TECHNICAL NOTES

EMC Unisphere for VMAX
Database Storage Analyzer
V8.0.1
Technical Note

P/N H13802
REV 01
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This document describes how Database Storage Analyzer collects data and the prerequisites that you should be aware of prior to installing the application. Topics include:

EMC²

Introduction

With the release of version 8.0.1, Unisphere for VMAX introduces support for Database Storage Analyzer (DSA). DSA is an application that provides a database to storage performance troubleshooting solution for Oracle databases running on EMC Symmetrix and VMAX storage systems.

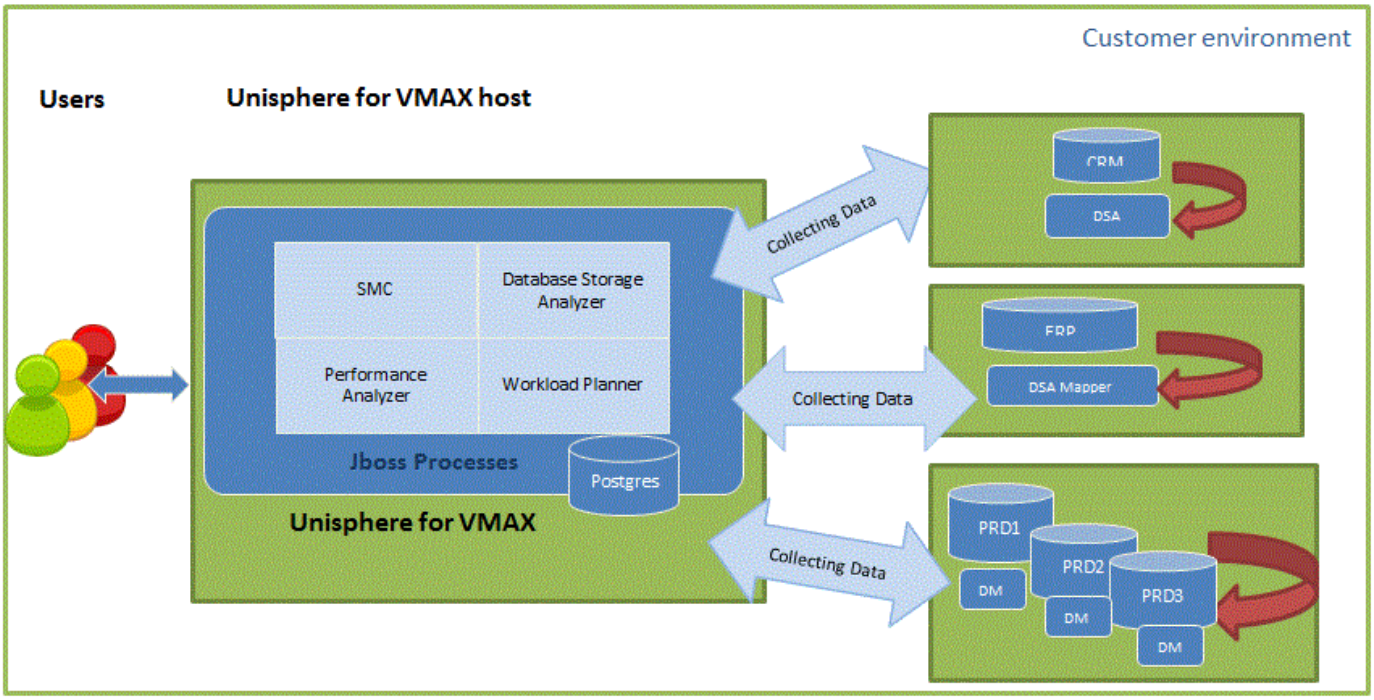
DSA is a feature of the Unisphere for VMAX Foundation Suite. It supports database to storage correlation by providing a shared view of how performance issues correlate to database and storage level activities. This view is accessible by database administrators (DBAs) and storage administrators (SAs). The view presents I/O metrics such as input/output operations per second (IOPS), throughput and response time from both the data base and the storage system, which helps to immediately identify gaps between the database I/O performance and the storage I/O performance.

