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Scope and Assumptions

This technical white paper is designed as a quick start reference guide for deploying Oracle Enterprise Manager 13c (OEM) on Oracle Cloud Infrastructure, following suggested platform best practices. This document should not be used as Full Reference Guide for OEM 13c.

Consumers of this document should first:

» Be familiar with the fundamentals of Oracle Cloud Infrastructure:
   » https://cloud.oracle.com/cloud-infrastructure

» Have a basic understanding of the Oracle Cloud Infrastructure Database service:
   » https://cloud.oracle.com/cloud-infrastructure

» Have a background of Oracle Enterprise Manager and its capabilities:
   » http://docs.oracle.com/cd/E63000_01/index.htm

Overview of Oracle Enterprise Manager 13c

Oracle Enterprise Manager is a complete, integrated, and business-driven enterprise cloud management solution. Oracle Enterprise Manager has built-in management capabilities of the Oracle stack for traditional and cloud environments that enables you to monitor and manage the complete Oracle IT infrastructure from a single console.

The key capabilities of Enterprise Manager are as follows:

» A complete cloud lifecycle management solution enabling you to quickly set up, manage, and support enterprise clouds and traditional Oracle IT environments from applications to disk

» Maximum return on IT management investment through the best solutions for intelligent management of the Oracle stack and engineered systems with real-time integration of Oracle’s knowledge base with each customer environment

» Best service levels for traditional and cloud applications through business-driven application management.
Architecture of Oracle Enterprise Manager 13c

Enterprise Manager Cloud Control includes the following components, as shown in the following image:

- Oracle Management Agent
- Oracle Management Service
- Oracle Management Repository
- Plug-ins
- Enterprise Manager Cloud Control Console
**OEM Management Agent**

Oracle Management Agent (Management Agent) is one of the core components of Enterprise Manager Cloud Control that enables you to convert an unmanaged host to a managed host in the Enterprise Manager system. The Management Agent works in conjunction with the plug-ins to monitor the targets running on that managed host.

**Oracle Management Server (OMS)**

Oracle Management Service (OMS) is a Web-based application that orchestrates with the Management Agents and the plug-ins to discover targets, monitor and manage them, and store the collected information in a repository for future reference and analysis. The OMS also renders the user interface for Enterprise Manager Cloud Control.

The OMS is deployed to the middleware home, which is the parent directory that contains Oracle WebLogic Server, OMS, plug-ins, Java Development Kit (JDK), Oracle WT directory, Oracle Common, and other relevant configuration files and directories.

**Oracle Management Repository**

The Oracle Management Repository (Management Repository) is a storage location where all the information collected by the Management Agent gets stored. It consists of objects such as database jobs, packages, procedures, views, and tablespaces.

The OMS uploads the monitoring data it receives from the Management Agents to the Management Repository. The Management Repository then organizes the data so that it can be retrieved by the OMS and displayed in the Enterprise Manager Cloud Control console. Since data is stored in the Management Repository, it can be shared between any number of administrators accessing the Enterprise Manager Cloud Control.

**OEM Plug-ins**

Plug-ins are pluggable entities that offer special management capabilities customized to suit specific target types and deployed at both OMS and Management Agent.

**Enterprise Manager Cloud Control Console**

The Enterprise Manager Cloud Control console is the user interface where you can monitor and administer your entire computing environment from one location on the network. All the systems and services including enterprise application systems, databases, hosts, middleware application servers, listeners, and so on, are made visible on Console and you can perform most administration tasks here.

**EMCTL and EMC CLI**

EMCTL is a command-line tool that enables you to execute certain tasks on the OMS and Management Agents. You can use it for tasks such as starting or stopping OMS instances, setting properties on OMS instances, or getting a list of targets being monitored by a specific Management Agent. EMCTL commands are executed on a specific OMS or Management Agent.
Recommended Oracle Cloud Infrastructure Instance Shape for OEM 13c Installation

Oracle Management Repository
There are two deployments options for the database repository. Customers can use the Oracle Cloud Infrastructure Database service, or they can install the Oracle database directly on a compute instance shape of BM.HighIO1.36 using Oracle Enterprise Linux 7.2. Oracle recommends protecting the database by using Data Guard Technology between two Availability Domains (AD).

Oracle Management Server
Oracle recommends Oracle Cloud Infrastructure shape BM.Standard1.36 with Oracle Enterprise Linux 7.2 for running the middleware application tier, also called Oracle Management Server. This instance shape comes with 36 CPU cores, 256GB RAM and ~50GB of root volume. Oracle strongly recommends not to use root volume as destination for OEM software; instead, attach a block volume (50 GB as of current offering) to the instance and that is big enough to run OMS to support a very large scale deployment.

Oracle recommends building OMS on two Instances each in different Availability Domain. This will provide High Availability in situation when one Availability Domain becomes unavailable.

