



MURAL Software Upgrade Guide

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Upgrade Overview

MURAL provides Web-based reporting and analytics for deep packet inspection (DPI) data emerging from your network.

This document describes how to upgrade the MURAL application from release 4.0 to release 4.1.

Before You Begin

This document assumes that you have a working knowledge of Linux operating system. Before you begin the upgrade, we recommend that you review the Release Notes for 4.1.

Upgrade Package

The MURAL software upgrade package contains the following components:

- **An IMG image file.** For the image name and associated MD5 checksum, refer to the Release Notes.
- **ImageUpgrade.sh** script. The script is used to automatically upgrade image on all the nodes from master GMS node.
- **configBackup.sh** script. The script is used to take backup of configuration dumps from all the MURAL nodes.
- The XML file that is used by the master GMS node. This configuration file provides configuration settings for your setup based on the network topology.
- Any software patches that apply to the release. A complete list is provided in the Release Notes.
- Management information bases (MIBs).

Pre-Upgrade Tasks

Before you begin the upgrade, perform the following tasks:

- "Copying and Installing Image on Nodes" below
- "Taking Backups" on page 9
- "Stopping Processes" on page 13

Copying and Installing Image on Nodes

Before starting the upgrade process, copy and install image on all the nodes using master GMS node.

1. Log into the master GMS node and execute the following commands to create a directory.

```
>en
# _shell
# mkdir /data/Mural4.1/
```

This creates a directory, where the image will be copied and installed.

2. From the master GMS node, copy the IMG file to /data/MURAL4.1 directory, and imageUpgrade.sh and configBackup.sh scripts to /data/directory.
3. Execute the following command on master GMS node to copy and install image on all the nodes:

```
# sh /data/imageUpgrade.sh <GMS XML File> <Image File>
```

For Example,

```
[admin@gms-1 ~]# sh /data/imageUpgrade.sh /config/gms/active-configuration/resolved_active.xml /data/Mural4.1/image-atlas4.1.rc1.img
```

The output may resemble as follows:

```
imageUpgrade.sh:msg:IMGNAME == image-atlas4.1.rc1.img
```

```
MD5SUM is : 6715aba79e6749c3beccb2d051444b48
/data/Mural4.1/image-atlas4.1.rc1.img
-----
imageUpgrade.sh:msg: Network Name is : MgmtNW
-----
imageUpgrade.sh:msg: Node : 192.168.188.56 have sufficient
empty space in /var FS - Required : 4187688 KB, Available :
7302120 KB
-----
imageUpgrade.sh:msg: Node : 192.168.188.66 have sufficient
empty space in /var FS - Required : 4187688 KB, Available :
7611028 KB
-----
imageUpgrade.sh:msg: Copying Image file into Node :
192.168.188.56 ...
imageUpgrade.sh:msg: Image file successfully copied into Node
: 192.168.188.56
-----
imageUpgrade.sh:msg: Copying Image file into Node :
192.168.188.66 ...
imageUpgrade.sh:msg: Image file successfully copied into Node
: 192.168.188.66
-----
Copying Remote Image upgrade script to 192.168.188.56 node ...
imageUpgrade.sh:msg:Image upgrade command has been submitted
on 192.168.188.56 ...
-----
Copying Remote Image upgrade script to 192.168.188.66 node ...
imageUpgrade.sh:msg:Image upgrade command has been submitted
on 192.168.188.66 ...
-----
.
```



```
.  
.br/>imageUpgrade.sh:msg: Please check /data/image_upgrade.log file  
and monitor remote_img_upgrade.sh process on target nodes  
[admin@gms-1 ~]#
```

After the successful execution of the above commands, image installation process starts on all the nodes.

4. Execute the following command on other target nodes, except master GMS node, to verify the successful execution of the installation command.

```
[admin@gms-2 data]# ps -eaf | grep remote_img_upgrade.sh | grep -v  
grep  
admin 19791 1 0 11:01 ? 00:00:00 sh /data/remote_img_upgrade.sh  
[admin@gms-2 data]#
```

The preceding output shows that the installation command is running on this node. Run the same command after 15-20 minutes to verify that the image is successfully installed.

```
[admin@gms-2 data]# ps -eaf | grep remote_img_upgrade.sh | grep -v  
grep  
[admin@gms-2 data]#
```

The preceding output shows that the image installation is complete for this node. You can run the command on other target nodes to verify the successful installation.

Taking Backups

It is recommended to take backups before proceeding with the upgrade.

Log in to each node and execute the following commands:

```
>en  
# _shell  
# mkdir /data/Backup_files
```

This creates a folder, where all the backed-up files will be saved.

Take a Backup of all IBs

Once you have created the folder to save the back up files on all the nodes.

Perform the following steps on the master name node:

1. Execute the following commands to take backup of all the IBs:

```
# cp -r /data/ib/inbox /data/Backup_files/
# cp -r /data/ib/work /data/Backup_files/
# hdfs dfs -get /IB /data/Backup_files/
```

Take a Backup of PGSQL Database

1. Execute the following commands on the master GMS node:

```
>en
# config terminal
(config)# pgsql file-path /data/Backup_files/pgsqlDB4.0_
gms.txt dbname gms_configuration backup
```

2. Execute the following commands on the master iNSTA node:

```
>en
# config terminal
(config)# pgsql file-path /data/Backup_files/pgsqlDB4.0_
rubix.txt dbname rubixdb backup
```

3. Execute the following commands on the master Name node:

```
>en
# config terminal
(config)# pgsql file-path /data/Backup_files/pgsqlDB4.0_
hive.txt dbname hivedb backup
```

Take a Backup of Active Configurations

- Execute the following commands from the master GMS Node to take configuration backup of all the MURAL nodes.

```
[admin@gms-1 ~]# sh /data/configBackup.sh /config/gms/active-  
configuration/resolved_active.xml
```

