<epam>

Systemd

Linux Essentials

TRAINING

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What is Systemd

systemd is a Linux initialization system and service manager with such features as:

- on-demand starting of daemons
- mount and automount point maintenance
- snapshot support
- processes tracking using Linux control groups.

systemd is the default init system for the major Linux distribution.

What is a Unit. Types of Units

Unit is a resource systemd tools know how to deal with.
These resources are defined using configuration files called **unit files**.

Units are stored in these directories:

- */usr/lib/systemd/system/*
- */run/systemd/system/*
- */etc/systemd/system/*

Types of units:

.service – the most used one	.automount	.timer
.socket	.swap	.snapshot
.device	.target	.slice
.mount	.path	.scope

Basic commands for services and units

```
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl list-units --type=service
UNIT                                LOAD   ACTIVE SUB     DESCRIPTION
auditd.service                      loaded active running Security Auditing Service
chronyd.service                     loaded active running NTP client/server
cloud-config.service                loaded active exited  Apply the settings specified in cloud-config
cloud-final.service                 loaded active exited  Execute cloud user/final scripts
cloud-init-local.service            loaded active exited  Initial cloud-init job (pre-networking)
cloud-init.service                  loaded active exited  Initial cloud-init job (metadata service crawler)
crond.service                       loaded active running Command Scheduler
dbus.service                        loaded active running D-Bus System Message Bus
dracut-shutdown.service             loaded active exited  Restore /run/initramfs on shutdown
getty@tty1.service                  loaded active running Getty on tty1
import-state.service                loaded active exited  Import network configuration from initramfs
kdump.service                       loaded active exited  Crash recovery kernel arming
kmod-static-nodes.service           loaded active exited  Create list of required static device nodes for the current kernel
NetworkManager-wait-online.service loaded active exited  Network Manager Wait Online
NetworkManager.service              loaded active running Network Manager
nis-domainname.service              loaded active exited  Read and set NIS domainname from /etc/sysconfig/network
polkit.service                      loaded active running Authorization Manager
rngd-wake-threshold.service         loaded active exited  Hardware RNG Entropy Gatherer Wake threshold service
rngd.service                        loaded active running Hardware RNG Entropy Gatherer Daemon
rsyslog.service                     loaded active running System Logging Service
serial-getty@ttyS0.service          loaded active running Serial Getty on ttyS0
sshd.service                        loaded active running OpenSSH server daemon
sssd.service                        loaded active running System Security Services Daemon
systemd-journal-flush.service       loaded active exited  Flush Journal to Persistent Storage
systemd-journald.service            loaded active running Journal Service
systemd-logind.service              loaded active running Login Service
systemd-random-seed.service         loaded active exited  Load/Save Random Seed
systemd-remount-fs.service          loaded active exited  Remount Root and Kernel File Systems
systemd-sysctl.service              loaded active exited  Apply Kernel Variables
systemd-tmpfiles-setup-dev.service loaded active exited  Create Static Device Nodes in /dev
systemd-tmpfiles-setup.service      loaded active exited  Create Volatile Files and Directories
systemd-udev-trigger.service        loaded active exited  udev Coldplug all Devices
systemd-udevd.service               loaded active running udev Kernel Device Manager
systemd-update-utmp.service         loaded active exited  Update UTMP about System Boot/Shutdown
systemd-user-sessions.service       loaded active exited  Permit User Sessions
tuned.service                       loaded active running Dynamic System Tuning Daemon
user-runtime-dir@1000.service       loaded active exited  /run/user/1000 mount wrapper
user@1000.service                   loaded active running User Manager for UID 1000

LOAD   = Reflects whether the unit definition was properly loaded.
ACTIVE = The high-level unit activation state, i.e. generalization of SUB.
SUB    = The low-level unit activation state, values depend on unit type.

38 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
[ec2-user@ip-172-31-45-199 ~]$
```

- *systemctl list-units* – lists all available unites.
- *systemctl list-units --type=<unit_type>* – lists all units of this type

Basic commands for services and units

- *sudo systemctl status <application.service>*
- *sudo systemctl start <application.service>*
- *sudo systemctl stop <application.service>*

```
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl status nginx
● nginx.service - The nginx HTTP and reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; disabled; vendor preset: disabled)
   Active: active (running) since Wed 2020-10-21 08:05:02 UTC; 1min 18s ago
  Process: 14064 ExecStart=/usr/sbin/nginx (code=exited, status=0/SUCCESS)
  Process: 14063 ExecStartPre=/usr/sbin/nginx -t (code=exited, status=0/SUCCESS)
  Process: 14061 ExecStartPre=/usr/bin/rm -f /run/nginx.pid (code=exited, status=0/SUCCESS)
 Main PID: 14066 (nginx)
    Tasks: 2 (limit: 4867)
   Memory: 4.0M
   CGroup: /system.slice/nginx.service
           ├─14066 nginx: master process /usr/sbin/nginx
           └─14067 nginx: worker process

Oct 21 08:05:02 ip-172-31-45-199.eu-central-1.compute.internal systemd[1]: Starting The nginx HTTP and reverse proxy server...
Oct 21 08:05:02 ip-172-31-45-199.eu-central-1.compute.internal nginx[14063]: nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
Oct 21 08:05:02 ip-172-31-45-199.eu-central-1.compute.internal nginx[14063]: nginx: configuration file /etc/nginx/nginx.conf test is successful
Oct 21 08:05:02 ip-172-31-45-199.eu-central-1.compute.internal systemd[1]: nginx.service: Failed to parse PID from file /run/nginx.pid: Invalid argument
Oct 21 08:05:02 ip-172-31-45-199.eu-central-1.compute.internal systemd[1]: Started The nginx HTTP and reverse proxy server.
[ec2-user@ip-172-31-45-199 ~]$
```