You can also install Oracle Management Server on the same host where Management Repository Database is running to keep costs low.

Note: See the latest Oracle Cloud Infrastructure offerings for more choices on instance shapes to suit your business needs. More shapes are being introduced regularly.
Architecture for OEM on Oracle Cloud Infrastructure

The suggested architecture of OEM on Oracle Cloud Infrastructure is shown in the following diagram:

Operating System Preparation for OEM Installation

This document is focused on OEM installation only and does not cover how to deploy the Oracle Database that will be used as the Repository for OEM installation.

The following are prerequisites on the Oracle Management Server (OMS) host before installing OMS:

Host Name Prerequisites

Do not use an underscore in the host name when launching the Oracle Cloud Infrastructure instance. The OEM installation wizard will not accept a host name with an underscore in it.

Operating System Package Requirements for OMS

The following packages are prerequisite for OMS installation on OEL 7.x:

- make-3.82-21
- binutils-2.23
- gcc-4.8.2-16
- libaio-0.3.109-12
- glibc-common-2.17-55
- libstdc++-4.8.2-16
- sysstat-10.1.5-4
- glibc-devel 2.17-55 (x86_64) *(64-bit package)*
- libXtst-1.2.2-2 (x86_64)
Oracle recommends using the following packages, which install all necessary libraries and perform the basic configuration required for OMS installation:

- # yum install oracle-rdbms-server-12cR1-preinstall
- # yum install glibc-devel
- # yum install glibc-2.17

Operating System Package Requirements for Oracle Management Agent

The following packages are prerequisite for OMS installation on OEL 7.x. Most of the packages should already be installed if Oracle Database is deployed on this host.

- make-3.82-21
- binutils-2.23
- gcc-4.8.2-16
- libaio-0.3.109-12
- glibc-common-2.17-55
- libstdc++-4.8.2-16
- sysstat-10.1.5-4

UDP and TCP Kernel Parameters

Set TCP/IP ephemeral port range parameters to provide enough ephemeral ports for the anticipated server workload. Ensure that the lower range is set to at least 11,000 or higher, to avoid well known ports, and to avoid ports in the Registered Ports range commonly used by Oracle and other server ports.

Oracle recommends that you make these settings permanent by following these steps:

1. Login as root.
2. Use a text editor to open /etc/sysctl.conf.
3. Add or change to the following: net.ipv4.ip_local_port_range = 11000 65500
5. Run sysctl –p to enable the change without rebooting the host.
6. Verify the port change from sysctl –a command output.

Set kernel.shmmax Kernel Parameters on the OMS host

On the OMS host, set the kernel.shmmax parameter to a value 1 byte less than 4 GB or 4294967295. Oracle recommends this value to avoid lack of memory issues for other applications and to enable a complete and successful core file generation under any and all circumstances. Perform the following steps to make the Kernel Parameter change on OMS host:

To verify the value assigned to the kernel.shmmax parameter, run the following command:

```
cat /proc/sys/kernel/shmmax
```

To set the value for the kernel.shmmax parameter, perform the following steps:

- Log in as root.
- Open the /etc/sysctl.conf file.
- Set the kernel.shmmax parameter to 4294967295.

By setting the value in the /etc/sysctl.conf file, the value persists even when you restart the system.
Run the following command to change the current values of the kernel parameters. Review the output and verify that the values are correct. If the values are incorrect, edit the /etc/sysctl.conf file, and run this command again.

```
# /sbin/sysctl -p
```

Enter the /sbin/sysctl -a command to confirm that the values are set correctly.

Add an entry for overlay IP Address

Add an Overlay IP Address to /etc/hosts, as shown below. If you use a Public IP address in /etc/hosts, the OEM installation will fail.

Before you make the change, the /etc/hosts file looks as follows:

```
# more /etc/hosts
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
::1  localhost localhost.localdomain localhost6 localhost6.localdomain6
```

After you make the change, the /etc/hosts file looks as follows:

```
# more /etc/hosts
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
::1  localhost localhost.localdomain localhost6 localhost6.localdomain6
10.0.4.19  pocem13c pocem13c.localdomain
```

Set up the Linux Group/User for OMS Installation

The following operating system group and user are required for all installation types:

- Oracle Inventory Group (typically dba)
- Oracle Software Owner also known as oracle user (typically oracle)

Run the following commands as the ROOT user:

```
# groupadd dba -g 1001
# useradd -d /home/oracle -g 1001 oracle
# passwd oracle
```

Prompts you to reset the password for the oracle ID that you just created.
Increase the Operating System limit for the Oracle User

vi /etc/security/limits.conf

Add these lines:

* soft nproc 65535
* hard nproc 65535
* soft nofile 65535
* hard nofile 65535
oracle hard nofile 65536

Verify by running - ulimit –a command

Add more swap space to the host

The default swap space on the Oracle Cloud Infrastructure instance is not enough for the OMS installation. Make sure at 32G of swap space is available before starting the OMS installation.

