The Domino 10 RHEL 7 Primer

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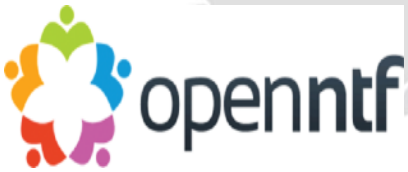


Agenda

- Introduction
- Important Insights
- Subscription Management
- Systemd
- Journald
- Containers
- A Few Upgrade Tips
- Reference Material
- Your Questions

Introduction

Disclaimer

- If you do anything that causes you or your company harm with what you see here, neither the presenter nor anyone connected with the conference is responsible
- But, my services are available to assist if you need help. :-)

Important Notation

Many of the new features of RHEL 7.x are provided through open source projects Red Hat does not run

Thus, they inherit the work and the changes

Finding the Current Release (Good)

This is consistent across all versions

- Handy if you are touching a box built by another admin
- Or if you suspect your documentation is incorrect/incomplete

```
[root@localhost system]# cat /etc/redhat-release
Red Hat Enterprise Linux Server release 7.5 (Maipo)
```

But… This is Better

The *redhat-release* file can be edited to install some third party apps, destroying accuracy

Instead, doublecheck with RPM

```
[root@localhost ~]# rpm -q redhat-release-server
redhat-release-server-7.5-8.el7.x86_64
```

Important Insights

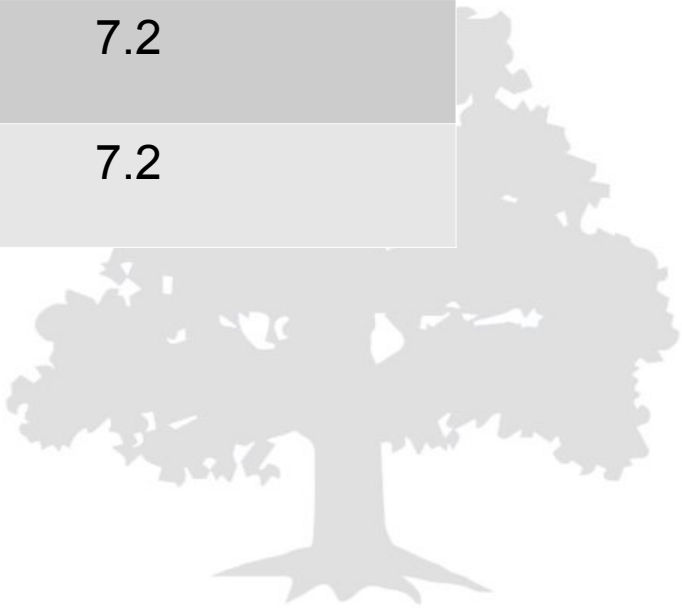
- Domino on Docker will be built on CentOS
  - A Linux only offering
- Release target is Oct 10, 2018
- Support to provide best effort for CentOS

Domino 10 Installation Status

- Tips and opinions for changes to file locations, filesystem sizing, memory requirements all remain under NDA--as of this writing
- When I can discuss the details, I will update---if needed---my previous recommendations on filesystem partitioning for IBM software plus planning particulars

Domino 10 Minimum OS Requirements

OS	Version
RHEL	7.4+
SLES	11 & 12
AIX	7.2
IBM i	7.2



Filesystem Changes in RHEL 7

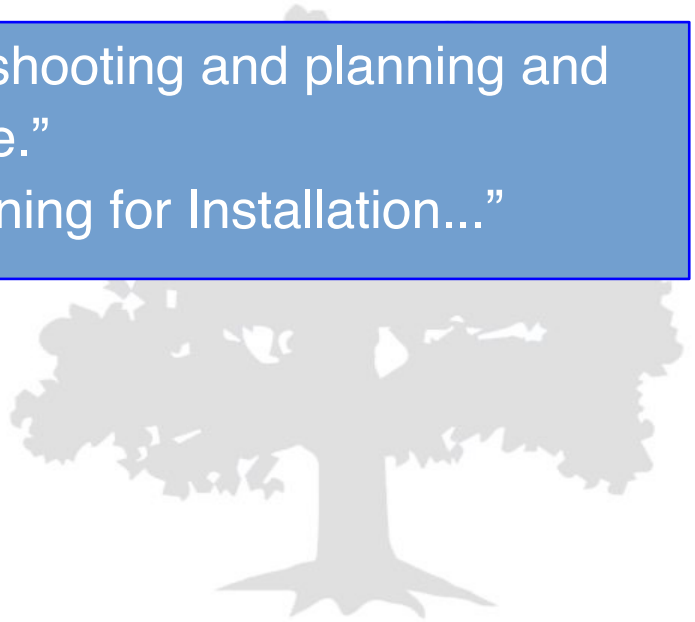
- Ext4 now supports 50TB file system size
  Previously, 16TB
- *XFS is the default FS*
  - Automatically assigned to / via Anaconda
  - Very difficult to resize an XFS filesystem
  - Best for partitions > 50TB; up to 500TB
- The directories /bin, /sbin, /lib, and /lib64 are now nested under /usr.

In-place Upgrade vs. Clean Install

Red Hat offers *Preupgrade Assistant*

- Assesses the current system
- Provides list of potential issues

"An in-place upgrade requires a lot of troubleshooting and planning and should only be done if there is no other choice."
--*RHEL 7 Installation Guide*, Chapter 3, "Planning for Installation..."



In-place Upgrade vs. Clean Install (2)


```
preupgrade-assistant risk check found EXTREME risks
for this upgrade.
Run preupg --riskcheck --verbose to view these risks.
Continuing with this upgrade is not recommended.
```

In case the last slide wasn't clear... go clean!

However, Updates are Really Easy

Before

```
[root@localhost system]# cat /etc/redhat-release
Red Hat Enterprise Linux Server release 7.2 (Maipo)
```

Start

```
[root@localhost system]# yum update
```

Confirm Install

```
Transaction Summary
================================================================
Install   13 Packages (+55 Dependent packages)
Upgrade  389 Packages

Total download size: 376 M
Is this ok [y/d/N]:
```

Red Hat security keys import prompt

```
(457/457): libreport-plugin-ureport-2.1.11-40.el7.x86_64.rpm
--------------------------------------------------------------------------------
Total
Retrieving key from file:///etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release
Importing GPG key 0xFD431D51:
 Userid     : "Red Hat, Inc. (release key 2) <security@redhat.com>"
 Fingerprint: 567e 347a d004 4ade 55ba 8a5f 199e 2f91 fd43 1d51
 Package    : redhat-release-server-7.2-9.el7.x86_64 (@anaconda/7.2)
 From       : /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release
Is this ok [y/N]: y
Importing GPG key 0x2FA658E0:
 Userid     : "Red Hat, Inc. (auxiliary key) <security@redhat.com>"
 Fingerprint: 43a6 e49c 4a38 f4be 9abf 2a53 4568 9c88 2fa6 58e0
 Package    : redhat-release-server-7.2-9.el7.x86_64 (@anaconda/7.2)
 From       : /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release
Is this ok [y/N]:
```

