

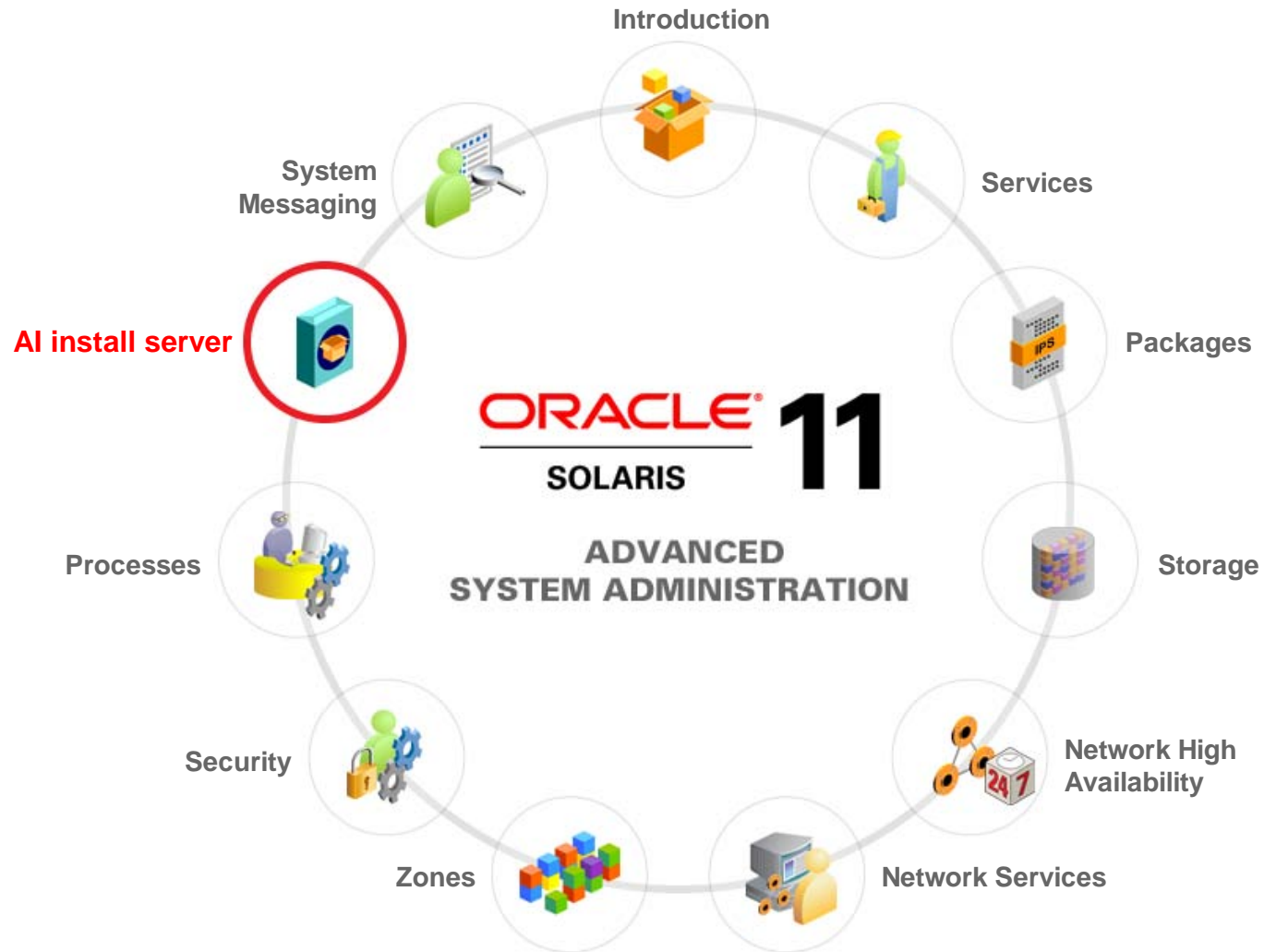
Installing Oracle Solaris 11 on Multiple Hosts

Objectives

After completing this lesson, you should be able to:

- Describe the Automated Installer (AI)
- Configure the AI install server
- Configure the AI client
- Build an Oracle Solaris image by using the distribution constructor

Job Workflow



Agenda

- Introducing the Automated Installer (AI)
- Configuring the AI install server
- Configuring the AI client
- Building an Oracle Solaris Image

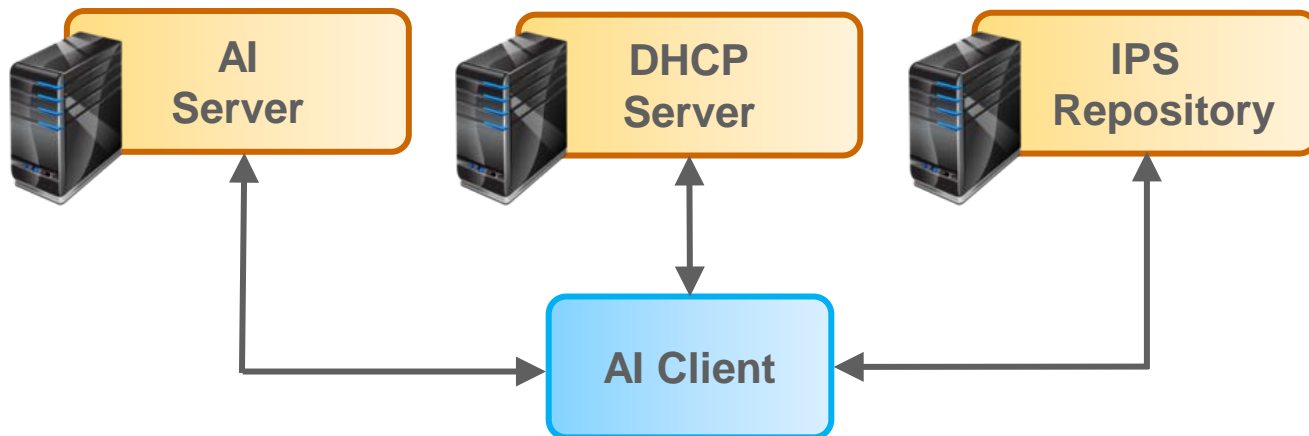
Advantages of Using the Automated Installer

The AI helps you achieve the following:

- Install the Oracle Solaris 11 OS.
- Update all Oracle Solaris x86/64 machines to Oracle Solaris 11.
- Allow flexible configuration of disk layout, Kerberos service and users, provisioning of zones, and software selection.
- Support unattended installation on multiple machines.
- Save significant installation time.

