

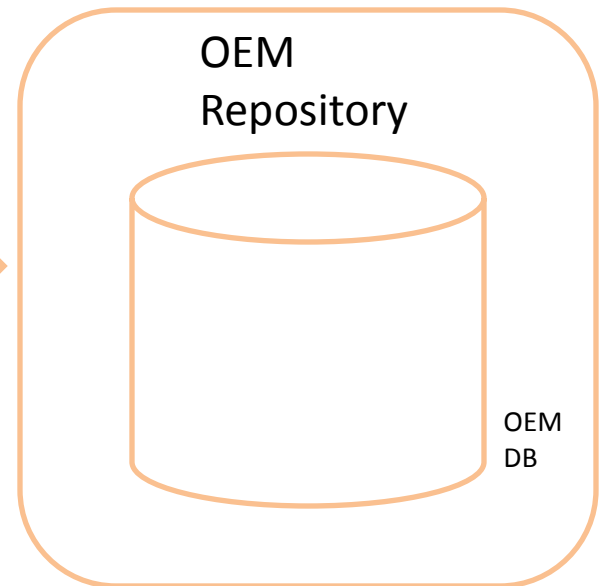
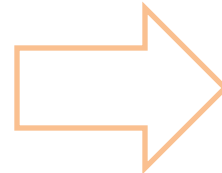
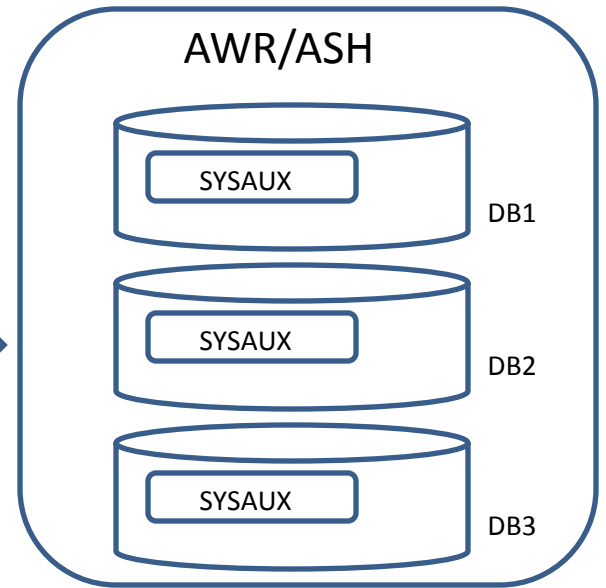
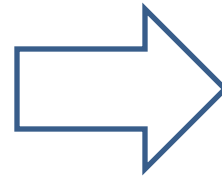
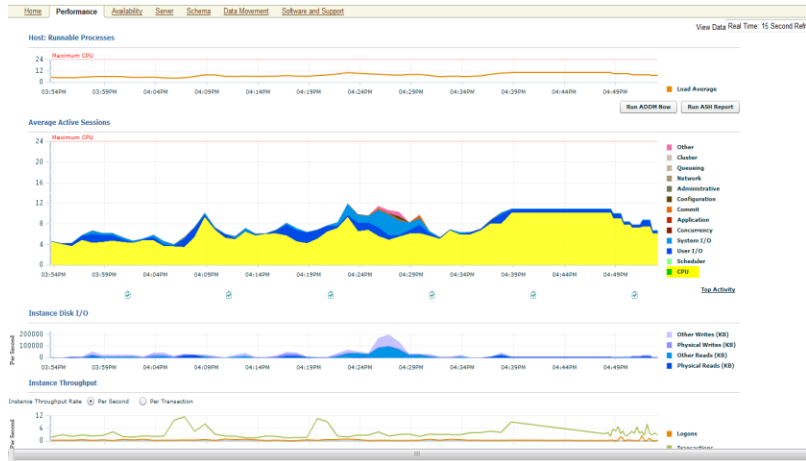
Unleash the Value of the Data in Your OEM Repository

