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Training Days 2016
Two Perspectives

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Quarterly Education Workshops

May 6, 2016

Build An Application Using APEX!

David Peake, Oracle APEX Product Manager, will lead you down the APEX path with hands on exercises building an interactive APEX application both with forms and reports. Laura Ramsey of Oracle Technical Network will be on hand with a short presentation on all the features, tutorials, information, videos, and product that is available via the Oracle Technical Network. She will bring shirts and other Oracle chacha as well. This meeting is currently scheduled for Friday May 6, 2016 at the Boulder Oracle offices. We will have further details as the time grows closer.

Bring your laptops and be prepared to learn!

Watch for RMOUG’s email announcement for your opportunity to register for the May QEW
On the Cover:

Sande Grotewohl is the Lead Business Analyst at the Regional Transportation District, Denver CO. A member of the IT department she has worked on many organizational change initiatives and technology implementations. Sande is also an artist, silversmith and a lover of the great outdoors. Her hobbies and interests include off-roading in her jeep, white water rafting and bird watching. The photos in this issue were taken on a road trip in New Mexico at Kasha-Katuwe Tent Rocks National Monument.
This is likely the last letter that I’ll write for this column in SQL>Update as president of the board of RMOUG, so I thought I would start it a little more personal...

I joined the Board of Directors of RMOUG in 1995 whilst an employee of Oracle Corporation, first as a “member at-large” and then as RMOUG’s first liaison with Oracle Corporation. Becoming a “member at-large” is largely for introductory purposes, to allow one the chance to get to know the business of the organization without the responsibilities of a director. The “liaison” role was ostensibly imagined as an avenue of communication with Oracle Corporation, but just as likely it was invented as a way to retain an Oracle employee within the board. Interestingly enough, Oracle Corporation prohibits its employees from serving as directors on Oracle users group boards, so having a non-director role such as “liaison” is an important way to maintain communications between users group boards and Oracle Corporation.

Over the years, I’ve ducked away from the board for a couple years, but I keep coming back because of the people. I’ve enjoyed the experiences and I have learned a great deal, about myself and others, and I treasure the people with whom I’ve worked. Over the past two decades, I’ve had the honor of serving as president for seven (7) of those years, and each of those years have been a humbling experience in their own way. You surely know the quote about having stood on the shoulders of giants? I stand in awe of those who have led this organization over all these years, in awe of the imagination, initiative, and sheer hard work they have devoted in getting us to the level at which we now operate.

RMOUG itself is now completing it’s 33rd year of existence, being founded in 1984. Among those who founded the organization are Rik Williams, Bob Suerstedt, Doug Faughnan, Pete Watson, Kent Graziano, Rex Walker, Ann Horton, and Dick Cross. I’m sure I’ve neglected to mention several, and for that I apologize. Many of these founders are still involved with RMOUG, and Ann Horton is indeed an active member of the board. Our annual “Training Days” conference just completed it’s 27th consecutive year, and its 20th year at the world-class Colorado Convention Center in downtown Denver. This conference has grown to become the fourth-largest Oracle event in North America, smaller than only Oracle Open World, Collaborate, and KScope. It should be noted that each of those larger events are produced by international and national organizations, while little ol’ volunteer-only RMOUG is based entirely locally within Colorado. It is a remarkable achievement, entirely dependent on the vibrant community of volunteers and activists we have here in Denver. Every member of RMOUG, and everyone who has volunteered at an RMOUG event, or contributed in any way, should give themselves a hearty round of congratulations. Every person’s effort, large and small, has helped make this community in Colorado as strong as it is.

There is so much that RMOUG has accomplished and continues to accomplish, and you cannot really begin to appreciate this until you look around North America -- and the world -- and see Oracle users groups in other local communities. Each of those communities is just as large and hard-working as this one in Colorado, but somehow we have maintained a large membership over three decades, and we have supported huge events over those decades. In many other communities, the local Oracle users groups have come and gone, and in other places they have held on just barely. We are very fortunate here in Colorado.

Recently an RMOUG member, Anthony Sanchez, shared materials from the very first RMOUG “Training Days” event held in January 1990. It wasn’t yet called “Training Days” or even “Training Day”, but rather “The Oracle Client/Server Forum”. The event would be renamed to become the “RMOUG Training Session” the following year, in 1991. I recall that the event was called “RMOUG Training Day” when I first participated in 1992, when I presented on “PRO*C Tips and Tricks”, and it was 1996 when the event expanded from one day to two days and became “Training Days”. In 2007, the event expanded yet again, from two days to two-and-a-half days.

By the way, RMOUG will be posting these materials from 1990 and 1991 on our website, very soon. If anyone else has materials from past RMOUG events, please be sure to share them so that we can post them as well?

There is no doubt that the information technology (IT) world has changed, not just over the past 33 years, but just over the past few years. With online meetings, conferences, and webinars, the phrase “community” is now more relevant to topic and subject area rather than locality. The need for face-to-face contact has lessened, and so all Oracle users groups have seen declines in attendance recently.

Does this mean that the concept of a users group has served its purpose, and is fading?

In some respects, the answer is “yes”. There is so much information available to be googled, freely and quickly. There is so much information available on MyOracleSupport and Oracle Technology Network, also available freely and quickly. There are so many videos on YouTube and free webinars listed on the RMOUG calendar page (http://rmoug.org/about/calendar/). With so much fast and free information available through your browser, what possible reason...
is there to drive somewhere in order to watch and listen to someone speak?

For many people, those sources of information are adequate all of the time. For many people, those sources of information are sufficient only most of the time.

One problem with self-ingested information is our own attention span. When I'm seeking a specific bit of knowledge, I bypass most everything else presented to me, and stop seeking when I find what I need. I don't necessarily attempt to gain information about anything additional. I search for what I need, find it, apply it, and move ahead onto the next part of my task. This is part and parcel of being in IT today, goal-oriented behavior.

But when I sit down at a conference, to learn from someone else, I'm opening myself up to understanding that topic from someone else's perspective. Someone who has taken the time to learn something thoroughly and completely, and who is now explaining it to me. Not just one specific piece of information, but the entire topic.

We not only learn by doing, but by hearing how others did things.

One of my mentors, Valerie Borthwick of Oracle Corporation, explained it to me back in the early 1990s: “You can’t claim to be expert at something until you have successfully explained it to someone else.” And I believe that is the basis of our organization.

This profession is the source of income for ourselves and our families. Those who take the trouble to learn from others are generally better equipped to handle a wider variety of tasks, as well as more difficult tasks. Those who are able to handle more tasks are more valuable, and are paid better. Those who make the effort to learn more, are more effective.

And I think this is the perennial value of face-to-face local communities like RMOUG. Technology will continue to advance, to provide more and better ways to learn. But at the core of learning, of knowledge transfer, is some form of contact. And the most effective contact is face-to-face.

So I believe that organizations like RMOUG and its special-interest groups and meetups, its quarterly meetings, and its annual conferences will continue to make Colorado a vibrant and important part of the worldwide IT community.

And the key to all of that is you. RMOUG needs your energy, your experience, and your expertise.

Please don’t be discouraged if the RMOUG volunteers whom you contact seem disorganized or discombobulated or slow to respond. Keep in mind that these volunteers are also focused on their “day job” and their family, and that volunteer activities like RMOUG can at times come in lower on the scale of life priorities, and so responses to your inquiries can be slower. Please don’t take this as a reason not to keep trying to become engaged, but as solid evidence that your help and energy are needed? Persist, persevere, and RMOUG will respond.

Because RMOUG has a constant need for new leaders.

I hope it is you. I hope you choose that path, and join this community. Please let it be you.
In part one of the series, we learned how to import data into Essbase using a relational source and Load rules. In this episode, we will learn how to export data out of Essbase Block Storage applications to a relational target.

Extracting data to relational tables from Essbase

Now that we know how to get data and metadata into Essbase, how can we get data out of Essbase and back to a relational table? This is easy if we are using Block Storage Option (BSO) databases. With BSO databases, we have calculation script commands for exporting data. The data can be exported to flat files or to relational tables. Alas, we don’t have that same functionality within Aggregate Storage Option (ASO) databases. We have restricted functionality with the new Hybrid cube functionality released in Essbase 11.1.2.3.500. In Hybrid, we can’t export any data that is an upper-level member of a hybrid hierarchy.

