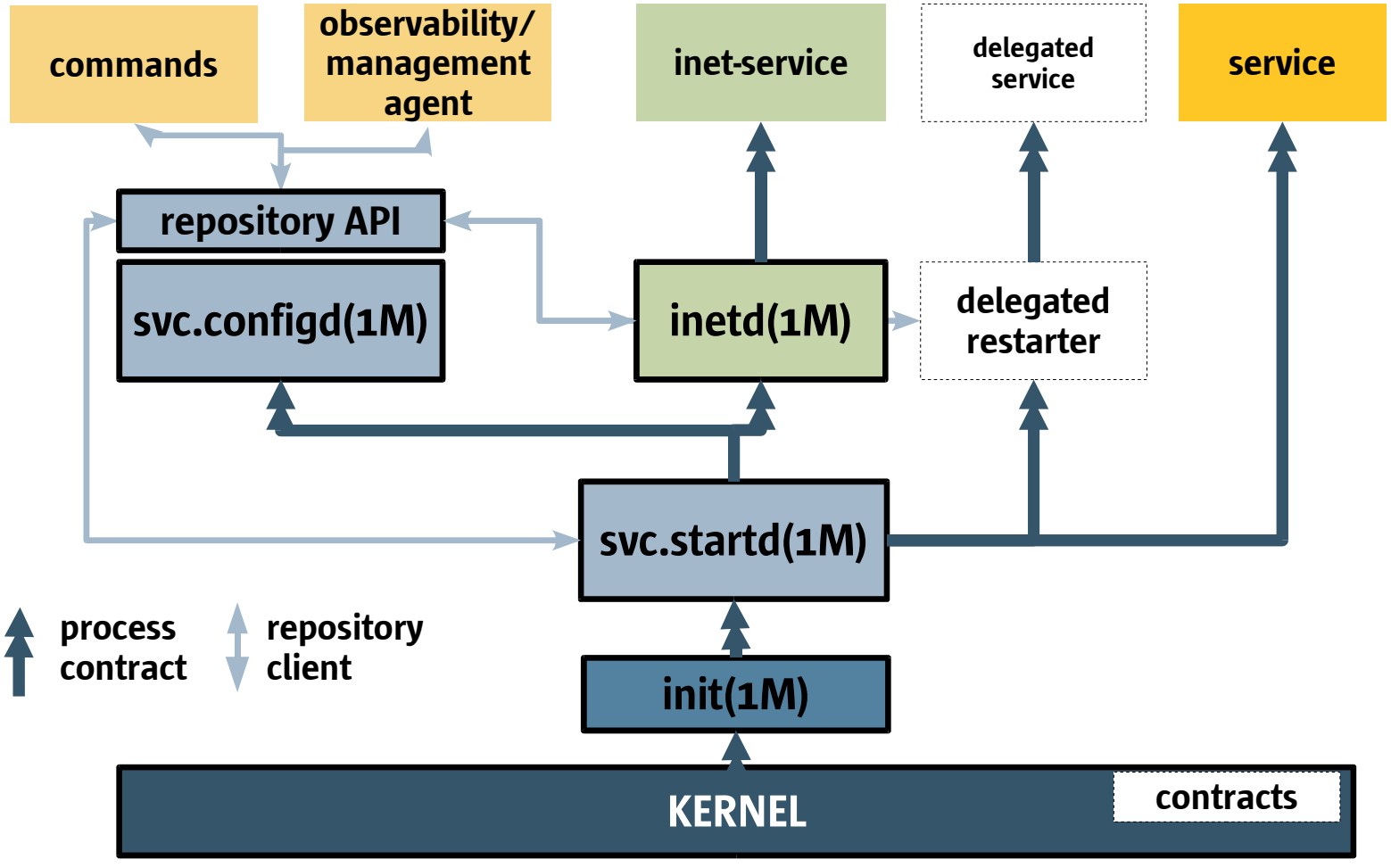
What does SMF do?

