ORACLE

# Oracle Database 23c and AHF Insights to do better AIOps

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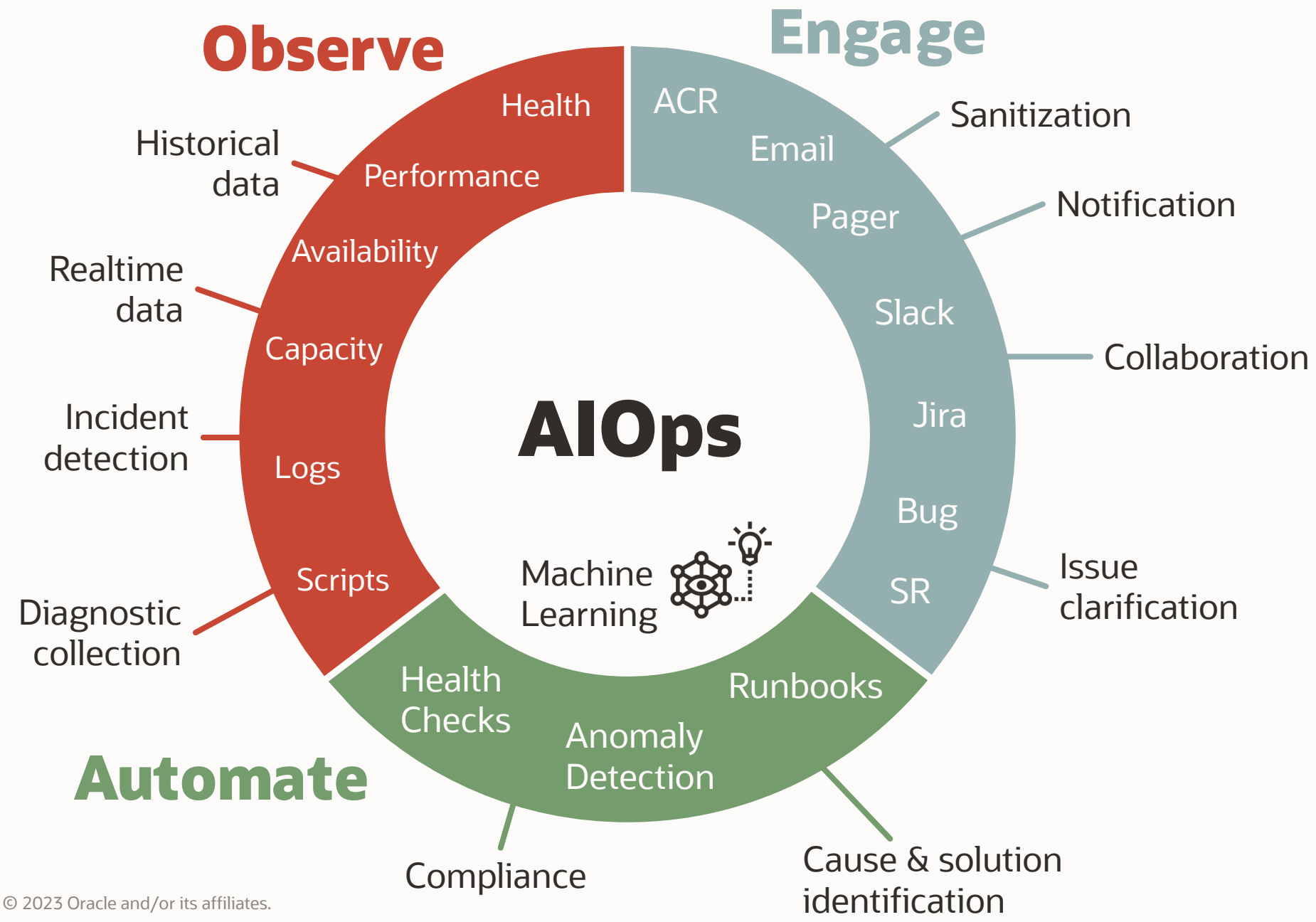


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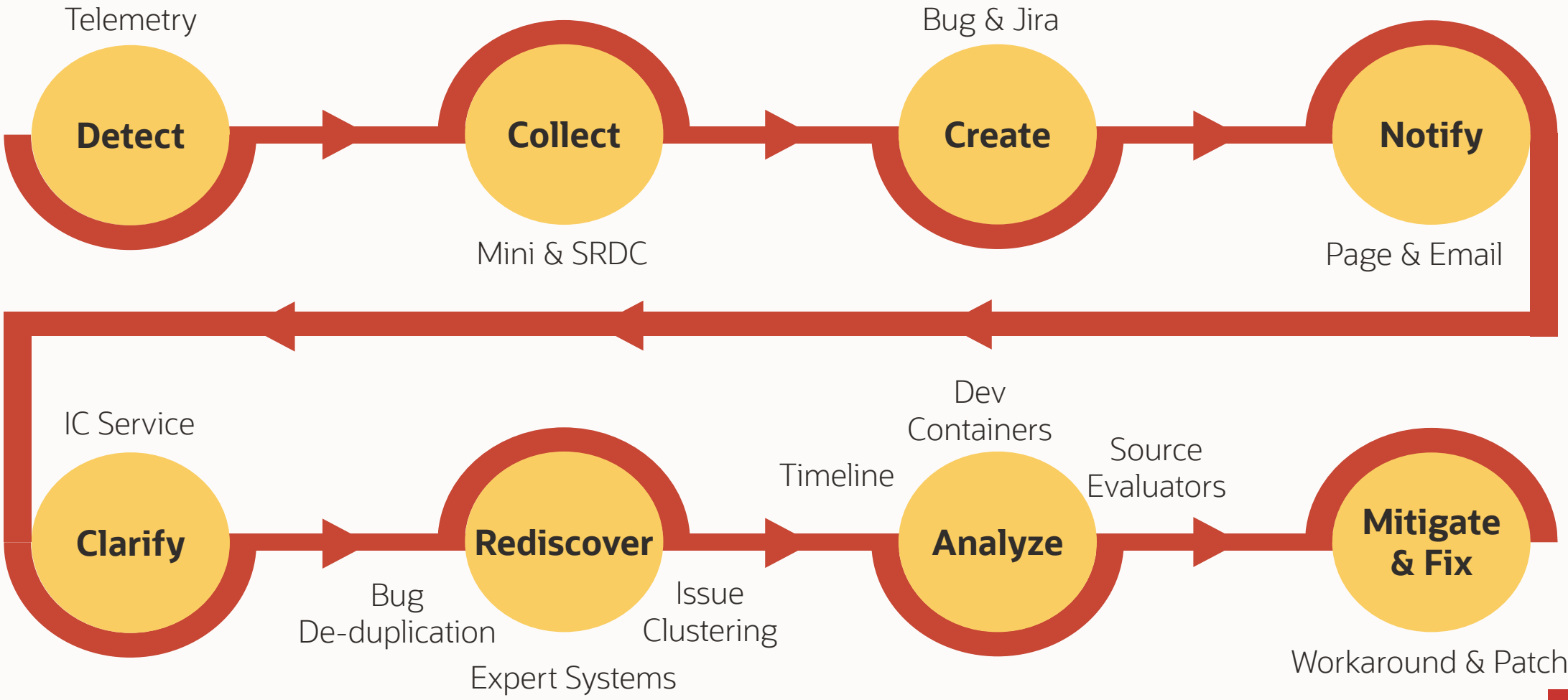
# AHF AIOps Platform

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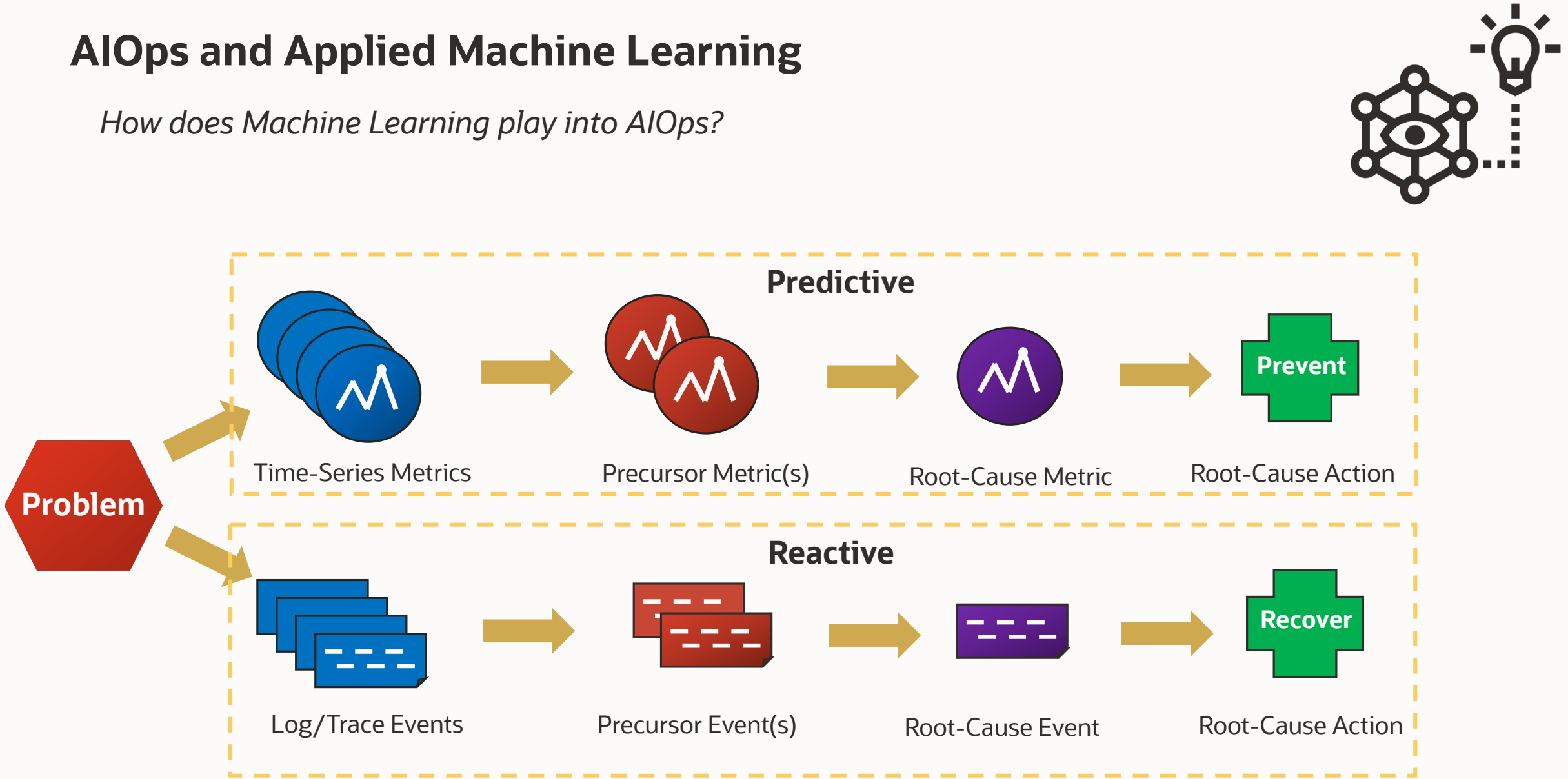
# AIOps and Applied Machine Learning

*How does Machine Learning play into AIOps?*

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# What is AHF

## AHF Compliance Manager

- Compliance management
- Around 4000+ best practices
- Covers Exadata and security
- Constant Cadence of features

## AHF Root Cause Analyzer

- Log scanners for obvious issues
- ML models to root cause
- Eliminate non-defect issues
- Recommend Patches

## AHF AutoUpgrade

- Stack Deployment
- RPM's , automated packaged installers
- Standard home locations

## AHF Data Collectors

- First Failure Capture
- Telemetry capture, streaming
- Diagnostic log collection
- OS and Database metrics
- Collection standardization
- Rudimentary aggregation and analysis

## AHF Service Console

- Front-end for analysis, cause and solution identification
- Unified Timeline
- Anomaly Detection
- Graphing for Time Series Data
- AHF Insights and Fleet Insights

## AHF ABS

- Bug rediscovery
- Autoclose known issues
- ML based models
- Cloud scale deployment

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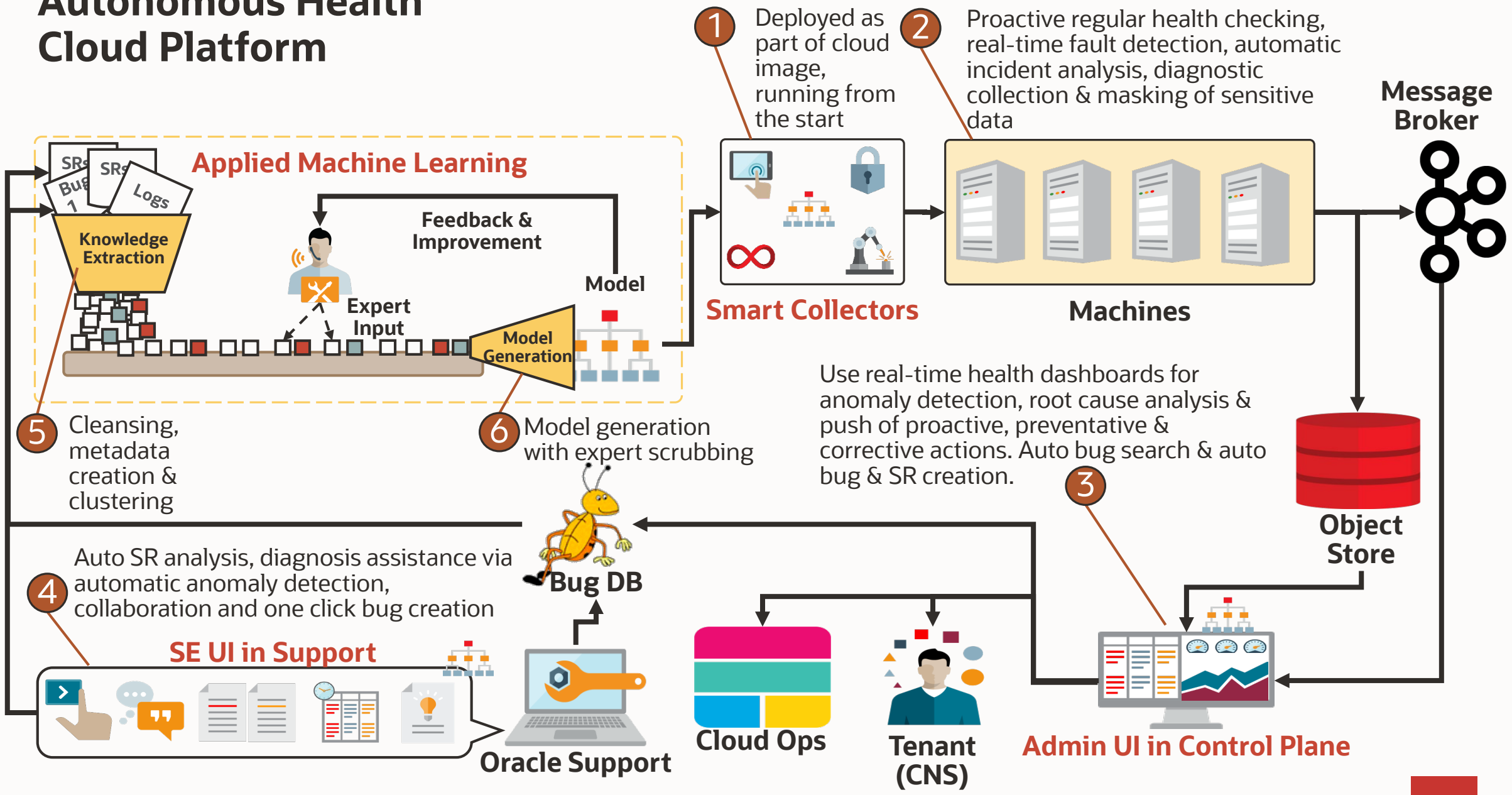
# Autonomous Health Cloud Platform

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# What is AHF

**EXAchk , ORAchk , DBSat , Autoupgrade , CVU , Collection Manager (Apex App)**

The verification and compliance tools which support all the components across the stack

**TFA , CHM , Data Plane Telemetry , OSWatcher**

The different OS and Data Collectors

**CHA , DT , Parsers**

Automation which responds to the customer issues or makes it easier to slice and dice data

**AHF Insights and Fleet Insights**

The frontend which is visible to Customers and Support

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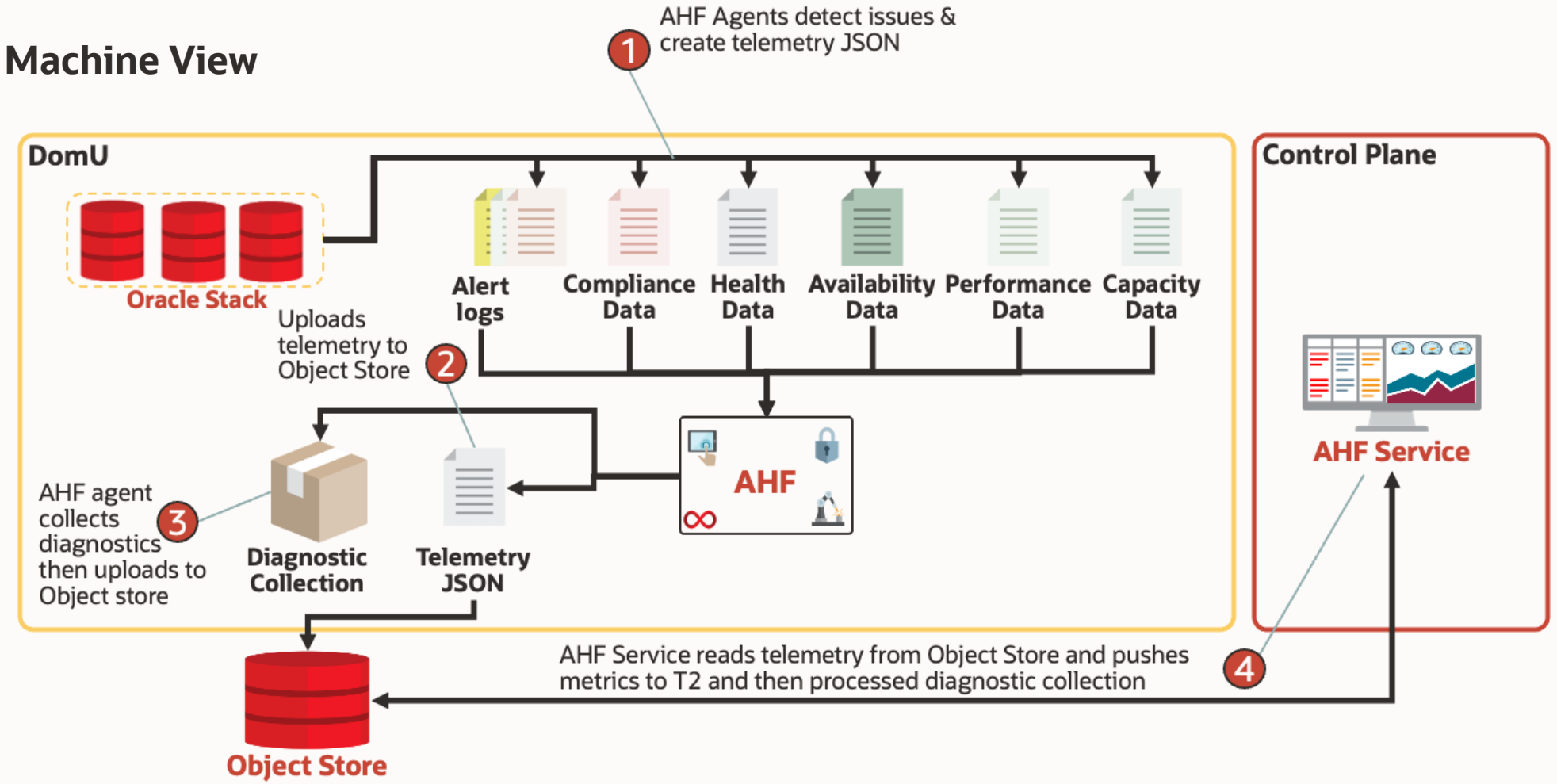
# Oracle's AI Ops Cloud Platform Implementation

*What does our platform look like implemented?*

## Machine View

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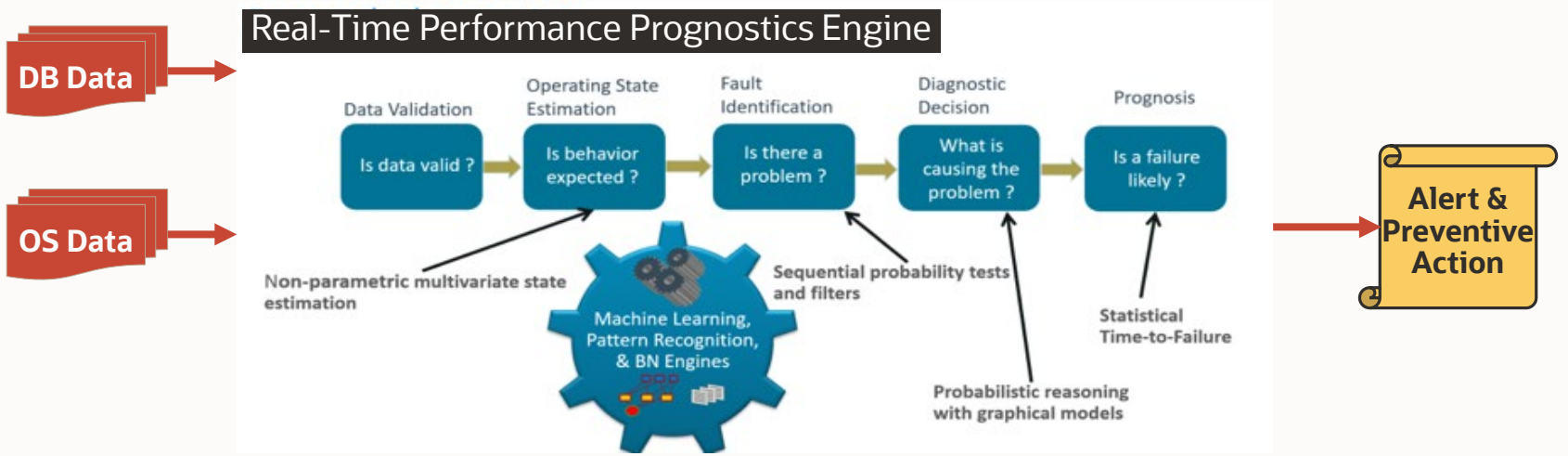
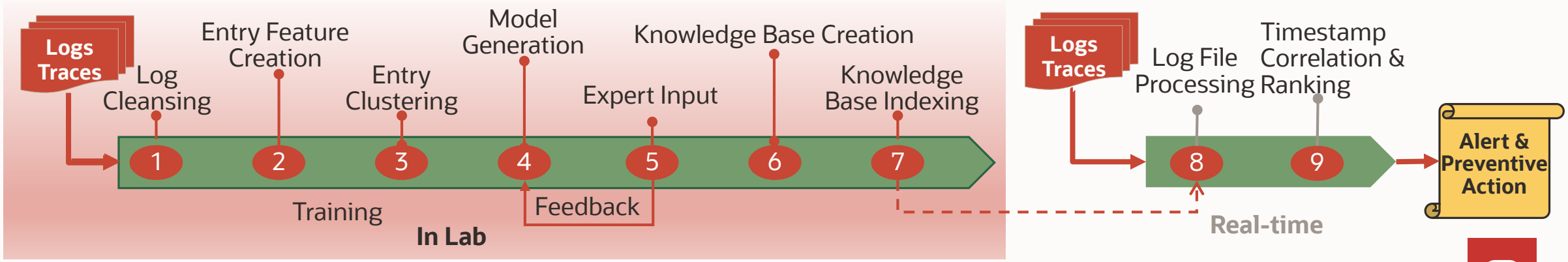
# AIOps Using Applied Machine Learning

*What are some of the Operations areas that use AML?*

## Proactive Prevention




## Rapid Recovery

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# AHF - combined installation of TFA, ORAchk and EXAchk

AHF (containing TFA and ORAchk/EXAchk) is installed via a single platform specific installation available at doc: 2550798.1

- Updated on a quarterly basis
- Included within Database & Grid Infrastructure install
- Included within Release Updates (RUs)

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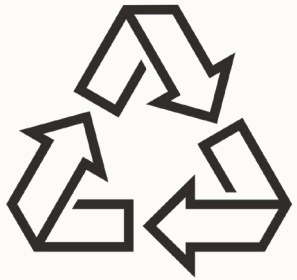
# Automatic notifications

ORAchk / EXAchk results older than two weeks are automatically purged

TFA automatically monitors for significant events, collects, analyses diagnostics then notifies you



Full ORAchk / EXAchk compliance run at 3am once a week

Most impactful compliance checks from ORAchk/EXAchk are run 2am every day

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# Install as root

```
[root@myserver1]# ./ahf_setup

AHF Installation Log : /tmp/ahf_install_26252_2023_08_14-08_27_59.log

Starting Autonomous Health Framework (AHF) Installation
AHF Version: 237000 Build Date: 202307181720
Default AHF Location : /opt/oracle.ahf

Do you want to change AHF Location (/opt/oracle.ahf) ? Y|[N] :
AHF Location : /opt/oracle.ahf

AHF Data Directory stores diagnostic collections and metadata.
AHF Data Directory requires at least 5GB (Recommended 10GB) of free space.

Choose Data Directory from below options :

1. /opt/oracle.ahf [Free Space : 2069 MB]
2. /u01/app [Free Space : 2290 MB]
3. Enter a different Location
Choose Option [1 - 3] : 1 AHF Data Directory : /opt/oracle.ahf/data
```

Installing as root provides the richest capabilities with:

- Automate diagnostic collections
- Collections from remote hosts
- Collecting files that are not readable by the Oracle home owner, for example, /var/log/messages, or certain Oracle Grid Infrastructure logs

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# Install as root

```
Do you want to add AHF Notification

Email IDs ? [Y]|N : y Enter Email IDs separated by space : john.doe@acme.com

Extracting AHF to /opt/oracle.ahf

Configuring TFA Services

Discovering Nodes and Oracle Resources

Not generating certificates as GI discovered

Starting TFA Services
Created symlink from /etc/systemd/system/multi-user.target.wants/oracle-tfa.service to
/etc/systemd/system/oracle-tfa.service.
Created symlink from /etc/systemd/system/graphical.target.wants/oracle-tfa.service to
/etc/systemd/system/oracle-tfa.service.
```

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# Install as root

```
.--------------------------------------------------------------------------------.
| Host              | Status of TFA | PID   | Port | Version    | Build ID             |
+-------------------+---------------+-------+------+------------+----------------------+
| myserver1         | RUNNING       | 27582 | 5000 | 23.7.0.0.0 | 202307181720         |
'-------------------+---------------+-------+------+------------+----------------------'
Running TFA Inventory...
Adding default users to TFA Access list...

.-----------------------------------------------------.
|                Summary of AHF Configuration         |
+-----------------+-----------------------------------+
| Parameter       | Value                             |
+-----------------+-----------------------------------+
| AHF Location    | /opt/oracle.ahf                   |
| TFA Location    | /opt/oracle.ahf/tfa               |
| Orachk Location | /opt/oracle.ahf/orachk            |
| Data Directory  | /opt/oracle.ahf/data              |
| Repository      | /opt/oracle.ahf/data/repository   |
| Diag Directory  | /opt/oracle.ahf/data/myserver1/diag |
'-----------------+-----------------------------------'
```

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# Install as root

```
AHF install completed on myserver1
AHF will also be installed/upgraded on these Cluster Nodes :
1. myserver2

The AHF Location and AHF Data Directory must exist on the above nodes
AHF Location : /opt/oracle.ahf
AHF Data Directory : /opt/oracle.ahf/data

Do you want to install/upgrade AHF on Cluster Nodes ? [Y]|N : y

Installing AHF on Remote Nodes :
AHF will be installed on myserver2, Please wait.
Installing AHF on myserver2 :
[myserver2] Copying AHF Installer
[myserver2] Running AHF Installer
AHF binaries are available in /opt/oracle.ahf/bin
AHF is successfully installed

Moving /tmp/ahf_install_26252_2023_08_14-08_27_59.log to
/opt/oracle.ahf/data/myserver1/diag/ahf/
```

orachk / exachk
tfactl
etc

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# TFA Daemon

```
[root@myserver1]#  systemctl status oracle-tfa.service

oracle-tfa.service - Oracle Trace File Analyzer
   Loaded: loaded (/etc/systemd/system/oracle-tfa.service; enabled; vendor preset: disabled)
   Active: active (running) since Mon 2023-08-14 14:40:00 EDT; 10m ago
 Main PID: 26316 (init.tfa)
   CGroup: /system.slice/oracle-tfa.service
           ├─25710 /bin/sleep 30
           ├─26316 /bin/sh /etc/init.d/init.tfa run >/dev/null 2>&1 </dev/null
           └─26509 /opt/oracle.ahf/tfa/myserver1/tfa_home/jre/bin/java -server -Xms64m -Xmx128m
-Djava.awt.headless=true -Ddisable.checkForUpdate=true oracle.rat.tfa.TFAMain
/opt/oracle.ahf/tfa/myserver1/tfa_home
```

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# ORAchk Daemon

```
[root@myserver1]# orachk -autostart
Started orachk discovery caching....

List of running databases

1. cdb1
2. None of above

Select databases from list for checking best practices. For multiple databases, select 1 for
All or comma separated number like 1,2 etc [1-2][1].
.   .
.   .

Checking Status of Oracle Software Stack - Clusterware, ASM, RDBMS

.   .   .  .  .  .   .   .  .  .
.   .   .   .   .   .   .   .   .   .   .
```

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# ORAchk Daemon

```
--------------------------------------------------------------------------------------------
                                        Oracle Stack Status
--------------------------------------------------------------------------------------------
  Host Name       CRS Installed       ASM HOME  RDBMS Installed    CRS UP    ASM UP  RDBMS UP    DB
Instance Name
--------------------------------------------------------------------------------------------
  localhost                  No           No          Yes           No       No      Yes          cdb1
--------------------------------------------------------------------------------------------

Copying plug-ins

. .
.  .  .  .  .  .  .  .
```

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# ORAchk Daemon

```
Collections and audit checks log file is
/opt/oracle.ahf/data/localhost/orachk/orachk_081423_144400_discovery/log/orachk.log

Successfully completed orachk discovery caching.

Setting up orachk auto restart functionality

oracle-orachkscheduler start/running, process 21042

Starting orachk daemon. . . . . .

orachk daemon started successfully

Daemon log file location is : /opt/oracle.ahf/data/localhost/orachk/orachk_daemon.log
```

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# ORAchk Daemon

```
[root@myserver1]#  systemctl status oracle-orachkscheduler.service

oracle-orachkscheduler.service - Oracle orachk scheduler initsetup
   Loaded: loaded (/etc/systemd/system/oracle-orachkscheduler.service; enabled; vendor preset: disabled)
   Active: active (running) since Thu 2023-08-14 14:44:00 EDT; 10m ago
 Main PID: 21042 (init.orachksche)
   CGroup: /system.slice/oracle-orachkscheduler.service
           ├─21042 /bin/sh /etc/init.d/init.orachkscheduler run >/dev/null 2>&1 </dev/null
           └─20324 /bin/sleep 30
```