Follow these steps to add more swap space:

Add a swap file:

dd if=/dev/zero of=/home/swapfile bs=1024 count=33554432 -- gives 32G swapfile

Set up the swap file:

mkswap /home/swapfile

Enable the swap file immediately but not automatically at boot time:

swapon /home/swapfile

Enable the swap file at boot time

Edit /etc/fstab to include the following entry:

/home/swapfile swap swap defaults 0 0

Verify the swap file by viewing the output of the following commands:

# cat /proc/swaps

or

# free
UMASK value requirements
Ensure that you set the default file mode creation mask (umask) to 022 in the shell startup file.

For example, in bash shell, .bash_profile should have the following entry:

```bash
# umask 022
```

CLASSEPATH Environment Variable
Make sure you unset the CLASSEPATH environment variable before starting the installation.

Configure VNC Server to be able to launch the OMS Installer
Oracle recommends default configuration of TigerVNC using standard ports [5901 to 5909]. For details on how to configure VNC Server, refer to the Getting Started section of the Oracle Cloud Infrastructure documentation.

Repository Database Preparation for OEM Installation
This document assumes that you have Oracle Database already deployed on another instance on Oracle Cloud Infrastructure. The following parameters must be configured as shown for OMS installation to succeed:

```
alter system set session_cached_cursors=400 scope=spfile;
alter system set shared_pool_size=2G scope=spfile;
alter system set optimizer_adaptive_features=FALSE scope=both;
alter system set processes=800 scope=spfile;
```

Oracle recommends Database CharacterSet to be AL32UTF8 for OMS installation. Refer to the OEM documentation for support of other Character Sets.
Oracle Enterprise Manager (OEM) 13c Installation on Oracle Cloud Infrastructure

Core Components Installed with OEM 13c

The following components are installed by the OEM Installer when you install OEM on a new instance:

- Oracle WebLogic Server 12c Release 1 (12.1.3.0).
- Java Development Kit (JDK) 1.7.0_80.
- Oracle Management Service 13c Release 1.
- Oracle Management Agent 13c Release 1 in the agent base directory you specify (outside the middleware home).
- Oracle JRF 12c Release 1 (12.1.3.0), which includes the oracle_common directory.
- Oracle Web Tier 12c Release 1 (12.1.3.0).
- Oracle BI Publisher 12c Release 1 (12.1.3.0), which includes the bi directory.
- Creates a plug-in directory and installs the following default plug-ins:
  - Oracle Database Plug-in
  - Oracle Fusion Middleware Plug-in
  - Oracle Exadata Plug-in
  - Oracle Cloud Framework Plug-in
  - Oracle System Infrastructure Plug-in
  - Any other additional plug-ins you choose to deploy
- Creates an Oracle WebLogic domain called GCDomain. For this WebLogic Domain, a default user account, weblogic, is used as the administrative user.
- Creates a Node Manager user account called nodemanager. A Node Manager enables you to start, shut down, or restart an Oracle WebLogic Server instance remotely, and is recommended for applications with high availability requirements.
- Configures an Oracle Management Service Instance Base location (gc_inst) outside the Oracle Middleware home (Middleware home), for storing all configuration details related to the OMS.
- Configures Oracle Management Repository in the existing, certified Oracle Database. If the database instance is created using the database template offered by Oracle, then this step is skipped.
- Runs the following configuration assistants to configure the installed components for simple as well as advanced installation:
  - Plugins Prerequisites Check
  - Repository Configuration
  - MDS Schema Configuration
  - BI Publisher Schema Configuration
  - OMS Configuration
  - Plugins Deployment and Configuration
  - BI Publisher Configuration
  - Start Oracle Management Service
  - Agent Configuration Assistant
Precautions to Take Before Installing OEM 13c

» Ensure there are no white spaces in the name of the directory from which you download and run the OEM software.
» The installation wizard cannot install OEM on remote hosts or multiple hosts at the same time.
» Do not install on a symlink; it will impact the functioning of your additional OMS.
» You must not set the ORACLE_HOME and ORACLE_SID environment variables. You must ensure that the Oracle directories do NOT appear in the PATH.
» The Enterprise Manager Cloud Control Installation Wizard installs Java Development Kit (JDK) 1.7.0_80 and Oracle WebLogic Server 12c Release 1 (12.1.3.0) by default. A preinstalled JDK or Oracle WebLogic Server is not supported from 13c Release 1 onwards.
» You must ensure that the Oracle WebLogic Server 12c Release 1 (12.1.3.0) installed by the Enterprise Manager Cloud Control Installation Wizard is dedicated for Enterprise Manager Cloud Control. You must not have any other Oracle Fusion Middleware product installed in that Middleware home.
» If you install the OMS and the Oracle Database, which houses the Management Repository, on the same host, then when you reboot the host, the OMS and the Management Agent installed with it will not automatically start. You will have to manually start them.
» You can find the OMS and Management Agent entries in the /etc/oragchomelist for RHEL platform.
» The locale-specific data is stored in the <OMS_Oracle_Home>/nls/data directory. Oracle strongly recommends that you either set the environment variable ORA_NLS10 to <OMS_Oracle_Home>/nls/data or do not set at all.
» Enforcing option is supported for Security-Enhanced Linux (SELinux).

