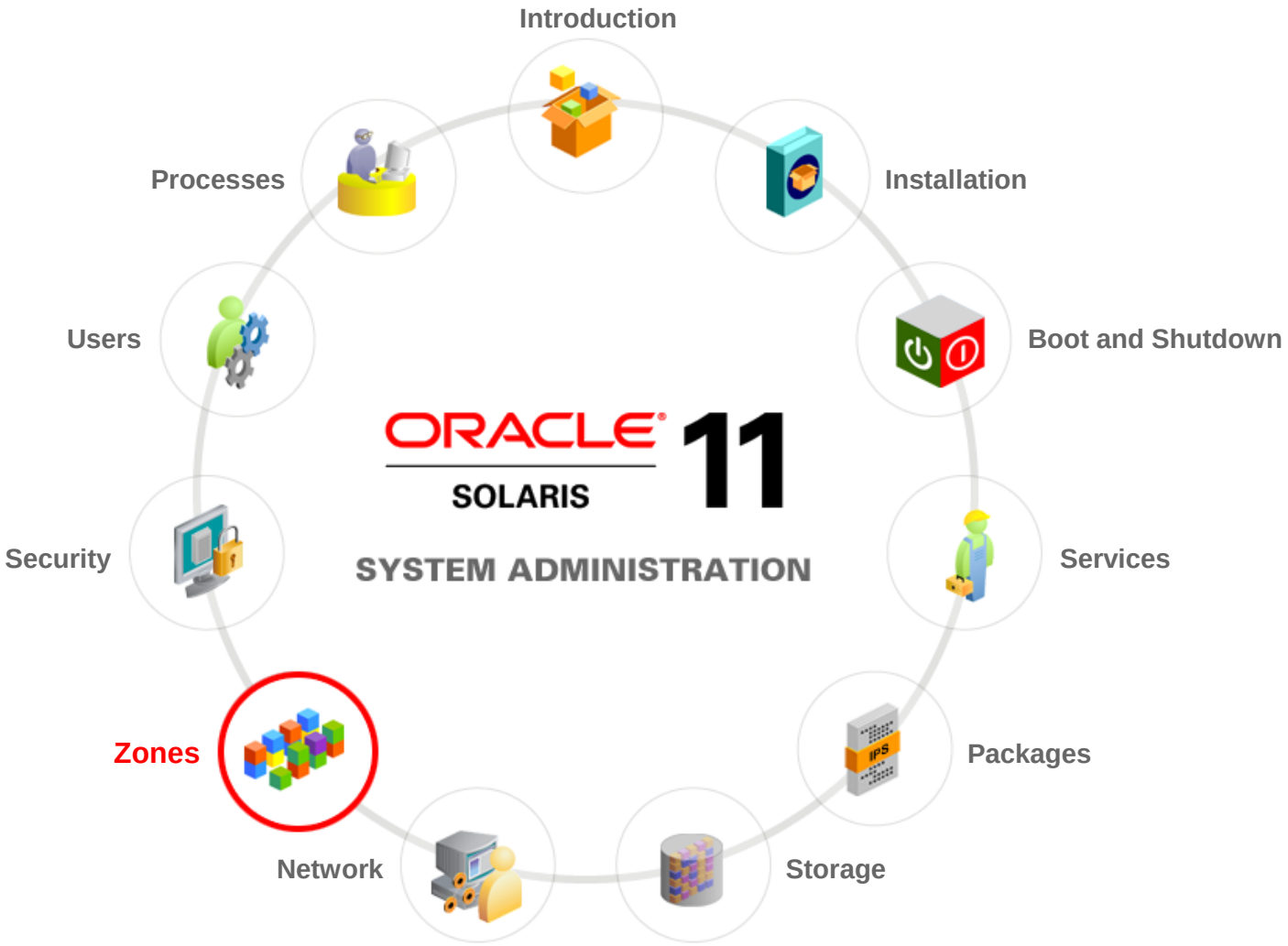
8

Administering Oracle Solaris Zones

Workflow Orientation



Objectives

After completing this lesson, you should be able to:

- Explain the fundamentals of Oracle Solaris zones
- Configure an Oracle Solaris zone
- Determine an Oracle Solaris zone configuration

Agenda

- **Introducing Oracle Solaris Zones**
- Configuring an Oracle Solaris Zone
- Determining an Oracle Solaris Zone Configuration

Oracle Solaris 11 Virtualization Technologies

- Virtualization technologies provide solutions to constantly changing business conditions.
- Data centers are using virtualization technologies to:
  - Consolidate applications and data onto fewer servers
  - Provide better flexibility for managing workloads
  - Support legacy applications on newer systems
  - Provision systems faster
  - Overcome scalability constraints
- The Oracle Solaris 11 virtualization technologies include:
  - Server virtualization
  - Desktop virtualization
  - Integrated solutions

Server Virtualization

- Oracle Solaris Zones
  - Provides isolated runtime environments for individual applications by using flexible, software-defined boundaries
- Oracle VM Server for SPARC
  - Is built for Oracle servers with the chip multithreading (CMT) technology
  - Is tightly integrated with the hardware
  - Reduces the overhead typically associated with software-based solutions
- Dynamic Domains
  - Are available on Oracle's Sun SPARC Enterprise M-Series servers
  - Divide a single machine into multiple electrically isolated partitions for efficient workload isolation