Update – Final Status

Success

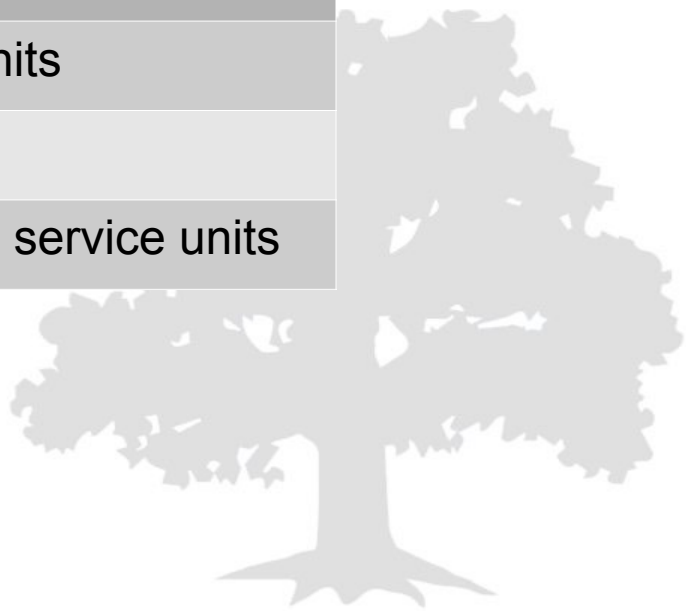
```
Replaced:
  NetworkManager.x86_64 1:1.0.6-27.el7   grub2.x86_64 1:2.02-0.29.el7      grub2-tools.x86_64 1:2.02-0.29.el7          pygobject3-base.x86_64 0:3.14.0-3.el7
  python-rhsm.x86_64 0:1.15.4-5.el7      rdma.noarch 0:7.2_4.1_rc6-1.el7   redhat-access-insights.noarch 0:1.0.6-0.el7

Complete!
```

After - Verify the new release version

```
[root@localhost system]# cat /etc/redhat-release
Red Hat Enterprise Linux Server release 7.5 (Maipo)
```

RHEL7 provides new terminology to better capture what technology offers

Old Term	New Term
Runlevels	Target units
Tasks	Units
init scripts	Systemd service units



Good News on Transitioning

To ease into the new terminology and system commands, systemd will accept ---for now---the RHEL6 command set

Examples:

1. service
2. chkconfig
3. runlevel
4. init

```
# chkconfig cups on
Note: Forwarding request to 'systemctl enable cups.service'.
```

Source: “Overview of systemd for RHEL 7” https://access.redhat.com/articles/754933

Security Changes: Bye, Bye iptables

- RHEL7 utilizes *firewalld*
  - New Dynamic Firewall
  - Project homepage: http://www.firewalld.org/
- Beginners Guide

  https://www.certdepot.net/rhel7-get-started-firewalld/
- Red Hat's Thomas Woerner's Training Video

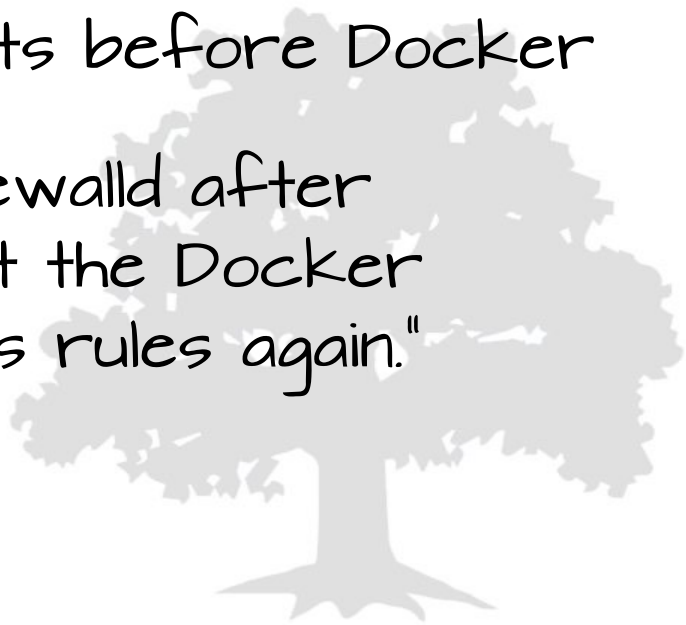
  https://www.youtube.com/watch?v=XhwvT05Puhs

Docker Conflict with firewalld & systemd

- "Why am I having network problems after firewalld is restarted?"

  https://success.docker.com/article/why-am-i-having-network-problems-after-firewalld-is-restarted

- With systemd, firewalld starts before Docker
- "If you start or restart firewalld after Docker, you need to restart the Docker daemon to enable the iptables rules again."



Firewalld can be disabled for *iptables*

- *CertDepot has an article with the full command set to install iptables, enable it, and disable the firewalld unit*
- *https://www.certdepot.net/rhel7-disable-firewalld-use-iptables/*

Remember – New Boot Behavior

If "rescue" appears on kernel command line, system automatically enters rescue mode (*rescue.target* or *runlevel 1*)

Useful Commands in systemd 219

- Check overall system state

```
#systemctl is-system-running
```

- List installed timer units with elapse next

```
#systemctl list-timers
```

- Display unit's original unit file to display full configuration

```
#systemctl cat {unit_pattern}
```

Help — systemctl Output Table

`systemctl is-system-running` command states

Table 2. Manager Operational States

Name	Description
initializing	Early bootup, before basic.target is reached or the maintenance state entered.
starting	Late bootup, before the job queue becomes idle for the first time, or one of the rescue targets are reached.
running	The system is fully operational.
degraded	The system is operational but one or more units failed.
maintenance	The rescue or emergency target is active.
stopping	The manager is shutting down.

Source: *systemctl* man page

New RHEL Changes

Full major feature list for the two most recent releases

- RHEL 7.4

  https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/7.4_release_notes/

- RHEL 7.5

  https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/7.5_release_notes/

How to Install Just the Security Updates

Checking for any available security updates

```
[root@localhost ~]# yum check-update --security
Loaded plugins: langpacks, product-id, search-disabled-repos, subscription-manager
```

A few thousand lines of files displayed

```
No packages needed for security; 0 packages available
[root@localhost ~]#
```

Running the update command

(Future reference)

```
[root@localhost ~]# yum update --security
Loaded plugins: langpacks, product-id, search-disabled-repos, subscription-manager
No packages needed for security; 0 packages available
No packages marked for update
```

Another Reason to Update to RHEL 7.4

- Systemd - Denial of Service Vulnerability
- RH Technote
  https://access.redhat.com/security/vulnerabilities/2679271
- Affected Red Hat Products impacted:
  - RHEL 7.2, 7.3 for CVE-2016-7795
  - RHEL 7.0, 7.1 for CVE-2016-7796

Subscription Management

Subscription Management Creates Simplicity

Red Hat transitioned to Red Hat Subscription Management (RHSM) for all Red Hat products July 31st, 2017

A few useful commands: list, status, attach

```
[root@localhost ~]# subscription-manager list
+-------------------------------------------+
    Installed Product Status
+-------------------------------------------+
Product Name:   Red Hat Enterprise Linux Server
Product ID:     69
Version:        7.5
Arch:           x86_64
Status:         Subscribed
Status Details:
Starts:         07/21/2018
Ends:           07/21/2019
```

```
[root@localhost system]# subscription-manager attach


Installed Product Current Status:
Product Name: Red Hat Enterprise Linux Server
Status:       Subscribed

[root@localhost system]# subscription-manager status
+-------------------------------------------+
   System Status Details
+-------------------------------------------+
Overall Status: Current
```

```
[root@localhost ~]# subscription-manager status
+-------------------------------------------+
   System Status Details
+-------------------------------------------+
Overall Status: Current
```