Automated Installation: Overview

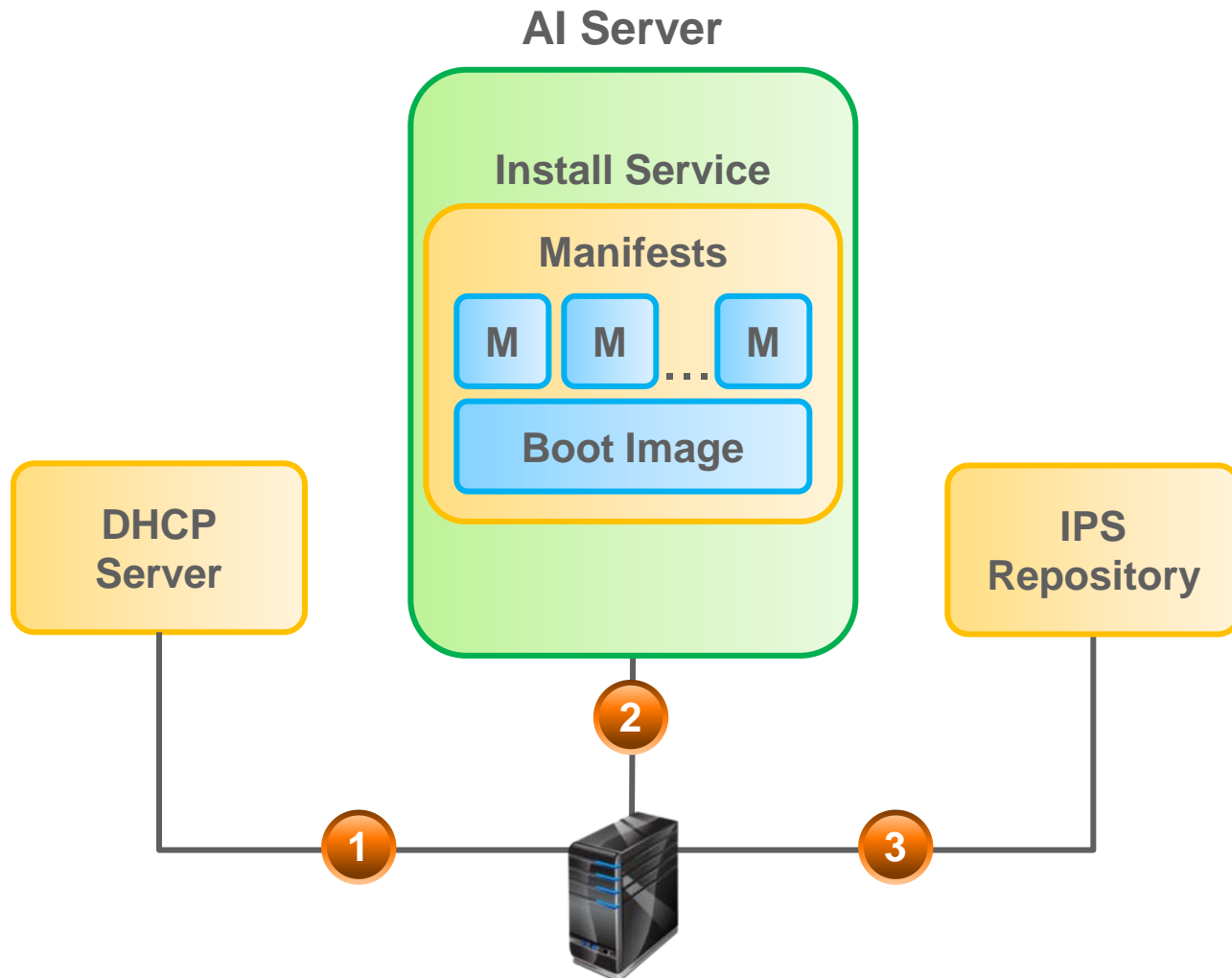
- The AI automates the installation of the OS on one or more SPARC and x86 systems over a network.
- The installations differ in architecture, software packages, disk capacity, network configuration, and other parameters.
- Automated installation requires an AI server, a DHCP server, an IPS repository, and a client system:



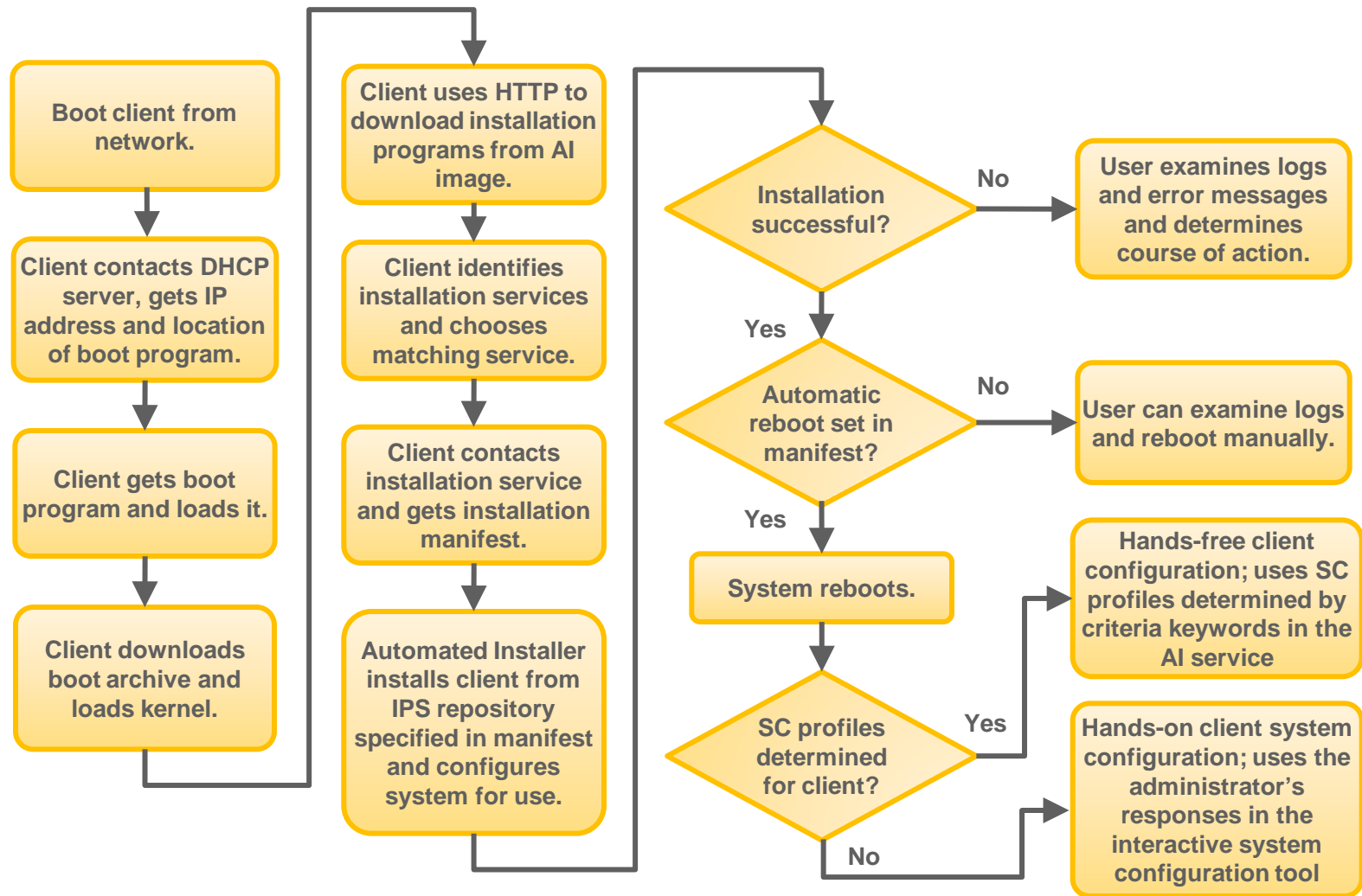
AI Environmental Requirements

- Network
- Client access to AI service and IPS repository
- AI service storage location
- Manifests and system configuration profiles
- Custom manifest and profile storage location

Automated Installation Process



How the AI Works



AI SMF Service

- The SMF service
`svc:/system/install/server:default` represents the overall state of the AI server application and all the installation services.
- The AI SMF service is enabled when `installadm create-service` is run.
 - To enable the AI SMF service manually:

```
# svcadm enable svc:/system/install/server:default
```

- To disable the AI SMF service manually:

```
# svcadm disable svc:/system/install/server:default
```

AI Manifest

- Part of the AI installation service
- XML file that contains installation and configuration instructions for one or more clients
- Default manifest included in each boot image
- Unpacked along with other files in the image

Identifying the Types of AI Manifests

Type	Description
Default AI manifest	Is an installation manifest that has no criteria associated with it
Custom AI manifest	Provides installation criteria for a specific client
Criteria manifest	Allows client-specific installation instructions to be associated with AI services

default.xml File

```
<!DOCTYPE auto_install SYSTEM "file:///usr/share/install/ai.dtd">
<auto_install>
  <ai_instance name="default">
    <target>
      <logical>
        <zpool name="rpool" is_root="true">
          <filesystem name="export" mountpoint="/export"/>
          <filesystem name="export/home"/>
          <be name="solaris"/>
        </zpool>
      </logical>
    </target>
    <software type="IPS">
      <source>
        <publisher name="solaris">
          <origin name="http://pkg.oracle.com/solaris/release"/>
        </publisher>
      </source>
      <software_data action="install">
        <name>pkg:/entire</name>
        <name>pkg:/group/system/solaris-large-server</name>
      </software_data>
    </software>
  </ai_instance>
</auto_install>
```

Criteria Manifest

- Associates client-specific installation instructions with AI services
- Uses an AI manifest selection algorithm
- Uses multiple nonoverlapping criteria
- Can be added using the `installadm create-manifest` command:

```
# installadm create-manifest -f \ /export/manifests/manifest_x86.xml \  
-n s11-x86 -C /export/manifests/criteria_x86.xml
```

Criteria Manifest: Examples

- arch criteria manifest file:

```
<ai_criteria_manifest>
  <ai_criteria name="arch">
    <value>i86pc</value>
  </ai_criteria>
</ai_criteria_manifest>
```

- mac criteria manifest file:

```
<ai_criteria_manifest>
  <ai_criteria name="mac">
    <value>0:14:4F:20:53:94</value>
  </ai_criteria>
</ai_criteria_manifest>
```

- ipv4 criteria manifest file:

```
<ai_criteria_manifest>
  <ai_criteria name="ipv4">
    <value>192.168.0.114/24</value>
  </ai_criteria>
</ai_criteria_manifest>
```

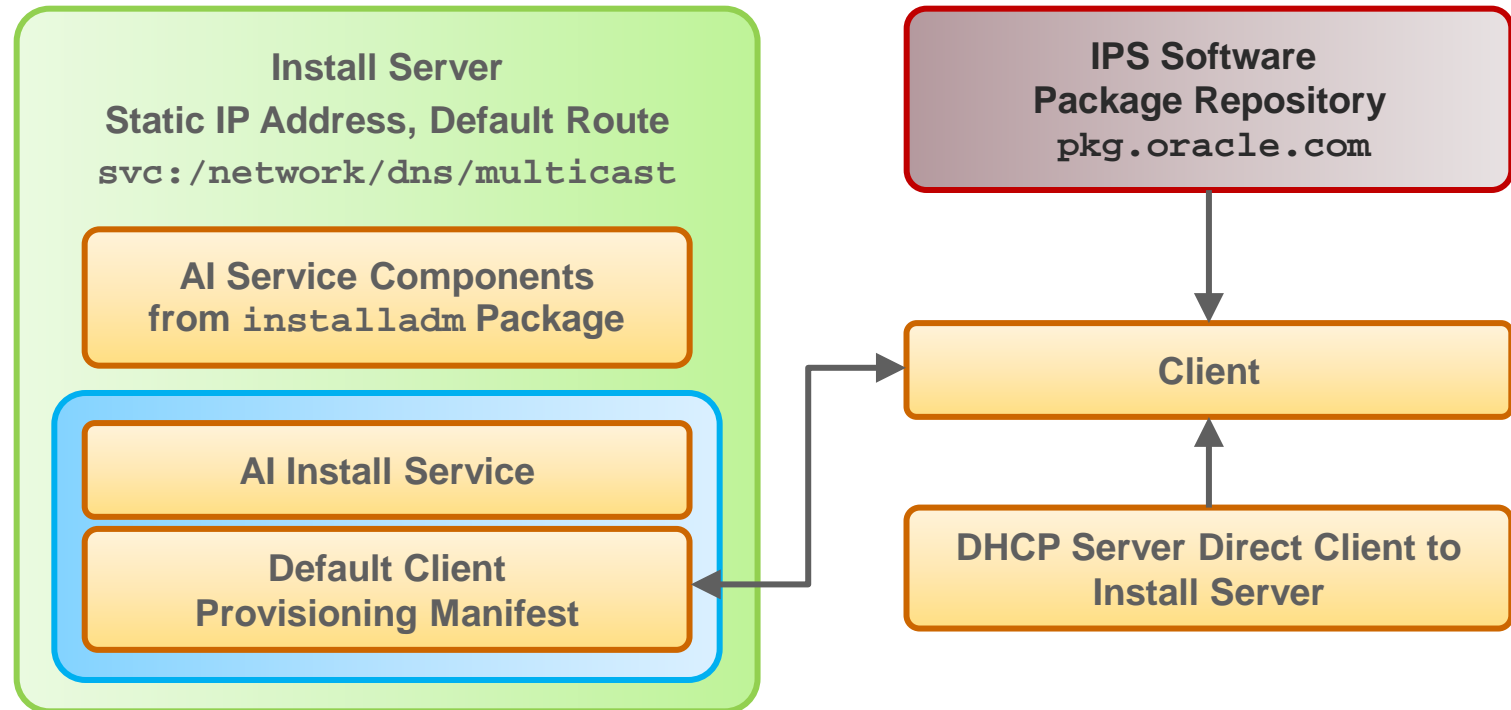
System Configuration Profiles

- SC profiles:
 - Specify client configuration
 - Set SMF properties for appropriate SMF services
 - Are applied during the first client boot after installation
 - Are created by using the `sysconfig create-profile` utility
- All clients may have multiple SC profiles.
- If no SC profile is specified, the interactive system configuration tool is used at first client boot.

