Oracle Maximum
Availability Architecture

Operational Considerations and Troubleshooting for Oracle Enterprise Manager 13c

ORACLE WHITE PAPER | OCTOBER 2016

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Introduction

Oracle Enterprise Manager (EM) 13c has become a valuable component in monitoring and administering an enterprise environment. The more critical the application, servers and services that are monitored and maintained via EM, the more critical the EM environment becomes. Therefore, EM must be as available as the most critical target it manages. This whitepaper will assist in defining the proper configuration, monitoring and maintenance activities to ensure that EM stays highly available.

There are many areas that need to be discussed when talking about managing Enterprise Manager in a data center. Some of these are as follows:

- Recommendations for staffing roles and responsibilities for EM administration
- Understanding the components that make up an EM environment
- Backing up and monitoring EM itself
- Maintaining a healthy EM system
- Patching the EM components
- Troubleshooting and diagnosing guidelines

This whitepaper will help define administrator requirements and responsibilities, and guide you in setting up the proper monitoring and maintenance activities to keep Oracle Enterprise Manager 13c healthy.

Infrastructure Components

Oracle Management Service (OMS)

The Oracle Management Service performs several important tasks in an EM environment. It is the web-based application that communicates with the Oracle Management Agents and Oracle Management Plug-ins to discover, monitor and manage targets as well as store the information in the Oracle Management Repository. It is also responsible for running the user interface for the Enterprise Manager Cloud Control Console.

Systems and Services

In EM, an application can be modeled as a service that runs on a group of targets called a system. A system is created to define the infrastructure required to host a specific application. Then, the application can be defined as a service allowing monitoring and management of the application. Out of the box, the EM components are combined into a system called “Management Services and Repository”. Services have been created on this system for specific functions within EM itself as described below.

EM Jobs Service

The EM Jobs Service is a service using the Management Services and Repository system and consists of all components required for the EM jobs to function properly. The availability of the EM Jobs System as a whole depends on the availability of each of the underlying components defined in this service.

EM Console Service

The EM Console Service is a service using the Management Services and Repository system and consists of all components required for the EM Console to function properly. The availability of the EM Console System as a whole depends on the availability of each of the underlying components defined in this service as well as a defined "EM Console Service Test" and the "EM Management Beacon".

Oracle Management Agent

The Oracle Management Agent is deployed on each host to be managed by an EM environment. It is responsible for managing and monitoring all of the targets on that host (including the host itself) and communicating all information to the Oracle Management Service.

Oracle Management Repository

The Oracle Management Repository is used for storing all of the data received from the Oracle Management Agents. It organizes the data so that the Oracle Management Service can retrieve it and display it in the Enterprise Manager Cloud Control Console.

Oracle Management Plug-ins

The core Enterprise Manager Cloud Control features for managing and monitoring the different Oracle components are provided via separate components called plug-ins. This allows the flexibility of updating EM with the latest product releases for one or more component releases without having to upgrade to a later Cloud Control release. These provide a more "pluggable" framework.

JVMD Engine

The JVMD Engine provides the ability to diagnose performance problems in Java applications in the production environment. As part of the EM 13c install, one JVMD Engine is installed and configured by default each OMS server.

Business Intelligence (BI) Publisher

The BI Publisher is the primary reporting tool for creating, maintaining and delivering reports. It is installed and configured by default on each OMS server.

Enterprise Manager Cloud Control Console

The Enterprise Manager Cloud Control Console is the user interface that provides one central location for monitoring and administrating an entire environment.

Shown below is a picture of a typical environment showing how the above components relate.

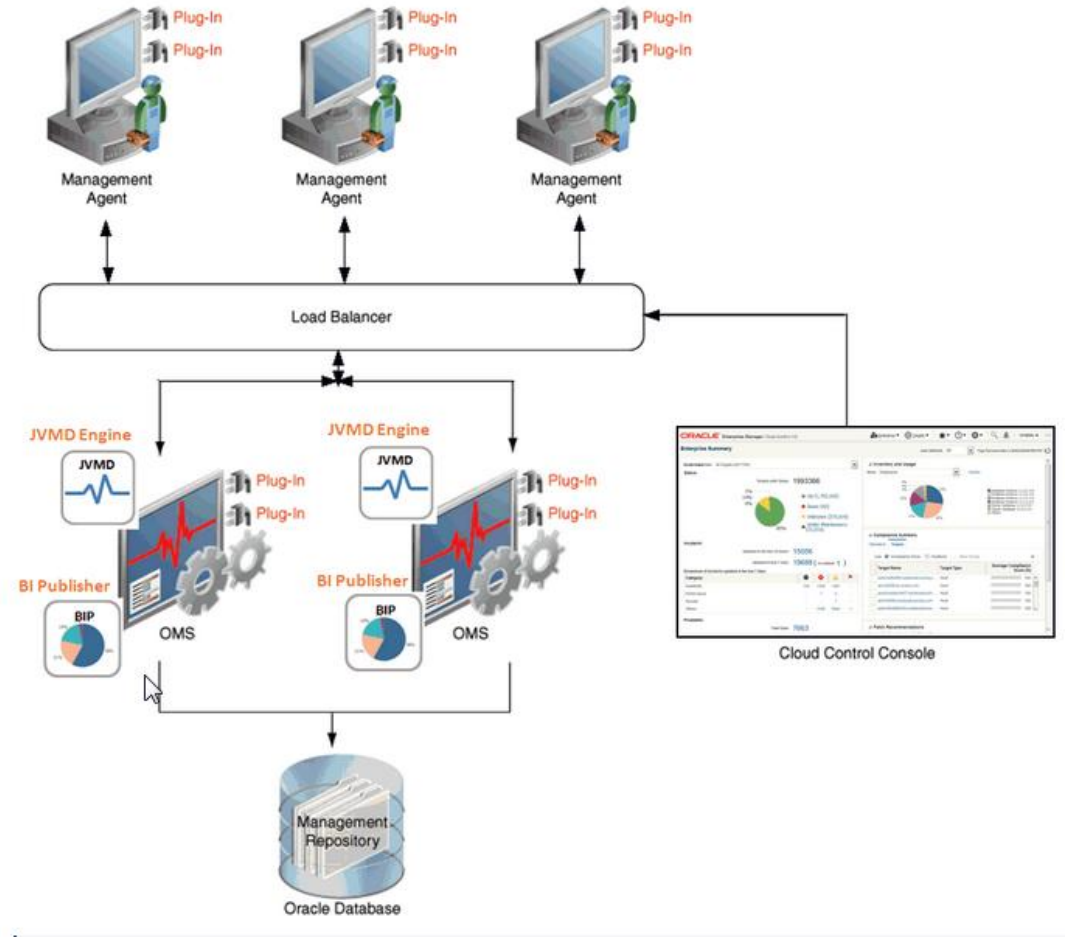


Figure1: EM Components

EM CLI

EM CLI is the Enterprise Manager Command Line Interface. Not only can this interface be executed from an operating system console, it also allows administrators to run many EM commands via scripts and thereby allows customers to create workflows based on their business needs. Using this interface, you can do many things such as manage credentials, define service targets/templates and setup incidents. For more information about using EM CLI refer to the *Enterprise Manager Command Line Interface* document.

Diagnostic Tools

EMDIAG

The EMDIAG Toolkit is a set of utilities that collect data from Cloud Control OMS, Repository and Agents to assist in troubleshooting and maintenance. EMDIAG consists of REPVFY, OMSVFY and AGTVFY Tools. Many of the recommendations in this whitepaper will utilize the EMDIAG tools. See EMDIAG Troubleshooting Kits Master Index [421053.1] for more information.

REPVFY

The EMDIAG REPVFY 13c kit is designed to collect data from a Cloud Control Management Repository 13c to assist in the diagnosis and correction of Cloud Control issues. For detailed installation instructions see EMDIAG REPVFY Kit for Cloud Control 12c,13c - Download, Install/De-Install and Upgrade [ID 1426973.1]. For details on utilizing REPVFY see EMDIAG Repvfy 12c/13c Kit - How to Use the Repvfy 13c kit [ID 1427365.1].

OMSVFY

OMSVFY is installed on each OMS server and collects data on the OMS configuration and patches. There are also several utilities available to help in searching log files, zipping the files for transfer to support, and identifying trouble areas on the OMS. See note EMDIAG Omsvfy 12c/13c Kit - Download and Install [ID 1374450.1] for detailed installation instructions.

AGTVFY

AGTVFY gets installed on the each Agent server. This is a good component to become familiar with and use when troubleshooting agent issues. For detailed install instructions see EMDIAG Agtvfy 12c/13c Kit - Download and Install [ID 1374441.1].

Best Practices Configuration

Enterprise Manager 13c Cloud Control is an enterprise application that manages and monitors the infrastructure in your environment as well as the applications running on top of that infrastructure. The system itself requires some care and feeding to ensure that it is performing properly and that the data available is timely and accurate. One of the most common questions is who should manage EM and how much effort will it require. This all depends on what functions you plan to leverage, how critical the targets are, and the size of the environment.

Staffing Recommendations

As EM is a very broad application on its own, the recommendation is to have at least 2 people trained and responsible for managing EM who know the system very well and maintain its health. Depending on the size and scope of your environment, this may be 2-4 people who spend 25-50% of their time on EM. This ensures backup coverage during vacation or extended illnesses. Someone with knowledge of Oracle Database and WebLogic Server is extremely helpful as these are the main backbones of EM; however EM Administrators also need to understand your entire enterprise. Integration into authentication and ticketing systems, placement in network/firewall rules, configuration of the Software Load Balancer, and segregation between support groups and organizations are all areas where the EM Administrator will be required to interface during initial setup and continued operations.

Administrator Responsibilities

Implementing EM and managing an enterprise will require involvement from various teams. Companies divide the roles and responsibilities differently based on the size of the implementations and the different data center responsibilities. There needs to be a well defined, agreed upon list of tasks that identifies the individual or team responsible for particular tasks. This is often referred to as a RACI diagram (Responsible, Accountable, Consulted and Informed). The EM Administrator should own architecture and installation, overall agent deployment procedures, agent patching procedures, OMS patching and user administration. It is also important for the EM Administrator to know the baseline functionality and performance of their EM environment to more easily identify existing or pending problems. Knowing the baseline environment consists of two items. The first item is to understand and document the architecture of the environment (i.e. topology, key components). This will help in understanding the impact of any architecture change. The second item is for the EM Administrator to understand

the normal baseline operations of the environment. This consists of understanding the environment and the expected load (i.e. how much data to expect in a day). Things like deploying agents, discovering targets, solving agent issues and solving target availability can all be delegated to target owners. The RACI diagram below is an example of defining this responsibility and is a starting point for your organization to define the roles and responsibilities in your environment even if multiple roles are performed by the same person.

TABLE 1: ENTERPRISE MANAGER 13C RACI

TASK	RESPONSIBLE	ACCOUNTABLE	CONSULTED	INFORMED
Define Monitoring Requirements	Target Owners, Infrastructure Teams, EM Admin	EM Admin		
Installation Planning and Architecture	Infrastructure Teams, EM Admin	EM Admin	Target Owners, Infrastructure Teams	
Installation and Configuration of EM	EM Admin	EM Admin		
Defining Agent Deployment and Patching Procedures and Processes	EM Admin	EM Admin		Target Owners
Security and User Administration	EM Admin/Security Admin	EM Admin		
Admin Group Creation	EM Admin	EM Admin	Target Owners	
Agent Deployment (can be performed by target owners)	Target Owners	Target Owners	EM Admin	
Agent Patching (can be performed by target owners)	Target Owners	Target Owners	EM Admin	
Target Configuration and Availability	Target Owners	Target Owners		
Agent Troubleshooting	Target Owners, EM Admin	EM Admin		
Target Troubleshooting	Target Owners	Target Owners	EM Admin	
Weekly/Monthly/Quarterely Maintenance	EM Admin	EM Admin		Target Owners
OMS Patching	EM Admin	EM Admin		Target Owners

Maximum Availability

Since EM plays an important role in managing and monitoring the enterprise environment, it is important to ensure that the environment is configured for maximum availability. This includes regular backups as well as architecting the environment for disaster recovery. The *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide* provides details on backing up the Enterprise Manager environment. As part of an overall backup strategy, it is important to take regular backups as well as backups before any patching or plug-in update is applied for the following components:

Oracle Management Service Backups

Backups for the OMS should consist of the following:

- Software Homes: The EM 13c install now only consists of a single OMS home for all of the components installed on the OMS server. This includes the Fusion Middleware home, the OMS software home, the Web Tier oracle home and the Plug-in Homes. A filesystem level backup of the software home and the Oracle inventory files should be taken whenever patches/patchsets are applied or new plug-ins deployed.
- Instance Homes/Administration Server/OMS Configuration: The configuration for the OMS can be backed up by issuing the *emctl exportconfig oms* command on each of the oms servers. This command saves a point in time snapshot of the configuration for the Instance Homes as well as the Administration Server so that if necessary, it can be restored.

Refer to the *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide* for further details on backing up the OMS server(s).

Management Repository Backups

The backup strategies for the repository are the same as for the Oracle Database. This includes having the database in archivelog mode and performing regular hot backups with RMAN which consists of a full backup and then incremental backups. EM provides a simple way to setup database backups via the option for Oracle suggested backups. This backup strategy will create a full database backup followed by an incremental backup on each subsequent run. The database backup will be recovered using these incremental backups thus creating a backup that is equivalent (for database recovery) to an image copy of the data files at the time of the last incremental level 1 backup. For further detail on the setup of Oracle Recommended Backups, refer to the *Oracle Database 2 Day DBA* document. The steps for configuring the backup in EM are documented below.

1. Click on **Targets** / **Databases**. Select the EM Repository database.

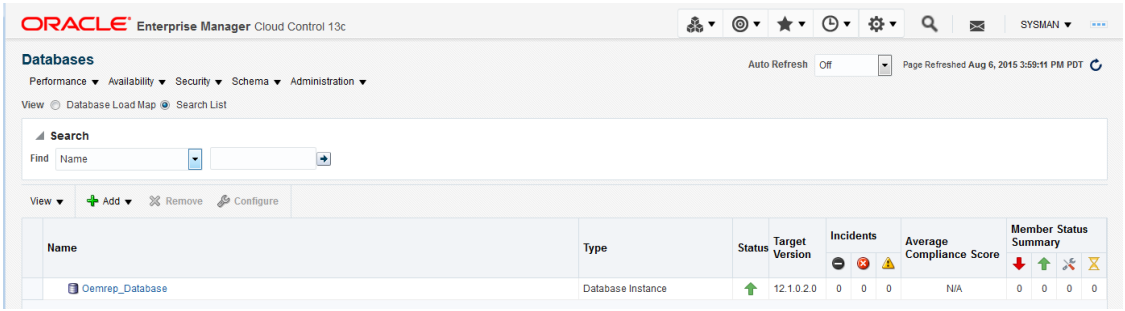


Figure 1: Databases

2. From the database home page, click on **Availability / Backup & Recovery / Schedule Backups**…
3. On the Schedule Backup page, select the proper login credentials for the database owner under the Host Credentials section and then click on **Schedule Oracle-Suggested Backup**

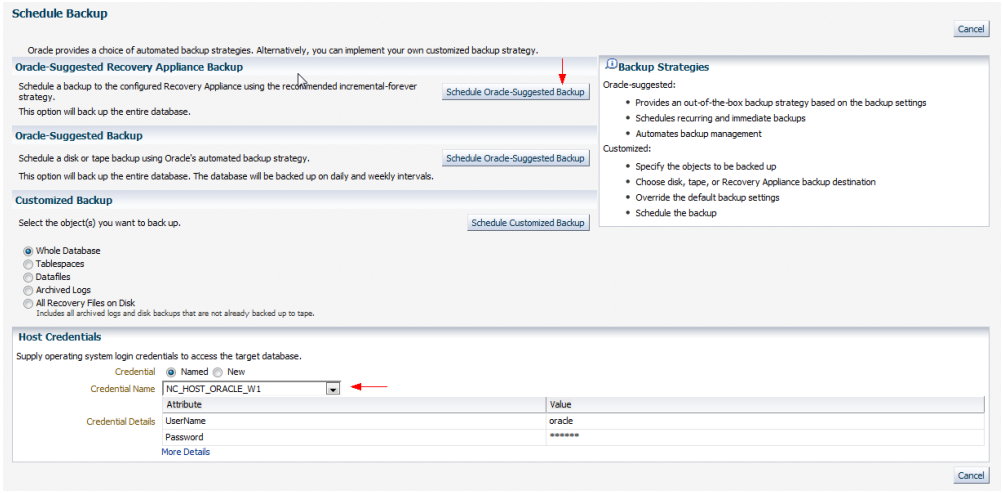


Figure 2: Schedule Backup

4. Select the destination media for the backup and click **Next**

Figure 3: Backup Destination

5. Set the backup settings for the backup based on the destination chosen above (a disk backup was selected for this example). Click **Next**