Three Fundamental RHSM Commands

- Basic Registration with or without parameters

  ```
  #subscription-manager register --username
  <username> --password <password>
  ```

- List all available subscriptions

  ```
  #subscription-manager list --available –all
  ```

- Attach to appropriate subscription
  - **#subscription-manager attach --auto**

    OR
  - #subscription-manager attach –pool=<poolID>

List all available subscriptions

```
[root@server1 ~]# subscription-manager list --available
+-------------------------------------------+
    Available Subscriptions
+-------------------------------------------+
ProductName:            RHEL for Physical Servers
ProductId:              MKT-rhel-server
PoolId:                 ff8080812bc382e3012bc3845ca000cb
Quantity:               10
Expires:                2011-09-20
```

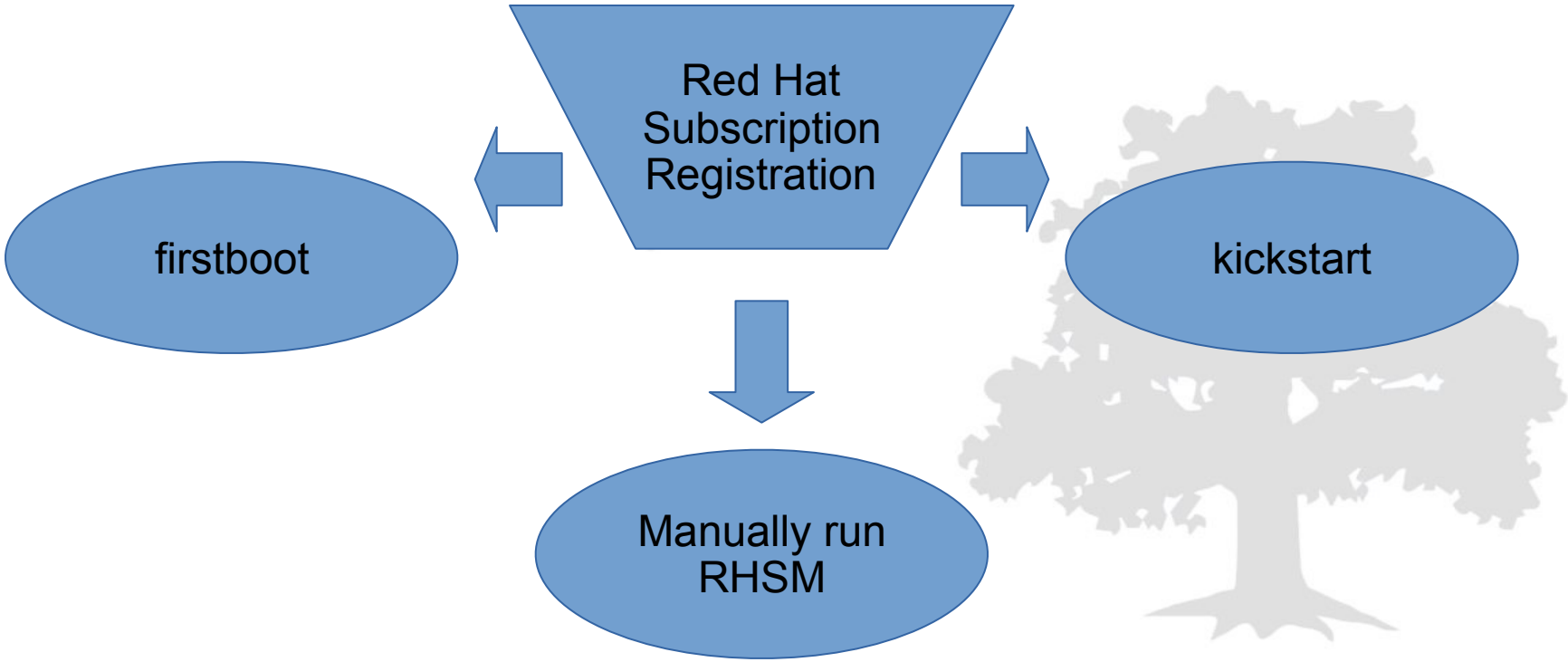
Footnote: Output provided via the Red Hat Subscription Manual, Section 4.3.1

Key RHSM Directories

Two key directory paths where confirmation information is stored:

- `/etc/pki/{consumer, entitlement, product}/*.pem`
- `/etc/rhsm/{rhsm.conf, facts/}`

Red Hat provides three convenient ways to attach your server to a subscription certificate



Subscription Manage Full Command Set 1-2

Primary modules

```
[root@localhost ~]# subscription-manager --?
Usage: subscription-manager MODULE-NAME [MODULE-OPTIONS] [--help]

Primary Modules:

  attach         Attach a specified subscription to the registered system
  list           List subscription and product information for this system
  refresh        Pull the latest subscription data from the server
  register       Register this system to the Customer Portal or another subscription management service
  release        Configure which operating system release to use
  remove         Remove all or specific subscriptions from this system
  status         Show status information for this system's subscriptions and products
  unregister     Unregister this system from the Customer Portal or another subscription management service
```

Subscription Manage Full Command Set 2-2

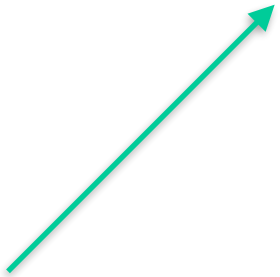
Other modules

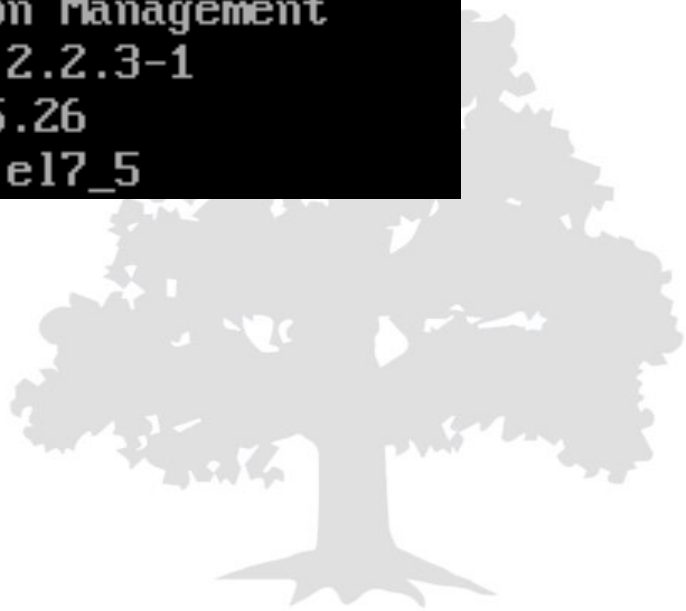
```
Other Modules:

  auto-attach     Set if subscriptions are attached on a schedule (default of daily)
  clean           Remove all local system and subscription data without affecting the server
  config          List, set, or remove the configuration parameters in use by this system
  environments    Display the environments available for a user
  facts           View or update the detected system information
  identity        Display the identity certificate for this system or request a new one
  import          Import certificates which were provided outside of the tool
  orgs            Display the organizations against which a user can register a system
  plugins         View and configure subscription-manager plugins
  redeem          Attempt to redeem a subscription for a preconfigured system
  repo-override   Manage custom content repository settings
  repos           List the repositories which this system is entitled to use
  service-level   Manage service levels for this system
  subscribe       Deprecated, see attach
  unsubscribe     Deprecated, see remove
  version         Print version information
```