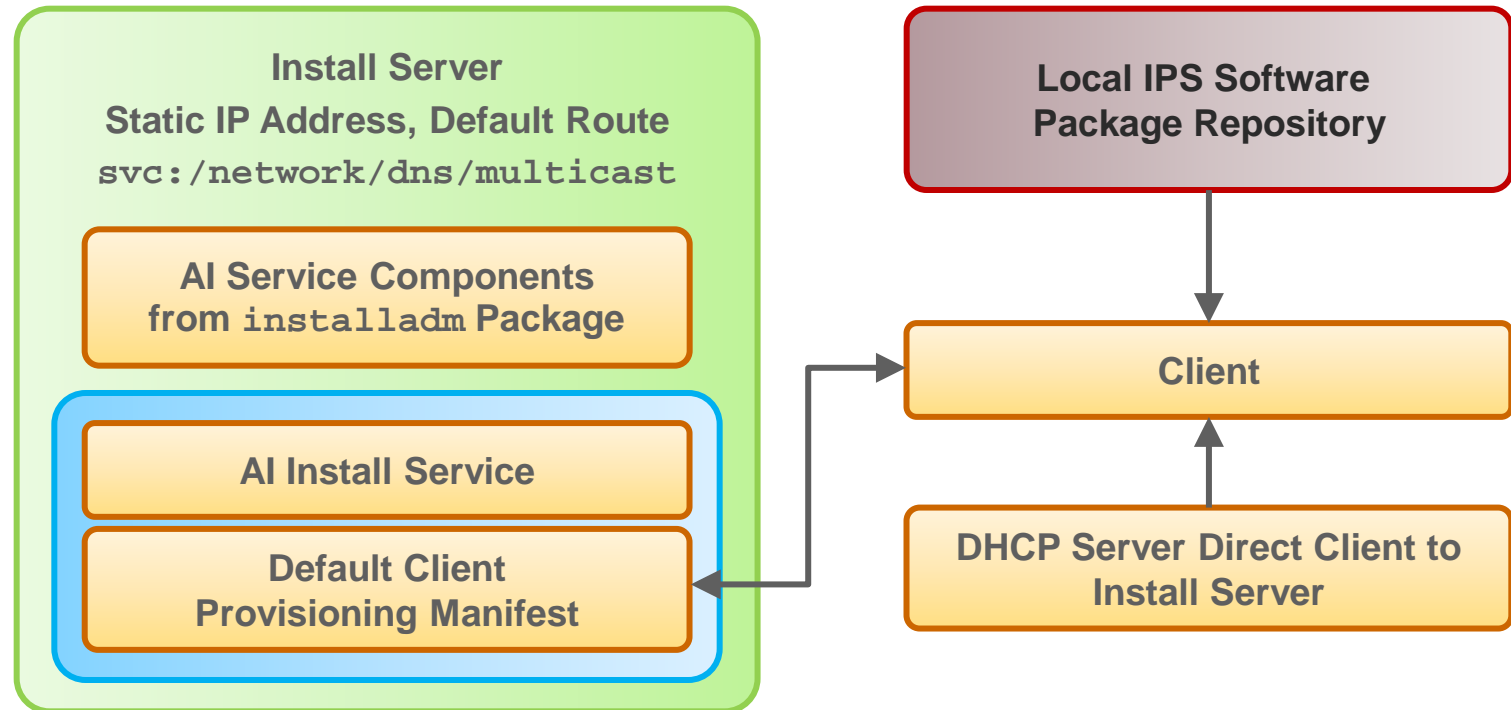
SC Profile: Example

```
<!DOCTYPE service_bundle SYSTEM "/usr/share/lib/xml/dtd/service_bundle.dtd.1">
<service_bundle type="profile" name="sysconfig">
  <service version="1" type="service" name="system/config-user">
    <instance enabled="true" name="default">
      <property_group type="application" name="root_account">
        <propval type="astring" name="login" value="root"/>
        <propval type="astring" name="password"
value="$5$bypT4oRp$Dsy3J0FhJNBXqlxDtCJj1qk3k3ZHA8cb98bPLs3kI9"/>
        <propval type="astring" name="type" value="role"/>
      </property_group>
      <property_group type="application" name="user_account">
        <propval type="astring" name="login" value="oracle1"/>
      </property_group>
      ...
    </instance>
    ...
  </service>
  <property type="astring" name="search">
    <astring_list>
      <value_node value="mydomain.com"/>
    </astring_list>
  </property>
</property_group>
</instance>
</service>
</service_bundle>
```