Jordan K. Iotzov

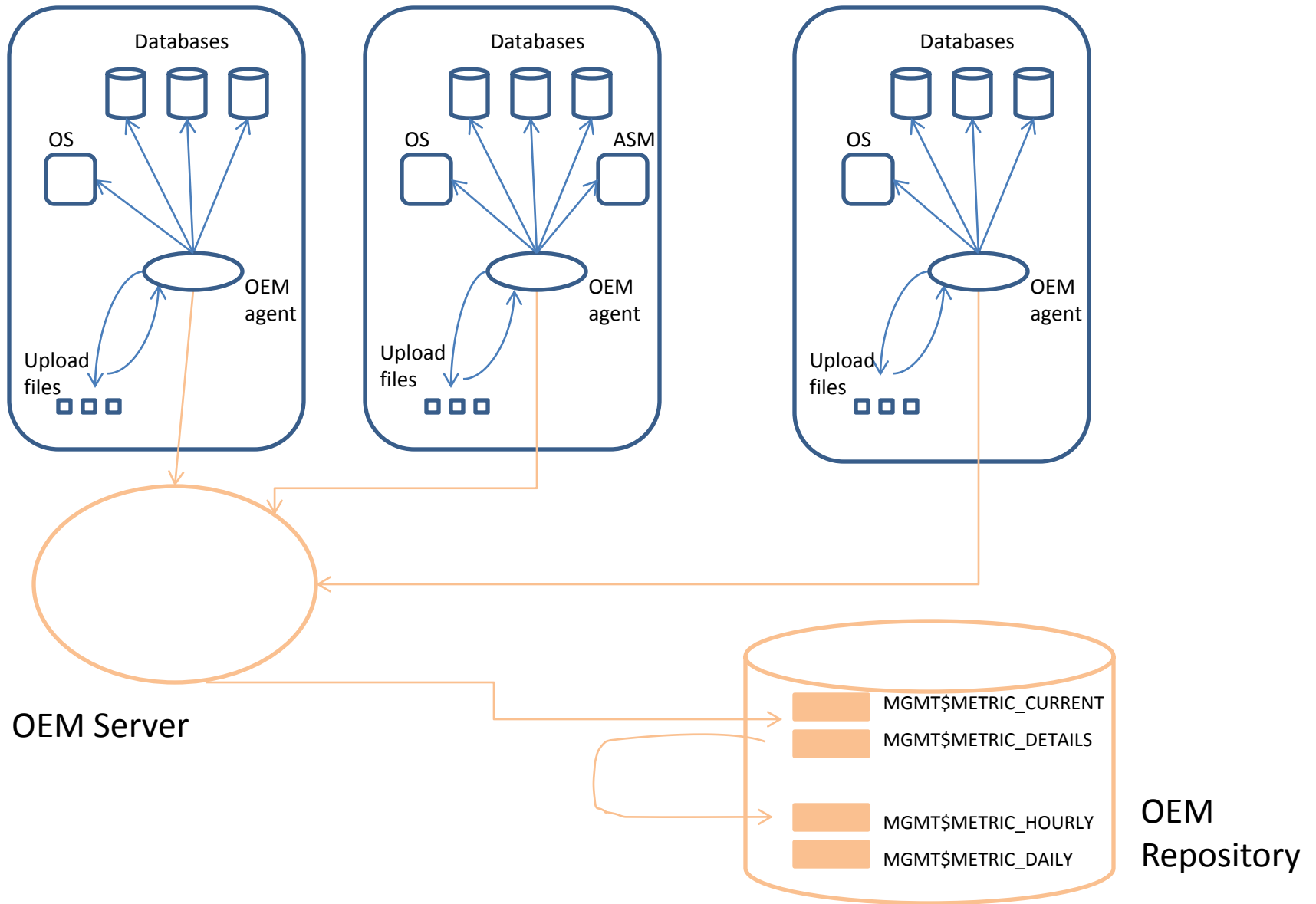
jiotzov@newsamerica.com

News America Marketing
(NewsCorp)

Sources of Information in OEM



Process of Metrics Gathering in OEM



Some Metrics-related OEM Repository Tables

MGMT\$METRIC_DETAILS

TARGET_NAME	VARCHAR2 (256)
TARGET_TYPE	VARCHAR2 (64)
TARGET_GUID	RAW (16)
METRIC_NAME	VARCHAR2 (64)
METRIC_TYPE	NUMBER
METRIC_COLUMN	VARCHAR2 (64)
METRIC_GUID	RAW (16)
METRIC_LABEL	VARCHAR2 (64)
COLUMN_LABEL	VARCHAR2 (256)
COLLECTION_TIMESTAMP	DATE (7)
VALUE	VARCHAR2 (4000)
KEY_VALUE	VARCHAR2 (256)
KEY_VALUE2	VARCHAR2 (256)
KEY_VALUE3	VARCHAR2 (256)
KEY_VALUE4	VARCHAR2 (256)
KEY_VALUE5	VARCHAR2 (256)