Determining the RHSM Version

Relevancy: post version 1.1.9-1, *attach* supersedes the now deprecated *subscribe*

```
[root@localhost ~]# subscription-manager version
server type: Red Hat Subscription Management
subscription management server: 2.2.3-1
subscription management rules: 5.26
subscription-manager: 1.20.11-1.el7_5
```





Subscription Manager Notation – Help

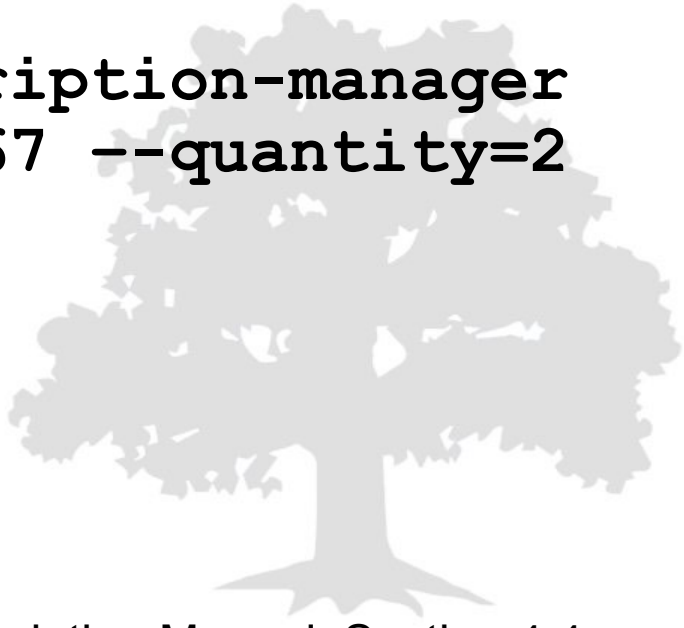
Primary Subscription Manager commands provide sub-commands

- Access via `-h` or `--help`
- *Attach* and *Register* offer the most options

```
[root@localhost ~]# subscription-manager attach -h
Usage: subscription-manager attach [OPTIONS]

Attach a specified subscription to the registered system

Options:
  -h, --help            show this help message and exit
  --proxy=PROXY_URL     proxy URL in the form of proxy_hostname:proxy_port
  --proxyuser=PROXY_USER
                        user for HTTP proxy with basic authentication
  --proxypassword=PROXY_PASSWORD
                        password for HTTP proxy with basic authentication
  --noproxy=NO_PROXY    host suffixes that should bypass HTTP proxy
  --pool=POOL           The ID of the pool to attach (can be specified more
                        than once)
  --quantity=QUANTITY   Number of subscriptions to attach. May not be used
                        with an auto-attach.
  --auto                Automatically attach compatible subscriptions to this
                        system. This is the default action.
  --servicelevel=SERVICE_LEVEL
                        Automatically attach only subscriptions matching the
                        specified service level; only used with --auto
  --file=FILE           A file from which to read pool IDs. If a hyphen is
                        provided, pool IDs will be read from stdin.
```

Powerful option: attach's `--quantity` command

- Allows assignment for multiple subscriptions to cover multi-socket servers
- `[root@server1 ~]#` **`subscription-manager attach --pool=XYZ01234567 --quantity=2`**



Footnote: Output provided via the Red Hat Subscription Manual, Section 4.4

My (Pre-Prod) Server is Not Online Yet

- Two Quick Use Cases
  1. Sans Internet access, you are unable to access Red Hat's subscription server
  2. Allocate a license before installation

- Solution

  Easy, with *import*

  - Get subscription file (`.pem`) via Customer Portal
  - Run this command:
    - `# subscription-manager import --certificate {/path/to/file.pem}`
    - `# subscription-manager import --certificate=/root/certs/6076874528963567 98.pem`
    - `Successfully imported certificate 6076874528963567 98.pem`

Removal vs. Unregister

Recycling Subscriptions is easy - ensure you use the correct method

- *Remove* expunges the subscribed certificate(s) assigned to the system, BUT keeps it registered with RHSM
- *Unregister* removes and deletes the system's registration record

Precise Removal

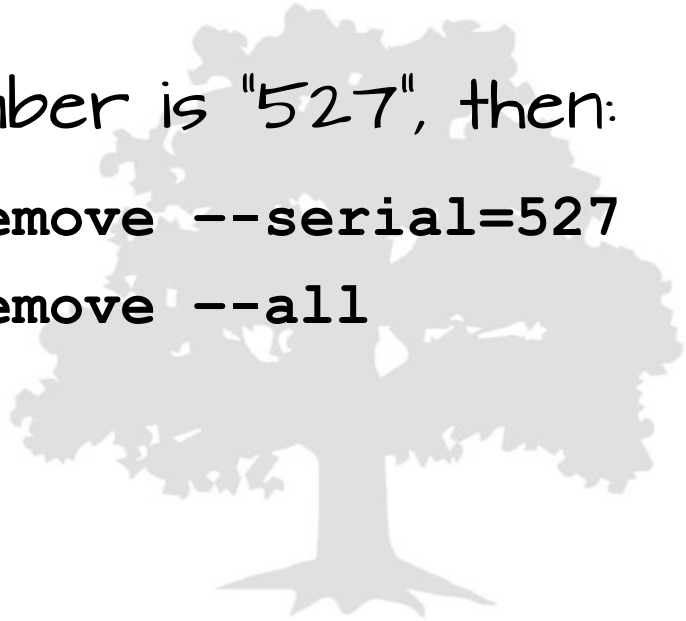
- Each registered product provides an identifying X.509 certificate

  `/etc/pki/entitlement/<serial_number>.pem`

- To remove a product's subscription, use the above certificate(s)' respective serial number(s)

  If a product's serial number is "527", then:

  - `#subscription-manager remove --serial=527`
  - `#subscription-manager remove --all`



Error: “No Installed Products Found”

- **#subscription-manager list**

```
No installed products to list
```

- Check to ensure `/etc/pki/product-default` has a respective `.pem` file
- Ensure file permissions of `644` are set, with `root:root`

```
[root@localhost ~]# ls -l /etc/pki/product-default/
total 4
-rw-r--r--. 1 root root 2159 Feb 28 10:42 69.pem
```

- You can also verify the RHSM log file:
  `/var/log/rhsm/rhsm.log`

Finally, to Acquire Additional Information

One of the best methods to learn about RHSM is to RTFM

```
$man subscription-manager
```

Systemd

Creating systemd Jargon Lucidity

Name	Function
systemd	The system and service manager Controls start, stop, and management of services Collection of daemons, utilities, targets, libraries, and core programs Grown to be much more than an init service
systemdctl	Command to query/manage systemd actions

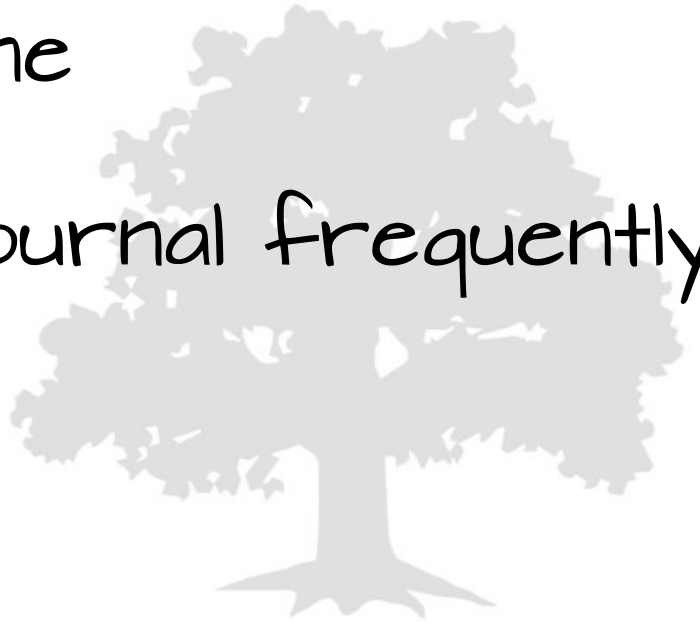
“What Does systemd Do For Me?”