The output may resemble as follows:

```
configBackup.sh:msg: Network Name is : MgmtNW  
-----  
configBackup.sh:msg: Collecting Running Config from Nodes ...  
-----  
configBackup.sh:msg:Backup config for 192.168.188.52 node ....  
configBackup.sh:msg:Backup config for 192.168.188.53 node ....  
. . .  
configBackup.sh:msg:Backup config for 192.168.188.62 node ....  
configBackup.sh:msg:Backup config for 192.168.188.66 node ....  
-----  
configBackup.sh:msg: Collecting Running Config from Nodes :  
Done.  
-----  
configBackup.sh:msg: Creating tar ball of Config Backup files  
collected from all the nodes ...  
runningConf_col-1_201707191018.txt  
runningConf_col-2_201707191018.txt  
. . .  
runningConf_ui-1_201707191018.txt  
runningConf_ui-2_201707191018.txt  
-----  
configBackup.sh:msg: Config Backup is available as :  
/data/configDumpDir/RunningConf_201707191018.tgz  
-----  
[admin@gms-1 ~]# ls -l /data/configDumpDir/RunningConf_  
201707191018.tgz
```

```
-rw-r--r-- 1 admin root 258441 Jul 19 10:19
/data/configDumpDir/RunningConf_201707191018.tgz
[admin@gms-1 ~]#
```

Take a Backup of Gateway Configurations

- Execute the following command from all the collector nodes to take a backup of gateway configurations for bulkstats:

```
# cli -t en 'show running' > /data/Backup_files/`hostname`_
configBackup.txt
# grep "bulkStatsFile" /data/Backup_files/`hostname`_
configBackup.txt > /data/Backup_files/coll_bsGW_config.txt
# echo "write memory" >> /data/Backup_files/coll_bsGW_
config.txt
```

Take a Backup of Manually Modified Files

Perform the following procedure:

- Execute the following commands on the master name node to create a folder for saving backup:

```
>en
# _shell
# mkdir -p /data/Backup_files/Patch_backup
```

- Execute the following command on the master Name node:

```
# cp /data/CoreJob/config/solutionConfig.json /data/Backup_
files/
# cp /opt/catalogue/atlas/dynamicWhiteListConfig.json
/data/Backup_files/image_dynamicWhiteListConfig.json
# cp /data/ib/inbox/dynamicWhiteListConfig.json /data/Backup_
files/
# cp -r /data/patchspace/patch/4.0.rc2 /data/Backup_
files/Patch_backup/
```

```
# cp /opt/samples/yarn_conf/capacity-scheduler.xml.template
/data/Backup_files/
```

Execute the following command on the master DPI node:

```
# cp /opt/tms/apache-tomcat/apache-tomcat-
7.0.27/conf/server.xml /data/Backup_files/
```

Stopping Processes

You must stop processes as explained in the following sections before proceeding with the upgrade.

Stop Oozie Jobs

- Log into the master Name node and execute the following commands:

```
>en
# _shell
# pmx subshell oozie stop jobname all
```

Note: Wait until all the jobs are stopped. To verify if all the jobs are stopped, execute the following command and ensure that no job is running:

```
# pmx subshell oozie show coordinator RUNNING jobs
```

For example:

```
[admin@MUR-COLL-2 ~]# pmx subshell oozie show coordinator
RUNNING jobs
No Jobs match your criteria!
[admin@MUR-COLL-2 ~]#
```

Stop Rubix Processes

- To disable all applications, execute the following commands on the corresponding UI nodes:

```
>en
# conf t
(config)# rubix modify-app <app-name> modify-instance 1
```

```

disable
(config)# rubix modify-app <app-name> disable
(config)# no pm process rubix launch auto
(config)# pm process rubix terminate
(config)# write memory

```

Where, <app-name> is as follows. Stop the applications in the same order as mentioned below.

For all the UI nodes:

- atlas

For both the RGE nodes:

- bulkstats
- reportAtlas
- rge
- ruleEngine

Stop Insta Processes

- Execute the following command on both the Insta nodes:

```

>en
# conf t
(config)# pm process insta terminate

```

Stop GMS Processes

- Execute the following commands on both the GMS nodes:

```

>en
# conf t
(config)# no pm process gms_server launch auto
(config)# no pm process pgsqlld launch auto
(config)# wr mem
(config)# pm process gms_server terminate
(config)# pm process pgsqlld terminate

```

Stop the Collector

- Execute the following commands on all the collector nodes:

```
>en
# conf t
(config)# no pm process collector launch auto
(config)# pm process collector terminate
(config)# write memory
```

Upgrade Tasks

Perform the following steps to upgrade MURAL from release 4.0 to release 4.1:

- "Upgrade Image on the Nodes" below
- "Restart Processes on GMS Nodes" on the next page
- "Upgrade MURAL and Bulkstats Databases on Insta Cluster" on page 18

Upgrade Image on the Nodes

Upgrade the image on the following nodes:

- Master and Standby NameNode
- Master and Standby node of the additional Collector (if any)
- Master and standby GMS nodes
- All the Rubix nodes including the RGE node
- Master and standby Insta nodes
- All Compute nodes, chassis-wise

Note: Ensure to upgrade image on Compute nodes chassis-wise. After upgrading the compute nodes on the first chassis, verify that the nodes have come up with new image and joined the YARN cluster. Only after this verification, proceed with the upgrade on the next chassis.

Perform the following steps on all the nodes in the same order as listed above.

1. SSH login to each node as an admin user.
2. Execute the following commands:

Note: Before executing these commands, note the role of each node to check if any master or standby nodes have interchanged their roles.

```
>en
# conf t
```



```
(config)# write memory  
(config)# reload
```

Note: Before executing this command on any other node(s) of the same cluster, wait for at least 10 to 20 minutes for the node to come up after reboot.

3. Run the following commands on all the nodes:

```
>en  
# _shell  
# mount -o remount,rw /
```

4. To verify if the new image is available on a node, execute the following commands:

```
host [master: standby] > en  
host [master: standby] # conf t  
host [master: standby] (config) # sho ver
```

The output may resemble to the following:

```
Product name:      Content Analytics  
Product release:   4.1.rc1  
Build ID:          #1-dev  
Build date:        2017-08-08 11:31:00
```

Note: While upgrading the image of a node in a cluster, execute the following command on the master node of the nodes whose roles have changed. This is to ensure that the role of the master node is the same as it was before the upgrade.

```
host [master: standby] (config) # cluster master self
```

Restart Processes on GMS Nodes

1. Execute the following commands on both the GMS nodes:

```
>en  
# conf t  
(config)# pm process gms_server launch auto
```

```
(config)# pm process pgsqld launch auto
(config)# wr mem
(config)# pm process pgsqld restart
(config)# pm process gms_server restart
```

Upgrade MURAL and Bulkstats Databases on Insta Cluster

After the image is installed successfully, wait for 15 minutes before upgrading the MURAL and bulkstats databases on the Insta cluster.