Desktop Virtualization

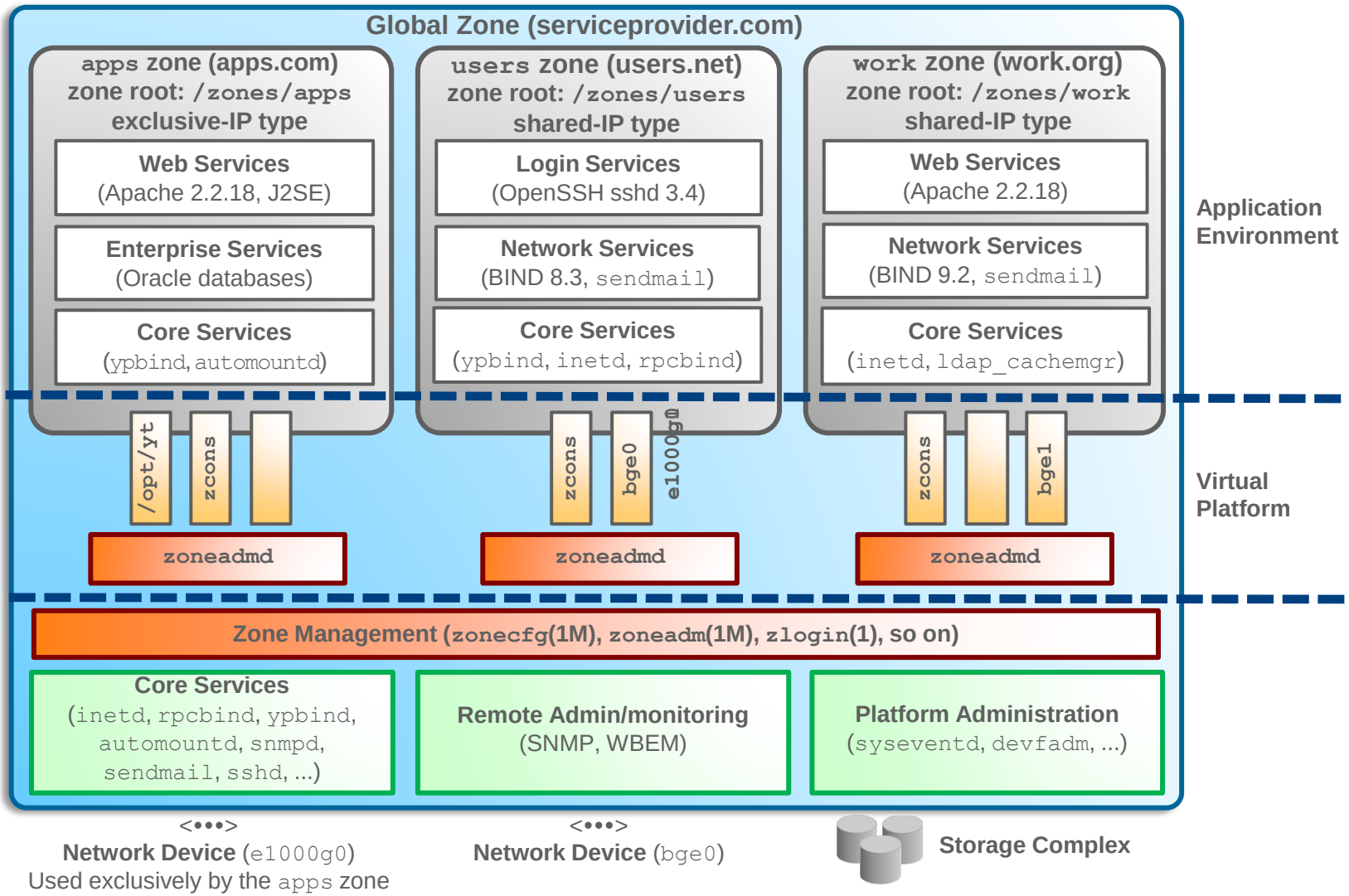
- Oracle Secure Global Desktop Software
  - Provides secure access to centralized, server-hosted Windows, UNIX, mainframe, and midrange applications from a variety of clients, including Windows PCs, Mac OS X systems, Oracle Solaris workstations, Linux PCs, thin clients, and more
- Oracle VM VirtualBox
  - Is an open-source solution that allows systems to run multiple environments at the same time to get the most flexibility and utilization