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# Install as non-root

If it is not possible to install as root, then you can install as non-root user

Will not include

- Automate diagnostic collections
- Collections from remote hosts
- Collecting files that are not readable by the Oracle home owner, for example, /var/log/messages, or certain Oracle Grid Infrastructure logs

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# Install as non-root

```
[oracle@myserver1]$ mkdir -p $ORACLE_HOME/ahf
[oracle@myserver1]$ ./ahf_setup -ahf_loc $ORACLE_HOME/ahf

AHF Installation Log : /tmp/ahf_install_512_2023_08_14-09_22_14.log

Starting Autonomous Health Framework (AHF) Installation

AHF Version: 237000 Build Date: 202307181720

AHF Location : /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf

AHF Data Directory stores diagnostic collections and metadata.
AHF Data Directory requires at least 5GB (Recommended 10GB) of free space.

Choose Data Directory from below options :

1. /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf [Free Space : 76493 MB]
2. Enter a different Location

Choose Option [1 - 2] : 1
```

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# Install as non-root

```
AHF Data Directory : /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/data
Do you want to add AHF Notification Email IDs ? [Y]|N : john.doe@acme.com
Extracting AHF to /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf

Configuring TFA in Standalone Mode...
Build Version : 237000  Build Date : 202307181720
Discovering Nodes and Oracle Resources

.-------------------------------------------------------------------------------------------.
|                                    Summary of TFA Configuration                           |
+----------------+--------------------------------------------------------------------------+
| Parameter      | Value                                                                    |
+----------------+--------------------------------------------------------------------------+
| TFA Location   | /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/tfa               |
| Data Directory | /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/data/myserver1/tfa|
| Repository     | /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/data/repository   |
| Diag Directory | /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/data/myserver1/diag/tfa|
| Java Home      | /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/jre               |
'----------------+--------------------------------------------------------------------------'
```

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# Install as non-root

```
.----------------------------------------------------------------------------------------------.
| Host             | Status of TFA | PID | Port    | Version    | Build ID             | Inventory Status |
+------------------+---------------+-----+---------+------------+----------------------+------------------+
| myserver1        | RUNNING       | -   | OFFLINE | 23.7.0.0.0 | 202307181720         | COMPLETED        |
'------------------+---------------+-----+---------+------------+----------------------+------------------'

AHF is deployed at /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf

AHF binaries are available in /u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/bin

AHF is successfully installed

Moving /tmp/aahf_install_26252_2023_08_14-08_27_59.log to
/u01/app/oracle/product/19.0.0/dbhome_1/ahf/oracle.ahf/data/myserver1/diag/ahf/
```

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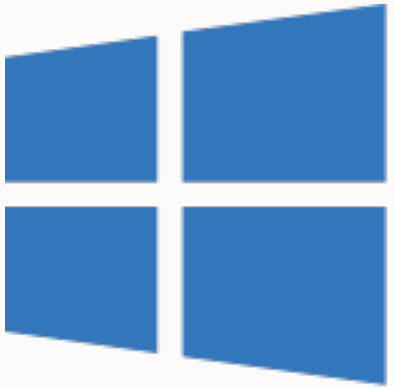
# Install on Microsoft Windows

To install, download and unzip the Windows installer then run the following command:

```
installahf.bat -perlhome {PERL_HOME} -ahf_loc {AHF_INSTALL_LOCATION}
```

e.g.

```
installahf.bat -perlhome D:\oracle\product\12.2.0\dbhome_1\perl -ahf_loc
D:\oracle\product\AHF
```



If installing with Oracle Grid Infrastructure use:

```
installahf.bat -crshome <crshome path>
```

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# Analyze logs and look for errors

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# Investigate logs and look for errors

```
tfactl analyze -since 1d
INFO: analyzing all (Alert and Unix System Logs) logs for the last 1440 minutes...
...
Unique error messages for last ~1 day(s)
   Occurrences percent  server name          error
   ----------- -------  -------------------- -----
             1  100.0%  myserver1     Errors in file
/u01/oracle/diag/rdbms/orcl2/orcl2/trace/orcl2_ora_12272.trc  (incident=10151):
ORA-00600: internal error code, arguments: [600], [], [], [], [], [], [], [], [], [], []
Incident details in:
/u01/oracle/diag/rdbms/orcl2/orcl2/incident/incdir_10151/orcl2_ora_12272_i10151.trc
...
```

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# Investigate logs and look for errors

```
tfactl analyze -search "ORA-04031" -last 1d
INFO: analyzing all (Alert and Unix System Logs) logs for the last 1440 minutes...
...
        Matching regex: ORA-04031
        Case sensitive: false
           Match count: 1
[Source: /u01/oracle/diag/rdbms/orcl2/orcl2/trace/alert_orcl2.log, Line: 1941]
Sep 15 12:09:05 2019
Errors in file /u01/oracle/diag/rdbms/orcl2/orcl2/trace/orcl2_ora_6982.trc  (incident=7665):
ORA-04031: unable to allocate  bytes of shared memory ("","","","")
Incident details in:
/u01/app/oracle/diag/rdbms/orcl2/orcl2/incident/incdir_7665/orcl2_ora_6982_i7665.trc
...
```

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# Examples

```
#Show summary of events from alert logs, system messages in last 5 hours
tfactl analyze -since 5h

#Show summary of events from system messages in last 1 day
tfactl analyze -comp os -since 1d

#Search string ORA- in alert and system logs in past 2 days
tfactl analyze -search "ORA-" -since 2d

#Search case sensitive string "Starting" in past 2 days
tfactl analyze -search "/Starting/c" -since 2d
```

```
#Show all system log messages at time Feb/24/2019 11
tfactl analyze -comp os -for "Feb/24/2019 11" -search "."

#Show OSWatcher Top summary in last 6 hours
tfactl analyze -comp osw -since 6h

#Show OSWatcher slabinfo summary for specified time period
tfactl analyze -comp oswslabinfo -from "Feb/26/2019 05:00:01" -to "Feb/26/2019 06:00:01"

#Analyze all generic messages in last one hour
tfactl analyze -since 1h -type generic
```

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# Investigate logs and look for errors

```
tfactl analyze -type generic -since 7d
INFO: analyzing all (Alert and Unix System Logs) logs for the last 10080 minutes...
...
                Total message count: 54,807, from 28-Jul-2023 04:26:28 PM PST to 03-Mar-2019 02:41:34
    Messages matching last ~7 day(s): 3,139, from 24-Jun-2023 02:46:23 PM PST to 03-Mar-2019 02:41:34
        last ~7 day(s) generic count: 3,139, from 24-Jun-2023 02:46:23 PM PST to 03-Mar-2019 02:41:34
last ~7 day(s) unique generic count:  94
Message types for last ~7 day(s)
   Occurrences percent  server name          type
   ----------- -------  -------------------- -----
         3,139  100.0%  myhost1              generic
...
```

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# Investigate logs and look for errors

```
...
Unique generic messages for last ~7 day(s)
   Occurrences percent  server name          generic
   ----------- -------  -------------------- -----
         1,504   47.9%  myhost1             : [crflogd(13931)]CRS-9520:The storage of Grid Infrastructure Managem...
           487   15.5%  myhost1             : [crflogd(13931)]CRS-9520:The storage of Grid Infrastructure Managem...
           336   10.7%  myhost1             myhost1 smartd[13812]: Device: /dev/sdv, SMART Failure: FAILURE...
           336   10.7%  myhost1             myhost1 smartd[13812]: Device: /dev/sdag, SMART Failure: FAILURE ...
           103    3.3%  myhost1             myhost1 last message repeated 9 times
           103    3.3%  myhost1             myhost1 kernel: oracle: sending ioctl 2285 to a partition!
...
```

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# Pattern match search output

```
tfactl analyze -search "ORA-" -since 7d
...
[Source: /u01/app/oracle/diag/rdbms/ratoda/RATODA1/trace/alert_RATODA1.log, Line: 9494]
Feb 25 22:00:02 2014
Errors in file /u01/app/oracle/diag/rdbms/ratoda/RATODA1/trace/RATODA1_j003_10948.trc:
ORA-12012: error on auto execute of job "ORACLE_OCM"."MGMT_CONFIG_JOB_2_1"
ORA-29280: invalid directory path
ORA-06512: at "ORACLE_OCM.MGMT_DB_LL_METRICS", line 2436
ORA-06512: at line 1
End automatic SQL Tuning Advisor run for special tuning task  "SYS_AUTO_SQL_TUNING_TASK”
...
```

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# OS Watcher top data

```
tfactl analyze -comp osw -since 6h
...

            statistic: t first highest   (time) lowest   (time) average non zero 3rd last 2nd last last trend
     top.cpu.util.id: %  98.0    99.7 @10:35AM   72.8 @03:11PM    97.3    2,059     95.2     96.8 96.0   -2%
     top.cpu.util.st: %   0.1     0.1 @09:14AM    0.0 @09:14AM     0.0      889      0.0      0.0  0.0 -100%
     top.cpu.util.us: %   0.1     8.8 @11:31AM    0.0 @09:14AM     0.6    1,966      4.3      0.8  3.4 3300%
     top.cpu.util.wa: %   1.7    18.7 @03:11PM    0.1 @10:35AM     1.1    2,059      0.3      0.4  0.4  -76%
top.loadavg.last01min:    1.17    3.12 @09:44AM   0.07 @12:45PM    0.93    1,823     0.31     0.26 0.22  -81%
top.loadavg.last05min:    0.94    2.26 @09:44AM   0.27 @12:45PM    0.93    1,823     0.82     0.79 0.77  -18%
top.loadavg.last15min:    0.79    1.60 @09:46AM   0.44 @01:18PM    0.92    1,823     0.96     0.95 0.94   18%
     top.mem.buffers: k  808232   808388 @09:41AM 785608 @02:57PM  796511 2,093  785744  785744  785744  -2%
        top.mem.free: k 1130332  1291344 @10:02AM 927576 @09:43AM 1188576 2,093 1244020 1265248 1265188  11%
       top.swap.used: k   47556    48088 @03:00PM  47556 @09:14AM   47828 2,097   48088   48088   48088   1%
   top.tasks.running:         1        4 @12:04PM      1 @09:14AM       1 1,996       1       2       2 100%
     top.tasks.total:       514      527 @02:57PM    509 @09:18AM     514 1,996     518     521     520   1%
    top.tasks.zombie:         0        5 @11:04AM      0 @09:14AM       0    62       0       0       0  n/a
          top.users:         5        6 @03:00PM      5 @09:14AM       5 1,823       6       6       6  20%
...
```

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# OS Watcher slabinfo data

```
tfactl analyze -comp oswslabinfo -from "Feb/26/2019 05:00:01" -to "Feb/26/2019 06:00:01"
...

 statistic: t first highest   (time) lowest   (time) average non zero 3rd last 2nd last last trend
     slabinfo.acfs_ccb_cache.active_objs:       4      38 @05:52AM      0 @05:01AM      10      294        3        1    8  100%
    slabinfo.inet_peer_cache.active_objs:      23      39 @05:59AM     23 @05:00AM      23      351       23       23   39   69%
          slabinfo.sigqueue.active_objs:     385     768 @05:28AM    285 @05:27AM     554      351      712      621  577   49%
slabinfo.skbuff_fclone_cache.active_objs:      55     133 @05:51AM     11 @05:20AM      69      351       56       77   70   27%
        slabinfo.names_cache.active_objs:     126     180 @05:00AM    110 @05:23AM     146      351      171      166  156   23%
          slabinfo.sgpool-8.active_objs:     135     228 @05:31AM     59 @05:11AM     152      351      180      165  157   16%
               slabinfo.UDP.active_objs:     568     675 @05:28AM    492 @05:17AM     597      351      630      596  626    10%
         slabinfo.size-8192.active_objs:     174     209 @05:36AM    160 @05:14AM     181      351      205      187  188     8%
    slabinfo.task_delay_info.active_objs:    1477    1856 @05:28AM   1334 @05:57AM    1574      351     1529     1411 1579     6%
              slabinfo.pid.active_objs:    1608    1980 @05:29AM   1452 @05:21AM    1678      351     1564     1487 1689     5%
    slabinfo.blkdev_requests.active_objs:     720     880 @05:04AM    651 @05:54AM     745      351      707      736  761     5%
          slabinfo.size-256.active_objs:    1116    1305 @05:06AM    846 @05:11AM    1091      351     1245     1143 1166     4%
       slabinfo.ip_dst_cache.active_objs:    1497    1800 @05:28AM   1279 @05:36AM    1517      351     1594     1466 1560     4%
   slabinfo.sock_inode_cache.active_objs:    2168    2329 @05:11AM   2106 @05:56AM    2225      351     2322     2278 2232     2%
          slabinfo.size-512.active_objs:    3036    3152 @05:38AM   3007 @05:01AM    3088      351     3136     3112 3075     1%
...
```

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# Keep track of the attributes of important files pre-post patching

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# Track attribute changes on important files

Start tracking using **–fileattr** start

Automatically discovers Grid Infrastructure and Database directories and files

- Prevent discovery using **–excludediscovery**

Further configure the list of monitored directories using **–includedir**

```
tfactl <orachk|exachk> -fileattr start -includedir "/root/myapp/config"
...
 List of directories(recursive) for checking file attributes:
        /u01/app/oradb/product/11.2.0/dbhome_11203
        /u01/app/oradb/product/11.2.0/dbhome_11204
        /root/myapp/config

orachk has taken snapshot of file attributes for above directories at:
/orahome/oradb/orachk/orachk_mysrv21_20170504_041214
```

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# Track attribute changes on important files

Compare current attributes against first snapshot using **–fileattr** check

When checking, use the same include/exclude arguments you started with

```
tfactl <orachk|exachk> -fileattr check -includedir "/root/myapp/config”
...
List of directories(recursive) for checking file attributes:
       /u01/app/oradb/product/11.2.0/dbhome_11203
       /u01/app/oradb/product/11.2.0/dbhome_11204
       /root/myapp/config
Checking file attribute changes...
       "/root/myapp/config/myappconfig.xml" is different:
Baseline :       0644     oracle       root
       /root/myapp/config/myappconfig.xml
Current  :       0644       root       root
       /root/myapp/config/myappconfig.xml
...
```

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# Track attribute changes on important files

Automatically proceeds to run compliance checks after file attribute checks

- Only run attribute checks by using **-fileattronly**

File Attribute Changes are shown in HTML report output

## File Attribute Changes

```
Baseline Snapshot:  /root/orachk/orachk_myserver18_2023_0814_033707/Snapshot_2023-08-14_03-37-07.txt

"/root/myapp/config/myappconfig.xml" is different:
Baseeline       :       0644    oracle  root    /root/myapp/config/myappconfig.xml
Current         :       0644      root  root    /root/myapp/config/myappconfig.xml
```

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# Event notification

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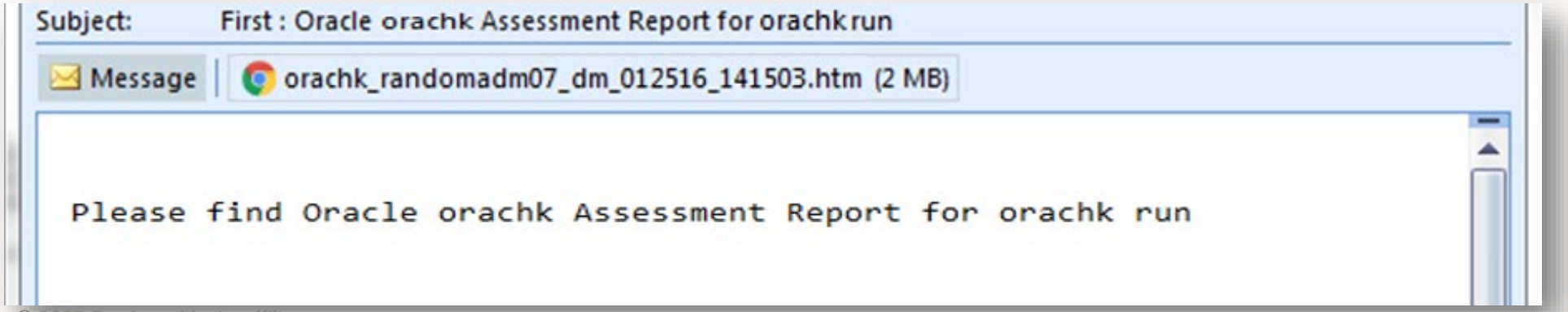
# ORAchk | EXAchk email notification

Automatically running

- Critical checks once a day at 2am
- Full checks once a week at 3am Sunday
- You only need to configure your email for notification – if not already done during install

```
tfactl <orachk|exachk> -set “NOTIFICATION_EMAIL=SOME.BODY@COMPANY.COM
```

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- ☐ Show Critical checks only
- ☐ Show Failed checks only
- Show checks with the following status:
  ☑ Critical ☐ Fail ☐ Warning ☐ Info ☐ Pass ☐ All
- Show details of the following regions:
  ☑ Maximum Availability Architecture (MAA) Scorecard
  ☑ Autonomous Health Certification
  ☑ Component Elapsed Times
  ☑ Top 10 Time Consuming Checks
- Show details of the checks:
  ○ Expand All ◉ Collapse All
- ☐ Show Check Ids
- ☐ Remove finding from report
- ☐ Printable View

---

## Database Server

| Status | Type | Message | Status On | Details |
|---|---|---|---|---|
| CRITICAL | OS Check | Temporary location is not configured for auto cleanup | All Database Servers | View |
| CRITICAL | Database Check | The RMAN snapshot control file location is not shared on all database nodes in the cluster | All Databases | View |
| CRITICAL | ASM Check | The clusterware state should be "Normal" | All ASM Instances | View |

---

Top

## Maximum Availability Architecture (MAA) Scorecard

| Outage Type | Status | Type | Message | Status On | Details |
|---|---|---|---|---|---|

---

Top

## Autonomous Health Certification

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| Status | Type | Message | Status On | Details |
|---|---|---|---|---|

# Critical event notification

TFA can send email notification when faults are detected – only required if not set during install

- Notification for all problems:

```
tfactl set notificationAddress=some.body@example.com
```

- Notification for all problems on database owned by oracle user:

```
tfactl set notificationAddress=oracle:another.person@example.com
```

- Optionally configure an SMTP server:

```
tfactl set smtp
```

- Confirm email notification work:

```
tfactl sendmail <email_address>
```

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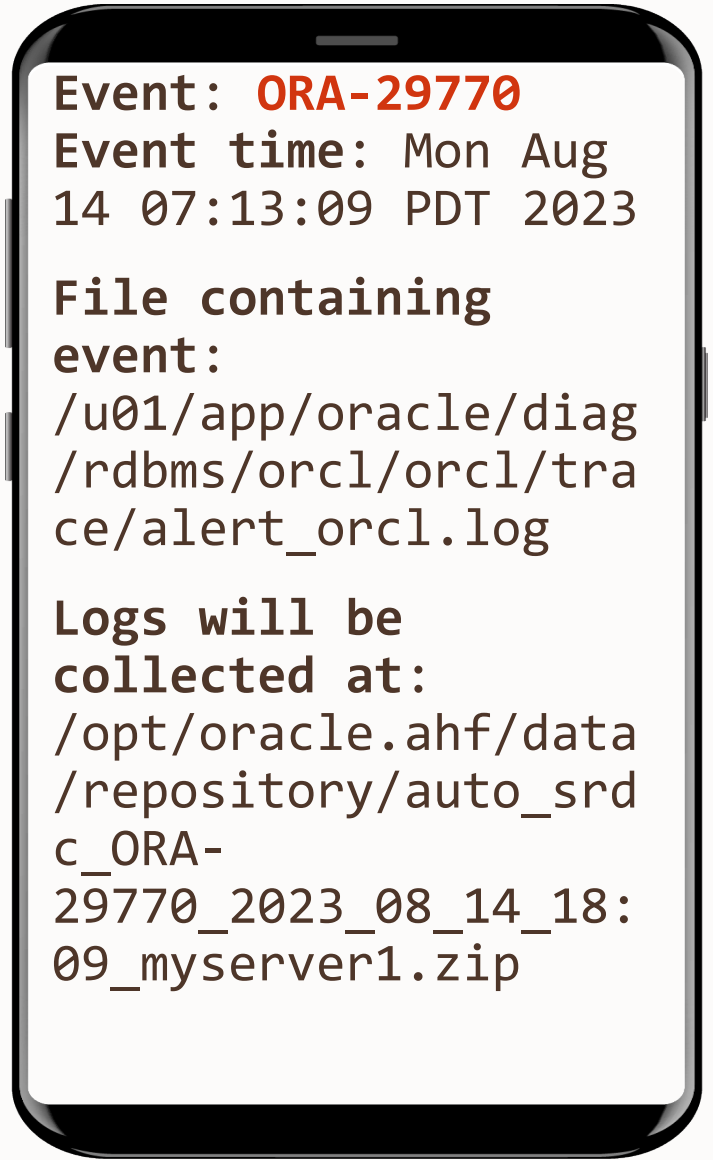
# Critical event notification

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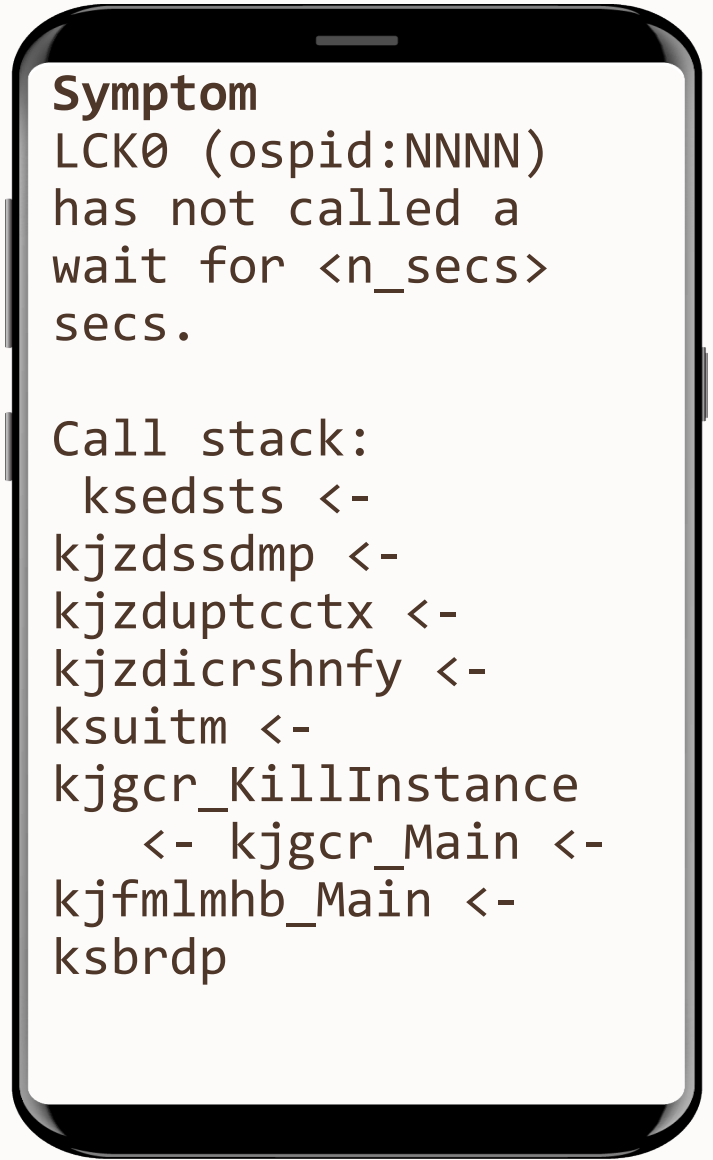
# Critical event notification

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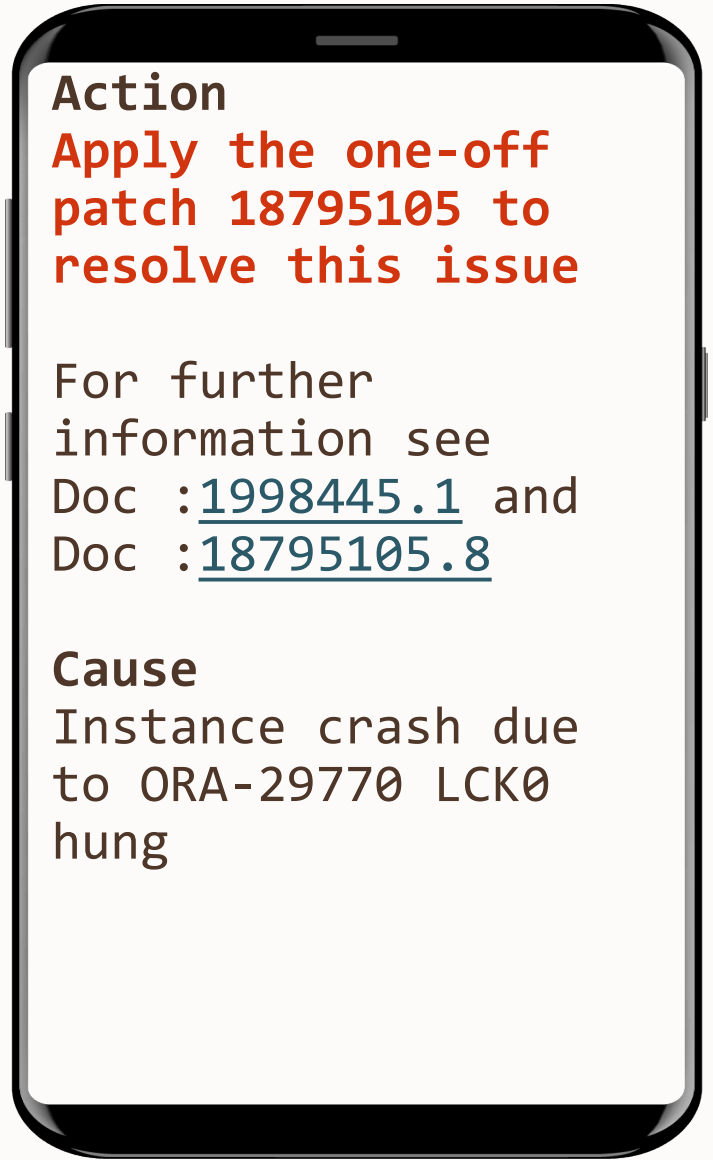
# Critical event notification

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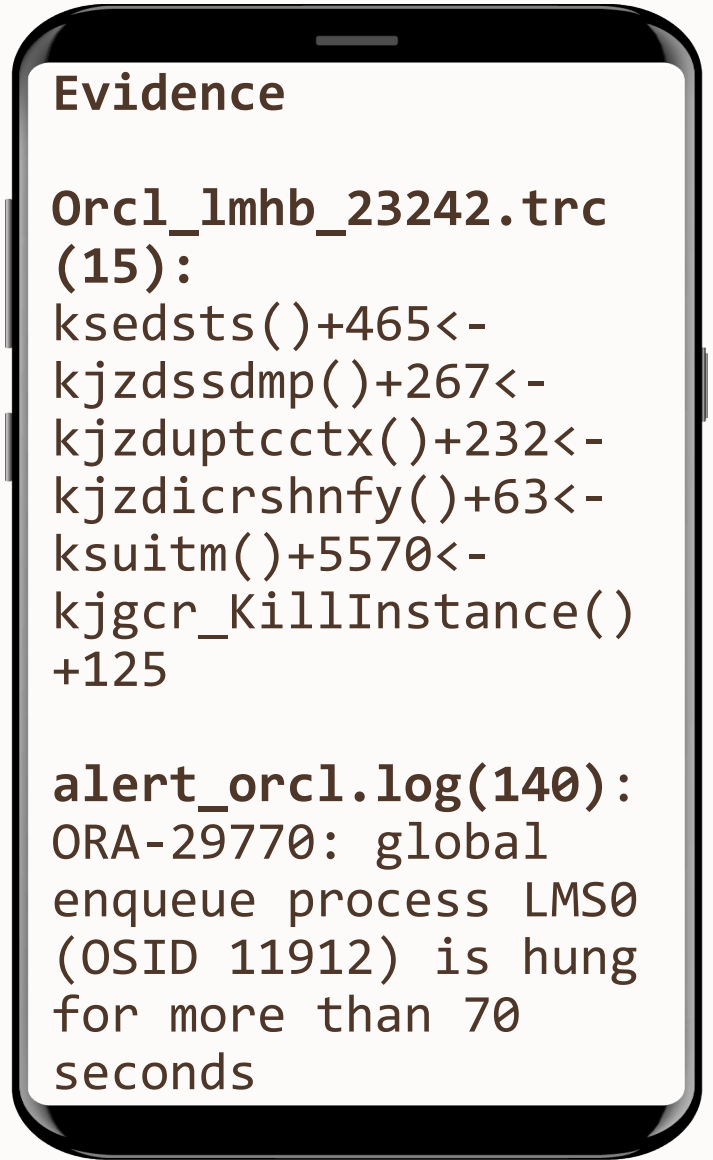
# Critical event notification

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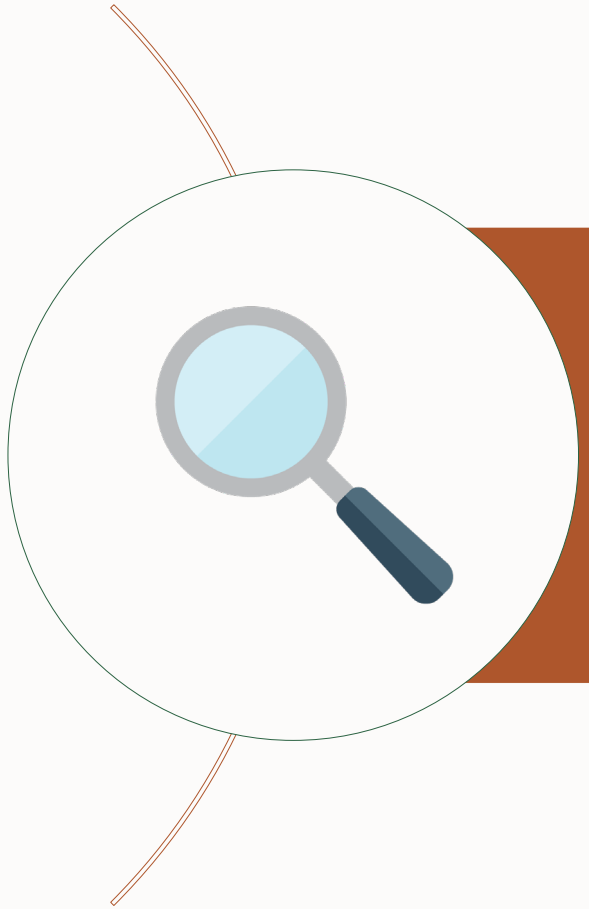

# Analyse in MOS using TFA uploads

## ORA-00600-Troubleshooting Tool

Describe Problem — Upload Files — Review Recommendations

Back | Step 1 of 3 | Next | Cancel

### What is the Problem?

What would you like to do ?

- (•) Troubleshoot a new issue
- ( ) Review a troubleshooting report

### Tip

This tool will provide recommendations to resolve ORA-600 issues based on details found in the uploaded IPS or Trace/Incident files. Click Document 1521912.1 to see why you should use this tool!

To fully benefit from this tool all requested files should be uploaded to this tool. For details regarding the requested files and how to obtain them, see Document 1521912.1 (ORA-600 Troubleshooting Tool).