Aggregate



MGMT\$METRIC_HOURLY

TARGET_NAME	VARCHAR2 (256)
TARGET_TYPE	VARCHAR2 (64)
TARGET_GUID	RAW (16)
METRIC_NAME	VARCHAR2 (64)
METRIC_COLUMN	VARCHAR2 (64)
METRIC_GUID	RAW (16)
METRIC_LABEL	VARCHAR2 (64)
COLUMN_LABEL	VARCHAR2 (256)
KEY_VALUE	VARCHAR2 (256)
KEY_VALUE2	VARCHAR2 (256)
KEY_VALUE3	VARCHAR2 (256)
KEY_VALUE4	VARCHAR2 (256)
KEY_VALUE5	VARCHAR2 (256)
ROLLUP_TIMESTAMP	DATE (7)
SAMPLE_COUNT	NUMBER
AVERAGE	NUMBER
MINIMUM	NUMBER
MAXIMUM	NUMBER
STANDARD_DEVIATION	NUMBER
TIMEZONE_REGION	VARCHAR2 (64)

Aggregate



MGMT\$METRIC_DAILY

TARGET_NAME	VARCHAR2 (256)
TARGET_TYPE	VARCHAR2 (64)
TARGET_GUID	RAW (16)
METRIC_NAME	VARCHAR2 (64)
METRIC_COLUMN	VARCHAR2 (64)
METRIC_GUID	RAW (16)
METRIC_LABEL	VARCHAR2 (64)
COLUMN_LABEL	VARCHAR2 (256)
KEY_VALUE	VARCHAR2 (256)
KEY_VALUE2	VARCHAR2 (256)
KEY_VALUE3	VARCHAR2 (256)
KEY_VALUE4	VARCHAR2 (256)
KEY_VALUE5	VARCHAR2 (256)
ROLLUP_TIMESTAMP	DATE (7)
SAMPLE_COUNT	NUMBER
AVERAGE	NUMBER
MINIMUM	NUMBER
MAXIMUM	NUMBER
STANDARD_DEVIATION	NUMBER
TIMEZONE_REGION	VARCHAR2 (64)

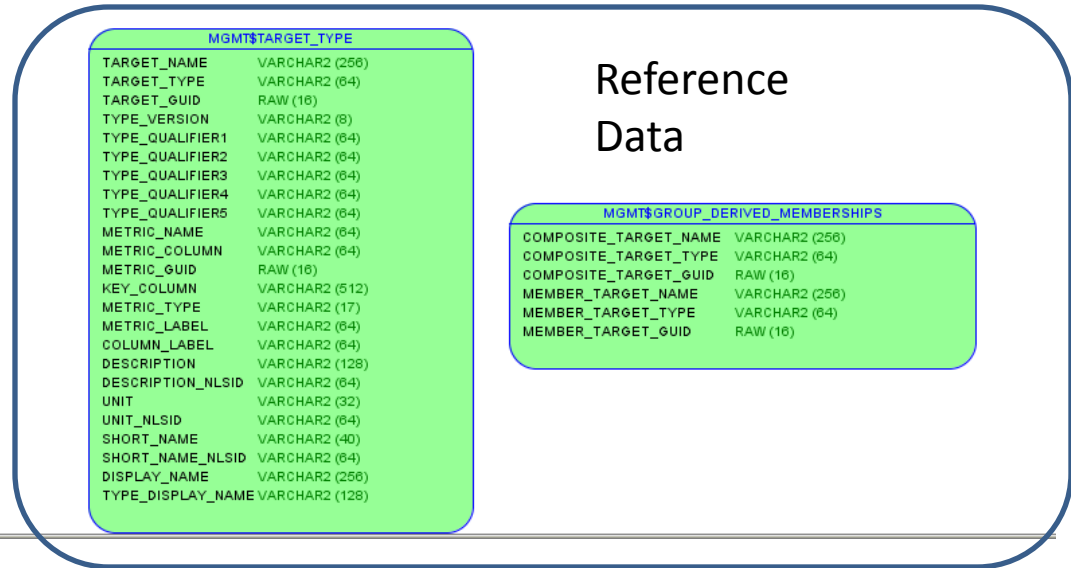
Raw



MGMT\$METRIC_CURRENT

TARGET_NAME	VARCHAR2 (256)
TARGET_TYPE	VARCHAR2 (64)
TARGET_GUID	RAW (16)
METRIC_NAME	VARCHAR2 (64)
METRIC_TYPE	NUMBER
METRIC_COLUMN	VARCHAR2 (64)
METRIC_GUID	RAW (16)
METRIC_LABEL	VARCHAR2 (64)
COLUMN_LABEL	VARCHAR2 (256)
COLLECTION_TIMESTAMP	DATE (7)
VALUE	VARCHAR2 (4000)
KEY_VALUE	VARCHAR2 (256)
KEY_VALUE2	VARCHAR2 (256)
KEY_VALUE3	VARCHAR2 (256)
KEY_VALUE4	VARCHAR2 (256)
KEY_VALUE5	VARCHAR2 (256)
TIMEZONE_REGION	VARCHAR2 (64)