- replaces the conventional method of starting services via scripts in `/etc/rc?.d`
- uses a single daemon (svc.startd) to start, monitor, restart, and stop services
- configuration and state are kept in a database (SQLite, in `/etc/svc`)
- database is populated from XML files (manifests, profiles)
- handles startup, dependencies, fault detection and management, ...

Service dependency hell



Components: Architecture schematic



(stolen from `http://mediacast.sun.com/share/lianep/t-smf-sane-may-2006.pdf`)

A typical first encounter with SMF

- `/etc/rc?.d` and `/etc/inetd.conf` are suspiciously empty.
- Where are all my init scripts?
- I kill daemon X, and it just reappears!
- How do I stop this f*****g daemon?

SMF administration

- svcs: print the state of all services, including reasons for failure and dependant services
- svcadm: enable/disable services, clear fault states
- svccfg: import new service descriptions, change properties

Example: svcs

```
$ svcs -x svc:/network/smtp:sendmail
svc:/network/smtp:sendmail (sendmail SMTP mail transfer agent)
 State: online since Wed Nov 30 18:29:34 2005
   See: sendmail(1M)
   See: /var/svc/log/network-smtp:sendmail.log
Impact: None.

$ svcs -D svc:/network/smtp:sendmail
STATE          STIME    FMRI
online         Nov_30   svc:/milestone/multi-user:default

$ svcs -d svc:/network/smtp:sendmail
STATE          STIME    FMRI
online         Nov_30   svc:/system/identity:domain
online         Nov_30   svc:/system/filesystem/local:default
online         Nov_30   svc:/milestone/name-services:default
online         Nov_30   svc:/network/service:default
online         Nov_30   svc:/system/filesystem/autofs:default
online         Nov_30   svc:/system/system-log:default
```

Adding a new service

- services are described by a manifest (XML file)
- components of a manifest:
  - service name
  - dependencies
  - methods for starting, stopping, and refreshing the configuration of a service
  - specific instances
  - environment for methods (user/group, environment variables)
  - when to restart a service (after processes exit, on core dumps, on signals received, ...)
- is imported via svccfg

A manifest example

```
 1  <?xml version="1.0"?>
 2  <!DOCTYPE service_bundle SYSTEM
 3    "/usr/share/lib/xml/dtd/service_bundle.dtd.1">
 4
 5  <service_bundle type='manifest'
 6    name='OracleListener9.2.0'>
 7
 8  <service
 9    name='application/oracle/listener'
10    type='service'
11    version='1'>
12
13    <single_instance />
```

A manifest example (cont'd)

```
15      <dependency
16        name='fs-local'
17        grouping='require_all'
18        restart_on='none'
19        type='service'>
20        <service_fmri
21          value='svc:/system/filesystem/local'/>
22      </dependency>
23
24      <!-- ... -->
25
26      <dependent
27        name='oracle-multiuser-server'
28        grouping='require_all'
29        restart_on='none'>
30        <service_fmri
31          value='svc:/milestone/multi-user-server'/>
32      </dependent>
```

A manifest example (cont'd)

```
34      <instance name='v9-2-0' enabled='false'>
35
36        <dependency
37          name='config'
38          grouping='require_all'
39          restart_on='restart'
40          type='path'>
41          <service_fmri
42            value='file://localhost/local/oracle
                  /9.2.0/network/admin/listener.ora'/>
43        </dependency>
```

A manifest example (cont'd)

```
45      <exec_method type='method' name='start'
46        exec='/local/oracle/9.2.0/bin/lsnrctl␣
              start'
47        timeout_seconds='60'>
48        <method_context>
49          <method_credential
50            user='oracle' group='dba' />
51          <method_environment>
52            <envvar
53              name='ORACLE_HOME' value='/local/
                    oracle/9.2.0/' />
54          </method_environment>
55        </method_context>
56      </exec_method>
57      <exec_method type='method' name='refresh'
58        exec='/local/oracle/9.2.0/bin/lsnrctl␣
              reload'
59        timeout_seconds='60'>
60        <!-- ... -->
61      </exec_method>
```

A typical second encounter with SMF

- Ick, XML!
- Ick, a database! ('That's just like a Registry for Unix!')
- Isn't all this stuff needlessly complicated?
- Can't I just turn it off?