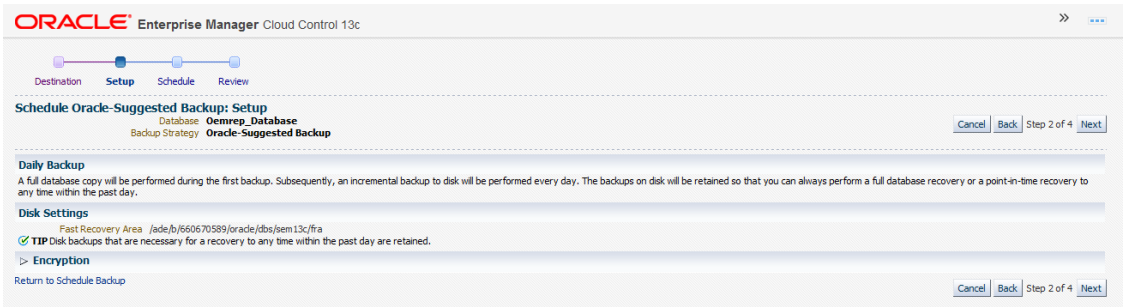


Figure 4: Backup Setup

6. Select the day and time to start the backups. Click **Next**.

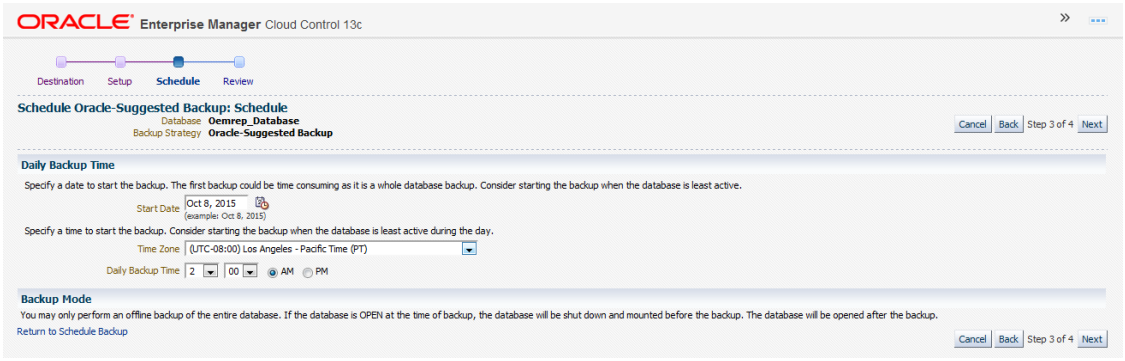


Figure 5: Backup Schedule

7. Review the backup details and if the information is correct, click **Submit Job**

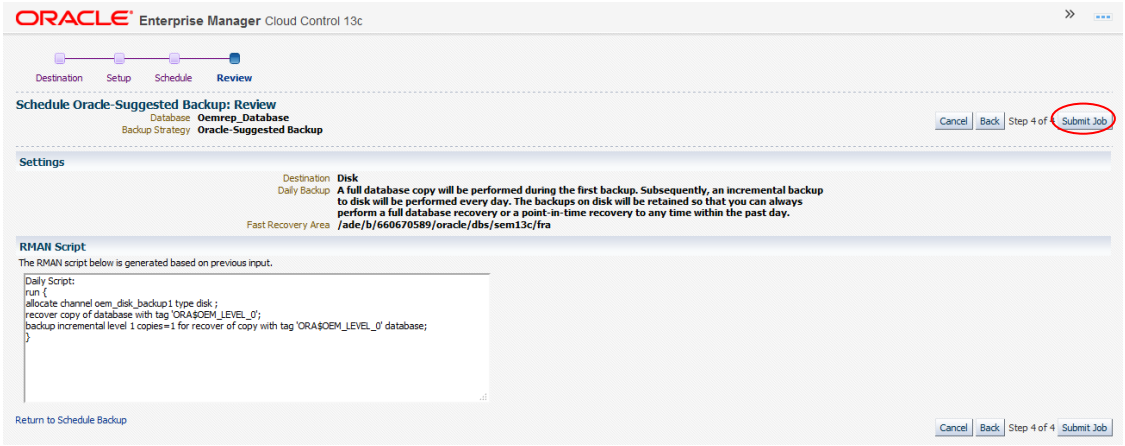


Figure 6: Backup Review

Software Library Backups

The Software library is a central location for storing software patches, application software images and other scripts. This library is required by specific EM features to function properly and therefore it is important to backup the software library storage location. The frequency of these backups may vary depending on how often content is added/removed but a good recommendation is to take a backup at the same time as the repository backup to maintain consistency. Not doing this may require running software library verifications after a recovery.

BI Publisher Backups

If the EM environment is setup with multiple OMSs, the BI Publisher requires a shared storage for storing the components that are shared between all BI Publisher instances. This should also be backed up at a at the same time as the repository backup.

Management Agent Backups

For the management agent, a reference agent should be maintained and kept current with patches so that if a management agent is lost, it can be reinstalled via cloning of this reference agent.

Increased High Availability and Disaster Recovery Options

As the importance of Enterprise Manager grows, so do the availability requirements. For some customers, it is just not enough to have a single OMS monitoring their entire database or WebLogic infrastructure. There are additional HA configurations available to meet specific business requirements. The table below details the different degrees of high availability that can be implemented for Oracle Enterprise Manager. Additional information on High Availability configurations can be found in the *Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*.

TABLE 2: HIGH AVAILABILITY CONFIGURATIONS

LEVEL	DESCRIPTION	MINIMUM NODES	RECOMMENDED NODES	LOAD BALANCER REQUIREMENTS
Level 1	OMS and Repository database each reside on their own host, no failover.	1	2	None
Level 2	OMS installed on shared storage with VIP based failover. Database replicated with Data Guard.	2	4	None
Level 3	OMS in Active/Active configuration. Database is using RAC + Data Guard.	3	5	Local load balancer
Level 4	OMS on the primary site in Active/Active Configuration. Repository deployed using Oracle RAC. Duplicate hardware deployed t the standby site. DR for OMS. Software Library, and BI Publisher using Storage Replication between primary and standby sites. Database DR using Oracle Data Guard. Note: Level 4 is a MAA Best Practice, achieving highest availability in the most cost effective, simple architecture.	4	8	Required: Local load balancer for each site. Optional: Global load balancer

Notifications

To properly monitor your EM environment, you need to receive notifications on events, incidents and problems that occur on the infrastructure components. In addition to your standard notifications for Database, FMW and Host targets Oracle recommends you set up notifications for the EM infrastructure. To receive notifications on the OMS and Repository components that consist of your EM infrastructure, create an Incident Rule Set specifically for these targets. The steps to do this are detailed in the section Setting Up Your Incident Management Environment of the Administrator's Guide. The best practice is to create a rule set for incoming Events on the OMS and Repository target that creates an incident and sends a notification (via e-mail, ticket or SNMP traps) to the EM Administrators for the categories listed below. The OMS and Repository target is an internal target type that will contain all of the EM components such as the infrastructure hosts, repository database, listeners, management services, etc. For the steps on how to create this rule set, refer to the My Oracle Support (MOS) note Oracle Enterprise Manager 13c Configuration Best Practices [2139083.1].

TABLE 3: INCIDENT RULE RECOMMENDATIONS

CATEGORY	FILTERS	ACTION
Metric Alert	Severity in Critical, Warning	E-mail/Ticket EM Administrators
Metric Alert	All	If event open > 7 days, clear the event
Metric Evaluation Error	Severity in Critical, Warning	E-mail/Ticket EM Administrators
Target Unreachable	Target Availability (Agent, Host)	E-mail/Ticket EM Administrators
Target Down	Target Availability	E-mail/Ticket EM Administrators
High Availability	Severity in Critical	E-mail/Ticket EM Administrators
Target Error	Target Availability	E-mail/Ticket EM Administrators

Out-of-Bound Notifications

Out-of-Bound Notifications for Enterprise Manager 13c can be configured to send an email or trigger a script when certain fatal conditions occur. This then allows the EM administrator to receive notifications when there is a failure in an EM component. The notification is triggered in the following scenarios:

- single OMS environment, if the OMS is down, but the Agent is up
- multi-OMS environment, if all OMSs are down, but the Agent is up
- if Repository database is unavailable (down, archiver hung, listener down, etc)
- if the notification job is broken or has an invalid schedule

Configure Out-of-Bound Notifications by following the steps in note How To Setup Out Of Bound Email Notification In 12c [1472854.1]. Even though this note was created for EM 12c, it is still applicable and works in EM 13c.

Patching

As with any application, regular patch maintenance is key. The recommended patches for Enterprise Manager, Agent and various Plug-ins can be found and downloaded from My Oracle Support. Oracle recommends setting up a planned maintenance window for the EM environment. This window would provide time for regular patching and activities that may require downtime (i.e. plug-in updates). A good recommendation is to schedule this planned maintenance on a quarterly basis and to check for the latest recommended patches at this same time (may vary according to the requirements of the individual companies). Note that the patching for the different components (i.e. agent) may be performed by different people or groups within your organization based on the roles and responsibilities as mentioned in Table 1: Enterprise Manager 13c RACI above. For additional information on guidelines for patching an Enterprise Manager environment, refer to Oracle Enterprise Manager Software Planned Maintenance. Also, a MOS note is published after each quarterly patch release providing a list of recommended patches for EM along with the installation steps. This MOS note is Applying Enterprise Manager Recommended Patches [ID 1664074.1].

Agent Patching

Keeping the Enterprise Manager Agent patched is a critical component to efficient and accurate monitoring as the collection scripts reside in the agent. Enterprise Manager offers a couple different methods that can be used for patching agents and the agent plugin components.

Manual Agent Patching

Manual patching is the process of downloading the patch to the server where the agent is running and following the instructions provided in the README file for manually apply the patch to the AGENT HOME. This is not the recommended method for maintaining the patch levels on all of the agents as it would be very time-consuming, however this option is available if required.

Enterprise Manager Agent Patch Plans

By using the automated patching feature in Enterprise Manager it is possible to create a patch plan from tested and approved agent patches, and deploy to many agents at one time or in batches. Recommended patches can be found by clicking **Enterprise / Provisioning & Patching / Patches & Updates** and then selecting the **Recommended Patch Advisor**. Select **Enterprise Manager Base Platform – Agent** for the product, and the correct Release and Platform. The Agent uses its internal credentials to Patch itself. Privileged credentials will need to be provided for any patch/upgrade requiring execution of the root.sh script if wanting EM to execute if as part of the patch apply. The account used to perform patching requires the Manage Target Patch and Patch Plan privileges. Full step by step instructions can be found in the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

Agent Gold Images

Starting with EM 13c, a new feature called Management Agent Gold Images has been introduced. This feature allows administrators to maintain a customized image of an agent including the agent binaries, plug-ins and patches. The Management Agent gold image is created from an existing management agent that has the desired configuration, referred to as the source agent.

The following capabilities are provided when using a Management Agent gold image:

- Provisioning a new management agent that will match the configuration of this gold image
- Updating any existing management agent including the tasks below:
  - Upgrade agent (upgrading the agent software)
  - Deploy new plug-ins to an agent
  - Upgrading the existing plug-ins that are currently deployed to a specific agent
  - Deploy patches on an agent
  - Deploy patches on the plug-ins that are currently deployed to a specific agent
- Check the compliance level across all agents to determine the percentage matching the gold image
- Track the Management Agent gold image activities (i.e. gold image jobs submitted and the associated activity of those jobs)

To create and manage the Management Agent gold images in EM, click on **Setup / Manage Cloud Control / Gold Agent Images**. This will open the Gold Agent Images console. From here, all images can be created and/or managed by clicking on "Manage All Images" as seen in the example image below:

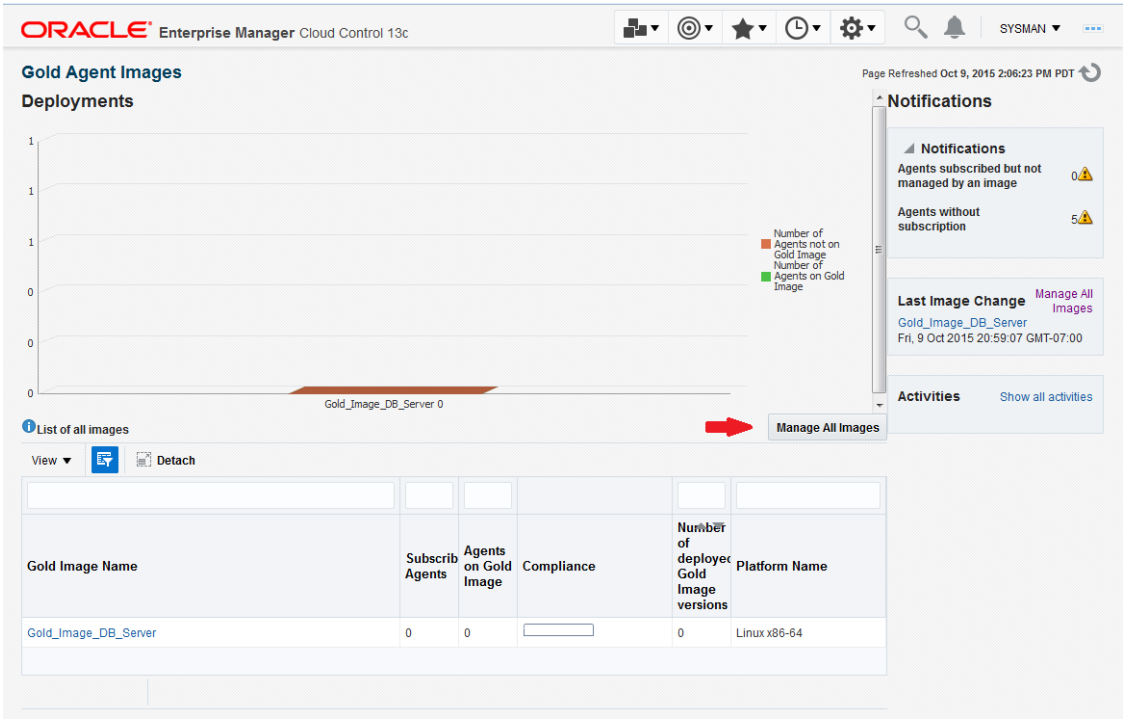


Figure 9: Gold Agent Images

For more details on creating and managing Agent Gold Images, refer to the *Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*.

Custom Plug-in Updates

Custom Plug-in updates provide the capability for the creation of a custom 'package' for an Agent-side plug-in that includes any required patches and updates. This is accomplished by applying all of the required patches to a specific plug-in and then creating a custom plug-in update. This custom plug-in update becomes a gold image of the plug-in with all of the required patches applied. With this feature, each deployment of that plug-in to an Agent will deploy the updated version of that plug-in preventing the need to patch a newly deployed plug-in. To create an updated/revised Agent-side plug-in, follow these steps (for more details on this process, refer to the Oracle Enterprise Manager Cloud Control Administrator's Guide):

1. Update and patch the plug-in on one agent with all of the required changes
2. Run this EMCLI command to create the custom plug-in version based on this modified agent:

   $ emcli create_custom_plugin_update \
   -agent_name="<patched agent name>" \
   -plugin_id="<internal ID of the plugin>"

   Note: To overwrite an existing custom plug-in, use the overwrite option as seen below:

   $ emcli create_custom_plugin_update \
   -agent_name="<patched agent name>" \
   -plugin_id="<internal ID of the plugin>" \
   -overwrite

3. To get the list of plug-ins and their ID's for an Agent, use this EMCLI command:

   $ emcli list_plugins_on_agent –agent_names="<patched agent name>"

   To get a list of all custom plug-in updates created, use this EMCLI command:

   $emcli list_custom_plugin_udpates

Once this custom plug-in is created, any push of that plug-in (with the same version) to the Agent will result in the custom updated plug-in being pushed. You can tell if a custom plug-in exists for a specific plug-in from the Plug-ins home page. (**Setup / Extensibility / Plug-ins**) If a custom plug-in has been created, a picture of a wrench and a plug will be displayed next to that version number as seen in the image below.