Oracle Solaris 11 Zones Technology: Overview

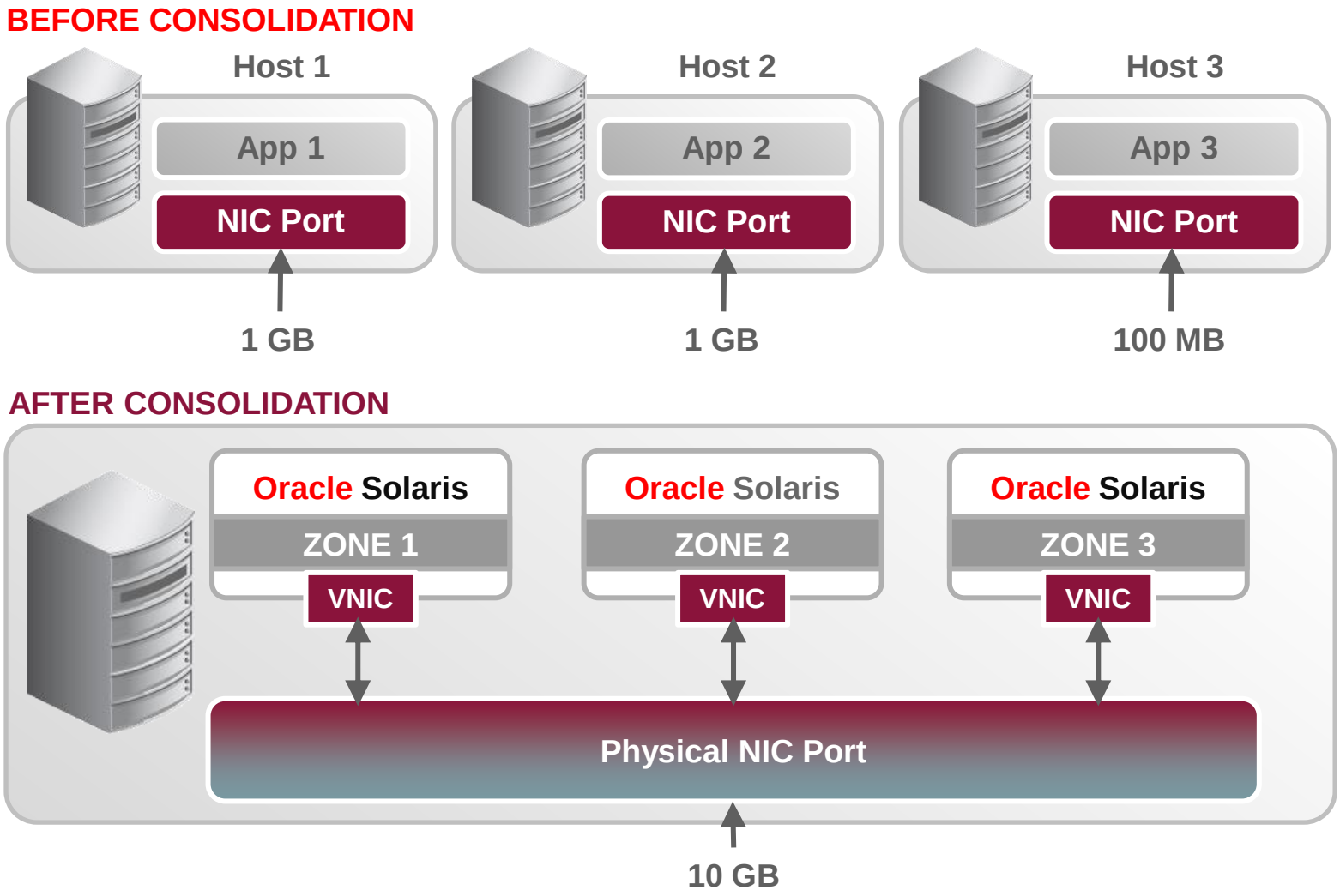
Zones:

- Provide an isolated and secure environment for running applications
- Are virtualized operating system environments, each created within a single instance of the OS
- Are isolated from each other and the rest of the system
- Enable a one-application-per-server deployment model to be maintained while simultaneously sharing hardware resources
- Support installing and running Oracle Solaris Zones on shared storage

When to Use Zones



Network Virtualization with Zones



Oracle Solaris Zones: Requirements and Restrictions

- Zones can be used on any machine that is running Oracle Solaris 10 or later.
- The number of zones is determined by the following:
  - Total resource requirement of the application software that is running in all the zones
  - Size of the system

Zone Types

- A global zone is:
  - The default zone for the system
  - Used for system-wide administration control
  - Used to configure, install, manage, or uninstall a non-global zone
  - Bootable from the system hardware
- Non-global zones enable:
  - Independent management of applications
  - Different versions of the same application to be run on the system
  - Allocation of system resources

Characteristics of the Global Zone and Non-Global Zones

Global Zone	Non-Global Zone
Is assigned ID 0 by the system	Is assigned a zone ID by the system when the zone is booted
Provides a single instance of the Oracle Solaris kernel that is bootable and running on the system	Shares operations under the Oracle Solaris kernel that is booted from the global zone
Contains a complete installation of the Oracle Solaris system software packages	Contains an installed subset of the complete Oracle Solaris operating system software packages
Can contain additional software packages or additional software, directories, files, and other data that are not installed through packages	Can contain additional software, directories, files, and other data created on the non-global zone that are not installed through packages; can also contain additional installed software packages

Characteristics of the Global Zone and Non-Global Zones

Global Zone	Non-Global Zone
Provides a complete and consistent product database that contains information about all the software components installed in the global zone	Provides a complete and consistent product database that contains information about all the software components installed in the zone
Holds configuration information that is specific only to the global zone, such as the global zone host name and file system table	Has configuration information that is specific only to that non-global zone, such as the non-global zone host name and file system table
Is the only zone that is aware of all device file systems, and non-global zones along with their configurations	Is not aware of the existence of any other zones
Is the only zone from which a non-global zone can be configured, installed, managed, or uninstalled	Cannot install, manage, or uninstall other zones, including itself

Branded Zones

- Provide an extension of Oracle Solaris zones
- Contain operating environments that are different from that of the global zone
- Run applications
- Use a brand (for example, `solaris10` brand) to:
  - Define the operating environment that can be installed in the zone
  - Determine how the system will behave within the zone
  - Identify the correct application type at application launch time
- Use extensions to the standard zone structure to perform branded zone management

Immutable (Read-Only) Zone

- A zone with a read-only root is called an Immutable Zone.
- It preserves a zone's integrity by using a read-only root file system.
- It blocks modifications to system binaries or system configurations.
- The `file-mac-profile` property:
  - Is used to configure a read-only root
  - Is set by using the `zonecfg` utility
  - Is not set by default

Zone Network Interfaces

- Zones communicate through IP network interfaces.
- The system administrator configures zone network interfaces during zone configuration.
- When a zone is booted, the network interfaces are set up and placed in the zone.
- Two IP types are available for non-global zones:
  - **Shared-IP:** A network interface is shared with the global zone.
  - **Exclusive-IP:** A network interface is dedicated to the non-global zone.