If you don't have a trace file please use the Document 153788.1 (ORA-600 / ORA-7445 Error Look-up Tool).

Press the NEXT button to continue.

Guided Resolution is always available from

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## ORA-00600-Troubleshooting Tool

Describe Problem — **Upload Files** — Review Recommendations

Back | Step 2 of 3 | Next | Cancel

### Upload Files

Choose the radio button for one of the below sets of requested files to use for troubleshooting
-Diagnostic files will be analyzed and a personalized solution will be provided if exists
-SR fields will be automatically populated if you choose to create an SR

Click the UPLOAD button after choosing files from your local file system to use for troubleshooting.

Refer to Document 1521912.1 to see why you should use this tool.

**Note:** Do not submit any personal information of European residents, protected health information subject to HIPAA, or any other sensitive personal information (such as payment card data) that requires protections greater than those specified in the Oracle GCS Security Practices.

| | | |
|---|---|---|
| Select File Group | (•) | * TFA package (Recommended approach.) Choose File myserver69....C_2018.zip |
| Select File Group | ( ) | * IPS Package Choose File No file chosen |
| Select File Group | ( ) | * tracefile Choose File No file chosen<br>Alertlog(Optional) Choose File No file chosen |

### Tip

To obtain the most accurate diagnosis, upload the requested files.

Ensure you are uploading the correct files from the instance in which you are having issues. File upload combinations are:

- TFA is the recommended approach and will gather all relevant diagnostics for the problem using one command **"tfactl diagcollect -srdc ora600"**. For more information refer to TFA Document Document 2165632.1
- Incident Packaging Service (IPS) package or any archive file containing trace files with the error
- Alert log AND Incident dump file (Release 11g or higher)/Trace file (Prior to Release 11g)

For details regarding the requested files and how to obtain them, see Document 1521912.1 (ORA-600 Troubleshooting Tool).

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# One command SRDC

**tfactl diagcollect –srdc <srdc_type>**

- Scans system to identify recent events
- Once the relevant event is chosen, proceeds with diagnostic collection

```
tfactl diagcollect -srdc ORA-00600
Enter the time of the ORA-00600 [YYYY-MM-DD HH24:MI:SS,<RETURN>=ALL] :
Enter the Database Name [<RETURN>=ALL] :

1. Aug147/2023 05:29:58 : [orcl2] ORA-00600: internal error code, arguments:
[600], [], [], [], [], [], [], [], [], [], [], []
2. Aug/12/2023 06:55:08 : [orcl2] ORA-00600: internal error code, arguments:
[600], [], [], [], [], [], [], [], [], [], [], []

Please choose the event : 1-2 [1]
Selected value is : 1 ( Aug/14/2023 05:29:58 )
```

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# One command SRDC

All required files are identified

- Trimmed where applicable
- Package in a zip ready to provide to support

```
...
2023/08/14 06:14:24 EST : Getting List of Files to Collect
2023/08/14 06:14:27 EST : Trimming file :
myserver1/rdbms/orcl2/orcl2/trace/orcl2_lmhb_3542.trc with original file size :
163MB
...
2023/08/14 06:14:58 EST : Total time taken : 39s
2023/08/14 06:14:58 EST : Completed collection of zip files.
...
/opt/oracle.ahf/data/repository/srdc_ora600_collection_Mon_Aug_14_06_14_17_EST_202
3_node_local/myserver1.tfa_srdc_ora600_Mon_Aug_14_06_14_17_EST_2023.zip
```

## ORA-00600-Troubleshooting Tool

Describe Problem — Upload Files — **Review Recommendations**

Back | Step 3 of 3 | Finish | Restart

### Troubleshoot a new issue: ORA-00600

Enter a report name and click 'Save' [ ] Save

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### ORA-600 [ktfbtgex-7] "Bitmap Managed Extent goes past end of file" (Doc ID 178643.1)

To Bottom

Modified: 04-Aug-2018 Type: REFERENCE

Note: For additional ORA-600 related information please read Document:1092832.1

This article represents a partially published OERI note.

It has been published because the ORA-600 error has been reported
in at least one documented bug and/or confirmed Support Related Article.

Therefore, the SUGGESTIONS section of this article may help
in terms of identifying the cause of the error.

### Tip

Based on the data available, it was not possible to identify a known bug or solution. A knowledge document containing details for the error is provided when available. In most cases the knowledge document will contain a list of known bugs which have been resolved for the error.

For further assistance click on the 'Create SR' button below to log an SR with Oracle Support.

Help us improve this tool by providing feedback using the feedback form on this page.

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# Sanitize sensitive information

# Sanitize or mask sensitive information

Sensitive information can be hidden from diagnostics

Machine learning algorithms determine sensitive data like:

- Host names
- IP addresses
- MAC addresses
- Oracle Database names
- Tablespace names
- Service names
- Ports
- Operating system user names

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# Sanitize or mask sensitive information

Add **–sanitize** or **–mask** to any command

–sanitize replaces a sensitive value with random characters

myhost123 >>>> JnsF3km9

–mask replaces a sensitive value with a series of ‘X’

myhost123 >>>> XXXXXXXX

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| | | | | | |
|---|---|---|---|---|---|
| 8300E0A2FFE48253E053D298EB0A76CC | FAIL | OS Check | The stix-fonts package is installed | All Database Servers | Hide |

**Verify stix-fonts RPM**

Check ID

| | |
|---|---|
| Recommendation | **Benefit / Impact:**<br>ridSetup.sh/runInstaller.sh Fails to Launch No Error Messages.<br><br>On Linux 7, when the Stix Font package is installed, it is set as the default font package for the OS.<br>This exposes Java <Bug 28522678> resulting in the java.lang.ArrayIndexOutOfBoundsException when initializing the fonts.<br>This subsequently causes gridSetup.sh and runInstaller.sh to fail to launch with no error messages or warnings displayed on the screen.<br><br>**Risk:**<br>Inability to install or upgrade<br><br>**Action / Repair:**<br>Workaround #1 - Remove the stix-fonts package:<br><br># rpm -e stix-fonts<br>Or you can run ORAchk -repair all -preupgrade -check 8300E0A2FFE48253E053D298EB0A76CC -dbnone -showpass to repair this check on all nodes in cluster<br><br>Workaround #2 - Modify the Default Font Package as follows:<br><br>Note: This workaround is applicable to those who have requirements on installation of the stix-fonts package<br><br>Create a file named /etc/fonts/local.conf with the following contents:<br><br><?xml version='1.0'?><br><!DOCTYPE fontconfig SYSTEM 'fonts.dtd'><br><fontconfig><br><alias><br><family>serif</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>sans-serif</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>monospace</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>dialog</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>dialoginput</family><br><prefer><family>Utopia</family></prefer><br></alias><br></fontconfig><br><br>Once one of the above workarounds are in place, gridSetup.sh will launch without issue. |
| Links | 1. Note: 2497357.1 - Doc ID: 2497357.1 - gridSetup.sh 18.1+: Returns Without Launching, No Errors Are Displayed |
| Needs attention on | qzh024703246tsa1 |
| Passed on | - |

```
tfactl orachk -preupgrade -sanitize
```

Sanitized hostname

| | | | | | |
|---|---|---|---|---|---|
| 8300E0A2FFE48253E053D298EB0A76CC | FAIL | OS Check | The stix-fonts package is installed | All Database Servers | Hide |

**Verify stix-fonts RPM**

| | |
|---|---|
| Recommendation | **Benefit / Impact:**<br>gridSetup.sh/runInstaller.sh Fails to Launch No Error Messages.<br><br>On Linux 7, when the Stix Font package is installed, it is set as the default font package for the OS.<br>This exposes Java <Bug 28522678> resulting in the java.lang.ArrayIndexOutOfBoundsException when initializing the fonts.<br>This subsequently causes gridSetup.sh and runInstaller.sh to fail to launch with no error messages or warnings displayed on the screen.<br><br>**Risk:**<br>Inability to install or upgrade<br><br>**Action / Repair:**<br>Workaround #1 - Remove the stix-fonts package:<br><br># rpm -e stix-fonts<br>Or you can run ORAchk -repair all -preupgrade -check 8300E0A2FFE48253E053D298EB0A76CC -dbnone -showpass to repair this check on all nodes in cluster<br><br>Workaround #2 - Modify the Default Font Package as follows:<br><br>Note: This workaround is applicable to those who have requirements on installation of the stix-fonts package<br><br>Create a file named /etc/fonts/local.conf with the following contents:<br><br><?xml version='1.0'?><br><!DOCTYPE fontconfig SYSTEM 'fonts.dtd'><br><fontconfig><br><alias><br><family>serif</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>sans-serif</family><br><prefer><family>Utopia</family></prefer><br></alias> |

```
tfactl orachk -preupgrade -sanitize
```

| | |
|---|---|
| | <alias><br><family>dialoginput</family><br><prefer><family>Utopia</family></prefer><br></alias><br></fontconfig><br><br>Once one of the above workarounds are in place, gridSetup.sh will launch without issue. |
| Links | 1. Note: 2497357.1 - Doc ID: 2497357.1 - gridSetup.sh 18.1+: Returns Without Launching, No Errors Are Displayed |
| Needs attention on | qzh024703246tsa1 |
| Passed on | - |

Sanitized hostname

# Reverse map the sanitization

```
tfactl orachk -rmap qzh024703246tsa1

TFA using ORAchk : /opt/oracle.ahf/orachk/orachk


_____________________________________________________________________________
|  Entity Type   |   Substituted Entity Name    |     Original Entity Name     |
_____________________________________________________________________________
|    hostname    |       qzh024703246tsa1       |       myserver1              |
_____________________________________________________________________________
```

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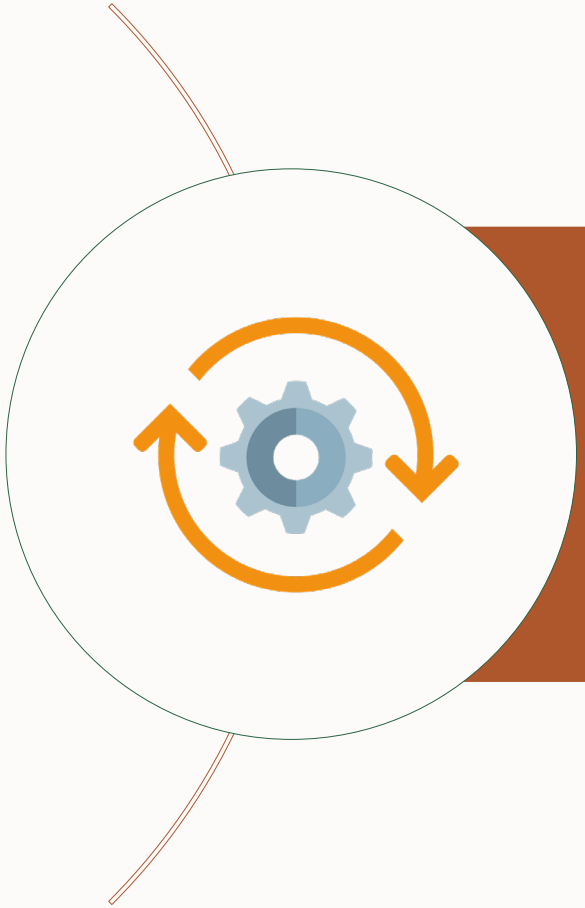

# Repair compliance drift

| | | | | | |
|---|---|---|---|---|---|
| 8300E0A2FFE48253E053D298EB0A76CC | FAIL | OS Check | The stix-fonts package is installed | All Database Servers | Hide |

**Verify stix-fonts RPM**

Check ID

| | |
|---|---|
| Recommendation | **Benefit / Impact:**<br>ridSetup.sh/runInstaller.sh Fails to Launch No Error Messages.<br><br>On Linux 7, when the Stix Font package is installed, it is set as the default font package for the OS.<br>This exposes Java <Bug 28522678> resulting in the java.lang.ArrayIndexOutOfBoundsException when initializing the fonts.<br>This subsequently causes gridSetup.sh and runInstaller.sh to fail to launch with no error messages or warnings displayed on the screen.<br><br>**Risk:**<br>Inability to install or upgrade<br><br>**Action / Repair:**<br>Workaround #1 - Remove the stix-fonts package:<br><br># rpm -e stix-fonts<br>Or you can run ORAchk -repair all -preupgrade -check 8300E0A2FFE48253E053D298EB0A76CC -dbnone -showpass to repair this check on all nodes in cluster<br><br>Workaround #2 - Modify the Default Font Package as follows:<br><br>Note: This workaround is applicable to those who have requirements on installation of the stix-fonts package<br><br>Create a file named /etc/fonts/local.conf with the following contents:<br><br><?xml version='1.0'?><br><!DOCTYPE fontconfig SYSTEM 'fonts.dtd'><br><fontconfig><br><alias><br><family>serif</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>sans-serif</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>monospace</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>dialog</family><br><prefer><family>Utopia</family></prefer><br></alias><br><alias><br><family>dialoginput</family><br><prefer><family>Utopia</family></prefer><br></alias><br></fontconfig><br><br>Once one of the above workarounds are in place, gridSetup.sh will launch without issue. |
| Links | 1. Note: 2497357.1 - Doc ID: 2497357.1 - gridSetup.sh 18.1+: Returns Without Launching, No Errors Are Displayed |
| Needs attention on | qzh024703246tsa1 |
| Passed on | - |

Repair command

Sanitized hostname

| | | | |
|---|---|---|---|
| 8300E0A2FFE48253E053D298EB0A76CC | FAIL | OS Check | The stix-fonts package is installed |

Check ID

**Verify stix-fonts RPM**

**Benefit / Impact:**
gridSetup.sh/runInstaller.sh Fails to Launch No Error Messages.

On Linux 7, when the Stix Font package is installed, it is set as the default font package for the OS.
This exposes Java <Bug 28522678> resulting in the java.lang.ArrayIndexOutOfBoundsException when initializing the fonts.
This subsequently causes gridSetup.sh and runInstaller.sh to fail to launch with no error messages or warnings displayed on the screen.

**Risk:**
Inability to install or upgrade

**Action / Repair:**
Workaround #1 - Remove the stix-fonts package:

Repair command

# rpm -e stix-fonts
Or you can run ORAchk -repair all -preupgrade -check 8300E0A2FFE48253E053D298EB0A76CC -dbnone -showpass to repair this check on al

Workaround #2 - Modify the Default Font Package as follows:

Note: This workaround is applicable to those who have requirements on installation of the stix-fonts package

```
</alias>
<alias>
<family>sans-serif</family>
<prefer><family>Utopia</family></prefer>
</alias>
<alias>
<family>monospace</family>
<prefer><family>Utopia</family></prefer>
</alias>
<alias>
<family>dialog</family>
<prefer><family>Utopia</family></prefer>
</alias>
<alias>
<family>dialoginput</family>
<prefer><family>Utopia</family></prefer>
</alias>
</fontconfig>
```

Once one of the above workarounds are in place, gridSetup.sh will launch without issue.

| | |
|---|---|
| Links | 1. Note: 2497357.1 - Doc ID: 2497357.1 - gridSetup.sh 18.1+: Returns Without Launching, No Errors Are Displayed |
| Needs attention on | qzh024703246tsa1 |
| Passed on | - |

# Understand what the repair command does

Understand what the repair command will do with:

```
tfactl orachk -showrepair 8300E0A2FFE48253E053D298EB0A76CC

TFA using ORAchk : /opt/oracle.ahf/orachk/orachk

Repair Command:
currentUserName=$(whoami)
if [ "$currentUserName" = "root" ]
then
      repair_report=$(rpm -e stix-fonts 2>&1)
else
      repair_report="$currentUserName does not have priviedges to run
$CRS_HOME/bin/crsctl set resource use 1"
fi
echo -e "$repair_report"
```

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# Run the repair command

Run the checks again and repair everything that fails

```
tfactl orachk -repaircheck all
```

Run the checks again and repair only the specified checks

```
tfactl orachk -repaircheck <check_id_1>,<check_id_2>
```

Run the checks again and repair all checks listed in the file

```
tfactl orachk -repaircheck <file>
```

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# Pre and post upgrade compliance checking

# ORAchk/EXAchk provides a single source for all upgrade checks

ORAchk checks

EXAchk checks

Database AutoUpgrade checks

Cluster Verification Utility (CVU) checks

Compare

Contrast

Combine

Consolidate

Resulting ORAchk / EXAchk checks

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# ORAchk/EXAchk provides a single source for all upgrade checks

To check an environment before upgrading run:

```
tfactl <orachk|exachk> -preupgrade
```

To check an environment after upgrade run:

```
tfactl <orachk|exachk> -postupgrade
```

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# Restrict the maximum size of files collected for data upload

# Optionally restrict the collection of excessively large files

During collection TFA will verify the size of each file to be collected

- Files greater than MaxFileCollectSize MB trimmed to last 1,000 lines
- skipped_files.txt in collection shows all the files, which were too large

```
tfactl set MaxFileCollectSize <size_mb>
```

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# Optionally restrict the collection of excessively large files

```
tfactl print config
.-----------------------------------------------------------------------------.
|                                   myserver                                  |
+-------------------------------------------------------------------+-----------+
| Configuration Parameter                                           | Value     |
+-------------------------------------------------------------------+-----------+
| TFA Version                                                       | 23.7.0.0.0 |
…
…
| Max Collection Size of Core Files (MB)                            | 500       |
| Max File Collection Size (MB)                                     | 5120      |
| Minimum Free Space to enable Alert Log Scan (MB)                  | 500       |
| Time interval between consecutive Disk Usage Snapshot(minutes)    | 60        |
| Age of Purging Collections (Hours)                                | 12        |
| TFA IPS Pool Size                                                 | 5         |
…
```

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# Use REST interfaces to programmatically execute diagnostics

# REST service

Install includes Oracle REST Data Services (ORDS)

```
tfactl rest -start
```

- **-start** #Starts TFA REST services
- **-stop** #Stops TFA REST services
- **-status** #Show current status
- **-dir** #Configuration location
- **-port** #Port to listen on (default 9090)
- **-user** #User to run as (default Grid Owner)

https://host:port/ords/<api>

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# REST service

Start diagnostic collection with a POST to API:

**<tfactl/diagcollect>**

Returns JSON with collectionId:

Download collection with a GET to API:

**</tfactl/download/{collectionid}>**

```
testuser: {
  "collectionId" : "20230814121115slc13lyb",
  "zipName" : "TFA_DEF_ZIP_20230814121115",
  "tagName" : "TFA_DEF_TAG_20230814121115",
  "message" : [ "Diagcollect request will be processed soon by TFA" ]
}
```

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# REST service

Customize diagnostic collection via JSON

- POST **https://host:port/ords/tfactl/diagcollect**

```
[{
  "components": "-database -asm -tns -crs -acfs -install -cfgtools -os",
  "timePeriod": "-since n[d|h] | -last n[d|h] | -for date |
        -from date -to date",
  "tagName": "crs_crash_collection",
  "nodeList": "node1,node2",
  "options": "-nocopy | -notrim | -silent | -nocores |
      -collectalldirs | -collectdir dir1,dir2..."
}]
```

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# REST service other key API methods

#Shows summary of events from alert logs

tfactl/run/alertsummary

#Shows major events from the cluster event log

tfactl/run/calog

#Shows system changes including DB & OS parameters & patches

tfactl/run/changes

#Reports warnings and errors seen in the logs

tfactl/run/events

#Reports history of commands  for the tfactl shell

tfactl/run/history

#start orachk/exachk run

tfactl/orachk/start_client

#run specific orachk/exachk profiles

tfactl/orachk/profile/<profile1>,<profile2>

#run specific orachk/exachk checks

tfactl/orachk/check/<check_id>,<check_id>

#query status of an ORAchk/EXAchk request

tfactl/orachk/status/<job_id>

#download results of an ORAchk/EXAchk request

tfactl/orachk/download/<job_id>

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# Deploy REST service via Apache Tomcat

Deploy the WAR file located at /opt/oracle.ahf/common/jlib/tfa.war to your Tomcat server

Change the tfaadmin user password

```
curl -k --user tfaadmin:tfaadmin https://host/tfa/tfactl/user/update ‘[{"password" :
"some_new_password" }]’
```

Change the tfarest user password

```
curl -k --user tfarest:tfarest https://host/tfa/tfactl/user/update ‘[{"password" :
"some_new_password" }]’
```

Add the user Tomcat runs as to the TFA access list

```
tfactl access add -user <tomcat_user>
```

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# Blackout scheduled events

# Temporarily restrict automatic collections for specific events

Temporarily prevent automatic collection using tfactl blackout

- Can be set for certain targets, events & durations

Do not collect ORA-00600 events on mydb for the next 24hrs (default time)

```
tfactl blackout add -targettype database -target mydb -event "ORA-00600"
```

Do not collect ORA-04031 events on any database for the next hour

```
tfactl blackout add -targettype database -target mydb -event "ORA-04031" –timeout 1h
```

Do not collect any events (during patching)

```
tfactl blackout add -targettype all -event all -target all -timeout 1h -reason "Disabling
all events during patching"
```

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# Temporarily restrict automatic collections for specific events

Use the print option to see all blackouts in place:

```
tfactl blackout print
.-------------------------------------------------------------------------------------------------------------------------------------------.
| Target Type | Target | Events    | Start Time                    | End Time                      | Do Collection | Reason                            |
+-------------+--------+-----------+-------------------------------+-------------------------------+---------------+-----------------------------------+
| ALL         | ALL    | ALL       | Mon Aug 14 00:23:47 PST 2023 | Mon Aug 14 01:23:47 PST 2023 | false         | Disabling all events during patching |
| DATABASE    | ALL    | ORA-04030 | Mon Aug 14 00:22:39 PST 2023 | Tue Aug 15 00:22:39 PST 2023 | false         | NA                                |
| DATABASE    | ALL    | ORA-04031 | Mon Aug 14 00:21:27 PST 2023 | Mon Aug 14 01:21:27 PST 2023 | false         | NA                                |
| DATABASE    | MYDB   | ORA-00600 | Mon Aug 14 00:20:34 PST 2023 | Tue Aug 15 00:20:34 PST 2023 | false         | NA                                |
'-------------+--------+-----------+-------------------------------+-------------------------------+---------------+-----------------------------------'
```

```
tfactl blackout remove -targettype database -event "ORA-00600" -target mydb
```

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# Temporarily restrict automatic collections for specific events

**tfactl <add|remove|print>**

#Limit to the target type, valid values: [all|crs|asm|asmdg|database|listener|service|os](default all)

-targettype <type>

#Target for blackout (default all)

-target all|name

#Limit to events

-events all|"str1,str2"

#Blackout duration in hours or days (default 24h)

-timeout nh|nd|none

#Cluster wide or Local (default local)
#Comment describing the reason for the blackout

-c|-local -reason <comment>

#Still do an auto collection even during blackout

-docollection

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# Detect and collect using SRDC's

# Some problem areas covered in SRDCs

## Around 100 problem types covered

- Database areas
- Errors / Corruption
- Performance
- Install / patching / upgrade
- RAC / Grid Infrastructure
- Import / Export
- RMAN
- Transparent Data Encryption
- Storage / partitioning
- Undo / auditing
- Listener / naming services
- Spatial / XDB
- Other Server Technology
- Enterprise Manager
- Data Guard
- GoldenGate
- Exalogic

Full list in documentation

```
tfactl diagcollect -srdc <srdc_type> [-sr <sr_number>]
```


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# Manual collection vs TFA SRDC for database performance

## Manual method

1. Generate ADDM reviewing Document 1680075.1 (multiple steps)
2. Identify “good” and “problem” periods and gather AWR reviewing Document 1903158.1 (multiple steps)
3. Generate AWR compare report (awrddrpt.sql) using “good” and “problem” periods
4. Generate ASH report for “good” and “problem” periods reviewing Document 1903145.1 (multiple steps)
5. Collect OSWatcher data reviewing Document 301137.1 (multiple steps)
6. Collect Hang Analyze output at Level 4
7. Generate SQL Healthcheck for problem SQL id using Document 1366133.1 (multiple steps)
8. Run support provided sql scripts – Log File sync diagnostic output using Document 1064487.1 (multiple steps)
9. Check alert.log if there are any errors during the “problem” period
10. Find any trace files generated during the “problem” period
11. Collate and upload all the above files/outputs to SR

## TFA SRDC

1. Run

```
tfactl diagcollect -srdc dbperf [-sr <sr_number>]
```

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# One command SRDC

## tfactl diagcollect –srdc <srdc_type>

- Scans system to identify recent events
- Once the relevant event is chosen, proceeds with diagnostic collection

```
tfactl diagcollect -srdc ORA-00600
Enter the time of the ORA-00600 [YYYY-MM-DD HH24:MI:SS,<RETURN>=ALL] :
Enter the Database Name [<RETURN>=ALL] :

1. Aug/14/2023 05:29:58 : [orcl2] ORA-00600: internal error code, arguments: [600], [], [], [], [], [], [], [], [], [], [], []
2. Aug/12/2023 06:55:08 : [orcl2] ORA-00600: internal error code, arguments: [600], [], [], [], [], [], [], [], [], [], [], []

Please choose the event : 1-2 [1]
Selected value is : 1 ( Aug/14/2023 05:29:58 )
```

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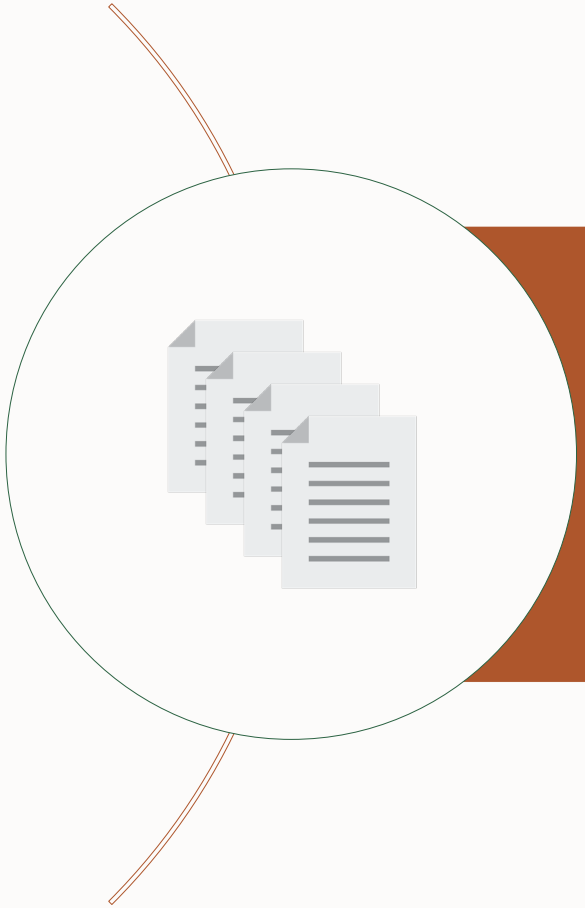
# One command SRDC

All required files are identified

- Trimmed where applicable
- Package in a zip ready to provide to support

```
...
2023/08/14 06:14:24 EST : Getting List of Files to Collect
2023/08/14 06:14:27 EST : Trimming file : myserver1/rdbms/orcl2/orcl2/trace/orcl2_lmhb_3542.trc with original file size :
163MB
...
2023/08/14 06:14:58 EST : Total time taken : 39s
2023/08/14 06:14:58 EST : Completed collection of zip files.
...
/opt/oracle.ahf/data/repository/srdc_ora600_collection_Mon_Aug_14_06_14_17_EST_2023_node_local/myserver1.tfa_srdc_ora600_Mo
n_Aug_14_06_14_17_EST_2023.zip
```



# Manage logs

# Automatic Database Log Purge

TFA can automatically purge database logs

```
tfactl set manageLogsAutoPurge=ON
```

Purging automatically removes logs older than 30 days

- Configurable with

```
tfactl set manageLogsAutoPurgePolicyAge=<n><d|h>
```

Purging runs every 60 minutes

- Configurable with:

```
tfactl set manageLogsAutoPurgeInterval=<minutes>
```

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# Manual Database Log Purge

TFA can manage ADR log and trace files

**tfactl managelogs <options>**

#Show disk space usage per diagnostic directory for both GI and database logs

–show usage

#Show disk space growth for specified period

-show variation –older <n><m|h|d>

#Remove ADR files older than the time specified

-purge –older <n><m|h|d>

#Restrict command to only files under the GI_BASE

–gi

#Restrict command to only files under the database directory

–database [all | dbname]

#Use with –purge to estimate how many files will be affected and how much disk space will be freed by a potential purge command

-dryrun

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# Understand Database log disk space usage

```
tfactl managelogs -show usage
...
.-------------------------------------------------------------------------.
|                          Grid Infrastructure Usage                      |
+-----------------------------------------------------------------+-----------+
| Location                                                        | Size      |
+-----------------------------------------------------------------+-----------+
| /u01/app/crsusr/diag/afdboot/user_root/host_309243680_94/alert  | 28.00 KB  |
| /u01/app/crsusr/diag/afdboot/user_root/host_309243680_94/incident | 4.00 KB   |
| /u01/app/crsusr/diag/afdboot/user_root/host_309243680_94/trace  | 8.00 KB   |
...
+-----------------------------------------------------------------+-----------+
| Total                                                           | 739.06 MB |
'-----------------------------------------------------------------+-----------'
...
```

Use **-gi** to only show grid infrastructure

# Understand Database log disk space usage

```
...

.-------------------------------------------------------------.
|                      Database Homes Usage                   |
+-------------------------------------------------+-----------+
| Location                                        | Size      |
+-------------------------------------------------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/alert  | 1.06 MB   |
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/incident | 4.00 KB   |
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/trace  | 146.19 MB |
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/cdump  | 4.00 KB   |
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/hm     | 4.00 KB   |
+-------------------------------------------------+-----------+
| Total                                           | 147.26 MB |
'-------------------------------------------------+-----------'
```

Use **-database** to only show database

# Understand Database log disk space usage variations

```
tfactl managelogs -show variation -older 30d

Output from host : myserver74
------------------------------
2023-08-14 12:30:42: INFO Checking space variation for 30 days

.-------------------------------------------------------------------------------------.
|                              Grid Infrastructure Variation                          |
+-----------------------------------------------------------------+-----------+-----------+
| Directory                                                       | Old Size  | New Size  |
+-----------------------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/asm/user_root/host_309243680_96/alert      | 22.00 KB  | 28.00 KB  |
+-----------------------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/clients/user_crsusr/host_309243680_96/cdump| 4.00 KB   | 4.00 KB   |
+-----------------------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/tnslsnr/myserver74/listener/alert          | 15.06 MB  | 244.10 MB |
+-----------------------------------------------------------------+-----------+-----------+
...
```

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# Understand Database log disk space usage variations

```
...

.-------------------------------------------------------------------------.
|                          Database Homes Variation                       |
+-------------------------------------------------+-----------+-----------+
| Directory                                       | Old Size  | New Size  |
+-------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/hm     | 4.00 KB   | 4.00 KB   |
+-------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/trace  | 16.63 MB  | 146.19 MB |
+-------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/cdump  | 4.00 KB   | 4.00 KB   |
+-------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/incident | 4.00 KB   | 4.00 KB   |
+-------------------------------------------------+-----------+-----------+
| /u01/app/crsusr/diag/rdbms/cdb674/CDB674/alert  | 1.06 MB   | 1.06 MB   |
'-------------------------------------------------+-----------+-----------'
```