Note the following:

- Unisphere for VMAX is the only software requirement
- There is no additional cost to use DSA
- DSA currently supports Symmetrix systems running Enginuity 5671 – 5876 and VMAX systems running HYPERMAX OS 5977 or higher
- There is no need to allocate any additional resources for the Unisphere server other than what is specified in the Unisphere for VMAX documentation

Architecture

DSA runs in Unisphere under Jboss. It uses the same Postgress DB as a repository for its information as other Unisphere applications, such as Performance Analyzer (PA) and Workload Planner (WLP).



Database collection and retention policy

DSA collects information by connecting directly to the monitored database through a database user. This read-only user only has select permissions on a fixed list of Oracle dictionary tables.

For a detailed list of the tables accessed by DSA, refer to *Command example* on page 5.

DSA fetches data every 5 minutes and sends it back to the Unisphere repository database (Postgress DB) where it aggregates the data into hourly and daily aggregations. By default, DSA saves the fetched data for 15 days; however, you can extend this period to 30 days. DSA saves the hourly aggregations for 15 months and the daily aggregations for 2 years; however, you can extend both periods up to 3 years.

To connect to the monitored database, you need to open the database TNS port (usually 1521 or 1525) between the Unisphere repository server and the monitored database server.

Mapping files

The mapping process is responsible for mapping the Oracle files to the storage system devices. By default, the process runs once a week, however, you can configure it to run at different times.

During device mapping, the list of database files is copied using SSH to the monitored database host. A process executing on the monitored database host identifies the host physical devices associated with the Oracle files, and then sends the list back to be loaded into the DSA repository.

An executable called Mapper is copied to the remote server with a list of Oracle datafiles to map. Mapper uses the SYMAPI infrastructure and calls the same APIs as the following Solutions Enabler (SYMCLI) commands:

- `symrslv identify`—Identifies whether the storage object is a file, ASM file, logical volume or a host physical device (disk).
- `symhostfs`—Maps the oracle datafile to its filesystem device.
- `symlv show` —Maps a logical volume to its disks. In case the storage object is identified as an ASM file, this command inquires `symrslv pd` – to get the storage device and array for a given disk.
- `symrslv pd`—Gets the storage device and array for a given disk.

To run the above commands, DSA requires root permission and an open SSH port between the Unisphere server and the database host. The installation program will prompt for the root password or a sudo user.

This is an automated process that requires no manual intervention.

The password is kept encrypted in Unisphere using the standard Unisphere encryption method.

Impact on the monitored server: DSA should not impact database activity. In general, DSA may take up to 3% of one CPU.

Storage statistics collection

DSA gets its storage statistics directly from Performance Analyzer, thereby keeping the DSA and PA storage views consistent.

Support matrix

DSA supports the following:

- Storage platforms: Symmetrix systems running Enginuity 5671 – 5876, or VMAX systems running HYPERMAX OS 5977 or higher
- Databases: Oracle version 10g or higher
- Operating systems (monitored database server):
  - AIX version 5.2 or higher (64-bit)
  - SUN Solaris 10 or higher (64-bit)
  - Linux Red Hat 5 or higher (64-bit)
  - SUSE Linux Enterprise Server
  - Oracle Linux 5 or higher
  - HP UX Itanium version 11.23 or higher

Note that virtual environments (for example, VMware VMDK, SUN container, AIX, VIO, Vplex and etc.) are not supported except of VMware RDM.

Command example

The following example illustrates the commands used by DSA.