In BSO cubes, there are three calculation commands for exporting data:

```
DATAEXPORT "File" "delimiter" "fileName" "missingChar" ;
DATAEXPORT "Binfile" "fileName" ;
DATAEXPORT "DSN" "dsnName" "tableName" "userName" "password" ;
```

The first command exports data to a flat file. We could use this version if we have a lot of rows to insert as the direct relational load does a single record at a time. We could export to a flat file then use SQL utilities to load that file into our relational source.

The second version is used solely for exporting in a format that is easily reloaded into Essbase.

Finally the third version of the command is for loading directly into a relational target. Before I go further, I will give a couple of caveats.

First, when using this command, it ALWAYS inserts new rows into the target table. There is no command to truncate or remove rows prior to loading. I typically get around this restriction by utilizing a staging table and a stored procedure to move the data once loaded.

Second, the unfortunate part of the relational export is we have to include the ID and Password in the calc script and these items are not encrypted. The Relational DSN is hard coded, the DSNName is the ODBC connection name on the Essbase server being used and of course the tablename is the name of the relational table that will hold the data. A way to mitigate this issue is to have a special ID that only has access to write to the specific staging tables and nothing else.

Third, the target table has to be predefined. The Dataexport command will not create a table. Often I’ll use the dataexport command to a flat file first and use that flat file as the template for building the relational table. We also need to be aware that we have little control over the order of the columns in the resulting table. The order is determined by the order of the dimensions in the Essbase database. The order is based on the order of the sparse dimensions in the order they appear in the outline, followed by the dense dimensions in outline order. We can specify which dense dimension is used for the data columns. That is done using a Set command which I’ll discuss in a minute. The implication of this is if someone changes the order of dimensions in the database, the order they get loaded into the table will change. This happens often during development, so be careful.

Here is an example of a CREATE TABLE statement used for the example below.

```
CREATE TABLE [dbo].[Budget](
    [Product] [varchar](80) NOT NULL,
    [Market] [varchar](80) NOT NULL,
    [Measures] [varchar](80) NOT NULL,
    [Scenario] [varchar](80) NOT NULL,
    [Jan] [float] NULL,
    [Feb] [float] NULL,
    [Mar] [float] NULL,
    [Apr] [float] NULL,
    [May] [float] NULL,
    [Jun] [float] NULL,
    [Jul] [float] NULL,
    [Aug] [float] NULL,
    [Sep] [float] NULL,
    [Oct] [float] NULL,
```
There are a number of set commands we can use to influence the behavior of the export.

```
SET DATAEXPORTOPTIONS {
    DataExportLevel LEVEL0 | INPUT;
    DataExportDynamicCalc ON | OFF;
    DataExportDecimal n;
    DataExportPrecision n;
    DataExportColFormat ON | OFF;
    DataExportColHeader dimensionName;
    DataExportDimHeader ON | OFF;
    DataExportRelationalFile ON | OFF;
    DataExportOverwriteFile ON | OFF;
    DataExportDryRun ON | OFF;
};
```

We really concentrate on a couple of these options for relational loads.

The `DataExportLevel` parameter defines what information we are pushing to the relational system. The most efficient is to only export level 0 data, but that is not always what we want. We might need totals in which case, we have to select all.

The `DataExportColumnHeader` parameter defines which dense dimension is used for the data columns. It has to be a dense dimension. We want this dimension to be one that never changes the number of members in it. For example a Periods dimension with the 12 months is a dense dimension. We want to make sure we use this dimension to be one that never changes the number of members in it. It has to be a dense dimension. We want this dimension to be one that never changes the number of members in it. For example a Periods dimension with the 12 months is a good selection since we are unlikely to be adding a 13th month any time soon. If our cube does not have a dimension like this, then add a dense dimension to the cube with a single member. This is also a good method if we only want a single data column. A single member dense dimension takes up no additional space in the database nor does it affect calculation time.

The `DataExportDynamicCalc` parameter setting determines if we want to export any dense members that are tagged as dynamic calc members in the outline. It is much faster if we do not export those values as Essbase has to calculate them when it retrieves the data. Notice I said dense members. I get questions about data not getting exported for a cube and the user wants to know why. The setting will not export sparse dynamic calculation members because there is no block for that member. When running the export, Essbase will look at its index file for existing blocks. Since there is no block for a dynamic sparse member, Essbase will ignore that block.

We want to make sure we use `DataExportRelationalFile` parameter as this ensures the data is parsed properly into our table.

We can optionally add the `DataExportDecimal` or `DataExportPrecision` parameters and if we want to test the calc in general, we can turn on the `DataExportDryRun` as it does not actually export any data.

So what does the full command look like?

```
SET AGGMISSG ON ;
SET UPDATECALC OFF;

SET DATAEXPORTOPTIONS {
    DataExportLevel LEVEL0 ;
    DataExportDynamicCalc OFF ;
    DataExportColHeader “Year” ;
    DataExportRelationalFile ON ;
    DataExportOverwriteFile ON ;
    DataExportDryRun OFF ;
};

FIX(@Relative(“Year”,0),@Relative(“Measures”,0),
    @Relative(“Product”,0),
    @Relative(“Market”,0),“Budget”)
    DATAEXPORT “DSN” “TBC_Sample” “BUDGET”
        “interrel” “training” ;
ENDFIX
```

We can see I wrapped the command in a FIX statement. Even though I specify `DataExportLevel Level0`, if I did not use the FIX statement to restrict the blocks I was looking at, Essbase would look through the entire index and only return the level 0 blocks. By using the FIX statement, we are helping Essbase limit the blocks it looks at, resulting in a faster export.

So we have now used Essbase functionality to export data to a relational table. Using built-in functionality, we have simplified how we do the maintenance of our Essbase cubes and move metadata and data around.

But what about integrating relational data as part of our analysis? Perhaps we could do some analysis in Essbase and then drill back to the relational source to gather additional detail and information?

Stay tuned for the final episode where we discuss Essbase Studio and drill through reporting.

Glenn Schwartzberg has been an IT professional for over 30 years. He started his career in IT (then MIS) working on IBM mainframes writing COBOL and CICS programs. He quickly worked his way up the food chain and as a manager had 15 people working for him. At this pivotal juncture, he decided he would rather be a technical resource than spend his time telling other people what to do and justify his life through paperwork. He entered the world of consulting, where he was a DBA on Teradata DBC1012 computers, programming, and maintaining databases. This was his introduction to SQL.

During his stint working on data warehouses, he ran into a little program from Arbor software called Essbase. It was a cool little program and Glenn immediately saw the value in allowing users to get their own data, so he started learning all he could about it. This was on version 3.11. As time and versions progressed, he learned more and more and the versions got more feature-rich and complicated. While Glenn did not like being a manager, he did feel it was important to assist others as they tried to figure out the issues they were having with the application. He joined bulletin boards and forums and was an ardent contributor, answering others’ questions and gaining more knowledge. In 2008, due to his continued efforts to assist others and evangelize Essbase, he was honored with the title of Oracle ACE in Business Intelligence. In 2010, he was privileged to be named an Oracle ACE Director. He continues to share his knowledge of Essbase and its associated products through the Oracle EPM discussion forums, presentations at conferences, user group meetings, webcasts, and his blog. He was one of the founding members of the ODTUG Hyperion SIG Board.
Introduction

While many enterprises rely on MySQL because of its open source freedom, lower total cost of ownership, scalability, application development and other advantages, it hasn’t, until very recently, been well instrumented for performance tuning and optimization. When 25% of users will abandon a database-driven web application after only three seconds of delay, slow database performance is no longer something that can be easily ignored.

What kind of improvements can be made through tuning? In one instance, tuning a customer-facing website application for end user response time resulted in increasing product searches from 10,000 to 30,000 per day and dropping product search queries from 22 hours to 22 minutes.\(^1\)

In this whitepaper, we discuss the challenges specific to MySQL tuning and provide practical guidance on how to achieve database-dependent application performance that can result in better enterprise productivity, agility and decision making, as well as improved user responsiveness. Drawing on our experience, we’ll:

- Demonstrate how to effectively use the MySQL performance schema to pinpoint bottlenecks and get clues on the best tuning approach
- Show you techniques for quickly identifying inefficient operations through review of query execution plans
- Discuss monitoring techniques to make sure the query stays tuned

How Do We Know What to Tune?

The impetus for seeking better performance might come from users vexed by productivity bottlenecks or executives determined to drive efficiencies, but improvement starts with one common question: How do we know what to tune?