What's so great about SMF?

- services are first-class objects
- faults can be detected
  without SMF: No way of monitoring a service
  - if it detaches or spawns child processes
  - for signals received or core dumps, or hardware errors
- dependencies can be restarted
- everything is restartable, even svc.startd
- automatic logging of all output
- parallel startup
- kill processes belonging to a service, and only them
  - no fiddling around with pgrep or pid files
- no fiddling with su to run service as a different user
- transaction-safe configuration repository

Under the hood: Contracts

- How does svc.startd detect exiting processes or signals received?
- conventional Unix API does not support this kind of service monitoring
- contracts are a kernel feature of Solaris 10
- contracts have
  - an owner (may be orphaned)
  - member processes
  - event sets (informative, critical, fatal)
- member processes and their children stay in the same contract, unless they explicitly create a new contract
- contracts can be monitored for being empty, for signals, for core dumps, and hardware errors
- contracts can be regained (after owning process exits)

Looking at a contract

```
bash-3.00 ctstat -i 6549 -v
CTID    ZONEID  TYPE    STATE   HOLDER  EVENTS  QTIME   NTIME
6549    150     process owned   13964   0       -       -
        cookie:                 0x20
        informative event set:  none
        critical event set:     hwerr empty
        fatal event set:        none
        parameter set:          inherit regent
        member processes:       20828 20830 20832 20834 20836 20838 20840 20842
        inherited contracts:    none
bash-3.00 ps -f -p 13964,20828,20830,20832,20834,20836,20838,20840,20842
     UID   PID  PPID   C    STIME TTY         TIME CMD
    root 13964 13949   0   Sep 22 ?           1:00 /lib/svc/bin/svc.startd
  oracle 20828 13949   0   Sep 29 ?           1:31 ora_pmon_ZTEST
  oracle 20830 13949   0   Sep 29 ?           0:40 ora_dbw0_ZTEST
  oracle 20832 13949   0   Sep 29 ?           1:39 ora_lgwr_ZTEST
  oracle 20834 13949   0   Sep 29 ?           4:21 ora_ckpt_ZTEST
  oracle 20836 13949   0   Sep 29 ?           0:26 ora_smon_ZTEST
  oracle 20838 13949   0   Sep 29 ?           0:00 ora_reco_ZTEST
  oracle 20840 13949   0   Sep 29 ?           1:41 ora_cjq0_ZTEST
  oracle 20842 13949   0   Sep 29 ?           2:36 ora_qmn0_ZTEST
```

What else?

- store properties in the repository
  For example:
  - store name of Apache config file in repository
  - have several instances with different config files
- SMF is integrated with RBAC (role-based access control)
  - you can delegate rights to restart services or change their configuration to ordinary users
- supports delegated restarters
  - example: inetd
- is integrated with zones
  - pgrep/pkill in the global zone? Bad idea...

What is SMF not?

- SMF is not network aware (no dependencies/restarts across different machines)
- SMF just does process monitoring, not monitoring of functionality
- SMF is not provisioning.

Where can I find out more?

- SMF introduction at BigAdmin:
  `http://www.sun.com/bigadmin/content/selfheal/smf-quickstart.html`
- Liana Praza's blog:
  `http://blogs.sun.com/lianep`
- SMF design criteria:
  `http://blogs.sun.com/roller/page/lianep/20050208`
- SMF and RBAC:
  `http://learningsolaris.com/archives/2005/04/25/smf_and_rbac/`
- link collection at del.icio.us:
  `http://del.icio.us/tag/solaris+smf`

Questions? Feedback?

Thanks for listening!

Slides are available at

`http://www.sebastian-kirsch.org/moebius/docs/smf.pdf`

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