1. Perform the following steps to upgrade the schema for new XML for bulkstats cubes from the master iNSTA node:
 - a. Execute the following commands:

```
>en
# _shell
# cli -m config
(config)# insta infinidb upgrade
(config) # quit
```

- b. Wait for 15 minutes, and then execute the following commands:

```
# echo "insta infinidb get-status-info" | cli -m config |
grep -A3 "instance 0 service status :"
```

Ensure that the output contains the following:

```
Insta instance 0 service status : RUNNING
Insta instance 1 service status : RUNNING
Infinidb Adaptor status : Adaptor Running
```

- c. Execute the following command to restart iNSTA process:

```
# cli -m config
(config)# pm process insta restart
(config)# quit
```

2. Perform the following steps to restart insta on the standby node:

- a. Execute the following commands:

```
>en
# _shell
# cli -m config
(config)# pm process insta restart
```

- b. Wait for a few minutes and check the status of infinidb by executing the following command:

```
(config)# insta infinidb get-status-info
(config)# quit
```

The output may resemble as follows:

```
Infinidb Install status : INSTALLED
insta instance 0 service status : RUNNING
Insta instance 1 service status : RUNNING
```

3. Execute the following command on the master INSTA node to check the installation status:

```
# cli -t "en" "conf t" "insta infinidb get-status-info" | grep
"Insta instance 0 service status"
```

The output may resemble as follows:

```
Insta instance 0 service status : RUNNING
```

Execute the following command:

```
# cli -t "en" "conf t" "insta infinidb get-status-info" | grep
"Infinidb Adaptor status"
```

The output may resemble as follows:

```
Infinidb Adaptor status : Adaptor Running
```

Execute the following command:

```
# cli -t "en" "conf t" "insta infinidb get-status-info" | grep
"Active insta nodes"
```

The output may resemble as follows:

```
Active insta nodes : <comma separated list of insta IPs>
```

Note the status as RUNNING and list of active iNSTA nodes in the output.

- Execute the following command on both the iNSTA nodes (master and standby) to ensure that 55555 port is in listen mode:

```
# netstat -napto | grep -i 55555
```

The output may resemble to the following sample:

```
tcp          0      0 :::55555          :::*
LISTEN      2730/insta        off (0.00/0/0)
```

Post-Upgrade Tasks

After upgrading the image and applying required patches, perform the tasks described in this chapter:

- "Activate the New XML from the Master GMS Node" below
- "Apply Configurations to Nodes" on page 26
- "Restart Processes" on page 40

Activate the New XML from the Master GMS Node

1. (Mandatory for Data Warehouse Integration (DWI) features) Execute the following command to add templates that are not available in ciscoConfig file:

For DWI:

```
>en
# _shell
# cd /config/gms/Profiles/Custom/
# ln -fs /opt/deployment/GMS_Templates/oozie/App/DWH/workflow_
dwh_with_timeout_jobs.xml
```

2. Perform the following steps to run MMI for generating new XML:
 - a. The following properties, which are configured through mmi, can be updated during mmi:
 - `adaptor.<>.numthreads`— can be obtained by searching for the string "num_threads" in the current running configuration.
 - `compute.dfs.datanode.data.dir`— can be obtained by searching for the string "dfs.datanode.data.dir" in the current running configuration.
 - `rubix sizing properties`— can be obtained by searching for the string "tomcatInstanceMaxSize, initialJavaHeapSize, rubixFQDN, mailSupport, mailNotificationSender, mailNotificationSender".

- b. Execute the following command:

```
# sh /opt/etc/scripts/mmi/cisco_mural_deployment_
wizard.sh
```

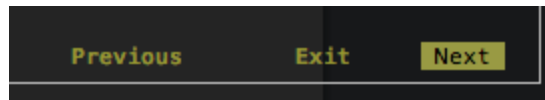
Use the existing active.xml as input XML to retain the hardware configuration. Note the name of the generated XML provided on the first page.

The MURAL Deployment wizard, as illustrated below, is launched on the terminal to accept various configuration inputs.

```
Welcome to Cisco Mural Deployment Wizard
GNS Hardware XML Filename :
/config/gns/Mura_Hardware.xml
Output XML File Name
/config/gns/Mura_Application.xml
Pack Type : (X) Standard
           ( ) Medium
           ( ) Starter
Additional Apps :
(X) Bulkstats
(X) Anomaly
(X) Tethering
(X) ServiceID Report
(X) Outbound Roaming Report
(X) YLS-SMZ Report
(X) Bulkbas Report
(X) Open Platform Support
Exit Next
```

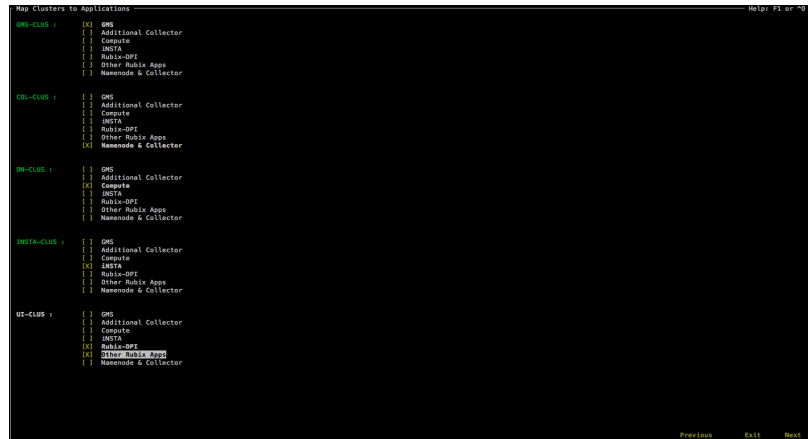
General instructions to use the MURAL Deployment wizard:

- Use arrow keys to navigate in the Deployment wizard.
- Use Space-bar to choose the selected item(s).



- Press **Enter** after selecting **Next**, **Previous** or **Exit** to move into next screen, previous screen or exit from the Deployment wizard, respectively.
- Selected items appear with swapped colors for text and

background.



Note: On the next screen, click **Next** without making any changes in the configurations.

- Select **Generate & Exit**, and press the **Enter** key to create the final XML.

After successful execution, final XML

(/config/gms/Mural_Application.xml) is generated.

3. Manually update the site specific collector Property value using vi editor in the Mural_Application.xml, generated in the preceding step.