Raw



Useful Applications – averages over any period of time

Find the average run queue length during business hours(M-F, 7 am – 8 pm) for 30 days

Custom Time Period

Data Available Jun 19, 2010 10:02:33 AM EDT to Mar 3, 2011 10:49:11 AM EST

* Start Date 
(example: Mar 3, 2011)

* End Date 
(example: Mar 3, 2011)

* Start Hour AM PM

* End Hour AM PM

Run Queue Length (1 minute average)

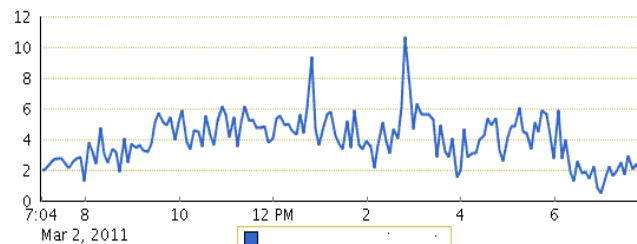
Collected From Target Mar 2, 2011 7:00:00 AM EST to Mar 2, 2011 8:00:00 PM EST

View Data

Statistics

Last Known Value 6.72
Average Value 3.94
High Value 10.72
Low Value .32
Warning Threshold Not Defined
Critical Threshold Not Defined
Occurrences Before Alert 6
Corrective Action None

Metric Value



Useful Applications – averages over any period of time

Find the average run queue length during business hours(M-F, 7 am – 8 pm)
for 30 days

```
Query:      select
            avg(average)
            from
            mgmt$metric_hourly
            where
            rollup_timestamp      > sysdate – 30
            and
            target_name           = 'dbtest01'
            and
            metric_name           = 'Load'
            and
            column_labal         = 'Run Queue Length (1 minute average)'
            and
            to_char(rollup_timestamp,'DAY') not in ('SATURDAY','SUNDAY')
            and
            rollup_timestamp      between trunc(rollup_timestamp,'DD') + 7/24
                                and trunc(rollup_timestamp,'DD') + 20/24
```

Output: 2.97053285256410256410256410256410256411

Opportunities: Unlimited flexibility in managing OEM metrics data

Useful Applications – enforcing enterprise-wide policies

Monitor Force Logging mode for all production databases.

Create UDM in each production database. The sole purpose of this UDM would be to supply data to the OEM repository

Edit User-Defined Metric: ForcedLogging

Definition

Metric Name **ForcedLogging**
Metric Type **STRING**
SQL Query Output **Single Value**

* SQL Query

```
SELECT FORCE_LOGGING FROM V$DATABASE
```

The maximum length of the SQL Statement can be 4,000 characters.

Schedule

Collection Schedule Enabled Disabled

Specify the frequency by which the metric will be evaluated.

Start

Immediately after creation

Date
(example: Dec 15, 2003)

Time AM PM EST

Frequency

Repeat every Minute(s)

Weekly on Monday Tuesday Wednesday Thursday Friday Saturday Sunday

Monthly on
Enter days separated by commas. Use LAST for last day of month. Example: 1,4,LAST

Useful Applications – enforcing enterprise-wide policies

Monitor Force Logging mode for all production databases.

Create UDM in the OEM repository database. This UDM will notify/page DBAs if a DB is not in Force Logging mode

* Metric Name

Metric Type Number String

SQL Query Output Single Value
Query is either (1) a SELECT statement that returns a single value (for example: SELECT sal FROM emp WHERE empno=7369) or (2) a function call (for example: myfunc(123, 'abc'))

Two Columns
Query is a SELECT statement that returns two columns (for example: SELECT ename, sal FROM emp). Each entry in the first column (the key column) must be a unique string. The second column (the value column) must be of the selected Metric Type.

* SQL Query

```
select
      count( member_target_guid )
from
      mgmt$group_derived_memberships o ,
      MGMT$TARGET t
where
      o.composite_target_name      = 'PROD'
and
      o.member_target_type        in  ('oracle_database', 'rac_database')
and ( t.target_type = 'rac_database'
      or t.target_type = 'oracle_database'
```

The maximum length of the SQL Statement can be 4,000 characters.

Database Credentials

* User Name

* Password

Thresholds

You can have the metric be compared against thresholds you specify. If the thresholds are crossed, an alert will be generated and an optional Response Action / Corr specify the Corrective Action in the "Metric and Policy" settings page which is accessible from the homepage of this target. Only administrators with Super User privilege

Comparison Operator Warning Critical

Useful Applications – enforcing enterprise-wide policies

Monitor Force Logging mode for all production databases.