Query tuning is both an art and a science, a venture that requires technical expertise and business acumen. Knowing how MySQL will access data, being able to read and verify the MySQL execution plan, understanding SQL query design and knowing how to write good SQL statements is required, since modifying the query might be necessary.

It’s also critical to determine how the application dovetails with business processes. Are the demands on the database made by any given user necessary? In one instance, a group within a company was unable to run the end-of-month reports they needed. Upon investigation, it was found that another group was dominating compute resources by running a series of reports that no one realized were obsolete. In this case, simply having insight into business processes solved the issue—no special technology required.

Unfortunately, tuning is almost never so simple. Prioritizing which statements to tune can be problematic and, because each statement is different, creative approaches are necessary; that’s where the “art” comes into play. Throwing shiny new hardware like SSDs and memory may seem like an easy and increasingly affordable solution. However, if you don’t know the root cause of the performance issue, you may be throwing money – and opportunity – away.

Those who manage a MySQL environment deal with a complex, dynamic environment, often bearing the responsibility of managing the hundreds of database instances that serve their enterprise. The continued migration of databases to the cloud potentially complicates the situation. Consequently, optimizing MySQL performance requires a proven process and tools to enable you to accurately assess baseline performance over time and accurately identify causes of slow performance.

Tuning Takes a Village—Who Should Be Involved?

Database administrators and developers each bring different skills to the table, which makes a convincing argument that tuning calls for a team effort. Users need to be part of the roster as well, because they are the primary customer, and it’s their experiences that usually first call attention to issues. Why are they the ones to point out slow application performance? It’s because DBAs are frequently trying to “just keep the lights on” while administering a large number of database instances, and developers are keenly focused on functionality as well as meeting their deadlines. Further, DBAs probably don’t know the code as well as developers, and developers might use SQL code generators to create the SQL statements, since they primarily code in PHP or Java.

By defining tuning to be a team project, management can draw on the skills possessed by each person in the team and diffuse the finger-pointing that not having a clear picture of issues sometimes causes.

Preparing to Tune—What Should Be Tuned?

Whether an enterprise is looking at disappointing internal- or external-facing database dependent processes, finding the root

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1. Aberdeen Group, “Reaching the Top of the Web Performance Mountain” (May 2013)
cause commonly begins with assessing counters and system health metrics. But that course of action often doesn’t provide complete information, can be misleading or focuses attention on a limited time span which doesn’t correlate with end user experience.

Determining which SQL statements to focus on is the first step in the tuning project. User complaints are obvious road signs that point you to the queries or batch jobs they are running. Next, looking for the queries that are consuming resources, like I/O or CPU, can narrow the search. You might also look to server metrics such as memory utilization, buffer cache or table scans for clues.

While all of these investigations are likely to yield important clues, a more effective approach is response time analysis (RTA.) RTA is a proven way to monitor, manage and tune database performance that is based on the optimal end user outcome, whether that user is an application owner, batch process or consumer. RTA does for those who manage MySQL what application performance management does for IT – identifies and measures a process end-to-end, starting with a query request and ending with a query response, including the wait time spent at each discrete step in the process.

You can apply RTA to MySQL by analyzing the performance and information schemas to reveal performance issues which traditional tools (used to assess the health of servers and databases) don’t identify. The ‘Performance_Schema’ is a real-time in-memory database providing information about users, the queries that are running and resources used. The ‘Information_Schema’ holds the metadata about all the objects in a MySQL instance and also contains INNODB storage engine’s transactional information.

**Step 1: Gather Metrics**

Because RTA takes into account the end user experience, you can quickly identify what they are waiting on and know where to begin gathering baseline performance data. By focusing on query response time, you can rank the hundreds or potentially thousands of steps that an SQL query works through before delivering the end result set.

In addition to the total time waited on for a given query, MySQL gives you data on Instrumented Waits and Thread States, showing the time required for each step and the resource allotment, which are great clues on where to start tuning. With these initial measurements in hand, you can now move to examining the execution plan.

**Step 2: Examine the Execution Plan**

Experienced MySQL users know that MySQL will generate a tabular execution plan when you use EXPLAIN or EXPLAIN EXTENDED commands. As of 5.6.3, Optimizer Trace became available, which gives more information on how Optimizer arrived at the final plan.

MySQL Workbench gives you both a graphic representation and tabular view into the execution plan. It also displays more granular details about each step when you mouse over an icon. In the example shown here, you can see a “high cost warning” that the Optimizer recognizes in this plan – one reason that the query needs tuning.

Using EXPLAIN will give a tabular view of the select type, the table names, possible keys it looks at, and the key that it finally chose. It will also show the key length, foreign key reference and the number of rows that it plans on reading. Finally, the “extra” columns will give you more information about how it’s going to filter and access the data.

Reading execution plans is a critical part of tuning. For example, the possible_keys field can often help in optimizing queries, since if the column is NULL, it indicates no relevant indexes could be found.

**MySQL 5.6+**

Enhancements to performance and information features in MySQL have made it more useful when tuning.

Performance_schema
- Greatly improved to give more information on users, the queries they are running and resources they are using
- Provides current and historical events at the Statement, Stages and Waits levels
- Consumers now on by default

Information_schema
- Holds the metadata for all the objects in an MySQL instance
- Contains INNODB storage engine’s transactional information

The performance drain characteristic of past versions has been significantly reduced and many more thread states and instrumented waits are captured.

It’s important to note that MySQL Optimizer can transform the SQL queries it receives. ‘EXPLAIN EXTENDED’ shows you how the MySQL optimizer rewrites your query when you use ‘SHOW WARNINGS’ after the EXPLAIN EXTENDED clause. The show warning’s output will display additional information, including the rewritten or transformed query. This can be very useful if you have data type mismatches (i.e. implicit conversions) or have ‘SELECT *’ in the query, as you can quickly see what transformations need to take place.

Optimizer tracing returns all the access paths and statistics the Optimizer considered before arriving at the final execution plan, and is especially revealing when you are trying to find out why MySQL Optimizer is “stuck” on a certain plan. The trace is stored in the INFORMATION_SCHEMA.OPTIMIZER_TRACE table (and the default size is 16K, which is often too small to see a large query).

To turn on optimizer tracing, you, ‘SET OPTIMIZER_TRACE="enabled=on"’ and then run your query. To view the trace, simply select it out of the OPTIMIZER_TRACE table in the INFORMATION_SCHEMA. Keep in mind that Optimizer Tracing is only a snapshot in time and doesn’t show historical trends, which
can mislead you to assume that you have pinpointed an issue which is not truly the root cause.

**Step 3: Review Table and Index Information**

After gathering baseline metrics and reviewing the execution plan, the next step is to review the table and index information. We suggest breaking this into three steps.

1. Confirm whether you are looking at a table or a view. Determine where the table resides, and review the keys and constraints to see how the tables are related. Use `MYSQLSHOW -- STATUS {database name}` to obtain table sizes.
2. Examine columns in the WHERE clause — Use ‘SHOW INDEXES FROM {TABLE NAME}’ to check out the indexes, their cardinality and length.
3. Know your existing indexes — Establish the number of columns the indexes contain. MySQL must reference the left-leading column in a multi-column or composite index, otherwise it can’t use the index.

**Step 4: Measure the Results, Repeat**

Once you’ve successfully tuned the query, you need to monitor the improvement to prove that tuning makes a difference. Take new baseline measurements and compare them to the initial reading. Tuning can be an iterative process as there is always room for improvement as applications change, data grows and workloads change.

**Continuous Monitoring: the New Normal**

Once you’ve successfully resolved a critical incident or singular performance issue, the final important step to take is to adopt a continuous monitoring approach. Continuous performance monitoring tools mark the next evolution of tools available for DBAs implementing RTA. These tools work in collaboration with MySQL to simplify performance management by consolidating performance information in one place, displayed on a dashboard that shows what issues to fix and how to proactively tune.

It isn’t humanly possible to monitor the hundreds if not thousands of databases a team of DBAs manage, and so an obvious benefit of a continuous performance management tool is that it can cope with the volume. Other advantages emerge as well. With insight into normal performance and trends over time, capacity planning and predictive analytics become more accurate. One can also assess the impact of transitioning database services to the cloud and track application performance in a shared environment where one database competes for resources with another, and then validate whether that move to a hosted storage and computing platform returns the positive ROI.