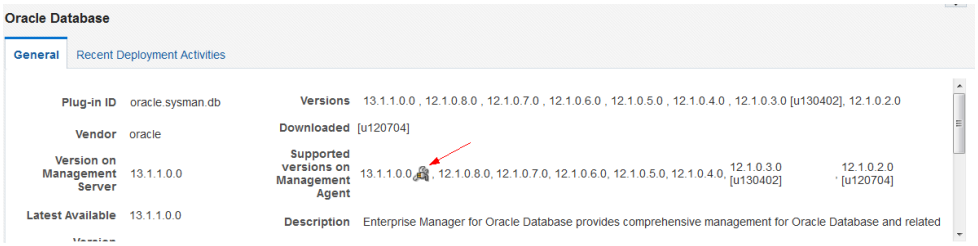


Figure 8: Custom Plug-in

Repository Patching

The recommended Database patches can be found on **My Oracle Support /Patches & Updates** by selecting the **Recommended Patch Advisor** and selecting Oracle Database for the product and the appropriate Release and Platform.

OMS Patching

For the OMS, patches must be manually applied with OMSPatcher. OMSPatcher is a utility that helps automate OMS patching by creating custom patching instructions based on the environment (single OMS or multi-OMS) and then automatically applying the patch. This utility functions much like the opatchauto command in EM 12c. OMSPatcher will require the Admin server URL as well as the WebLogic Administration Server username and password. Some patches require all OMS servers to be down during the application of any post-patch scripts. In multi-OMS environments, it is possible to shorten the patching cycle by following the procedure below:

1. Shut down the 1st OMS
2. Use OMSPatcher to apply the patch. This will generate scripts that will be used to apply the patch to each OMS server after they have been shutdown
3. Shutdown the remaining OMSs
4. Run the post patch scripts on the 1st OMS
5. Apply any other potential one-off patches to the 1st OMS
6. Restart the 1st OMS to reduce downtime
7. Patch the remaining OMS servers and then restart them

To see a list of the patches applied to an OMS home, use the following command:

OMSPatcher lspatches

For further details on OMS patching see the *Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*. Oracle is now creating rolling OMS patches which provide even higher availability since all

OMSs do not have to be shutdown to apply the patch but it can be applied in a rolling fashion. Not all patches are able to be rolling patches so it is important to check the individual patch README.txt file.

Plug-ins

To make the Enterprise Manager 13c framework extensible, the plug-ins contain all the binaries needed for specific components; therefore each plug-in has its own ORACLE_HOME on the OMS and sometimes the Agent. For example, a database plug-in is deployed on the OMS and Agent. The scripts that collect metrics from the database reside in the plug-in home. There will be plug-in specific patches for these components. They can be found in My Oracle Support by looking for Enterprise Manager for Oracle Database or Enterprise Manager for Fusion Apps, etc.. These patches also require that the OMS be shutdown during patching so it is a good idea to combine them in the same patching window as any OMS patch requiring downtime.

The individual OMS-side plug-in bundles are grouped into a System Patch each month. Therefore, this bundle patch will contain any available patches for all plug-ins. Each month includes the patches from the previous months unless a patch has been updated in which case the patch is replaced with the current plug-in patch. Patches that are not required will be skipped during patch application. For more details on plug-ins and how to maintain them, see the *Enterprise Manager Cloud Control Administrator's Guide*. For more information on the EM Patch Bundles and Patching EM see the following support note:
Enterprise Manager 13.1.0.0.0 (PS3) Master Bundle Patch List (Doc ID 2124038.1)

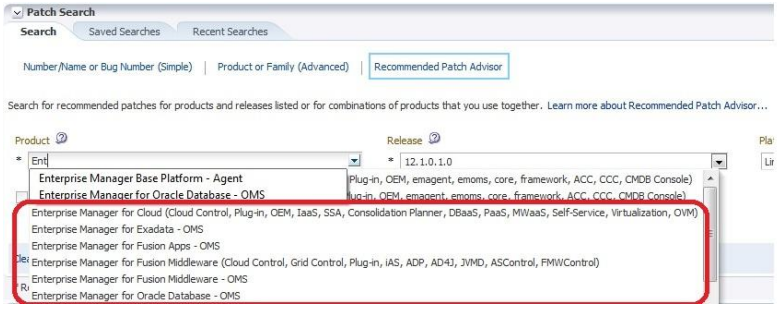


Figure 10: Patch Advisor

Always-On Monitoring

A common concern for customers is how to continue to monitor and receive notifications about targets when EM is down for patching. EM 13c introduces a new utility called Always-On Monitoring (AOM). AOM provides customers with the capability of receiving critical target status and metric alerts on a controlled list of targets. This is very useful during EM planned downtime. AOM requires its own repository and can be setup with multiple AOM instances for high availability. It is a good practice to setup and configure AOM and then to enable notifications ahead of planned EM downtime. For more details on AOM, refer to the Always-On Monitoring chapter in the *Enterprise Manger Cloud Control Administrator's Guide*.

Audit Log Data

Certain security operations should be audited to ensure compliance with the Sarbanes-Oxley Act of 2002 (SAS 70). In the EM environment, there is auditing for both the EM application and repository database.

EM Auditing

Enterprise Manager offers over 150 options for auditing that can be configured using EMCLI but by default, it audits a few basic and infrastructure operations and this auditing cannot be turned off. The audit data is stored in the

repository and the volume of this data can impact the performance of the system so it is important to externalize or archive the data at regular intervals. An API called EM_AUDIT_EXTERNALIZATION is provided to externalize the data. The data is stored in XML format and the files are named *<file-prefix>NNNNN*.xml where *<file-prefix>* is a configurable value and *NNNNN* is a number. The audit externalization service is enabled/configured using the EMCLI update_audit_settings command and the externalization of the audit data is performed by a repository job called EM Audit Externalization Service. The status of this job can be seen in Cloud Control by clicking on **Setup / Manage Cloud Control / Repository.**

To enable and configure the externalization of the audit data, follow the commands below:

1. Connect to the database as sysdba and create an external directory

   SQL> CONNECT / AS sysdba;

   SQL> CREATE DIRECTORY EM_AUDIT AS '/u01/app/oracle/em_audit'; GRANT

   SQL> READ,WRITE ON DIRECTORY EM_AUDIT to SYSMAN;

2. Execute the command below to configure the externalization: NOTE: be sure the select the specific operations that should be audited. Setting this to the value of "ALL" will mostly likely create more audit files than necessary.

   $ emcli update_audit_settings

   -audit_switch="ENABLE"

   -operations_to_enable="ALL"

   -externalization_switch="ENABLE "

   -directory="EM_AUDIT"

   -file_prefix="EMAudit"

   -data_retention_period="30"

3. *The following command will show the settings:*

   $ emcli show_audit_settings;

The above commands will enable the externalization of the audit data using a name such as EMAudit00001.xml and will save the files in the directory /u01/app/oracle/em_audit. Once this is done, archiving of the mandatory audit records from the operating system can be done via Oracle Audit Vault or tape/disk backups.

For more information, refer to the Enterprise Manager Cloud Control Security Guide.

Repository Database Auditing

Oracle always audits certain operations regardless of the database audit settings. This is referred to as Mandatory Auditing and the audit records are written to the operating system in the destination specified by the initialization parameter AUDIT_FILE_DEST.

Mandatory auditing includes these operations:

- SYSDBA and SYSOPER logins
- CREATE/ALTER/DROP AUDIT POLICY
- AUDIT/NOAUDIT

- EXECUTE of the DBMS_FGA PL/SQL package
- EXECUTE of the DBMS_AUDIT_MGMT PL/SQL package
- ALTER TABLE attempts on the AUDSYS audit trail table
- Top level statements by the administrative users SYS, SYSDBA, SYSOPER, SYSASM, SYSBACKUP, SYSDG, and SYSKM, until the database opens. When the database opens, Oracle Database audits these users using the audit configurations in the system.
- All configuration changes that are made to Oracle Database Vault

The agent that resides on each OMS server logs into the repository every few minutes for self monitoring and generates an audit record for each login. Therefore, it is very important that the audit records are regularly archived and purged. The steps for doing this may vary according to a company's security requirements but a sample setup is provided below.

Archive the audit data

Archiving of the mandatory audit records from the operating system can be done via Oracle Audit Vault or tape/disk backups. For further details on using Oracle Audit Vault, refer to *Oracle Audit Vault and Database Firewall Administrator's Guide*.

Purge the records

This can be done manually or via a purge job that performs the purge at a specified time interval. The recommendation is to setup a job that will purge the records at a specified time interval and is the approach in the example shown below. Note that purging a large audit trail can take time to complete so it is wise to schedule the job so that it runs during a time when the database is not too busy. For further details on the process and an explanation for each parameter used in the example, refer to the *Database Security Guide*.

1. Initialize the audit trail cleanup operation.

```
SQL> begin
  dbms_audit_mgmt.init_cleanup(
  AUDIT_TRAIL_TYPE => DBMS_AUDIT_MGMT.AUDIT_TRAIL_ALL,
  DEFAULT_CLEANUP_INTERVAL => 12);
  end;
  /
```

2. Setup an archive timestamp for the audit records. The RAC_INSTANCE_NUMBER refers to the instance number when using a RAC database. This must be set for each instance since the mandatory audit records are stored on the operating system and therefore for each instance. If this is a standalone database, use the number 0.

```
SQL> begin
  DBMS_AUDIT_MGMT.SET_LAST_ARCHIVE_TIMESTAMP(
  AUDIT_TRAIL_TYPE => DBMS_AUDIT_MGMT.AUDIT_TRAIL_OS,
  LAST_ARCHIVE_TIME => TO_DATE('2013-07-29 09:00:00','YYYY-MM-DD HH:MI:SS'),
  RAC_INSTANCE_NUMBER => 1);
  END;
  /
```

3. Create and schedule the purge job

```
SQL> BEGIN
  DBMS_AUDIT_MGMT.CREATE_PURGE_JOB(
  AUDIT_TRAIL_TYPE => DBMS_AUDIT_MGMT.AUDIT_TRAIL_ALL,
```

```
AUDIT_TRAIL_PURGE_INTERVAL => 12,
AUDIT_TRAIL_PURGE_NAME => 'Standard_Audit_Trail_Cleanup',
USE_LAST_ARCH_TIMESTAMP => TRUE);
END;
/
```

Maintaining Enterprise Manager

To ensure Enterprise Manager is configured and optimized properly, implementation planning should take into account the sizing recommendations provided in the *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*. Sizing is based on a combination of the number of agents, targets and concurrent users. After implementation, review the system sizing and usage on a regular basis to account for system growth.

The OMS servers process incoming and outgoing tasks. The incoming tasks are telemetry data and alert information coming in from the agents. A problem occurs if there is more data coming in than the network can handle. This is seen via the following:

- Network statistics (bandwidth/IO throughput/collisions)
- Loader backlog
- Job backlog (only if there is a backlog and a low number of available threads)

The outgoing tasks are created when the OMS sends requests out to the agents (configuration updates and job/tasks to perform on the managed targets) and when the OMS process sends out the notifications. To detect if an OMS server is having a bottleneck with outgoing tasks, look for the following:

- A job backlog even though a significant number of jobs are processed (sufficient throughput)
- Notification backlog even though there is a significant 'churn' on getting stuff out.

An additional OMS may need to be added into an environment based on the following situations. Note that the more incoming/outgoing stress on the system, the more likely the need for an additional OMS.

- load (number of agents and number of Admins) and whether or not that load is increasing
- backlog for incoming or outgoing tasks (as discussed above)

In addition to proper sizing and configuration, there are a few areas that should be checked on a regular basis using the EM Cloud Control Console itself as well as EMDIAG. Both of these tools provide a good way to make sure any issues that occur in the EM components can be identified and resolved. Below are the recommended tasks and frequency to maintain a healthy Enterprise Manager environment. The need to review the daily tasks should lessen as proper notifications and incidents are setup and the EM Admin has established a good baseline and understanding of the data components.

TABLE 4: RECOMMENDED MAINTENANCE TASKS

TASK	DAILY	BIWEEKLY	MONTHLY	QUARTERLY
Review critical EM component availability	X			
Review events, incidents and problems for EM related infrastructure	X			
Review overall health of the system including the job system, backlog, load, notifications and task performance	X			

Review agent issues for obvious problems (i.e. large percentage of agents with an unreachable status)	X			
Review agent issues (deeper/more detailed review of agents with consistent or continual problems)		X		
Review metric trending for anything out of bounds		X		
Evaluate database (performance, sizing, fragmentation)			X	
Check for updates in Self Update (plug-ins, connectors, agents, etc.) Note that there is an out-of-obx ruleset that will provide notification for the availability of new updates				X
Check for recommended patches				X

EM Encryption

Due to changes driven by the need to use the newer more secure algorithms the new version of JDK no longer supports X.509 certificates containing MD5-based digital signature algorithm. As of Enterprise Manager 13.2, this new version of JDK is used which means that the communication between the Oracle Management Service, agents and targets will be affected if the MD5-based X.509 certificates are configured. If these certificates are used, they must be remediated prior to upgrading to EM 13.2.

Availability

When confirming the health of the EM 13c environment the first place to start is to verify the status of the key components that make up this environment. Enterprise Manager is dependent upon many components for a complete working system. The Repository database, OMS, Console and PBS services, and WebLogic servers all have to be available for EM to function properly. A key component that is down could impact performance as well as availability. The goal is to keep the infrastructure components in an available status and to resolve any critical errors occurring in each one

Oracle Management Servers

The **Management Servers** page provides a more detailed status of the OMS services. In Cloud Control, click on **Setup / Manage Cloud Control / Management Servers**.

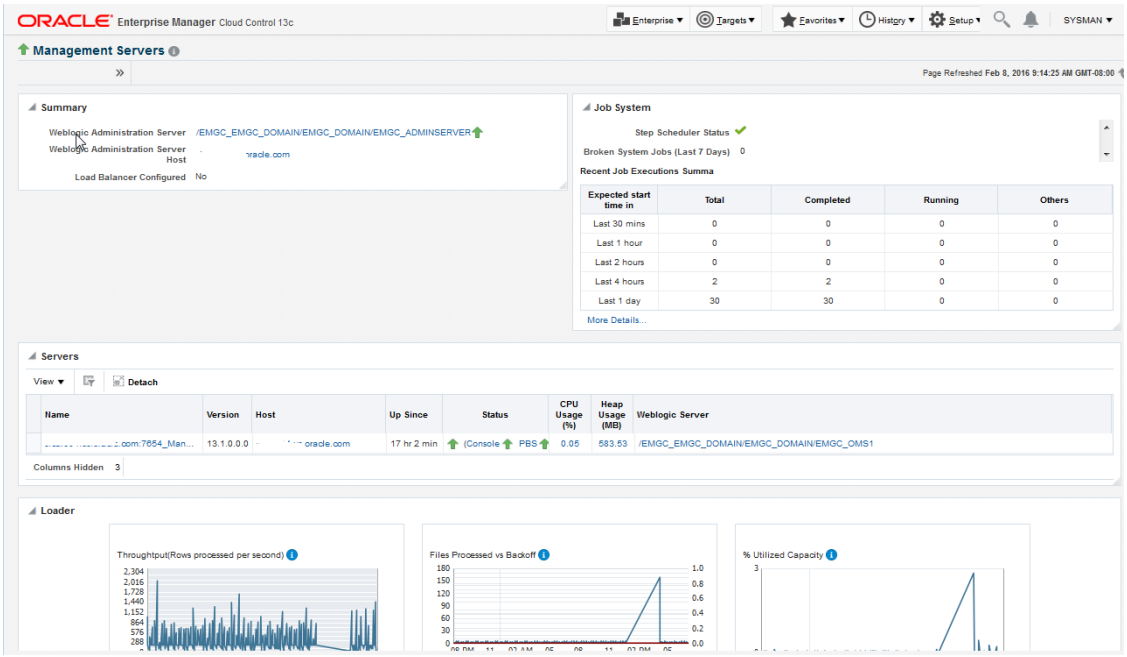


Figure 11: Manage Cloud Control Management Servers

The figures above show the information about the Management Servers. It includes details such as a summary of the job executions, graphs showing loader performance and any open incidents. Verify that the Management Servers show an Up status, including the status of the Console and Platform Background Service (PBS) for each Management Server.

Repository Database

Verify the status of the Repository database and underlying instances in the case of a RAC database. Click on **Setup / Manage Cloud Control / Health Overview**. Click on the name of the Database or Cluster Database under the **Repository Details** section.

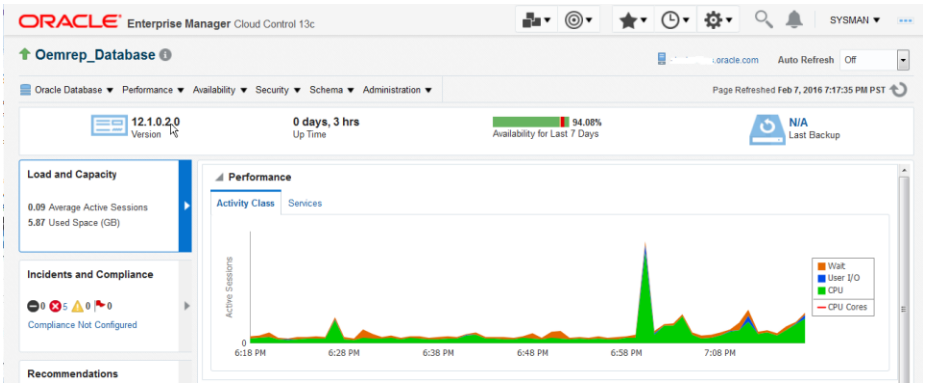


Figure 12: Manage Cloud Control Repository

In the case of a standalone database, the top section of this page will show the Up Time for the database. If implemented with Level 3 or Level 4 High Availability, verify the status of the standby database by clicking on **High Availability** located on the left side of the page.