Quiz

Which type of zone is the default zone for a system?

a. Global zone
b. Non-global zone
c. Branded zone

Quiz

Which type of zone is the default zone for a system?

a. Global zone
b. Non-global zone
c. Branded zone

Quiz

Zones are isolated from each other and from the rest of the system.

a. True
b. False

Quiz

Zones are isolated from each other and from the rest of the system.

a. True
b. False

Quiz

A shared-IP zone must share a network interface with at least one other non-global zone.

a. True
b. False

Quiz

A shared-IP zone must share a network interface with at least one other non-global zone.

a. True

b. False

Quiz

Non-global zones can communicate only over a virtual network.

a. True
b. False

Agenda

- Introducing Oracle Solaris Zones
- **Configuring an Oracle Solaris Zone**
- Determining an Oracle Solaris Zone Configuration

Planning for a Non-Global Zone Configuration

Before configuring your non-global zone, its important to do the following:

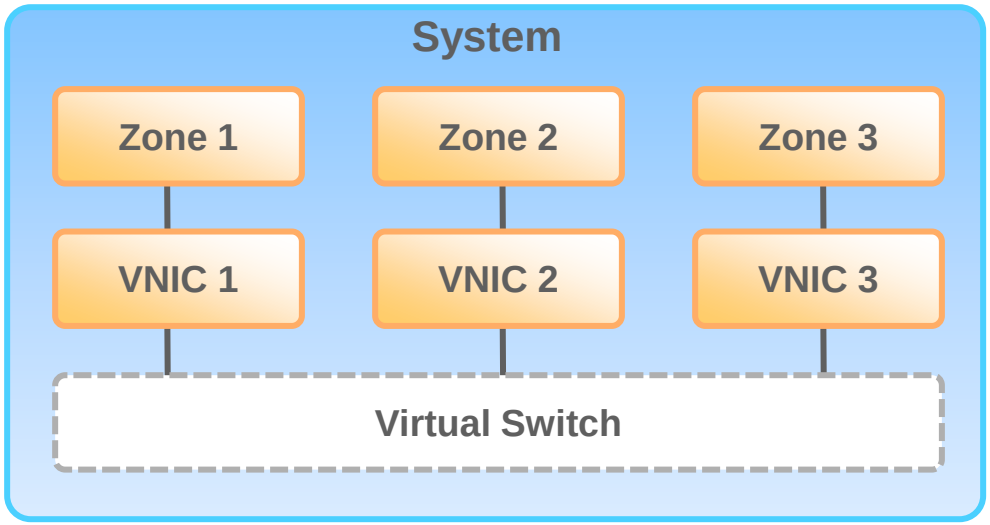
- Evaluate the applications that are running on your system to determine the applications that you want to run in a zone.
- Assess the availability of disk space to hold the files that are unique in the zone.
- Decide the naming convention you want to follow for your zone.
- Determine the zone path.
- Determine the type of zone (shared or exclusive) you want to set up. Note that exclusive-IP is the default type for zones.
- Determine the file system that you want to mount in the zone.
- Determine the network interface that should be made available in the zone.