**Conclusion**

A growing number of IT teams are moving from established performance monitoring practices to RTA, recognizing that taking an end user perspective, where the time elapsed using an application is the true measure of productivity and success of the database service. MySQL has evolved to support that paradigm, and along with third-party tools gives DBAs further information to flesh out the story partially told by database health metrics and network performance measurements.

Using RTA, you can identify bottlenecks, pinpoint their root causes and prioritize your actions based on the impact to end users. RTA enables IT management to direct issues to the appropriate resources, whether that’s the DBA, a developer or network administrator. In short, RTA helps you provide better service, resolve trouble tickets faster by knowing precisely where to focus MySQL tuning efforts and free up time to focus your efforts where they have the most impact.

Computing power has soared. Data volumes have grown astronomically, and enterprise dependence on application performance has become truly business critical. With so much at stake and so many responsibilities, DBAs need to find and fix problems the first time, every time.

**How can Database Performance Analyzer Help?**

Database Performance Analyzer (DPA) from SolarWinds (NYSE: SWI) provides the fastest way to identify and resolve database performance issues. DPA is part of the SolarWinds family of powerful and affordable IT solutions that eliminate the complexity in IT management software. DPA’s unique Multi-dimensional Database Performance Analysis enables you to quickly get to the root of database problems that impact application performance with continuous monitoring of SQL Server, Oracle, SAP ASE and DB2 databases on physical, Cloud-based and VMware servers.

For additional information, please contact SolarWinds at 866.530.8100 or e-mail sales@solarwinds.com.

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1. The Total Impact of SolarWinds Database Performance Analyzer, Forrester, Michelle Bishop, Principal Consultant, 2013
2. www.sitepoint.com/using-explain-to-write-better-mysql-queries/
**RMOUG 2016 Training Days Awards**

*Training Days 2016 – another great year! With over 84 speakers from around the world presenting 126 sessions, there were also over 22 opportunities to talk with companies sponsoring and exhibiting their products.*

**2016 Volunteer of the Year Award Recipient**

This is awarded to an RMOUG member who has shown exemplary service and has had the significant impact on RMOUG and the Oracle user group community over the past year.

Dan Hotka has been an active supporter of RMOUG for many years. As the Programs Director, Dan has enthusiastically jumped into bringing fresh ideas to the Quarterly Educational Workshop. Dan has also served as a Training Days Volunteer for many years.

**2016 Doug Faughnan Lifetime Achievement Award Recipient**

In 2002, this award was created as a memorial to Doug Faughnan, RMOUG’s first webmaster, longtime contributor, good friend, and mentor to many. This special award is presented to an RMOUG member who has shown exemplary service to the organization as a volunteer over a long period of time.

Kellyn Pot’Vin-Gorman has been active with the Rocky Mountain Oracle Users Group since 2009 and has served as Membership Director, and has been our Training Days Director since 2013. As Director of Training Days, Kellyn has recruited many new speakers and expanded topics, such as SQL Server. Kellyn is actively involved SIG Groups – “Raspberry Pi” and “Womens In Technology”

**2016 Stan Yellott Spring Scholarship Recipient**

Rajesh Rajchal comes to Colorado from Nepal, and is currently studying at Computer Science, specializing in software development at Front Range Community College (FRCC). His career goal is to make the world a better place by managing biodiversity through computer applications.
Dara Tallmadge, at your service. I have been an attendee at RMOUG’s Training Days and most years a room ambassador volunteer since 2007, and on and off in the years before. Kellyn Pot’Vin-Gorman asked me to share my Training Days experiences as an attendee, panelist and volunteer. So here goes...

Tuesday, February 9th

Tuesday dawned bright and clear – very pleasant standing at the bus stop. I remember some years when it has been bitter cold. I guess Mother Nature decided to smile on us this year. Oh and on the Broncos’ Super Bowl Victory Parade and Rally. Arriving early on Tuesday to help with bag stuffing and early registration, I was fortunate to miss the majority of the fans streaming into Downtown. But I heard and saw lots of the effects. People arriving at the registration desks shared horror stories of hours of delays – getting light rail tickets and the sheer volume of people. And during the afternoon sessions, tired people staggered in until well after the sessions had started, having battled the hordes of revelers.

Being a room ambassador means that I had to select many of my sessions well in advance of arriving at Training Days, and as I am in between jobs now, I decided to attend more sessions outside of my previous role as a system DBA. I chose to focus this year on PL/SQL and fewer strictly system DBA, as opposed to application DBA, sessions. Even with that as my goal, my choices were so numerous, that I missed out some excellent presentations.

With learning more about PL/SQL as my new goal, I attended 2 Deep Dives on Tuesday afternoon – Steven Feuerstein’s Key PL/SQL Performance Techniques: Bulk Processing and Function Result Cache and Bill Coulam’s PL/SQL: Newbie to Knowledgeable. (Note to self: two Deep Dives in one afternoon is too much.) First, Steven delved into utilizing the FORALL and BULK COLLECT constructs to eliminate context switches to improve performance. Then up was a demonstration of the powerful functionality and ease of use of the Function Result Cache.

Bill’s session delivered the promised Newbie introduction and started in on the Knowledgeable – Enterprise-level PL/SQL constructs and best practices for developing databases. From both sessions, I learned a lot about where to get more information and how to get started learning and practicing writing PL/SQL.

Wednesday, February 10th

On Wednesday, although the Broncos fans were long gone, the motivational speaker Tony Robbins was speaking in the convention center and that made for difficulties parking – sometimes you just can’t win. But I think most everyone found the venue easier to get to than the previous day. On this day I continued my “study” of PL/SQL, starting the morning with Bryn Llewellyn’s Why Use PL/SQL? Bryn’s discussion of importance of modular design and how that ties in with using PL/SQL, again to minimize the context switches between PL/SQL and the SQL Engines, as well as the idea of the thick database paradigm - was illuminating and a fascinating idea to consider and implement.

Back down to the main ball room for Keynote speech by Carlos Sierra and Mauro Pagano. Their discussion about SQLTXplain and its evolution from coe_xplain and on to the newest version – SQLd360 – was instructive and humorous as they tag-teamed the presentation, helping us to understand where the tool had come from, where it is going in the future, and why it is a great benefit to all who battle in the SQL tuning and troubleshooting arena.

The next session I attended was a detour back to the world of system DBAs – Craig Shallahamer’s Let’s Build Something! Building Your Own ASH Toolkit – almost like “This Old House”.

At lunch on Wednesday, I had the opportunity to sit with Steven Feuerstein and his colleague Blaine Carter and discussed more about how to learn to use PL/SQL as well as other topics. I cut lunch a bit short – Kellyn had talked me in to being a member of the Women in Technology (WIT) Panel. As my first time in front of a large room of people, I was a bit nervous – OK – a lot nervous! The panel – four women and one supportive husband and dad – sat behind a table so I was able to relax. The process started slowly as we shared how we each came into the technology field and then Kellyn asked for audience participation. As the hour rolled by, the discussion was quite free flowing, with as many dads/uncles piping in as women/moms/aunts. When the time was up, I was a little disappointed it has gone by so fast.

My afternoon sessions stayed in the familiar realm of system DBAs, attending Mike Donovan’s The DBA as Linchpin, Not Roadblock: Fast-Track Your Career in 60 Minutes, and Capacity Planning with AWR: Eliminating the Guesswork by Roger Cornejo. Mike’s session focused on the need for the DBA to be involved in all stages of the architecture and design of the infrastructure that the database will be an integral part of. To paraphrase Mike, “DBAs can be both guardians and gatekeepers of the organization’s data but we should also be essential parts of the planning and enabling phases of the overall design.”

Capacity planning has always been a black box for me so Roger’s presentation was an opportunity for me to gather some
much needed insight on how to utilize tools already available and populated, to help plan for the future. The presentation included three case studies that illustrated how the information in AWR can be mined to provide the necessary information to make informed capacity decisions about increases in volume, application upgrades, or DB consolidation.

**Something New**

At the evening’s reception, there was a new event – the Team Trivia. I joined Team Kevlar more or less willingly (I love trivia but didn’t have a team to play on) - Kellyn drafted the rest of the team. But the guys – Randy Cunningham, Werner De Gruyter, and John Piwowar (from the WIT panel) were great sports and ultimately enthusiastically participated as we went from vendor to vendor in the exhibition hall. The vendors were all very helpful and in the end with only two other teams in competition, Team Kevlar won!! The bonus for me was that I won the free registration for Next Year’s Training Days!