Basic commands for services and units

```
Type=forking
Restart=no
PIDFile=/run/nginx.pid
NotifyAccess=none
RestartUSec=100ms
TimeoutStartUSec=1min 30s
TimeoutStopUSec=5s
RuntimeMaxUSec=infinity
WatchdogUSec=0
WatchdogTimestampMonotonic=0
PermissionsStartOnly=no
RootDirectoryStartOnly=no
RemainAfterExit=no
GuessMainPID=yes
MainPID=14066
ControlPID=0
FileDescriptorStoreMax=0
NFileDescriptorStore=0
StatusErrno=0
Result=success
UID=[not set]
GID=[not set]
NRestarts=0
ExecMainStartTimestamp=Wed 2020-10-21 08:05:02 UTC
ExecMainStartTimestampMonotonic=1935109203
ExecMainExitTimestampMonotonic=0
ExecMainPID=14066
ExecMainCode=0
ExecMainStatus=0
```

- *sudo systemctl show <application.service>* – shows low-level properties of a unit

Basic commands for services and units

```
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl list-dependencies nginx
nginx.service
● ├─-.mount
● ├─system.slice
● └─sysinit.target
●   ├─dev-hugepages.mount
●   ├─dev-mqueue.mount
●   ├─dracut-shutdown.service
●   ├─import-state.service
●   ├─kmod-static-nodes.service
●   ├─ldconfig.service
●   ├─loadmodules.service
●   ├─nis-domainname.service
●   ├─proc-sys-fs-binfmt_misc.automount
●   ├─rngd.service
●   ├─selinux-autorelabel-mark.service
●   ├─sys-fs-fuse-connections.mount
●   ├─sys-kernel-config.mount
●   ├─sys-kernel-debug.mount
●   ├─systemd-ask-password-console.path
●   ├─systemd-binfmt.service
●   ├─systemd-firstboot.service
●   ├─systemd-hwdb-update.service
●   ├─systemd-journal-catalog-update.service
●   ├─systemd-journal-flush.service
●   ├─systemd-journald.service
●   ├─systemd-machine-id-commit.service
●   ├─systemd-modules-load.service
●   ├─systemd-random-seed.service
●   ├─systemd-sysctl.service
●   ├─systemd-sysusers.service
●   ├─systemd-tmpfiles-setup-dev.service
●   ├─systemd-tmpfiles-setup.service
●   ├─systemd-udev-trigger.service
●   ├─systemd-udevd.service
●   ├─systemd-update-done.service
●   ├─systemd-update-utmp.service
●   ├─cryptsetup.target
●   ├─local-fs.target
●   │ ├─-.mount
●   │ └─systemd-remount-fs.service
●   └─swap.target
[ec2-user@ip-172-31-45-199 ~]$
```

- *sudo systemctl list-dependencies <application.service>* – shows a unit's dependency tree

Basic commands for services and units

```
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl mask nginx.service
Created symlink /etc/systemd/system/nginx.service → /dev/null.
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl start nginx.service
Failed to start nginx.service: Unit nginx.service is masked.
[ec2-user@ip-172-31-45-199 ~]$
```

- *sudo systemctl mask <application.service>* – mark a unit as *completely* unstartable, automatically or manually

```
NetworkManager.service                          enabled
nginx.service                                   masked
nis-domainname.service                          enabled
```

- *sudo systemctl list-unit-files* – shows unit status

```
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl unmask nginx.service
Removed /etc/systemd/system/nginx.service.
[ec2-user@ip-172-31-45-199 ~]$ sudo systemctl start nginx.service
[ec2-user@ip-172-31-45-199 ~]$
```

- *sudo systemctl unmask <application.service>* – make unit available for use again

Simple systemd file

```
[Unit]
Description=Apache Tomcat Web Application Container
After=syslog.target network.target

[Service]
Type=forking

Environment=JAVA_HOME=/usr/lib/jvm/jre
Environment=CATALINA_PID=/opt/tomcat/temp/tomcat.pid
Environment=CATALINA_HOME=/opt/tomcat
Environment=CATALINA_BASE=/opt/tomcat
Environment='CATALINA_OPTS=-Xms512M -Xmx1024M -server -XX:+UseParallelGC'
Environment='JAVA_OPTS=-Djava.awt.headless=true -Djava.security.egd=file:/dev/./urandom'

ExecStart=/opt/tomcat/bin/startup.sh
ExecStop=/bin/kill -15 $MAINPID

User=tomcat
Group=tomcat
UMask=0007
RestartSec=10
Restart=always

[Install]
WantedBy=multi-user.target
```

Unit – Used for defining metadata for the unit and configuring the relationship of the unit to other units.
Service – Used to provide configuration that is only applicable for services.
Install – This section is optional and is used to define the behavior or a unit if it is enabled or disabled