Planning for a Virtual Network and Zones

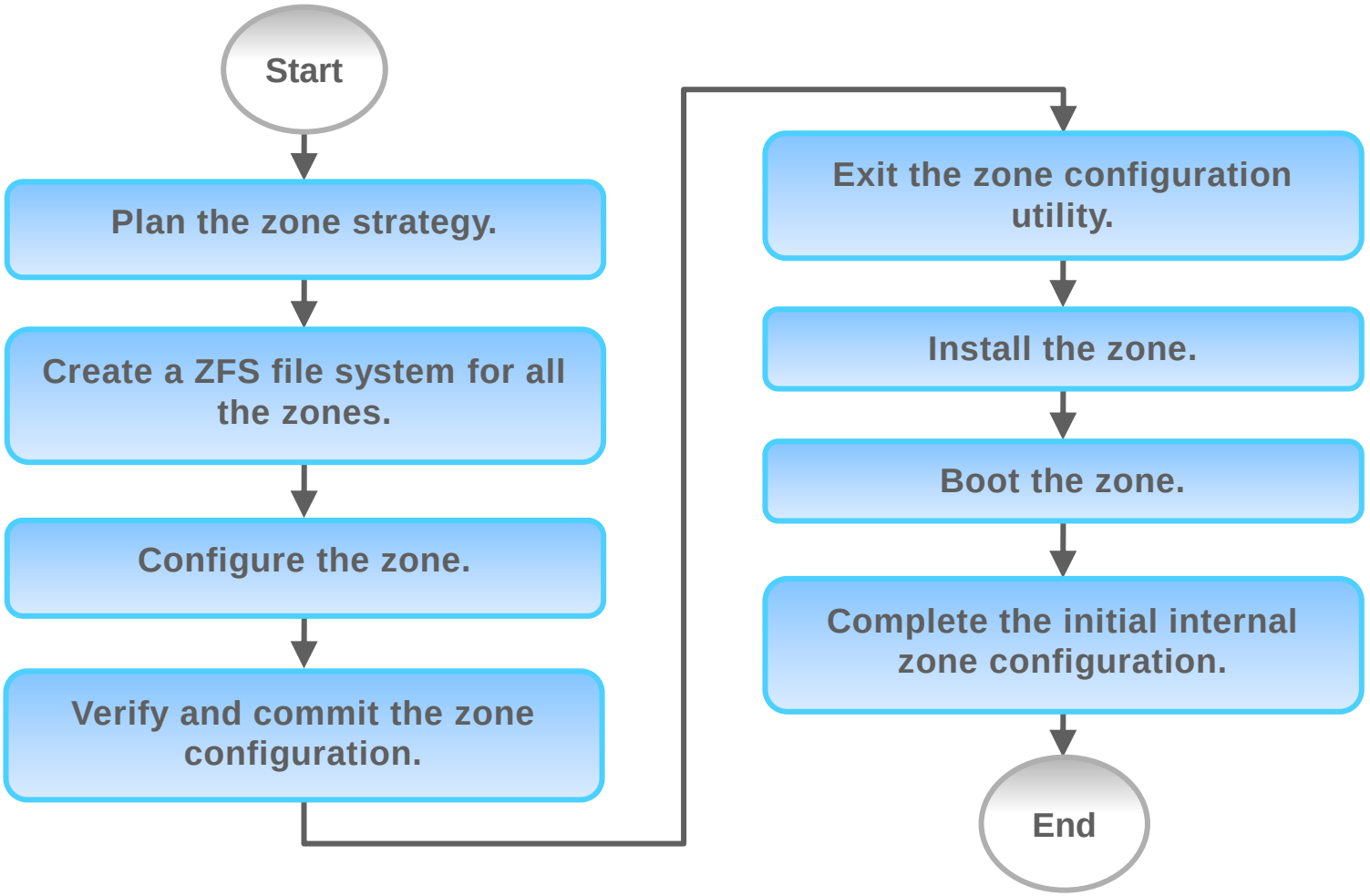
- Identify the virtual network configuration:
  - Virtual switch or etherstub
  - Number of VNICs and name assignments
- Identify the zone configuration:
  - Number of zones
  - Zone configuration details
  - Zone and VNIC assignments

Configuring Zones by Using VNICs

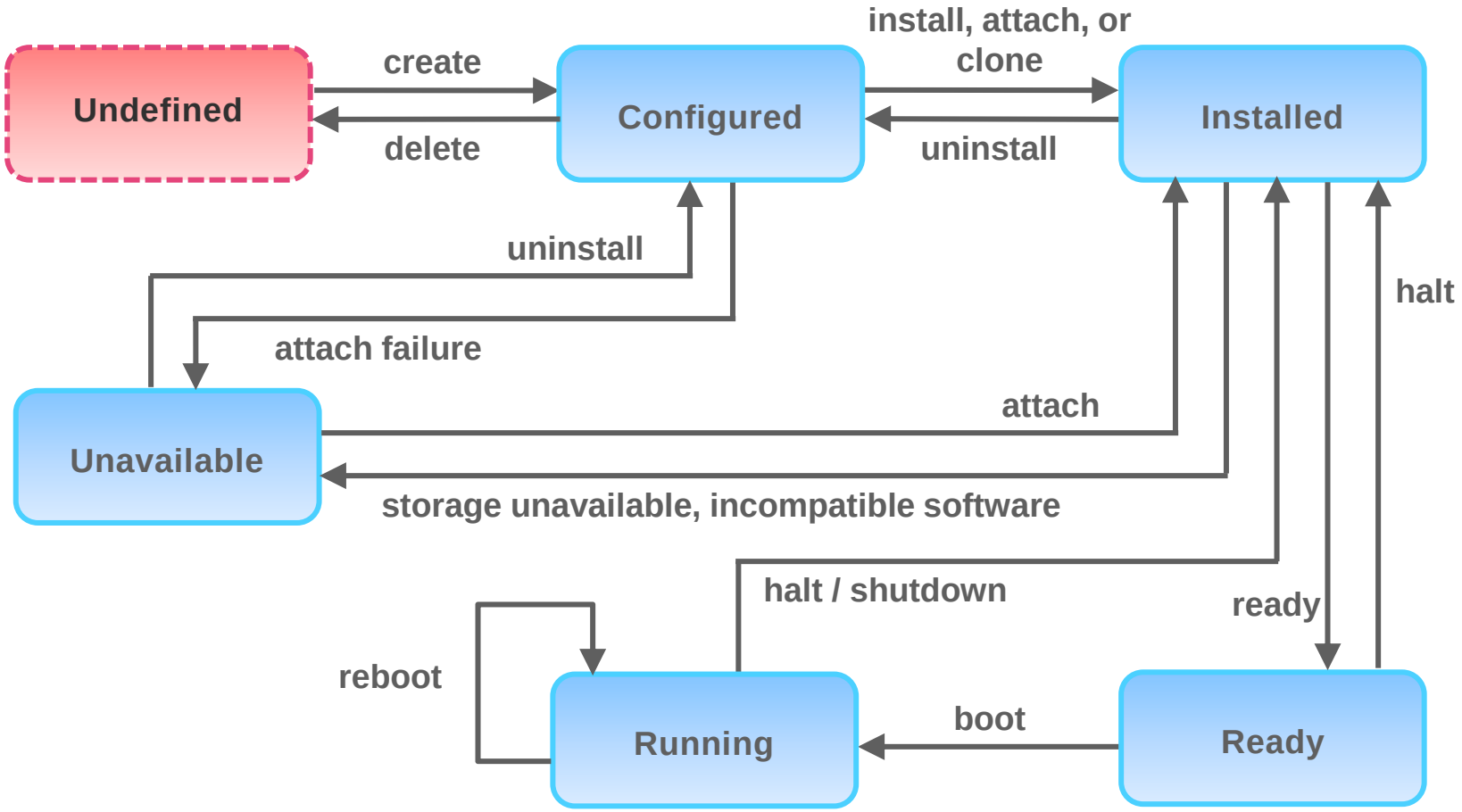
1. Create the virtual switch or etherstub.
2. Create the VNICs.
3. Configure the zones to use the VNICs.