In the case of a RAC cluster database, the top section of this page will show the number of Instances for this database and the status summary. Verify that each instance is in a "good" status. If implemented with Level 3 or Level 4 High Availability, verify the status of the standby database by clicking on **High Availability** located on the left side of the page.

EM 13c now provides more details on the Management Services and Repository target home page (**Setup / Manage Cloud Control / Repository)**. It includes three tabs of information called Repository, Metrics, and Schema. Each tab includes the following data:

Repository

This page provides a quick view of some details about the repository database including the following:

- Configuration Details
- Repository Volume Trend – this graph shows the total space allocated to tablespaces in the repository database and the total space used. Verify that the database is not running out of disk space and if so, make sure additional space is added or the autoextend options are set for the tablespaces.
- Initialization Parameter Compliance – verify that none of the initialization parameters are listed as non-compliant. If so, adjust the parameter to the recommended value.
- Repository Job Status – verify that none of the scheduler jobs are listed as down.
- Collection Performance – details for this graph are provided in the Task Subsystem section later in this paper.
- Metric Rollup Performance – this graph shows the number of records rolled up and the throughput per minute. These values may increase over time as more targets are added in the environment but on a daily basis, they should remain somewhat level. A large spike could indicate a communication problem between agents and the OMS. If there are not a large number of agent communication problems, then the number of worker threads can be increased by clicking on "Configure". The default value is 1. Do not increase the number of workers above 5 without consulting Oracle Support.

Metrics

This tab provides graphs showing the rollup of key repository performance measurements. Use this data to help identify the target types and/or metric alerts that are the highest in volume and then further analysis the cause of the metric alerts. The information includes the following:

- Top 25 Metric Data Loading Target Types In Last 30 Days
- Top 10 Data Loading Metrics In Last 30 Days
- Metric Alerts Per Day In Last 30 Days
- Top 10 Metric Collection Errors By Target Type In Last 30 Days

Schema

The Schema tab provides data pertaining to the repository database schema. The information includes the following:

- Tablespace Growth Rate – use this data to help maintain the proper space in the repository database
- Top 20 Tables With Unused Space In Repository
- Purge Policies – this section provides the retention time (in hours) defined for the purging of data. The retention time can be modified for the different Policies/Groups from this page by clicking on "Modify"/
- Partition Retention - this section provides the retention time (in days) defined for the partitions in the database. The retention period can be modified for the different partitions from this page by clicking on "Modify"/

Software Library

EM now provides metrics for monitoring the software library. To view these metrics, click on **Setup / Manager Cloud Control / Repository**. Click on the drop down menu for OMS and Repository. Select **Monitoring / All Metrics / Software Library Upload Locations**. From here, make sure the software library is accessible and check the available space. Make sure the below metrics are set to warn when available space is running low and to notify in the event the software library is not accessible.

Available Space (MB) for Software Library Storage Location: Under the All Metrics, click on Software Library Upload Storage Locations and then on Available Space (MB) for Software Library Storage Location. Click on the row for the software library defined in your environment. This will populate the details for this metric. To set the threshold for this metric, click on "Modify Thresholds". Use the average value and low/high values provided on this page to help determine the value for the thresholds.

Is Accessible: Under the All Metrics, click on Software Library Upload Storage Locations and then on Is Accessible. Click on the row for the software library defined in your environment. This will populate the details for this metric. This metric is configured by default to alert if the software library is not accessible so this metric should not need to be modified.

General Availability

To confirm the overall health of the complete list of EM components from the Enterprise Manager Console navigate to **Setup / Manage Cloud Control / Health Overview** where the overall status is displayed. To drill further into each component, click on the menu bar for **OMS and Repository / Members / Show All**.

Check the status of the key components such as the EM services, application deployments, and WebLogic Deployments as described above. The status should show Up. Clicking on the status icon will drill down to show availability details. Each component represents a target in EM. If any components are down, use the information provided on the target's home page (i.e. errors/alerts) to assist in diagnosing and resolving the availability issue. For additional information on High Availability configurations, see the *Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*.

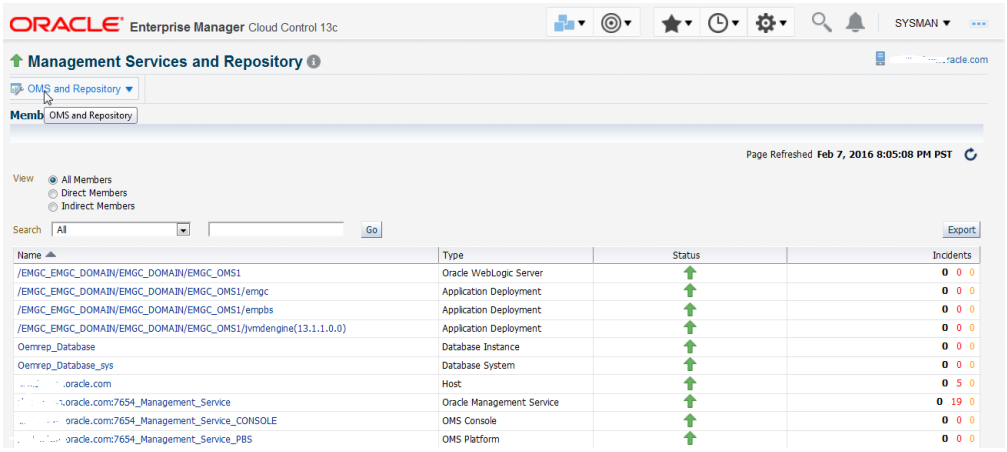


Figure 13: OMS and Repository All Members

EM Internal Subsystems

There are several internal subsystems that work in the background to process incoming data, evaluate alerts and severities, send notifications and perform internal housekeeping for EM. This section will review some of the critical internal subsystems and provide guidance as to what to look for when maintaining EM performance and availability.

EM Page Performance

In EM 13c, a feature has been added allowing for the capability of finding and diagnosing performance issues in the EM pages. The performance pages are found by clicking on either **Setup / Manage Cloud Control / Health Overview** or **Setup / Manage Cloud Control / Repository**. From either of these two pages, click on the drop down menu for OMS and Repository. From here, select **Monitoring / Page Performance**. There are three tabs on this page. Below is a quick description of each tab.

Overview

If there appears to be an issue in the performance of the EM pages, this page will assist in narrowing down a possible cause for the slowness. This page provides detail on the following:

- Page Accesses and Sessions
- Current Page Accesses and Sessions Distribution across OMS – use this graph to determine if one OMS is doing more work than another. This could indicate a problem with the SLB configuration or a potential problem with a specific OMS.
- Page Processing Time (Overall statistics) – use this graph to help determine in which area most of the page processing time is spent between the network, repository or OMS. This information can then be used to further analysis the component with the largest processing time.
- OMS and Repository Details (Page processing time across OMS for last 24 hours)
- Page Processing Time (Overall Statistics for last 24 hours
- Repository Details

Page Level Performance

This page provides detail on the list of pages accessed in the last 24 hours. This table provides information such as the page processing time total and broken down to the time spent processing on the OMS and processing in the repository. You can also get details on the requests per page, SQL/PL SQL executions per page, page accesses, etc. Clicking on a specific page will populate a graph at the bottom showing the page processing time in the Network, Repository and OMS.

Performance Correlation

This tab shows graphs on Page Accesses and Sessions, Page Processing Time, and SQL/PL SQL executions allowing for the ability to correlate performance trends.

EM will trigger a symptom diagnosis when the set metric threshold for overall page processing time is exceeded. This symptom diagnosis can be triggered for the overall page processing time and for the individual page times. If the symptom diagnosis has triggered, it can be accessed via an icon on the Overview tab in the Overall Statistics section as shown by the graphic below.

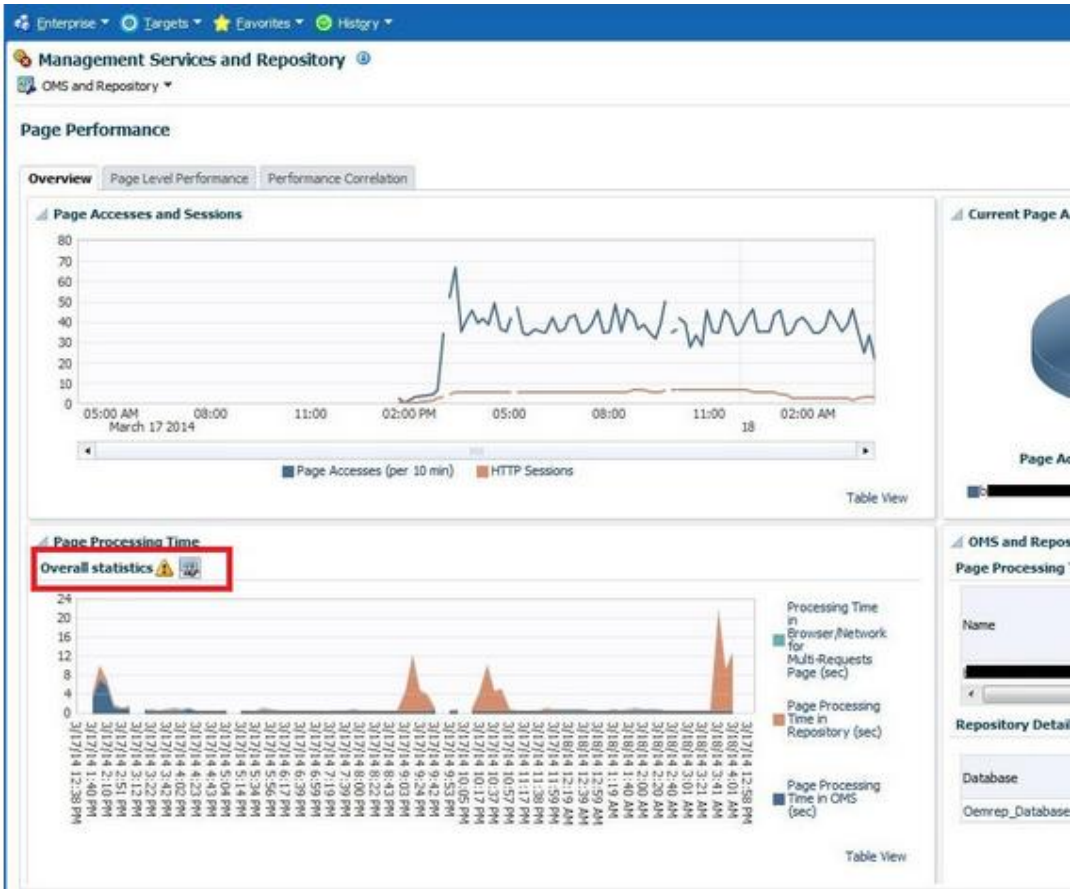


Figure 14: OMS and Repository All Members

If this icon is present, it means that the overall performance of the Enterprise Manger pages has exceeded the threshold in the last 10 minutes. Click on the icon and review the details of the diagnosis. This diagnosis should indicate the root cause for the overall page performance issue. It should help determine if the issue is due to the network, OMS or repository.

DBMS Scheduler

The DBMS Scheduler is a database feature and is used to execute SQL and PL/SQL at specific times. If any of the system jobs are running behind schedule or are down completely, they can cause significant performance problems, stale and incorrect availability data, as well as missing critical alerts and notifications. For the repository jobs to run, the DBMS_SCHEDULER must be enabled and db initialization parameter JOB_QUEUE_PROCESSES must be set to a non-zero value. It is common to set JOB_QUEUE_PROCESSES to 0 during upgrades or patches, so be sure to reevaluate this parameter often.

To view the Job status click on **Setup / Manage Cloud Control / Repository**. The Repository Scheduler Jobs Status is shown in its own section on this page. This window can be set to show only those jobs with a Down status or to show all jobs.

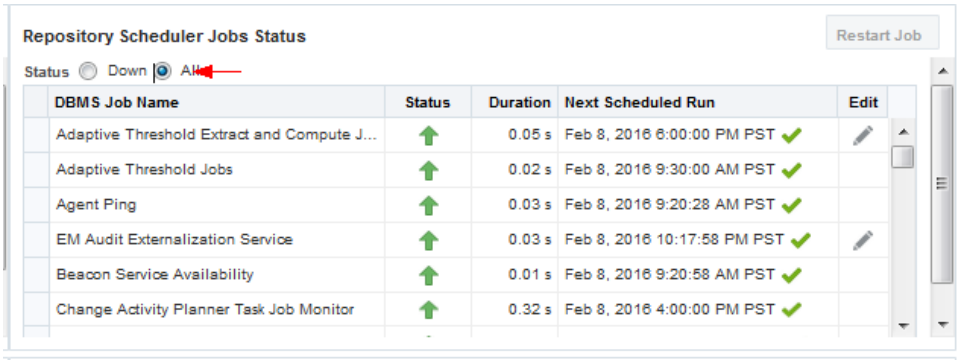


Figure 15: Repository Jobs

In the **Repository Scheduler Jobs Status** section, check the following items:

1. **Status** - Make sure all jobs are in an "up" status. If there are errors, click on the error to get more details. A job that is down can be restarted by clicking on the job name and clicking on the "Restart Job" button.
2. **Duration** – Seconds per hour for a job. If a job is consistently running at higher durations, there may be a resource problem in the database. The overall health and performance of the database should be checked and any issues resolved if found to make sure the database does not start to fall behind and thereby create a permanent backlog problem. If the duration time increases and runs consistently high, this is a problem and it may mean a need to increase resources for the repository server.
3. **Next Scheduled Run** - If the next scheduled time is not correct or empty, the database has stopped scheduling the job. The job that is not running can be resubmitted by selecting the job and clicking on the "Restart Job" button at the top right of that window. It also provides an edit option for high cost performance jobs to provide the ability to reschedule the next runtime. Only change the frequency of runtime under guidance of Oracle.
4. For jobs deemed as high cost jobs that require more resources and can impact repository performance, EM allows the administrator to modify the schedule as to when this job is executed. For these jobs, a pencil icon will be displayed under the Edit column. To modify the next run time, click on the pencil icon.

A few of the more critical system jobs are listed below with a description of the tasks that they control:

TABLE 5: KEY SCHEDULER JOBS

JOB NAME	SCHEDULER JOB NAME	TASK
Agent Ping	EM_PING_MARK_NODE_STATUS	Keeps track of the health of the host targets in EM. A nonzero number means there are machines that are suspected to be down. As long as this number is low relative to the total number of machines in EM (considering that some may be in blackout or offline), there is not a major health issue for EM. There is a potential problem if the processing time is showing 30-40% or higher and should be diagnosed further.
EM Daily Maintenance	EM_DAILY_MAINTENANCE	This job performs the daily repository maintenance tasks such as partition maintenance, stats updates, etc. If this job is not running, you will eventually stop receiving information into the repository.
Job Step Scheduler	EM_JOBS_STEP_SCHED	This is the job that puts the work into the queues that are ready to be dispatched to the agents

Repository Metrics <number>	MGMT_COLLECTION.Collection Subsystem	This job shows the amount of work done for the repository metrics. This metric will have a number associated with it (i.e. Repository Metrics 71) and represent the short and long task workers. The short task workers handle tasks that should run in a minute or less and the long task workers handle the longer tasks. The best thing to look for here is that the duration time for all Repository Metric jobs are fairly close to each other.
Rollup	EM_ROLLUP_SCHED_JOB	This job indicates the amount of data involved in the rollup job. This number may increase over time as more targets are added to the system but on a daily basis should remain about the same. Large spikes could indicate that agents are not communicating properly to the OMS.

Database Advanced Queuing (AQ)

Both the OMS and the repository rely heavily on Advanced Queues. This then implies that the Advanced Queues have to be 'up' and healthy. To confirm the status of the Advanced Queues in EM, do the following:

5. Click on **Setup / Manage Cloud Control / Health Overview**
6. In the drop down list next to "OMS and Repository" select **Monitoring/All Metrics**
7. Look at the Metric for Management Services AQ Status as seen in the figure below.