Installing OEM 13c

Simple Installation
The Simple installation type is suitable for non-production environments where OEM is installed with default configuration settings and preferences. It does not offer too many options to customize your installation.

Following are the steps for a Simple installations:
1. Log in as the oracle:dba user (which you created earlier in the host preparation steps).
2. Invoke the OEM installation wizard by running the .bin file from the directory where the software is downloaded.
3. (Optional) Fill in My Oracle Support Details, and click Next.
4. If you provided My Oracle Support Details, complete the Software Updates page and then click Next.

5. If this is the first Installation of an Oracle product on this instance, enter information on the Oracle Inventory Details page. Enter the full path to a directory where inventory files and directories can be placed; for example, 

/opt/app/oraInventory.

If you have already installed Oracle products on this host, then the central inventory location can be found in the /etc/oraInst.loc file.

Select appropriate OS group name that will own Oracle Inventory directories; for example, dba. Click Next.

6. The next page checks the prerequisites.

The installation wizard runs the prerequisite checks automatically when you come to this page. It checks for the required operating system patches, operating system packages, and so on.

The status of the prerequisite check can be Warning, Failed, Succeeded, Not Executed, In Progress, or Pending.

If some checks result in Warning or Failed status, then investigate and correct the problems before you proceed with the installation. The page provides details on why the prerequisites failed and how
you can resolve them. After you correct the problems, return to this page and click Rerun to check the prerequisites again.

7. Select the Simple installation type, and then click Next.
   
   **Note:** The next section of this document covers Advanced installation steps.

8. Provide the location for the OEM installation as follows, and then click Next:

   **Middleware Home Location:** Enter the middleware home where OMS and other core components will be installed; for example, /opt/app/OMS13c/middleware. Make sure the location specified here is an empty directory; otherwise the installation will fail.

   **Agent Base directory:** Enter the absolute path to the agent base directory, a location outside the Oracle Middleware home where the Management Agent can be installed.

   **Host Name:** Enter the host name as specified in /etc/hosts earlier in the host preparation steps. The host name must have a fully qualified domain name and it must be pointing to the Overlay IP address; otherwise, installation will fail in the next steps.
9. Enter configuration details as follows, and then click Next:

Enter the OEM Administrator Password that is used for the following:

- SYSMAN user in Repository database
- Default Weblogic User Account weblogic
- Default Node Manager User Account nodemanager
- Agent Registration Password

Enter the OEM Repository database information that is required for the OEM installer to connect to the database during installation. Provide the following information for the Repository database:

- Database Host Name
- Port
- Service/SID
- SYS Password

The installer uses this information to connect to the existing database for creating the SYSMAN schema and plug-in schemas. If you provide details of a database that already has a preconfigured Management Repository, then the installer only creates plug-in schemas.
10. Configuring a shared location is not necessary for a simple installation. Clear all three check boxes and click Next.

11. On the Review page, review all the parameters you have provided in previous steps, and then click Next.
   You can go back and change any parameters you like or you can continue with next steps.

12. Track the installation progress on the Install Progress page.
   You can view the overall progress (in percentage) of the installation and the status of each of the configuration assistants. Configuration assistants are run for configuring installed components.
13. Run scripts as root.
   Once the software binaries are copied and configured, you are prompted to run the allroot.sh script, and the oraInstRoot.sh script if this is the first Oracle product installation on the host. Open another window, log in as root, and manually run the scripts.

14. End the Installation
   The installer will display the Summary at the end of installation with various links that can be used to access OEM console and CLI. Capture this summary information for your future reference.

Advanced Installation
The Advanced installation is similar to Simple installation, except it offers custom or advanced configuration options that enable you to customize your installation to suit your needs.

This installation type provides the following benefits:

- Offers an option to select the deployment size (small, medium, or large) of your choice, and depending on the deployment size you select, configures with the required memory. The deployment size essentially indicates the number of targets you plan to monitor, the number of Management Agents you plan to have, and the number of concurrent user sessions you plan to have.
- Allows you to use a database where the Management Repository is preconfigured using the database templates offered by Oracle.
- Deploys the mandatory plug-ins such as Oracle Database plug-in, Oracle Fusion Middleware plug-in, Oracle Exadata plug-in, Oracle Cloud Framework plug-in, and Oracle System Infrastructure plug-in. In addition, enables you to select and deploy other optional plug-ins of your choice. The screenshot for this section is as follows:
Allows you to change the name of the default user account weblogic for the WebLogic domain GCDomain. Also, prompts for separate, distinct passwords for WebLogic Server administration, Node Manager, SYSMAN user account, and Management Agent registration. It also allows you to change the name of the default OMS instance base directory (gc_inst) to a name of your choice, and creates that directory outside the Middleware home. The screenshot for this section is as follows:
» Allows you to change the locations of the tablespace for management, configuration data, and JVM diagnostics data. The screenshot for this section is as follows:
 Allows you to customize the ports according to your environment. The screenshot for this section is as follows:
Port Configuration Details