- Is backwards compatible with SysV init scripts
- On-demand daemon activation
- System state snapshots
- Never loses initial log messages
- Kills all service components cleanly
- Server boots faster
  - Uses fewer scripts
  - Increased task (unit) parallelization
- Requires more reboots for patch installation than previously

Safety Tip

- Systemd uses binary log files
- Binary logs can become corrupted

  Cases of/references to systemd log corruption found online
- Backup the systemd Journal frequently to avoid pain later



Systemd's Distributed File Locations

Path	Provides
`/etc/systemd`	Global systemd configuration
`/etc/systemd/system/`	Systemd unit files created by systemctl enable, plus administrator created and managed units ***Supersedes runtime units (/run/systemd/system)***
`/run/systemd/system/`	Systemd units created at runtime
`/usr/lib/systemd/system`	Service configuration files
`/etc/systemd/system`	Custom service configuration files
`/usr/lib/systemd/system/`	RPM packages' distributed units

Use systemctl for System Interactions

Basic command set for systemctl

Command	Provides
`# systemctl --version`	Systemd version
`# systemctl start sshd`	Start a service
`# systemctl stop sshd`	Stop a service
`# systemctl {enable, disable} sshd`	Enable/disable a service at boot
`# systemctl status sshd`	Display current sevice status
`# systemctl status --all`	Display status for all status

Note: You can also include the *.service* extension above

Basic command set for systemd-analyze

Command	Provides
`# systemd-analyze`	Startup/boot-up duration
`# systemd-analyze critical-chain [<app>.service] | [unit.target]`	Linked list of boot-time tasks & times; examples - service = rcdomino.service target = basic.target
`# systemd-analyze dump`	Provides long human-readable serialization of boot process

Available systemd Unit Types

Unit Type	File Extension	Description
Service unit	`.service`	A system service.
Target unit	`.target`	A group of systemd units.
Automount unit	`.automount`	A file system automount point.
Device unit	`.device`	A device file recognized by the kernel.
Mount unit	`.mount`	A file system mount point.
Path unit	`.path`	A file or directory in a file system.
Scope unit	`.scope`	An externally created process.
Slice unit	`.slice`	A group of hierarchically organized units that manage system processes.
Snapshot unit	`.snapshot`	A saved state of the systemd manager.
Socket unit	`.socket`	An inter-process communication socket.
Swap unit	`.swap`	A swap device or a swap file.
Timer unit	`.timer`	A systemd timer.

Available systemd Unit Types — Attribution

The previous slide's robust table provided via:

RHEL 7 System Administration Guide, Table 8.1
https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/System_Administrators_Guide/chap-Managing_Services_with_systemd.html#tabl-Managing_Services_with_systemd-Introduction-Units-Types

Displaying Currently Active Units

Use the following command:

```
#systemctl
```

```
UNIT                                                                LOAD   ACTIVE SUB       DESCRIPTION
proc-sys-fs-binfmt_misc.automount                                   loaded active waiting   Arbitrary Executable File Formats File Sy
sys-devices-pci0000:00-0000:00:10.0-host0-target0:0:0-0:0:0:0-block-sda-sda1.device loaded active plugged   VMware_Virtual_S 1
sys-devices-pci0000:00-0000:00:10.0-host0-target0:0:0-0:0:0:0-block-sda-sda2.device loaded active plugged   VMware_Virtual_S 2
sys-devices-pci0000:00-0000:00:10.0-host0-target0:0:0-0:0:0:0-block-sda-sda3.device loaded active plugged   VMware_Virtual_S 3
sys-devices-pci0000:00-0000:00:10.0-host0-target0:0:0-0:0:0:0-block-sda.device loaded active plugged   VMware_Virtual_S
sys-devices-pci0000:00-0000:00:11.0-0000:02:01.0-net-eno16777736.device loaded active plugged   82545EM Gigabit Ethernet Controller
sys-devices-pci0000:00-0000:00:11.0-0000:02:02.0-sound-card0.device loaded active plugged   ES1371/ES1373 / Creative Labs CT2518 (Au
sys-devices-pci0000:00-0000:00:11.0-0000:02:05.0-ata4-host4-target4:0:0-4:0:0:0-block-sr0.device loaded active plugged   VMware_Virt
sys-devices-platform-serial8250-tty-ttyS1.device                    loaded active plugged   /sys/devices/platform/serial8250/tty/ttyS
sys-devices-platform-serial8250-tty-ttyS2.device                    loaded active plugged   /sys/devices/platform/serial8250/tty/ttyS
sys-devices-platform-serial8250-tty-ttyS3.device                    loaded active plugged   /sys/devices/platform/serial8250/tty/ttyS
sys-devices-pnp0-00:05-tty-ttyS0.device                             loaded active plugged   /sys/devices/pnp0/00:05/tty/ttyS0
sys-module-configfs.device                                          loaded active plugged   /sys/module/configfs
sys-subsystem-net-devices-eno16777736.device                        loaded active plugged   82545EM Gigabit Ethernet Controller (Copp
-.mount                                                             loaded active mounted   /
boot.mount                                                          loaded active mounted   /boot
dev-hugepages.mount                                                 loaded active mounted   Huge Pages File System
dev-mqueue.mount                                                    loaded active mounted   POSIX Message Queue File System
run-user-1000.mount                                                 loaded active mounted   /run/user/1000
sys-kernel-config.mount                                             loaded active mounted   Configuration File System
sys-kernel-debug.mount                                              loaded active mounted   Debug File System
brandbot.path                                                       loaded active waiting   Flexible branding
systemd-ask-password-plymouth.path                                  loaded active waiting   Forward Password Requests to Plymouth Dir
systemd-ask-password-wall.path                                      loaded active waiting   Forward Password Requests to Wall Directo
session-2.scope                                                     loaded active running   Session 2 of user malchw
```

Displaying Currently Active Units (2)

It's a long list. Here is the concluding output

```
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.

110 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
```

Determining Installed Units

Use the following command:

```
#systemctl list-unit-files
```

```
UNIT FILE                                   STATE
proc-sys-fs-binfmt_misc.automount           static
dev-hugepages.mount                         static
dev-mqueue.mount                            static
proc-sys-fs-binfmt_misc.mount               static
sys-fs-fuse-connections.mount               static
sys-kernel-config.mount                     static
sys-kernel-debug.mount                      static
tmp.mount                                   disabled
brandbot.path                               enabled
systemd-ask-password-console.path           static
systemd-ask-password-plymouth.path          static
systemd-ask-password-wall.path              static
session-2.scope                             static
abrt-ccpp.service                           enabled
abrt-oops.service                           enabled
abrt-pstoreoops.service                     disabled
abrt-vmcore.service                         enabled
abrt-xorg.service                           enabled
```

```
281 unit files listed.
lines 238-284/284 (END)
```