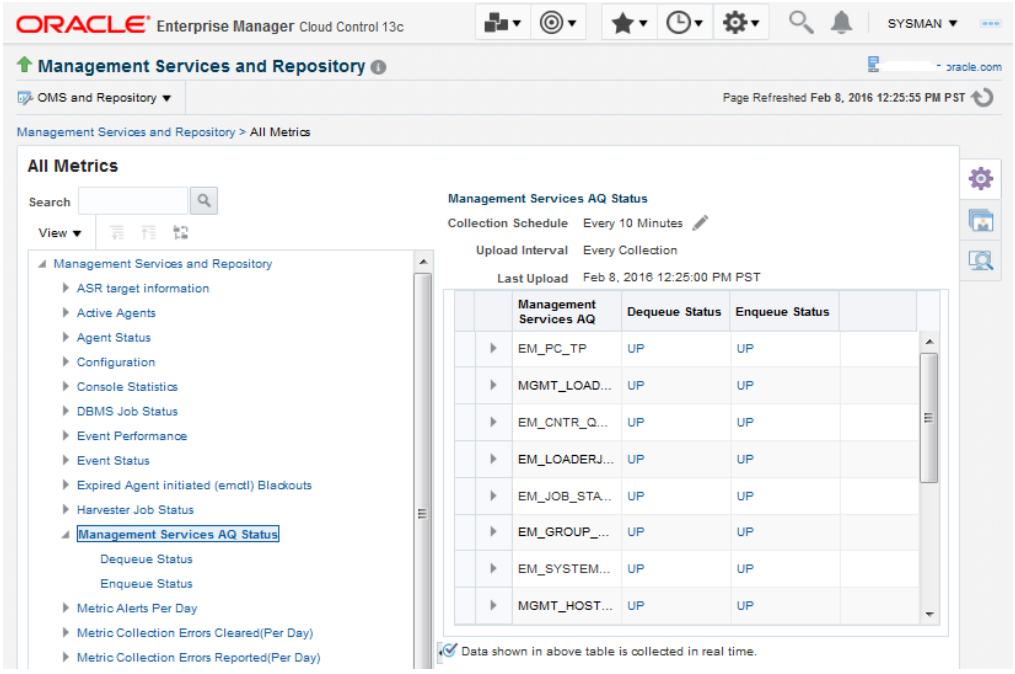


Figure 16: Advanced Queuing Metrics

The current severity status of the underlying components can be checked by clicking on the Dequeue Status or Enqueue Status for a particular Management Services AQ as seen in the figure below.

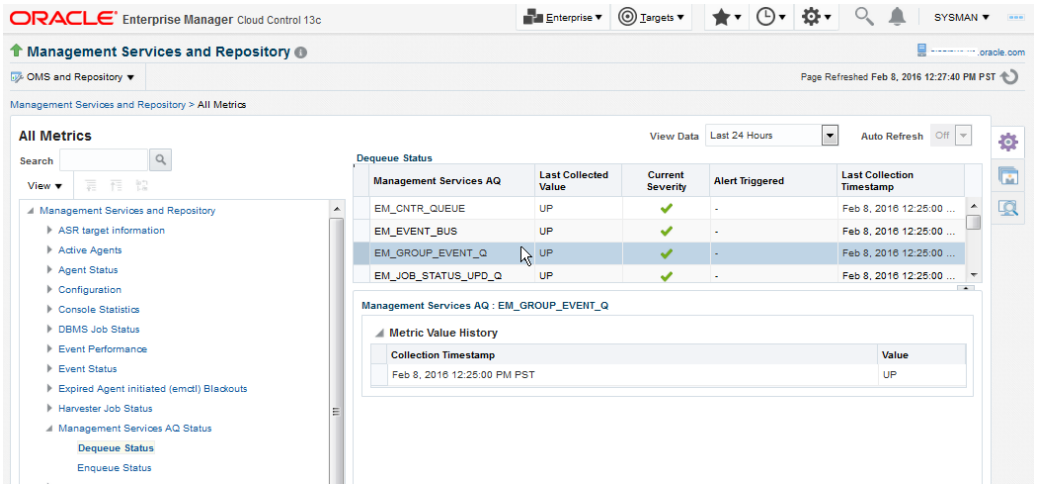


Figure 17: Advanced Queuing Status

If system performance deviates from previously experienced levels, it is possible that the AQ have become fragmented. Refer to the MOS note on AQ performance tuning for further details: Performance Tuning Advanced Queuing Databases and Applications [102926.1].

Loader Subsystem

All the data collected by agents has to be loaded to the repository as the data is not stored on the OMS server. The efficiency of this process can greatly impact the performance and health of your system overall. When an OMS is overloaded and not able to process the files sent by the agent, then the OMS will send what is called a Backoff Request to notify the agent about its condition. A graph showing the Backoff Requests can be found by doing the following:

1. Click on **Setup / Manage Cloud Control / Health Overview**
2. In the drop down list next to "OMS and Repository" select **Monitoring/All Metrics**
3. Look at the Metric for Overall Status as seen in the figure below.

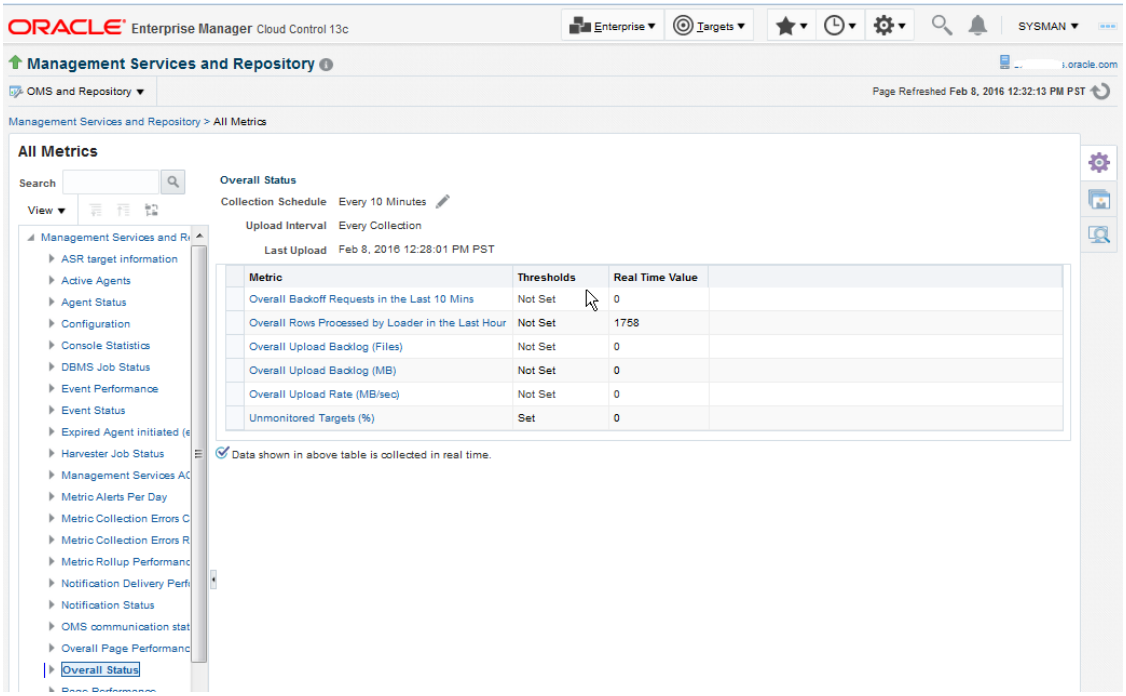


Figure 18: Backoff Requests Metric

To monitor the loader process, look for a consistent increase in the Overall Backup Requests in the Last 10 Mins and the Overall Upload Backlog (Files)/(MB). This is a good indicator as to whether or not the loader threads are keeping up with incoming data. Higher values for these metrics indicate the system is backlogged and not keeping up, lower values indicate the loader throughput is efficient. For additional details on loader metrics and throughput see the sizing guide.

A loader backlog can cause delays in receiving critical information and notifications. It can also cause the Agent to stop collecting data once it reaches it maximum threshold, to avoid filling up the file system it's installed on. Backlogs can also cause poor console performance and OMS restarts if not resolved quickly.

Some of the key metrics to watch are:

- Overall Backoff Requests in the Last 10 Mins
- Overall Rows Processed by Loader in the Last Hour
- Overall Upload Backlog (files)
- Overall Upload Backlog (MB)
- Overall Upload Rate (MB/sec)

EM provides a graph showing the Upload Rate and the Upload Backlog as seen below. This graph is found by clicking on **Setup / Manage Cloud Control / Health Overview**.

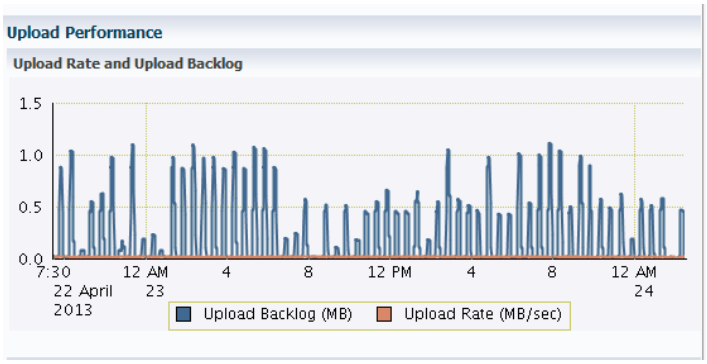
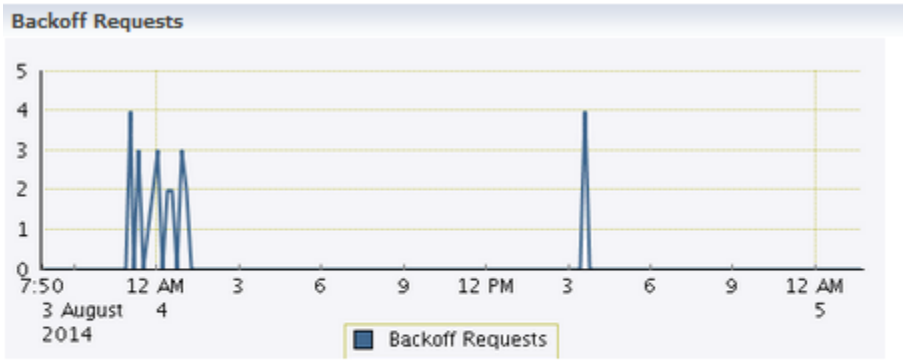


Figure 19: Upload Graph

Loader report

If an OMS is busy processing the uploaded XML files, it may send a backoff request to an agent, asking the agent to backoff sending the XML files for a specified period of time. EM provides a graph showing the overall backoff requests for a 24 hour period. A sample of this graph is shown below and can be found by clicking on **Setup** / **Manage Cloud Control** / **Health Overview**.



TIP If Upload Backlog is increasing but Upload Rate is not increasing and there has been a significant number of Backoff Requests, this indicates a probable loader problem.If Upload Backlog is increasing but Upload Rate is not increasing and there has been no Backoff Requests, this indicates a probable network problem.

Figure 20: Backoff Requests Graph

EM also provides an out-of-the-box report showing loader statistics including the configured loader resource allocation, loader performance and the agent count broken down by agent priority level. The available values are None, Mission Critical, Production, Staging, Test, and Development. This report is found under **Enterprise / Reports / BI Publisher Enterprise Reports / Enterprise Manager Health / Loader Statistics**. If the Loader Performance (Last 3 hour) chart shows a high number of backoff requests and there has not been a recent downtime, it is an indication that the OMS cannot keep up with the load from the agent. This report will also provide the priority level of the agents that can be used by the EMDIAG loader_health report as mentioned below.

EMDIAG also provides a report for the health of the loader subsystem. By using **repvfy dump loader_health** you can generate a report of loader health and statistics. The loader_health report will break down the backoff requests based on agent priority level (the lifecycle stages of the agent target). It is important to watch for backoff requests

for mission critical and production agents. If there are issues with these agents, contact Oracle Support for help in diagnosing the issue.

Notification Subsystem

The notification system controls all e-mail, ticket connectors and custom notification methods. For each event, the notification job checks to see if there's a required action and submits the task for processing. A backlog in notifications can cause a delay in alerts being sent, or missing an alert all together.

To check the health of the notification subsystem, in the Console click on **Setup / Manage Cloud Control / Health Overview**. Check the Notification Performance section for a notification backlog. A steady increase needs to be evaluated further using the guidelines below.

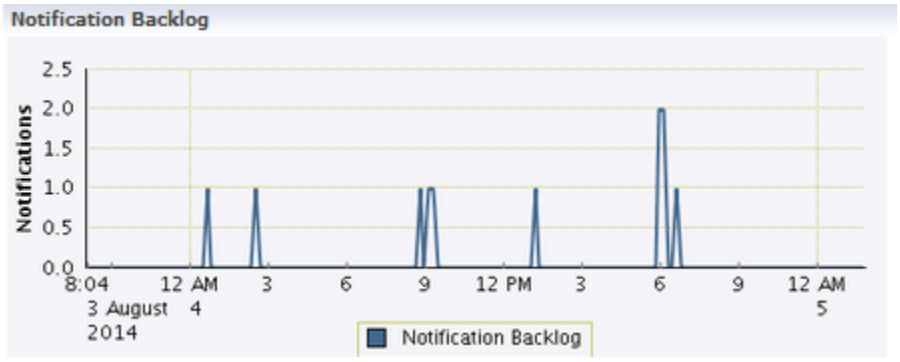


Figure 21: Notification Performance Graph

Select **OMS and Repository / Monitoring / All Metrics**. From here, validate Notification Status metric is Up.

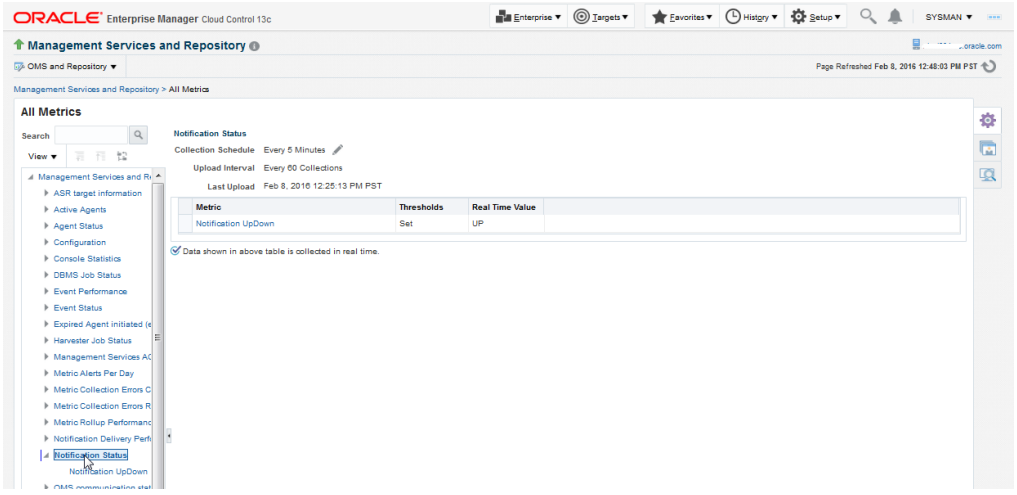


Figure 22: Notification Status

To determine if a specific notification queue is having a problem, select *Pending Notifications Count* metric within Notification Delivery Performance as seen below.

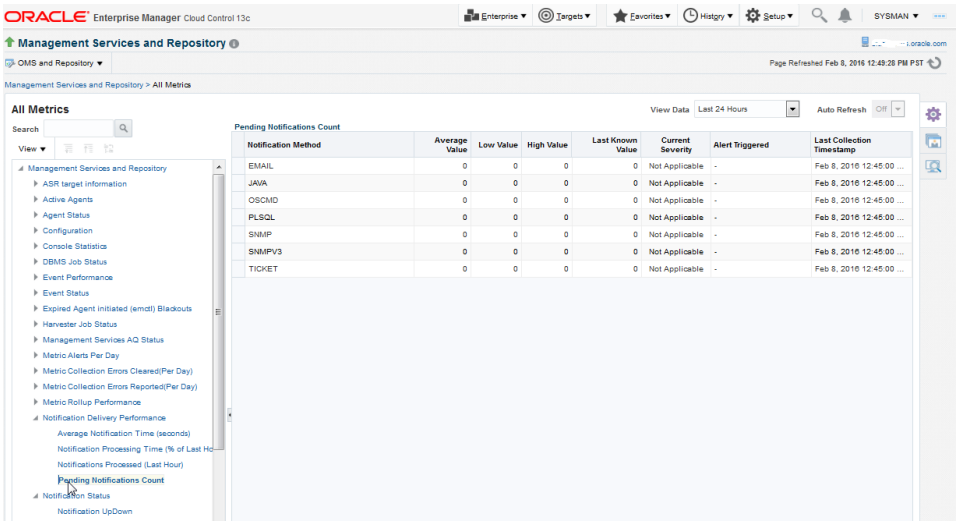


Figure 23: Pending Notification Count

There are 4 performance metrics for Notification delivery. By default, there are no Warning/Critical thresholds. Once you have your system running, evaluate the trend in these metrics and set a Warning/Critical threshold based on this baseline. The metrics below can be found by selecting **Setup / Manage Cloud Control / Health Overview**. Under the drop down list next to the OMS and Repository target, select **Monitoring / All Metrics.** From here, click on Notification Delivery Performance and review the following detail.