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# Run a database log purge dryrun

```
tfactl managelogs -purge -older 30d -dryrun

Output from host : myserver74
------------------------------
Estimating files older than 30 days

Estimating purge for diagnostic destination "diag/afdboot/user_root/host_309243680_94" for files ~ 2 files deleted , 22.58 KB freed ]
Estimating purge for diagnostic destination "diag/afdboot/user_crsusr/host_309243680_94" for files ~ 2 files deleted , 11.72 KB freed ]
Estimating purge for diagnostic destination "diag/asmtool/user_root/host_309243680_96" for files ~ 2 files deleted , 21.36 KB freed ]
Estimating purge for diagnostic destination "diag/asmtool/user_crsusr/host_309243680_96" for files ~ 3 files deleted , 23.22 KB freed ]
Estimating purge for diagnostic destination "diag/tnslsnr/myserver74/listener" for files ~ 23 files deleted , 225.33 MB freed ]
Estimating purge for diagnostic destination "diag/diagtool/user_root/adrci_309243680_96" for files ~ 73 files deleted , 517.69 KB freed ]
Estimating purge for diagnostic destination "diag/clients/user_crsusr/host_309243680_96" for files ~ 38 files deleted , 17.15 KB freed ]
Estimating purge for diagnostic destination "diag/asm/+asm/+ASM" for files ~ 0 files deleted , 0 bytes freed ]
Estimating purge for diagnostic destination "diag/asm/user_root/host_309243680_96" for files ~ 1 files deleted , 19.52 KB freed ]
Estimating purge for diagnostic destination "diag/asm/user_crsusr/host_309243680_96" for files ~ 1 files deleted , 20.25 KB freed ]
Estimating purge for diagnostic destination "diag/crs/myserver74/crs" for files ~ 40 files deleted , 219.39 MB freed ]
Estimation for Grid Infrastructure [ Files to delete : ~ 185 files | Space to be freed : ~ 445.36 MB ]

Estimating purge for diagnostic destination "diag/rdbms/cdb674/CDB674" for files ~ 27760 files deleted , 66.57 MB freed ]
Estimation for Database Home [ Files to delete : ~ 27760 files | Space to be freed : ~ 66.57 MB ]
```

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# Run a database log purge

```
tfactl managelogs -purge -older 30d

Output from host : myserver74
------------------------------
Purging files older than 30 days

Cleaning Grid Infrastructure destinations

Purging diagnostic destination "diag/afdboot/user_root/host_309243680_94" for files - 0 files deleted , 0 bytes freed
Purging diagnostic destination "diag/afdboot/user_crsusr/host_309243680_94" for files - 1 files deleted , 10.16 KB freed
Purging diagnostic destination "diag/asmtool/user_root/host_309243680_96" for files - 1 files deleted , 10.16 KB freed
Purging diagnostic destination "diag/asmtool/user_crsusr/host_309243680_96" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/tnslsnr/myserver74/listener" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/diagtool/user_root/adrci_309243680_96" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/clients/user_crsusr/host_309243680_96" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/asm/+asm/+ASM" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/asm/user_root/host_309243680_96" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/asm/user_crsusr/host_309243680_96" for files - 2 files deleted , 29.18 KB freed
Purging diagnostic destination "diag/crs/myserver74/crs" for files - 2 files deleted , 29.18 KB freed
...
```

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# Run a database log purge

```
...

Grid Infrastructure [ Files deleted : 18 files | Space Freed : 253.75 KB ]

.-------------------------------------------------------------------------------------------.
|                      File System Variation : /u01/app/crsusr/12.2.0/grid2                 |
+--------+-----------------------------------+----------+----------+---------+----------+-------+
| State  | Name                              | Size     | Used     | Free    | Capacity | Mount |
+--------+-----------------------------------+----------+----------+---------+----------+-------+
| Before | /dev/mapper/vg_rws1270665-lv_root | 51475068 | 46597152 | 2256476 |      96% | /     |
| After  | /dev/mapper/vg_rws1270665-lv_root | 51475068 | 46597152 | 2256476 |      96% | /     |
'--------+-----------------------------------+----------+----------+---------+----------+-------'
```

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# Disk Usage Snapshots

TFA will track disk usage and record snapshots to:
/opt/oracle.ahf/data/repository/suptools/<node>/managelogs/usage_snapshot

Disk usage monitoring is ON by default, configurable with:

```
tfactl set diskUsageMon=<ON|OFF>
```

Snapshot happens every 60 minutes, configurable with:

```
tfactl set diskUsageMonInterval=<minutes>
```

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# Find events

# Find events

```
tfactl events

Output from host : myserver70
INFO    :0
ERROR   :0
WARNING :0
Event Timeline:
No Events Found

Output from host : myserver71
INFO    :0
ERROR   :0
WARNING :0
Event Timeline:
No Events Found
...
```

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# Find events

```
...
Output from host : myserver69
INFO    :1
ERROR   :1
WARNING :0
Event Timeline:

[Aug/14/2023 02:38:25.000]: [db.ogg11204.ogg112041]: Incident details in:
/scratch/app/oradb/diag/rdbms/ogg11204/ogg112041/incident/incdir_102702/ogg112041_ora_5001_i102
702.trc
[Aug/14/2023 02:38:25.000]: [db.ogg11204.ogg112041]: ORA-00600: internal error code, arguments:
[ksprcvsp2], [1596993584], [], [], [], [], [], [], [], [], [], []
```

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# Search metadata

All metadata stored in the TFA index is searchable:

```
tfactl search -showdatatypes|-json [json_details]
```

Search for all events for a database between certain dates:

```
tfactl search -json
‘{
  “data_type” : “event”,
  “content”: “oracle”,
  “database” : “rac11g”,
  “from”: “08/01/2023 00:00:00”,
  “to” : “08/14/2023 00:00:00”
 }’
```

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# Search metadata

Listing all index events:

```
tfactl search -json ‘{“data_type” : “event”}’
```

Listing all available datatypes:

```
tfactl search -showdatatypes
```

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# Monitor multiple logs

# tail files

```
tfactl tail alert

Output from host : myserver69
------------------------------
/scratch/app/11.2.0.4/grid/log/myserver69/alertmyserver69.log
2023-08-14 23:28:22.532:
[ctssd(5630)]CRS-2409:The clock on host myserver69 is not synchronous with the mean cluster
time. No action has been taken as the Cluster Time Synchronization Service is running in
observer mode.

2023-08-14 23:58:22.964:
[ctssd(5630)]CRS-2409:The clock on host myserver69 is not synchronous with the mean cluster
time. No action has been taken as the Cluster Time Synchronization Service is running in
observer mode.
...
```

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# tail files

```
...
/scratch/app/oradb/diag/rdbms/apxcmupg/apxcmupg_2/trace/alert_apxcmupg_2.log

Mon Aug 14 06:00:00 2023 VKRM started with pid=82, OS id=4903
Mon Aug 14 06:00:02 2023 Begin automatic SQL Tuning Advisor run for special tuning task
"SYS_AUTO_SQL_TUNING_TASK"
Mon Aug 14 06:00:37 2023 End automatic SQL Tuning Advisor run for special tuning task
"SYS_AUTO_SQL_TUNING_TASK"
Mon Aug 14 23:00:28 2023 Thread 2 advanced to log sequence 759 (LGWR switch)
  Current log# 3 seq# 759 mem# 0: +DATA/apxcmupg/onlinelog/group_3.289.917164707
  Current log# 3 seq# 759 mem# 1: +FRA/apxcmupg/onlinelog/group_3.289.917164707
...
```

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# tail files

```
...
/scratch/app/oradb/diag/rdbms/ogg11204/ogg112041/trace/alert_ogg112041.log

Clearing Resource Manager plan via parameter
Mon Aug 14 05:59:59 2023
Setting Resource Manager plan DEFAULT_MAINTENANCE_PLAN via parameter
Mon Aug 14 05:59:59 2023
Starting background process VKRM
Mon Aug 14 05:59:59 2023
VKRM started with pid=36, OS id=4901
Mon Aug 14 22:00:31 2023
Thread 1 advanced to log sequence 305 (LGWR switch)
  Current log# 1 seq# 305 mem# 0: +DATA/ogg11204/redo01.log
...
```

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# tail files

```
...
/scratch/app/oragrid/diag/asm/+asm/+ASM1/trace/alert_+ASM1.log <==

Mon Aug 14 04:42:22 2023
NOTE: [ocrcheck.bin@myserver69 (TNS V1-V3) 2323] opening OCR file
Mon Aug 14 01:05:39 2023
NOTE: [ocrcheck.bin@myserver69 (TNS V1-V3) 16591] opening OCR file
Mon Aug 14 01:05:41 2023
NOTE: [ocrcheck.bin@myserver69 (TNS V1-V3) 16603] opening OCR file
Mon Aug 14 01:21:12 2023
NOTE: [ocrcheck.bin@myserver69 (TNS V1-V3) 1803] opening OCR file
Mon Aug 14 01:21:12 2023
NOTE: [ocrcheck.bin@myserver69 (TNS V1-V3) 1816] opening OCR file
...
```

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# Edit files

# Edit files

```
tfactl vi alert

2023-08-14 19:58:19.481:
[ctssd(5630)]CRS-2409:The clock on host myserver69 is not synchronous with the mean cluster
time. No action has been taken as the Cluster Time Synchronization Service is running in
observer mode.

2023-08-14 20:28:19.911:
[ctssd(5630)]CRS-2409:The clock on host myserver69 is not synchronous with the mean cluster
time. No action has been taken as the Cluster Time Synchronization Service is running in
observer mode.

2023-08-14 20:58:20.346:
[ctssd(5630)]CRS-2409:The clock on host myserver69 is not synchronous with the mean cluster
time. No action has been taken as the Cluster Time Synchronization Service is running in
observer mode.
```

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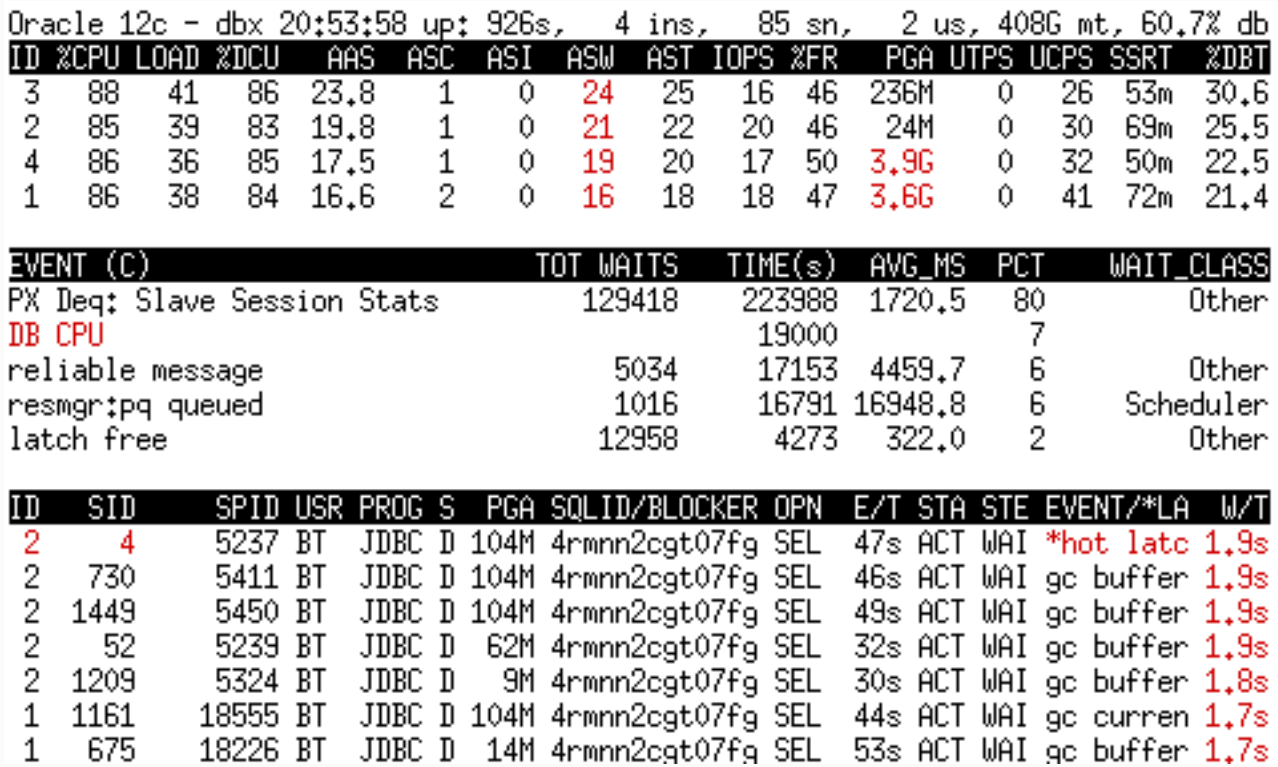
# Monitor Database performance

# oratop (Support Tools Bundle)

Near real-time Database monitoring

- Single instance & RAC
- Monitoring current database activities
- Database performance
- Identifying contentions and bottleneck
- Process & SQL Monitoring
- Real time wait events
- Active Data Guard support
- Multitenant Database (CDB) support



```
Oracle 12c - dbx 20:53:58 up: 926s,   4 ins,   85 sn,   2 us, 408G mt, 60.7% db
ID %CPU LOAD %DCU   AAS  ASC  ASI  ASW  AST IOPS %FR   PGA UTPS UCPS SSRT  %DBT
 3   88   41   86  23.8    1    0   24   25   16  46  236M    0   26  53m  30.6
 2   85   39   83  19.8    1    0   21   22   20  46   24M    0   30  69m  25.5
 4   86   36   85  17.5    1    0   19   20   17  50  3.9G    0   32  50m  22.5
 1   86   38   84  16.6    2    0   16   18   18  47  3.6G    0   41  72m  21.4

EVENT (C)                          TOT WAITS   TIME(s)  AVG_MS  PCT     WAIT_CLASS
PX Deq: Slave Session Stats           129418    223988  1720.5   80          Other
DB CPU                                          19000            7
reliable message                        5034    17153  4459.7    6          Other
resmgr:pq queued                        1016    16791 16948.8    6      Scheduler
latch free                             12958     4273   322.0    2          Other

ID   SID     SPID USR PROG S  PGA SQLID/BLOCKER OPN  E/T STA STE EVENT/*LA  W/T
 2     4     5237 BT  JDBC D 104M 4rmnn2cgt07fg SEL  47s ACT WAI *hot latc 1.9s
 2   730     5411 BT  JDBC D 104M 4rmnn2cgt07fg SEL  46s ACT WAI gc buffer 1.9s
 2  1449     5450 BT  JDBC D 104M 4rmnn2cgt07fg SEL  49s ACT WAI gc buffer 1.9s
 2    52     5239 BT  JDBC D  62M 4rmnn2cgt07fg SEL  32s ACT WAI gc buffer 1.9s
 2  1209     5324 BT  JDBC D   9M 4rmnn2cgt07fg SEL  30s ACT WAI gc buffer 1.8s
 1  1161    18555 BT  JDBC D 104M 4rmnn2cgt07fg SEL  44s ACT WAI gc curren 1.7s
 1   675    18226 BT  JDBC D  14M 4rmnn2cgt07fg SEL  53s ACT WAI gc buffer 1.7s
```

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# Monitor Database performance

```
tfactl run oratop -database ogg19c
```

```
Oracle 19c - sh1 02:01:57 up: 4.3d,  2 ins,  128 sn,   1 us,  10G sga,  84.6%db
ID %CPU %DCP LOAD  AAS  ASC  ASI  ASW  IDL  MBPS  %FR  PGA UTPS  RT/X DCTR DWTR
 2 19.2 13.7 10.2 39.2   11    4   22   26  100M    7 3.1G  656   56m   17   81
 1 20.3 16.9 15.6 42.0   15    1   22   27  104M   14 2.7G  719   48m   16   78

EVENT (C)                          TOT WAITS   TIME(s)  AVG MS  PCT     WAIT CLASS
log file sync                       17841193    266406    14.1   39         Commit
DB CPU                                          154327           23
gc current block busy               71129790    108578     1.5   16        Cluster
gc buffer busy acquire               8896661     73845     9.9   11        Cluster
enq: TX - row lock contention        3220952     71866    24.0   11    Application

ID    SID     SPID USR PROG S  PGA SQLID/BLOCKER OPN   E/T STA STE EVENT/*LA  W/T
 1     35    35023 TPC tpcc D 5.3M 4dxgf9wkjvbz8 INS     0 ACT I/O db file s  29m
 1    932    35058 TPC tpcc D 5.3M ah1vrygbhqdry DEL     0 ACT WAI enq: TX -  12m
 2      6     7416 TPC tpcc D 5.2M 5zbj18g6dz0gk SEL     0 ACT I/O db file s  10m
 1    995    35051 TPC tpcc D 6.3M 462cz6g854c88 INS     0 ACT I/O db file s  10m
 2   1282     7328 TPC tpcc D 3.4M 5j4ntzvntxqxm UPD     0 ACT I/O db file s 9.4m
 2     71     7343 TPC tpcc D 5.4M 5j4ntzvntxqxm UPD     0 ACT I/O db file s 7.5m
 1   1251    35081 TPC tpcc D 4.3M 57kvfpfmx9801 UPD     0 ACT WAI enq: TX - 6.2m
 1   1447    35015 TPC tpcc D 5.1M 236ksg44h80ht UPD     0 ACT WAI gc buffer 5.7m
 1   1220    35079 TPC tpcc D 4.3M 57kvfpfmx9801 UPD     0 ACT WAI enq: TX - 5.1m
 1      4    35021 TPC tpcc D 5.3M 4j8r6zsm6upcv UPD     0 ACT WAI gc curren 5.0m
 2    902     7376 TPC tpcc D 5.1M                      0 ACT WAI log file  4.4m
 1     34    35159 TPC tpcc D 5.3M gz8100xp0fbc9        0 ACT CPU cpu runqu 3.9m
 1   1446    35097 TPC tpcc D 5.4M 4j8r6zsm6upcv UPD     0 ACT WAI gc buffer 3.7m
 2    582     7356 TPC tpcc D 5.1M                      0 ACT WAI log file  3.6m
 1    102    35164 TPC tpcc D 4.5M 236ksg44h80ht UPD     0 ACT WAI gc curren 2.6m
 2   1473    49080 B/G LGWR D 2.7M              2:1   4.3d ACT WAI LGWR any  2.2m
 1      1    31199 B/G LG00 D 2.4M                    2.8d ACT CPU cpu runqu 2.2m
```

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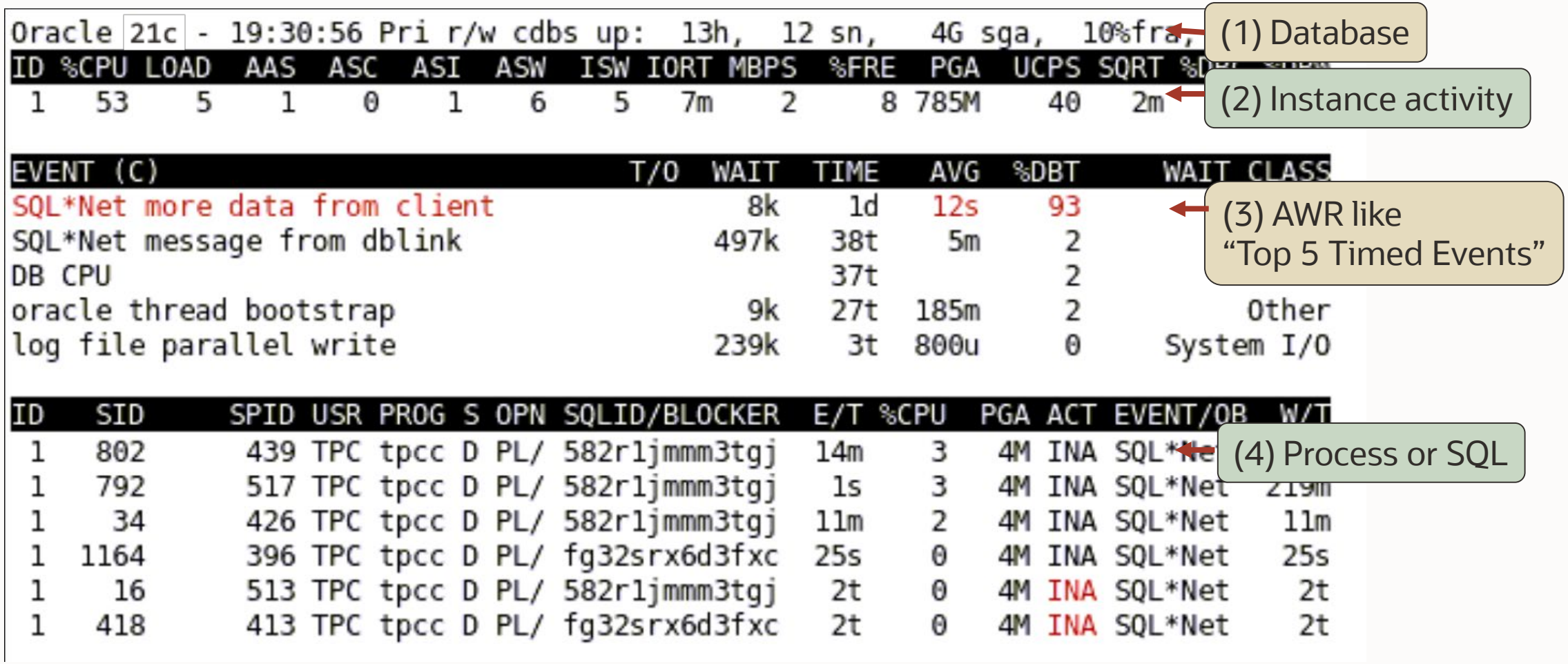
# Visual layout



# Analyze OS Metrics

# OS Watcher (Support Tools Bundle)

Collect & Archive OS Metrics

Executes standard UNIX utilities (e.g. vmstat, iostat, ps, etc) on regular intervals

Built in Analyzer functionality to summarize, graph and report upon collected metrics

Output is Required for node reboot and performance issues

Simple to install, extremely lightweight

Runs on ALL platforms (Except Windows)

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# Analyse OS Metrics

```
tfactl run oswbb
Starting OSW Analyzer V8.1.2

OSWatcher Analyzer Written by Oracle Center of Expertise
Copyright (c)  2017 by Oracle Corporation
Parsing Data. Please Wait...

Scanning file headers for version and platform info...
Parsing file rws1270069_iostat_18.11.24.0900.dat ...
Parsing file rws1270069_iostat_18.11.24.1000.dat ...
...
```

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# Analyse OS Metrics

```
...
Enter 1 to Display CPU Process Queue Graphs
Enter 2 to Display CPU Utilization Graphs
Enter 3 to Display CPU Other Graphs
Enter 4 to Display Memory Graphs
Enter 5 to Display Disk IO Graphs
Enter GC to Generate All CPU Gif Files
Enter GM to Generate All Memory Gif Files
Enter GD to Generate All Disk Gif Files
Enter GN to Generate All Network Gif Files
Enter L to Specify Alternate Location of Gif Directory
Enter Z to Zoom Graph Time Scale (Does not change analysis dataset)
...
```

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# Analyse OS Metrics

```
...
Enter B to Returns to Baseline Graph Time Scale (Does not change analysis dataset)
Enter R to Remove Currently Displayed Graphs
Enter X to Export Parsed Data to Flat File
Enter S to Analyze Subset of Data(Changes analysis dataset including graph time scale)
Enter A to Analyze Data
Enter D to Generate DashBoard
Enter Q to Quit Program

Please Select an Option:1
```

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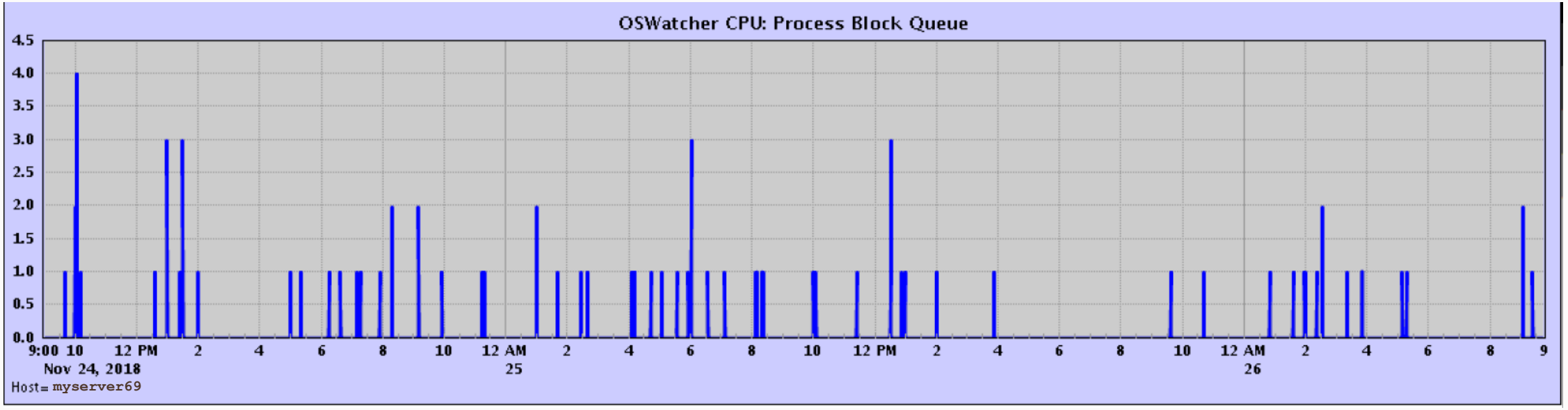
# Analyse OS Metrics

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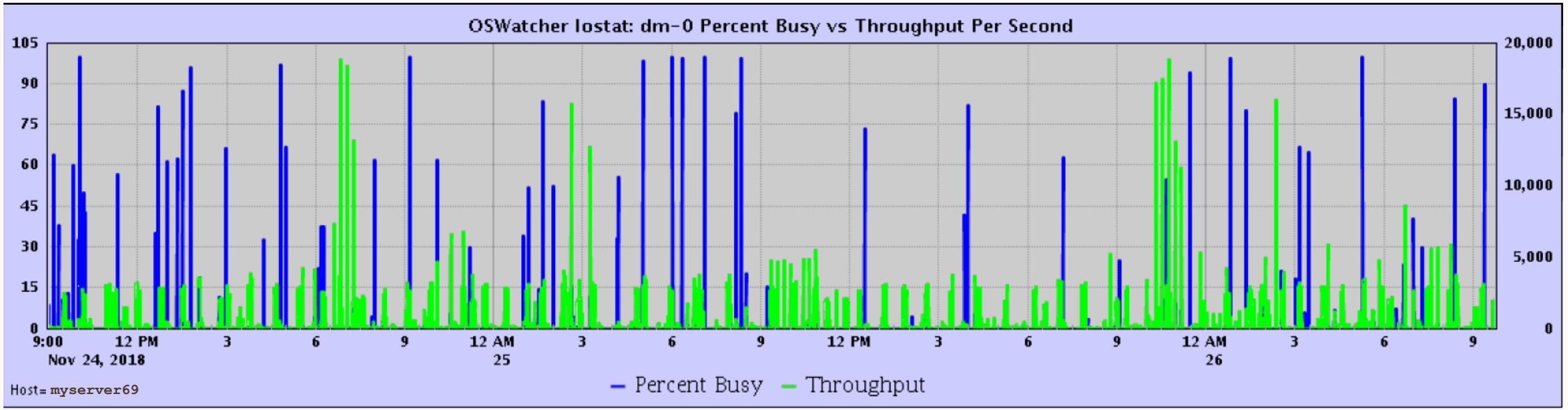
# Analyse OS Metrics




more info 3011137.1

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# Find if anything has changed

# Has anything changed recently?

```
tfactl changes
Output from host : myserver69
------------------------------
[Aug/14/2023 04:54:15.397]: Parameter: fs.aio-nr: Value: 95488 => 97024
[Aug/14/2023 04:54:15.397]: Parameter: fs.inode-nr: Value: 764974 131561 => 740744 131259
[Aug/14/2023 04:54:15.397]: Parameter: kernel.pty.nr: Value: 2 => 1
[Aug/14/2023 04:54:15.397]: Parameter: kernel.random.entropy_avail: Value: 189 => 158
[Aug/14/2023 04:54:15.397]: Parameter: kernel.random.uuid: Value: 36269877-9bc9-40a3-82e0-
1619865096f2 => 7551c5e7-c59f-40fa-b55f-5bd170e8b1ab
[Aug/14/2023 05:46:15.397]: Parameter: fs.aio-nr: Value: 119680 => 122880
[Aug/14/2023 05:46:15.397]: Parameter: fs.inode-nr: Value: 1580316        810036 => 1562320
        768555
[Aug/14/2023 05:46:15.397]: Parameter: kernel.pty.nr: Value: 19 => 18
[Aug/14/2023 05:46:15.397]: Parameter: kernel.random.uuid: Value: 37cc31aa-ee31-459e-8f2a-
0766b34b1b64 => f5176cdc-6390-415d-882e-02c4cff2ae4e
...
```

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# Has anything changed recently?

```
...
Output from host : myserver70
------------------------------
[Aug/14/2023 04:54:15.397]: Parameter: fs.aio-nr: Value: 95488 => 97024
[Aug/14/2023 04:54:15.397]: Parameter: fs.inode-nr: Value: 764974 131561 => 740744 131259
[Aug/14/2023 04:54:15.397]: Parameter: kernel.pty.nr: Value: 2 => 1
[Aug/14/2023 04:54:15.397]: Parameter: kernel.random.entropy_avail: Value: 189 => 158
[Aug/14/2023 04:54:15.397]: Parameter: kernel.random.uuid: Value: 36269877-9bc9-40a3-82e0-
1619865096f2 => 7551c5e7-c59f-40fa-b55f-5bd170e8b1ab
[Aug/14/2023 05:46:15.397]: Parameter: fs.aio-nr: Value: 119680 => 122880
[Aug/14/2023 05:46:15.397]: Parameter: fs.inode-nr: Value: 1580316        810036 => 1562320
        768555
[Aug/14/2023 05:46:15.397]: Parameter: kernel.pty.nr: Value: 19 => 18
[Aug/14/2023 05:46:15.397]: Parameter: kernel.random.uuid: Value: 37cc31aa-ee31-459e-8f2a-
0766b34b1b64 => f5176cdc-6390-415d-882e-02c4cff2ae4e
[Aug/14/2023 16:56:15.398]: Parameter: fs.aio-nr: Value: 97024 => 98560
```

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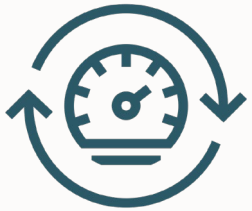
# Upgrade

# Automatic AHF upgrade



Automatic upgrade when AHF finds a new version

New versions can be found automatically at:

- The local file system
- REST locations
- Object store locations

On-demand via `ahfctl upgrade`

The latest version can be pulled on-demand from My Oracle Support

AHF will also prompt you to upgrade when it detects it's older than 180 days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# Automatic AHF upgrade

Configure automatic upgrade

## Interactive prompt

```
ahfctl setupgrade -all
Enter autoupgrade flag <on/off> : on
Enter software stage location :
/scratch/ahfstage
Enter auto upgrade frequency : 30
AHF autoupgrade parameters
successfully updated
Successfully synced AHF
configuration
```