Non-Global Zone Configuration Process: Overview



Non-Global Zone States



Planning the Zone Strategy

- Virtual network configuration: Two VNICs `vnic1` and `vnic2`
- Two zones: `hrzone` and `itzone`
- Zone paths: `/zones/hrzone` and `/zones/itzone`
- IP type: Exclusive-IP
- VNIC to zone association: `vnic1` for `hrzone`; `vnic2` for `itzone`

Creating a ZFS File System for Zones in `rpool`

To create a ZFS file system for zones in `rpool`, use the following command:

```
# zfs create -o mountpoint=/zones rpool/zones
```

To verify that the file system exists and that it has been mounted, use the following command:

```
# zfs list rpool/zones
NAME           USED  AVAIL  REFER  MOUNTPOINT
rpool/zones     31K  22.6G    31K  /zones
```

Configuring the Zone

To configure a zone, use `zonecfg -z zonename`.

```
# zonecfg -z hrzone
Use 'create' to begin configuring a new zone.
zonecfg:hrzone> create
create: Using system default template 'SYSdefault'
zonecfg:hrzone> set zonepath=/zones/hrzone
zonecfg:hrzone> set autoboot=true
zonecfg:hrzone> add net
zonecfg:hrzone:net> set physical=vnic1
zonecfg:hrzone:net> end
zonecfg:hrzone> verify
zonecfg:hrzone> commit
zonecfg:hrzone> exit
```

Verifying That a Zone Is in `configured` State

To list all configured and running zones in the system, use `zoneadm list -cv`.

```
# zoneadm list -cv
  ID NAME STATUS           PATH                   BRAND     IP
   0 global  running        /                      solaris   shared
   - hrzone  configured     /zones/hrzone          solaris   excl
   - itzone  configured     /zones/itzone          solaris   excl
```

Installing the Zone

To install a zone, use `zoneadm -z <zone_name> install`.

```
# zoneadm -z hrzone install
The following ZFS file system(s) have been created:
    rpool/zones/hrzone
Progress being logged to /var/log/zones/zoneadm.20151037T065334Z.hrzone.install
       Image: Preparing at /zones/hrzone/root.

AI Manifest: /tmp/manifest.xml.fXai_f
SC Profile: /usr/share/auto_install/sc_profiles/enable_sci.xml
  Zonename: hrzone
Installation: Starting ...

           Creating IPS image
Startup linked: 1/1 done
           Installing packages from:
               solaris
                  origin: http://s11-server1.example.com:10000/
DOWNLOAD                  PKGS         FILES       XFER (MB)    SPEED
Completed              255/255   51394/51394     341.6/341.6    2.8M/s
...
...
Log saved in non-global zone as
/zones/hrzone/root/var/log/zones/zoneadm.20151027T235442Z.hrzone.install
```

Booting the Zone

To list all running and installed zones on the system, use `zoneadm list -iv`.

```
# zoneadm list -iv
  ID NAME      STATUS          PATH              BRAND      IP
   0 global    running         /                 solaris    shared
   - hrzone    installed       /zones/hrzone     solaris    excl
   - itzone    installed       /zones/itzone     solaris    excl
```

To boot a zone, use `zoneadm -z zonename boot`.

```
# zoneadm -z hrzone boot
# zoneadm -z itzone boot
# zoneadm list -v
  ID NAME     STATUS        PATH              BRAND      IP
   0 global   running       /                 solaris    shared
   1 hrzone   running       /zones/hrzone     solaris    excl
   2 itzone   running       /zones/itzone     solaris    excl
```

Logging In to a Zone

To log in to a zone, use `zlogin`, followed by the zone name.

```
# zlogin -C hrzone
[Connected to zone 'hrzone' console]
```

Gathering Information for the System Configuration Tool

- Computer Name: `hrzone`
- DNS Name service: `Do not configure DNS`
- Alternate Name Service: `None`
- Time Zone, Region, and Location: *Use your specific location.*
- Locale Language and Territory: *Use your specific locale.*
- Users, username, and password