**Thursday, February 11th**

Hurray, no parades or motivational speakers to worry about. My choices of sessions were all over the board. First up, *After the AWR Warehouse* by Kellyn. This presentation was a sneak preview of the next generation of the AWR Warehouse – the Oracle Management Cloud which is a soon-to-be-available cloud only offering by Oracle. Kellyn was very clear that this is not Enterprise Manager 13c – but a completely different product.

Next was Bryn’s follow-up presentation to yesterday’s *Why Use PL/SQL?* – this one entitled *Transforming One Table to Another: SQL or PL/SQL*. I found the topic intriguing but a bit over my head as a newbie to the PL/SQL world. I did understand the concepts on a high level because Bryn’s descriptions were so clear. Equally intriguing was the way the SQL community at large rose to the coding challenges put forward by Bryn and Jonathan Lewis.

Iggy Fernandez and *Give me a SQLT Report (or Admin That You’re Not Serious about Solving your SQL Performance Problem)* was a detailed account of how to utilize a structured problem-solving method with output from SQLT when digging into an SQL performance issue. I don’t know about you, but I’m all about the process so it was a compelling presentation for me.

After lunch, I enjoyed the session by Kellyn and Jeff Smith – *Social Media Makeover with @DBAKevlar and @thatjeffsmith*. This topic was timely for me as I am trying to bring some cohesion and clarity to my online presence, small though it is. I found the case study makeovers that were done on two well respected members of the Oracle Community to be helpful and encouraging – I’m not the only one lost in the social media wilderness.

As a system DBA for over a decade, I know the importance of a database backup and as I haven’t had an opportunity to work on a live 12c system (Virtual Box can only take you so far), I was interested in René Antúnez’s presentation on *RMAN 12c Live: It’s All About Recovery, Recovery, Recovery*. The intricacies of backups for Container databases vs. Pluggable databases is one of the many complex facets of Oracle 12c. I was glad to see René’s exploration of this topic and I came away with lots of valuable information from his presentation.

My last session of Training was *Extreme GoldenGate Replication for the Oracle DBA: Performance Tuning Integrated Oracle GoldenGate Processes* by Bobby Curtis. I have experience with GoldenGate implementations and wanted to expand my knowledge of performance tuning techniques in this area. But this time, many were suffering from mushy brains (myself included), Bobby’s presentation was well delivered and I did pick up some tidbits and techniques for my future GoldenGate deployments.

As always, I came away from RMOUG’s Training Days with so much great information and more action items that it will take me a couple months or more to sift through them all. I look forward to next year and the great sessions that will be presented then!
Training Days 2016
Conference Review

Training Days Director, Kellyn Pot’Vin Gorman

The last two years have garnered in a large shift to the strong history of Rocky Mountain Oracle User Group’s annual conference, Training Days. The two ½ day event is met with great anticipation by many in the Oracle community and as the conference director for the last four years, I’m quite aware of how valuable conference evaluation data is. Each year, post the conference, I pour over the evaluations and create an elaborate report of charts and findings to help me make the most of the upcoming year.

One of the biggest changes in our conference the last two years has been our attendance. As our membership of over 25 years is leaving the workforce, changing career fields and other reasons that cause them not to attend, a large amount of time each year has been spent on reaching new attendance for the conference. This shift can be seen in the graphs from 2015 to 2016.

How Many Training Days Have You Attended?

2015- 10%

2016- 31%!

We’re reaching out to new companies, new technologists and new opportunities to help the conference stay relevant in the Rocky Mountain area. It’s never an easy road- We have started marketing to companies looking for Oracle candidates on job boards, are attending other Oracle events and may be involved in meetups or other networking opportunities that may not be aware of RMOUG.

Technical Content is Important to You

RMOUG strives to ensure that, unlike the free events that you could attend anytime during the year from different vendors and other groups, we keep our content technical and from the best of the best in the Oracle world. This quality shows in our evaluations, too.

Are the sessions technical in nature and not marketing?

Type of Sessions

I’m consistently asked at the conference, “Why don’t you have more <insert area of expertise here> sessions?” We work really hard to make sure that there is something for everyone, but I also make sure that our content matches the attendees that pay to come to Training Days.

How Many Training Days Have You Attended?

2015- 10%

2016- 31%!
If you take the track of greatest importance, (know that submitters could list more than one…) and compare it to their roles they fulfill in their jobs:

You can see that our content by track matches it out pretty well. One of the tracks that attendees consistently rate high and mention as a reason to invest more in at Training Days is our Professional Empowerment track. Many commented the value it added to the conference and that how we live our lives and getting to our place in our careers is as important as what we technically know. Due to this, we’ll continue to grow this track and bring you inspirational speakers and mentors.

The Things RMOUG Can’t Change

There are many items that come out in the evaluations that we can’t do much about to improve-

• Quality of food, snacks, coffee or that you wanted to have more dessert.
• Price of parking around the convention center or move the Broncos parade.
• Temperature of hallways at the convention center that’s akin to a meat locker.
• Making Steven Feuerstein part of the ACE program again even though he’s with Oracle and give him an ACE lunch table.

These were all thrown in for humor, but these were real comments that I enjoyed reading, even if there isn’t much I can do about those kinds of issues that folks would like me to improve upon. Do know that the data from the conference evaluations are not something that is requested and ignored. I pour over these evaluations each year, create a massive report, (that you’re seeing just a few charts from) and RMOUG uses it to ensure that you get the best conference for your training budget dollar.
It all began with an email describing a problem which appeared to be rather easy at first. Someone’s database wasn’t starting. Of course, as with most emails asking for help, no further information was provided. But how hard could it be? And so I got ready to fix whatever boring issue this turned out to be.

The first thing to try was to start the database myself:

```
SQL> startup
ORACLE instance started.
```

All System Global Area 1837318144 bytes
Fixed Size 2254184 bytes
Variable Size 754977432 bytes
Database Buffers 1073741824 bytes
Redo Buffers 6344704 bytes
Database mounted.
ORA-01092: ORACLE instance terminated.
Disconnection forced

The database wasn’t starting because it was crashing on startup! Maybe it wasn’t boring after all? So what do you do? The first place to look is the alert log, which is what I did (leaving only relevant information in place for the sake of brevity):

```
Tue Dec  8 16:57:18 2015
Starting ORACLE instance (normal)
Tue Dec  8 16:57:23 2015
ALTER DATABASE MOUNT
Tue Dec  8 16:57:27 2015
Database mounted in Exclusive Mode
Completed: ALTER DATABASE MOUNT
Tue Dec  8 17:14:04 2015
alter database open
Tue Dec  8 17:14:05 2015
Beginning crash recovery of 1 threads
parallel recovery started with 4 processes
Tue Dec  8 17:14:06 2015
Completed crash recovery at
Thread 1: logseq 3570569, block 773, scn 14318911386941
278 data blocks read, 278 data blocks written, 770 redo blocks read
Tue Dec  8 17:14:11 2015
SMON: enabling tx recovery
Tue Dec  8 17:14:11 2015
Errors in file /opt/oracle/admin/DBM/bdump/dbm_p000_34079344.trc:
ORA-07445: exception encountered: core dump [], [], [], [], [],
Tue Dec  8 17:14:12 2015
Doing block recovery for file 1065 block 94314
Tue Dec  8 17:14:12 2015
SMON: slave died unexpectedly, downgrading to serial recovery
Tue Dec  8 17:14:13 2015
Errors in file /opt/oracle/admin/DBM/bdump/dbm_pmon_27722138.trc:
ORA-00474: SMON process terminated with error
Tue Dec  8 17:14:13 2015
PMON: terminating instance due to error 474
Instance terminated by PMON, pid = 27722138
```

Let’s quickly go through what is happening. After the startup we see that the database tried a crash recovery (Beginning crash recovery of 1 threads). This entails reading the redo, replaying the changes that were still in-memory while the database was running, and rolling back any uncommitted changes. This is useful to know because it tells us that the database wasn’t shutdown in a clean way. We see that the crash recovery is able to complete successfully (Completed crash recovery). After that, SMON signals to begin the transaction recovery (SMON: enabling tx recovery). Things get interesting right after that. There is a core dump (ORA-07445) of one of the parallel slaves – as we can see from the process name (p000) which appears as part of the trace file name (dbm_pmon_27722138.trc). What’s happening here is, by default, the transactions will be rolled back in parallel – this is controlled by the database parameter called fast_start_parallel_rollback. Evidently one of the parallel slaves dies while trying to perform the recovery. When a parallel recovery fails for any reason a serial recovery will be tried by SMON. This is done in case there are any bugs or issues in the parallel recovery code. Unfortunately SMON follows the same fate as the parallel recovery slave and terminates as well (ORA-00474: SMON process terminated with error). Except
this time the consequences are far worse – SMON is one of the vital background processes the database cannot work without. The PMON - Process Monitor process – notices the SMON is no longer alive and terminates the instance.