## Single command

```
ahfctl setupgrade
-swstage /scratch/ahfstage -autoupgrade
on
-frequency 30
AHF autoupgrade parameters successfully
updated
Successfully synced AHF configuration
```


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# Automatic AHF upgrade

## Configure on-demand Upgrade

Configure your My Oracle Support credentials

```
ahfctl setupload -name mosconf –type https
Enter mosconf.https.user : john.doe@acme.com
Enter mosconf.https.password :
Enter mosconf.https.url : https://transport.oracle.com/upload/issue

Successfully synced AHF configuration
Configuration set for: mosconf
type: https mosconf.https.user: john.doe@acme.com
mosconf.https.password: ******
mosconf.https.url: https://transport.oracle.com/upload/issue
```

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# Automatic AHF upgrade

On-demand Upgrade

```
ahfctl upgrade
AHF Installer for Platform Linux Architecture x86_64
AHF Installation Log : /tmp/ahf_install_237000_31931_2023_08_14-06_54_58.log
Starting Autonomous Health Framework (AHF) Installation
AHF Version: 23.7.0 Build Date: 202307290252
AHF is already installed at /opt/oracle.ahf
Installed AHF Version: 23.1.0 Build Date: 202103290200
Upgrading /opt/oracle.ahf
Shutting down AHF Services
Shutting down TFA
. . . . .
. . .
Successfully shutdown TFA..
Starting AHF Services
Starting TFA..
Waiting up to 100 seconds for TFA to be started..
. . . . .
```


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# Automatic AHF upgrade

On-demand Upgrade

```
. . . . .
Successfully started TFA Process..
. . . . .
TFA Started and listening for commands
No new directories were added to TFA
INFO: Starting exachk scheduler in background. Details for the process can be found at
/u01/app/grid/oracle.ahf/data/busm01client01/diag/exachk/compliance_start_290321_065650.log
AHF is successfully upgraded to latest version
.-------------------------------------------------------.
| Host          | TFA Version| TFA Build ID | Upgrade Status  |
+---------------+------------+--------------+-----------------+
| node01        | 23.7.0.0.0 | 202307290252 | UPGRADED        |
| node02        | 23.7.0.0.0 | 202307290252 | UPGRADED        |
'---------------+------------+--------------+-----------------'
Moving /tmp/ahf_install_237000_31931_2023_08_14-06_54_58.log to
/u01/app/grid/oracle.ahf/data/busm01client01/diag/ahf/
Please upgrade AHF on the below mentioned nodes as well using ahfctl upgrade
node02
```


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# Oracle Database Alert Log

**Pros:**

- Destination for Important DB Events
- Single file to monitor by DBAs
- Many tools available to parse
- Supported by TFA for generating alarms

**Cons:**

- Includes both critical and non-critical events
- Incudes messages not intended for DBAs
- Inconsistently reports severity level
- Can report unintuitive cause and action
- New undocumented messages in every release

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# The Curated Solution - New 21c Attention Log

**Contains only important events requiring customer attention**

Includes documented set of messages and attributes

All Messages include these attributes:

- Type
- Urgency
- Scope
- Target User
- Cause and Action
- Additional debug information

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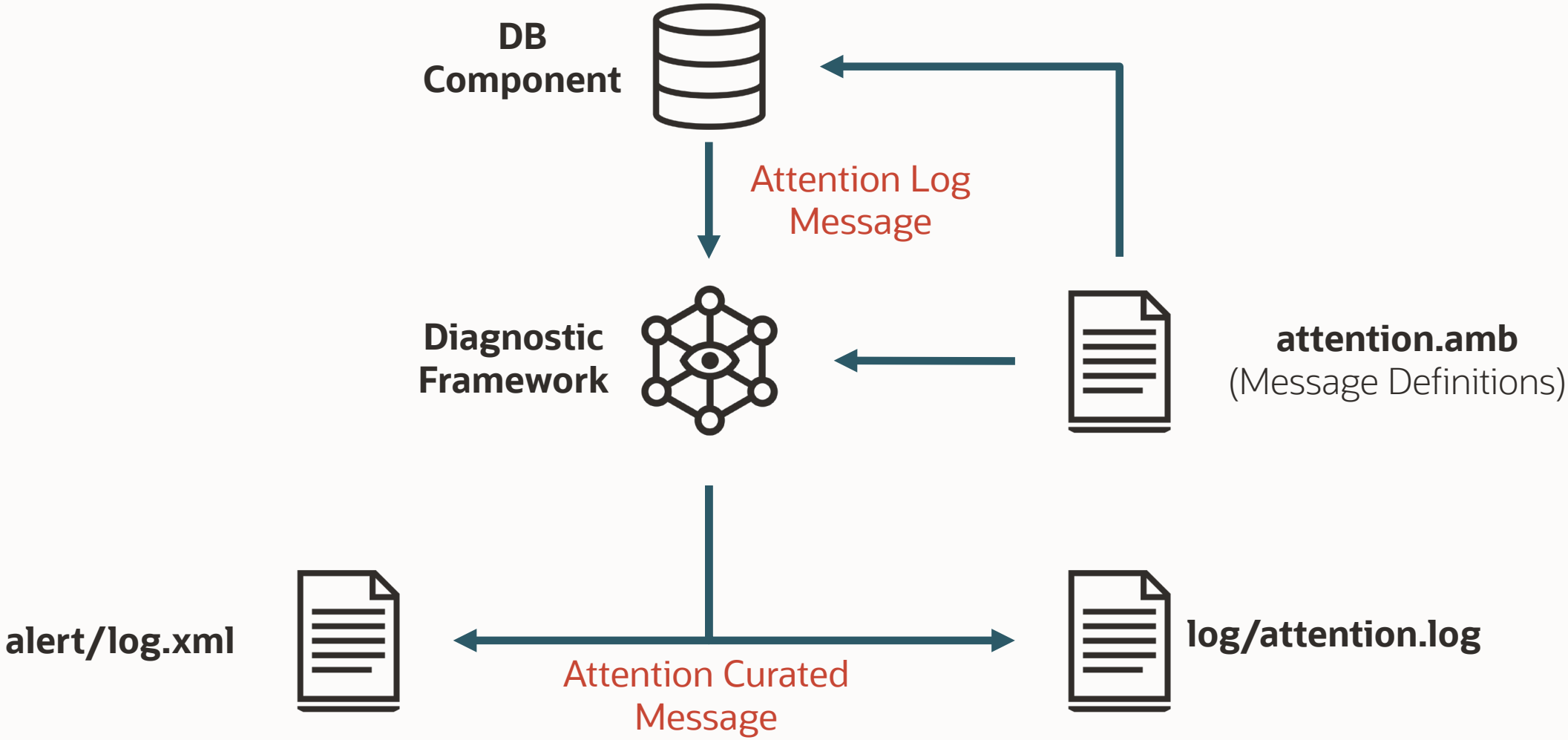
# Oracle Database Attention Log Message Flow

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# Attention Log Curation - Message Attributes

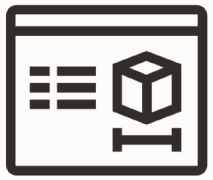
## TYPE

1. Error
2. Warning
3. Notification

## URGENCY

1. Immediate
2. Soon
3. Deferable
4. Info

## SCOPE



1. Session
2. Process
3. PDB-Instance
4. CDB-Instance
5. CDB-Cluster
6. PDB-Persistent
7. CDB-Persistent

## TARGET USER

1. App-Dev
2. Sec-Admin
3. Net-Admin
4. Cluster-Admin
5. PDB-Admin
6. CDB-Admin
7. Server-Admin
8. Storage-Admin
9. DataOps-Admin

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# Example Attention Message Definition – CDB Warning

```
// TYPE       - 1 error,  2 warning,  3 notification
// URGENCY    - 1 immediate, 2 soon, 3 deferable, 4 info
// SCOPE      - 1 session, 2 process, 3 pdb-instance, 4 cdb-instance, 5 cdb-cluster, 6 pdb-persistent, 7 cdb-persistent
// TARGETUSER - 1 app-dev, 2 sec-admin, 3 net-admin, 4 cluster-admin, 5 pdb-admin, 6 cdb-admin, 7 server-admin, 8 storage-admin, 9 dataops-admin

ID::2000

TYPE::2

URGENCY::1

SCOPE::4

TARGETUSER::6

TEXT::Parameter %s specified is high

CAUSE::Memory parameter specified for this instance is high

ACTION::Check alert log or trace file for more information relating to instance
configuration, reconfigure the parameter and restart the instance

STARTVERSION::21.1
```

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# Example Attention Log Curated Message – CDB Warning

```
[
  IMMEDIATE      Parameter SGA_MAX_SIZE specified is high
  CAUSE:         Memory parameter specified for this instance is high
  ACTION:        Check alert log or trace file for more information relating to instance
                 configuration, reconfigure the parameter and restart the instance
  CLASS:         CDB Instance / CDB ADMINISTRATOR / WARNING / AL-2000
  TIME:          2020-05-01T11:09:02.223-07:00
  ADDITIONAL INFO: -
  WARNING: SGA_MAX_SIZE (6144 MB) is too high - it should be less than 5634 MB (80
percent of physical memory).
]
```

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# Example Attention Log Curated Message – CDB Error

```
[
  IMMEDIATE    Shutting down ORACLE instance (abort) (OS id: 8394)
  CAUSE:       A command to shutdown the instance was executed
  ACTION:      Check alert log for progress and completion of command
  CLASS:       CDB Instance / CDB ADMINISTRATOR / ERROR / AL-1002
  TIME:        2020-05-08T17:09:33.773-07:00
  ADDITIONAL INFO: -
  Shutdown is initiated by sqlplus@den02tlh (TNS V1-V3).
]
```

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# Example Attention Log Curated Message – Server Warning

```
[
  SOON            Heavy swapping observed on system
  CAUSE:          Memory usage by one more application is leading to heavy swapping
  ACTION:         Check alert log for more information, use tools to analyze memory
                  usage and take action
  CLASS:          CDB Instance / SERVER ADMINISTRATOR / WARNING / AL-2100
  TIME:           2020-05-01T11:09:02.223-07:00

  ADDITIONAL INFO: -
  WARNING: Heavy swapping observed on system in last 15 mins.
  Heavy swapping can lead to timeouts, poor performance, and instance eviction.
]
```

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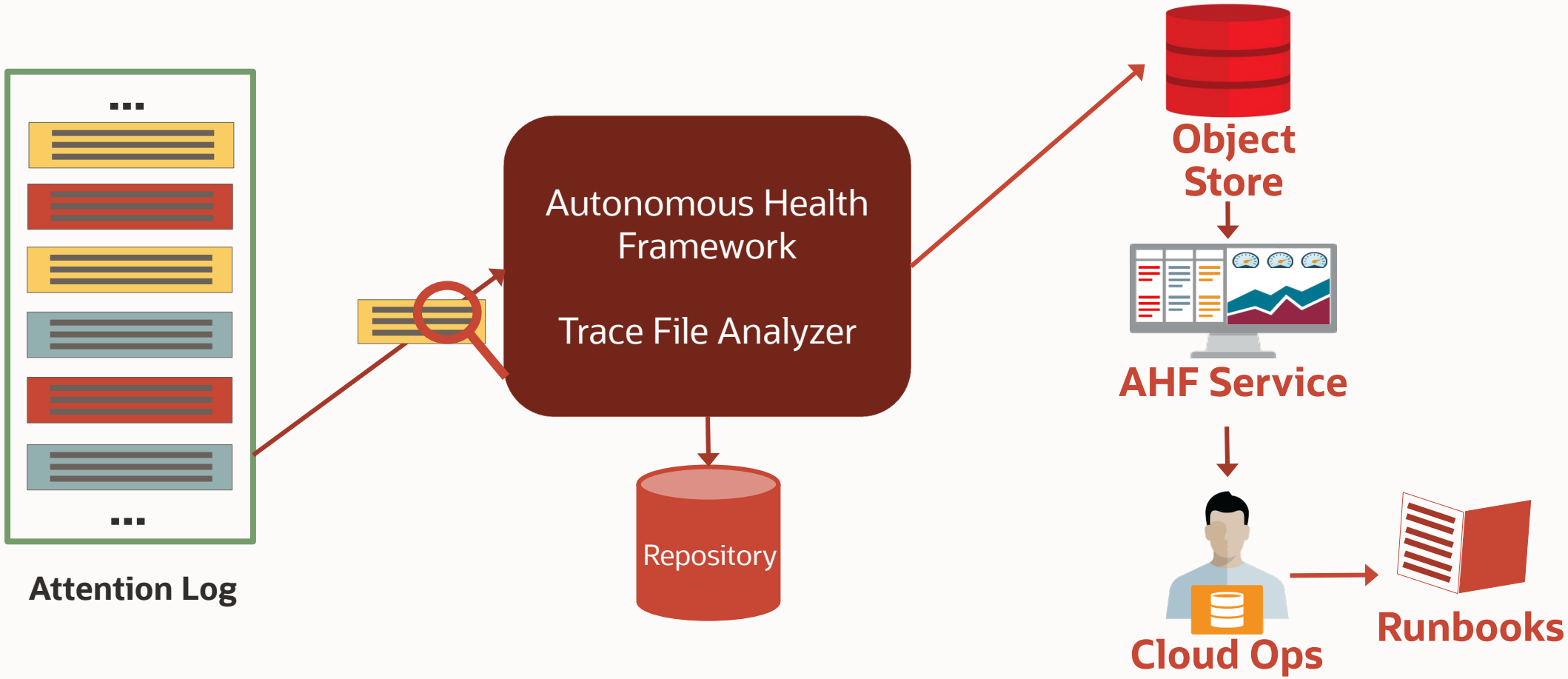
# Attention Log Use Cases – AHF + OCI Integration

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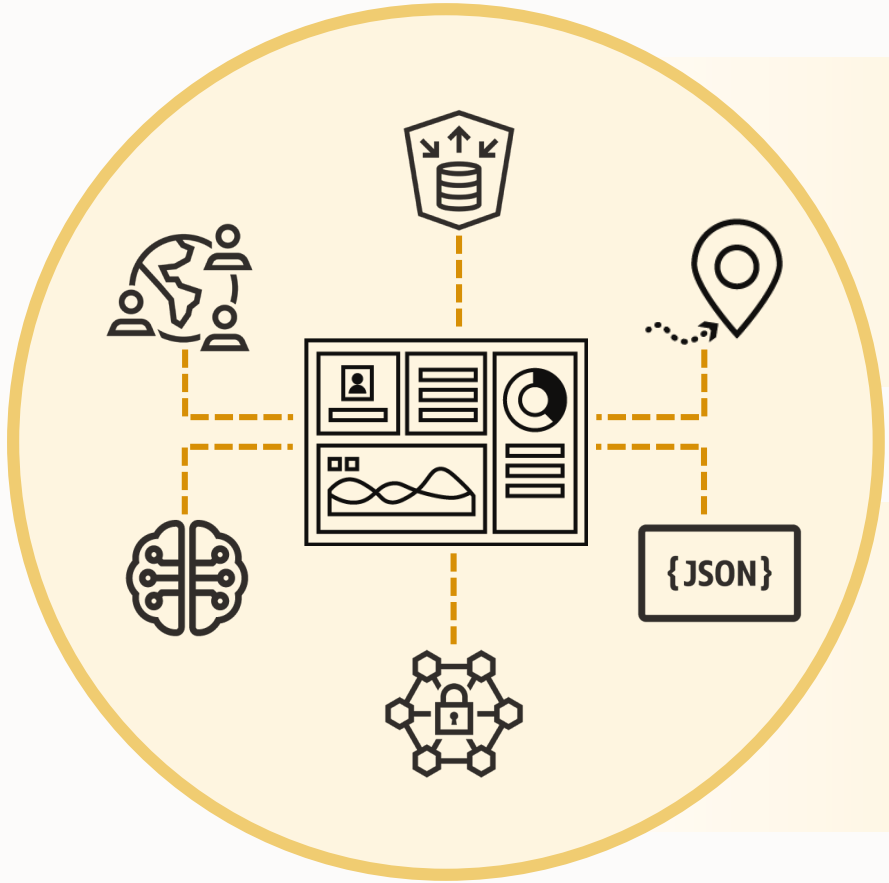
# AHF uses all of 23c Database Features




Machine Learning

Real-Time Analytics

IoT

Graph Analysis

{JSON}

Documents

Text Search

Spatial Processing

Blockchain

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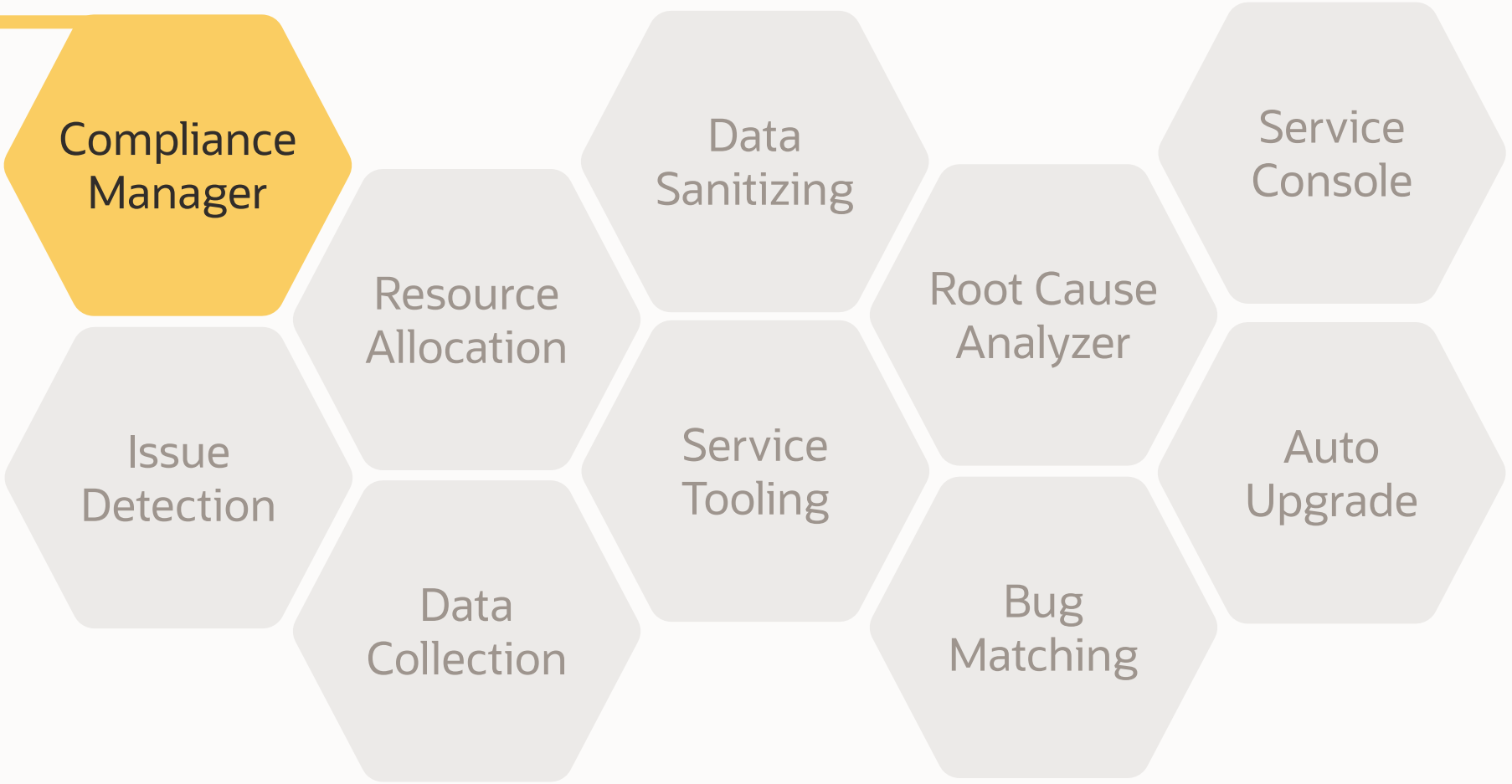
# What is AHF

- Compliance management
- Around 4000+ best practices
- Covers Exadata and security
- Constant Cadence of features

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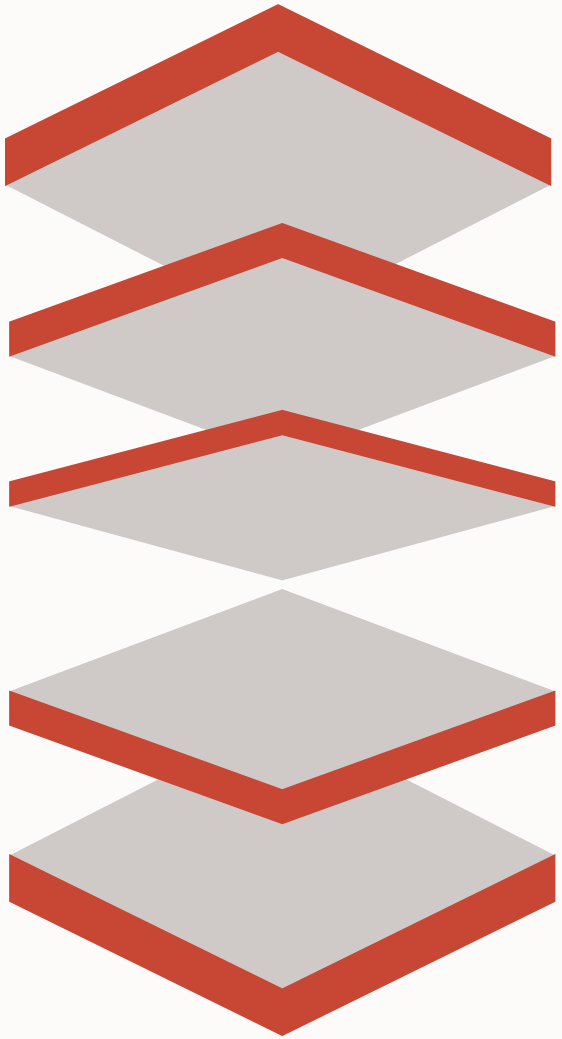
# Development methodology

## Building compliance with best practices



1. **Idea**
   Reports from development, testing, support etc
2. **Expert review**
   Weekly meetings to review and test
3. **MOS Note 757552.1**
   Published Exadata best practices
4. **Default deployment**
   Bake best practices back in to default deployment
5. **AHF compliance check**
   Generation of new checks

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# Ways to run compliance checks

## Limit checks

**`-profile`**

One or more of 40+ different component focused check categories

## Upgrade readiness

**`-Database`**

**`-GI`**

**`-ODA`**

**`-Exadata`**

**`-ODA`**

## Limit targets

**`-cells`**

**`-clusternodes`**

**`-ibswitches`**

**`-dbnames`**

## Security assessment

`Default password for OS and database users`

`Database security checks using DBSAT`

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# Oracle Exadata Assessment Report

# System Health Score is 88 out of 100 (detail)

## Cluster Summary

| | |
|---|---|
| **Cluster Name** | Cluster-c1 |
| **OS/Kernel Version** | LINUX X86-64 OELRHEL 7 4.14.35-1902.5.1.2.el7uek.x86_64 |
| **CRS Home - Version** | /u01/app/19.0.0.0/grid - 19.0.0.0.0 |
| **DB Home - Version - Names** | /u01/app/oracle/product/19.0.0.0/dbhome_1 - 19.0.0.0.0 - 3 databases<br>/u01/app/oracle/product/18.0.0.0/dbhome_1 - 18.0.0.0.0 - 2 databases<br>/u01/app/oracle/product/12.2.0.1/dbhome_1 - 12.2.0.1.0 - 4 databases<br>/u01/app/oracle/product/12.1.0.2/dbhome_1 - 12.1.0.2.0 - 6 databases<br>/u01/app/ora11g/product/11.2.0.4/dbhome_1 - 11.2.0.4.0 - 2 databases |
| **Exadata Version** | 19.3.0.0.0 |
| **Number of nodes** | 7 |
| **Database Servers** | 2 |
| **Storage Servers** | 2 |
| **IB Switches** | 3 |
| **EXAchk Version** | 20.1.0(BETA)_20200219 |
| **Collection** | exachk_ random1client01_PDB19C_021920_13347 |
| **Duration** | 50 mins, 33 seconds |
| **Executed by** | root |
| **Arguments** | -showpass -show_critical -dball -c X4-2,EXAMAA |
| **Collection Date** | 19-Feb-2020 13:59:45 |

**Please Note!**

- There are 14 flagged critical checks, 30 flagged failed checks , 15 flagged warning checks, 18 flagged info checks. By default it displays the most severe ones. To display other checks, please select the corresponding alert level checkbox.
- This version of EXAchk is considered valid for 180 days from today or until a new version is available
- WARNING! EXAchk was unable to connect to few nodes. This condition will result in missing data and an incomplete EXAchk report. Click on "Skipped Nodes" link in Table of contents to see list of nodes. Investigate why these nodes could not be pinged from the database server where EXAchk was launched, and take corrective action, followed by another EXAchk run.

## Database Server

| Status | Type | Message | Status On | Details |
|---|---|---|---|---|
| CRITICAL | OS Check | System is exposed to Exadata Critical Issue EX57 | All Database Servers | View |
| CRITICAL | OS Check | System is exposed to Exadata critical issue DB43 | All Database Servers | View |
| FAIL | SQL Parameter Check | Database parameter PARALLEL_ADAPTIVE_MULTI_USER is not set to recommended value | sing11g | View |
| FAIL | Database Check | There should be no duplicate parameter entries in the database init.ora(spfile) file | All Databases | View |
| WARNING | Database Check | Local listener init parameter is not set to local node VIP | random1client02:sing12c, random1client02:cdbm18c | View |
| WARNING | OS Check | Free space in root(/) filesystem is less than recommended. | random1client02 | View |
| INFO | OS Check | Exadata Critical Issues (Doc ID 1270094.1):- DB1-DB4,DB6,DB9-DB44, EX1-EX60 and IB1-IB3,IB5-IB8 | All Database Servers | View |
| INFO | Database Check | One or more non-default AWR baselines should be created | All Databases | View |
| PASS | Database Check | The bundle patch version installed matches the bundle patch version registered in the database | random1client02:sing12c | View |
| PASS | Patch Check | Patch 16618055 is applied on RDBMS_HOME | All Homes | View |
| PASS | ORACLE_HOME Check | Same bundle patch is installed on GRID_HOME and RDBMS_HOME | All ORACLE_HOME's | View |
| PASS | SQL Parameter Check | Exadata optimized incremental backup is enabled | All Instances | View |
| PASS | SQL Parameter Check | Database initialization parameter PFILE is set to recommended value | All Instances | View |
| PASS | Database Check | The bundle patch version installed matches the bundle patch version registered in the database | All Databases | View |
| PASS | SQL Parameter Check | Database parameter processes is set to recommended value | All Instances | View |
| PASS | SQL Parameter Check | Database parameter PARALLEL_ADAPTIVE_MULTI_USER is set to recommended value | cdbm1211 rac1_1 rac11g1 rac12c1 rac11g2 more | View |
| PASS | Database Check | The recommended patches for Adaptive features are installed | All Databases | View |

# Collection Manager

Oracle Health Checks Collection Manager

guest | Home | Help | My Oracle Support | Logout

Home | Collections | Report View | Incidents | Audit Checks | Administration

Data Interval: 1 Year | Business Unit: All Business Unit | System: All System | Health Score <= 100 | Refresh

## Checks reported with the most failures

- Verify Hidden Database Initialization Parameter Usage **Failed 125 times**
- log_buffer **Failed 94 times**
- Flashback database on primary **Failed 84 times**
- Primary database protection with Data Guard **Failed 84 times**
- Verify the Fast Recovery Area (FRA) has reclaimable space **Failed 82 times**
- Check alerthistory for stateful alerts not cleared [Storage **Failed 70 times**
- Verify Hardware and Firmware on Database and Storage Servers **Failed 65 times**
- Check alerthistory for non-test open stateless alerts [Stora **Failed 63 times**

## Recent Collections

- 98% | 1 | 3 | 1 | 137 | 0 etc12m7dbadm0101 swboe 102821 020328 autostart client exatier1 [ 21.3.0 / root ] created 3 months ago
- 93% | 12 | 13 | 17 | 276 | 0 etc12m7dbadm0101 swboe 102821 01057 [ 21.3.0 / root ] created 3 months ago
- 95% | 1 | 1 | 1 | 27 | 0 scam02db01vm01 102621 093634 [ 21.3.0(beta) / root ] created 3 months ago
- 95% | 1 | 1 | 1 | 27 | 0 scam02db01vm01 102621 06217 [ 21.3.0(beta) / root ] created 3 months ago
- 96% | 2 | 1 | 1 | 60 | 0 scam02db01vm01 CDB11 102621 020343 autostart client exatier1 [ 21.3.0(beta) / root ] created 3 months ago
- 95% | 1 | 1 | 1 | 27 | 0 scam02db01vm01 102521 235037 [ 21.3.0(beta) / root ] created 3 months ago
- 95% | 1 | 1 | 1 | 27 | 0 scam02db01vm01 102521 094310 [ 21.3.0(beta) / root ] created 3 months ago
- 0% | 1 | 0 | 0 | 0 | 0 busm01client02 sing12c 090921 033855 [ 21.3.0(dev) / root ] created 4 months ago

## Checks reported with the most warnings

- Database init parameter DB_BLOCK_CHECKING **Warned 175 times**
- Verify Platform Configuration and Initialization Parameters **Warned 60 times**
- Verify Non-Default Database Services Were Created for Each D **Warned 46 times**
- Verify rman controlfile autobackup is set to ON **Warned 38 times**
- High Redundancy Controlfile **Warned 33 times**
- Free space in root file system **Warned 31 times**
- Local listener set to node VIP **Warned 30 times**
- pre_page_sga **Warned 30 times**

## Recent Activity

- Ticket db_block_checksum created by **kavitha.dhanasekar** 3 months ago
- Ticket Flashback database on primary created by **kavitha.dhanasekar** 3 months ago
- Ticket exachk_cetrain19_sidb_092713_163750 created by **kavitha.dhanasekar** 3 months ago
- Ticket Primary database protection with Data Guard created by **kavitha.dhanasekar** 3 months ago

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Data Interval 5 Year | Business Unit All Business Unit | System All System | Health Score <= 100 | Refresh

## Filters

Apply Filters | Reset Page

Collection Name: etc12m7dbadm0101 swboe 102821 020328 autostart cl

Status: -- Select Status --

Host Name: -- Select Host --

Search ( Searches "Check Name" Column)

DB Version: -- Select DB Version --

Platform: -- Select OS Platform --

DB Name: -- Select DB Name --

Search By Check Id

## Collection Details

## Audit checks

Ignore Selected | Undo Ignore | Raise Ticket On Collection | HTML Report | Diff Html Report