Note: systemctl command output now pipes into more

Boot Process Time Check

"You thought that was fast? I thought it was fast. Well was it?" -Annabelle in Maverick

RHEL 7.2

```
[root@localhost ~]# systemd-analyze
Startup finished in 902ms (kernel) + 2.629s (initrd) + 45.290s (userspace) = 48.821s
```

RHEL 7.5

```
[root@localhost ~]# systemd-analyze
Startup finished in 920ms (kernel) + 3.267s (initrd) + 45.135s (userspace) = 49.322s
```

Boot Process Critical-Chain Time Check


```
[root@localhost ~]# systemd-analyze critical-chain
The time after the unit is active or started is printed after the "@" character.
The time the unit takes to start is printed after the "+" character.

multi-user.target @45.122s
└─postfix.service @17.291s +2.613s
  └─network.target @17.260s
    └─network.service @15.885s +1.365s
      └─NetworkManager.service @15.022s +861ms
        └─network-pre.target @15.018s
          └─firewalld.service @12.633s +2.384s
            └─polkit.service @9.951s +2.656s
              └─basic.target @9.204s
                └─sockets.target @9.203s
                  └─dbus.socket @9.201s
                    └─sysinit.target @9.150s
                      └─systemd-update-utmp.service @9.096s +51ms
                        └─auditd.service @8.531s +555ms
                          └─systemd-tmpfiles-setup.service @8.455s +72ms
                            └─rhel-import-state.service @8.242s +210ms
                              └─local-fs.target @8.238s
                                └─run-user-1000.mount @40.817s
                                  └─swap.target @6.010s
                                    └─dev-disk-by\x2duuid-2bd53070\x2d18f6\x2d4f2d\x2d9a3e\x2d25cadf416c9a.swap @5.903s +106ms
                                      └─dev-disk-by\x2duuid-2bd53070\x2d18f6\x2d4f2d\x2d9a3e\x2d25cadf416c9a.device @5.899s
```

Note: Some output can provide a false positive as time may be dependent upon socket activation and unit parallel execution

Runlevel Translation Table from sysVinit

SysVinit to systemd conversions

Sysvinit Runlevel	Systemd Target	What does it do?
0	runlevel0.target, poweroff.target	System halt/shutdown
1, s, single	runlevel1.target, rescue.target	Single-user mode
2, 4	runlevel2.target, runlevel4.target, multi-user.target	User-defined/Site-specific runlevels. By default, identical to 3.
3	runlevel3.target, multi-user.target	Multi-user, non-graphical mode, text console only
5	runlevel5.target, graphical.target	Multi-user, graphical mode
6	runlevel6.target, reboot.target	Reboot
emergency	emergency.target	Emergency mode

Source: https://access.redhat.com/solutions/2142121

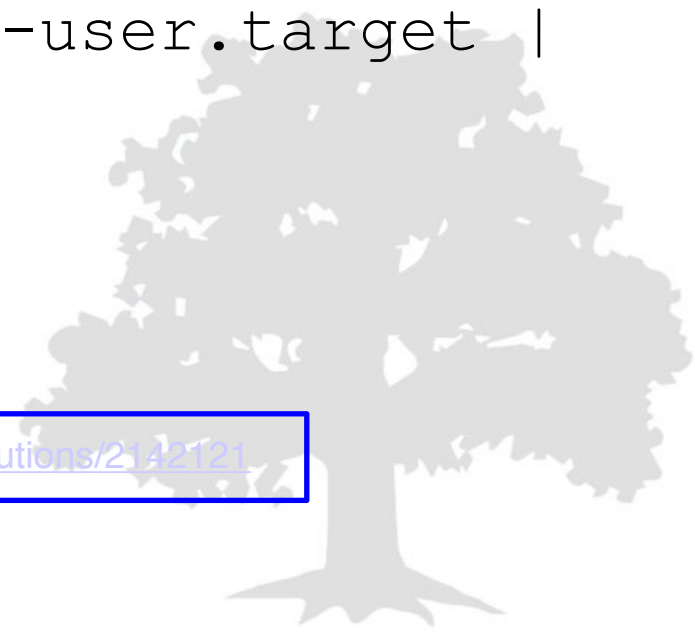
Set Default

```
# systemctl set-default <desired>.target
```

In real-time

```
systemctl isolate [multi-user.target |
graphical.target]
```

Source: https://access.redhat.com/solutions/2142121



Journal - The system event log file

Creating Journal Jargon Lucidity

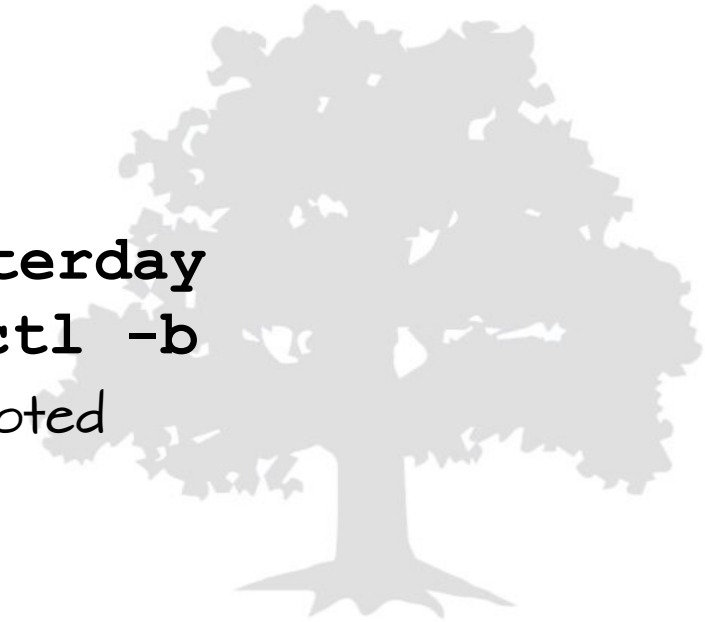
Name	Function
Journal	New systemd log file
journald	The Journal service (daemon)
journalctl	Tool allowing access to the Journal logs

Searching the systemd Journal

- Systemd manages the RHEL7 system log through the Journal component
  - Written via `systemd-journald.service`
  - Run `#journalctl`
- Notations
  - Listed time stamps converted to local time zone of your system
  - Beginning of a boot is tagged for parsing
  - Color coded fonts for errors, warning, and notices

Useful Journald Query Commands

- Print recent sshd entries, refresh as written
  #journalctl `which sshd` -f
- Print most recent 100 lines
  #journalctl -n 100
- Reverse display order
  #journalctl -r
- List time-based subset
  - **#journalctl --since=yesterday**
  - From previous boot: **#journalctl -b**
    Only helpful if just recently booted



Useful Journald Query Commands (2)

- Display recent boots

  #journalctl --list-boots

```
[root@localhost ~]# journalctl --list-boots
 0 c90983b5d86543f2bafa5765a6a09742 Tue 2018-07-24 18:00:42 PDT—Wed 2018-07-25 06:21:07 PDT
```