Configuration of the Enterprise Manager system requires the allocation of several ports to facilitate internal communication between system components and to provide access to the console via a browser. The table below contains the ports that will be allocated, along with the recommended port ranges, for each component. By default, the first available port in the specified port range has been chosen.

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Recommended Port Range</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Manager Upload Http Port</td>
<td>4089-4090</td>
<td>4089</td>
</tr>
<tr>
<td>Enterprise Manager Upload Http SSL Port</td>
<td>4900-4908</td>
<td>4901</td>
</tr>
<tr>
<td>OMS Http Port</td>
<td>8768-8769</td>
<td>8768</td>
</tr>
<tr>
<td>BI Publisher Http Port</td>
<td>9701-9702</td>
<td>9702</td>
</tr>
<tr>
<td>Enterprise Manager Central Console Http Port</td>
<td>7799-7800</td>
<td>7801</td>
</tr>
<tr>
<td>Node Manager Http SSL Port</td>
<td>7401-7500</td>
<td>7401</td>
</tr>
<tr>
<td>BI Publisher Http SSL Port</td>
<td>8901-8902</td>
<td>8904</td>
</tr>
<tr>
<td>OMS Http Port</td>
<td>8083-8084</td>
<td>8082</td>
</tr>
<tr>
<td>Managed Server Http Port</td>
<td>7200-7300</td>
<td>7200</td>
</tr>
<tr>
<td>Oracle Management Agent Port</td>
<td>3872-3873</td>
<td>3872</td>
</tr>
<tr>
<td>Enterprise Manager Central Console Http Port</td>
<td>7789-7790</td>
<td>7789</td>
</tr>
<tr>
<td>Admin Server Http SSL Port</td>
<td>7101-7200</td>
<td>7102</td>
</tr>
<tr>
<td>Managed Server Http SSL Port</td>
<td>7301-7400</td>
<td>7302</td>
</tr>
</tbody>
</table>
Adding Additional Oracle Management Services 13c

Oracle Management Service (OMS) is one of the core components of OEM Cloud Control that works with Management Agents and plug-ins to discover targets, monitor and manage them.

So OMS is a very critical component in IT Infrastructure and we highly recommend making it fault-tolerant and build it with a Highly Available architecture.

To make OMS fault-tolerant, we strongly recommend installing additional OMS instances on a separate dedicated Compute Instance in a different Availability Domain that will provide redundancy at Data Center level. Please make sure all Availability Domains for OMS Installation are in the same Region to achieve the optimal performance.

The following guidelines should be observed when adding additional OMS Instance. Please refer to Oracle Documentation for OMS 13c for full details.

» You can clone only an existing, running Oracle Management Service 13c that is associated with an AdminServer host. The patches applied on the source OMS are automatically carried over to the cloned instance.

» You can clone only one OMS at a time and to only one destination host at a time. If you want to add multiple OMS instances, then you must repeat the installation procedure on each host.

» You can clone only when the source host and the destination host are running on the same operating system and architecture.

» All general purpose file systems, including OCFS2 and ACFS (except OCFS), are acceptable for storing Enterprise Manager Cloud Control 13c software binaries and OMS instance home files (configuration files in gc_inst).

» If you are installing on an NFS-mounted drive and creating the OMS instance base directory (gc_inst) on that NFS-mounted drive, then after you install, move the lock files from the NFS-mounted drive to a local file system location. Modify the lock file location in the httpd.conf file to map to a location on a local file system.

» Oracle BI Publisher that is installed and configured on the first OMS is automatically carried over to the additional OMS. However, as a prerequisite for installing an additional OMS, you must ensure that the Oracle BI Publisher installed on the first OMS is configured with a shared storage location for cluster volume and configuration volume. If a shared storage location is configured, then the same shared location is used by the additional OMs as well. Otherwise, you must configure a shared storage location first and then proceed with installing an additional OMS.

» Starting with 13c Release 1, as part of the Oracle Fusion Middleware Plug-in deployment, one Java Virtual Machine Diagnostics (JVMD) Engine is installed by default on the first OMS. Therefore, when you install an additional OMS using the first OMS as the source, you receive one JVMD Engine by default with the additional OMS as well.
Do not discover any Oracle ZFS Storage Appliance target in 13c environment.

