The AskTOM Journey

- The Super-Power of Autonomous Database and Machine Learning
- Tips for Oracle Ace Associates and other Advocacy Groups
- APEX Series Part 2: What's New in APEX 19.2?

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Have a comment? Suggestion? Want to submit an article proposal? **Here's how to do it.**

Editorial

Dear ORAWORLD Readers,

Welcome to our first issue of 2020. It will be an interesting year with us starting up a formal umbrella organization for EMEA User Groups. It's still a work in progress so there will be a big announcement later this spring.

I want to start with a few words about sharing. When I worked for Oracle many years ago, there was not so much information on the internet. All support and help with developer issues was more or less done internally through the Oracle intranet. But still I was amazed by all the knowledge we shared.

That kind of collaboration was the main reason why I stayed for 11 years. By the years this changed, for developers it's now natural to find information and get help on the internet. But where to look? Is everything a reliable source? The APEX community for me, and I guess for many of you, is an amazing community with sharing as the mantra. In part two of his APEX series, Carsten Czarski gives you all the news of 19.2.

AskTom is another great source for knowledge and has been here for years. In our title story, Connor McDonald takes you on a journey from its start in Oracle Magazine to today.

Jim Czuprynski starts a series demonstrating how to discover unseen patterns and relationships by leveraging the AI and ML already built into the Oracle Autonomous Database. Superpower? Read for yourself!

Be curious,
Ann-Sofie

Ann-Sofie Vikström Often
Board member of OUGN (Norway)

Who's interested?

www.commitstrip.com

Connor McDonald

The AskTOM Journey (Part 1)

This article is about the AskTOM journey from its inception, its current state of play, and what role AskTOM can play in the future, and by way of exploring that journey I thought I would also take some time to explore my personal journey toward AskTOM because the two are linked hand in hand.

Work & Life

I studied mathematics and computer science at college and I suspect, like many universities, the languages that one studied at college typically bore no relationship to those out in the workplace. We studied "futuristic" languages, or at least languages that were considered futuristic at the time, such as Prolog, Lisp and similar. This was the 1980s and hence mainstream languages like Java etc. were yet to be invented. Hence when I joined the workforce, I had no knowledge of my first programming language, which was COBOL against VSAM, DL1 and eventually DB2 databases on an IBM mainframe. In those days the PC did exist, yet in terms of the software available for PCs, it was considered so useless that the first thing that most of us put into our *autoexec.bat* file was to jump straight into the mainframe emulation software so we could get down to the "real" business of coding in COBOL.

But as I continued programming into the late 1980s a "revolution" was coming. That revolution was not the internet, it was a thing called "client-server". Just like the internet 10 years later, we were all promised that client-server was the future of all computing, and that one day all computing tasks would be done on a personal computer, and that mainframes would be going the way of the dodo. Because this was before the age of the internet, in those days the way you got information about what was happening on the computing landscape was via hard copy magazines. We used to receive a publication called "Computer Weekly" or something similar, I cannot exactly recall. It naturally would be filled with advertisements, but also articles about what was taking shape in the computer industry. I remember in those days seeing advertisements for the very early versions of Oracle database, with the main focus being that Oracle was able to connect to any kind of machine, running any kind of operating system, across any kind of network. A lot of that flexibility and choice remains today in the Oracle database.

The company I was working for was very keen to get onto the client-server revolution and this came to a decision between two of the industry front-runners at the time – Ingres and Oracle. Being part of the COBOL programming team, I was not really involved in this project until a series of unfortunate events lead me to being on the team. I won't share those events here in this article, but if you ever bump into me at a conference or meet up and are interested in all the gory details please stop by and say hello! I'll paraphrase by saying that the Oracle contractor who was looking after both the database and the server that that database was running on, took an extended leave of absence from the company. My manager came up to me, sat me down, and just as I was expecting him to give me my next COBOL assignment he said: "*Peter..*" (the Oracle contractor) "*...will not be here tomorrow, and you happen to be sitting closest to his desk. So, Connor, the server and the Oracle database are now yours to look after*". And that is how I got started with Oracle!

Please bear with me, we are leading to how the AskTOM journey for me started! After some time gaining more experience with Oracle, I went to an Oracle presentation given by Oracle legend Dave Ensor, who spoke about the 20 most common mistakes that people make with their database. My egotistical self was quietly confident that none of these would apply to me because after all, I had now been using the Oracle database for a couple of years. But it was a humbling experience to find myself ticking off 18 of the 20 mistakes, a crushing realisation that I didn't have as much Oracle knowledge as I thought I did.

Suitably chastened, I realised that there must be a much broader community of Oracle expertise beyond the wall of my company, and after some investigation (because Google search did not exist in those days!) I found out about the

Deja News, also known as the Usenet newsgroups. This was an early way in which people participated in community discussion like we do nowadays in terms of technology. I would pose questions on Usenet and get responses from various people in the Oracle community, and one person that always seemed to give very thorough, precise and correct answers was a person named Thomas Kyte.

Through many interactions by Usenet Tom and I became what I would refer to as "virtual friends". We had never met yet we seemed to have a similar passion for technology, humour and a touch of sarcasm. Then, in 1999, I noticed that Tom had started to be a less frequent visitor on the Usenet forums. Unbeknown to me, he had had an experience on Usenet that inspired the genesis of the AskTOM website that we see today.

Someone had asked a question on Usenet about how to rename a column in the Oracle database. While many of us may take that functionality for granted today, in the late 90s, in early versions of Oracle you could not do this. Hence the workaround was typically to create a database view to present the appearance of a new column name. However, on Usenet someone had posted an answer suggesting to directly update the Oracle database dictionary table SYS. COL$, and then bounce the database. Tom quickly jumped into the discussion and pointed out that this was a terrible piece of advice for anyone, whether expert, professional, or newbie to give, and that such courses of action should never be taken unless explicitly given by Oracle support.

When Tom inquired from where this advice had been sourced, he discovered that the idea had come from an article from an issue of the then hard copy Oracle magazine! The magazine had a regular section for user-contributed

About Connor McDonald

Connor is a Database Advocate for Oracle Corporation. Ever being frustrated as a child with the limits imposed by the single kilobyte of RAM in his Sinclair ZX80 computer, he has loved the challenges that come with storing data, which ultimately led to a career in database technology. When the infamous Y2K data issue did not end the world as people thought, he started presenting on his database passions, found that he loved doing it, and has spoken at over 120 conferences around the world since then. Due to his partners predilection for rescuing stray cats, he doesn't just speak the phrase "as hard as herding cats", he lives it every day.

tips. Tom got in touch with the Oracle magazine editor and discovered that user-contributed tips could be provided from anyone in the community, and they would be simply published verbatim in the magazine. There was no verification, no validation and no checking of whether the tip was sound, or whether it could do great damage to customer databases.