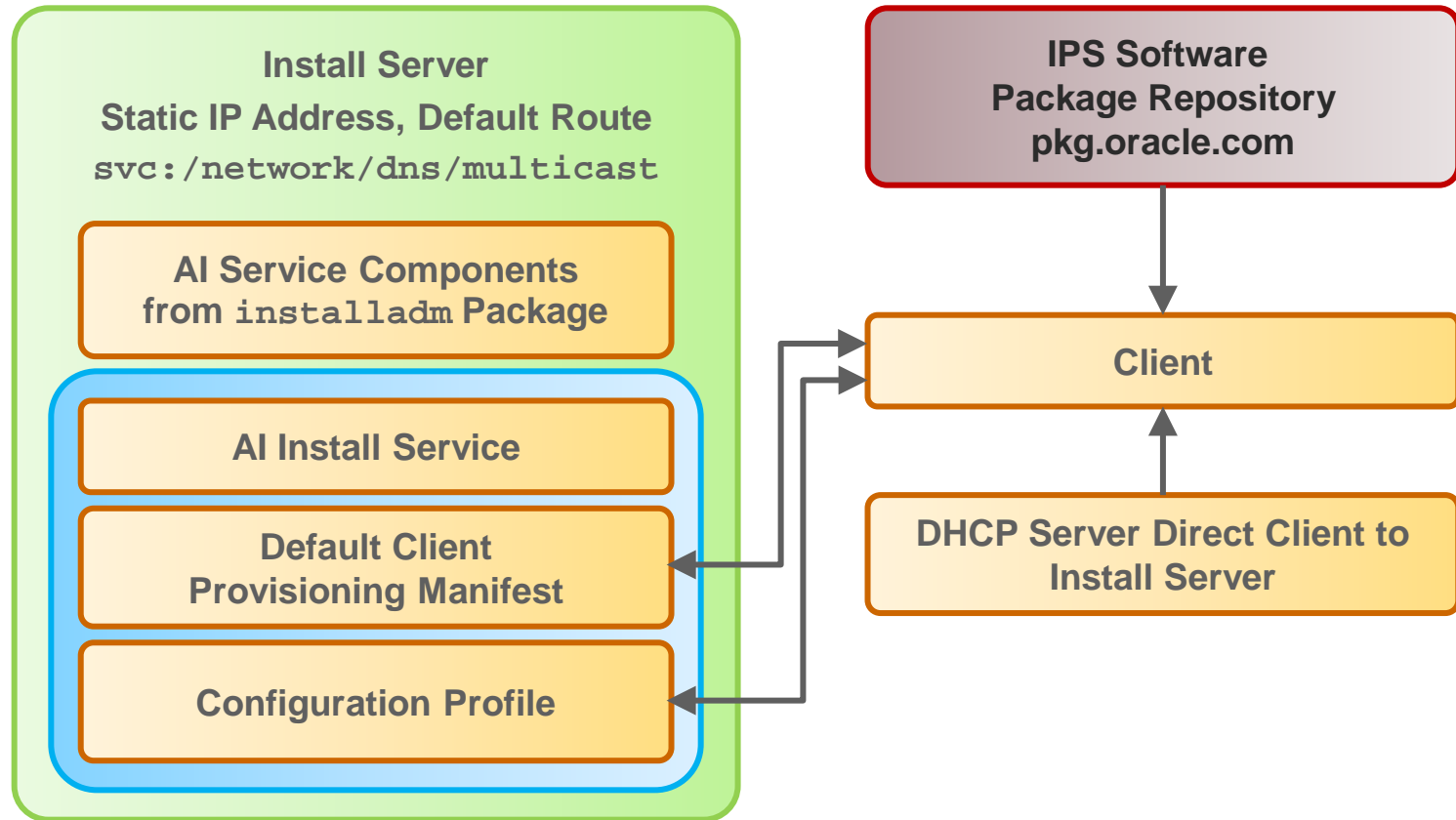
AI Use Case: Using Default Manifest



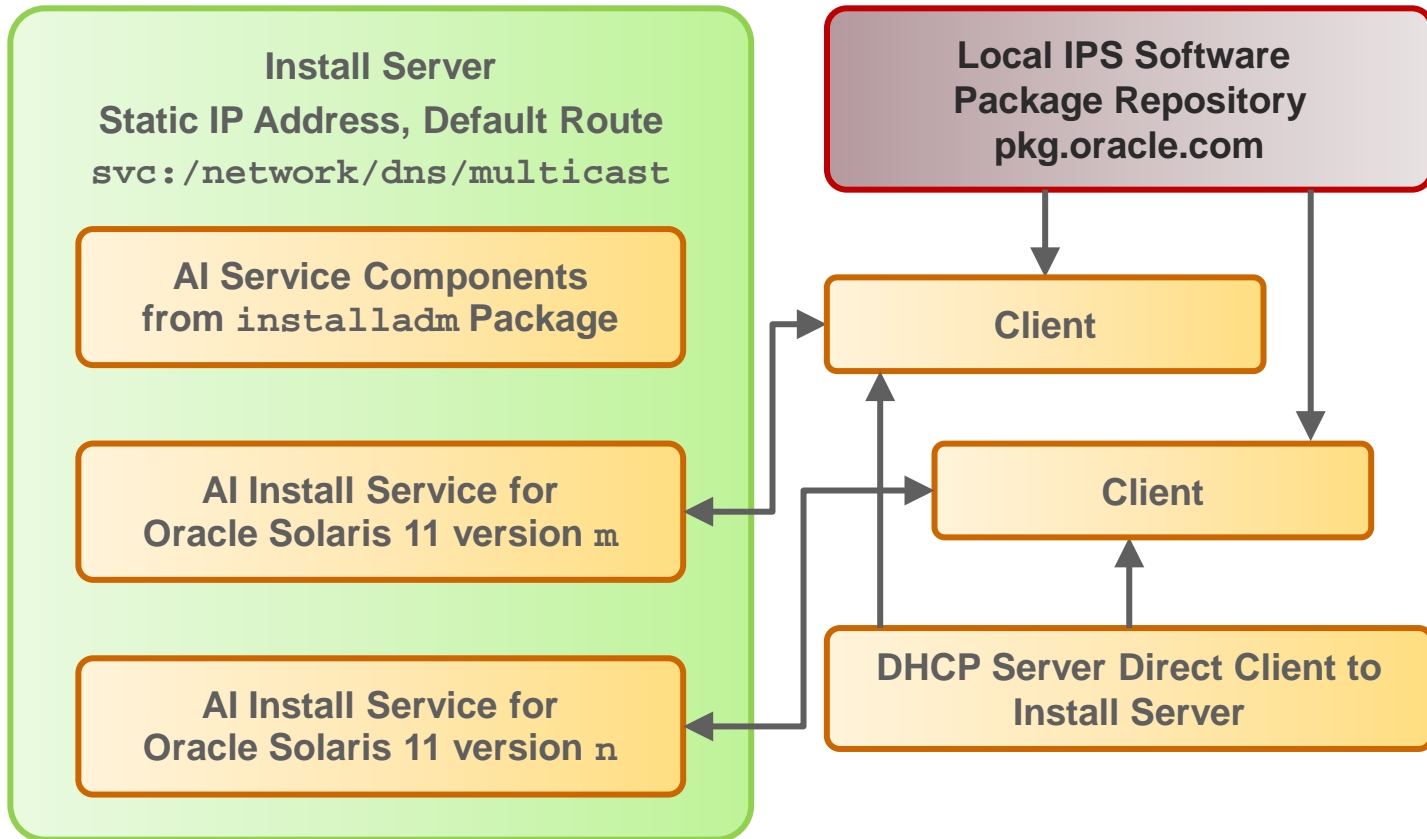
AI Use Case: Using Custom Manifest



AI Use Case: Using an SC Profile



AI Use Case: Multiple AI Services



Quiz



Which AI component provides installation instructions to the client system?

- a. AI server
- b. DHCP server
- c. IPS repository

Agenda

- Introducing the Automated Installer
- **Configuring the AI install server**
- Configuring the AI client
- Building an Oracle Solaris Image

Reviewing AI Install Server Requirements

Package Group	Memory	Recommended Minimum Disk Space
solaris-desktop	2 GB	13 GB
solaris-large-server		9 GB
solaris-small-server		8 GB
solaris-minimal-server		6 GB

Software	Requirement
Operating system	Oracle Solaris 11 must be installed.
IP address	A static IP address must be used.
Router	The default route must be set.
DHCP	DHCP must be set up.
IPS repository	The repository must be set up locally.