Prerequisites for Adding an Additional Oracle Management Service

The following prerequisites must be validated on the new host before adding an additional OMS:

- Hardware – Same as First Host
- Operating System – Same as First Host. The OS of additional Host must be same as First Host.
- OS Packages, Kernal and Library – Same as First Host.
- OS Group and Users – Same as First Host
- NFS Mount Point Location – If you are planning to install on an NFS-shared location, then follow Oracle Documentation for NFS requirements.
- Existing OMS – The existing OMS on first node must be installed, up and running and available for cloning.
- Existing Management Agent – Ensure that the destination host already has a Management Agent installed, up and Running.
- Middleware Home Location – By default (and recommended), the Oracle home on the destination hosts is same as source host. Make sure this Oracle home doesn’t already exist on destination host.
- DNS Failover and/or Server Load Balancer – Ensure that you have configured DNS failover properly to be able to failover to Standby Site in AD2. All Management Agents communicating with the first OMS must be able to upload data to OEM WebTier in AD2. Please refer to EM 13c documentation for full details on configuring DNS and Server Load Balancers.
- Firewall – Make sure all the ports required for OMS installations are open between all OMS hosts.
- Make sure you use the Private IP Address of compute instance and not use the Public IP address.

Adding an Additional Oracle Management Service

The following steps should be followed to add an additional Oracle Management Service:

1. From the Enterprise menu, select Provisioning and Patching, then select Procedure Library.
2. On the Deployment Procedure Manager page, in the Procedure Library tab, from the table, select Add Oracle Management Service, and then, click Launch.
3. On the Getting Started page, complete the preinstallation tasks listed there. Once you are done, select each of the tasks you have completed, and then, click Next.
4. On the Select Destination page, do the following:
   - For Destination Host, select or enter the name of the managed host (a host managed by the first OMS using a Management Agent) on which you want to install the additional OMS. For example, myhost.example.com. Do not enter the IP Address of the managed host, instead add alias host name in the /etc/hosts file on all OMS instances.
   - For Destination Instance Base Location, accept the default location to the OMS instance base directory or enter the absolute path to another location of your choice where OMS-related configuration files can be stored. As a best practice, this directory path should be the same as the directory path on the first OMS. Ensure that this directory has 100 MB of space. Also ensure that the directories and subdirectories you mention in the path already exist. For example, /apps/john/oracle/prod.
   - In the Source Credentials section and in the Destination Credentials section, select the credential type you want to use for accessing the source host.
5. Click Next.
6. On the Options page, do the following:
   » In the File Transfer Option section, select a suitable protocol to transfer the cloned ZIP files to a staging location. FTP is the default transfer mode.
   » In the Staging Locations section, for Source Staging, enter a location on the source host where the cloned ZIP files can be created and placed temporarily. Ensure that this temporary directory has 10 GB of space. For example, /myhost.example.com/shared.
   » Similarly, for Destination Staging, enter a location on the destination host where the cloned ZIP files can be copied to temporarily. Ensure that this temporary directory has 10 GB of space.
   » In the Destination Ports section, validate the ports displayed by default. These default ports are based on the ports already assigned and used by the OMS that you are cloning. Oracle recommends you to use the same ports as your source OMS so that you have a homogeneous environment.
   » Click Next.

7. On the Post Creation Steps page, entering email address is optional. Click Next.

8. On the Review page, review the details and click Finish.

   If the installation fails for any reason, you must clean up the Oracle Home on the destination host before retrying. The Oracle Home on destination home must be empty before the installation.

9. Once Installation is completed, run $ORACLE_HOME/root.sh as a root user on the destination host.

   The following targets on the destination host are automatically discovered and monitored in the OEM Cloud Control Console:
   » Oracle WebLogic Server, where the additional OMS is deployed
   » Oracle Web Tier
   » Application deployments, one for the Enterprise Manager Cloud Control console and one for the platform background services.
   » Oracle Management Service
   » Oracle Management Agent
   » The host on which you installed Enterprise Manager Cloud Control

An encryption key is generated to encrypt sensitive data in the Management Repository. If this key is lost, all encrypted data in the Management Repository becomes unusable. Therefore, back up the Management Service configuration including the emkey, and maintain the backup on another host or on Object Storage. You can follow your Enterprise Guidelines to store encryption keys if you already have encrypted database in your fleet.

To back up the Management Service configuration including the emkey, run the following command:

   » $ORACLE_HOME/bin/emctl exportconfig oms -dir <path_to_backup_location>

Prerequisites for Installing Agents using Add Host Targets Wizard

All the OS level prerequisites mentioned above for Installing EM apply to Agent Installation as well. In addition, following requirements must be satisfied for Agent Installation:

   » Destination host must be accessible from the OMS host so Agent can upload the data from Target Host to OMS repository.
   » Destination host credentials (ssh keys) must be uploaded to OMS console for Agent Installation to succeed. Or else, you can specify the username/password in the wizard itself when you add a new
Target Host. The username you specify here will be used for Agent Installation so make sure this user has required permissions to run Agent.