Thus, the original AskTOM concept was born. It was part of Oracle magazine tips that were contributed by Oracle magazine readers. They were vetted by Tom before being published and would be phrased more along the lines of a question to the magazine and an appropriate answer by Tom. To complement the magazine, the first AskTOM website also came out in the year 2000. The world wide web was in its infancy and in those days web servers typically were simple flat html with some CGI scripts to provide functionality. The first AskTOM website followed that model. Anyone could ask a question in the online form and once that question was submitted it would be sent as an email to Tom. That model did not last long because each morning when Tom came into work, there would be hundreds of emails sitting in his inbox! There was no control over the volume or the speed at which these emails came in and hence **the AskTOM website as you see it today** was born. Application Express did not exist yet and so Tom wrote the site by hand using the OWA toolkit, which was the predecessor of the MOD_PLSQL architecture.

Fast forwarding a few years and a new tool was under development within Oracle called HTML DB, which we now know as Application Express (APEX). Joel Kallman was looking for an application that could be a perfect proof of the tool and the AskTOM site seemed the perfect fit. The initial AskTOM website in HTML DB was just a few pages but today, even though there is more than 40 pages to handle

questions, reviews and other administrative tasks, the AskTOM site is still a HTML DB aka APEX application, now running on the latest version 19.2 of APEX. As an aside, the AskTOM website is a wonderful validation of the robustness of APEX because the AskTOM website from that moment in the early 2000s has been upgraded through all the APEX versions over the years with almost no changes required.

A few years after the AskTOM website went live I was fortunate enough to almost bring my own Oracle journey through a complete circle. I was lucky enough to win a global competition for which the prize was a trip to OpenWorld, plus a dinner invitation to meet some dignitaries of the Oracle community. (Sidenote: If you would like to see a much younger version of myself plus the details of that competition you can visit **my blog**.

But little did I know that once at OpenWorld, the dignitaries that I would be having my meal with were none other than Tom Kyte and Dave Ensor. It was a very humbling experience to know that the person that first introduced me to the importance of reaching outside one's company to the community to gain expertise, plus the person who I probably most admired in that community once I got there, were both sitting at the same table and I finally got to meet them and have a great conversation with them.

Dave Ensor retired from information technology and sought out a different career direction soon after that, but I remained in touch with Tom both virtually and in-person at conferences and meet ups from that point onwards right up until the year 2015.

When Tom Kyte retired in 2015, the AskTOM site sat dormant for approximately 9 months, still creating a lot of value to the

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community in terms of a question and answer repository, but there was no new content. In September 2015 a few months after I joined Oracle Corporation, a decision was made to resurrect the site to be run by myself and fellow database advocate Chris Saxon.

Once the site was re-launched, a natural question was: What would the website be called given that Tom was no longer inside Oracle? As much as our egos would have liked perhaps to rename the site to AskConnorAndChris :-), it did not seem the right thing to do. Juan Loaiza, an executive VP at Oracle produced an excellent compromise. He said that the AskTOM website was always about getting the best information from experts from inside the Oracle Corporation, and hence

customers who use the site were seeking out advice from Oracle Masters. "The Oracle Masters" was a natural replacement name and kept the TOM acronym. Hence the only change to the name since Tom's departure is simply to capitalise the T.O.M, as it represents what we aim to provide for the global customer community – trusted and definitive answers from people who are subject matter experts in Oracle technology.

That is the history of AskTOM and how it is intertwined with my own personal history of using Oracle technology. In the next ORAWORLD issue I will write about AskTOM today and in the future.

Thanks for using AskTOM!

Christian Luda

Remembering Terry Jones and the Origins of Spam, Spam, Spam, Spam…

On January 21, we lost one of the greatest comedians of the 20th century: Terry Jones of Monty Python fame died a few days after his 78th birthday.

Terry Jones and fellow members John Cleese, Terry Gilliam, Eric Idle, Graham Chapman and Michael Palin, formed Monty Python in the 1960's. The group's sketch comedy TV show "Monty Python's Flying Circus" debuted on BBC in 1969 and revolutionized the world of comedy.

Their surreal humor gained them a lot of fans, among them many in the tech community: While one of our favorite languages, Python, is named after the collective, the word for one of our least favorites things also stems from Monty Python: Spam.

The term for unsolicited electronic messages is derived from a legendary Monty Python sketch that celebrates its 50th anniversary this year. It premiered on the 25th show of "Monty Python's Flying Circus" in December 1970.

In the sketch, two spoon café customers want to order a breakfast only to find out that almost every dish includes spam which is short for spiced ham. Because it was one of the few meats excluded from World War II rationing, the British people had become tired of it at that time. While the waitress, played by

Terry Jones, recites the menu, the conversation is drowned out by a room full of Vikings singing praises of spam ("Spam, Spam, Spam, Spam... Lovely Spam! Wonderful Spam!").

Within the sketch's three and a half minutes the word "spam" is uttered over 130 times. This is probably why some early internet users started to use the word as an expression for repeatedly sent messages.

Terry Jones, who co-wrote the popular sketch together with Michael Palin, had a penchant for depicting middle-aged Women and later also directed three famous Monty Python movies: "Monty Python and the Holy Grail" (co-directed with Terry Gilliam), "Life of Brian" and "The Meaning of Life". When Monty Python broke of up in the mid-eighties, Jones concentrated on directing movies and documentaries and also wrote books for children.

In 2016, his family announced that Jones was suffering from dementia. In his final years, he could no longer speak. He left behind some of the funniest sketches ever created.

I have two sons (Patrik, 23, and Matias, 20) who both love playing computer games. You might have met them somewhere since they have been travelling with me to many Oracle and user group events since they were very small. Being raised in a family of both parents being techies it is natural they have seen and used a lot of technology. And it is quite common we talk about technology at home.

The other evening, we were having an early dinner, since I and Patrik wanted to go to the gym early. During the dinner Matias told about his problems with one of the games they have loved since very young: Minecraft. There were problems with the current server and sometimes whatever he did was only saved to his computer and since he is using several computers, he now had a "version control" problem. Patrik asked him why he was not using Oracle Cloud for the server. He had heard about the Always Free Cloud and he also mentioned he had read a blog post about setting up a Minecraft server on Oracle Cloud. This was something Matias had not heard about before. After the dinner, Patrik and I left for the gym. While doing my exercises I received a message from Matias saying he had the cloud up and running and he was now moving all his stuff there. He had found the **great blog post by Todd Sharp**. That and a lot of googling helped him setup everything. In Todd's post he is using Mac while as Matias was using Windows, which makes life a bit different. Later I came back home to hear that everything was running, and he had already tested it with his friends to make sure it really worked. He had learned how to start the server in a way it stays up even when he is not connected to it. At this point I was already

very impressed. He has proven to me that this kind of quite complex environment can be set up to Oracle Cloud by somebody who is not on the IT field and that he was able to solve problems by himself. He realized testing is important and must be done in a logical way. It is not something everybody can do. But the biggest moment of impression was yet to come. After everything was up and running and all his friends were excited about the new server and playing the game, he decided to take a shower. Not much later he showed up to the living room with his bathrobe saying: "Now I figured out how to manage my cloud with a phone!" That was the last problem he had to solve since now he suddenly was the 24/7 support for the server!