Average Notification Time (seconds) / **Notification Processing Time (% of Last Hour)** – This shows the average time for notification delivery and the total amount of processing time for notification delivery. If the average delivery time and notification processing time are both steadily increasing, you have a performance or capacity problem which will create a risk of not receiving notifications in a timely manner. If the system is not experiencing a general performance problem, examine the notification queue detail to look for an issue with a specific queue. If a specific issue is not found, contact Oracle Support.

Notifications Processed (Last Hour) - The total number of notifications delivered by the Management Service over the previous 10 minutes. The metric is collected every 10 mins and no alerts will be generated. If the number of notifications processed is continually increasing over several days, consider adding another Management Service.

Pending Notifications Count – This shows the number of notifications waiting to be delivered. If this number is continually increasing there is a notification backlog. Look at the view to determine which queue has an issue and use this to further diagnose the issue.

In addition, you can use the **repvfy dump notif_health** command to generate a detailed report to identify Notification statistics and backlogs.

Task Subsystem

EM provides a chart to display the backlog performance of the repository collections as seen in the image below. This chart can be found by clicking on **Setup / Manage Cloud Control / Repository**. A steady increase in backlog indicates a problem that needs to be evaluated.

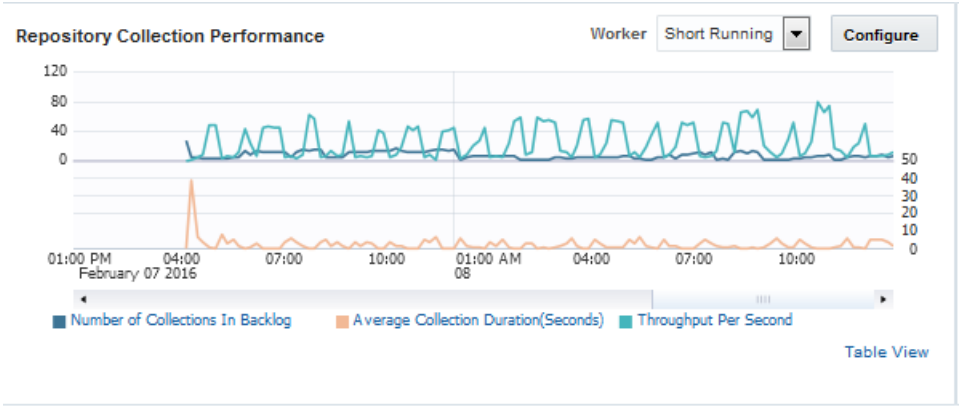


Figure 24: Repository Collections Graph

Many of the repository collection jobs are divided between short running tasks and long running tasks. Each EM environment should be configured with a minimum of 2 short running task workers and 2 long running task workers. The performance of these task workers can be monitored via the details in the Jobs Status chart above. Click on the drop down list to select the Long Running workers. The graph shows information about the Workers such as the number of collections in backlog, throughput per second, and average collection duration (seconds) for both short running and long running workers. The job names are Repository Metrics xx (where xx is a number). The lower numbers are the short running task workers and the higher numbers are the long running task workers. If the task worker jobs are down, they can be restarted via the Repository Scheduler Job list found by clicking **Setup / Manage Cloud Control / Repository**. Look for any large spikes in processing time or throughput as this could indicate some occurrence that is generating more work for the repository (i.e. many server outages). If the throughput for these Repository Metric jobs is consistently high and the backlog is continuous or grows, then consider adding another task worker.

The Short Running task workers can be configured by clicking on the Configure push button as seen in the above image. This opens a new window that allows the ability to start the Collection Manager. The figure below shows the options available when configuring the Collection Manager. It is recommended to turn this option on if high spikes are seen in the backlog of tasks at specific times. The Collection Manager will check at specific frequencies (30 minutes by default) and if the backlog is climbing, a task worker will be added up to the specified maximum number of workers. When the backlog decreases, the Collection Manager will remove task workers. It is recommended that the maximum workers not be set higher than 5. If the backlog is not going down when using up to 5 workers, then contact Oracle Support for further assistance.

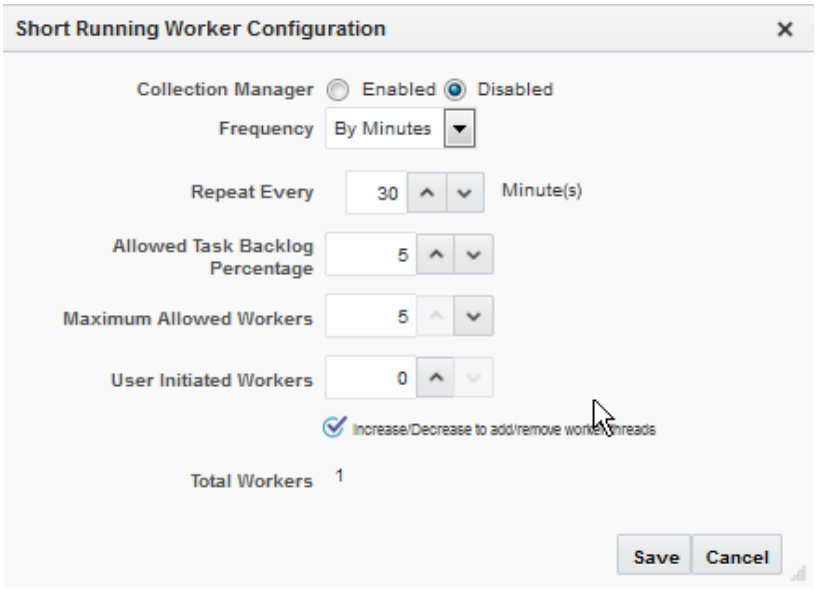


Figure 75: Short Running Worker Configuration

To get a health report of the Task sub-system, run this EMDIAG report:

$ repvfy dump task_health

If you suspect a performance problem with the tasks the workers are executing, execute the following EMDIAG tests to look for 'expensive' tasks:

For short running tasks:

$ repvfy verify repository -test 6013 (short running tasks)

For long running tasks:

$ repvfy verify repository -test 6014 (long running tasks)

If a 'rogue/expensive' task is found, it can be further debugged using the following EMDIAG commands:

$ repvfy send run_task -id <task id>

This command will run the task in debug mode and record the PL/SQL trace information in the repository

$ repvfy dump trace

This command will show the debug information written in the repository with the above command

EM 13c now provides a chart that displays details on the Metric Data Rollup Performance as seen in the image below. This chart can be found by clicking on **Setup / Manage Cloud Control / Repository**. This chart shows the Number of Records Rolled Up and the Throughput per Minute. These values may increase over time as new targets are added but large spikes could indicate that agents are not communicating properly to the OMS. If large spikes are seen on a consistent basis, increase the number of rollup worker threads. This is done by clicking on the Configure push button seen in the image below and increasing the number of threads.

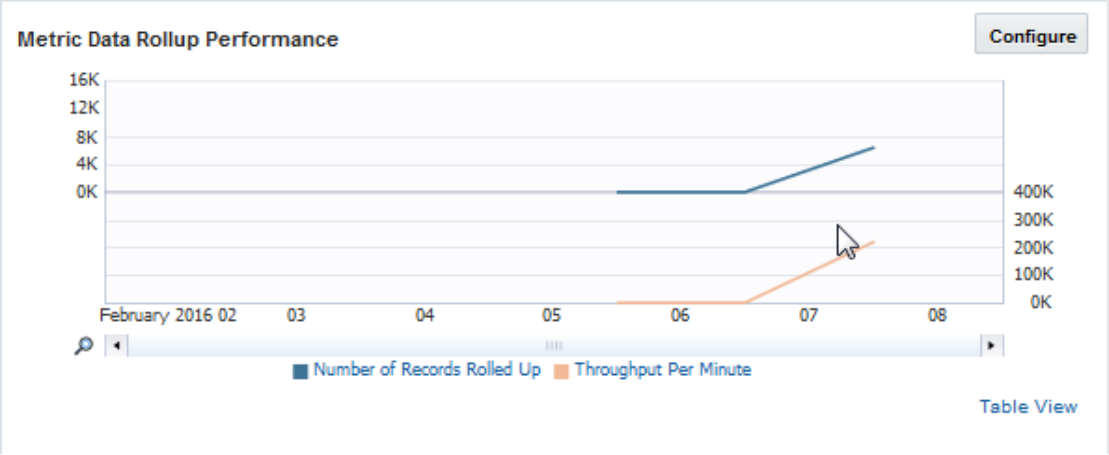


Figure 86: Metric Data Rollup Performance Graph

EM Job System

The EM job system is crucial to Enterprise Manager's health. The majority of background processes and tasks are run via a series of jobs. Included in these jobs are loading metric data, calculating availability of composite targets, rollup and purge of metric data and notifications. This Job System is an OMS subsystem and includes a Job Scheduler and Job Workers. The Job Scheduler in turn consists of two components, the Job Step Scheduler and the Job Dispatcher. Each of these components are described in further detail below.

Job Step Scheduler – The Job Step Scheduler is a global component so there is only one per EM environment. It is scheduled to run by the DBMS Scheduler. The primary purpose of this component is to look for jobs that need to be executed. Make sure that this job is up. This can be seen by clicking on **Setup** / **Manage Cloud Control** / **Repository** and looking for the status of the *Job Step Scheduler* in the Repository Scheduler Jobs Status section as seen below:

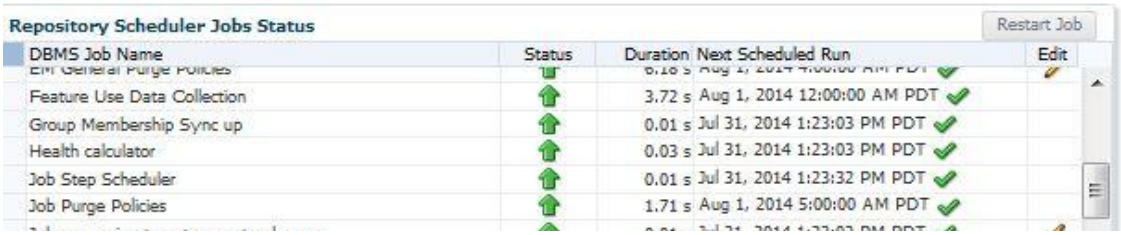


Figure 27: Job Step Scheduler

Job Dispatcher - The EM Job system also has a notion of a 'short' and 'long' jobs (based on execution time) and has separate worker pools in the OMS (not in the database as with the job workers) to handle those requests. The Job Dispatcher runs locally on each OMS and its purpose is to dispatch the jobs found by the Job Step Scheduler to the job workers. If the dispatcher cannot keep up with the work in the queue, a backlog is created. This is not a problem as long as the backlog is temporary. If it is not temporary, then either the dispatcher is not able to keep up with the amount of work which could mean it may be necessary to add another OMS server or there is a problem with the job workers and they are not able to accept the work from the dispatcher (see the next section below for details on how to diagnose a job worker problem.

Job Workers – The Job Workers take work from the Job Dispatcher, send it to the appropriate agent and also receive information from the agents. If Job Workers are always busy and never free, then capacity needs to be

added either by adding another OMS server or by increasing the number of job workers and potentially increasing the number of db connections (each job worker takes a connection to the database). EM provides a way to tell if the Job Workers are keeping up with the dispatched work. If the amount of work the dispatcher is able to give to the job workers approaches zero, then the workers are not keeping up.

To see the Job Worker details for each OMS server, select **Setup / Manage Cloud Control / Management Servers**. The top right quarter of the window is titled "Job System". Under the "Recent Job Executions Summary" table, click on the link called "More Details…". This will open a new window showing two tabs: Job Executions and Job Dispatchers. Click on the Job Dispatcher tab to see the details for each OMS server. In that table, the Configured Threads column is the number of threads configured for each thread pool. The Avg. Threads Available is the number of threads that are waiting to take work from the dispatcher. See the screenshot below (note the Configured Threads shown below are the defaults).

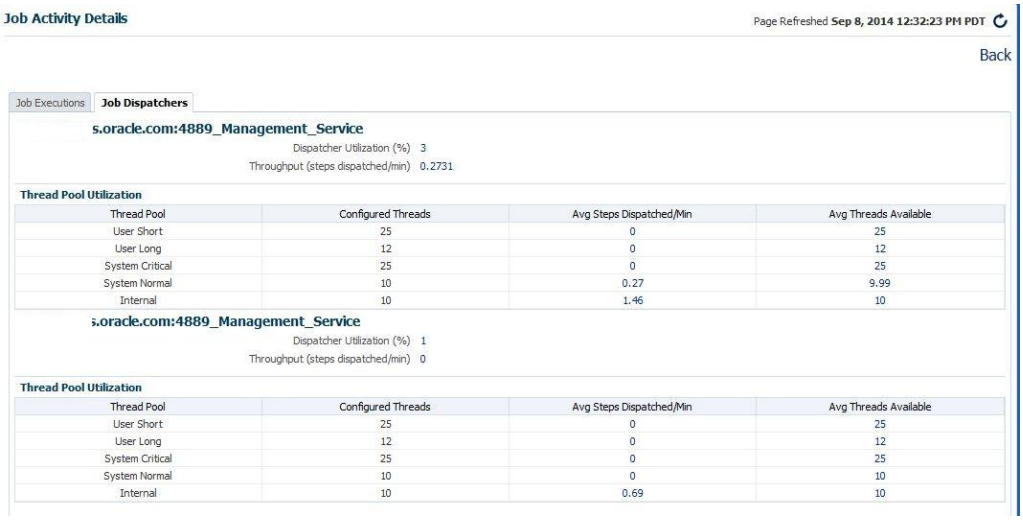


Figure 28: Job Dispatcher Threads

- The number of Configured Threads should be the same for each OMS server. The values in the Avg. Steps Dispatched/Min and Avg. Threads Available columns should be approximately the same for each OMS while EM is running. If the values are consistently different then one OMS is working harder than the others. At this point, it is best to contact Oracle Support for further diagnosing.
- If the number for Avg. Threads Available is getting close to zero then it means the dispatcher cannot dispatch to all the workers in a timely fashion.
- If the Avg. Steps Dispatched/Min is high, there is a resource problem, and the environment could probably benefit from more worker threads. However do not go beyond 'doubling' the size of the threads. If doubling the number of threads does not seem high enough, contact Oracle as it might be better to add an additional OMS.
- If the Avg. Steps Dispatched/Min is low, but the number of available threads per cycle is also low, this typically means that either a thread is stuck, or is 'busy for too long'. If this persists, refer to the section "Omsvfy Commands" in the Use of the emctl dump Options to Collect OMS Log Files [ID 1369918.1] for steps on how to take a thread dump of the OMS processes. It is also possible to use EMDIAG for this information with this command:

  $ omsvfy snapshot oms

  If the Avg Steps Dispatched/Min numbers are all zero, the Avg Threads Available numbers are all zero and there is an increase in the Job Backlog (steps) (found on the Health Overview page under the Job System Status section), then it is most likely that the Job Dispatcher process is stuck. The Job Dispatcher is responsible for

updating the numbers on the Thread Pool Utilization charts and if it is not working, it cannot update the numbers and thus they all show zero.

In both of these cases described where the Avg Threads Available is zero or approaching zero, the most likely cause is a stuck thread and related to known Bug 22910732. This bug is fixed in EM 13.2. For earlier releases of EM, a restart of the OMS servers is required to work around this bug.

To get a health report of the Job system, run this EMDIAG report:

$ *repvfy dump job_health*

This report will provide details about items such as the OMS configuration, operational data for Job steps and backlogs, performance and throughput statistics and a list of the job system errors. To get more detailed diagnostics for any of the jobs returned in the output, there are additional EMDIAG commands that can be executed using the identified jobs:

- repvfy dump execution –guid <job execution id>
- repvfy dump job –guid <job id>
- repvfy dump step –id <job step id>

Agent Health

The overall health of the environment can also be seen by the status of the Agents. The central view for all agents can be seen from **Setup / Manage Cloud Control / Agents**. From here you can evaluate agents that are blacked out, unreachable, pending or blocked.