1 - 150

| Check Name | Status | Status Message | Hostname | Instance Name | Database Name |
|---|---|---|---|---|---|
| Exadata Critical Issue EX22 | PASS | System is not exposed to Exadata Critical Issue EX22 | etc12m7celadm03 | NA | None |
| Exadata Critical Issue DB36 | PASS | System is not exposed to Exadata Critical Issue DB36 /u01/app/12.1.0.2/grid | etc12m7dbadm0101 | NA | None |
| Exadata Critical Issue DB39 | PASS | System is not exposed to Exadata Critical Issue DB39 | etc12m7dbadm0101 | NA | None |
| Exadata Critical Issue IB6 | PASS | System is not exposed to Exadata Critical Issue IB6 on infiniband switch etc12m7sw-ibs0 | etc12m7dbadm0101 | NA | None |
| Exadata Critical Issue IB6 | PASS | System is not exposed to Exadata Critical Issue IB6 on infiniband switch etc12m7sw-ibb0 | etc12m7dbadm0101 | NA | None |
| Exadata Critical Issue IB6 | PASS | System is not exposed to Exadata Critical Issue IB6 on infiniband switch etc12m7sw-iba0 | etc12m7dbadm0101 | NA | None |
| Verify there are no files present that impact normal firmware update procedures [Storage Server] | PASS | There are no files present that impact normal firmware update procedures | etc12m7celadm03 | NA | None |
| Verify there are no files present that impact normal firmware update procedures [Storage Server] | PASS | There are no files present that impact normal firmware update procedures | etc12m7celadm03 | NA | None |
| Verify there are no files present that impact normal firmware update procedures [Storage Server] | PASS | There are no files present that impact normal firmware update procedures | etc12m7celadm03 | NA | None |
| Exadata Database Server rolling switch patching minimum GI software requirement | PASS | Exadata Database Server GI software version meets requirement for rolling switch patching | etc12m7dbadm0101 | NA | None |
| Exadata critical issue DB25 | PASS | System is not exposed to Exadata critical issue DB25 for swboe | etc12m7dbadm0101 | NA | swboe |
| Recovery and Create File Destinations | PASS | Database DB_CREATE_FILE_DEST and DB_RECOVERY_FILE_DEST are in different diskgroups for swboe | etc12m7dbadm0101 | NA | swboe |
| Exadata Critical issue EX16 | PASS | System is not exposed to Exadata critical issue EX16 | etc12m7celadm03 | NA | None |
| Exadata Critical issue EX16 | PASS | System is not exposed to Exadata critical issue EX16 | etc12m7celadm03 | NA | None |
| Exadata Critical issue EX16 | PASS | System is not exposed to Exadata critical issue EX16 | etc12m7celadm03 | NA | None |
| Exadata Critical Issue EX42 | PASS | System is not exposed to Exadata critical issue EX42 | etc12m7celadm03 | NA | None |
| Exadata Critical Issue EX42 | PASS | System is not exposed to Exadata critical issue EX42 | etc12m7celadm03 | NA | None |
| Exadata Critical Issue EX41 | PASS | System is not exposed to Exadata critical issue EX41 | etc12m7celadm03 | NA | None |

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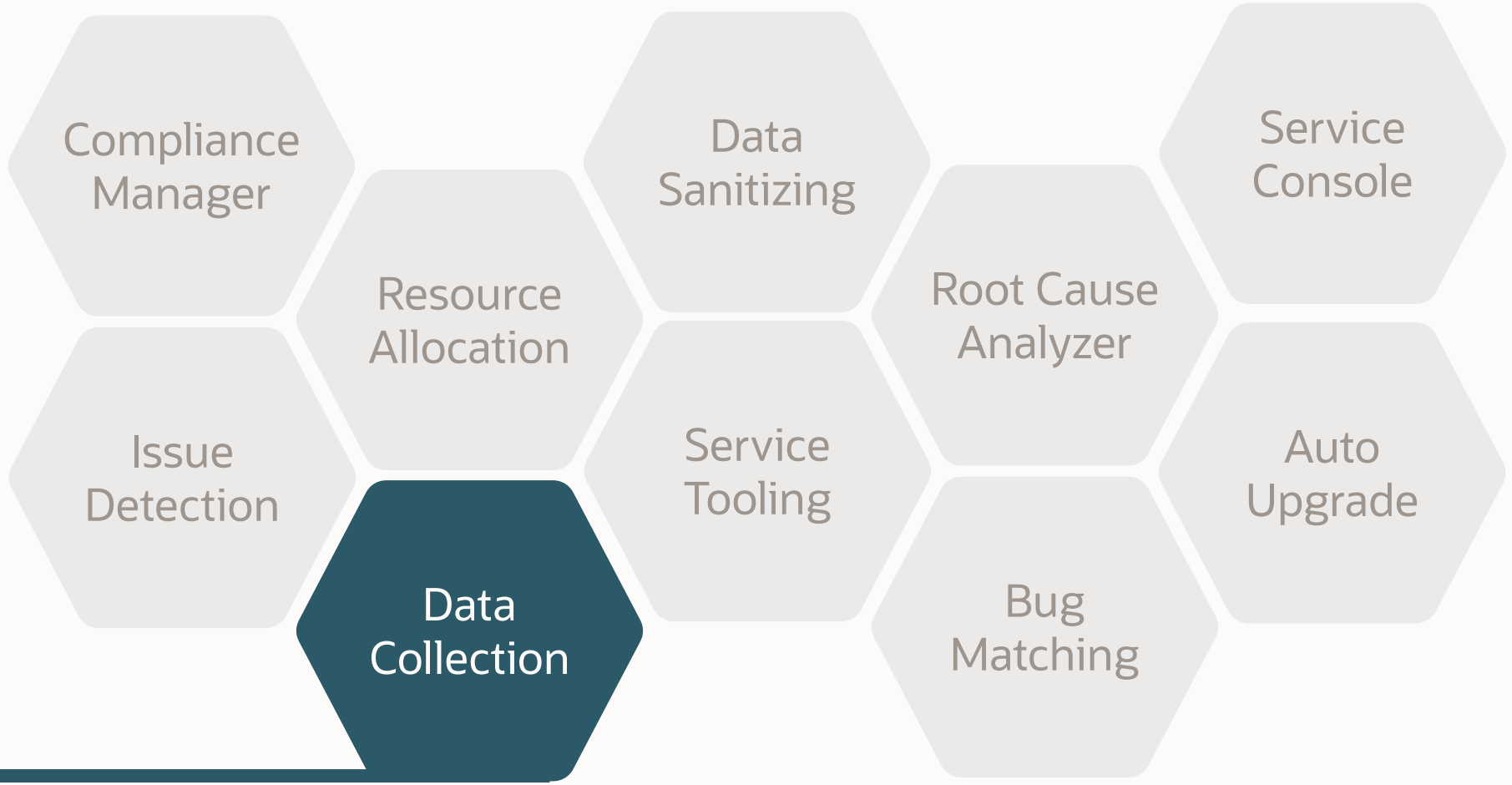
# What is AHF

- First Failure Capture
- Telemetry capture, streaming
- Diagnostic log collection
- OS and Database metrics
- Collection standardization
- Rudimentary aggregation and analysis

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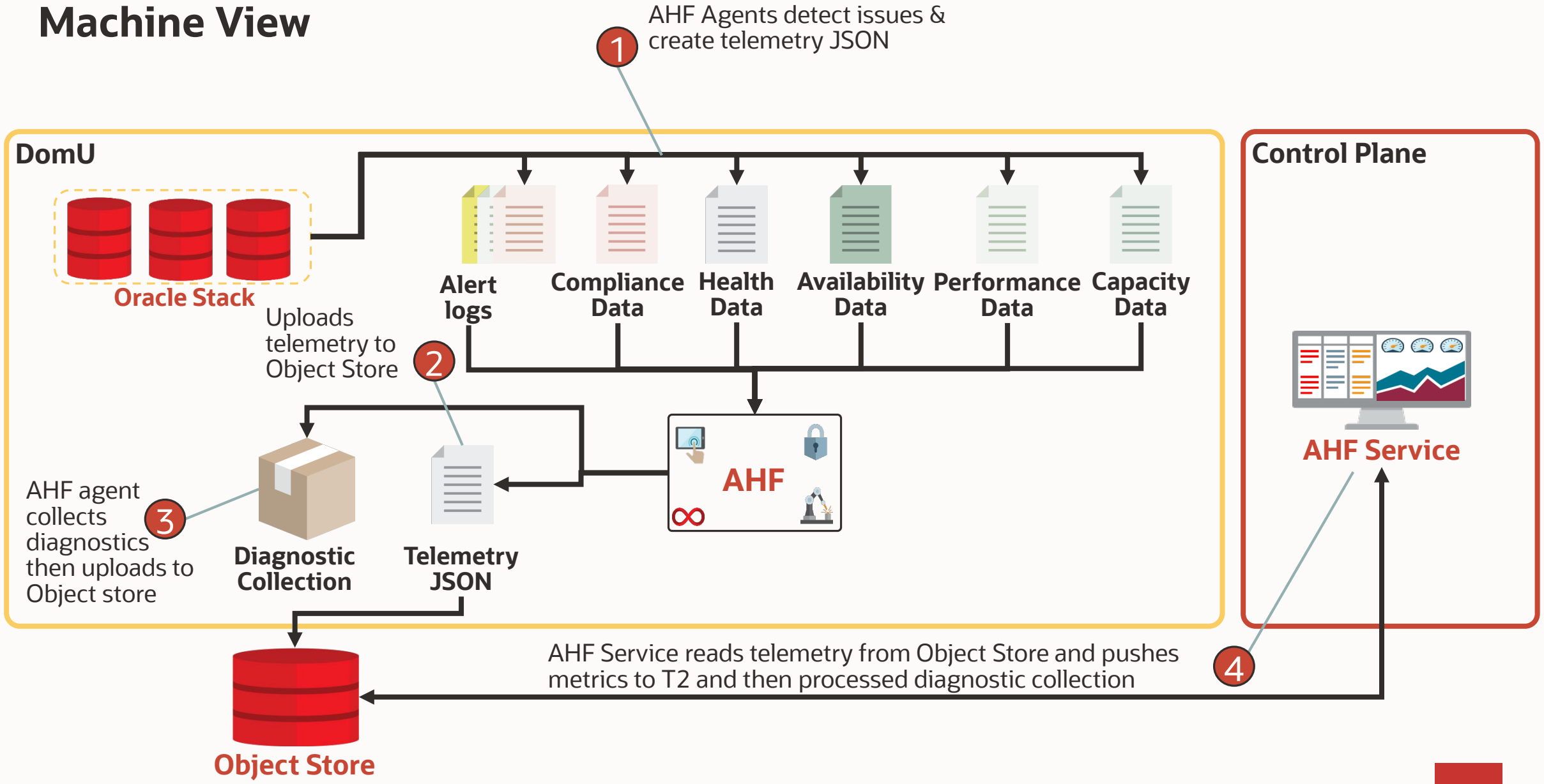
# Machine View

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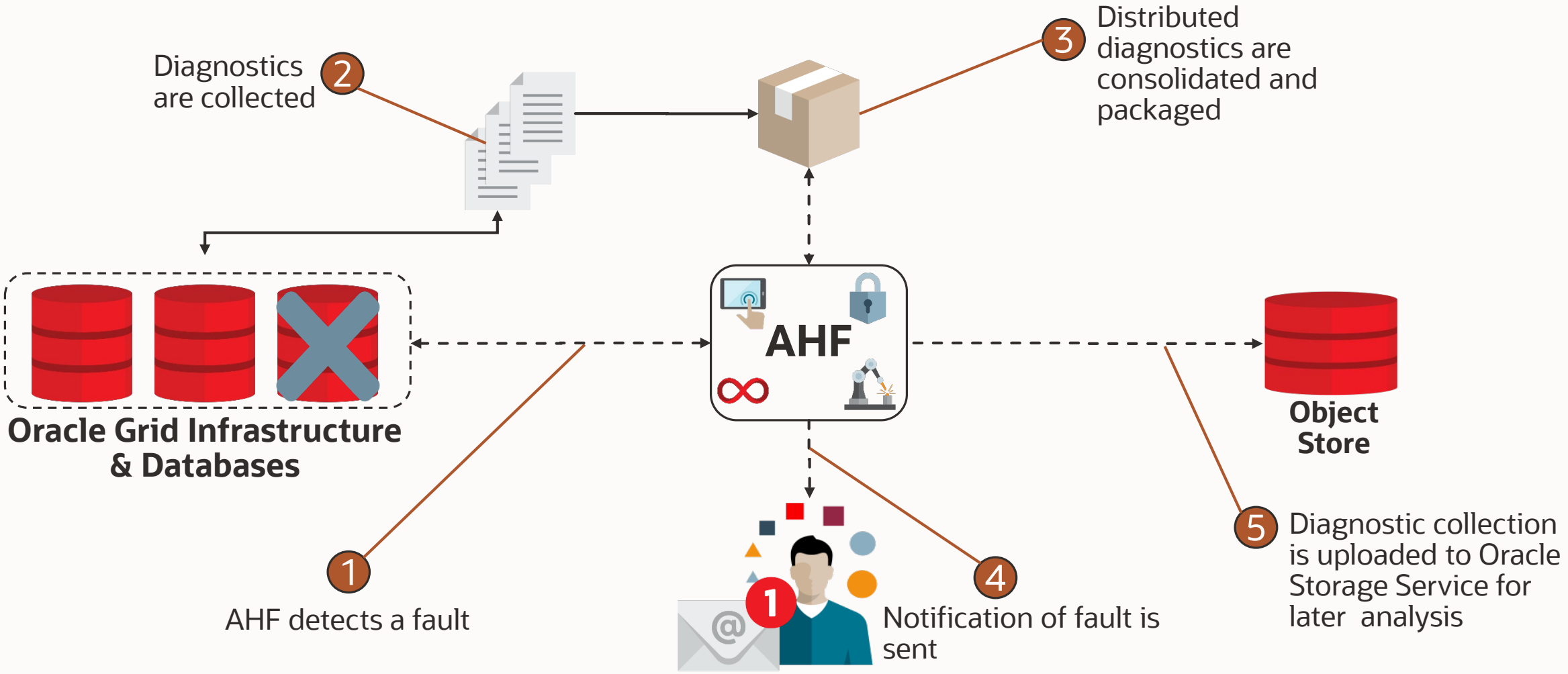
# SRDCs (Service Request Diagnostic Collection)

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# Some problem areas covered in SRDCs

## Around 100 problem types covered

- Database areas
- Errors / Corruption
- Performance
- Install / patching / upgrade
- RAC / Grid Infrastructure
- Import / Export
- RMAN
- Transparent Data Encryption
- Storage / partitioning
- Undo / auditing
- Listener / naming services
- Spatial / XDB
- Other Server Technology
- Enterprise Manager
- Data Guard
- GoldenGate
- Exalogic

Full list in documentation

```
tfactl diagcollect -srdc <srdc_type> [-sr <sr_number>]
```

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# Manual collection vs TFA SRDC for database performance

## Manual method

1. Generate ADDM reviewing Document 1680075.1 (multiple steps)
2. Identify “good” and “problem” periods and gather AWR reviewing Document 1903158.1 (multiple steps)
3. Generate AWR compare report (awrddrpt.sql) using “good” and “problem” periods
4. Generate ASH report for “good” and “problem” periods reviewing Document 1903145.1 (multiple steps)
5. Collect OSWatcher data reviewing Document 301137.1 (multiple steps)
6. Collect Hang Analyze output at Level 4
7. Generate SQL Healthcheck for problem SQL id using Document 1366133.1 (multiple steps)
8. Run support provided sql scripts – Log File sync diagnostic output using Document 1064487.1 (multiple steps)
9. Check alert.log if there are any errors during the “problem” period
10. Find any trace files generated during the “problem” period
11. Collate and upload all the above files/outputs to SR

## TFA SRDC

1. Run

```
tfactl diagcollect -srdc dbperf [-sr <sr_number>]
```

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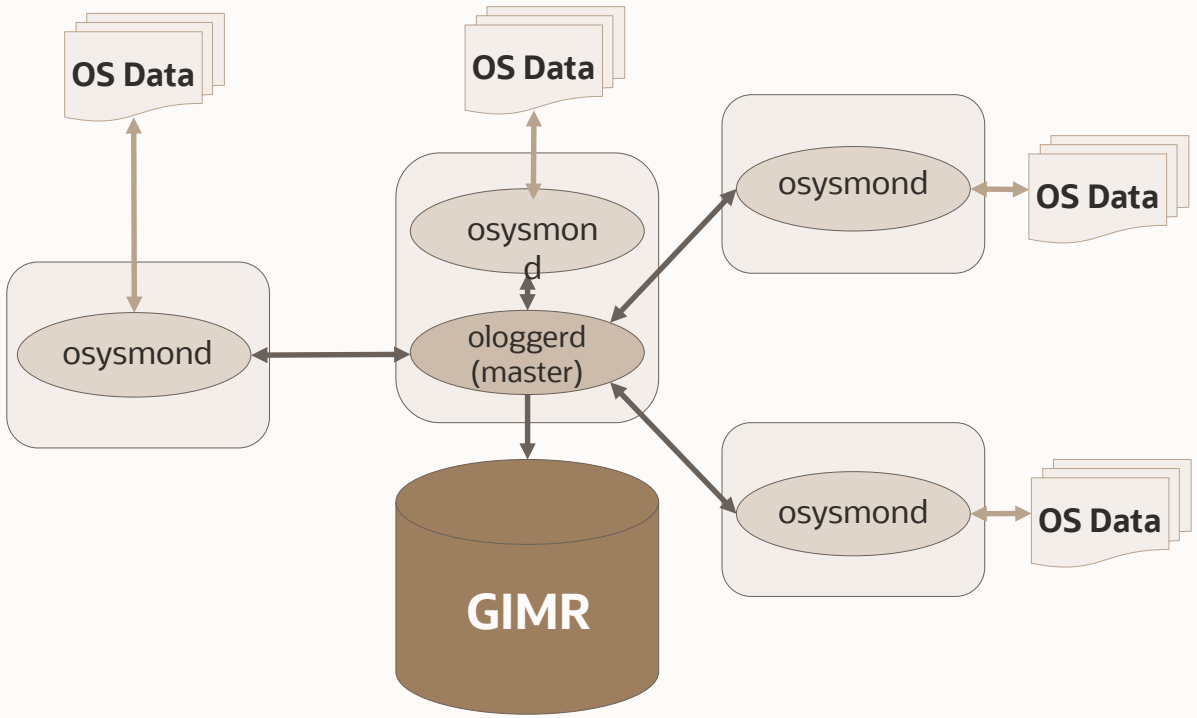
# AHF OS Data Collector

Generates view of Cluster and Database diagnostic metrics

- Always on - Enabled by default
- Provides Detailed OS Resource Metrics
- Assists Node eviction analysis
- Locally logs all process data
- User can define pinned processes
- Listens to CSS and GIPC GI events
- Categorizes processes by type
- Supports plug-in collectors (ex. traceroute, netstat, ping, etc.)
- New CSV output for ease of analysis

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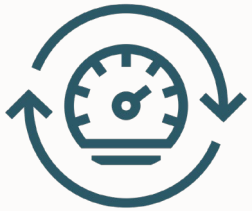
# Automatic AHF upgrade



Automatic upgrade when AHF finds a new version

New versions can be found automatically at:

- The local file system
- REST locations
- Object store locations

On-demand via `ahfctl upgrade`

The latest version can be pulled on-demand from My Oracle Support

AHF will also prompt you to upgrade when it detects it's older than 180 days

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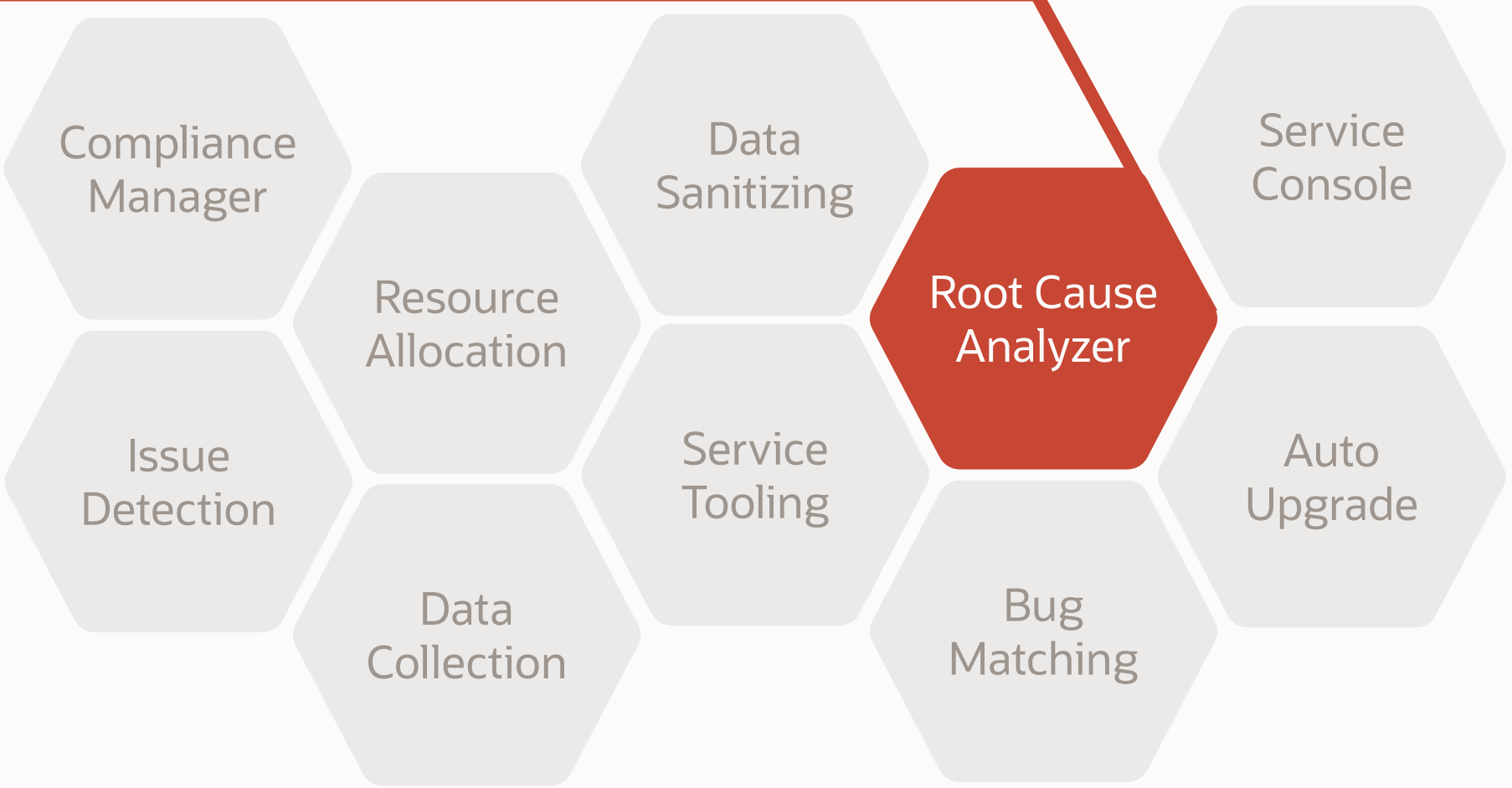
# What is AHF

- Log scanners for obvious issues
- ML models to root cause
- Eliminate non-defect issues
- Recommend Patches

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# Database Health - Applied Machine Learning

Discovers Potential Cluster & DB Problems

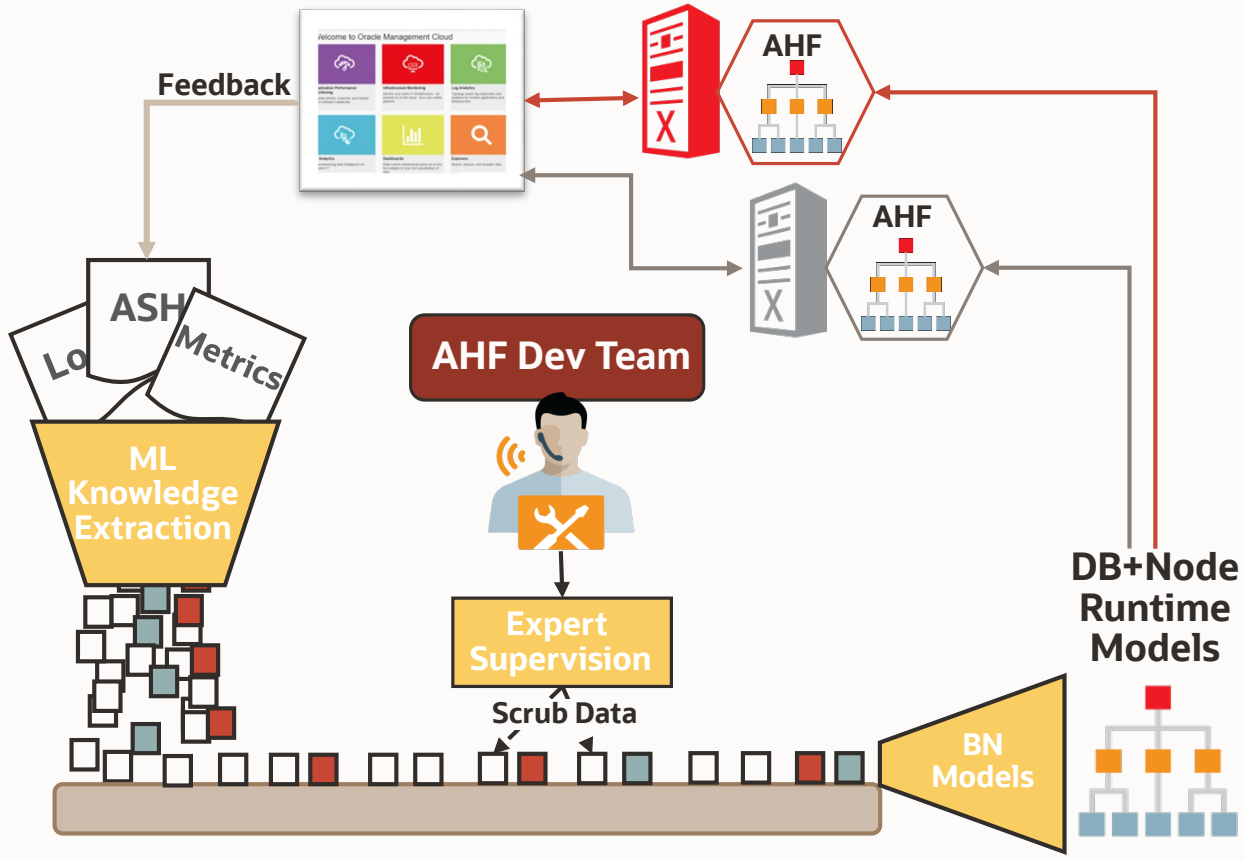
Actual Internal data drives model development

Applied purpose-built Applied ML for knowledge extraction

Expert Dev team scrubs data

Generates Bayesian Network-based diagnostic root-cause models

Uses BN-based run-time models to perform real-time prognostics

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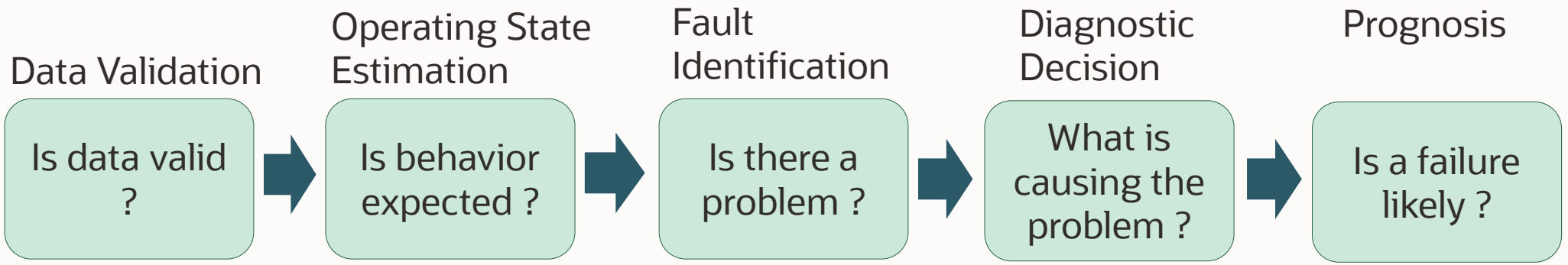
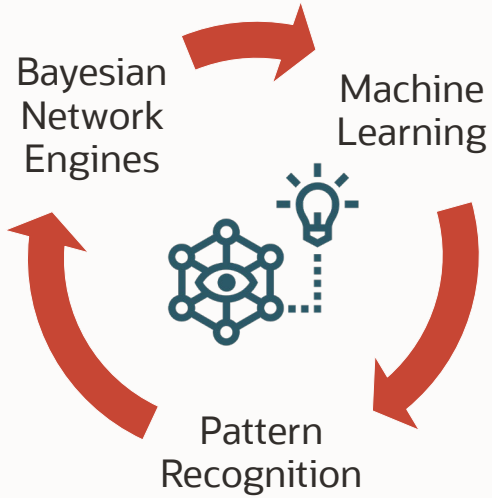
# AHF Anomaly Detection flow

*CHA Operational Flow : Anomaly Detection -> Diagnostics -> Prognosis*

*For each data point …*

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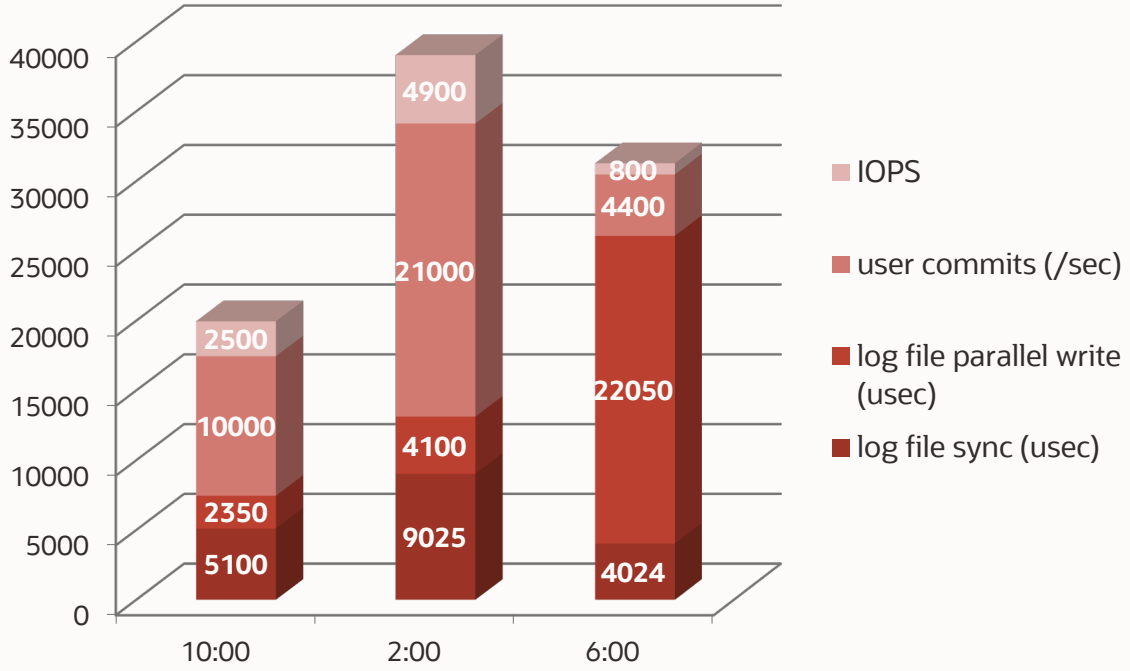
# Models Capture all Normal Operating Modes

## Models Capture the Dynamic Behavior of all Normal Operation




**In-Memory Reference Matrix**
**(*Part of "Normality" Model*)**

| IOPS | #### | 2500 | 4900 | 800 | ##### |
|---|---|---|---|---|---|
| User Commits | #### | 10000 | 21000 | 4400 | ##### |
| Log File Parallel Write | #### | 2350 | 4100 | 22050 | ##### |
| Log File Sync | #### | 5100 | 9025 | 4024 | ##### |
| ... | ... | ... | ... | ... | ... |

A model captures *the **normal load phases*** and their statistics over time , and thus the characteristics for all load intensities and profiles .