The way the next generation sees and thinks about technology is so different from the way my generation does. I have spent more than 20 years on IT but still I am very old-fashioned in many ways compared to them. The way I want to build systems is not always the way the new generation wants to use them! This reminds me of a famous quote from Henry Ford: "If I had asked people what they wanted, they would have said faster horses." Instead of giving them faster horses he gave them a car. I feel like I am the people and my son is Henry Ford!

And this brings us an important remark: diversity. In every IT team there should be diversity to make sure different skills will be used. After seeing what my son can do with a computer and especially with finding out solutions and ideas, I very much hope he will end up on IT and one day I will have a chance to work with him.

I have recently nominated a colleague to join the Oracle Ace program as an Associate – the entry-level in the program. In discussing the potential nomination, we talked through what was involved and the steps I'd recommend, and addressing the concerns – of I don't consider myself a subject matter expert, what should I, could I share?

Whilst I'm familiar with the Oracle Ace program (having just been promoted to Ace Director). The following is probably true for any getting involved in any other initiative from Microsoft MVP, SAP's Mentor program among others. The heart of these communities is to share knowledge and insights that can supplement the stand material from Oracle (or the other vendors) – after all the easier it is for people to know how to apply the various technologies the better it is.

Sharing your story and knowledge

Blogging is probably the easiest aspect to all of this, although some might disagree with this, and I will address perhaps the most common concerns. Starting a blog isn't difficult these days, we've got a great choice of platforms from GitHub to WordPress and Medium not to mention many employers will have a blogging solution as part of their web presence to help convey the culture/ethos/expertise etc.

Your blog or your employer's blog?

This question is perhaps a touch sensitive. If you're committed to writing a blog, then your employer will prefer employees share content through that. For more ad-hoc blogging then being part of a wider group blog like an employer's blog is a great way to get content published, the accumulated output will attract more attention, than your posts alone. But be prepared to lose a degree of control. Depending on your organization, you may have to align

to company policy and there are risks such as discovering your contributions have been syndicated to other websites without being told – something that happened to me (great that people want to syndicate the content, but not being told is disappointing).

The other thing to consider is your "personal brand". In this day and age, a job is rarely for life. So, if your blogging becomes popular and you switch jobs, then you're likely to lose some of that followership, and you need to start building your profile again through another site. A personal blog gives you a lot more control on your "personal band" and the readers will remain despite a potential change of employer. It may seem a little disloyal, even selfish, but it is a modern reality.
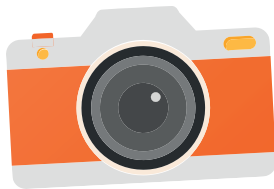
Your Blog Platform

Whatever you choose, the platform needs to address a couple of basic requirements:

- Will be indexed by search engines such as Google,
- You can give the blog an relatively easy web address to use (more on this in a moment) and crucially a name that is easy for people to remember/search for and sensible for the subject you're blogging about (ok, I might have blundered there),
- You find it easy to use, if you find a platform frustrating to use it will inhibit the goal of sharing.

One of my colleagues has adopted the name "a Neate Blog", a clever play on his name. But is a nice short name, easy to remember if someone is looking for him. It also doesn't create the wrong associations that may put people off (i.e suggest it isn't a site about tech). My domain, MP3Monster, well once you remember that, you don't forget, its association with me goes back a long way, but as a domain name suggesting what I do, oops (so I have established alias DNS addresses that are a little more sensible). When it comes to domain names, for getting started you don't have to have a domain name, but ultimately it will help people find you and your content. So even if you don't apply the domain directly to the service you use (as this may cost), you can at-least get the domain registration to use it as a CName, so people using you domain name can be redirected to the name provided by you blog service.

What Do You Blog About?

This can be the biggest stumbling block for most people, with hesitation coming from the view that they aren't the expert, or someone has probably already done it, and so on. To be honest, I take a step back and think of my blog, particularly when it comes to technology more as a journal or engineering log. When I encounter a problem that has required some effort, then my engineering log (i.e. blog) would have a record of how I solved it, why that particular approach was the best way, links back to any collateral that already exists. Essentially the details I might need to revisit

About Phil Wilkins

Phil is an Oracle Ace Director, Technology Evangelist & Snr Consultant Architect for Capgemini. He specializes in PaaS and particularly with API and modern development techniques such as microservices and Integration Cloud. Phil has supported the publication of several Java development books as a technical reviewer; in addition to being a published author himself with several co-authored books to his name, along with regular blog posts (**https://blog.mp3monster.org/**) and magazine articles.

Phil has presented at events around the world from Sweden to California. Phil is a co-organizer to the London Oracle Developer Meetup & Oracle Ace Director.

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a problem and solve it again in a year's time. I may not be the first to have found a problem, and solved it, but has anyone written the solution down in a way that is easy for me to understand and follow? Will it be easy for me to find the answer again in the future, if it took lots of digging, then probably not, so a little blog just to record where the answer was found.

Is it worth writing down, if someone has already explained it? Probably, we all learn things from different viewpoints. Some people will have existing knowledge so don't want to read articles that go back to first principles. The point is, there is space for more than one article or book on a subject. But also consider this, we often ascribe the process of writing as a means to rehearse knowledge and strengthen memory, so writing a blog post is just a vehicle to reinforce your own memory, worry about the readership afterwards.

It doesn't all need to be how to ...
Your blog doesn't need to just be about how a problem is solved, or how you've used a specific journey. People are interested not only in the answers but also the journey, so you might consider ...
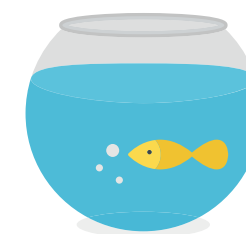
- How you managed to master a new technology – from your viewpoint what are the key ideas that meant you could get to grips with something,
- You experience in attending a course, exam, conference – this all helps people understand what they might need to prep for/expect and whether their involvement is worthwhile,
- What resources you have found useful, particularly why – which means relevant book reviews, websites, presentations that can be downloaded, podcasts and so on. If readers feel they have similar perspectives as you, then they'll find this really helpful,

- English is not your first language, not a problem, write in your own language. Talk to bloggers you like, they may agree for you to translate their blogs.