» The Agent Installation user must have sudo permission to run the agentdeployroot.sh at the end of Agent Installation.

» Agent Installation directory must be empty and Installation user (as mentioned above) should have write permission on this directory. Also installation directory name can’t have any spaces in it.

» The timezone of Target Host and OMS Host must be same and they should be synchronized using same NTP server.

» The SSH daemon must be running on Target Host on default port 22. This is required to copy the Golden Image of Agent Software at the beginning of Installation.

» Unset CLASSPATH variable on Target Host for Agent Installation username profile.

Installing Stand-alone EM Agent using Add Host Targets Wizard

To install fresh Management Agents using the Add Host Targets Wizard, follow these steps:

1. Ensure that you have downloaded and applied the Management Agent software for the platforms of the hosts on which you want to install Management Agents.

2. In Cloud Control, do one of the following:
   » From the Setup menu, select Add Target, then select Auto Discovery Results. On the Auto Discovery Results page, under the Servers, Storage and Network tab, select a host that you want to monitor from the displayed list, then click Promote.
   » From the Setup menu, select Add Target, then select Add Targets Manually. On the Add Targets Manually page, select Install Agent on Host.

3. On the Host and Platform page, do the following:
   » Accept the default name assigned for this session or enter a unique name of your choice.
   » From the Add menu, select Manually to enter the fully qualified name and select the platform of the host on which you want to install the Management Agent. You must enter only one host name per row. Entering multiple host names separated by a comma is not supported.

The host names that are retrieved from the system for the installation may include IP addresses and short names. However, it is recommended that you provide fully qualified host names, such as foo.mydomain.com, which persist over the life of the host targets. This is recommended for ease of maintenance and overall security.

4. On the Installation Details page, do the following:
In the Deployment Type section, select Fresh Agent Install.

- From the table, select the first row that indicates the hosts grouped by their common platform name.
- In the Installation Details section, provide the installation details common to the hosts selected in Step 3 (b). For Installation Base Directory, enter the absolute path to the agent base directory where you want the software binaries, security files, and inventory files of the Management Agent to be copied.
  
  For example, /u01/software/em13c/agentbasedir/

If the path you enter does not exist, the application creates a directory at the specified path, and copies the Management Agent software binaries, security files, and inventory files there.

- From Named Credential list, select an appropriate profile whose credentials can be used for setting up the SSH connectivity between the OMS and the remote hosts, and for installing a Management Agent on each of the remote hosts.

- For Port, accept the default port (3872) that is assigned for the Management Agent to communicate, or enter a port of your choice.

You can use the defaults settings for rest of the parameters on this screen.

5. On the Review page, review the details you have provided for the installation and do one of the following:

- If you want to modify the details, then click Back repeatedly to reach the page where you want to make the changes.
- If you are satisfied with the details, then click Deploy Agent to install the Management Agent. You are automatically taken to the Add Host Status page that enables you to monitor the progress of the deployment session.

If you want to cancel a running deployment session, then on the Add Host Targets page, click Cancel. Note that once you cancel the session, you cannot track or resume the session in any way. However, the currently launched commands on the remote hosts will continue to run until they are completed.
To view the details or track the progress of all the Add Host sessions using the Add Host Targets Wizard, from the Setup menu, select Add Target, then click Add Targets Manually. On the Add Targets Manually page, click Install Agent Results.

**Post Agent Installation**

After you install a stand-alone Management Agent using the Add Host Targets Wizard or EM CLI, follow these steps:

1. Verify the installation on the Add Host Status page.
2. If required, manually verify the installation:
   - Navigate to the Management Agent home and run the following command to see a message that confirms that the Management Agent is up and running:
     ```bash
     $<AGENT_INSTANCE_HOME>/bin/emctl status agent
     ```
   - Navigate to the Management Agent home and run the following command to see a message that confirms that EMD upload completed successfully:
     ```bash
     $<AGENT_INSTANCE_HOME>/bin/emctl upload agent
     ```
   - From the Setup menu, select Manage Cloud Control, then select Agents. Verify that the Management Agent you installed is up and running.
3. Verify whether all the plug-ins listed in `/<AGENT_BASE_DIRECTORY>/plugins.txt` were installed successfully. To do so, run the following command:
   ```bash
   $<AGENT_INSTANCE_HOME>/bin/emctl listplugins agent -type all
   ```

By default, the host and the Management Agent get automatically added to the Enterprise Manager Cloud Control console for monitoring. None of the targets running on that host get automatically discovered and monitored. To monitor other targets on the host, follow the Discover Target steps in the next section.

**Discover Targets on a Managed Host**

By default, the host and the Management Agent get automatically added to the Enterprise Manager Cloud Control console for monitoring. The next step after installing Agent is discovering all targets running on the host. The steps involved are:

- Discovery
- Promotion
- Monitoring

**What are Targets on a Managed Host**

Targets are entities that you want to monitor with OEM Cloud Control, such as host machines, Databases, Middleware components, WebServers and any other processes running on a managed host.