So what do you do when SMON dies while trying to perform transaction recovery and prevents your database from starting normally? The first thing we need to do is get the database to open without crashing, which will allow us to troubleshoot the issue further. But this creates a little bit of a chicken and egg problem. Fortunately there is a way to disable SMON transaction recovery by setting event 10513. Now before you get all worked up about setting events in the database, this particular one is documented in a number of MOS notes. For example “How to Disable Parallel Transaction Recovery When Parallel Txn Recovery is Active (Doc ID 238507.1)”. I encourage the reader to search for it on MOS and get familiar with the cases in which it can be used. Let’s put it into the parameter file:

```
*.event='10513 trace name context forever, level 2'
```

We can now try and start the database:

```
SQL> startup
ORACLE instance started.
```

```
Total System Global Area 1837318144 bytes
Fixed Size 2254184 bytes
Variable Size 754977432 bytes
Database Buffers 1073741824 bytes
Redo Buffers 6344704 bytes
Database mounted.
Database opened.
```

The good news is we can now open the database without crashing! Though we didn’t yet solve the problem as running the database with transaction recovery disabled is not really what anybody should be doing. We can now begin troubleshooting the issue further. What we need to do next is determine which object SMON is trying to recover that lead to a crash. We can get file# and block# from the SMON trace file:

```
*** 2015-12-08 14:00:25.232
SMON: about to recover undo segment 17
*** SESSION ID:(546.1) 2015-12-08 14:00:25.219
```

```
Do ing block recovery for file 1065 block 94314
```

```
If we know file# and block# we can find what object it belongs to:
```
SQL> select owner, segment_name, segment_type
2   from dba_extents
3   where file_id=1065
4   and 94314 between block_id and block_id+blocks-1;

<table>
<thead>
<tr>
<th>OWNER</th>
<th>SEGMENT_NAME</th>
<th>SEGMENT_TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWH</td>
<td>TRAN_AGGR</td>
<td>TABLE</td>
</tr>
</tbody>
</table>
```

Just in case let’s record object_id and data_object_id for this table which will help us with further investigation, if required:

```
SQL> select object_id, data_object_id
2   from dba_objects
3   where owner='DWH'
4   and object_name='TRAN_AGGR';
```

```
OBJECT_ID DATA_OBJECT_ID
---------- ----------
103071     103071
```

What SMON is trying to do is recover a block which belongs to a table called DWH.TRAN_AGGR. Now that we know the table name, we can determine what to do next. Development reached out to us and said that the information in this table can be fully rebuilt and therefore is not needed. This is good news because it means we can just drop the table and there will be no need for SMON to try and recover the block from it:

```
SQL> drop table DWH.TRAN_AGGR;
Table dropped
```

Now we can unset the event 10513 and try to start the database again:

```
SQL> startup
ORACLE instance started.
```

```
Total System Global Area 1837318144 bytes
Fixed Size 2254184 bytes
Variable Size 754977432 bytes
Database Buffers 1073741824 bytes
Redo Buffers 6344704 bytes
Database mounted.
ORA-01092: ORACLE instance terminated.
Disconnection forced
```

Whoops… that didn’t work out as expected! After checking the alert log it turned out that SMON was still dying. Things were getting more and more interesting. Let’s see what happened by checking the SMON trace file:

```
*** SESSION ID:(546.1) 2015-12-08 18:31:36.752
SMON: about to recover undo segment 17
*** 2015-12-08 18:31:36.752
```

```
Exception signal: 11 0xf59c (0000F59C) 9103fff8
```

With the table recovery out of the way we’re now hitting a different issue – SMON is dying while trying to recover one of the UNDO segments.

One of the ways to go about this problem is by setting _offline_ rollback_segments parameter and putting rollback segment 17 to it. However extreme care should be exercised before using this parameter as any transactions that require rollback and need information from this segment won’t be able to do so. Which brings us to the next point – how can we find out more about transactions in rollback segment 17 in order to make a better informed decision? Every UNDO segment contains an undo segment header and within it a transaction table which is used to track the status of the transactions. So one way (and a geeky way at that!) to find out what was happening to the transactions in this undo segment is to dump the segment header block and look at the transaction table. So we put event 10513 back, started up the database, and find undo segment 17 header block:

```
SQL> select segment_id, file_id, block_id
2   from dba_rollback_segs
3   where segment_id=17;
```

```
SEGMENT_ID FILE_ID BLOCK_ID
---------- ---------- ----------
17 478 5
```

We can now dump the block:
```
alter system dump datafile 478 block 5;
```

If you open the trace file and scroll to the very bottom you will find the transaction table in there:
This is where talking to development helped us again. They confirmed that transactions against that table are self-contained. So in order to start the database we can put this rollback segment in _offline_rollback_segments. Please note that this measure should be used as a last resort and only to allow you to get the database opened, and should be carefully weighed against other supported measures such as doing database point in time recovery. Remember that every time you deviate from what I call a standard documented procedure you can introduce unintended consequences and a full database rebuild using import and export might eventually be on the table if you want the database to get back into a guaranteed clean state. Some problems may stay hidden and manifest themselves later during a less than desired time, such as an upgrade. Let’s find out rollback segment’s name:

```
SQL> select segment_name
2   from dba_rollback_segs
3   where segment_id=17;
```