Note: You do not have to run this script to create users. Instead, you can use the Unisphere for VMAX console. For instructions, refer to Unisphere help system.

```
-- Creation script of EMC DBC's guest user.

-- Before running the script please:
-- Replace â€œ$EMC_Unisphere_USERâ€ with the real name of the Database
guest user
-- Replace â€œ$EMC_Unisphere_PASSâ€œ with the userâ€™s password


declare
  sqlStr varchar2(200);
begin
    sqlStr := 'create user $EMC_Unisphere_USER identified by
$EMC_Unisphere_PASS';

  execute immediate sqlStr;
end;
/

--Create the new user
--create user $EMC_Unisphere_USER identified by $EMC_Unisphere_USER_PASS;
grant connect to $EMC_Unisphere_USER;
GRANT SELECT ON dba_segments TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tab_partitions TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tab_subpartitions TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tables TO $EMC_Unisphere_USER;
```

```
GRANT SELECT ON dba_ind_columns TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_part_key_columns TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_data_files TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_cons_columns TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tab_columns TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_indexes TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_part_tables TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_col_comments TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_lobs TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_free_space TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_temp_files TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tablespaces TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_tab_comments TO $EMC_Unisphere_USER;
GRANT SELECT ON obj$ TO $EMC_Unisphere_USER;
GRANT SELECT ON syn$ TO $EMC_Unisphere_USER;
GRANT SELECT ON view$ TO $EMC_Unisphere_USER;
GRANT SELECT ON user$ TO $EMC_Unisphere_USER;

GRANT SELECT ON v_$tempfile TO $EMC_Unisphere_USER;
GRANT SELECT ON v_$event_name TO $EMC_Unisphere_USER;
GRANT SELECT ON v_$sqlarea TO $EMC_Unisphere_USER;
GRANT SELECT ON v_$database TO $EMC_Unisphere_USER;
GRANT SELECT ON V_$TEMP_SPACE_HEADER TO $EMC_Unisphere_USER;
GRANT SELECT ON V_$PARAMETER TO $EMC_Unisphere_USER;
GRANT SELECT ON v_$instance TO $EMC_Unisphere_USER;

GRANT SELECT ON gv_$instance TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$database TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$filestat TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$tempfile TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$tempstat TO $EMC_Unisphere_USER;
grant select on gv_$system_event to $EMC_Unisphere_USER;
GRANT SELECT ON gv_$active_session_history TO $EMC_Unisphere_USER;

GRANT SELECT ON gv_$segstat TO $EMC_Unisphere_USER;

GRANT SELECT ON dba_hist_active_sess_history TO $EMC_Unisphere_USER;

GRANT SELECT ON dba_extents TO $EMC_Unisphere_USER;

-- These permission are required for the script
GRANT SELECT ON DBA_HIST_FILESTATXS TO $EMC_Unisphere_USER;
GRANT SELECT ON DBA_HIST_TEMPSTATXS TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_hist_snapshot TO $EMC_Unisphere_USER;
GRANT SELECT ON ts$ TO $EMC_Unisphere_USER;
GRANT SELECT ON sys_objects TO $EMC_Unisphere_USER;
GRANT SELECT ON seg$ TO $EMC_Unisphere_USER;
GRANT SELECT ON file$ TO $EMC_Unisphere_USER;

--10 and up
GRANT SELECT ON gv_$waitclassmetric_history TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$system_wait_class TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$sysmetric_history TO $EMC_Unisphere_USER;

GRANT SELECT ON GV_$LOGFILE TO $EMC_Unisphere_USER;
GRANT SELECT ON GV_$LOG TO $EMC_Unisphere_USER;

GRANT SELECT ON GV_$PARAMETER TO $EMC_Unisphere_USER;
GRANT SELECT ON gv_$services TO $EMC_Unisphere_USER;

GRANT SELECT ON dba_part_indexes TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_ind_partitions TO $EMC_Unisphere_USER;
GRANT SELECT ON dba_ind_subpartitions TO $EMC_Unisphere_USER;


-- Create synon
create synonym $EMC_Unisphere_USER.dbc_obj$ for obj$;
create synonym $EMC_Unisphere_USER.dbc_syn$ for syn$;
create synonym $EMC_Unisphere_USER.dbc_view$ for view$;
create synonym $EMC_Unisphere_USER.dbc_user$ for user$;

create synonym $EMC_Unisphere_USER.dbc_ts$ for ts$;
create synonym $EMC_Unisphere_USER.dbc_sys_objects for sys_objects;
```

```
reate synonym $EMC_Unisphere_USER.dbc_seg$ for seg$;
                  create synonym $EMC_Unisphere_USER.dbc_file$ for file$;



                  --10 only
                  declare
                    x number;
                  begin
                    select substr(version,0,2) into x from v$instance;
                    if (x < 11) then
                      execute immediate 'GRANT SELECT ON gv_$sysstat TO