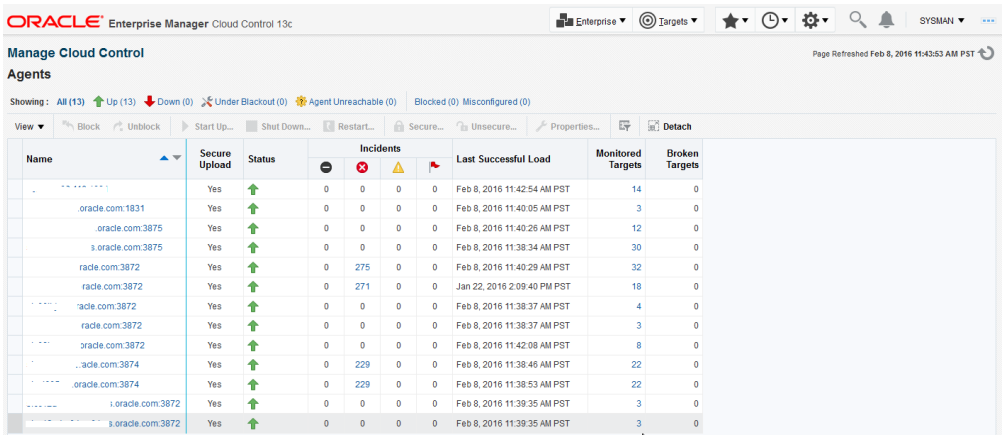


Figure 29: Manage Cloud Control Agents Page

This is a very powerful page for EM Administrators as you can issue various agent control commands from this page, including: startup, shutdown, block, unblock, restart, secure, unsecure. It is possible to edit agent properties (emd.properties file) or submit a job to edit properties for multiple agents at one time. For additional details on managing and configuring Agents, see Controlling and Configuring Management Agents in the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

A significant percentage of agents down or not responding indicates an unhealthy environment and a lack of proper monitoring. The goal is to have 100% agent availability. Spot check the agent health daily watching for a significant increase in the percentage of problem agents and checking the alerts for the problem agents, correcting those that

are creating issues (pinging, etc). On a bi-weekly basis, take the time to fix those agents that have shown problems for several days.

A large number of agents in the “Agent Unreachable”, “Status Pending” and/or “Blocked/Misconfigured” status indicate that these targets are not being properly monitored. Click on the status type in the summary line with the most problematic agents to get a list of these agents and begin diagnosing to resolve the issues. EM will attempt to perform initial troubleshooting of unreachable/pending status issues. To view the output from these checks, click on the symptom diagnosis icon next to the Agent Status as seen in the image below. This will open a page providing the top causes for the agent unreachable status. Be aware that if the OMS and Agent are not able to communicate, then the diagnosis will base its findings on the data available in the repository which may not reflect the actual cause of the availability issue.

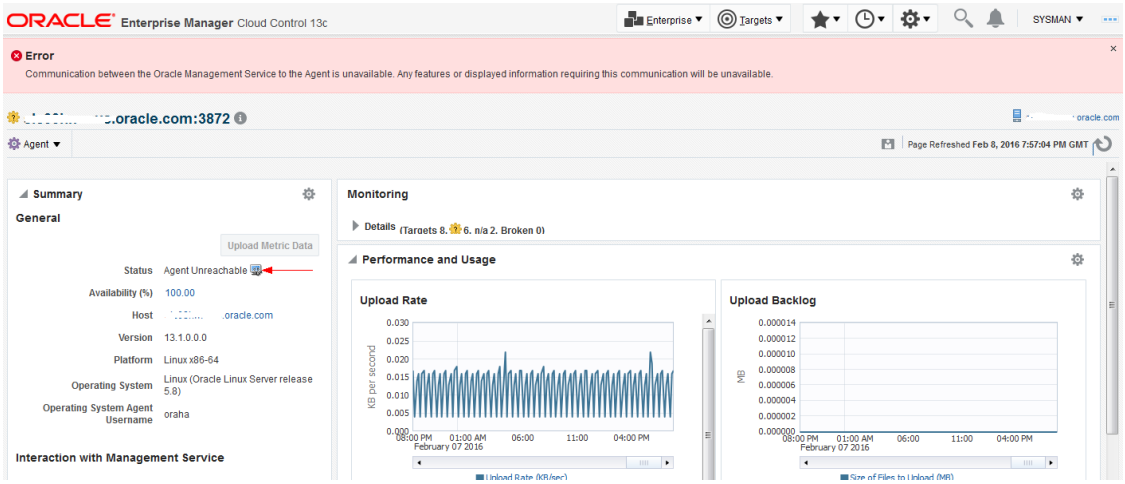


Figure 30: Manage Cloud Control Agents Page

Basic agent troubleshooting steps to be followed:

TABLE 6: AGENT TROUBLESHOOTING

CHECK	NOTES
Host Up	Check to verify if the host is up. If not, is the host still valid? Many times hosts are decommissioned but not removed from monitoring.
Agent Up	Check to verify if the agent is up: emctl status agent Start agent if necessary
Agent Uploading	In the emctl status agent, check for messages about heartbeat/upload. Attempt upload with emctl upload agent
OMS Reachable	Ping the oms from the agent, and agent from the OMS, ensure ports are not blocked by firewalls
Check Logs	$EMSTATE/sysman/log/ (Ex: /u01/app/oracle/em/agent_inst/sysman/log) • gcagent.log – contains trace, debug, information, error or warning messages from the agent. • gcagent_skd.trc – logging about fetchlets and receivelets

	• gcagent_mdu.log – tracks the metadata updates to the agent • emctl.log – information from the execution of the emctl commands
Agent Dump	If the agent is still not uploading or reachable, run a target and availability dump on the agent target from repvfy. *repvfy dump availability -name <agent:port>* *repvfy dump target -name <agent:port>*

REPVFY can also be used to get an overview of agent health by running a **repvfy dump agent_health** report. The command will provide details about the agent such as agent ping statistics, agent down statistics and system errors.

Events and Incidents

It is also necessary to review Critical or Warning errors which could indicate an underlying issue and lead to an outage. Also, large amounts of alerts cause a performance impact on the EM system. Metric errors indicate that data is not being collected or monitored properly, and these should be resolved to have an accurate picture of the current system status. For a detailed look at using Incident Manager see the *Oracle Enterprise Manager 13c Cloud Control Administrator's Guide*. Below is a list of some of the places to check for events and/or incidents.

1. **OMS and Repository Events and Incidents** – Click on **Setup / Manage Cloud Control / Health Overview**. Then from the target menu select **OMS and Repository / Monitoring / Incident Manager**. This will filter the events and incidents to those related to the OMS and Repository targets. The default view is all open incidents.

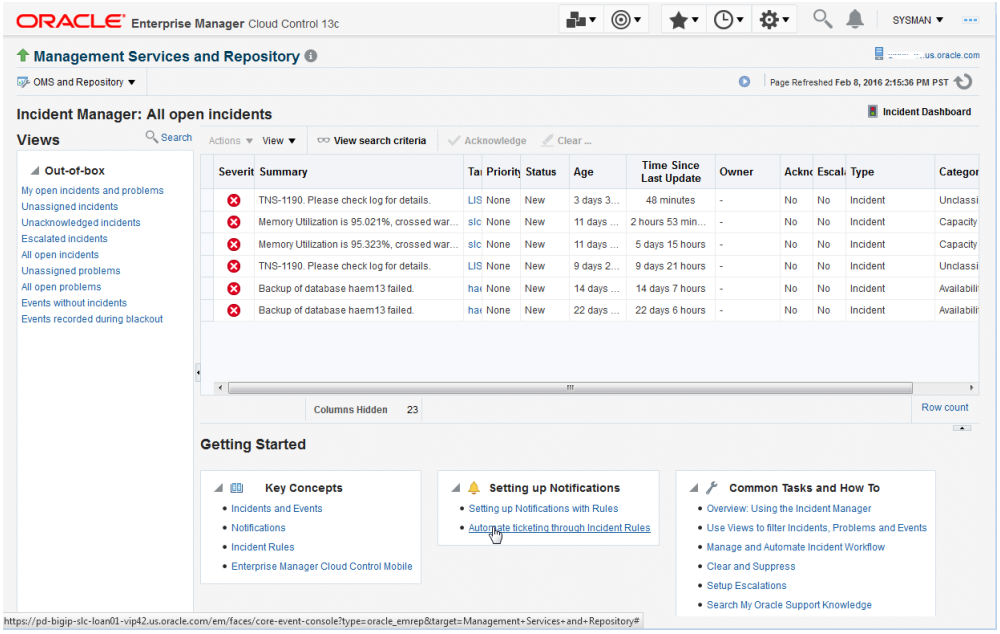


Figure 31: Open Incidents Page

To see additional events, click on "Events without incidents". Depending on your incident rules, you may not be receiving an incident for each event. For details on how to create the recommended rule set to ensure notifications are sent to the EM administrator, refer to Oracle Enterprise Manager 13c Configuration Best Practices [2139083.1].

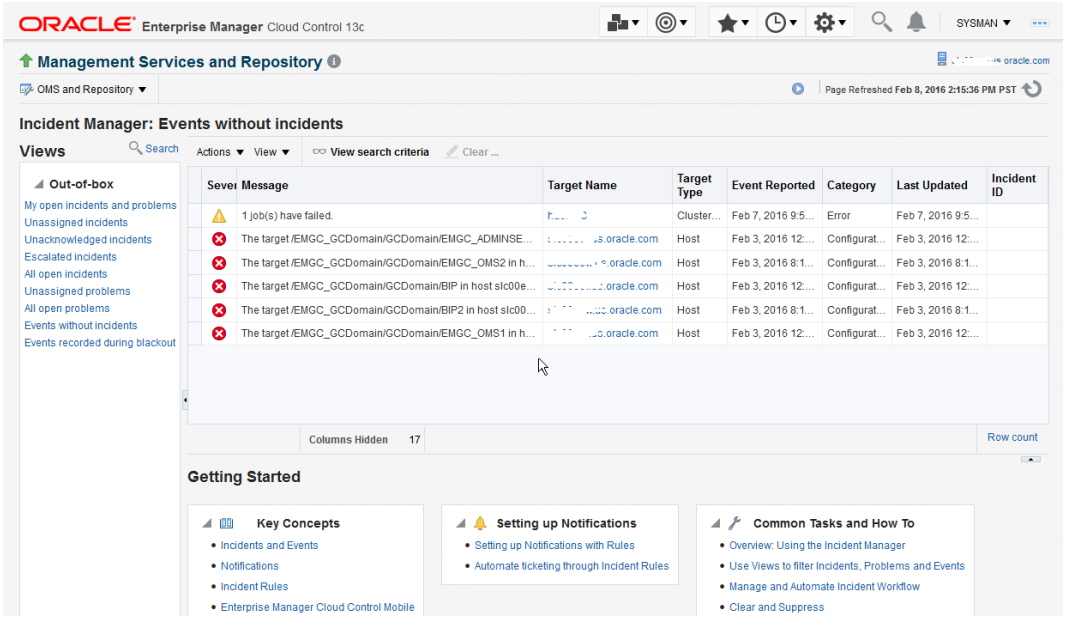


Figure 32: Open Events Page

Clicking on an individual message will provide more details for that particular alert. Look for repeating messages and address these first. Some alerts must be manually closed, such as TNS errors or alert log errors. These will have an additional action of Close as seen below. Clearing these errors regularly helps maintain a clean environment. This can also be done with the EM CLI utility using the clear_stateless_alerts flag.

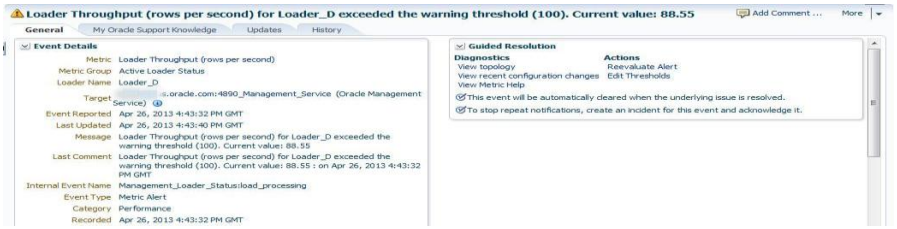


Figure 33: Event Detail

Note: You may see BEA-337 [WebLogicServer] errors coming from WebLogic Server. By default WLS will ping applications and wait for a response for up to 600 seconds. EM will keep threads running as long as there is work in the queue so they will not respond to a heartbeat, causing WLS to timeout and error. To stop these alerts, modify the EM WLS xml configuration file and set the StuckThread flag to “false”. Note that this should only be done for the EM WebLogic server. To set this flag, edit the <gc_inst>/user_projects/domains/GCDomain/config/diagnostics/Module-FMWDFW-2818.xml file and change the flag for StuckThread to “false”. This will require a restart of the OMS server.

2. **Target Incidents** - Click on **Enterprise / Monitoring / Incident Manager**. The list of incidents can be sorted by clicking on the column heading. To find the highest number of repeating error messages to address first, click on the Summary column to sort by error message.
3. **System Errors** – EM provides a system error log page. This page details the errors found on the repository and/or the management services. The URL to this page is http[s]://*your_em_link*/em/console/health/healthSystemError. This page will provide information such as the

component type, the agent monitoring that component, date and time of the error, level, and the error message text. It is used for advanced fault research and should only need to be reviewed to help resolve a problem that has not been resolved through any of the other event and incident management tools. It is best to work with Oracle Support for help in resolving these issues.

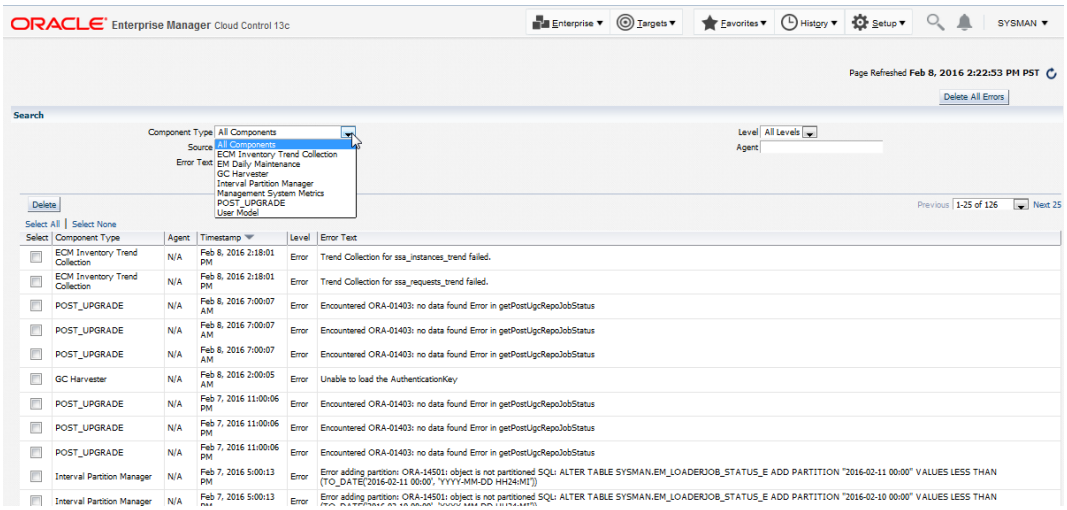


Figure 34: Health System Error Page

Log & Trace Files

As part of diagnosing problems with the different EM components, it is important to review the log and trace files for these components. The table below details the standard location for log and trace files broken down by the different components. For more details on managing log files, refer to *Enterprise Manager Cloud Control Administrator's Guide*.

TABLE 7: LOG/TRACE FILES

EM COMPONENT	LOG FILES	TRACE FILES
Oracle Management Agent	• $EMSTATE/sysman/log ("emctl getemhome" will return the location for $EMSTATE) Ex: /u01/app/oracle/em/agent_inst/sysman/log	• $EMSTATE/diag/ofm/emagent/emagent/trace
Oracle Management Service	• $EM_INSTANCE_BASE/em/<OMSNAME>/sysman/log Ex: /u01/app/oracle/em/agent_inst/em/OMS1/sysman/log • $EM_INSTANCE_BASE/user_projects/domains/<DOMAIN>/servers/<OMSNAME>/logs Ex: /u01/app/oracle/gc_inst/user_projects/domains/GCDomain/servers/OMS1/logs • $EM_INSTANCE_BASE/user_projects/domaings/<DOMAIN>/servers/<OMSNAME>/sysman/log Ex:	• $EM_INSTANCE_BASE/em/<OMSNAME>/sysman/log • $EM_INSTANCE_BASE/user_projects/domaings/<DOMAIN>/servers/<OMSNAME>/sysman/log (where $EM_INSTANCE_BASE is the gc_inst location and OMSNAME is the name of the oms instance ex: EMGC_OMS1)

	/u01/app/oracle/gc_inst/user_projects/domains/GCDomain/servers/OMS1/sysman/logs (where $EM_INSTANCE_BASE is the gc_inst location and OMSNAME is the name of the oms instance ex: EMGC_OMS1)	
Oracle HTTP Server (OHS)	• $EM_INSTANCE_BASE/user_projects/domains/<domain_name>/servers/<ohs_name>/logs Ex: /u01/app/oracle/gc_inst/user_projects/domains/GCDomain/servers/ohs1/logs	
Oracle WebLogic	• $EM_INSTANCE_BASE/user_projects/domains/<domain_name>/servers/<server_name>/logs/<server_name>.log Ex: /u01/app/oracle/MWare/gc_inst/user_projects/domains/GCDomain/servers/EMGC_OMS1/logs	

Maintaining Log and Trace Files

In an EM environment, the majority of the log and trace files for the OMS, WebLogic Server, HTTP Server, Agent and database are maintained automatically. However, there are a few exceptions. For these exceptions, the size/retention of the files must be maintained manually. Also, for most of the automated methods, the details such as file size and number of files to retain can also be controlled. This is an important item to understand to help ensure that log and trace files are maintained for the expected period of time and that the amount of disk space consumed by these type of files is also maintained. Below are some helpful tips for managing these files as well as pointers to MOS notes and Oracle documentation for further information.