During monitoring , ***any data point similar*** to one of the vectors is NORMAL.

One could say **that *the model REMEMBERS the normal operational dynamics over time***

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# AHF Anomaly Detection flow

In-Memory Reference Matrix
(*Part of "Normality" Model*)

| | | | | | |
|---|---|---|---|---|---|
| IOPS | #### | 2500 | 4900 | 800 | ##### |
| User Commits | #### | 10000 | 21000 | 4400 | ##### |
| Log File Parallel Write | #### | 2350 | 4100 | 22050 | ##### |
| Log File Sync | #### | 5100 | 9025 | 4024 | ##### |
| ... | ... | ... | ... | ... | ... |

Observed values
(*Part of a Data Point*)

| |
|---|
| 10500 |
| 20000 |
| 4050 |
| 10250 |
| ... |

Observed - Predicted =

Residual Values
(*Part of a Data Point*)

| |
|---|
| 5600 |
| -1000 |
| -50 |
| 325 |
| ... |

**Estimator/predictor (ESEE):** ***"based on my normality model, the value of IOPS should be in the vicinity of ~ 4900, but it is reported as 10500, this is causing a residual of ~ 5600 in magnitude",***

**Fault detector:** ***"such high magnitude of residuals should be tracked carefully! I'll keep an eye on the incoming sequence of this signal IOPS and if it remains deviant I'll generate a fault on it".***

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# AHF Anomaly Detection flow

*Inline and Immediate Fault Detection and Diagnostic Inference*

**Input : Data Point at Time *t***

| Time | CPU | ASM IOPS | Network % util | Network_Packets Dropped | Log file sync | Log file parallel write | GC CR request | GC current request | GC current block 2-way | GC current block busy | Enq: CF - contention | ... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15:16:00 | 0.90 | 4100 | 88% | 105 | 2 ms | 600 us | 504 ms | 513 ms | 2 ms | 5.9 ms | 0 | |

**Fault Detection and Classification**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15:16:00 | OK | OK | HIGH 1 | HIGH 2 | OK | OK | HIGH 3 | HIGH 3 | HIGH 4 | HIGH 4 | OK | |

**Diagnostic Inference**

15:16:00

**Symptoms**

1. Network Bandwidth Utilization
2. Network Packet Loss
3. Global Cache Requests Incomplete
4. Global Cache Message Latency

Machine Learning, Pattern Recognition, & BN Engines

**Diagnostic Inference Engine**

**Root Cause**
**(Target of Corrective Action)**

→ Network Bandwidth Utilization

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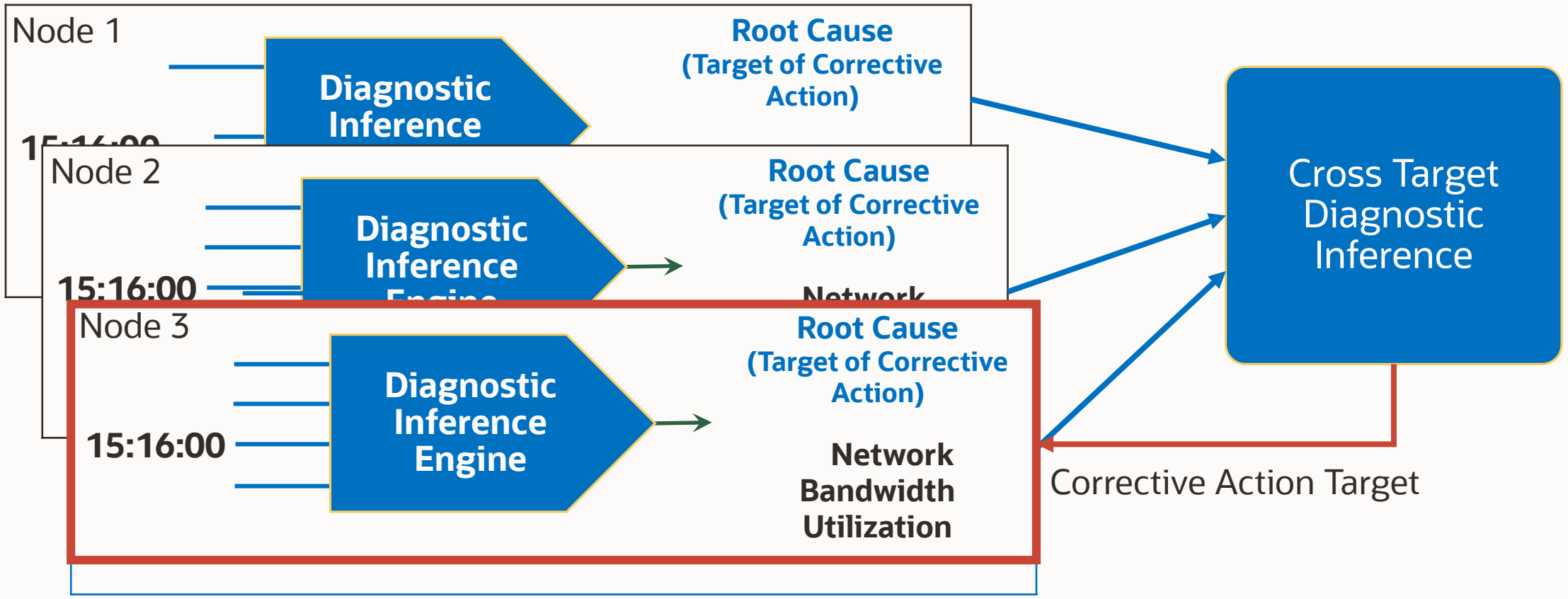
# AHF Anomaly Detection flow

*Cross Node and Cross Instance Diagnostic Inference*

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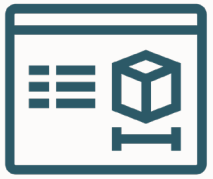
# Some AIOps Use Cases



## Identify Signatures

- Incidents
- Bugs

## Detect anomalies

- Logs
- OS metrics

## Predict

- Resource usage
- Maintenance window
- Performance issues
- Workload Stability

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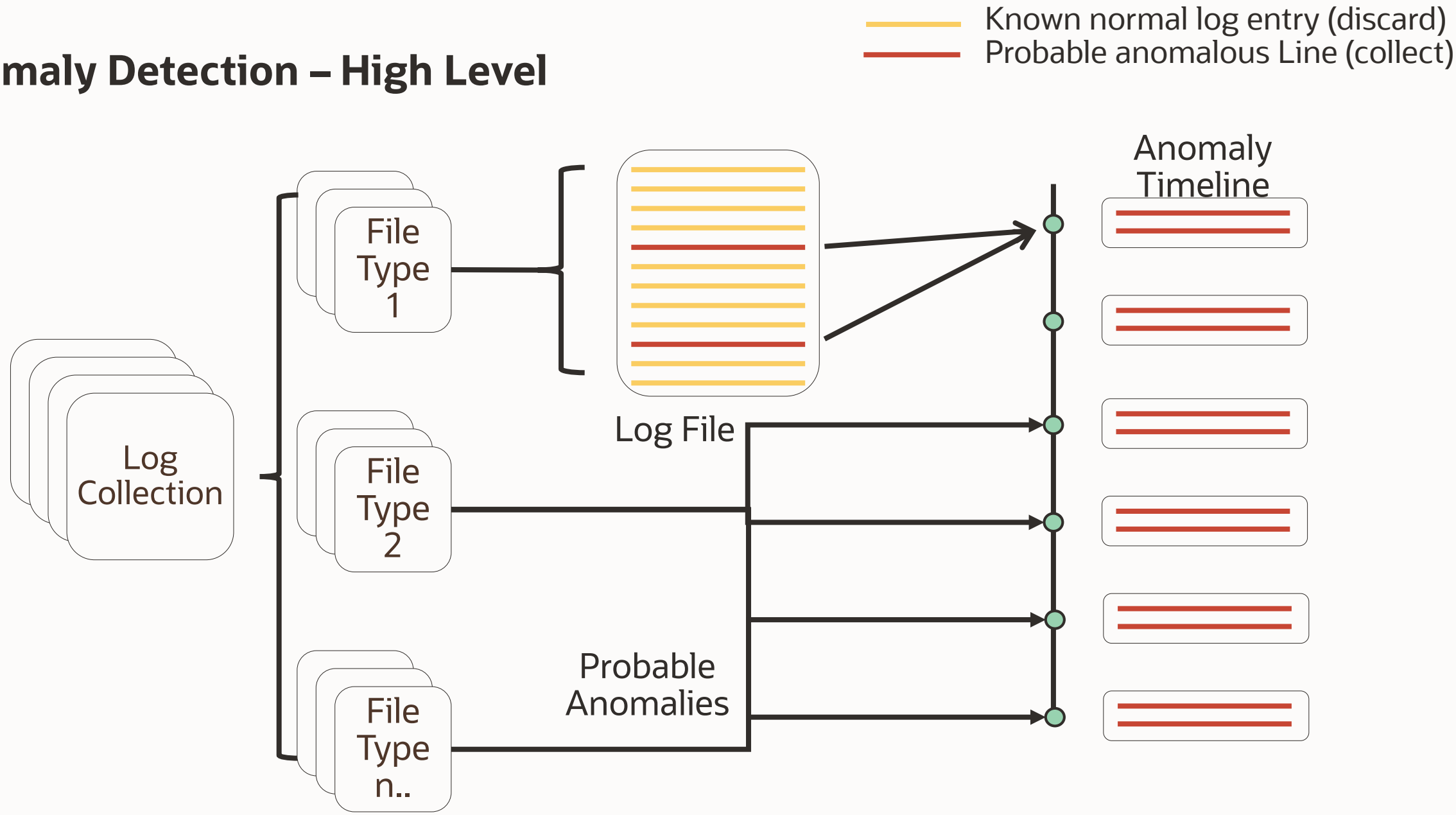
# Anomaly Detection – High Level

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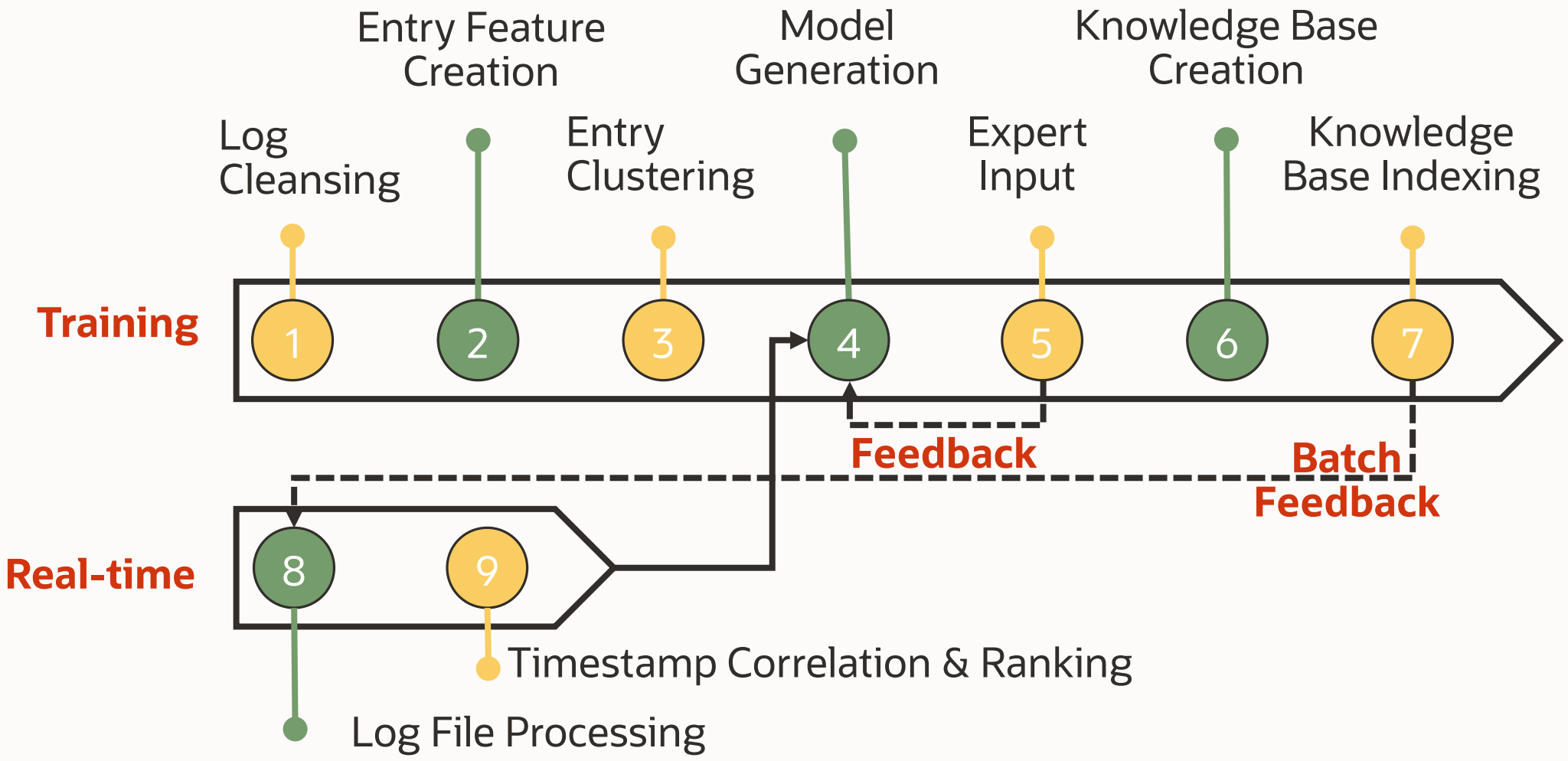
# Trace File Analyzer – High Level Anomaly Detection Flow

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# Drain Algorithm

- Drain is an **online log template miner** that can extract templates (clusters) from a stream of log messages in a timely manner.
- It employs a **parse tree with fixed depth to guide the log group search process**, which effectively avoids constructing a very deep and unbalanced tree.
- Drain continuously **learns on-the-fly and extracts log templates** from raw log entries.
- **Drain Research Paper** :
  - Pinjia He, Jieming Zhu, Zibin Zheng, and Michael R. Lyu. Drain: An Online Log Parsing Approach with Fixed Depth Tree, Proceedings of the 24th International Conference on Web Services (ICWS), 2017.
  - Link : http://jiemingzhu.github.io/pub/pjhe_icws2017.pdf

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# Drain Algorithm – Parameters for Tuning

- Drain Parameters for tuning to the log file type needs.

| Parameter | Description |
|---|---|
| [DRAIN]/sim_th | similarity threshold |
| [DRAIN]/depth | max depth levels of log clusters |
| [DRAIN]/max_children | max number of children of an internal node |
| [DRAIN]/max_clusters | max number of tracked clusters |
| [DRAIN]/extra_delimiters | delimiters to apply when splitting log message into words |
| [MASKING]/masking | parameters masking |
| [SNAPSHOT]/snapshot_interval_minutes | time interval for new snapshots |
| [SNAPSHOT]/compress_state | whether to compress the state before saving it |

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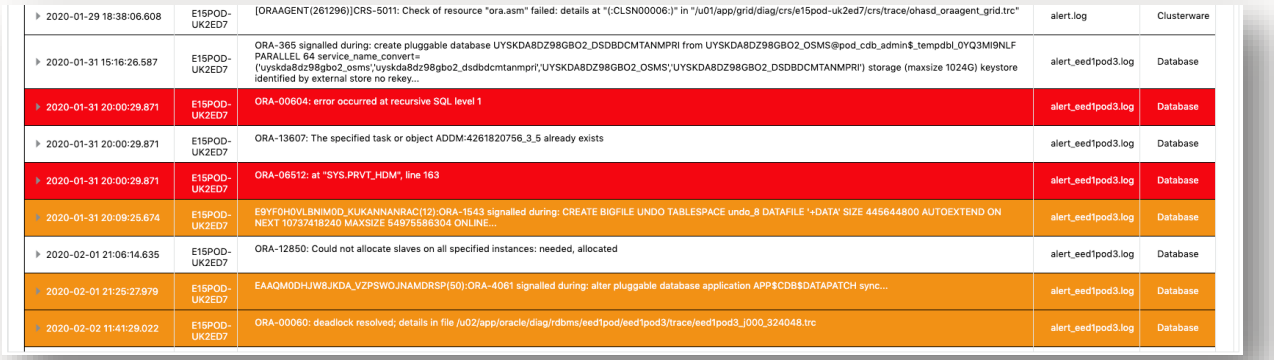
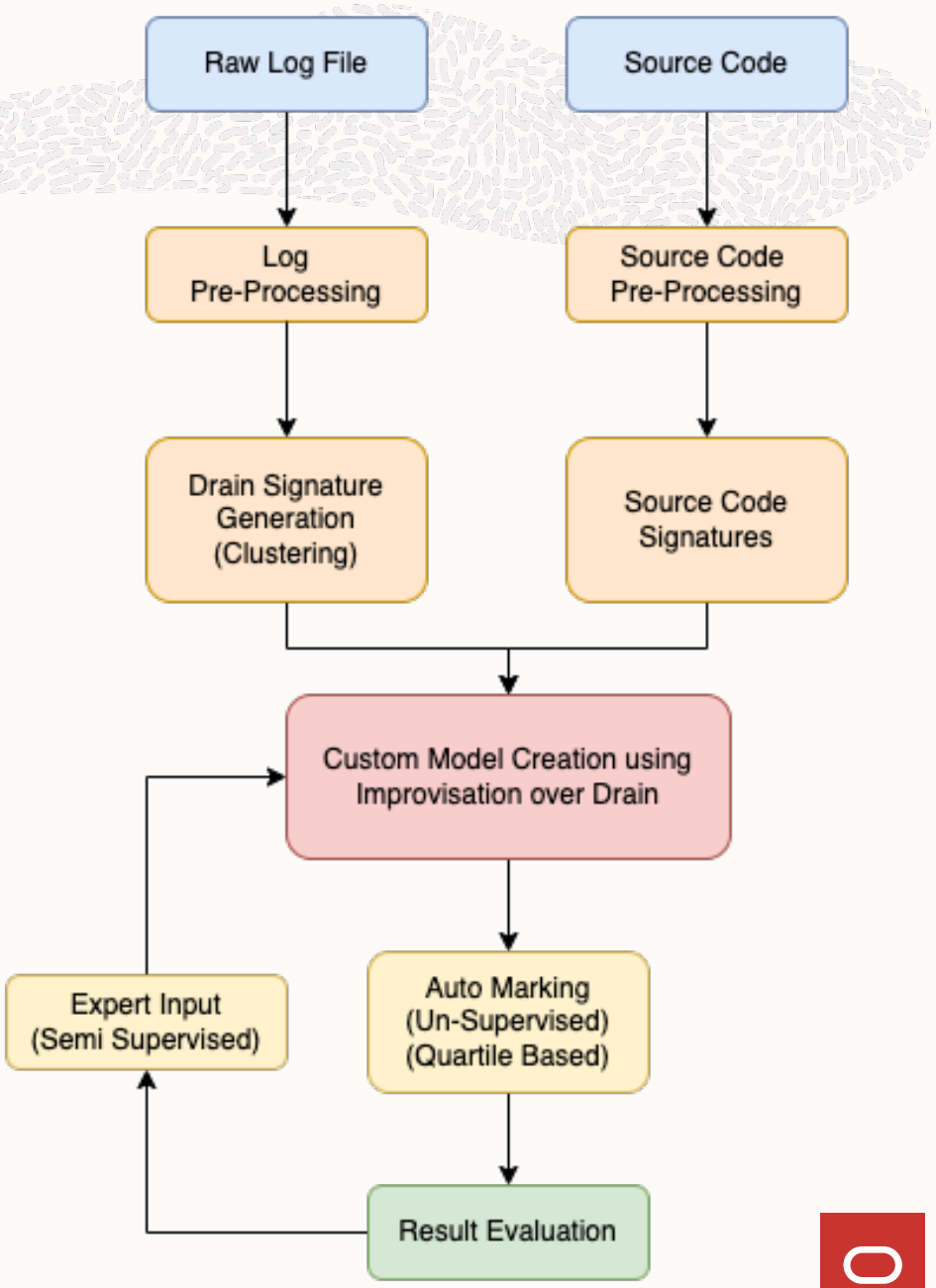
# Our Improvisation over Drain

- Multi level drain signatures
- Association with source code with drain signature for more precise feature capturing
- Interface to tune auto-marking of signatures to view results of parameter changes in real-time.



| | | | | |
|---|---|---|---|---|
| 2020-01-29 18:38:06.608 | E15POD-UK2ED7 | [ORAAGENT(261296)]CRS-5011: Check of resource "ora.asm" failed: details at "(:CLSN00006:)" in "/u01/app/grid/diag/crs/e15pod-uk2ed7/crs/trace/ohasd_oraagent_grid.trc" | alert.log | Clusterware |
| 2020-01-31 15:16:26.587 | E15POD-UK2ED7 | ORA-365 signalled during: create pluggable database UYSKDA8DZ98GBO2_DSDBDCMTANMPRI from UYSKDA8DZ98GBO2_OSMS@pod_cdb_admin$_tempdbl_0YQ3MI9NLF PARALLEL 64 service_name_convert= ('uyskda8dz98gbo2_osms','uyskda8dz98gbo2_dsdbdcmtanmpri','UYSKDA8DZ98GBO2_OSMS','UYSKDA8DZ98GBO2_DSDBDCMTANMPRI') storage (maxsize 1024G) keystore identified by external store no rekey... | alert_eed1pod3.log | Database |
| 2020-01-31 20:00:29.871 | E15POD-UK2ED7 | ORA-00604: error occurred at recursive SQL level 1 | alert_eed1pod3.log | Database |
| 2020-01-31 20:00:29.871 | E15POD-UK2ED7 | ORA-13607: The specified task or object ADDM:4261820756_3_5 already exists | alert_eed1pod3.log | Database |
| 2020-01-31 20:00:29.871 | E15POD-UK2ED7 | ORA-06512: at "SYS.PRVT_HDM", line 163 | alert_eed1pod3.log | Database |
| 2020-01-31 20:09:25.674 | E15POD-UK2ED7 | E9YF0H0VLBNIM0D_KUKANNANRAC(12):ORA-1543 signalled during: CREATE BIGFILE UNDO TABLESPACE undo_8 DATAFILE '+DATA' SIZE 445644800 AUTOEXTEND ON NEXT 10737418240 MAXSIZE 54975586304 ONLINE... | alert_eed1pod3.log | Database |
| 2020-02-01 21:06:14.635 | E15POD-UK2ED7 | ORA-12850: Could not allocate slaves on all specified instances: needed, allocated | alert_eed1pod3.log | Database |
| 2020-02-01 21:25:27.979 | E15POD-UK2ED7 | EAAQM0DHJW8JKDA_VZPSWOJNAMDRSP(50):ORA-4061 signalled during: alter pluggable database application APP$CDB$DATAPATCH sync... | alert_eed1pod3.log | Database |
| 2020-02-02 11:41:29.022 | E15POD-UK2ED7 | ORA-00060: deadlock resolved; details in file /u02/app/oracle/diag/rdbms/eed1pod/eed1pod3/trace/eed1pod3_j000_324048.trc | alert_eed1pod3.log | Database |

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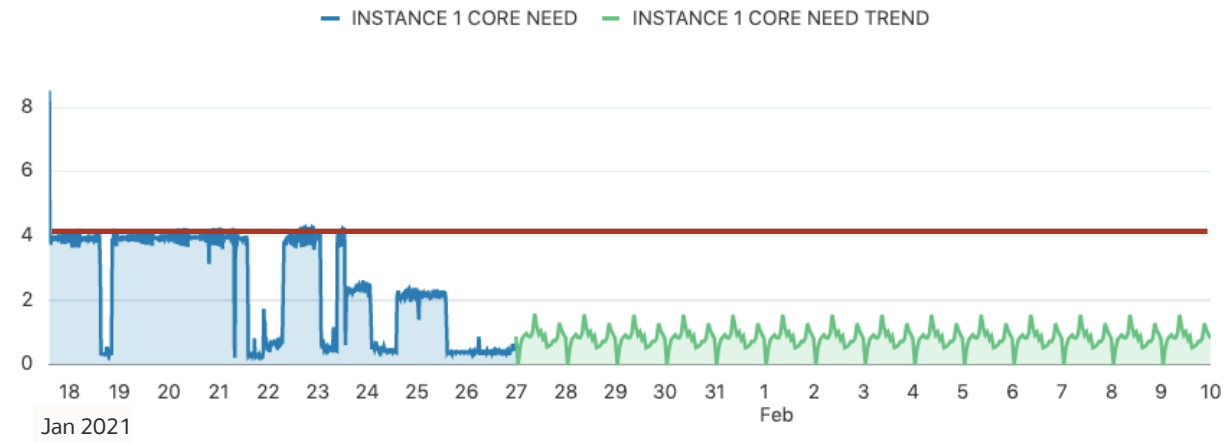
# CPU Usage and forecast

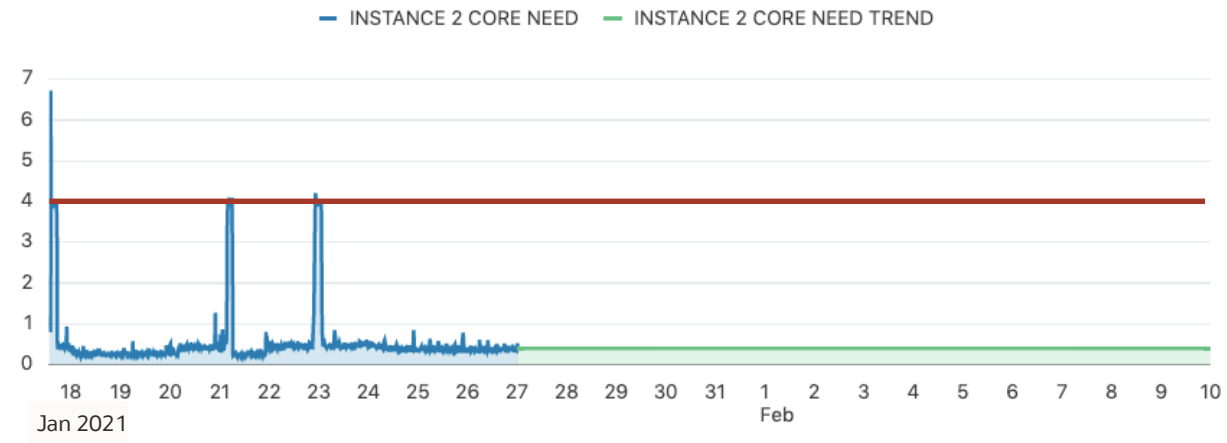
Type CPU Capacity

## Capacity

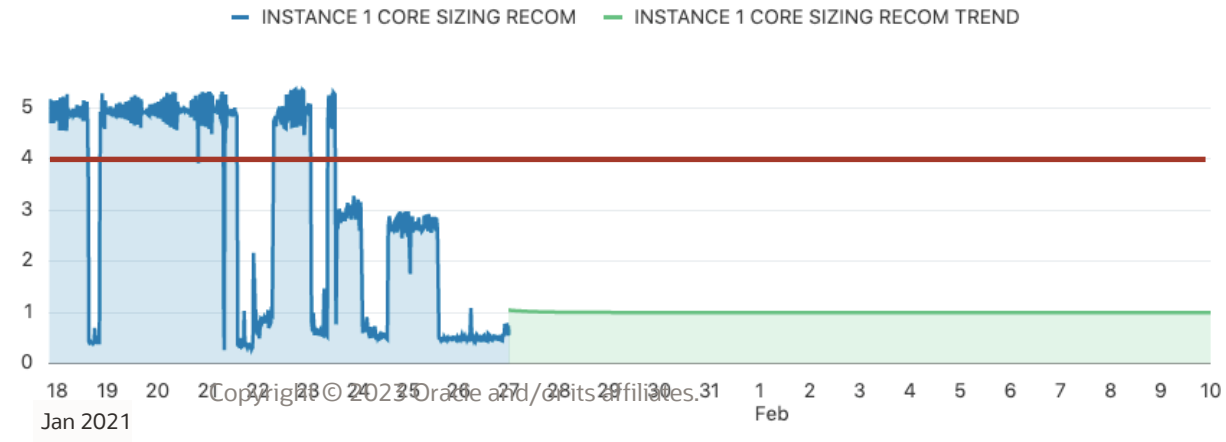
### INSTANCE 1 CORE NEED



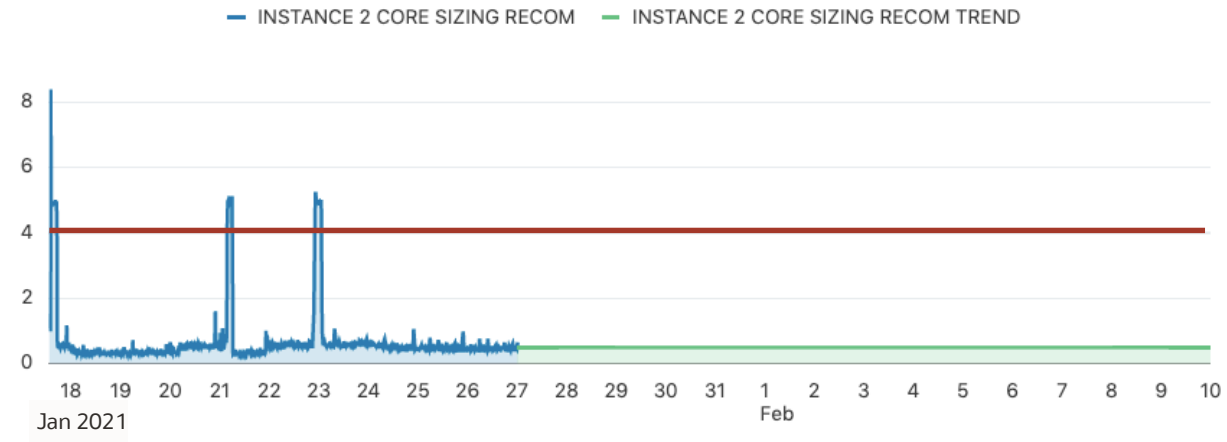

### INSTANCE 2 CORE NEED




### INSTANCE 1 CORE SIZING RECOM




### INSTANCE 2 CORE SIZING RECOM

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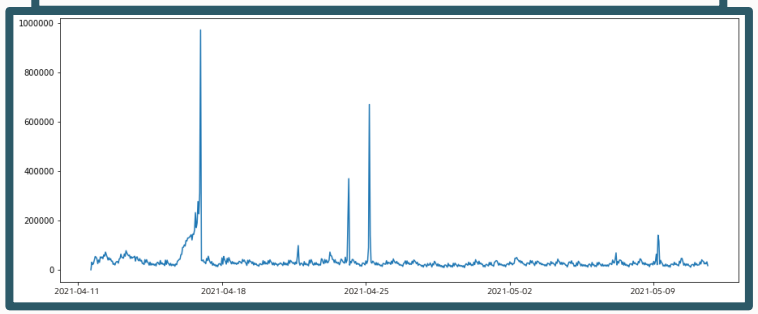
# Seasonality determination to window identification flow