Obviously thought pieces are the "crème de la crème" of blogs, but don't expect to be writing these on a regular basis or even occasionally, as these only come when writing is easier, and with experience and accumulated insight.
I would say there are a couple golden rules for blogs:

- Have a tidy conclusion. A post about a problem needs an answer – unless you're actively soliciting engagement in a dialogue,
- A post about an experience needs to have a clear "takeaway",
- Blogs should never come across as negative.

Sometimes saying nothing is better
We all have those moments, where something seems out right stupid, nonsensical even. Whilst you want to share the solution to the crazy problem there is the temptation to let the irritation of needing a workaround. It is times like these, where stopping is the best course of action unless you put a constructive slant on the issue – for example here is a stop gap solution until a product hopefully gets a feature you think is important etc. If you're part of one the industry advocacy setups, you don't want to irritate the sponsor, this is the time to use the back channels you're likely to get chances to develop. Not only that getting drawn into a flame war can mean your credit ability can be harmed.

Finding the time

We all have day jobs that pay the mortgage, keep the taxman happy etc. So how to find the time? For me, I do a couple of things, that means when I do have time, the time is well used …

- Create draft posts with blog ideas – something comes to mind as potentially worth writing about, quickly get down some rough thoughts, why did I think there is value in sharing etc. If someone asks for help or advise – there's a candidate post,
- I don't write the blog, particularly longer ones, until I've let the idea rattle around in the back of my head and I have some clarity on the points I want to convey and how to get them across,
- Sometimes a blog idea on reflection isn't worth pursuing – so every now and again I will purge those drafts, so the worthwhile ideas get the attention.

These steps I find mean it is a lot quicker when I do have time to write. As the thoughts and ideas have been caught, I can work on translating a few sentences or bullets means that the writing time, doesn't necessarily need lots of deep, quiet, quality thinking time. So, planes, trains, those 15 minutes waiting for your better half to finish getting ready or sat waiting for children on the school run and sports club activities can get put to use. Of course, you don't want to be lugging a laptop around – so a tablet is key to make these opportunities.

The last trick, which has to be executed with a little care, if I'm battling with a problem and not feeling like headway is being made, I'll switch away to something else – writing or finishing a blog can be energizing, and whilst you're tapping away, your subconscious is probably figuring out how to move forward your original problem.

Making the Effort worthwhile

Having set up a blog, started writing posts, you really want to make that effort deliver some benefit. We can do this with several things …

- Ensure you're making the most of the SEO features your blogging platform provides, so things like tags might be a distracting faff, but they do help, over time they will become second nature,
- Some blogging services can publish extracts or link blog posts as you publish them, take advantage of this. Link it to as many feeds as you have, as it all helps raise profile and draw in readers,
- Get all your different social/web presence cross linking to each other so your LinkedIn profile has a link to your blog and vice versa. Some search engine indexing will take into account the number of links in and out of your blog etc. Ultimately people will follow links,
- If there are websites aggregating content together in the area you're specialising then get you're blog etc. referenced. In the Oracle area, this would be things like OraNA.info and PaasCommunity.com, and oaktable.net for example. There is plenty of choice reflecting the diversity of Oracle's technology community,
- Make sure you record your articles promptly with the Ace activity tracker, as that increases the possibility of article being included in the publication of community activity.

In the next part of this article we'll explore how you can take blogging to another level and leverage blogging to feed other activities that the Ace community.

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CONTENT

Number of the Month

64,000,000

Oracle OpenWorld's move to Las Vegas will cost the city of San Francisco $ 64 million a year.

In December, it was **announced** that the OpenWorld and Code One events will be moving to Las Vegas in 2020. Oracle has signed an agreement with Las Vegas' Caesars Forum for the next three years. The location is currently being built and will open this year. According to the **Caesars website** the 550,000 square feet forum will include 300,000 square feet of meeting space and the world's two largest pillarless ballrooms.

While Sin City gets another attraction, San Francisco suffers a great loss. As **CNBC reported**, The San Francisco Travel Association (SFTA), a nonprofit organization promoting tourism, sent an e-mail to its members estimating the annual loss to $ 64 million. SFTA says the two main reasons for Oracle's decision are the high prices for hotels and the city's "poor street conditions".

The OpenWorld had been launched in 1996. Attracting more than 60,000 attendees every year, it was notorious for shutting down a large part of downtown San Francisco. At the same time the hotel prices skyrocketed. While the Golden Gate City is **one of the most expensive US cities for hotels**, Las Vegas is a much more affordable destination with an average double room rate of $ 69 per night opposed to $ 214 in San Francisco.

The OpenWorld and Code One Las Vegas premiere will take place from September 21 to 24, 2020.

Here's a report on Oracle's opt out by the San Francisco TV channel KPIX-TV:

Carsten Czarski

Oracle Application Express (Part 2): Faceted Search and more – What's New in APEX 19.2?

Fig. 1: Faceted Search page in APEX 19.2

APEX 19.2 is available since November 1, 2019. And although this is a "dot 2" version, it is *not* a maintenance release: a number of major new features are introduced. While the new *Faceted* Search is clearly focused in blog postings, at conferences or on Twitter, APEX 19.2 introduces many other and highly interesting features: Enhancements to lists of values, REST support for Interactive Grid, declarative Oracle Text support, and many more. This article will provide an overview on what's new with APEX 19.2.

Faceted Search

Faceted Search is the marquee feature of APEX 19.2. This kind of search interface is typically known from sales sites on the internet: on the left, a list of *Facets* is displayed – the end user can pick a brand, color, price or other attribute. On the right, or below, the page shows relevant data, matching the filter criteria from facets (fig. 1).

The most interesting aspect of faceted search in APEX is that it comes as a standard APEX component, like a report or a chart region. APEX developers create faceted search pages simply by picking a database table in the create page wizard. APEX will analyze the data and automatically create a faceted search page. Of course, the developer can remove or add new facets to the page. All the logic of filtering the data, refreshing the reports and the facets, as well as computing the facet item counts is done transparently by the APEX engine.

Enhancements to Lists of Values

Lists of Values (LOV) have been a part of APEX since the very first release, back in 2004. LOVs are used *inline*, directly in the APEX component, or as a *shared LOV*. Shared LOVs can be reused in multiple APEX components (report columns, page items or within PL/SQL code (APEX_ITEM package).

A shared LOV is either *static* or *dynamic*. For a static LOV, the developer provides display and return values for each LOV item at design time. Dynamic LOVs are based on a SQL query returning display and return columns.