- a. Log into master NameNode as admin.
- b. Execute the following commands:

Note the output values of the following commands.

```
> en
# _shell
# configFile=/data/Backup_files/`hostname`_configBackup.txt
# grep "edr.* filename-format " $configFile | awk '{print $(NF-1)}"\t"$NF}' | sort -u
filename-format %DC*_*_MM%DD%YYYY%hh%mm%ss_*.gz
# grep "edr.* transfer-filename-fmt " $configFile | awk '{print $(NF-1)}"\t"$NF}' | sort -u
transfer-filename-fmt %DC*_*_MM%DD%YYYY%hh%mm%ss_*.gz.tmp
```

```
# grep "edr.*output-directory" $confFile | awk '{print $(NF-1)}' | sort -u
output-directory
/data/collector/1/output/edrDNS/%Y/%m/%d/%h/%mi/
gurgaon.EDRDNS.
output-directory
/data/collector/1/output/edrflow/%Y/%m/%d/%h/%mi/
gurgaon.EDRFLOW.
output-directory
/data/collector/1/output/edrhttp/%Y/%m/%d/%h/%mi/
gurgaon.EDRHTTP.
# grep "edr.*-expiry-" $confFile | awk '{print $(NF-1)}' | sort -u
backup-file-expiry-period 24
```

- Update GMS XML using the vi editor from the master GMS node.

For example, `/config/gms/Mural Application.xml`.

Search for all the occurrences of properties in the GMS XML as mentioned in the following table and specify corresponding values displayed in the preceding output (step 3).

The following table lists the properties to be searched for in the GMS XML and their mapping to the properties and values displayed in the preceding output (step 3):

| Properties in the GMS XML | Properties in the Output | Value displayed in the Output |
|-----------------------------|--------------------------|--|
| File.fileNameFormat | filename-format | %DC_*_*_%MM%DD%YYYY%h-h%mm%ss_*.gz |
| File.transferFileNameFormat | transfer-filename-fmt | %DC_*_*_%MM%DD%YYYY%h-h%mm%ss_*.gz.tmp |

| Properties in the GMS XML | Prop- erties in the Out- put | Value displayed in the Output |
|--------------------------------|---------------------------------------|--|
| edr.*.output.directory | output-dir- ectory | /data/collector/1/output/ edrdns/%y/%m/%d/%h/%mi/ gurgaon.EDRDNS. |
| | | /data/collector/1/output/ edrflow/%y/%m/%d/%h/%mi/ gurgaon.EDRFLOW. |
| | | /data/collector/1/output/ edrhttp/%y/%m/%d/%h/%mi/ gurgaon.EDRHTTP. |
| edr.*.- backUpDeleteTimeOut | backup- file-expiry- period | 24 |
| autoBinSlide | disable | |

- Execute the following commands to copy data from standby collector to master node:

```
>en
# _shell
# echo show running-config full | cli -m config | grep
"flowFile input-directory" | awk '{print $9}'
# echo show running-config full | cli -m config | grep
"httpFile input-directory" | awk '{print $9}'
# echo show running-config full | cli -m config | grep
"bulkStatsFile" |grep "input-directory" | awk '{print $9}'
# scp <dir>/* admin@<collector-vip>:<dir>
```

Here, `dir` contains the output of these commands.

- From the master GMS node, activate the XML that has only collector related changes in templates:

```
>en
# _shell
# cli -m config
(config)# gms config <New-XML> activate
```

Note: Allow the runtime activation to complete so that it applies the new template changes. This process may take 5 to 7 minutes as the activation process applies the new changes as per the new activated XML and will only stop and start Collector Process on all 4 Collector nodes including the NameNodes. Execute the following commands to verify the status:

```
> en
# _shell
# cli -m config
(config)# gms config-runtime show status all
```

If any error is encountered, correct the error and execute the following command:

```
(config)# gms config-runtime cluster cluster-name
<clustername> all
```

Here, <clustername> refers to the cluster to which the erroneous nodes belong. If the erroneous nodes belong to different clusters, execute the preceding command on all those clusters.

Apply Configurations to Nodes

- (Mandatory for DWI) Log in to both NameNodes and execute the following commands:

```
# cli -m config
(config)# internal set modify -
/tps/process/oozie/jobs/TransferJob/actions/TransferOozieAction/attribute/destNamenode/value value string <Dest cluster name>
```

To enable webhdfs on both the clusters, ensure that each datanode and namenode has the source and destination IP addresses mapped in the `/etc/hosts` file. For example, the `hosts.txt` file may resemble as following:

```
192.168.194.121    machine-194-121<dest NN node>
192.168.194.122    machine-194-122<dest DN node>
192.168.192.148    machine-192-148<src NN>
192.168.192.149    machine-192-149<dest DN>
192.168.192.151    machine-192-151<dest DN>
192.168.192.152    machine-192-152<dest DN>
192.168.192.41     <Dest cluster name>
```

To change the required IP filter rules on all the nodes of source as well as destination cluster, identify the INPUT rule to be removed:

Execute the following command:

```
# echo "show ip filter configured" | cli -m config | grep DROP
| grep 50070
```

The output may resemble as follows:

```
71 DROP tcp all all
dpt 50070
```

Execute the following command:

```
# echo "show ip filter configured" | cli -m config | grep DROP
| grep 50075
```

The output may resemble as follows:

```
75 DROP tcp all all
dpt 50075
```

The first column in the preceding output provides the rule number. Execute the following command (as an example) to remove the rule:

```
# cli -m config -t "no ip filter chain INPUT rule 75"
# cli -m config -t "no ip filter chain INPUT rule 71"
```

- Perform the following steps on both the name nodes (as specified):
 - a. Execute the following commands to verify the difference between the current and earlier configuration:

```
> en
# _shell
# cli -t "en" "conf t" "show running full" >
/data/Backup_files/`hostname`_configCurrent.txt
```

- b. Verify the difference between the current (/data/Backup_files/*_configCurrent.txt) and previous ((/data/Backup_files/*_configBackup.txt)) configuration files.

Execute the commands that are found.

Note: Following are the expected commands to be executed on oozie subshell due to feature updates. Take a note of default values corresponding to the properties as these commands will overwrite the values.