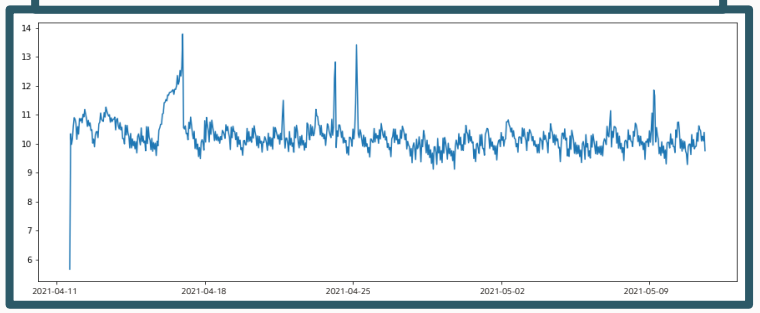
## 1 Original observation data

| START_TIME | CNT |
|---|---|
| 2021-04-11 15:00:00 | 290 |
| 2021-04-11 16:00:00 | 31120 |
| 2021-04-11 17:00:00 | 21530 |
| 2021-04-11 18:00:00 | 26240 |
| 2021-04-11 19:00:00 | 40520 |
| 2021-04-11 20:00:00 | 54270 |
| 2021-04-11 21:00:00 | 51460 |
| 2021-04-11 22:00:00 | 44310 |
| 2021-04-11 23:00:00 | 25690 |



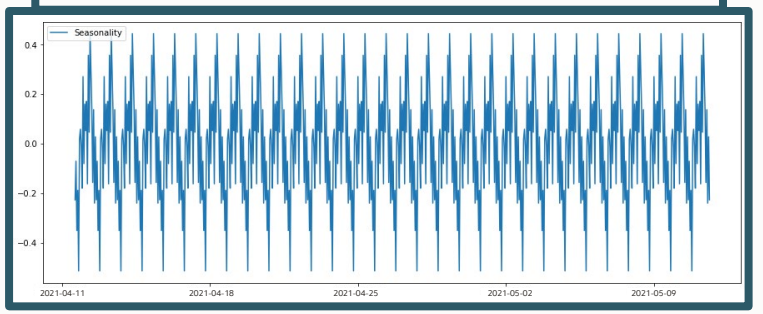

## 2 Convolution filter & average

| START_TIME | |
|---|---|
| 2021-04-11 15:00:00 | 5.669881 |
| 2021-04-11 16:00:00 | 10.345606 |
| 2021-04-11 17:00:00 | 9.977203 |
| 2021-04-11 18:00:00 | 10.175040 |
| 2021-04-11 19:00:00 | 10.609551 |
| 2021-04-11 20:00:00 | 10.901727 |
| 2021-04-11 21:00:00 | 10.848560 |
| 2021-04-11 22:00:00 | 10.698966 |
| 2021-04-11 23:00:00 | 10.153857 |




## 3 Calculate seasonality

| START_TIME | |
|---|---|
| 2021-04-11 15:00:00 | -0.226098 |
| 2021-04-11 16:00:00 | -0.069821 |
| 2021-04-11 17:00:00 | -0.350088 |
| 2021-04-11 18:00:00 | -0.187483 |
| 2021-04-11 19:00:00 | -0.513240 |
| 2021-04-11 20:00:00 | 0.019737 |
| 2021-04-11 21:00:00 | 0.059213 |
| 2021-04-11 22:00:00 | -0.011312 |
| 2021-04-11 23:00:00 | -0.179156 |




## 4 Use seasonality to predict best maintenance window

```
Current Date : 2021-05-12 15:00:00
Current Position in Seasonality : -0.226098297425335 85
Best Maintenance Period in next Cycle : 2021-05-12 19:00:00
Worst Maintenance Period in next Cycle : 2021-05-13 08:00:00
```

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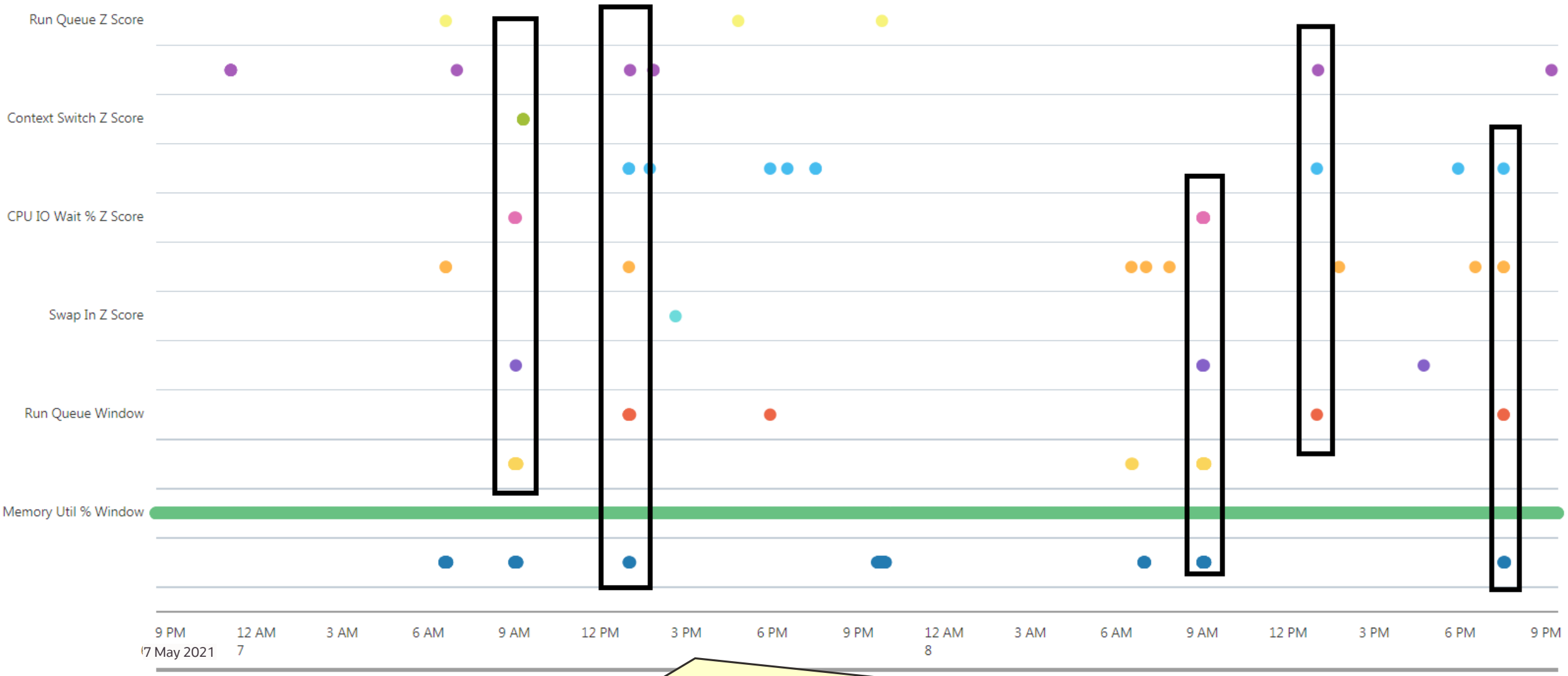


Identifying time periods with high z-score events across multiple metrics

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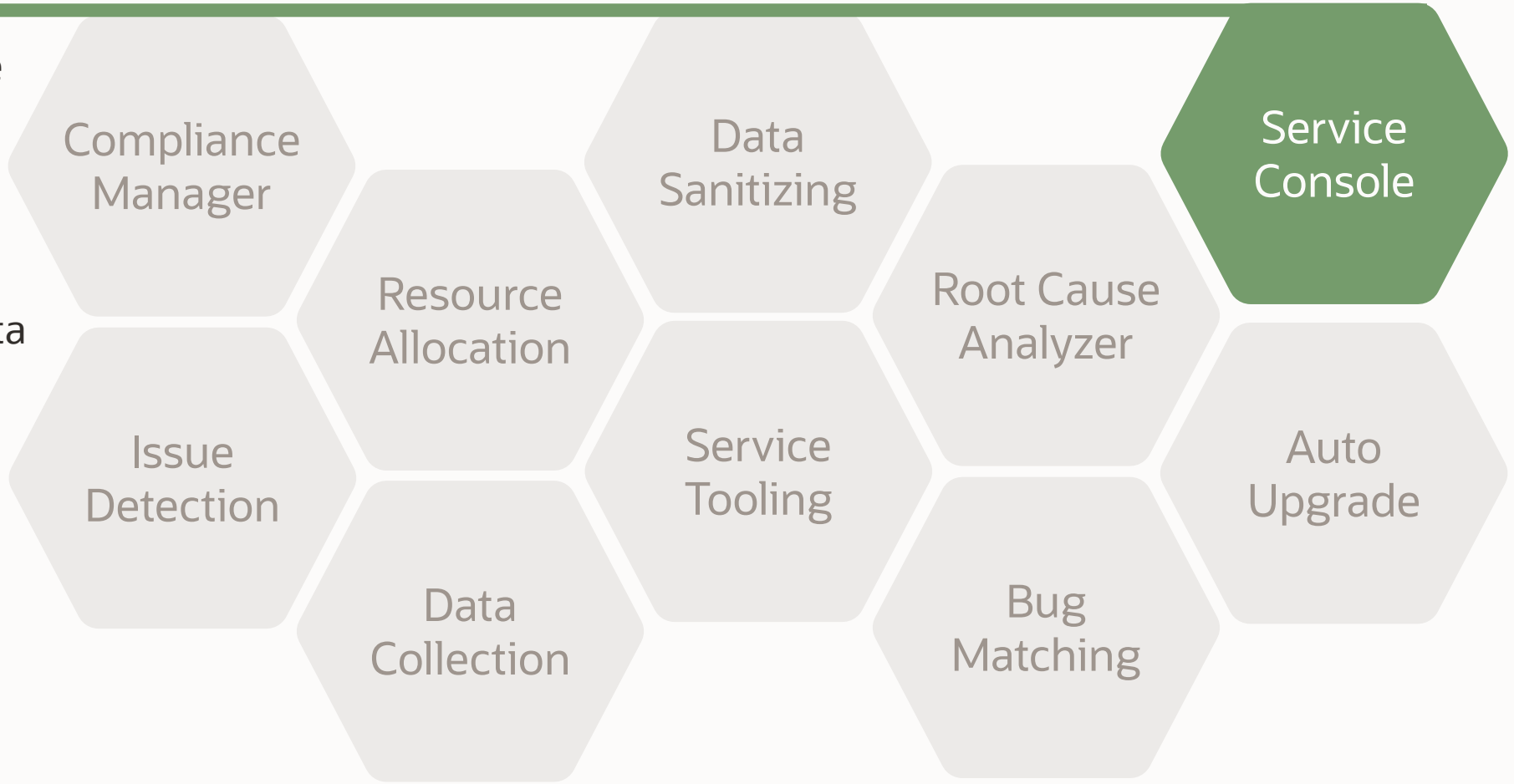
# What is AHF

- Front-end for analysis, cause and solution identification
- Unified Timeline
- Anomaly Detection
- Graphing for Time Series Data
- AHF Insights and Fleet Insights

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# AHF Insights Overview

AHF Insights provides a bird's eye view of the entire system with the ability to further drill down for root cause analysis.

Previously, results from different AHF components were not available in a single dashboard making it challenging to combine and correlate.

To mitigate this, AHF Insights provides a web-based graphical user interface, which does not require a web server to host the web pages, for all diagnostic data collectors and analyzers that are part of AHF Kit.

AHF performs a diagnostic  collection for a given period to analyze the performance of database systems from:

- Configuration
- Environment Topology
- Metrics
- Logs

This diagnostic data collected from the system passes through AHF Insights and produce an offline report.

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# Information Captured

| | |
|---|---|
| **System Topology** | • Resource Information<br>• Resource Configuration<br>• Summarized viewing of resource data |
| **Insights** | • Major events happening on the system<br>• Operating system information and it's analysis<br>• Best practice compliance issues<br>• Software Recommendation<br>• Software / Hardware alerts for Database Server<br>• System changes over last 14 days<br>• RPM details and RPM inconsistencies among hosts<br>• Database Parameters and differences among databases<br>• Kernel Parameters and differences among hosts |

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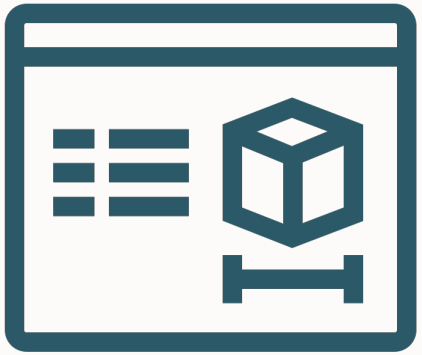
# Prerequisites

- Latest AHF with AHF Insights code
  - Feature available from AHF 22.3 for Exadata Systems
- Required AHF data sources (TFA, Exachk, CHM) should be enabled and running
- 23.4 and higher for RAC Linux and ODA Systems



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# How can I generate it ?

```
[root@adcs11adm01 ~]# tfactl print status

.-------------------------------------------------------------------------------------------.
| Host        | Status of TFA | PID    | Port | Version    | Build ID             | Inventory Status |
+-------------+---------------+--------+------+------------+----------------------+------------------+
| adcs11adm01 | RUNNING       | 279609 | 5000 | 22.3.0.0.0 | 22300020221031131221 | COMPLETE         |
| adcs11adm02 | RUNNING       | 320435 | 5000 | 22.3.0.0.0 | 22300020221031131221 | COMPLETE         |
| adcs11adm03 | RUNNING       | 319559 | 5000 | 22.3.0.0.0 | 22300020221031131221 | COMPLETE         |
| adcs11adm04 | RUNNING       | 349404 | 5000 | 22.3.0.0.0 | 22300020221031131221 | COMPLETE         |
'-------------+---------------+--------+------+------------+----------------------+------------------'


[root@adcs11adm01 ~]# ahf analysis create --type insights --last 2h
Starting analysis and collecting data for insights
Report is generated at : /opt/oracle.ahf/data/repository/collection_Mon_Oct_31_23_11_33_CDT_2022_node_all/adcs11adm01.us.oracle.com_insights_2022_10_31_23_15_11.zip
AHF Insights report is being generated  for the last 2h
Please wait while we are generating the report collection ...
From Date : 10/31/2022 21:11:38 CDT
To Date : 10/31/2022 23:13:09 CDT
Please wait while we are generating the report ...
Report is being generated at path : /opt/oracle.ahf/data/repository/collection_Mon_Oct_31_23_11_33_CDT_2022_node_all ...
```

- Command : **ahf analysis create --type insights --last 2h**
- Takes around : **3 - 4 minutes (depending on the system)**
- Size : **46MB zip (depending on the system)**

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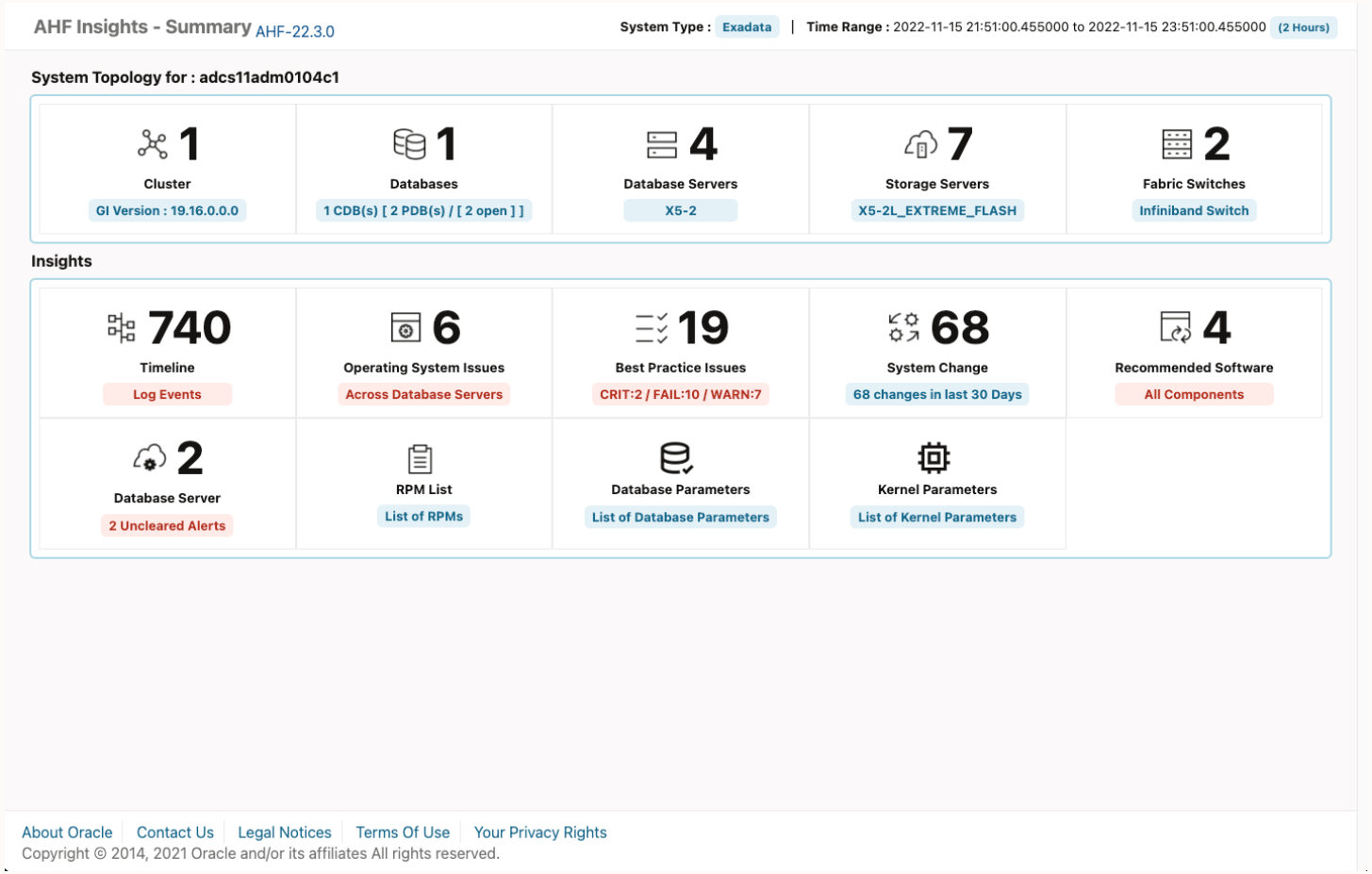
# AHF Insights Report

## System Topology

- Cluster
- Databases
- Database Servers
- Storage Servers
- Fabric Switches

## Insights

- Timeline
- Operating System Issues
- Best Practice issues
- System Change
- Recommended Software
- Database Server
- RPM List
- Database Parameters
- Kernel Parameters

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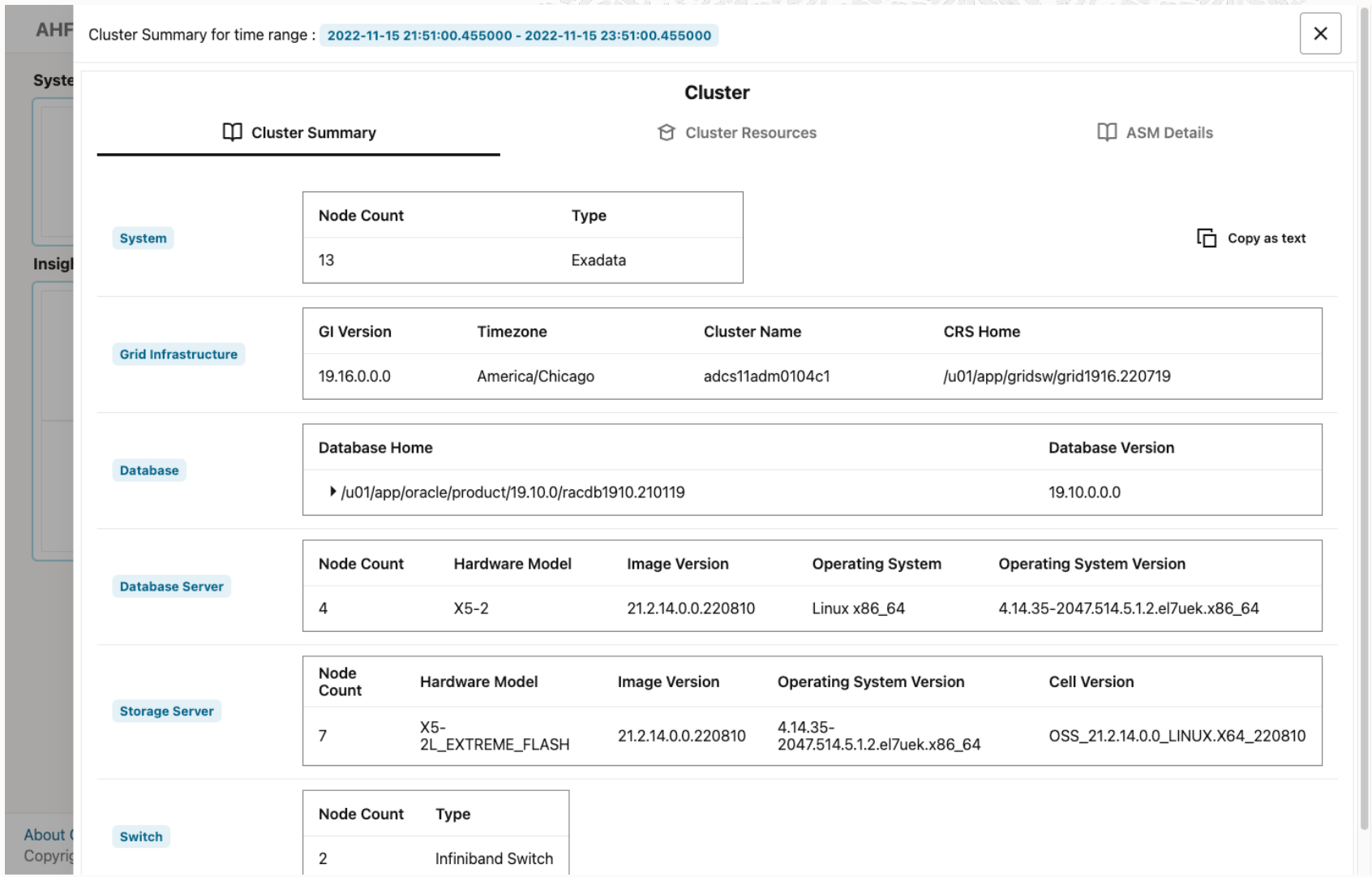
# Cluster

## Cluster Summary

1.Showcase relevant system cluster information.

2.Get DB Home details by clicking on the dropdown button located inside the DB Home section.

3.Copy Cluster summary into user clipboard.

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# Cluster

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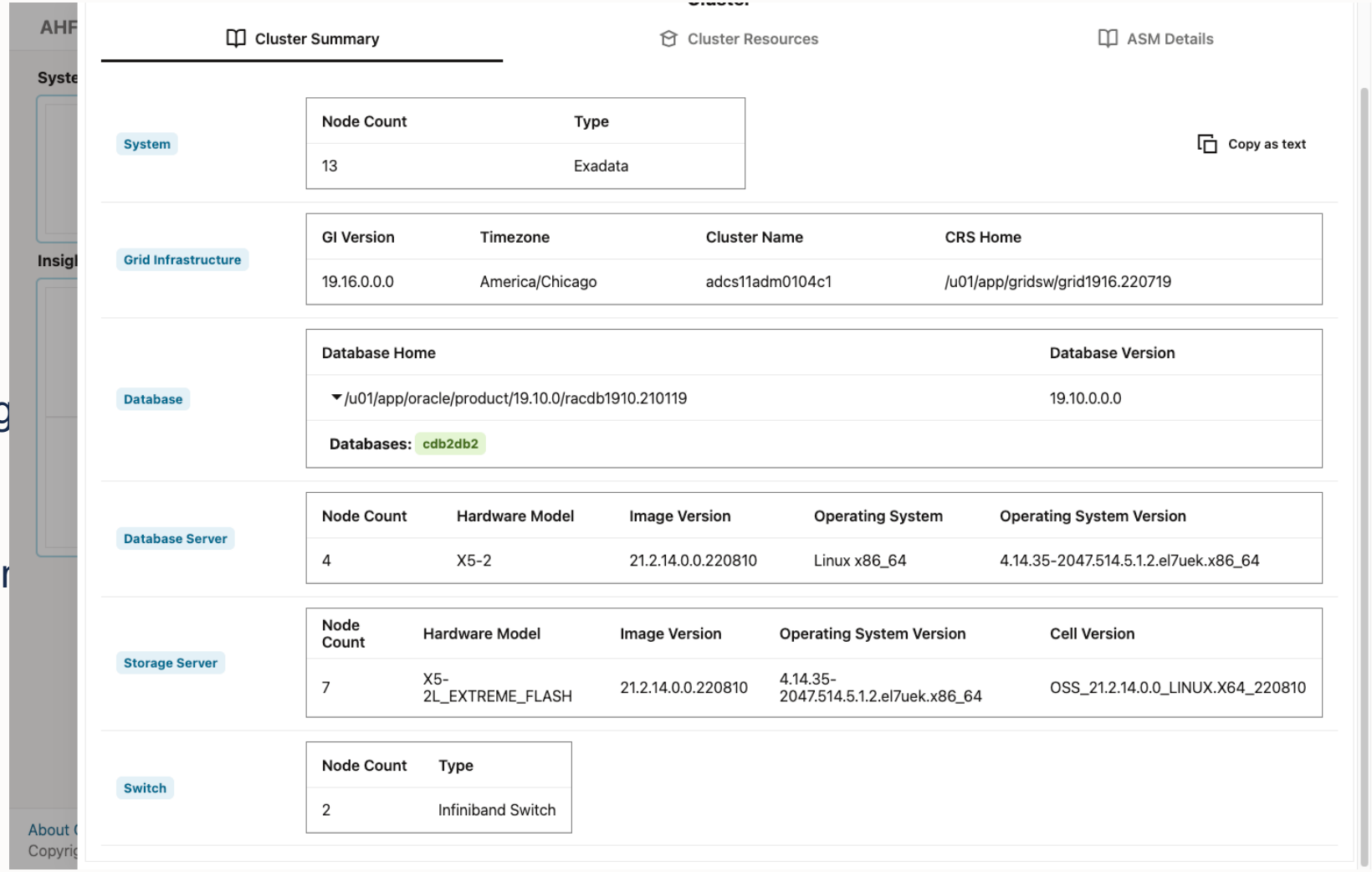


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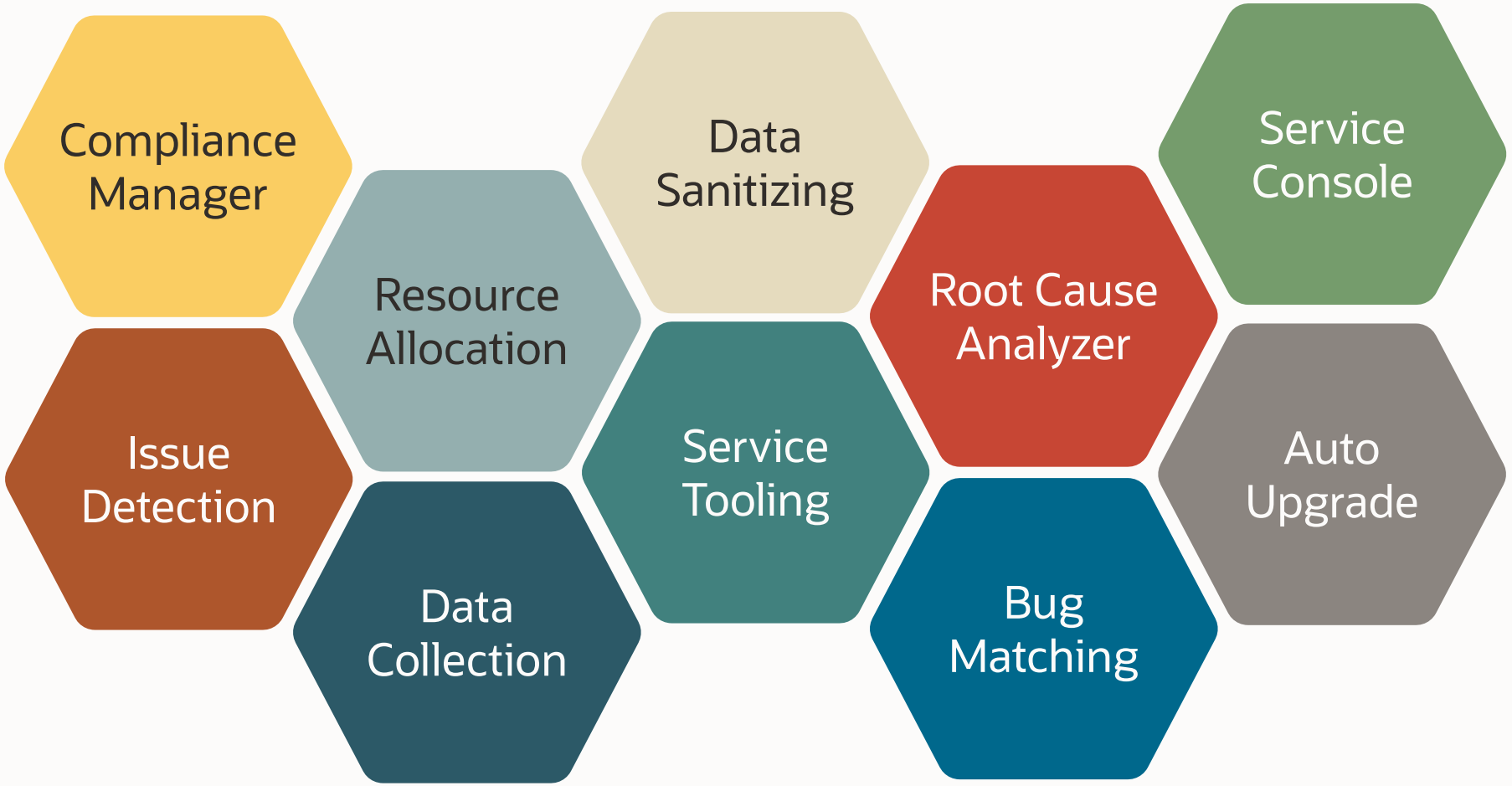
# Oracle Autonomous Health Framework (AHF) 23c

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# Oracle Cloud AI Ops Takeaways

*How has Oracle and Customers benefited from this AI Ops implementation?*

- ✓ AI Ops has become an essential Cloud technology
- ✓ Understand the problem space
- ✓ Understand the environmental, technical and legal constraints
- ✓ Use appropriate ML algorithms to the task
- ✓ Spend quality time with your training sets
- ✓ Incorporate explainability into the results
- ✓ Provide a feedback mechanism for model evolution
- ✓ Look for opportunities to incorporate actuators
- ✓ Honor the culture and risk tolerance of your target audience

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# Thank you

# Any Questions?

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VP AIOps Autonomous Database

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https://www.slideshare.net/SandeshRao4

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