The LOV infrastructure has been significantly improved in APEX 19.2: First, LOVs now support *external data sources*: An LOV can be created on top of a *Web Source Module* (fig. 2) which references an external REST service.

APEX 19.2 also improves on the metadata, which is stored for a list of values. Query columns to use for display or return values are now declaratively chosen – the first query column is no longer strictly treated as display column. APEX maintains additional meta data for query columns like *Icon Column*, *Group by Column, Sort Column* or *Additional Display Columns* (fig. 3).

LOV page item types use this new meta data differently. For instance, the new *Popup LOV* uses *Additional Display Columns* in order to display data similar to a report. Radio Group and Checkbox items leverage the *Icon Column*; Select Lists the *Group by Column*.
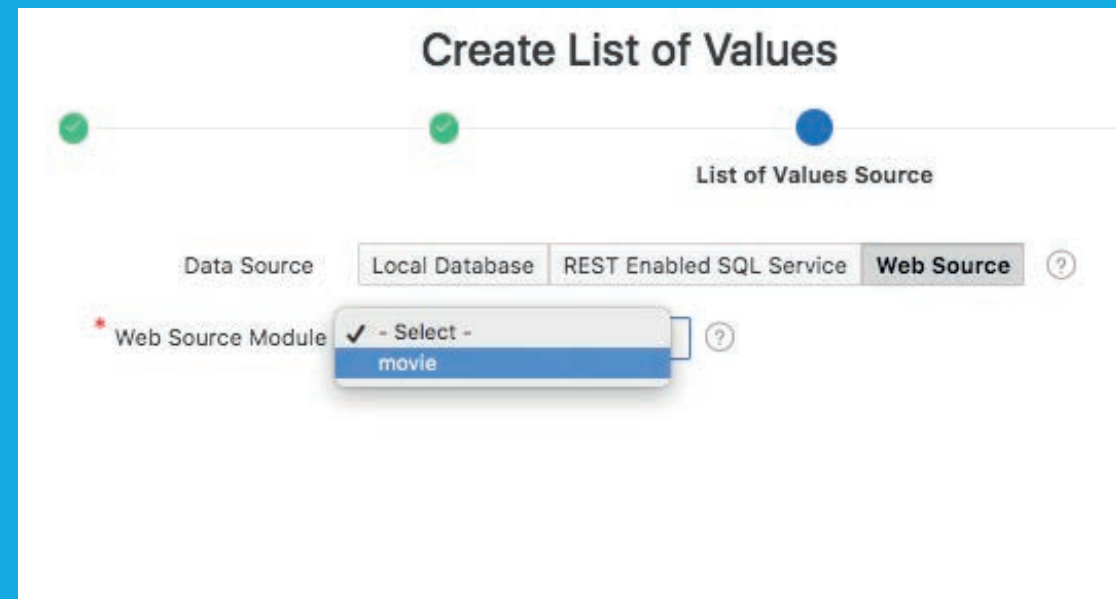

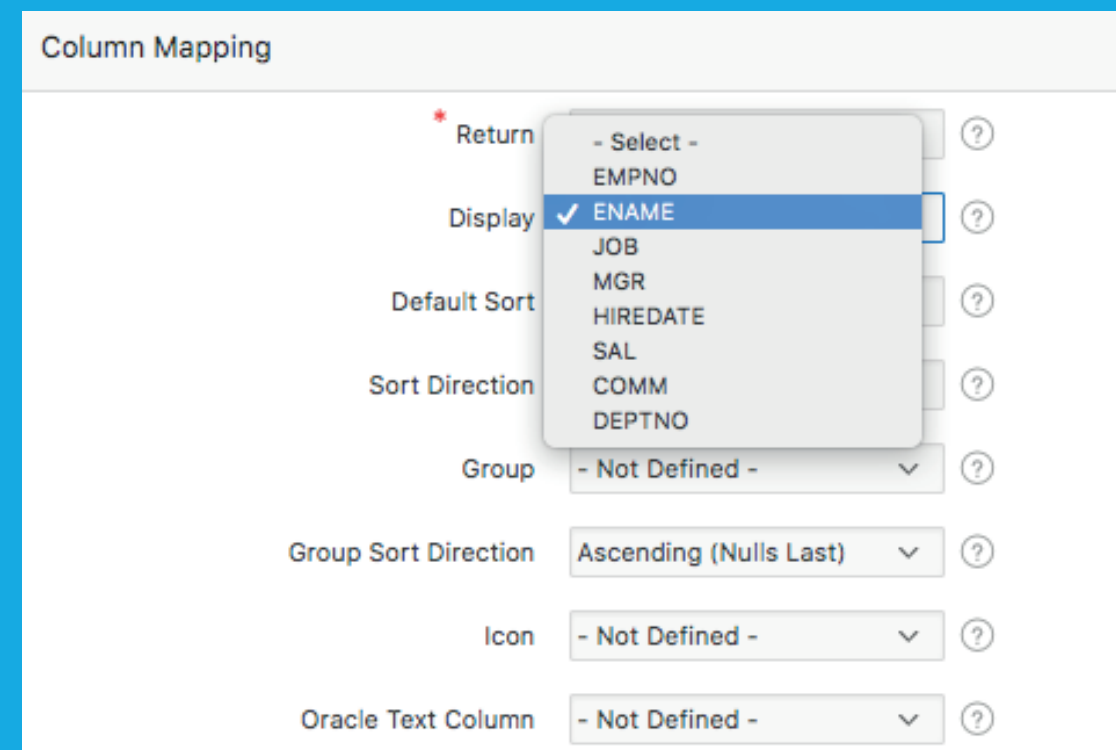Fig. 2: Create an LOV on top of a Web Source Module.

Fig. 3: Additional LOV meta data

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The new and enhanced Popup LOV item type is way more powerful than its pendant in previous APEX versions. As fig. 4 shows, additional display columns can be configured, so that much more information can be transported to the end user. Also, there are multiple search options: Besides other attributes, the developer can configure which columns to search, whether to use an Oracle Text index, or when to execute the search query (as the end user types, clicking an icon).