Execute the following command to set jobStart time of NNModelID job:

```
(config)# _shell
# hdfs dfs -cat /data/CoreJob/done.txt
```

The output may resemble as follows:

```
2016-07-28T08:00Z
```

Note the timestamp in the preceding output and execute the following commands to ensure that ModelID job always starts from 00:00 hour of the day till CoreJob is executed.

```
>en
# config t
(config)# pmx subshell oozie
pm extension (oozie)> set job NNModelID attribute jobStart
2016-07-28T00:00Z
```

Execute the following command to set cleanupOffset for dataset, *generic_report_output_hourly*:

```
>en
# conf t
# pm extension (oozie)> pmx subshell oozie set dataset
generic_report_output_hourly attribute cleanupOffset 3
```

Execute the following commands to set the Jobstart time of *CleanupOutput job*

```
(config)# _shell
# hdfs dfs -cat /data/CleanupOutput/done.txt
```

The output may resemble as follows:

```
2016-07-28T00:00Z
```

Note the timestamp in the preceding output, and execute the following commands:

```
>en
# config t (config)# internal set modify -
/tps/process/oozie/jobs/CleanupOutput/attribute/jobStart
/value value string 2016-07-28T00:00Z
```

- c. Execute the following command on the master name node:

```
# cli -m config
(config)# pm process tps restart
```

Wait for 10 minutes and execute these commands on standby name node.

Run the following commands to verify Hadoop status:

```
> en
# _shell
# hdfs dfsadmin -report | head -12
```

The output may resemble to the following sample:

```

Configured Capacity: 5624751722496 (5.12 TB)
Present Capacity: 5326934437888 (4.84 TB)
DFS Remaining: 1634512154624 (1.49 TB)
DFS Used: 3692422283264 (3.36 TB)
DFS Used%: 69.32%
Under replicated blocks: 852
Blocks with corrupt replicas: 0
Missing blocks: 0

-----
Datanodes available: 4 (4 total, 0 dead)

```

Here, 4 denotes the number of Compute nodes available in the setup.

Retain Manual Changes in IBs

Any changes that are done manually in an IB are lost during the upgrade.

Perform the following steps on the master name node to retain the changes made in IBs:

1. Compare the diff between backup IB of inbox and `/opt/catalogue/atlas` of image.
2. If an IB is found to be overwritten or modified after the update all ib is performed, create a map file containing new entries and an empty line at the end. The structure of the new entry must be similar to the existing entries in the map file.

Note: The IBs, `apnGroup.map`, `ratidtype.map`, `ipSgsn.map`, `ipGgsn.map`, and `dcRegionArea.map` are non-empty and contain all required entries.

3. Execute the following commands for bulk update:

```

>en
# _shell
# pmx subshell aggregation_center

```

```
(aggregation_center)# edit ib <map file to be updated> add
bulk <path to bulk file>
```

Update the IBs

Perform the following steps:

1. Execute the following commands to update the DPI IB:

```
>en
# _shell
# pmx subshell aggregation_center
(aggregation_center) # update all ibs from image
(aggregation_center) # generate urlcat ib from image
(aggregation_center) # show urlcat version
(aggregation_center) # generate all ibs
(aggregation_center) # push all ibs
(aggregation_center) # quit
```

2. Execute the following commands to update the Bulkstats IB:

```
# pmx subshell bulkstats
(bulkstats) # update all ibs from image
(bulkstats) # generate all ibs
(bulkstats) # push all ibs
(bulkstats) # quit
```

3. Execute the following commands to update the Anomaly IB:

```
# pmx subshell anomaly
(anomaly) # update all ibs
(anomaly) # quit
```

Modifying Behaviour for Cell Sector Annotation

You can categorize the Cell Sectors, which are not present in the IB configuration into Other cells, and GGSN and SGSN which are not present in the IB configuration into Miscellaneous.

The values of Cell Sectors, GGSN and SGSN to be retained in data are specified in the following IBs:

- cellLocationInfo.list for Cell Sectors
- ipGGSN.map for GGSN
- ipSGSN.map for SGSN

Perform the following steps for categorizing the Cell Sectors, GGSN and SGSN:

1. Execute the following command to create the backup of Annotations.json:

```
# mount -o remount,rw /
# cp -p /opt/etc/oozie/EDR/app/Annotations.json
/opt/etc/oozie/EDR/app/Annotations.json.org
```

2. Execute the following command to check the current values assigned to groupSGSNAsMisc, groupGGSNAsMisc and emitUsingMCCMNC:

```
# grep -e groupSGSNAsMisc -e groupGGSNAsMisc -e
emitUsingMCCMNC /opt/etc/oozie/EDR/app/Annotations.json
```

The output may resemble as follows:

```
"groupGGSNAsMisc":"false"
"groupSGSNAsMisc":"false"
"emitUsingMCCMNC":"false"
```

3. Execute the following command to set the value of emitUsingMCCMNC, groupGGSNAsMisc, and groupSGSNAsMisc as true:

```
# sed -
i's/"emitUsingMCCMNC":\s*"false"/"emitUsingMCCMNC":"true"/'
/opt/etc/oozie/EDR/app/Annotations.json
# sed -i
's/"groupGGSNAsMisc":\s*"false"/"groupGGSNAsMisc":"true"/'
/opt/etc/oozie/EDR/app/Annotations.json
# sed -i
's/"groupSGSNAsMisc":\s*"false"/"groupSGSNAsMisc":"true"/'
/opt/etc/oozie/EDR/app/Annotations.json
```


- Execute the following command to validate the value of groupSGSNAsMisc, groupGGSNAsMisc and emitUsingMCCMNC:

```
# grep -e groupSGSNAsMisc -e groupGGSNAsMisc -e
emitUsingMCCMNC /opt/etc/oozie/EDR/app/Annotations.json
```

Ensure that the output shows these values as "true":

```
"groupSGSNAsMisc":"true"
"emitUsingMCCMNC":"true"
"groupGGSNAsMisc":"true"
```

Enabling CSV Report

This section explains how to enable reports selected under **Additional Apps** on the deployment wizard in "Activate the New XML from the Master GMS Node" on page 21.

- For **ServiceID** report:
 - Execute the following commands on master and all standby namenodes:

```
>en
# _shell
# python
/opt/etc/oozie/SolutionConfigs/EnableServiceId.py yes
```

- Edit or create the file `/data/work/serverfile_ServiceId` on master namenode with destination details in the format shown below.


```
<ip_address>,admin,admin@123,/data/serviceIdReports/
```

For Example, `192.168.193.205, admin, admin@123, /data/serviceIdReports/`
- Copy the file, `serverfile_ServiceId` at `/data/work/` on all the standby namenodes.