```
SEGMENT_NAME
-------------------------------
_SYSSMU17_3548212873$
```

After putting its name into _offline_rollback_segments parameter and removing the event 10513, the database started right up and ran through the batch cycle without any issues. This concludes our tale of a not starting database.

Alex Fatkulin is a master of the full range of Oracle technologies. This mastery has been essential addressing some of the greatest challenges his customers met.

Alex draws on years of experience working with some of the world’s largest companies, where he was involved with almost everything related to Oracle databases, from data modeling to architecting high availability solutions and resolving performance issues of extremely large production sites.

Alex holds a Bachelor of Computer Science from Far Eastern National University in Vladivostok, Russia. He is also an Oracle ACE and a proud OakTable member.
The RMOUG Board of Directors have been busy over the past few months preparing for Training Days 2016 and working on a new scholarship program. We are happy to announce the introduction of the new RMOUG Women in Technology (WIT) Scholarship. Through this scholarship, we are joining larger efforts to draw more women into Information Technology fields of study and ultimately into the workplace. Women make up 59% of the US labor force and almost 51% of the US population, but only account for 26% of the IT workforce and that number has been steadily declining. Studies consistently show that having more diversity in the workplace is highly beneficial. In addition, the US Bureau of Labor Statistics predicts that IT will be one of the fastest growing sectors of the US economy, adding nearly 1.4 million job openings by 2020. Based on current statistics for college graduates completing IT related degrees, up to two-thirds of those jobs could go unfilled due to an insufficient pool of candidates. Women represent a potential vast untapped talent pool that could help keep the IT workforce strong. Our new WIT scholarship will award scholarships to deserving women pursuing their career goals in IT. Our first WIT scholarship deadline is April 15, 2016. After that the WIT scholarship will become an annual award with a December 15 deadline. Please go to rmoug.org for more details.

RMOUG's Stan Yellott Scholarship has been a continuing scholarship award program that we are proud to offer. In the last two years, we have stepped up this program to award scholarships on a quarterly basis. Again for this year the RMOUG Board of Directors voted to stick with the original Stan Yellott program that started back in 2001 by funding the attendance of students from Pine Creek High School (PCHS) in Colorado Springs to attend our RMOUG Training Days 2016 Event. Ms. Denise Gardiner, a technology teacher at PCHS, took 16 students this year to experience Training Days with the Stan Yellott Scholarship Fund absorbing the costs.

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The new generation of Oracle's popular database has been designed for the Cloud and will enable you to make more efficient use your IT resources while continuing to improve your users' service levels. With this, there are enhancements and new features, which will make it easier for customers to take advantage of the Cloud.

In the past article we discussed several of the new features introduced in 12c, specific to Oracle's backup and recovery utility RMAN. In this article we will explore how RMAN and EM12c can be used together to expand each other's capabilities.

**EM12c and RMAN 12c**

Oracle Enterprise Manager 12c provides you with an interface where you can manage most of RMAN’s features via a GUI interface. Using EM 12c also removes the need to continuously maintain RMAN scripts and crontab jobs. Another great advantage of using EM 12c for RMAN is for reporting purposes as you can view a more friendly report of your backups, that is not as cryptic as the LIST BACKUP command.

It is imperative to know that to access the RMAN features in EM 12c you need to have a credentialed OS account, as it will be a needed requirement for you to setup your backups with this tool.

To access the RMAN features in EM 12cR3, you need to login and go to the following location, Targets → Databases→DB_NAME→Availability→Backup&Recovery. There you will find all the Backup And Recovery Options you have in your hand with EM12cR3

**A. Scheduling a Full Backup**

To run a full backup within EM12c, you need to go to Availability→Backup&Recovery→Schedule Backup... Where you will have the range of backup types that you want to run, either Oracle-Suggested Backup or Customized Backup. In this document we will only explore the Customized Backup. With the Customized Backup you are given the option to select the type of objects you want to backup.

- Whole Database
- Container Database Root
- Pluggable Databases
- Tablespaces
- Datafiles
- Archived Logs
- All Recovery Files on Disk

Now you will have the Options for your backup, where you will decide if you want to run a full or incremental backup, hot or cold backup as well as backup your Archived Redo Logs.

In the settings section, you can define if your backup will reside in Disk or you will use a MML, as well were you can view the RMAN settings for your database.

In the third step of this process, you will set the schedule for your backups:

- One Time (Immediately). - This is a one time only execution of your backup and will start as soon as you submit the job.
- One Time (Later). - This is a one time only execution of your backup and will start at the specified date.
• Repeating. – This job will run at the desired start time, will repeat throughout the defined frequency and it can be indefinite or end at a specified date.

The last step in this process will allow you to revise the script that is going to be executed.

Once the job is submitted, you can view the progress of the backup run

Also by clicking on the status, you can view the details of the current step.

B. VIEWING BACKUP REPORTS

Once the backup finishes, if you want to view a report the backup job, go to Availability→Backup&Recovery→Backup Reports→BACKUP_NAME. Were you will see the details of the backup, like the number of datafiles, to which container and tablespace they belong, compression ratio (if any), etc...

C. GROUPS BACKUPS

One of the greatest advantages of using EM12c, is the feature of setting up and scheduling backups for a whole set of groups. This is not only available for 12c databases, it is available for 10.2 and higher versions in EM12cR3. Taking advantage of setting up the following only once per group:

• Backup Storage Settings
• Recovery Catalog Settings
• Backup Type
• Frequency

If you are using Administrative Groups, this will make the task even easier, as you would setup the Backup Configuration and Schedule Backup for each of your administrative group and every time you add a new target to an administrative group, it will automatically use these properties, without worrying about them.

To use this, you will need to have a group or an administrative group created. For this example, I have an administrative group defined by Lifecycle Status→Location, and will do the setup for the group “Prod-Mexi-Grp”

To access this group, in EM12cR3, you need to go to Targets→Groups→View→Expand All and click on “Prod-Mexi-
Once you have accessed the Prod-Mexi-Grp page, you will see several dashboards that will provide you the Status, general Information, Incidents Job Activities, etc...

To start the group backup setup, you need to define the backup configuration first for this group; then to go to “Prod-Mexi-Grp” ➔ “Group” ➔ “Backup Configurations”

You will now click on Create to define all of the following:

• Storage
  - Disk Settings
    ◊ Parallelism
    ◊ Backup Type. - Backup Set/ Image Copy/ Compressed Backup Set
    ◊ Backup Location. – If Left blank, it will use the database FRA
  - Tape Settings. - Important that you have the same vendor across all target groups

• Policy
  - Backup Policy
  - Retention.- It is important to know that you can only set by number of days. If you have retention based on redundancy for a specific target, choose “Do not override the retention policy” and setup at each of the group target level.
  - Compression. – Basic/Low/Medium/High
  - Encryption. – AES128/AES192/AES256

• Recovery catalog
  - Control File
  - RMAN Recovery Catalog

Once you have setup your Backup Configurations, you need to go to “Prod-Mexi-Grp” ➔ “Group” ➔ “Schedule Backup”, where you will choose the Backup Scope, that can only be in EM12cR3:

• Whole Database
• All Recovery Files on Disk. - Tape Backup

As well you can define if you want to include all of the databases in the group, or just a select number of databases.

You will now need to define the Database credentials for the whole group, and as well the OS Credentials, so for this to work, you will need to have the same OS user password as well as the same DB User password across all the targets that are going to be backed up as a group.

In the options stage of this process, you will define options of your backup

• Backup Type. - Full/Incremental
• Backup Mode. - Hot/Cold
• Maximum Files per Backup Set
• Section Size

In the settings section, you will choose the Media Destination and the Backup Configuration that was created previously, “MEXICO_PROD_BACKUPS”.
Before finishing, you will setup the frequency and start time of these backups.

In the last part, similar to other backup jobs, you get the opportunity to review the job, and if you are set with the Backup Procedure, you hit submit and you will see an informational banner that the job was submitted.

You can click on the link of the submitted procedure and it will take you to a detail page, where you will see the status of all your backups, as well as the logs of each of the steps that were submitted. Another way to see the jobs that have been run for this group is to go to Enterprise  Provisioning and Patching  Procedure Activity  Advanced Search  Type  Backup and Restore, and if needed filter by the name you gave it above.

Conclusion

In RMAN 12c there are great new features that will help you if you are ever faced with a disaster, these new features will allow you to reduce your mean time to recover (MTTR) and as well ease your tasks in duplicating your databases. If you incorporate EM12c into your backup strategy, you can simplify your backup administration tasks, especially when you have correctly setup your administrative groups and you have several hundred databases within those groups.

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Rene Antunez is an Oracle ACE; Speaker at Oracle Open World, Oracle Developers Day, IOUG Collaborate and RMOUG training Days; Co-President of ORAMEX (Mexico Oracle User Group) and Web Events Chair for IOUG Cloud Computing Special Interest Group (SIG); At the moment I am a DBA Team Lead at The Pythian Group.
Formerly, he worked for Oracle as a Database Consultant and Solution Architect, which involved many challenging projects including, Exadata, ODA and EM 12c implementation, as well as upgrade projects specialising in backup strategy and high availability solutions.
In his free time Rene likes to say that he’s a movie fanatic, music lover and bringing the best from México (Mexihtli) to the rest of the world and in the process photographing it :)
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A Few Enterprise Manager 13c New Features

Kellyn Pot’Vin-Gorman
Consulting Member of Technical Staff SCP
Oracle Enterprise Manager and Oracle Management Cloud

