Operating System

Lab 10

Init-based Run Levels in Linux

In Linux with an init system manager, the run level defines the operating state of the init process and the whole system and indicates system services that are running.

When the Linux Kernel boots, the init process is the first thing that gets started, and further, it leads to the initialization of other Linux processes.

The moment the init process begins it looks for the value of the default run level of the system. Run level i.e. state of the system is represented in a single-digit integer.

The Standard Linux kernel supports the following seven different run levels:

0 – Halt the system
1 – Single user mode
2 – Multiple user mode with no network file system
3 – Multiple user mode under CLI
4 – User-definable
5 – Multiple user mode under GUI
6 – Reboot

By default, if a system has a desktop environment like GNOME or KDE, it boots to graphical run level 5, or else the command line run level 3.

Change Init-Based Run Levels in Linux

If you want to know the current run level of your system it is running, type:

```
$ runlevel
```

Output

```
sarvottam@linuxshelltips:~$ runlevel
N 5
sarvottam@linuxshelltips:~$
```

To switch to CLI from GUI, change the run level to 3 by running:

```
$ sudo init 3
```

Enter and password and you'll be redirected to the command line mode where you need to log in again.

Likewise, if you want to come back to GUI from CLI, type the following in the command line:

```
$ sudo init 5
```

Systemd-Based Boot Target In Linux

Currently, the majority of Linux distributions have already replaced the old init system with the modern systemd system manager. Hence, instead of the runlevel concept, we need to use the Systemd-based target concept to switch between CLI and GUI in Linux.

Similar to runlevel 3 for CLI and runlevel 5 for GUI, systemd has a corresponding target multi-user.target for CLI and graphical.target for GUI.

By executing the below command, you can list all systemd active targets:

```
$ systemctl list-units --type target
```

Output

```
sarvottam@linuxshelltips:~$ systemctl list-units --type target
  UNIT                     LOAD   ACTIVE SUB    DESCRIPTION
  basic.target             loaded active active Basic System
  cryptsetup.target        loaded active active Local Encrypted Volumes
  getty-pre.target         loaded active active Preparation for Logins
  getty.target             loaded active active Login Prompts
  graphical.target         loaded active active Graphical Interface
  local-fs-pre.target      loaded active active Preparation for Local File Sy
  local-fs.target          loaded active active Local File Systems
  multi-user.target        loaded active active Multi-User System
  network-online.target    loaded active active Network is Online
  network-pre.target       loaded active active Preparation for Network
  network.target           loaded active active Network
  nss-lookup.target        loaded active active Host and Network Name Lookups
  nss-user-lookup.target   loaded active active User and Group Name Lookups
  paths.target             loaded active active Path Units
  remote-fs.target         loaded active active Remote File Systems
  slices.target            loaded active active Slice Units
  snapd.mounts-pre.target loaded active active Mounting snaps
  snapd.mounts.target      loaded active active Mounted snaps
  sockets.target           loaded active active Socket Units
  swap.target              loaded active active Swaps
  sysinit.target           loaded active active System Initialization
  time-set.target          loaded active active System Time Set
  timers.target            loaded active active Timer Units
  veritysetup.target       loaded active active Local Verity Protected Volume

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.
24 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
sarvottam@linuxshelltips:~$
```