Managed targets are entities that are actively being monitored and managed by OEM Cloud Control.
Discovery of Targets on a Managed Host

Discovery is a process of identifying unmanaged hosts and targets in your environment. You can discover hosts and targets automatically or manually with following three options:

- Auto Discovery
- Guided Discovery
- Declarative Discovery

Auto Discovery

The AutoDiscovery process enables a Management Agent running on the host to run an Enterprise Manager job that scans for unmanaged hosts. One discovery is complete, you search for targets such as databases or other deployed components or applications on these managed hosts, and finally you promote these targets to managed status.

The benefit of using this process is that as new components are added to your infrastructure, they can be found and brought under management on a regularly-scheduled basis.

Guided Discovery Process

The guided discovery process enables you to explicitly add a target to bring under management. The discovery wizard guides you through the process and most of the specifications required are filled by default. You can think of Guided Discovery as Discovery on Demand.

You can use Guided Discovery if you want to discover targets without waiting for AutoDiscovery to run. Guided Discovery also saves resources from routine AutoDiscovery processes if new targets are not added very often.

Declarative Process

Declaring target monitoring properties enables you to manually specify all the details required to discover the database target, such as the host name and location, target name and location, and other specific information. This process is generally used when the autodiscovery process and guided discovery process fails to discover the target that you want to add.

Promotion of Discovered Targets

Promotion is a process of converting unmanaged hosts and targets, which have been discovered in your network, to managed hosts and targets in Cloud Control so that they can be monitored and managed efficiently. The conversion of unmanaged targets running on those hosts to managed targets involves only adding the targets as manageable entities in Cloud Control without deploying any additional component other than Agent.

Here is a full life-cycle of Discovery and Monitoring in EM Cloud Control:
Discovering and Adding Host Targets

You can discover Host Targets using the AutoDiscovery process or by using the Manual Guided Discovery Process.

The steps for Auto Discover are as follows:

1. Run IP Scan
2. From the Setup menu, select Add Target, then select Configure Auto Discovery.
3. On the Setup Discovery page, in the Host and Oracle VM Manager tab, click Create. Select the Schedule to run discovery jobs immediately or later.
4. On the Network Scan Discover: Create page, click Add. Select the Management Agent that is installed by default on the Oracle Management Service host. Since the Network Scan is run as root, use Host Credentials with Run as root or SSH Key Credentials.

5. Select the agent in the IP Ranges for scan table, and enter the IP ranges to scan.
   A default list of ports to scan within the IP ranges you specified is listed in the Configure Ports Tables. You can change the ports if you like and add/modify upto 10 ports.

6. You can configure the schedule for Discovery Job in the next screen.

7. Click Save and Submit Scan.

8. To check for discovered targets from the Setup menu, select Add Target, then select Auto Discovery Results.

9. Select a host from the Discovery Result Table and click Promote to promote the host to managed target status.
   The Add Host Targets wizard will open now that will guide you through the Management Agent Installation on the host.

Discovering and Promoting Oracle Homes

When you deploy an Oracle software component outside of the deployment procedures provided by Enterprise Manager, the Oracle home is not automatically discovered and promoted as targets. You will have to manually discover and promote the Oracle home target.

The following steps should be followed to discover and promote an Oracle home target:

1. From the Enterprise menu, select Job and then select Activity.
2. On the Job Activity page, from the drop-down list in the table, select Discover Promote Oracle Home Target.
3. On the next page, in the General tab, specify the name of the discovery and click Add.
4. On the next page, select Target Type as Host, then select all the hosts targets by clicking Select All.
5. On the next page, the host targets that you selected are displayed in the table.
6. Select the Parameters tab, then do one of the following:
   » To discover a single Oracle Home, specify the path to the home and then select Oracle Home as the manage entity.
   » To discover all Homes in an inventory, specify the path to the Inventory, and then select Inventory as the manage entity.
   » To discover all homes in a Middleware Home, specify the path to the Middleware Home and select Middleware Home as the manage entity.
7. To submit the job, click Submit. A confirmation is display when the discovery is successful.

Conclusion
Oracle Enterprise Manager 13c offers seamless integration of Oracle Cloud Infrastructure resources and deploying OEM on Oracle Cloud Infrastructure is similar to deploying it into on-premises environments. OEM delivers business driven application performance management both on-premises and on the cloud, by monitoring user experience and business transactions. Integrating these business metrics with infrastructure monitoring, Enterprise Manager provides IT operators an End-To-End view of their services and ensures effective utilization of the IT resources.
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Author: Shan Gupta (shan.gupta@oracle.com)
Contributing Authors: Bruce Burns (bruce.burns@oracle.com)

Integrated Cloud Applications & Platform Services

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