Checking the Virtual Network Configuration in a Zone

To display the network interface address information for a zone, log in to the zone, and then use `ipadm show-addr`.

```
# zlogin hrzone
[Connected to zone 'hrzone' pts/2]
Oracle Corporation      SunOS 5.11      11.3     June 2015
root@hrzone:~# ipadm show-addr
ADDROBJ           TYPE     STATE        ADDR
lo0/v4            static   ok           127.0.0.1/8
vnic1/v4          static   ok           192.168.1.100/24
lo0/v6            static   ok           ::1/128
vnic1/v6          addrconf ok
fe80::8:20ff:fe43:7986/10
```

Exiting a Non-Global Zone

To exit a non-global zone from a pseudo terminal or terminal login, use `exit`.

```
# exit
```

To disconnect from a zone from a virtual console or console login, use `~.`

```
# ~.
```

Shutting Down a Non-Global Zone

To shut down a zone, use `zoneadm -z <zone_name> shutdown`.

```
global# zoneadm -z hrzone shutdown
```

Halting a Zone

To halt a zone, run `zoneadm -z <zone_name> halt`.

```
global# zoneadm -z hrzone halt
```

To verify that the zone has been halted, run `zoneadm list -v`.

```
global# zoneadm list -iv
ID  NAME     STATUS       PATH                BRAND      IP
 0  global   running      /                   solaris    shared
 2  itzone   running      /zones/itzone       solaris    excl
 -  hrzone   installed    /zones/hrzone       solaris    excl
```

Administering Immutable Zones

- Setting a strict Immutable Zone

```
zonecfg:hrzone> set file-mac-profile=strict
```

- Setting a fixed-configuration Immutable Zone

```
zonecfg:itzone> set file-mac-profile=fixed-configuration
```

- Setting a flexible-configuration Immutable Zone

```
zonecfg:userszone> set file-mac-profile=flexible-configuration
```

- Displaying zone properties

```
# zoneadm list -p
0:global:running:/::solaris:shared:-:none
1:hrzone:running:/zones/hrzone:<UUID>:solaris:excl:R:strict
2:itzone:running:/zones/itzone:<UUID>:solaris:excl:R:fixed-configuration
3:userszone:running:/zones/userszone:<UUID>:solaris:shared:R:flexible-
    configuration
```

Booting Immutable Zones

You can temporarily override the zone restrictions in the read-only root file system by booting the zone with the `-w` option.

```
# zoneadm -z hrzone boot  -w
```

Delegating Zone Administration

Delegate zones administration to different users.

- The `auth` property:
  - `login (solaris.zone.login)`
  - `manage (solaris.zone.manage)`
  - `clone (solaris.zone.clonefrom)`
- The `admin` zone property:

```
zonecfg:zone1> add admin
zonecfg:zone1:admin> set user=oracle
zonecfg:zone1:admin> set auths=login,manage
zonecfg:zone1:admin> end
```

Quiz

The privileges of a zone administrator are confined to a non-global zone.

a. True
b. False

Quiz

The privileges of a zone administrator are confined to a non-global zone.

a. True
b. False

Quiz

After you have run the `zonecfg -z` *`zonename`* command, which command would you use to start the configuration of a new zone?

a. `add zone`

b. `begin`

c. `create`

d. `start`

Quiz

After you have run the `zonecfg -z` *`zonename`* command, which command would you use to start the configuration of a new zone?

a. `add zone`

b. `begin`

c. `create`

d. `start`

Quiz

To use VNICs, which IP type must a zone be configured as?

a. Shared-IP
b. Exclusive-IP
c. Either shared or exclusive

Quiz

To use VNICs, which IP type must a zone be configured as?

a. Shared-IP
b. Exclusive-IP
c. Either shared or exclusive

Quiz

You have created the configuration for a new zone. What is the next step?

a. Boot the new zone.
b. Commit the configuration.
c. Exit the configuration.
d. Verify the configuration.

Quiz

You have created the configuration for a new zone. What is the next step?

a. Boot the new zone.
b. Commit the configuration.
c. Exit the configuration.
d. Verify the configuration.

Quiz

Which command is used to perform a clean shutdown of a zone?

a. `exit`

b. `zoneadm -z zonename shutdown`

c. `zoneadm -z zonename halt`

d. `~.`

Quiz

Which command is used to perform a clean shutdown of a zone?

a. `exit`

b. `zoneadm -z zonename shutdown`

c. `zoneadm -z zonename halt`

d. `~.`

Agenda

- Introducing Oracle Solaris Zones
- Configuring an Oracle Solaris Zone
- **Determining an Oracle Solaris Zone Configuration**

Determining an Oracle Solaris Zone Configuration

- Displaying the status of zones
- Displaying a zone configuration
- Displaying zone network information
- Determining a zone’s resource utilization
- Determining a zone’s kernel file system statistics

Displaying the Status of Zones

The `zoneadm list` subcommand helps in verifying the status of all the zones running in the system.