The full query behind the OEM repository UDM:

```
select
    count( member_target_guid )
from
    mgmt$group_derived_memberships o ,
    mgmt$target t
where
    o.composite_target_name      = 'PROD'
and
    o.member_target_guid        = t.target_guid
and
    ( t.target_type              = 'rac_database'
      or
      (t.target_type              = 'oracle_database'
       and t.type_qualifier3      != 'RACINST'
      )
    )
and
    not exists (
        select
            *
        from
            mgmt$metric_current i
        where
            i.target_guid          = o.member_target_guid
            and
            metric_name            = 'SQLUDM'
            and
            column_label           = 'ForcedLogging'
            and
            Metric_Column           = 'StrValue'
            and
            collection_timestamp    > sysdate - 20/1440
            and
            value                   = 'YES'
        )
    )
```

Useful Applications – enforcing enterprise-wide policies

Monitor Force Logging mode for all production databases.

How about exempting a database? One need to do a concerted effort to exempt a database.

Definition

Metric Name **ForcedLogging**
Metric Type **STRING**
SQL Query Output **Single Value**
* SQL Query

```
SELECT 'YES' FROM V$DATABASE
```

SQL Query

The maximum length of the SQL Statement can be 4,000 characters.

Schedule

Collection Schedule Enabled Disabled

Specify the frequency by which the metric will be evaluated.

Start

Immediately after creation
 Date
(example: Dec 15, 2003)
Time 12 ▾ 00 ▾ AM PM EST

Frequency

Repeat every 5 Minute(s) ▾
 Weekly on Monday Tuesday Wednesday Thursday Friday Saturday Sunday
 Monthly on
Enter days separated by commas. Use LAST for last day of month. Example: 1,4,LAST

Cancel Test OK

Useful Applications – enforcing enterprise-wide policies

Monitor Force Logging mode for all production databases.

Ability to deliver customized solutions – all but two tablespaces (TBLS_STG, TBLS_UNRECOVERABLE) must be in Force Logging mode

Definition

* Metric Name

Metric Type Number String

SQL Query Output Single Value
Query is either (1) a SELECT statement that returns a single value (for example: SELECT sal FROM emp WHERE empno=7369) or (2) a function call (for example: myfunc(123, 'abc'))

Two Columns
Query is a SELECT statement that returns two columns (for example: SELECT ename, sal FROM emp). Each entry in the first column (the key column) must be a unique string. The second column (the value column) must be of the selected Metric Type.

* SQL Query

```
select min(force_logging)
from dba_tablespaces
where contents = 'PERMANENT'
and tablespace_name not in ('TBLS_STG','TBLS_UNRECOVERABLE')
```

The maximum length of the SQL Statement can be 4,000 characters.

Schedule

Collection Schedule Enabled Disabled

Specify the frequency by which the metric will be evaluated.

Start

Immediately after creation

Date

(example: Dec 15, 2003)

Time AM PM EST

Frequency

Repeat every

Weekly on Monday Tuesday Wednesday Thursday Friday Saturday Sunday

Monthly on

Enter days separated by commas. Use LAST for last day of month. Example: 1,4,LAST

Cancel Test OK

Useful Applications – integration with other data sources

Combining ASH/AWR and OEM repository

Where does the variation in single block read time come from?

```
select
  corr(db.time_waited , oem.value) , count(*)
from
  (select
    sample_time ,
    time_waited
  from
    dba_hist_active_sess_history@prod_db
  where
    event          = 'db file sequential read'
  and
    session_state = 'WAITING'
  and
    sample_time   > sysdate - 1 ) db ,
  ( select
    collection_timestamp ,
    value
  from
    mgmt$metric_details
  where
    target_name = '+ASM_PROD'
  and
    metric_name = 'Single_Instance_DiskGroup_Performance'
  and
    metric_column = '<ASM Metric>' ) oem
where
  oem.collection_timestamp between db.sample_time - 15/1440
  and db.sample_time
```

ASM Metric	Correlation
writes_ps	0.04
reads_ps	-0.04
write_throughput	0.04
read_throughput	0.01

Very different sampling rates usually result in lower correlation

Useful Applications – the power of Oracle’s own SQL

Why is the latency of Streams Apply so high? Could it be the disk IO? It is often the issue...

```
Check:  select      corr(streams_latency.value , IO_load.value)
        from
        ( select *
          from
          mgmt$metric_details
        where
          target_name = 'STRDEST'
        and
          metric_name = 'streams_latency_throughput'
        and
          column_label = 'Latency' ) streams_latency ,
        (select *
          from
          mgmt$metric_details
        where
          target_name = 'STRDEST'
        and
          metric_name = 'instance_throughput'
        and
          column_label = 'I/O Megabytes (per second)') IO_load
        where
          streams_latency.collection_timestamp between IO_load.collection_timestamp
                                                and IO_load.collection_timestamp + 5/(60*24)
        and
          streams_latency.collection_timestamp > sysdate - 1
```

Output: -0.001043436634863007975354458994748444098631

Interpretation: Hypothesis rejected! Need to look for other explanation...