Management Agent Log and Trace Files

Agent logs are segmented and have a limited overall size and hence need not be deleted or managed. The log files are segmented (archived) into a configurable number of segments of a configurable size. These settings are controlled by properties in emd.properties and can be modified via the EMCTL utility. The latest segment is always *filename*.log and the oldest is the *filename*.log.X where X is the highest number. For more details on the Management Agent log and trace files, refer to the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

- Control the size of the logs: The size of each of the individual agent log files is controlled by the property *<handler>.totalSize*. This property will specify the total size in MB for the file segments. Once the file reaches this size, it will be archived to a new file. The default setting is 100M. Here is an example of finding the value for the gcagent.log file in 12c: *emctl getproperty agent –name "Logger.log.totalSize"*. For more details on setting the max size of the agent log files, refer to the documentation link above.
- Control when the agent writes to log files: The amount of data that an agent will log is controlled by the property *<handler>.level* where the possible levels are DEBUG, INFO, WARN, ERROR, and FATAL. By default, this is set to INFO which means that logs messages with the level of INFO and above (WARN, ERROR, and FATAL) will be logged. The recommendation is to keep the default setting unless debugging an agent issue. Then, set the logging level to DEBUG for specific modules only rather than changing the root logging level. For more details on setting the agent logging level, refer to the documentation link above.
- Control when to purge log files: The number of archived log segments that will be maintained is specified by the property *<handler>.segment.count*. The default setting varies by log file. Here is an example of finding the value for the gcagent.log file: *emctl getproperty agent –name "Logger.log.segment.count"*. For more details on setting the number of log files to retain, refer to the documentation lins above.

OMS Trace and Log Files

The maintenance of trace and log files on the OMS servers can be handled automatically via properties set for the different components.

Oracle Management Service (OMS) Log and Trace Files

The OMS log and trace files are segmented (archived) into a configurable number of segments of a configurable size so they do not need to be manually deleted or managed. These settings are controlled by properties in emomslogging.properties and can be modified via the EMCTL utility. For more details on the OMS log and trace files, refer to the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

- Control the size of the logs and trace files: the size of the individual log and trace files are controlled by the properties *log4j.appender.emlogAppender.MaxFileSize* and *log4j.appender.emtrcAppender.MaxFileSize* respectively. These properties will specify the total size in bytes for the file segments. Once a file reaches this size, it will be archived to a new file. Here is an example of finding the value for the gcagent.log file: *emctl get property –name "log4j.appender.emlogAppender.MaxFileSize".* For more details on setting the max size of the OMS log files, refer to the documentation link above.
- Control when the OMS writes to log files: The amount of data that an OMS will log is controlled by the property –*value* "<LEVEL>" where the possible levels are DEBUG, INFO,WARN, ERROR, and FATAL. The specific category or logging module name must also be specified. The recommendation is to keep the default setting unless debugging an issue. Then, set the logging level to DEBUG for specific modules only rather than changing the root logging level which can cause a lot of messages to be written to the trace files and potentially slowing down the system. For more details on setting the OMS logging level, refer to the documentation link above
- Control when to purge log files: The number of archived log and trace files that will be maintained is specified by the properties *log4j.appender.emlogAppender.MaxBackupIndex* and *log4j.appender.emtrcAppender.MaxBackupIndex* respectively. Here is an example of finding the value for the gcagent.log file: *emctl get property –name "log4j.appender.emlogAppender.MaxBackupIndex".* For more details on setting the max number of OMS log and trace files to retain, refer to the documentation link above.

Oracle WebLogic Server and HTTP Server Log Files

The different WebLogic Server components generate their own log files. These files are stored under different sub-directories in the *middleware_home*/gc_inst location. For the majority of these log files, the size and number of files can be maintained automatically. To maintain the size and number of backup files, the log files are segmented (archived) into a new segment of a configurable size based on a configurable rotation type. These settings can be set in the WebLogic Server Administration Console or via the WLST utility. Starting with the 12.1.0.2 OMS release onwards, the log file rotation and retention options are set out-of-the box for the GCDomain.log*, EMGC_ADMINSERVER.log* and access.log* files. For more details on the WebLogic and HTTP Server log files, refer to the *Oracle Fusion Middleware Administering Oracle Fusion Middleware Guide* and the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

- Control the size of the logs files: the size of the individual log files can be based on file size or time. If the Rotation type "By Size" is selected, the log file will be archived to a new segment once the file reaches a specified size. If the Rotation type "By Time" is selected, the log file will be archived to a new segment according to the specified Rotation interval (in hours). The default setting is a rotation type of "By Size" and a files size of 5M. These default settings should be sufficient for most EM installations. If needed, the settings can be modified by connecting to the Oracle WebLogic Server Administration Console. For more details on how to modify this setting, refer to the documentation links above.
- Control when the WebLogic and HTTP servers write to log files: The amount of data that will be logged can be controlled by specifying the level for the log and different message destinations. Some of the different levels are Debug, Info, Notice, Warning, Trace, Error, Critical, Alert, Emergency and Off. The default setting is Warning for the log files and Error for the domain log broadcaster file. These settings should be sufficient for most EM installations. If needed, the settings can be modified by connecting to the Oracle WebLogic Server Administration Console.

» Control when to purge log files: The maximum number of archived log files that will be maintained can be controlled by selecting the option to limit the number of retained files and then specifying the number of files to retain. This number does not include the current log file. The default setting is to retain 10 files and should be sufficient for most EM installations. If needed, this setting can be modified by connecting to the Oracle WebLogic Server Administration Console. For more details on how to modify this setting, refer to the documentation links above.

NOTE: The following log files need to be maintained and manually purged. One method for addressing these files would be to create a cronjob that would find all files older than a specific period of time and delete them. Here is an example crontab entry to remove all of the *.out* files under the OMS instance domain directory that are older than 30 days:

```
00 * * * * cd /u01/app/oracle/gc_inst/user_projects/domain;find . -name "*.out*" -mtime +30 -exec rm {} \;
```

- All files under *middleware_home*/gc_inst/WebTierIH1/diagnostics/logs/OHS/ohs#/.
- Log files under the admin server and emgc_oms server:
    - *middleware_home*/gc_inst/user_projects/domains/<*domain_name*>/servers/EMGC_ADMINSERVER/logs/*.out*
    - *middleware_home*/gc_inst/user_projects/domains/<*domain_name*>/servers/EMGC_OMS#/logs/*.out*

Database Trace and Log Files

All diagnostic data including the alert log is stored in the Automatic Diagnostic Repository (ADR). Each instance of each product stores diagnostic data underneath its own ADR home directory. The ADR homes are grouped together under the same directory referred to as the ADR Base. This location is set via the DIAGNOSTIC_DEST initialization parameter. The different ADR home directories that are known to the Automatic Diagnostic Repository Command Interpreter (ADRCI) utility can be seen by issuing a "show homes" command. To execute any commands such as purge or list, the ADRCI utility must be told which home to operate against via the "set home *adr_home*" command. Failure to do this will result in this error: DIA-48448: This command does not support multiple ADR homes.

Alert Log

The alert log is stored as an XML file in the ADR and can be viewed with Enterprise Manager and with the ADRCI utility. Oracle also provides a text-formatted version of the alert log for backward compatibility. For details on using the ADRCI PURGE command, refer to the *Oracle Database Utilities 12c Release 1 (12.1)* guide.

» Control the size of the text based alert log: the size of the alert log must be controlled manually. It is safe to delete the alert log while the instance is running but it is recommended to create an archived copy first for possible future reference.

» Control when to purge the XML based alert log file: The ADRCI utility can be used to purge the XML-formatted alert log file. The content is only automatically purged based on these purging policies. Therefore, data in the files that does not meet the time in the purging policy is maintained. Alert log content is subject to purging after one year (long-lived or LONGP_POLICY). To see the default purging policies for long-lived ADR content, issue the SHOW CONTROL command in ADRCI. The values are specified in hours. The default values should be sufficient for most database installations. NOTE: if you have multiple homes on the server, you must issue the SET HOMEPATH command to a specific home before issuing a SHOW CONTROL command. The content can also be purged manually. Here is an example of a command to purge the alert log content older than 30 days (note that the age is specified in minutes): *purge -age 43200 -type alert.* For further details on the ADRCI utility refer to the *Oracle Database Utilities 12c Release 1 (12.1)* guide.

Trace Files

Trace files are created by server and background processes, the SQL trace facility and also by enabling SQL tracing for a session or an instance. The file extension for trace files is *.trc* (i.e. orcl_ora_762.trc). Trace files are sometimes accompanied by a corresponding trace map file which contains structural information about trace files. These trace map files use the file extension *.trm*.

- Control the size of the trace files: the maximum size of all trace files can be controlled using the initialization parameter MAX_FILE_SIZE. This will limit the size of trace files to a specific number of operating system blocks.
- Control when the database writes to trace files: The only background process that allows this control is the ARC*n* process. This is controlled via the LOG_ARCHIVE_TRACE initialization parameter. There are multiple trace levels that can be set which control the amount of trace data written. For more details, refer to the *Oracle Database Administrator's Guide 11c Release 1 (12.1)* guide.
- Control when to purge trace files: Trace files can be purged from the ADR home based on purging policies. The content is only purged based on these purging policies. Therefore, data in the files that does not meet the time in the purging policy is maintained. Incidents and incident dump content are subject to purging after one year (long-lived or LONGP_POLICY) however the trace files, core dumps and incident packaging information are subject to purging after 30 days (short-lived or SHORTP_POLICY). Some Oracle products (Oracle Database) automatically purge diagnostic data at the end of its life cycle. The default values should be sufficient for most database installations. To see the default purging policies for short and long-lived ADR content, issue the SHOW CONTROL command in ADRCI. The values are specified in hours. NOTE: if you have multiple homes on the server, you must issue the SET HOMEPATH command to a specific home before issuing a SHOW CONTROL command. The content can also be purged manually. Here is an example of a command to purge the trace files (including dumps) older than 30 days (note that the age is specified in minutes): *purge -age 43200 -type trace.* For further details on the ADRCI utility refer to the Oracle Database Utilities 12c Release 1 (12.1) guide.

Listener Log Files

The listener log, much like the alert log, is stored in the ADR home for the listener in an xml file. It is also stored in a text-formatted version for backward compatibility.

- Control the size of the trace files: *When the XML*-formatted listener file (log.xml) reaches 10MB in size, it will be archived into a file named log_1.xml, log_2.xml, etc. This only applies to the XML-formatted file.
- Purge listener log files: Listener log files and information within a listener log are not purged via the automatic purge. Unlike the RDBMS product, the network products have not supported purging. Therefore, the maintenance of the listener log and trace files is manual. This includes the log files for the SCAN_LISTENERS in a RAC cluster. The XML-formatted files can be purged using the ADRCI utility as with the XML-formatted alert logs.

  NOTE: The ADR location for the LISTENER trace and log files may not be the same as for the SCAN LISTENER log and trace files. When connecting into the ADRCI utility, it will show one ADR Base location only. This can be seen when issuing the "show base" command. To point to the ADR Base for the Oracle Grid install, issue the "set base" command. For example: set base /u01/app/grid. After issuing the set base command, then a "show homes" will show all of the diag locations that can be controlled. Be sure to issue the "set home" command before purging trace files. The locations are as follows: ADR Base for LISTENER and SCAN_LISTENER log and trace files is based on the DIAGNOSTIC_DEST initialization parameter.

Incident Files

OMS Incident Files

Any errors in these log files indicate product defects (bugs). Open an SR with Oracle Support for these issues. There are two different locations for the Automatic Diagnostic Repository (ADR) incidents created on the OMS servers. These are as follows:

WebLogic Server incidents:

<EM_INSTANCE_BASE>/user_projects/domains/<domain_name>/servers/<SERVER_NAME>/adr/diag/ofm/EMGC_DOMAIN/EMOMS/incident

Ex:

/u01/app/oracle/gc_inst/user_projects/domains/GCDomain/servers/EMGC_OMS1/adr/diag/ofm/EMGC_DOMAIN/EMOMS/incident

This command will show the WLS incident details:

$ omsvfy show wlsincidents

Refer to the My Oracle Support (MOS) note Oracle Enterprise Manager 13c Configuration Best Practices [2139083.1] for more information on stopping a common WLS related incident.

OMS incidents:

<EM_INSTANCE_BASE>/user_projects/domains/<domain_name>/servers/<SERVER_NAME>/adr/diag/ofm/<domain_name>/<SERVER_NAME>/incident

Ex:

/u01/app/oracle/gc_inst/user_projects/domains/GCDomain/servers/EMGC_OMS1/adr/diag/ofm/GCDomain/EMGC_OMS1/incident

This command will show the OMS incident details:

$ omsvfy show emincidents

Agent Incident Files

The ADR incidents created for the Agent are found here: $EMSTATE/diag/ofm/emagent/emagent/incident

Ex:

/u01/app/oracle/em/agent_inst/diag/ofm/emagent/emagent/incident

This command will show the agent incident details:

$ agtvfy show incidents

Troubleshooting

The following are high-level process flows for troubleshooting various issues with Enterprise Manager.

TABLE 8: TROUBLESHOOTING

ISSUE	COMPONENT
Performance	**RUN REPVFY EXECUTE OPTIMIZE (FOR FURTHER DETAILS ON THIS REPVFY COMMAND, REFER TO ORACLE ENTERPRISE MANAGER 13C CONFIGURATION BEST PRACTICES [2139083.1].** 1. Evaluate DB Performance, locks, waits, etc. 2. Look for ADDM recommendations

	3. Validate SYSMAN statistics 4. Run repvfy dump performance 5. Run repvfy dump errors
Jobs	1. Check DBMS_SCHEDULER Status 2. Check value of JOB_QUEUE_PROCESSES 3. Run repvfy dump job_health 4. Check for errors relating to a specific job failure (see MOS note 744645.1 to identify the job) 5. Refer to MOS notes 783357.1 and 1520580.1 for further help in diagnosing an issue with Jobs
Notifications – if a notification is missing or late	1. Check event/incident details to see if Notification was triggered 2. Check EM Jobs Service – Notification Job 3. Run repvfy dump notif_health
Events – missing event or incident	1. Check for loader backlog (repvfy dump loader_health) 2. Check agent status (not blocked, uploading?) 3. Check target thresholds 4. Check incident rules
OMS Availability	1. Verify that the repository database and listener are up 2. Verify that the sysman, sysman_opss, sysman_mds user accounts in the repository database are open 3. Check log files • emctl - $EM_INSTANCE_BASE/em/EMGC_OMSn/sysman/log • HTTP_SERVER - $EM_INSTANCE_BASE/user_projects/domains/GCDomain/servers/ohs1/logs • EM Node Manager - $EM_INSTANCE_BASE/user_projects/domains/GCDomain/nodemanager • Admin Server - $EM_INSTANCE_BASE/user_projects/domains/GCDomain/servers/EMGC_ADMINSERVER/logs • EM Managed Server - $EM_INSTANCE_BASE/user_projects/domains/GCDomain/servers/EMGC_OMS1/logs 4. For diagnosing issues with connectivity between OMS and the Repository
Target Availability	1. Check gcagent.log for ERROR messages 2. Run repvfy dump target 3. Run repvfy dump availability

Conclusion

As an environment grows for any enterprise, the dependency on Oracle Enterprise Manager 13c to help monitoring and administer the environment becomes very important. This also means that the EM environment itself must be supported, maintained and treated as highly available as the most highly available target it manages. Therefore, this means that EM must be properly configured, monitored, maintained and high performing to provide the daily monitoring and administration capabilities that an enterprise requires to maintain their environment.

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October 2016
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