- For **Rulebase** report:

1. Execute the following commands on master and all standby namenodes:

```
>en
# _shell
# python /opt/etc/oozie/SolutionConfigs/EnableRulebase.py
yes
```

2. Edit or Create the file `/data/work/serverfile_Rulebase` on master namenode with destination details in the format shown below.

`<ip_address>,admin,admin@123,/data/rulebaseReports/`

For example, 192.168.193.205, admin, admin@123, /data/rulebaseReports/.

3. Copy the file, `serverfile_Rulebase` at `/data/work/` on all the standby namenodes.

- For **Outbound Roaming** report:

1. Execute the following commands on master and all standby namenodes:

```
>en
# _shell
# sed -i "s/:SP:/SP:/g"
/opt/etc/oozie/Reports/config.json
# python
/opt/etc/oozie/SolutionConfigs/EnableOutboundRoaming.py
yes
```

- For **TLS-SNI** report:

1. Execute the following commands on master and all standby namenodes:

```
>en
# _shell
# python /opt/etc/oozie/SolutionConfigs/EnableTlsSni.py
```

```
yes
```

2. Edit or Create the file `/data/work/serverFile_SNIReports` on master namenode with destination details in format shown below.

```
<ip_address>,admin,admin@123,/data/SNIReports/
```

For example,

```
192.168.193.205, admin, admin@123, /data/SNIReports/
```

3. Copy the file, `serverfile_SNIReports` at `/data/work/` on all the standby namenodes .

Adding Home Network for Outbound Roaming Report

You can generate a report to understand the usage of the subscribers who are roaming (outbound roamers). MURAL provides device, content and Service Provider usage reports per roaming partner based on the feature.

For the outbound roaming report feature, you must configure the mobile country code (MCC)/mobile network code (MNC) of the required outbound roamers.

Perform the following steps:

1. Execute the following commands on both the Name nodes to verify if the outbound roaming report feature is enabled:

```
>en
# _shell
# grep -e emitCubes /opt/etc/oozie/EDR/app/Annotations.json
"emitCubes":"true",
```

Note: The value of "emitCubes" as "true" signifies that the feature is enabled.

2. Execute the following commands to add the MCC/MNC of the outbound roamers:

```
>en
# conf t
```

```
(config)# pmx subshell aggregation_center
pm extension (aggregation center)> edit ib homeNetwork.list
add
mcc: <mobile country code of roamer>
mnc: <mobile network code of roamer>
```

Add all the possible MCC/MNC combinations. To view all the added values:

```
pm extension (aggregation center)> show ib homeNetwork.list
1 [440][001]
```

- Execute the following commands to add the IB to the system:

```
pm extension (aggregation center)> push ib homeNetwork.list
```

Note: Execute the code,

`opt/etc/scripts/validateHomeNwList.py` before running the core job to check any overlapping MNC prefixes for a given MCC in the home network list.

For example,

```
# python /opt/etc/scripts/validateHomeNwList.py
```

The output may resemble to the following sample:

```
Fetching information from /data/ib/inbox/homeNetwork.list
Fetching information from /data/ib/inbox/globalNetwork.list
For 440:002 also exits 440:00
For 310:02 also exits 310:020
```

Configure System Monitoring Interface

System Monitoring Interface (SMI) is a dashboard that can be used to display MURAL's system-related health information for the rolling 24-hours period.

Benefits of SMI:

- The system administrator can check the health of the MURAL system and contact Technical Support if a condition is not being met.

- The system administrator can use the dashboard to provide assurance to customer that MURAL services are working fine as per the benchmarking.

Note: You can install SMI only in a Standard pack or a Medium pack.

To configure SMI, perform the following steps:

1. Log into the master RGE node.
2. Execute the following command to copy the active GMS file from the GMS node to the RGE master node:

```
> en
# _shell
# cd /var/home/root
# scp admin@<GMS Master IP/Hostname>:/config/gms/active-configuration/resolved_active.xml .
```

3. Execute the following commands to install SMI on the RGE master node:

```
# cd /var/home/root
# tar -xvzf pkg_dashboard.tgz
# ./install_dashboard.sh
```

The output may resemble as follows:

```
-----
install_dashboard.sh:msg: Usage.....
-----
install_dashboard.sh:input: Enter TAR Filename (with full path)
: /var/home/root/dashboard.tgz
install_dashboard.sh:input: Enter GMS XML Filename (with full
path) : /var/home/root/resolved_active.xml
install_dashboard.sh:input: Enter Management Network Name used
in above XML [MgmtNW]: MgmtNW
install_dashboard.sh:msg: Network Name is : MgmtNW
-----
install_dashboard.sh:msg: Extracting tar ball into node ...
```

```

.
.
.

Stopping pm:
[ OK ]

Starting pm:
[ OK ]

install_dashboard.sh:msg: Dashboard configuration is done
successfully!!!!

install_dashboard.sh:msg: Start Dashboard from UI by
http://<This node IP>:15443

#

```

Note: Provide the value for "Management Network Name" attribute as specified in the resolved_active.xml file.

- Execute the following commands to check if SMI processes have started successfully:

To check if grafana is up:

```
# ps -ef|grep grafana
```

The output may resemble as follows:

```

admin      4300  2653  0 14:43 ?          00:00:00
/opt/grafana/bin/grafana-server -homepath=/opt/grafana

admin      6669 31484  0 14:44 pts/1    00:00:00 grep grafana