Christmas came early for some of us in the Oracle world when Enterprise Manager 13.1.0.0.0, (EM13c) came out on Dec. 24, 2015. Those of us internal to Oracle had been waiting patiently by our computer each day waiting for the release notice, but it was still a wonderful surprise, diligently working on the new features and enhancements that went into this release.

With EM13c, there was a major overhaul of the Cloud Control Console to a cleaner, more tablet and mobile user-friendly interface.

Gone are the days of heavy background shading and mysterious menus. The icon menus at the top are clearly labeled and load faster, even on mobile devices.

Upgrading from Enterprise Manager 12c

With the high rate of adoption for Enterprise Manager 12c, upgrades are going to be a common occurrence in the near future. We have a number of large customers that have already made the leap to 13.1.0.0.0 and many more in the planning stages. If you’re on EM12c, version 12.1.0.3, there is even an option to eliminate downtime by upgrading the database at a later time:

Even if you’re on an earlier version than 12.1.0.3 or still on EM10g or 11g, Oracle has a documented path of upgrade steps to one of the versions shown above that will upgrade then to EM13c. As part of this upgrade, the Oracle Management Repository, (OMR) database must be upgraded to a single-tenant database 12c, (12.1.0.2) database, too.

No matter if you upgrade or decide to just clean house and start with a fresh EM13c install, there are some seriously impressive features that are worth everyone’s time to investigate.

Simplified Cloning of Existing Targets

In EM12c, a number of supplemental pieces had to be put in place for cloning. Now on premise cloning is built into the EM13c cloud control. It’s best you discuss all the licensing requirements for what you want to accomplish with your Oracle representative, but with the Database Lifecycle Management pack, (aka DBLM) you can easily clone and set up quotas and profiles with the self-service portal so users can request database clones that meet your requirements, but eliminate the need for a DBA to be allocated every time a new database clone is needed.

Next time when a project manager or development comes to you and says they need a copy of production for a new development project TODAY and instead of multiple steps of backing up, copying, setting up directories and other manual cloning tasks, all you need now to clone is EM13c, space and an Oracle home! No Ftp'ing files over or datapump and if you need to save space, you could create a test master and then create numerous snap clones, (snapshot from the testmaster) to save considerable space by just tracking block changes between the test master and the snap clone!

Management of clones is simplified, too, with Clone Management available for each database environment from the database drop down menu.
The New Notification Blackout

I used to become quite frustrated when I would take an EM12c target out of blackout and I’d receive a massive number of alerts until the Oracle Management Service received the first upload of new data from the Agent on the host. This has been greatly reduced by making the Agent the “owner” of the blackout process in EM13c. In doing so, development was able to add an enhancement to the black out feature, now called a Notification Black Out.

You’ll note for any target, you have the option for starting or stopping for both these types of black outs, but when choosing a Notification Black Out, there a number of options that may also be decided to give you more definitive control over the blackout properties:

Should jobs continue to run? Should collections on the targets still continue without interruption? This can be defined in a notification black out.

Once you fill out the main requirements, that aren’t that different from a traditional black out, then you have to fill out the lower section, which is more complex.

• Members targets- Are any of them subsequently impacted by the blackout and need to be notify differently?
• Targets on the host that are or aren’t involved in the maintenance? There may be more than one Oracle home or an application that needs to continue to notify while another shouldn’t.
• Dependent targets to the main target you’re blacking out. Do they require a black out to, even though they may reside on another target host?

As with a standard blackout, a notification black out can be scheduled for later or go into effect immediately and the duration set for a specific time or indefinite.

Always on Monitoring

The Enterprise Manager was my view into my IT infrastructure. I was always concerned with what if it went down and no one had given me the redundancy into the design to let me know? Without high availability or a monitoring script, what was to let IT know that the environment wasn’t being monitored. Introducing Always On Monitoring. (AOM.)

This is a one feature that I really think is a no-brainer if you’re working in a high pressure environment that relies on Enterprise Manager to keep you informed. Your EM13c Oracle Management Repository and Oracle Management Service could be down and you would still receive alerts via email.

There’s only a few requirements to implement AOM.
1. A secondary database to install the AOM schema and since it has to match the Oracle Management Repository, (OMR) for EM13c, it must be a DB12c database, (but could be a PDB vs. a single tenant database.)
2. Make sure to update the NLS Character set to match the OMR’s and turn off the optimizer adaptive features:

   ALTER SYSTEM SET OPTIMIZER_ADAPTIVE_FEATURES=FALSE
   SCOPE=BOTH SID='<PDBNAME>';

3. Configure the smtp gateway emails to be used for notifications, as this is the conduit for email for OAM.
4. Configure the new OAM Repository database:
   • Set the database to be the MONITOR
   • Create the EMS User.
   • Copy the EMKey to the OMR and copy it to the Repository, (OMR.)
   • Download, install and configure the OAM to the new repository database.
   • Launch the OAM via EMSCA and remove the EMKey to resecure the OMR.

Once these steps are performed, the monitoring to each of your targets has a redundant environment to notify of an outage, even if the EM13c is down.

Gold Agent Image

Lifecycle management of agents is something that is often neglected for customers. We aimed to make it easier with EM13c. It was a feature that was available in EM12c, but the dashboard is more user friendly, creating and managing agents is simpler, as it patching and upgrading of agents. The Gold Agent Image is available via the Setup menu and you’re able to Create, Edit and Remove images as needed from this console.

The ease of use is shown, once you download the version of agent you wish to use for your “pristine” gold image, you can then click on “Create” to build out your Gold Agent-

I pick the one I want from the software library, name it and click Submit. The dashboard now becomes your one stop location
ME

I don’t know about other readers, but it’s very strange trying to write an article about myself. What should I say? Does anyone really care?

So… here goes...

Born and raised in a suburb of Philadelphia, I was a good student – very studious, athletic, etc. For my last three years of high school, I had the privilege of living in Brussels, Belgium. At this time, computers were in their infancy – especially in Europe!

My first actual ‘programming’ class was in college in NY, using the language PL1 - and punch cards!! Like all of us during that time, I once dropped my deck of cards… and picked them up ‘out of order’ – not a good thing!! Each card represented one command – one line of code. And, as you all know, executing ‘where tab1.col1 = 123’ before ‘select col1 from tab1’ just doesn’t work! It was quite the experience.

After the PL1 class, I took additional Computer Sciences class using SPSS – which, at the time, was the equivalent to SAS… a statistical analysis software language. Luckily, we were allowed to use actual terminals (and not punch cards) to complete the assignments in this class. However, we were granted a limited amount of actual terminal time to complete the work.

Long-story-short, I graduated with a degree in Mathematics, a minor in Economics and an ‘emphasis’ in Computer Science. At the time, there was no Computer Science degree at my college – and not many around the country.

After college, I secured my first real job at Storage Technology Corporation, and moved to Boulder, CO.

I started working with Oracle databases in 1990 – RDBMS 8. At the time, I was an Oracle Forms/Reports developer.

Fast-forward a few years (decades) …

I have been incredibly lucky to have worked for Return Path (RP) for the last 8 ½ years. Return Path has been voted one of the top 5 ‘Best Places to Work in Colorado’ for the last 5 years – and rightfully so. I was hired by RP in September, 2007 as a Database Developer and Backup DBA. At the time, the company employed approximately 75 people and used only one database technology… Oracle. And – back then, we had offices in NY and CO.

RP now employs over 500 team members world-wide. In mid-2010, I was promoted to DBA – which was incredibly scary – and quite frankly, over my head. However, RP invested the time and money into training, allowing me to ultimately grow into a senior DBA role. And, a few years ago, RP adopted Big Data solutions. We now utilize Hadoop, Elastic Search, Hbase, Maria (a MySQL derivative), Cassandra, etc. And, I am fortunate enough to have the opportunity to expand my knowledge to learn a couple of these technologies.

Patti

Thanks to Return Path for allowing me to grow technically and professionally, and thanks to RMOUG for the consistent reassurance that Oracle databases aren’t becoming extinct.
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for all agent status for compliance, deployments required and view what agents you have as your gold agents for all platforms in your environment.

The dashboard is simple to manage multiple gold agent images and quickly view how many targets are deployed each image, what is left to deploy and set up deployment jobs to bring all into compliance.

**EM13c, the Future**

I’ve only covered four of the incredible number of new features in the newest release, Enterprise Manager 13.1.0.0.0. A few of the other great new features are:

- System Broadcast
- Engineered System Patching
- Hybrid Cloud Management Enhancements
- Continuous Refresh for Database Environments
- New Middleware Console Consolidation to EM13c
- Drift Management

All of these new features create a release that incorporates both enhancements and new features that make it worth everyone’s time to investigate upgrading to Enterprise Manager 13c!

Kellyn Pot’Vin-Gorman is a member of the Oak Table Network and was an Oracle ACE Director until joining Oracle as the Consulting Member for the Strategic Customer Program, a specialized group of Enterprise Manager Specialists. Kellyn is known for her extensive work with Enterprise Manager 12c, its command line interface, environment optimization tuning, automation and architecture design. Her blog, http://dbakevlar.com and social media activity under her handle, DBAKeval is well respected for her insight and content. She is the lead author on a number of technical books, hosts webinars for numerous technical groups, including All Things Oracle and has presented at Oracle Open World, HotSos, Collaborate, KSOPE, along with other US and European conferences. Kellyn is a strong advocate for Women in Technology, (WIT) and technical education for the next generation, (STEAM/STEM) working with the Raspberry Pi and code to instruct kids of all ages to embrace a passion for the technology that runs our world!

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Contact Dan Hotka - Programs Director - ProgramsDir@rmoug.org
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