Verifying AI Install Server Software Requirements

Check the following to verify that the server is ready to be configured as an AI server:

- Static IP address configuration
- Operational DNS
- IPS configured and available from the AI server

Verifying the Static IP Address

To verify that the operating system is configured with a static IP address, run `svcs network/physical`, followed by `ipadm show-addr`.

```
# svcs network/physical:default
```

STATE	STIME	FMRI
online	15:02:57	svc:/network/physical:default

```
# ipadm show-addr
```

ADDROBJ	TYPE	STATE	ADDR
...			
net0/v4	static	ok	192.168.0.100/24

```
...
```

```
#
```

Verifying That DNS is Operational

To verify that the DNS is operational, run `nslookup server domain name`.

```
# nslookup server1.mydomain.com
Server:          192.168.0.100
Address:         192.168.0.100#53

Name:   server1.mydomain.com
Address: 192.168.0.100
```

Verifying That IPS is Available Locally

To verify that the correct local IPS repository is available to your server, run `pkg publisher`.

```
# pkg publisher
PUBLISHER    TYPE      STATUS  P  LOCATION
solaris      origin    online  F  http://s11-server1.mydomain.com
```

To test IPS on the local server by searching for the entire package, run `pkg search entire`.

```
# pkg search entire
INDEX      ACTION    VALUE          PACKAGE
pkg.fmri   set       solaris/entire  pkg:/entire@0.5.11-0.175.3.0.0.30.0
```

Practice 10-1 Overview: Verifying System AI Requirements (Optional)

In this practice, you check the existing version of Oracle Solaris 11 to verify the system requirements for the AI installation.

Note: This practice is optional and must be completed *only* if you have not completed the Practice 3 tasks.

Configuring the AI Install Server

1. Enable the DNS multicast service.
2. Create a directory for the AI service.
3. Verify the `netmasks` file configuration.
4. Create an AI installation service:
 - With a DHCP setup
 - Without a DHCP setup
5. Review the default installation instructions.
6. Add installation criteria to an AI service.

Enabling the DNS Multicast Service

To enable the DNS multicast service, run `svcadm enable svc:/network/dns/multicast`.

```
# svcadm enable svc:/network/dns/multicast
# svcs network/dns/multicast
```

STATE	STIME	FMRI
online	1:32:27	svc:/network/dns/multicast:default

Installing the AI Installation Tools

1. Ensure that you are connected to an IPS repository that contains the `install/installadm` package .

```
# pkg publisher
PUBLISHER    TYPE        STATUS    P    LOCATION
solaris      origin     online    F    http://s11-server1.mydomain.com
# pkg list -a installadm
NAME (PUBLISHER)          VERSION                                IFO
install/installadm       0.5.11-0.175.3.0.0.30.0             ---
```

2. Determine whether the `installadm` package is already installed on this system.

```
# pkg list installadm
pkg list: no packages matching 'installadm' installed
```

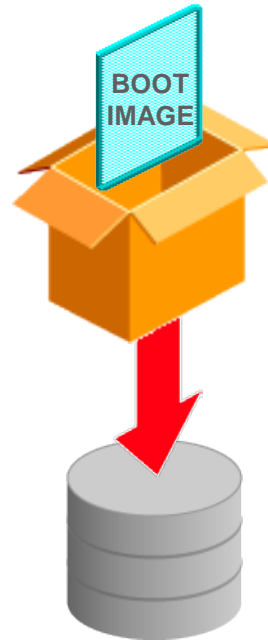
3. Install the `installadm` package by using the `pkg install` command.

```
# pkg install install/installadm
```


Setting Up the AI Boot Image

Download the AI boot image from:

<http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html>

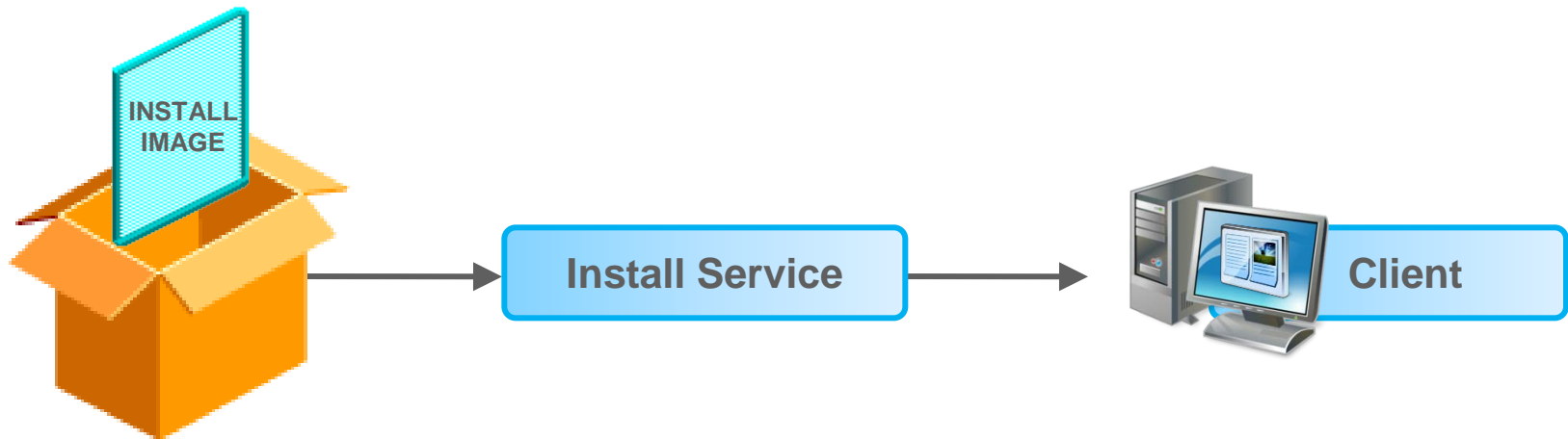


Note: The AI ISO image must be the same version as the Oracle Solaris OS that you plan to install on the client.