```

- To check if graphite and carbon-cache are up:

```
# ps -ef|grep graph
```

The output may resemble as follows:

```
admin      3313  2653  0 14:43 ?          00:00:00
/usr/local/bin/python /opt/graphite/bin/carbon-cache.py -
--nodaemon --logdir=/var/log --pidfile=/var/run/carbon-
cache.pid start
admin      5546  2653  1 14:43 ?          00:00:00
/usr/local/bin/python /usr/local/bin/gunicorn_django --
bind=127.0.0.1:12040 --log-file=/var/log/gunicorn-
graphite/gunicorn.log --preload --
pythonpath=/opt/graphite/webapp/graphite --
settings=settings --workers=3 --pid=/var/run/gunicorn-
graphite/gunicorn-graphite.pid
admin      5753  5546  0 14:43 ?          00:00:00
/usr/local/bin/python /usr/local/bin/gunicorn_django --
bind=127.0.0.1:12040 --log-file=/var/log/gunicorn-
graphite/gunicorn.log --preload --
pythonpath=/opt/graphite/webapp/graphite --
settings=settings --workers=3 --pid=/var/run/gunicorn-
graphite/gunicorn-graphite.pid
admin      5773  5546  0 14:43 ?          00:00:00
/usr/local/bin/python /usr/local/bin/gunicorn_django --
bind=127.0.0.1:12040 --log-file=/var/log/gunicorn-
graphite/gunicorn.log --preload --
pythonpath=/opt/graphite/webapp/graphite --
settings=settings --workers=3 --pid=/var/run/gunicorn-
graphite/gunicorn-graphite.pid
admin      5779  5546  0 14:43 ?          00:00:00
/usr/local/bin/python /usr/local/bin/gunicorn_django --
bind=127.0.0.1:12040 --log-file=/var/log/gunicorn-
graphite/gunicorn.log --preload --
pythonpath=/opt/graphite/webapp/graphite --
settings=settings --workers=3 --pid=/var/run/gunicorn-
graphite/gunicorn-graphite.pid
```

```
admin      6702 31484  0 14:44 pts/1    00:00:00 grep
graph
```

Note the running statuses of the graphite and carbon-cache processes as highlighted in the preceding sample output.

- Execute the following commands:

```
# cli -m config
(config)# cluster master self
(config)# quit
```

Restart Processes

- Run the following commands on all the collector nodes to restore the collector bulkstats configuration from configuration backup:

```
>en
# _shell
# echo -e "\nen\n\nconf t\n\n" > /data/Backup_files/coll_
bsConfigRestore.cli
# grep "add-file-if bulkStatsFile" /data/Backup_
files/`hostname`_configCurrent.txt | sed 's/add/delete/' >>
/data/Backup_files/coll_bsConfigRestore.cli
# cat /data/Backup_files/coll_bsGW_config.txt >> /data/Backup_
files/coll_bsConfigRestore.cli
# cli -x -h /data/Backup_files/coll_bsConfigRestore.cli
```

For more information about gateway configurations, see "Take a Backup of Gateway Configurations" on page 12

- Perform the following steps to configure SSH session limit:
 - Execute the following commands to set the concurrent SSH limit to 50:

```
en
# conf t
```



```
(config) # ssh server max-startups 50
(config) # ssh server max-sessions 50 (config) # write
memory
(config) # pm process sshd restart
```

b. Repeat steps 1 through 2 on the standby Collector node.

3. Log into Collector nodes and restart collector:

```
>en
# conf t
# pm process collector restart
```

4. Log into UI nodes and execute the following steps to enable reverse proxy on your setup.

This section is optional, if you do not require to use reverse proxy in your setup, you can skip these steps.

Note: You must perform all the steps if you are enabling reverse proxy on your setup for the first time. You can skip steps marked as **(Optional)** if reverse proxy was already enabled on your setup before the upgrade. However, performing optional steps in either case will not cause any issue in the upgrade.

1. Execute the following commands on all the UI and RGE nodes to take backup of the files:

- /opt/tms/lib/web/conf.d/httpd.conf
- /var/opt/tms/output/httpd.conf
- /opt/tms/rubix-atlas4.1/config/config.json
- /opt/tms/rubix-atlas4.1/config/app-switcher-config.json
- /opt/tms/rubix-bulkstats-atlas4.1/config/config.json
- /opt/tms/rubix-bulkstats-atlas4.1/config/app-switcher-config.json
- /opt/tms/rubix-bulkstats-atlas4.1/index.html
- /opt/tms/apache-tomcat/apache-tomcat-7.0.41/conf/web.xml

For example,

```
>en
# _shell
# mkdir /data/backup_reverse
# cp /opt/tms/lib/web/conf.d/httpd.conf /data/backup_
reverse
```

2. Execute the following command to replace the file, `- /opt-t/tms/lib/web/conf.d/httpd.conf` with the new file on all UI and RGE nodes.

```
# cp /opt/tms/lib/web/conf.d/httpd.conf_proxy
/opt/tms/lib/web/conf.d/httpd.conf
```

3. Execute the following commands to update the url in the httpd file on all the UI and RGE nodes.

Note: Before updating the URL in the httpd file, you must have complete information about the the rubix applications configured for the setup.

```
>en
# _shell
# sed -i 's/\$/g' /opt/tms/lib/web/conf.d/httpd.conf
# sed -i "s#CLI_REPLACE_ANOMALYSOLUTIONURL#<RGE-NODE
URL>:50443#g" /opt/tms/lib/web/conf.d/httpd.conf
# sed -i "s#CLI_REPLACE_BULKSTATSURL#<RGE-NODE
URL>:20443#g" /opt/tms/lib/web/conf.d/httpd.conf
# sed -i "s#CLI_REPLACE_RGESOLUTIONURL#<RGE-NODE
URL>:30443#g" /opt/tms/lib/web/conf.d/httpd.conf
# sed -i "s#CLI_REPLACE_MURALDPIURL#<UI-NODE
URL>:6443/#g" /opt/tms/lib/web/conf.d/httpd.conf
```

Note : There is an extra `'/'` at the end of `<UI URL>:6443`, where `UI URL` is **ucsd.cisco.com** and RGE URL is **ucsd-report.cisco**.

```
sed -i "s#CLI_REPLACE_ANOMALYSOLUTIONURL#https://ucsd-
```

```

report.cisco.com:50443#g"
/opt/tms/lib/web/conf.d/httpd.conf
sed -i "s#CLI_REPLACE_BULKSTATSURL#https://ucsd-
report.cisco.com:20443#g"
/opt/tms/lib/web/conf.d/httpd.conf
sed -i "s#CLI_REPLACE_RGESOLUTIONURL#https://ucsd-
report.cisco.com:30443#g"
/opt/tms/lib/web/conf.d/httpd.conf
sed -i "s#CLI_REPLACE_
MURALDPIURL#https://ucsd.cisco.com:6443/#g"
/opt/tms/lib/web/conf.d/httpd.conf

```

4. **(Optional)** Execute the following commands to update the file, `/var/opt/tms/output/httpd.conf` with value of common port, `port_value`, that will be used to open UI and RGE nodes.

```

>en
# shell
# sed -i "s/:443/:<port_value>/g"
/var/opt/tms/output/httpd.conf

```

For Example, if the `port_value` = **5443**,

```

sed -i "s/:443/:5443/g" /var/opt/tms/output/httpd.conf