Useful Applications – the power of Oracle’s own SQL

Why is the latency of Streams Apply so high? Maybe it is the redo volume on the Capture side...

Check:

```
select corr(streams_latency.value , redo_source_1.value + redo_source_2.value)
from
    ( select *
      from
          mgmt$metric_details
        where
            target_name = 'STRDEST'
          and
            metric_name = 'streams_latency_throughput'
          and
            column_label = 'Latency' ) streams_latency ,
    (select *
      from
          mgmt$metric_details
        where
            target_name = 'STRSRC_STRSRC 1'
          and
            metric_name = 'instance_throughput'
          and
            column_label = 'Redo Generated (per second)' ) redo_source_1 ,
    (select *
      from
          mgmt$metric_details
        where
            target_name = 'STRSRC_STRSRC 2'
          and
            metric_name = 'instance_throughput'
          and
            column_label = 'Redo Generated (per second)' ) redo_source_2
where
    streams_latency.collection_timestamp between redo_source_1.collection_timestamp
                                         and redo_source_1.collection_timestamp + 5/(60*24)
and
    streams_latency.collection_timestamp between redo_source_2.collection_timestamp
                                         and redo_source_2.collection_timestamp + 5/(60*24)
and
    streams_latency.collection_timestamp > sysdate - 1
```

Output: 0.7641297491294021289799243642319279128629

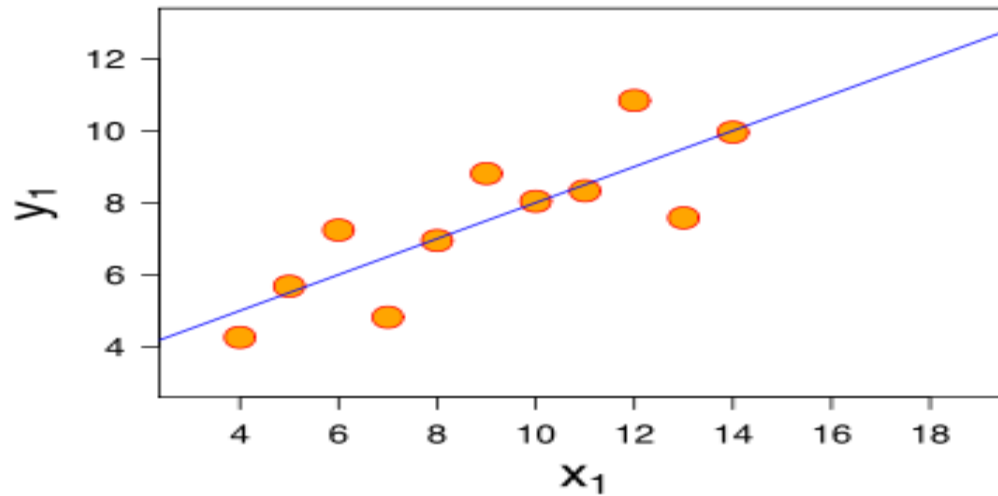
Interpretation: The redo volume on the Capture side is likely the reason for increased latency on the Apply side

Advanced Forecasting Example - tablespace size forecast

Simple linear regression:

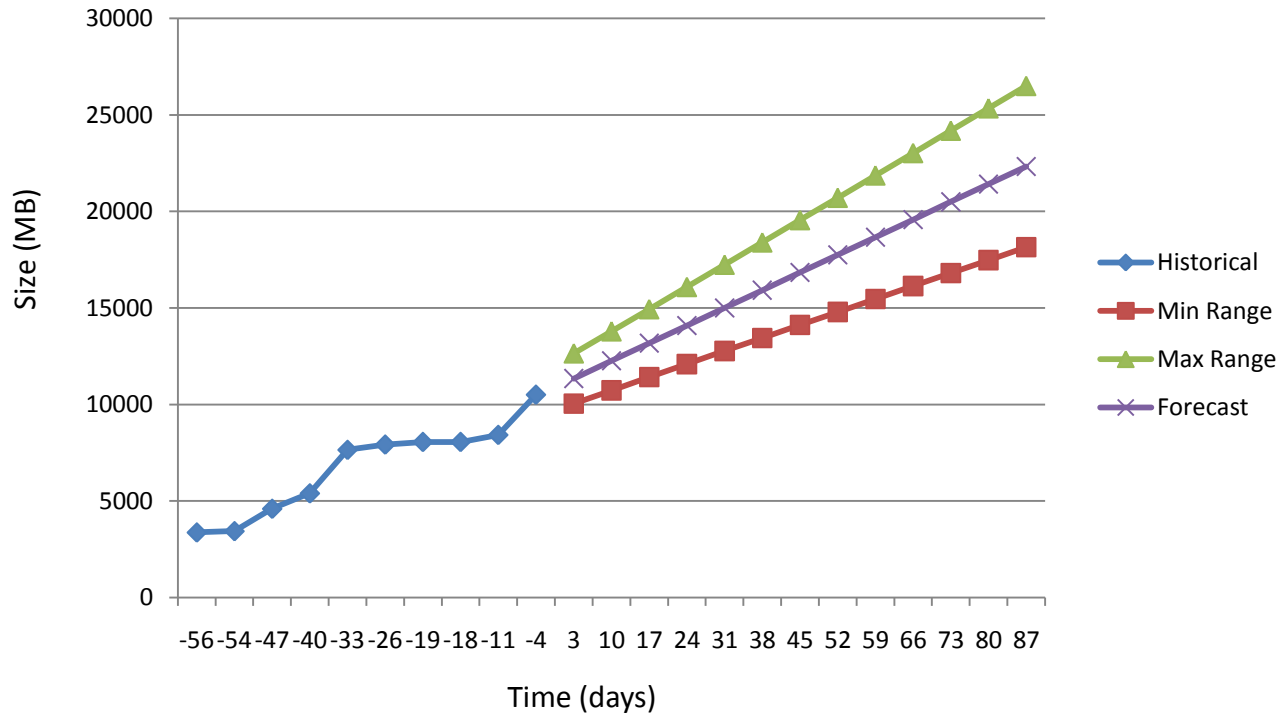
$$\text{tbls}(t) = \text{tbls0} + \text{incr} * t$$

tbls0 (Intercept)	– tablespace size for time 0
incr (Slope)	– how fast a tablespace grows
t	– time
tbls(t)	– tablespace size at time t



Advanced Forecasting Example - tablespace size forecast

Quality of forecasting - 95% prediction interval of the regression line



Advanced Forecasting Example - tablespace size forecast

Getting raw historical tablespace sizing data from the OEM repository

```
insert into raw_data
select
    m.rollup_timestamp ,
    m.average
from
    mgmt$metric_daily m ,
    mgmt$target_type t
where
    (t.target_type = 'rac_database'
     or (t.target_type = 'oracle_database'
         and t.type_qualifiers3 != 'RACINST'))
and
    m.target_guid          = p_target_guid (Database)
and
    m.target_guid          = t.target_guid
and
    m.metric_guid          = t.metric_guid
and
    t.metric_name          = 'tbspAllocation'
and
    t.metric_column        = 'spaceUsed'
and
    m.rollup_timestamp     >= sysdate - p_period_hist
and
    m.rollup_timestamp     <= sysdate
and
    m.key_value            = p_tablespace_name;
```

Advanced Forecasting Example - tablespace size forecast

Utilize Oracle's built-in packages and functions to compute most of the statistics in this project

```
select
    regr_intercept (average , rollup_timestamp - sysdate ),
    regr_slope (average , rollup_timestamp - sysdate ),
    regr_r2 (average , rollup_timestamp - sysdate ),
    regr_count (average ,rollup_timestamp - sysdate ),
    regr_avgx (average ,rollup_timestamp - sysdate ),
    regr_sxx (average ,rollup_timestamp - sysdate ) ,
    regr_syy (average ,rollup_timestamp - sysdate ),
    regr_sxy (average ,rollup_timestamp - sysdate )
into
    ....
from
    raw_data
```

Import data and create functions that are not available in Oracle

```
create or replace
FUNCTION f_forecast_t_dist (p_degree_freedom NUMBER , p_conf NUMBER) RETURN NUMBER IS
l_res          NUMBER;
l_one_tail_conf NUMBER;
BEGIN
    --- Custom Code
END f_forecast_t_dist;
```

Advanced Forecasting Example - tablespace size forecast

Final computations

```
l_ci:=sqrt ( 1/ l_cnt
            +
            power((p_period_forecast - l_avgx),2)
            /
            l_sxx
            );

l_sigma:= sqrt(
            abs(
                    (l_syy
                    -
                    (power(l_sxy,2)/l_sxx)
                    )
            )
            /(l_cnt-2)
            );
p_out_estimate_95_range:=(l_ci
            *
            f_forecast_t_dist(l_cnt-2,0.95)
            *
            l_sigma);
```

Advanced Forecasting Example - tablespace size forecast

Delivery Methods - Various

Edit Report Definition: "Production Oracle Database Tablespaces in need of sizing review"

Preview Cancel OK

General Elements Schedule Access

* Title: Production Oracle Database Tablespaces in need of sizing
Category: Custom Reports
Subcategory: Disk Usage Forecast

Description: Detects which production tablespace may need to have their size reviewed.