External Data Sources for Interactive Grid

APEX 18.1 (released May 2018) started to add declarative support for external data sources, like REST Services or REST Enabled SQL. First, support was restricted to read-only components (Classic or Interactive Reports, Charts, Calendar or Tree Region). APEX 19.1 added support for Form Pages, enabling APEX not only to report on REST Services, but also to manipulate data over REST.
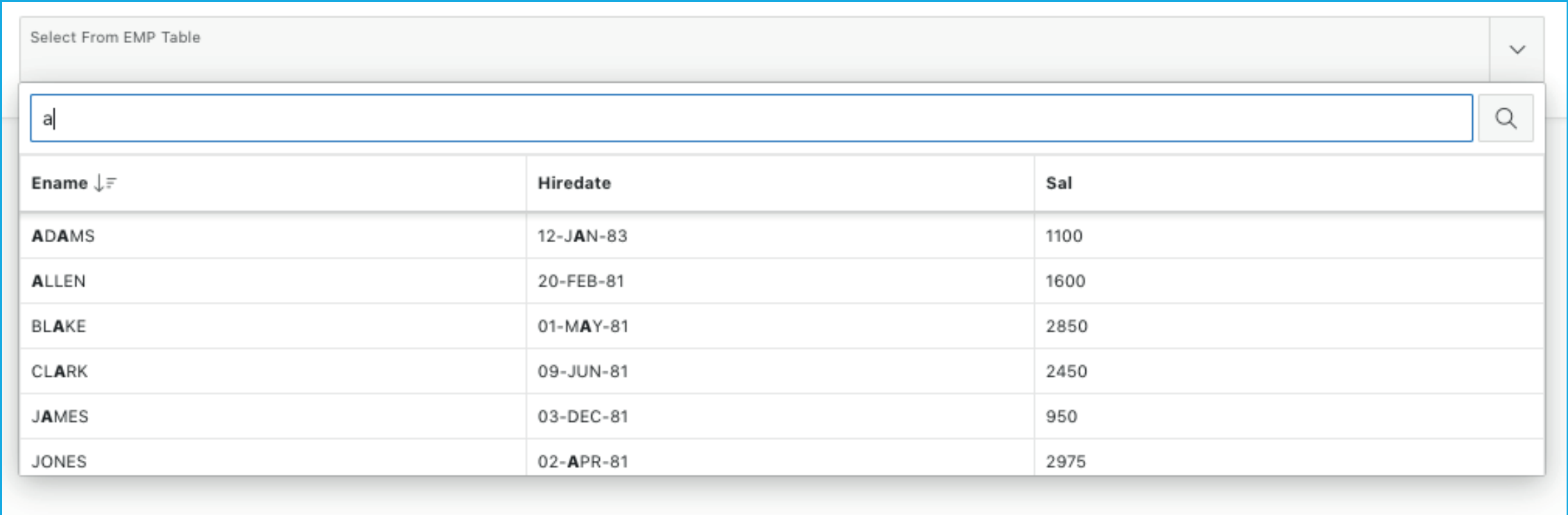

Select From EMP Table		
a		
Ename ↓=	Hiredate	Sal
ADAMS	12-JAN-83	1100
ALLEN	20-FEB-81	1600
BLAKE	01-MAY-81	2850
CLARK	09-JUN-81	2450
JAMES	03-DEC-81	950
JONES	02-APR-81	2975

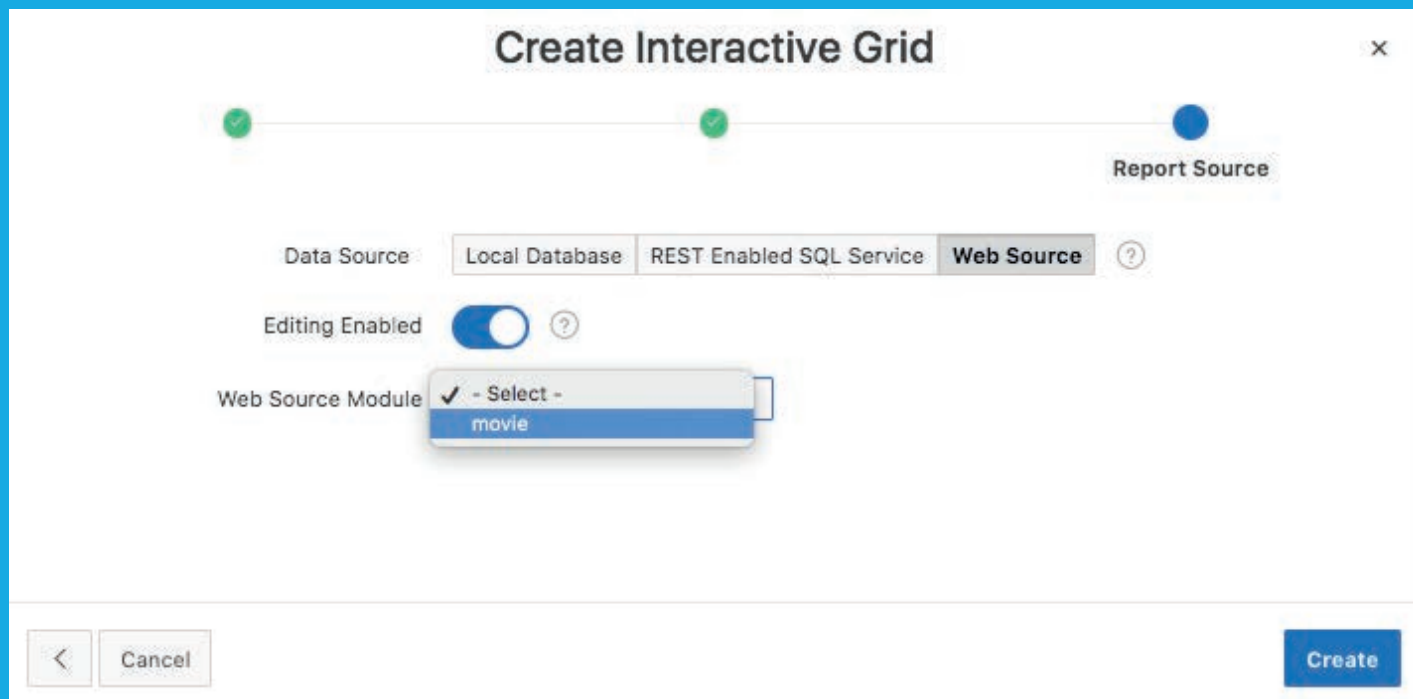*Fig. 4: The new Popup LOV item type in action*

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Fig. 5: Create Interactive Grid on top of a Web Source Module (REST Service)

APEX 19.2 completes support for external data sources by enabling these for Interactive Grid. Interactive Grids can thus be declaratively created on top of a Web Source Module (fig. 5). Of course, in order to manipulate data over REST, the REST endpoint must support the POST, PUT and DELETE methods and these must be configured in the Web Source Module.

As a side-effect of external data source support, Interactive Grids can now also be created using a *PL/SQL function body returning SQL query*. This allows to get interactive grid data from dynamic table names and with using dynamic WHERE clauses. However, the selected column names and data types must remain stable, since Interactive Grid stores column meta data based on query column names.