Configuring an AI Installation Service

The AI installation service:

- Associates an installation image with a named installation service
- Enables client systems to use the install service name to find the correct install image
- Is associated with only one boot image
- Can be created with or without a DHCP setup



Verifying the netmasks File Configuration

To verify the netmasks file configuration, run `getent netmasks IP_Address`.

```
# getent netmasks 192.168.0.0
```

If a network mask entry for the local subnet does not exist in `/etc/netmasks`, update the file.

```
# pfedit /etc/netmasks
...
192.168.0.0 255.255.255.0
```

Creating an AI Installation Service with an ISC DHCP Server Setup

To create an AI installation service with an ISC DHCP server setup, run `installadm create-service`, followed by the service name, the path to the ISO image, the IP address range, and the path to where the ISO image should be unpacked.

```
# installadm set-server -i 192.168.0.130 -c 5
<output omitted>
# installadm create-service -n basic_ai \
-s /opt/ora/iso/sol-11_3-ai-x86.iso -d /export/ai/basic_ai
<output omitted>
# installadm list
```

Service Name	Status	Arch	Type	Secure	Alias	Alients	Clients	Profiles	Manifests
-----	-----	----	-----	-----	-----	-----	-----	-----	-----
basic_ai	on	i386	iso	no	on	0	0	0	1

Creating an AI Installation Service Without a DHCP Setup

To create an AI installation service without a DHCP setup, run `installadm create-service`, followed by the service name, the path to the ISO image, and the path to where the ISO image should be unpacked.

```
# installadm create-service -n s11-sparc \  
-s /var/tmp/images/sparc/sol-11_3-ai-sparc.iso -d /install/images/s11-sparc
```

```
Creating service: s11-sparc
```

```
Setting up the target image at /install/images/s11-sparc ...
```

```
Service discovery fallback mechanism set up
```

```
Creating SPARC configuration file
```

```
Refreshing install services
```

```
Creating default-sparc alias.
```

```
No local DHCP configuration found. This service is the default alias  
for all SPARC clients. If not already in place, the following should be added to the DHCP  
configuration:
```

```
    Boot file : http://10.80.238.5:5555/cgi-bin/wanboot-cgi
```

```
Service discovery fallback mechanism set up
```

```
Creating SPARC configuration file
```

```
Refreshing install services
```

Adding a Client to the AI Installation Service

To add a client to the AI installation service, run `installadm create-client -c`, followed by the client MAC address and the AI installation service name.

```
# installadm create-client -e 08:00:27:85:C7:D6 -n basic_ai
```

```
# installadm list -c
```

Service Name	Client Address	Arch	Image Path
-----	-----	----	-----
basic_ai	08:00:27:85:C7:D6	i386	/export/ai/default_ai

Adding an SC Profile to an Installation Service

Use the `installadm create-profile` command to add the *profile_filename* SC profile to the *svcname* installation service.

```
# installadm create-profile -n svcname -f profile_filename
```

Use the `installadm validate` command to validate SC profiles for syntactic correctness.

```
# installadm validate -n svcname -p profile_name
```

Creating a Custom AI Manifest

To create and apply a custom AI manifest, perform the following steps:

1. Create a directory to store your manifest files.
2. Copy the `default.xml` file to the `basic_ai.xml` file.
3. Modify the `basic_ai.xml` file.
4. Add the new custom AI manifest to the appropriate AI installation service.
5. Add the criteria file to associate the client host.

Selecting the AI Manifest

- The criteria file associates installation instructions with the client.
- The AI manifest selection algorithm is as follows:
 - The client does not match the criteria for any manifest: The client uses the default manifest.
 - The client matches the criteria for a single manifest: The client uses that manifest.
 - The client matches the criteria for multiple manifests: The criteria are evaluated based on ordering.
- The criteria file uses multiple nonoverlapping criteria.

Adding Installation Criteria to an AI Manifest

To create a manifest for a service and associate it with the installation criteria, run `installadm create-manifest`, followed by the service name, the manifest's file path name, and the criteria file's path name.

```
# installadm create-manifest -n basic_ai \  
-f /var/tmp/manifests/basic_ai.xml \  
-C /var/tmp/manifests/criteria_ai.xml  
# installadm list -m
```

Service Name	Manifest	Status
-----	-----	-----
basic_ai	basic_ai	
	orig_default	Default
default-i386	orig_default	Default

```
# installadm list -m -n basic_ai
```

Manifest	Status	Criteria
-----	-----	-----
basic_ai		mac = 08:00:27:85:C7:D6
orig_default	Default	None

Introducing the Automated Installer CLI Manifest Editor

- Administrators can edit AI manifests without any knowledge of XML by using enhancements to the existing `installadm(1M)` command.
- This interface provides the ability to interactively create and edit new manifests that can be associated with AI services.
 - The interface presents the AI manifest content as a set of objects and properties
 - The interface can be accessed from the `create-manifest` or `update-manifest` subcommands. For example:

```
# installadm create-manifest -n servicename -m new-manifest
```

Note: It brings up a manifest in the `installadm` interactive mode that is based on reasonable defaults.

```
# installadm update-manifest -n servicename -f file -m manifest
```

Note: It updates a manifest using the contents of the named file

Installing and Configuring Zones by Using AI

This section covers the following topics:

- How AI installs nonglobal zones
- Specifying nonglobal zones in the global zone AI manifest
- Nonglobal zone configuration and installation data

How AI Installs Nonglobal Zones

Nonglobal zones are installed and configured on the first reboot after the global zone is installed.

1. When a system is installed using AI, nonglobal zones can be installed on that system by using the configuration element in the AI manifest.
2. When the system first boots after the global zone installation, the zone's self-assembly SMF service (`svc:/system/zones-install:default`) configures and installs each nonglobal zone defined in the global zone AI manifest.
3. If the zone is configured with `autoboot=true`, the `system/zones-install` service boots the zone after the zone is installed.

Specifying Nonglobal Zones in the Global Zone AI Manifest

```
<!DOCTYPE auto_install SYSTEM "file:///usr/share/install/ai.dtd.1">
<auto_install>
  <ai_instance>
    <target>
      <logical>
        <zpool name="rpool" is_root="true">
          <filesystem name="export" mountpoint="/export"/>
          <filesystem name="export/home"/>
          <be name="solaris"/>
        </zpool>
      </logical>
    </target>
    <software type="IPS">
      <source>
        <publisher name="solaris">
          <origin name="http://pkg.oracle.com/solaris/release"/>
        </publisher>
      </source>
      <software_data action="install">
        <name>pkg:/entire@latest</name>
        <name>pkg:/group/system/solaris-large-server</name>
      </software_data>
    </software>
    <configuration type="zone" name="zone1" source="http://server/zone1/config"/>
    <configuration type="zone" name="zone2" source="file:///net/server/zone2/config"/>
  </ai_instance>
</auto_install>
```

Nonglobal Zone Configuration and Installation Data

Required File	Description
<code>config</code> file	Required. The <code>config</code> file is the zone's configuration in file form from the output of the <code>zonecfg export</code> command.
AI manifest	Optional. This AI manifest for zone installation specifies packages to be installed in the zone, along with publisher information, and certificate and key files as necessary.
Configuration profile	Optional. You can provide zero or more configuration files for a nonglobal zone. These configuration profiles are similar to the system configuration profiles for configuring the global zone.