$EMC_Unisphere_USER';
                    end if;
                  end;
                  /

                  --10,11 only
                  declare
                    x number;
                  begin
                    select substr(version,0,2) into x from v$instance;
                    if (x < 12) then
                      execute immediate 'create or replace view dbc_$kccle as select * from
x$kccle';
                      execute immediate 'grant select on dbc_$kccle to
$EMC_Unisphere_USER';
                      execute immediate 'create or replace synonym
$EMC_Unisphere_USER.dbc_$kccle for sys.dbc_$kccle';
                    end if;
                  end;
                  /

                  -- 12 only
                  declare
                    x number;
                    v_name varchar (200);
                  begin
                    select substr(version,0,2) into x from v$instance;
                    if (x >= 12) then
                        execute immediate 'select cdb from v$database' into v_name;
                        if (v_name = 'YES') then
                          execute immediate 'grant select on v_$pdbs to
$EMC_Unisphere_USER';
                          execute immediate 'select name from v$pdbs where name =
''PDB$SEED''' into v_name;
                          execute immediate 'alter user $EMC_Unisphere_USER SET
CONTAINER_DATA = all CONTAINER = CURRENT';
                       end if;
                    end if;
                    exception when NO_DATA_FOUND then
                      null;
                  end;
                  /
                  --for 11g and above only                                          N
                  declare
                    x number;
                  begin
                    select substr(version,0,2) into x from v$instance;
                    if (x >= 11 ) then
                      execute immediate 'grant SELECT ON gv_$iostat_function TO
$EMC_Unisphere_USER';
                    end if;
                  end;
                  /

                  create or replace view $EMC_Unisphere_USER.dbc_segments as
                    select o.*,
                  -- Get table name - If the object is a table or cluster(including
partitions) we use its name, otherwise we use the table name from the index join or lob
join
```

```
                    case when segment_type liKE '%TABLE%' or segment_type='CLUSTER' OR
OBJECT_ID<0 then o.SEGMENT_NAME else nvl(i.table_name, l.table_name) end table_name,
                -- Get owner - If the object is a table or cluster(including partitions)
we use its owner, otherwise we use the table name from the index join or lob join
                    case when segment_type liKE '%TABLE%' or segment_type='CLUSTER' OR
OBJECT_ID<0 then o.owner else nvl(i.owner, l.owner) end table_owner,
                -- Get table id - If the object is a table or cluster we use its id
                -- If the object is a partition we find the id using analytic function
from the dbc_obj$ table
                -- If the object is a index of some sort we get it from the joined index
query
                -- If the object is a lob of some sort we get it from the joined lob
query
                    case when segment_type liKE '%TABLE' or segment_type='CLUSTER' OR
OBJECT_ID<0 then o.object_id
                    when segment_type like 'TABLE%PARTITION%' then
                      first_value(object_id) over(partition by o.segment_name, o.owner,
                        case when segment_type like '%TABLE%' then 1
                        when segment_type like '%INDEX%' then 2
                        when segment_type like '%LOB%' then 3
                        else 4
                        end
                        order by decode(segment_type,'TABLE',1,2))
                    when segment_type like '%INDEX%' and i.table_id is not null then
i.table_id
                    when segment_type like 'LOB%' then l.table_id
                    end table_id,
                -- Get parent object_id
                    case when segment_type liKE '%PARTITION%' then
                    first_value(object_id) over(partition by o.segment_name, o.owner,
                        case when segment_type like '%TABLE%' then 1
                        when segment_type like '%INDEX%' then 2
                        when segment_type like '%LOB%' then 3
                        else 4
                        end)
                    else
                        o.object_id
                    end parent_object_id,
                    case when column_name is not null then column_name
                    when segment_type like '%INDEX%' then (select column_name
                                                           from    dba_lobs l