New Form Item types

APEX 19.2 introduces new Form Item types. The *Star Rating* item is typically being used when end users are about to provide a *rating* – by selecting a number of stars or points (fig. 6).
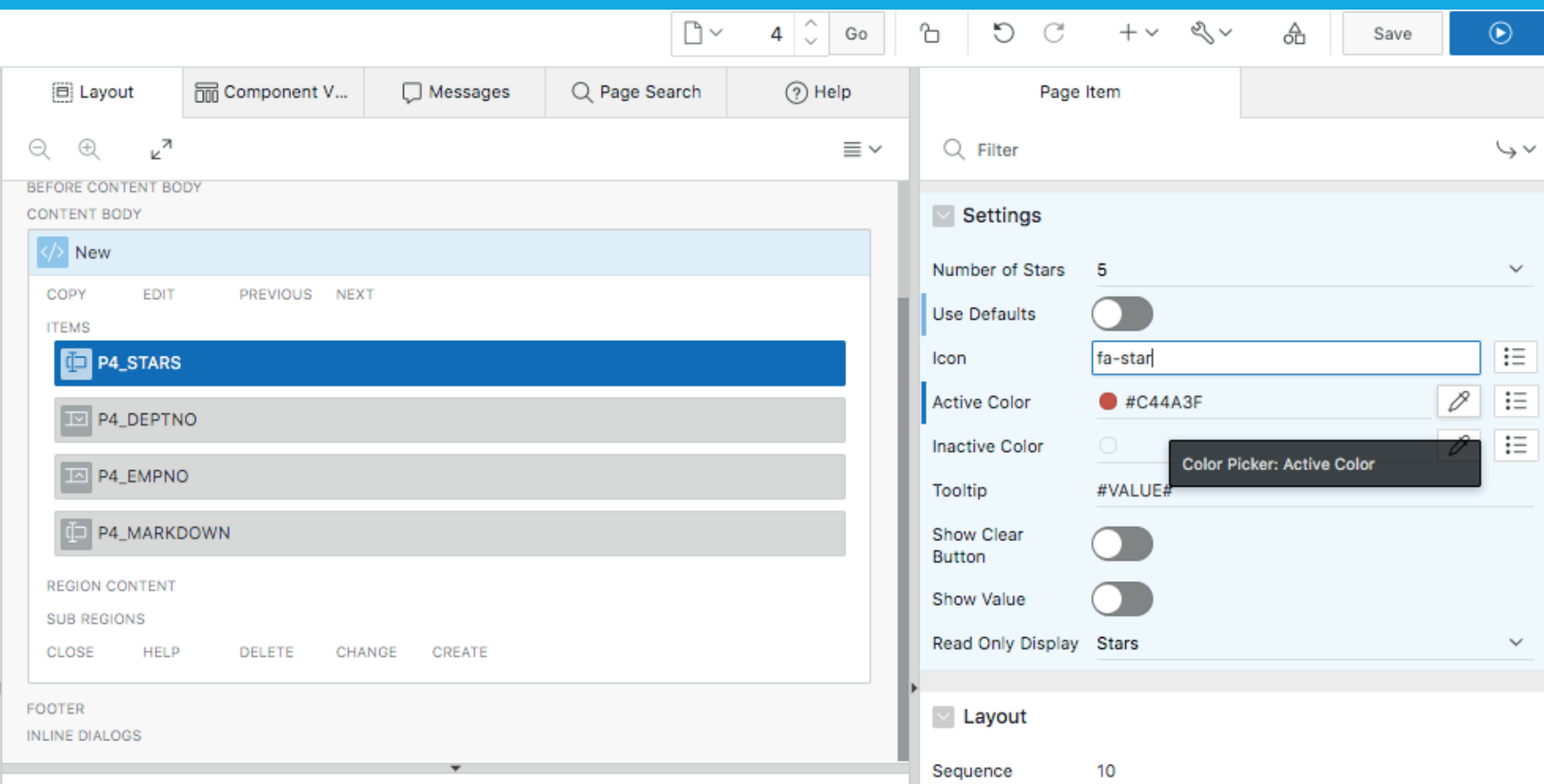

Fig. 6: Adding a Star Rating item in Page Designer

The new *Markdown Editor* item (fig. 7) provides an alternative (**not** a replacement) to the already existing *Rich Text Editor*. Markdown is typically used when only a subset of formatting options is needed – and when (limited) formatting should also be visible in plain text output. Markdown is heavily used on popular Internet sites (Github) or collaboration tools (Slack Messaging).

When the item is set to *Read Only*, the Markdown syntax will be properly rendered as formatted HTML. However, even if Markdown content is viewed with a plain text editor (or on the console, using SQL*Plus), formatting remains readable (fig. 8). Also, a lot of open source libraries are able to consume and to render Markdown. If more HTML formatting options are required, the Rich Text Editor will remain as an alternative to use.