- Display all messages for current user or system
  - **#journalctl --user**
  - **#journalctl --system**

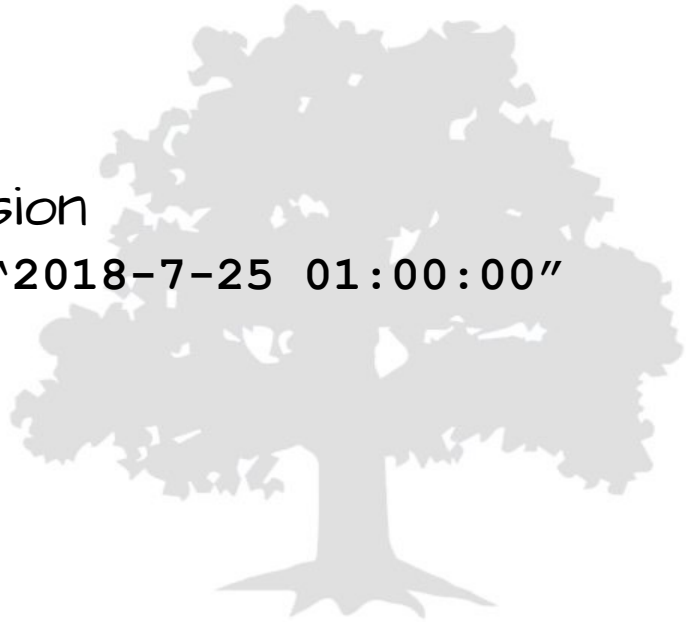
Useful Journald Query Commands (3)

- Filter by priority
  - `#journalctl -p {emerg, alert, crit, err, warning, notice, info, debug}`
  - **`#journalctl -p crit`**
- Filter by (output) forms

  `#journalctl -o {14 values}; eg. verbose, export, json`
- Filter by log fields: `$man system.journal-fields` for a list
  - **`#journalctl -F {fieldname}`**
  - **`#journalctl fieldname={value}`**
- Combine queries for surgical precision

  `#journalctl –p warning --since="2018-7-25 01:00:00"`
- Live feed - last ten lines in real-time

  `#journalctl -f`

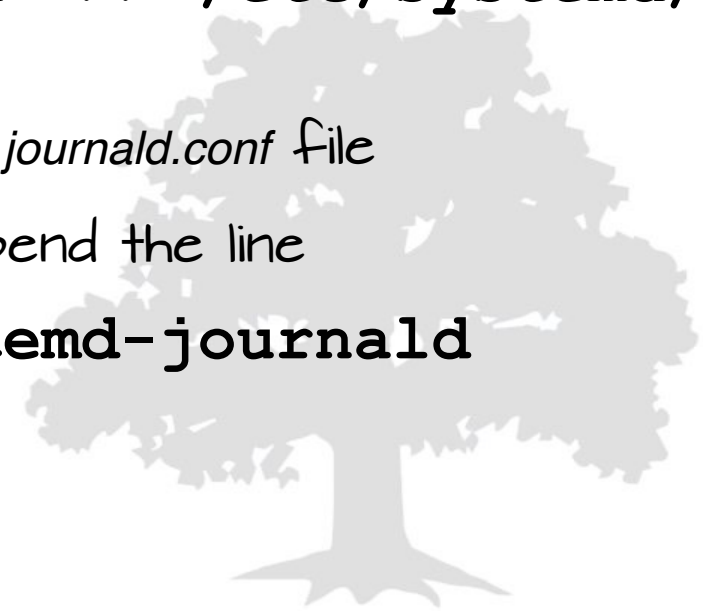


Journal Useful Tips

- Data stored in `/run/log/journal`

  But are purged after each reboot

- If permanency is desired - one way is below:
  - **#mkdir /var/log/journal**
  - **#echo "SystemMaxUse=75M" >> /etc/systemd/journald.conf**
    - Append the parameter to the *journald.conf* file
    - You could use *vi* as well to append the line
  - **#systemctl restart systemd-journald**



Let's See How Big the Journal Is

Journald provides a simple command:

```
#journalctl --disk-usage
```

```
[root@localhost ~]# journalctl --disk-usage
Archived and active journals take up 8.0M on disk.
```

Containers

Stating the Section's Scope

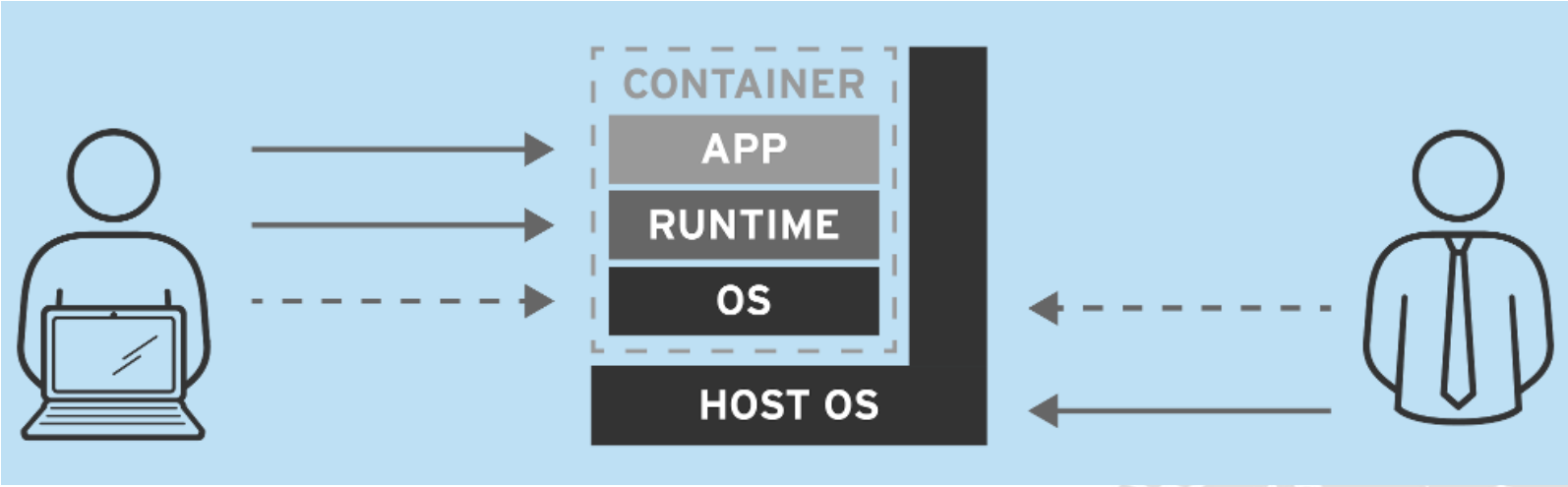
- CollabSphere contains great content via its sessions
- Two such cases discuss Docker Containers
  1. IS101 - Adopt Domino running in Docker Containers by Slobodan Lohja
  2. IS102 - An Introduction to Configuring Domino for Docker by Gabriella Davis
- Thus, this section provides an OS level taste

What are they?

Linux® containers keep applications and their runtime components together by combining lightweight application isolation with an image-based deployment method. Containers package applications with the files on which they depend. This reduces the friction between development and operations, simplifies application deployment, and accelerates delivery cycles—allowing you to deliver value to customers faster.