Practice 10-2 Overview: Configuring the AI Server

This practice covers the following topics:

- Enabling the DNS multicast service
- Verifying the `netmasks` file configuration
- Creating an AI installation service with a DHCP setup
- Adding installation criteria to an AI service
- Creating a directory to store the AI manifest files
- Modifying the AI manifest files

Agenda

- Introducing the Automated Installer
- Configuring the AI install server
- **Configuring the AI client**
- Building an Oracle Solaris Image

How a Client Is Installed

The client is booted from the network. After booting, the client system performs the following steps:

1. Contacts the DHCP server and retrieves the client's network configuration and the location of the installation server
2. Loads the net image
3. Completes its installation using the AI manifest
4. Reboots if `auto_reboot` is set in the AI manifest, or the client should be manually rebooted

Note: During reboot, the client system is configured either by using system configuration profiles or by using the responses provided in the interactive system configuration tool.

Configuring the Client System

This section covers the following topics:

- Identifying the client system requirements
- Using Secure Shell to remotely monitor an installation
- Implementing the configuration
- Reviewing client installation messages

Identifying Client System Requirements

Client System	Requirement
Disk space	Recommended minimum: 13 GB
Memory	Recommended minimum: 2 GB
Architectures	<ul style="list-style-type: none">• X86: 64-bit only• SPARC: Oracle Solaris M-series and T-series systems only
Network access	<ul style="list-style-type: none">• DHCP server that provides network configuration information• AI install server• IPS repository that contains the packages to be installed on the client system

Additional SPARC client system requirements:

- WAN boot support
- Firmware that includes the current version of the OBP that contains the latest WAN boot support

Using Secure Shell to Remotely Monitor an Installation

- For x86 client installations, the `menu.lst` file is located in:
 - `/etc/netboot/menu.lst.01MAC_address` if `installadm create-client` was used
 - `/etc/netboot/<service_name>/menu.lst` if `installadm create-client` was not used
- For SPARC client installations, `system.conf` and `wanboot.conf` are in:
 - `/etc/netboot/<service_name>`

For the default-sparc service, symlinks to these files are in `/etc/netboot`.

Implementing the Configuration

- To boot a SPARC client and start an installation, use the following command from the OBP prompt:
`OK boot net:dhcp - install`
- To boot an x86 client from the network, from the GNU GRUB menu, select the Oracle Solaris 11.3 Text Installer and command line boot option.

Reviewing Client Installation Messages

If the client installation is successful, you see the following:

- Automated Installation started message:

```
Automated Installation started
  The progress of the Automated Installation will be
output to the console
  Detailed logging is in the logfile at
/system/volatile/install_log
  Press RETURN to get a login prompt at any time.
```

- Automated Installation succeeded message:

```
Automated Installation finished successfully
The system can be rebooted now
Please refer to the /system/volatile/install_log file for
details
After reboot it will be located at
/var/sadm/system/logs/install_log
```

Practice 10-3, Practice 10-4, Practice 10-5, and Practice 10-6: Overview

You will now perform the following practices:

- Deploying the OS to a network client
- Configuring Oracle Solaris 11 instances
- Customizing the automated installation
- (Optional) Deploying a system by using a Unified Archive through the AI

Agenda

- Introducing the Automated Installer
- Configuring the AI install server
- Configuring the AI client
- Building an Oracle Solaris Image

Distribution Constructor: Introduction

- Is a command-line tool that is used to build:
 - Preconfigured custom Oracle Solaris images
 - An ISO image based on the XML manifest file
- Allows creation of the following Oracle Solaris image types:
 - x86 or SPARC Oracle Solaris text installer image
 - Oracle Solaris x86 Live Media image
 - x86 or SPARC ISO image for Automated Installations
 - SPARC USB images for AI and text installer
- Is distributed in the `distribution-creator` package, which contains:
 - The `distro_const` command-line utility and its files
 - Sample manifest files

Identifying System Requirements for Using the Distribution Constructor

Requirement	Description
Disk space	Recommended minimum: 8 GB
Oracle Solaris release	<ul style="list-style-type: none">• SPARC or x86 Oracle Solaris 11 operating system (OS) must be installed.• Network access to the IPS repositories specified in the manifest file is required.• SPARC images can be created only on a SPARC system.• x86 images can be created only on an x86 system.• The Oracle Solaris release version must match the release version of the image to be built with the distribution constructor.
Required packages	The distribution-constructor package must be installed.

Using Distribution Constructor Manifest Files

Manifest File	Manifest Type	Description
<code>/usr/share/distro_const/dc_text_x86.xml</code>	x86 text installer ISO image	Used to create an ISO image that you can boot to initiate a text installation of the Oracle Solaris OS on x86 machines
<code>/usr/share/distro_const/dc_text_sparc.xml</code>	SPARC text installer ISO image	Used to create an ISO image that you can boot to initiate a text installation of the Oracle Solaris OS on SPARC machines
<code>/usr/share/distro_const/dc_livedc.xml</code>	x86 Live Media ISO image	Used to create an ISO image that is comparable with the Oracle Solaris live media image
<code>/usr/share/distro_const/dc_ai_sparc.xml</code>	SPARC AI ISO image	Used to create a SPARC AI ISO image for automated installations of the Oracle Solaris OS to SPARC clients
<code>/usr/share/distro_const/dc_ai_x86.xml</code>	x86 AI ISO image	Used to create an x86 AI ISO image for automated installations of the Oracle Solaris OS to x86 clients

Image Creation Process

- The distribution constructor:
 - Contains sample manifests that can be used to create a custom x86 Live Media ISO, an x86 or SPARC Automated Install ISO image, or an x86 or SPARC text installation ISO image
 - Creates images based on settings specified in manifest files
- The manifest files contain specifications for the contents and parameters of the ISO images that you create using the distribution constructor.

Creating a Custom Image

To create a custom image, perform the following steps:

1. Install the `distribution-creator` package, which contains the distribution creator application and the sample manifests.

```
# pkg install distribution-creator
```

2. Copy one of the sample manifests and create a custom manifest file with a new file name.
3. Optionally, you can edit the manifest elements to specify a different location for the build area or different publisher and repository location.
4. Create custom scripts to further modify the image.

Building an Image

- The build can be performed in one step:
 - `distro_const build manifest`
- Checkpointing is enabled by default.
- The build can be stopped and resumed at a specific checkpoint (step):
 - `distro_const build -p step manifest`
 - `distro_const build -r step manifest`

Quiz



The distribution constructor is used to create only Oracle Solaris SPARC text installer images.

- a. True
- b. False

Quiz



Which command enables you to build an OS image in one step?

a. `distro_const`

b. `distro_const build`

c. `distro_const build manifest`

Quiz



The process of stopping and restarting during the image build process is called _____.

- a. checking
- b. checkpointing
- c. spotcheck

Summary

In this lesson, you should have learned how to:

- Describe the Automated Installer
- Configure the AI install server
- Configure the AI Client
- Build an Oracle Solaris Image