```

5. **(Optional)** Log into a UI node (master or standby), and execute the following commands to generate the certificate:

Note: Enter the password as **admin123** when prompted for password while executing the following commands.

```

>en
# _shell
# mkdir /data/certificate/
# cd /data/certificate/
# /usr/java/jre1.7.0_45/bin/keytool -genkey -keystore
httpdkeystore -alias httpd -storepass admin123 -keypass

```

```
admin123 -dname "CN=mural-scrum, OU=MURAL, O=GUA, L=SM,
S= CA, C=US" -validity 365
# /usr/java/latest/bin/keytool -importkeystore -
srckeystore httpdkeystore -destkeystore intermediate.p12
-deststoretype PKCS12
# openssl pkcs12 -in intermediate.p12 -out mural_cert.pem
-nodes
```

6. **(Optional)** Execute the following commands to create directory, /data/certificate/, and copy the file generated in the preceding step, mural_cert.pem, on all the other UI and RGE nodes.

```
>en
# _shell
# scp /data/certificate/mural_cert.pem admin@<other
UI/RGE node ip>:/data/certificate
```

7. **(Optional)** Run the following commands on all the RGE nodes:

```
>en
# conf t
(config)# rubix modify-app rge set adv-attribute rubixUrl
value <RGE Node URL>
```

For example,

```
rubix modify-app rge set adv-attribute rubixUrl value
https://ucsd-report.cisco.com:40443
```

8. **(Optional)** Execute the commands to update the cli httpd property on all the UI and RGE nodes:

```
>en
# conf t
(config) # web https port <port_value>
```

For example, if the the port_value is **5443**,

```
(config) # web https port 5443
```

9. Execute the following commands to restart httpd process on all the UI and RGE nodes:

```
>en
# conf t
(config) # pm process httpd restart
//To verify that https is running.
(config) # show pm process httpd
```

10. Execute the following commands to update new files on all UI and RGE nodes.

```
>en
# _shell
# cp /opt/tms/rubix-atlas4.1/config/config_proxy.json
/opt/tms/rubix-atlas4.1/config/config.json
# cp /opt/tms/rubix-atlas4.1/config/app-switcher-config_
proxy.json /opt/tms/rubix-atlas4.1/config/app-switcher-
config.json
# cp /opt/tms/rubix-bulkstats-atlas4.1/config/config_
proxy.json /opt/tms/rubix-bulkstats-
atlas4.1/config/config.json
# cp /opt/tms/rubix-bulkstats-atlas4.1/config/app-
switcher-config_proxy.json /opt/tms/rubix-bulkstats-
atlas4.1/config/app-switcher-config.json
# cp /opt/tms/rubix-bulkstats-atlas4.1/index_proxy.html
/opt/tms/rubix-bulkstats-atlas4.1/index.html
```

11. Execute the following commands to update the web.xml file on all the UI and RGE nodes.

```
# sed -i
"s#>application/json<#>application/javascript<#g"
/opt/tms/apache-tomcat/apache-tomcat-7.0.41/conf/web.xml
```

12. **(Optional)** Execute the following commands to add the hostname mapping on all the UI and RGE node:

```
>en
# conf t
(config) # ip host <RGE node URL> <RGE node vip>
(config) # ip host <UI node URL> <UI node vip>
```

For example, vip of UI cluster is 192.168.193.245 and vip of rge cluster is 192.168.193.246.

```
(config) # ip host ucsd.cisco.com 192.168.193.245
(config) # ip host ucsd-report.cisco.com 192.168.193.246
```

13. **(Optional)** Execute the following commands to enable ip filter setting that allows the new port on all the UI and RGE nodes:

```
>en
# conf t
(config) # ip filter chain INPUT rule append tail target
ACCEPT source-addr <ip of the server> /32 dest-port
<port_value> protocol tcp
(config) # configuration write
```

For example,

```
(config) # ip filter chain INPUT rule append tail target
ACCEPT source-addr 192.168.117.67 /32 dest-port 5443
protocol tcp
```

5. Log into corresponding UI nodes, and execute the following commands:

```
>en
# _shell
# /bin/rm -f /data/instances/*/1/bin/blazed*
# cli -m config
(config)# no pm process rubix launch auto
(config)# pm process rubix restart
(config) # rubix modify-app <app-name> modify-instance 1
enable
```

```
(config) # rubix modify-app <app-name> enable
(config) # write memory
```

Where, <app-name> is as follows. Start the applications in the same order as mentioned below.

For all the UI nodes:

- atlas

For both the RGE nodes:

- bulkstats
- reportAtlas
- rge
- ruleEngine

6. Perform the following steps to update the `/etc/hosts` mapping:

- Map the UI node to domain. For example, <VIP of UI> domain.
- Map the RGE and other rubix application nodes to domain-report. For example, <VIP of RGE cluster> domain-report.

7. Hit the following URLs through your browser:

- `https://domain-name:21443/`, if reverse proxy configurations are applied.

For example, `https://demo.cisco.com:21443/`.

- `https://domain-name:6443/`, if reverse proxy configuration not applied.

For example, `https://demo.cisco.com:6443/`.


Use the domain name which was provided to you at the time of initial configuration for the UI nodes.

Note: For browsers, except Chrome, you need to perform an additional step for the UI to run properly. In the browser address bar, hit the

following URLs to accept certificates in order to access different UI modules:

- *https://demo-report.cisco.com:20443*
- *https://demo-report.cisco.com:30443*
- *https://demo-report.cisco.com:50443*

8. Perform the following steps to access SMI user interface:

- a. Log into MURAL with administrator credentials.
- b. Click optional modules,  on the top-right corner.
- c. Click **System Monitoring Interface** icon, the SMI user interface opens in a new tab.
- d. Log into the application by entering username as **admin** and password as **admin**.

9. Log into master NameNode and run all jobs:

```
>en
# _shell
# pmx subshell oozie run job all
```

Enable the Collector in the Live Mode

- Execute the following commands to enable the collector again in the live mode:

```
>en
# _shell
# cli -m config
(config)# collector modify-instance 1 modify-adaptor bulkStats
auto-bin-slide enable
(config)# collector modify-instance 1 modify-adaptor edrflow
auto-bin-slide enable
(config)# collector modify-instance 1 modify-adaptor edrhttp
auto-bin-slide enable
```



```
(config)# wr me  
(config)# pm process collector restart
```