`list` options include the following:

- `-c` displays all the configured zones in the system.
- `-i` expands the display to all installed zones.
- `-v` displays verbose information, including zone name, ID, current state, root directory, brand type, IP-type, and options.

```
# zoneadm list -cv
ID NAME             STATUS     PATH              BRAND    IP
 0 global           running    /                 solaris  shared
 2 itzone           running    /zones/itzone     solaris  excl
 - hrzone           installed  /zones/hrzone     solaris  excl
```

Displaying a Zone Configuration

To display a non-global zone configuration, use `zonecfg -z` *`zonename`* `info`.

```
# zonecfg -z finzone info
zonename: finzone
zonepath: /zones/finzone
brand: solaris
autoboot: true
bootargs:
file-mac-profile:
pool:
limitpriv:
scheduling-class:
ip-type: shared
hostid:
fs-allowed:

<output continued on next slide>
```

Displaying a Zone Configuration

```
<output continued from previous slide>
fs:
        dir: /local/finzone
        special: rpool/finzone
        raw not specified
        type: lofs
        options: []
net:
        address: 192.168.0.20
        allowed-address not specified
        configure-allowed-address: true
         physical: net0
        defrouter not specified
rctl:
        name: zone.max-lwps
        value: (priv=privileged,limit=500,action=deny)
```

Displaying Zone Network Information

To display network interface address information, use `ipadm show-addr`.

```
# ipadm show-addr
ADDROBJ           TYPE      STATE    ADDR
lo0/v4            static    ok       127.0.0.1/8
lo0/zoneadmd-v4   static    ok       127.0.0.1/8
net0/v4           static    ok       192.168.0.100/24
net0/zoneadmd-v4  static    ok       192.168.0.10/24
lo0/v6            static    ok       ::1/128
lo0/zoneadmd-v6   static    ok       ::1/128
net0/v6           addrconf  ok       fe80::a00:27ff:fe68:6f2d/10
```

Determining a Zone's Resource Utilization

To determine a zone's resource utilization, use the `zonestat` utility.

```
# zonestat -r summary 5
Collecting data for first interval...
Interval: 1, Duration: 0:00:05
SUMMARYInterval: 3, Duration: 0:00:15
SUMMARY                   Cpus/Online: 1/1   PhysMem: 1023M  VirtMem:
2047M
                     ---CPU----  --PhysMem-- --VirtMem-- --PhysNet--
                ZONE  USED %PART  USED %USED  USED %USED PBYTE %PUSE
             [total]  1.00  100%  658M 64.3%  839M 41.0%  1431 20.00%
            [system]  0.18 18.9%  373M 36.5%  521M 25.4%     -     -
            choczone  0.68 68.8% 44.0M 4.30% 49.6M 2.42%     0  0.00%
              global  0.11 11.0%  133M 13.0%  167M 8.16%  1431 20.00%
                  QA  0.00 0.40% 53.5M 5.23% 50.3M 2.46%     0  0.00%
          grandmazone  0.00 0.81% 53.3M 5.21% 51.4M 2.51%     0  0.00%
...
...
...
<output truncated>
```

Determining a Zone's Kernel File System Statistics

```
# fsstat -z s10 -z s10u9 zfs tmpfs
  new  name  name  attr attr lookup rddir  read  read write write
 file remov  chng   get  set    ops   ops   ops bytes   ops bytes
   93    82     6  163K  110   507K   148 69.7K 67.9M 4.62K 13.7M zfs:s10
  248   237   158  188K  101   612K   283 70.6K 68.6M 4.71K 15.2M zfs:s10u9
12.0K 1.90K 10.1K 35.4K   12  60.3K     4 25.7K 29.8M 36.6K 31.0M tmpfs:s10
12.0K 1.90K 10.1K 35.6K   14  60.2K     2 28.4K 32.1M 36.5K 30.9M tmpfs:S10u9
# fsstat -A -Z zfs tmpfs
  new  name  name  attr  attr lookup rddir  read  read write write
 file remov  chng   get   set    ops   ops   ops bytes   ops bytes
 360K 1.79K 20.2K 4.20M 1.02M  25.0M  145K 5.42M 2.00G 1.07M 8.10g zfs
 359K 1.48K 20.1K 4.04M 1.02M  24.5M  144K 5.31M 1.88G 1.06M 8.08G zfs:global
   93    82     6 74.8K   107   250K   144 54.8K 60.5M 4.61K 13.7M zfs:s10
  248   237   158 90.2K   101   336K   283 53.0K 58.3M 4.71K 15.2M zfs:s10u9
60.0K 41.9K 17.7K  410K   515   216K   426 1022K 1.02G  343K  330M tmpfs
49.4K 38.1K 11.0K  366K   489   172K   420  968K  979M  283K  273M
tmpfs:global
5.28K 1.90K 3.36K 21.9K    12  21.7K     4 25.7K 29.8M 29.9K 28.3M tmpfs:s10
5.25K 1.90K 3.34K 22.1K    14  21.6K     2 28.4K 32.1M 29.8K 28.2M tmpfs:s10u9
```

Quiz

If you want to see additional information about all configured, running, and installed zones on a system, which command would you use?

a. `zoneadm list`

b. `zoneadm list -c`

c. `zoneadm list -civ`

Quiz

If you want to see additional information about all configured, running, and installed zones on a system, which command would you use?

a. `zoneadm list`

b. `zoneadm list -c`

c. `zoneadm list -civ`

Quiz

Which command would you use to display configuration information about a zone named `myzone`?

a. `zoneadm myzone status`

b. `zoneadm myzone info`

c. `zonecfg -z myzone info`

d. `zonecfg -z myzone verify`

Quiz

Which command would you use to display configuration information about a zone named `myzone`?

a. `zoneadm myzone status`

b. `zoneadm myzone info`

c. `zonecfg -z myzone info`

d. `zonecfg -z myzone verify`

Summary

In this lesson, you should have learned how to:

- Explain the fundamentals of Oracle Solaris zones
- Configure an Oracle Solaris zone
- Determine an Oracle Solaris zone configuration

Practice 8: Overview

- 8-1: Configuring Zones
- 8-2: Determining an Oracle Solaris Zone's Configuration