                                                           where
l.table_name=i.table_name
                                                                   and
l.index_name=o.segment_name
                                                                   and
l.owner=o.owner)
                    else null end lob_column_name
                  from
                      (select o.obj# object_id, o.dataobj# data_object_id, s.OWNER,
S.SEGMENT_NAME,s.segment_type, S.PARTITION_NAME,
                        S.TABLESPACE_NAME,nvl(S.bYTES/1024/1024,0) SEGMENT_SIZE      ,
o.ctime creation_date, O.mtime LAST_DDL_TIME, s.extents
                       from     dba_segments s,
                         $EMC_Unisphere_USER.dbc_obj$ o,
                         $EMC_Unisphere_USER.dbc_user$ u
                       where  o.name= s.segment_name
                         and o.name not like 'BIN$%'
                              and       u.user#=o.owner#
                                        and       u.name= s.owner
                                        and
nvl(o.subname,'********')=nvl(s.partition_name,'********')
                                        and       (
                         (s.segment_type IN ('TABLE', 'NESTED TABLE') and o.type#=2)
                         or
                         (s.segment_type IN ('LOBINDEX', 'INDEX') and o.type#=1)
                         or
                         (s.segment_type IN ('CLUSTER') and o.type#=3)
                         or
                         (s.segment_type IN ('TABLE PARTITION') and o.type#=19)
                         or
                         (s.segment_type IN ('INDEX PARTITION') and o.type#=20)
                         or
```

```
(s.segment_type IN ('TABLE SUBPARTITION') and o.type#=34)
                           or
                           (s.segment_type IN ('INDEX SUBPARTITION') and o.type#=35)
                           or
                           (s.segment_type IN ( 'LOBSEGMENT') and o.type#=21)
                           or
                           (s.segment_type IN (  'LOB PARTITION') and o.type#=40)
                           or
                           (s.segment_type IN ( 'LOB SUBPARTITION') and o.type#=41)       )
                         UNION ALL
                         select o.obj# object_id,o.dataobj# data_object_id, u.name owner,
o.name SEGMENT_NAME,decode(o.type#, 1, 'INDEX', 2,'TABLE', 21, 'LOBSEGMENT') segment_type,
null PARTITION_NAME,
                                                                              null
TABLESPACE_NAME,0 SEGMENT_SIZE, o.ctime creation_date, O.mtime LAST_DDL_TIME, null extents
                         from          $EMC_Unisphere_USER.dbc_obj$ o,
                           $EMC_Unisphere_USER.dbc_user$ u
                         where
                           o.dataobj# is null
                           and o.name not like 'BIN$%'
                           and u.user#=o.owner#
                                     and o.type# IN (1,2,21)
                       ) o
                  -- Join to index query (get table_name+table_owner+table_id from index
table)
                        left outer join (select i.index_name, i.owner, i.table_name, o.obj#
table_id
                                         from    $EMC_Unisphere_USER.dbc_obj$ o,
                                           $EMC_Unisphere_USER.dbc_user$ u,
                                           dba_indexes i
                                         where   i.table_name=o.name
                                                 and     i.owner=u.name
                                                 and        linkname is null
                                                 and     u.user#=o.owner#
                                                         and     o.type# in(2,3)) i
on (i.index_name=o.SEGMENT_NAME and i.owner=o.owner)
                  -- Join to lob query (get table_name+table_owner+table_id from lob table)
                        left outer join (select l.segment_name, l.owner, l.table_name,
o.obj# table_id, column_name
                                         from    $EMC_Unisphere_USER.dbc_obj$ o,
                                           $EMC_Unisphere_USER.dbc_user$ u,
                                           dba_lobs l
                                         where   l.table_name=o.name
                                                 and     l.owner=u.name
                                                 and        linkname is null
                                                 and     u.user#=o.owner#
                                                         AND     O.TYPE# IN(2,3)) L
ON (L.SEGMENT_NAME=O.SEGMENT_NAME AND L.OWNER=O.OWNER);
                  /
```