Source: “What are Linux containers?”, Red Hat site article
https://www.redhat.com/en/insights/containers

Let's Get Visual



Source: "What are Linux containers?", Red Hat site article
https://www.redhat.com/en/insights/containers

Three Ways Containers Can Help Admins

Collaborate	Compose	Modernize
Dev and Ops get apps in prod faster	Enables microservices deployment and recycling	Avoid maintaining physical environments with traditional applications

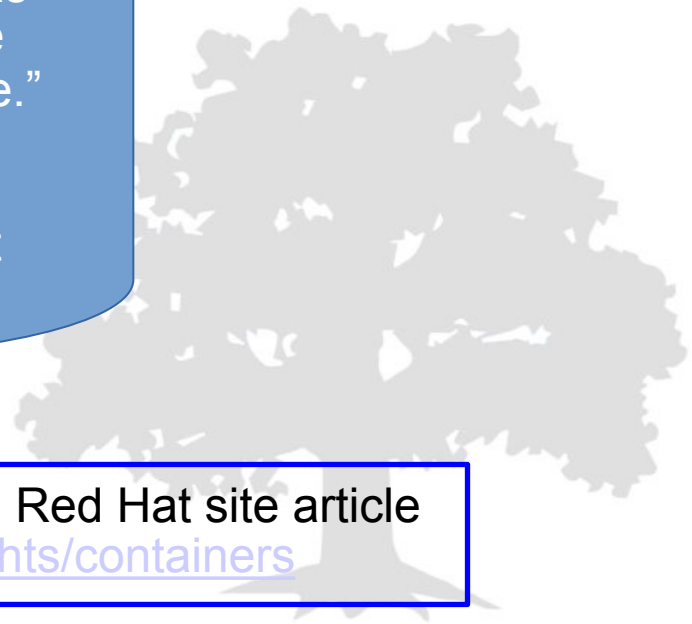
Mobile, Social, Web, Cloud
All make good deployment candidates

Source: “What are Linux containers?”, Red Hat site article
https://www.redhat.com/en/insights/containers

Security is of the Utmost Importance

Just because an application is contained,
does not imply it is secure...

"Security is just as important
Inside a container as
it is anywhere else
in your Infrastructure."
--Josh Bressers
Red Hat
Security Strategist



Source: "What are Linux containers?", Red Hat site article
https://www.redhat.com/en/insights/containers

There Are Container Changes in RHEL 7.5

- Buildah - fully supported now
  - Simplifies Docker container image creation
- OverlayFS: Docker container storage default
- Kubernetes RPMs, container images, plus docker-latest package deprecated
  - See Red Hat OpenShift for full support

Footnotes: Red Hat –
https://rhelblog.redhat.com/2018/04/10/container-related-changes-in-red-hat-enterprise-linux-7-5/
https://www.redhat.com/en/resources/The-Business-Value-of-Red-Hat-OpenShift

A Few Upgrade Tips

Mandatory User Account Creation at Install

- RHEL6+ you are required to create a user with firstboot
- User attributes are minimized
- Solution: create an ephemeral account
- Login as root
- Create new accounts properly
- Expunge the ephemeral account

Finding Mounted Hardware

Use *findmnt* to locate a new filesystem

- e.g. USB drive, second HDD
- $ **findmnt**

```
[root@localhost ~]# findmnt
TARGET                                SOURCE     FSTYPE     OPTIONS
/                                     /dev/sda3  xfs        rw,relatime,
├─/sys                                sysfs      sysfs      rw,nosuid,no
│ ├─/sys/kernel/security              securityfs securityfs rw,nosuid,no
│ ├─/sys/fs/cgroup                    tmpfs      tmpfs      ro,nosuid,no
│ │ ├─/sys/fs/cgroup/systemd          cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/perf_event       cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/devices          cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/cpu,cpuacct      cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/memory           cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/blkio            cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/cpuset           cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/hugetlb          cgroup     cgroup     rw,nosuid,no
│ │ ├─/sys/fs/cgroup/net_cls          cgroup     cgroup     rw,nosuid,no
│ │ └─/sys/fs/cgroup/freezer          cgroup     cgroup     rw,nosuid,no
│ ├─/sys/fs/pstore                    pstore     pstore     rw,nosuid,no
│ ├─/sys/fs/selinux                   selinuxfs  selinuxfs  rw,relatime
│ ├─/sys/kernel/debug                 debugfs    debugfs    rw,relatime
│ └─/sys/kernel/config                configfs   configfs   rw,relatime
├─/proc                               proc       proc       rw,nosuid,no
│ └─/proc/sys/fs/binfmt_misc          systemd-1  autofs     rw,relatime,
├─/dev                                devtmpfs   devtmpfs   rw,nosuid,se
│ ├─/dev/shm                          tmpfs      tmpfs      rw,nosuid,no
│ ├─/dev/pts                          devpts     devpts     rw,nosuid,no
│ ├─/dev/mqueue                       mqueue     mqueue     rw,relatime,
│ └─/dev/hugepages                    hugetlbfs  hugetlbfs  rw,relatime,
├─/run                                tmpfs      tmpfs      rw,nosuid,no
│ └─/run/user/1000                    tmpfs      tmpfs      rw,nosuid,no
└─/boot                               /dev/sda1  xfs        rw,relatime,
```

- Primary vendor documentation

  http://partnerweb.vmware.com/GOSIG/RHEL_7.html

- VMware Knowledge Base articles on RHEL7

  https://kb.vmware.com/s/global-search/%40uri#q=%22rhel%207%22&sort=relevancy

Become Even Smarter Through Reading Reference Material

- Understanding Linux Filesystems: ext4 and Beyond

  https://opensource.com/article/18/4/ext4-filesystem

- XFS and Other File Systems in Red Hat Enterprise Linux 7

  https://access.redhat.com/articles/796293

- Migration from EXT4 to XFS

  https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/storage_administration_guide/migrating-ext4-xfs#differences-ext4-xfs

- Appendix E. Reference Table for ext4 and XFS Commands

  https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/installation_guide/appe-ext4-to-xfs-command-reference

"New Red Hat Enterprise Linux 7 Security Feature: systemd-journald"

https://access.redhat.com/blogs/766093/posts/1976263

systemd Cheat Sheet for Red Hat Enterprise Linux 7

https://access.redhat.com/articles/systemd-cheat-sheet

Container Enablement

- Containers, Microservices, and Orchestrating the Whole Symphony

  https://opensource.com/business/14/12/containers-microservices-and-orchestrating-whole-symphony

- Red Hat Experts Author The Containers Blog

  http://rhelblog.redhat.com/tag/containers/

"Securing Containers Before They Take Over the World" - The Stack

https://thestack.com/security/2016/01/21/red-hat-insider-securing-containers-before-they-take-over-the-world/

Performance Tuning View CertDepot

https://www.certdepot.net/rhel7-apply-tuning-profile-server/

Need Help Burning an ISO Image to USB

Red Hat offers a nice step-by-step guide here

https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Installation_Guide/sect-making-usb-media.html

Quick Background

- Co-founder of Linuxfest at Lotusphere/Connect
- Speaker at 40+ Lotus®/IBM® LUGs/Conferences
- Co-authored two Linux IBM Redbooks
- IBM Champion for Collaboration Solutions

  2018, 2017, 2016, 2015, 2014, 2013, 2011-2012
- Linux aficionado

IBM COLLABORATION SOLUTIONS
IBM CHAMPION
7 YEAR MILESTONE
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redhat.
READY
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Follow-up — Contact Information

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