Targets

Either the report viewer can select a target, or your report definition can specify the target. An element-specific target, if specified, overrides any choice below.

A target will be selected by the report viewer when viewing the report

Target Type: Any
Limits the report viewer's choice of targets

Use the specified target

Target:
Leave blank if this report has no report-wide target

[Create Report Definition >](#)

Set Parameters

Element Type	Table from SQL
Applicable Target Types	Any Target
Element Description	Displays query results as a table

Header:

Options

Create a customized table by entering a statement that returns the result set you want to display.

Statement:

```
select forecast_type "Forecast Parameters", db_name "Database Name", tablespace_name "Tablespace Name",
current_size "Current Size", estimate_value "Forecasted Size ", '+/' ||estimate_95_band "Range for Forecasted Size ", '+/'
||estimate_95_band_ct||'% "Range for Forecasted Size (%)", target_value "Suggested Size" ,
estimate_normality "Estimate of Normality" , estimate_autocorr "Estimate of Autocorrelation" ,
estimate_heteroscedasticity "Estimate of Heteroscedasticity" , estimate_r2 "Estimate of Determination" from
(SELECT * from table(FORECAST. EST_PROD_DBS (90,45,90,'FIT')) A
WHERE a.TABLESPACE_NAME = 'TBL'S'
union
SELECT * from table(FORECAST. EST_PROD_DBS (90,90,180,'FIT') ) B
WHERE B.TABLESPACE_NAME <> 'TBL'S'
)union
```


Statement Type: SQL
 PL/SQL

Rows to Display in Table:


Advanced Forecasting Example - tablespace size forecast

Sample Output:

Tablespace Growth Fits Linear Regression Model

Forecast Parameters 	Database Name	Tablespace Name	Current Size	Forecasted Size	Range for Forecasted Size	Range for Forecasted Size (%)	Suggested Size	Estimate of Normality	Estimate of Autocorrelation	Estimate of Heteroscedasticity	Estimate of Determination
90 days look back - 90 days forecast - 180 days sizing goal	DRRP	DRRP_DATA	83,100	98,199	+/- 26654	+/- 27%	128,354	0	0.65	0.27	0.54
90 days look back - 90 days forecast - 180 days sizing goal	ZFFO	LFD_DATA	16,000	17,645	+/- 3182	+/- 18%	25,518	0.83	0.56	0.05	0.87
90 days look back - 90 days forecast - 180 days sizing goal	ZFFO	LFD_IND	3,100	3,589	+/- 783	+/- 21%	5,282	0.87	0.41	0.01	0.83
90 days look back - 90 days forecast - 180 days sizing goal	ZFFO	POSI_DATA	344,177	610,715	+/- 77604	+/- 12%	903,460	0.21	0.54	0.23	0.94
90 days look back - 90 days forecast - 180 days sizing goal	ZFFO	DMWW_DATA	19,000	20,224	+/- 3147	+/- 15%	25,342	0.25	0.71	0.28	0.74
90 days look back - 90 days forecast - 180 days sizing goal	ZFFO	SYSTEM	20,520	34,678	+/- 14119	+/- 40%	54,144	0.23	0.74	0.08	0.67
90 days look back - 90 days forecast - 180 days sizing goal	WPPT	TXCD	150	153	+/- 33	+/- 21%	197	0.55	0.54	0.08	0.64

Tablespace Growth Does not Fit Linear Regression Model

Forecast Parameters 	Database Name	Tablespace Name	Current Size
90 days look back - 45 days forecast - 180 sizing goal	LSPPR	TEMP	1,000
90 days look back - 45 days forecast - 180 sizing goal	LSPPR	UNDOTBS1	516
90 days look back - 45 days forecast - 180 sizing goal	JBOB	TEMP	58
90 days look back - 45 days forecast - 180 sizing goal	FQQ	TEMP	14,300

References

- *Metalink Note 831243.1 (Examples: Creating Custom Reports).*
- *Oracle® Enterprise Manager Extensibility 10g Release 2 (10.2) for Windows or UNIX*
- Liang's Blog: <http://lianggang.wordpress.com/category/grid-control/>

OEM 11g appears to have the same OEM repository structures as OEM 10g