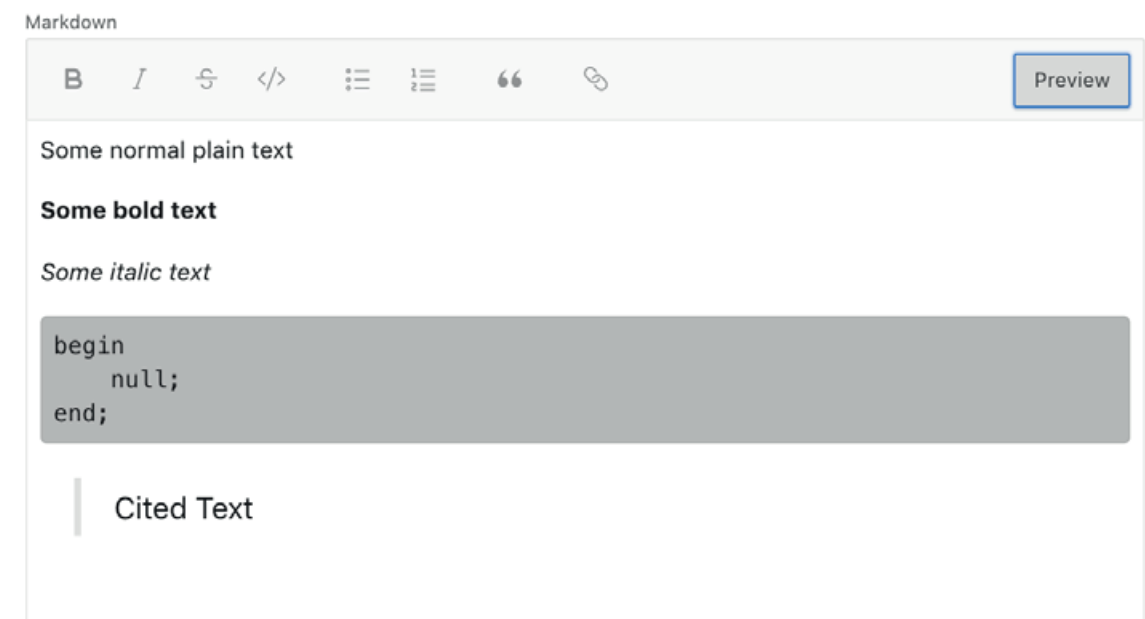*Fig. 7: Markdown Editor in APEX 19.2*
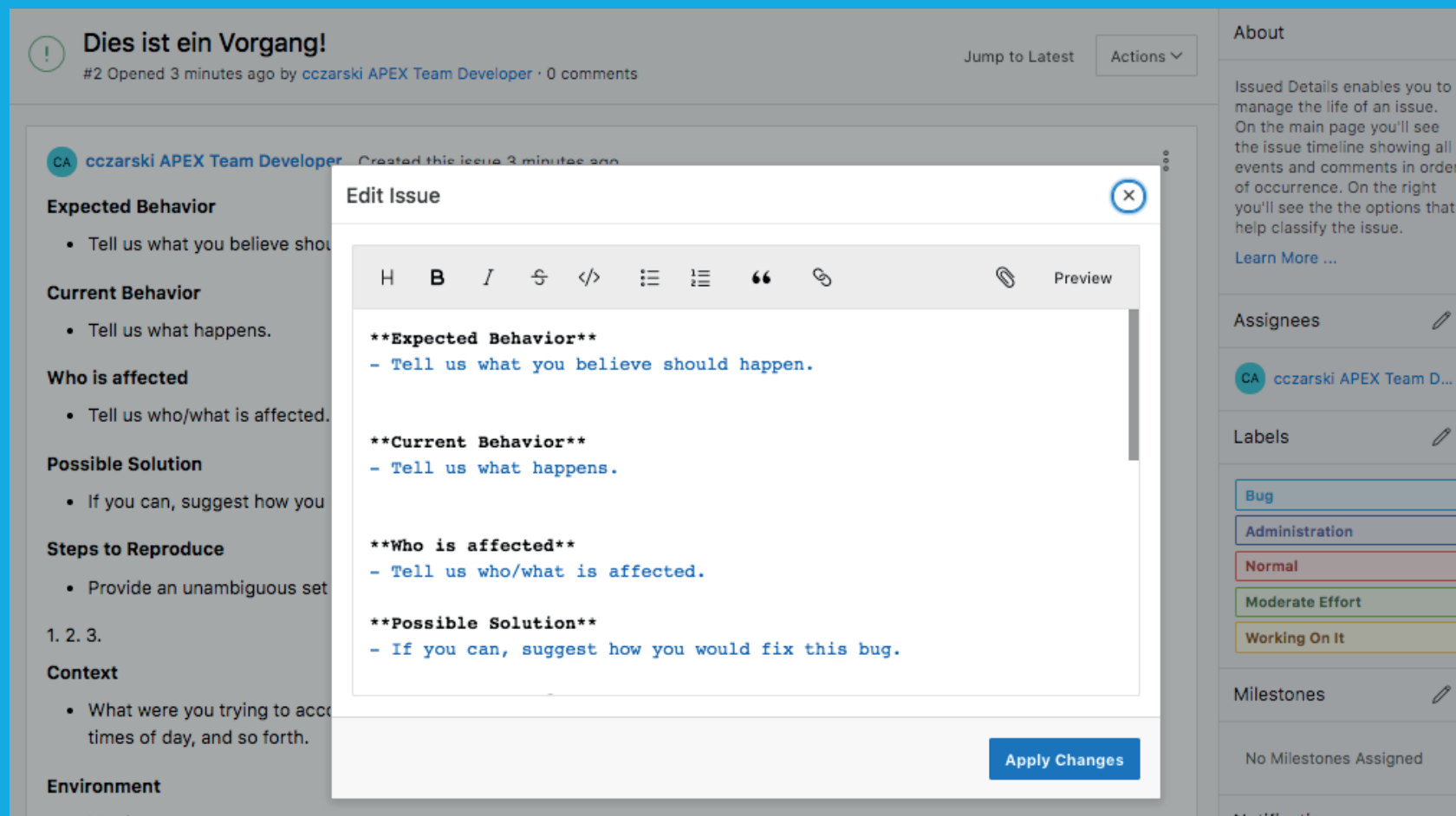

Fig. 8: Formatted Markdown content

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Fig. 9: Issues in the new Team Development Application

New Team Development Application

The Team Development Application in APEX Application Builder has been completely revamped and simplified in APEX 19.2. Team Development is intended to help small development teams, which only have simple project tracking requirements and don't use standard project management or issue tracking tools.

In Team Development, everything is an *Issue* (fig. 9). An issue is created with some description about its nature and then it is being assigned to a workspace user. Progress on the issue is documented by adding *Comments*. To get a quick overview on existing issues, Team Development allows to assign *Labels* (e.g. *Bug, Enhancement, Urgent* or others).

Universal Theme Dark Mode

Back in March 2019, APEX 19.1 introduced *Dark Mode* for the Application Builder. APEX 19.2 takes Dark Mode to the Universal Theme (fig. 10). In Theme Roller, a new Theme Style (*Vita – Dark*) has been added, which makes Dark Mode available to APEX applications.

Additional new features

Besides the features described above, APEX 19.2 contains a number of additional new features. A few of these are outlined below.

- **Declarative Oracle TEXT support**
  APEX 19.2 adds declarative Oracle TEXT support to Interactive Reports, the Popup LOV and to Faceted Search. Once a column is indexed with Oracle Text, and the developer configures the Oracle Text Index Column, APEX will use Oracle Text for Search within the component. This allows to leverage Oracle TEXT functionality like Fuzzy Searching in Interactive Report and Grid, the Popup LOV or Faceted Search.

- **New SQL Workshop Data Loading to existing tables**
  The new SQL Workshop Data Loading wizard, which was introduced in APEX 19.1, now supports loading CSV, XLSX, JSON or XML to existing tables as well.

- **CLOB support for SQL Workshop Data Loading the APEX_DATA_PARSER package**
  SQL Workshop Data Loading and the *APEX_DATA_PARSER* PL/SQL package now support up to 20 CLOB columns, in order to load texts larger than 4000 bytes.

- **Support for Oracle Cloud Infrastructure (OCI) REST API**
  If installed on database version 18 or higher, APEX supports declarative support for the *Oracle Cloud Infrastructure (OCI)* REST interfaces. Developers can use Web Source Modules and the APEX_WEB_SERVICE package to natively integrate e.g. with the Oracle Cloud Object Store.
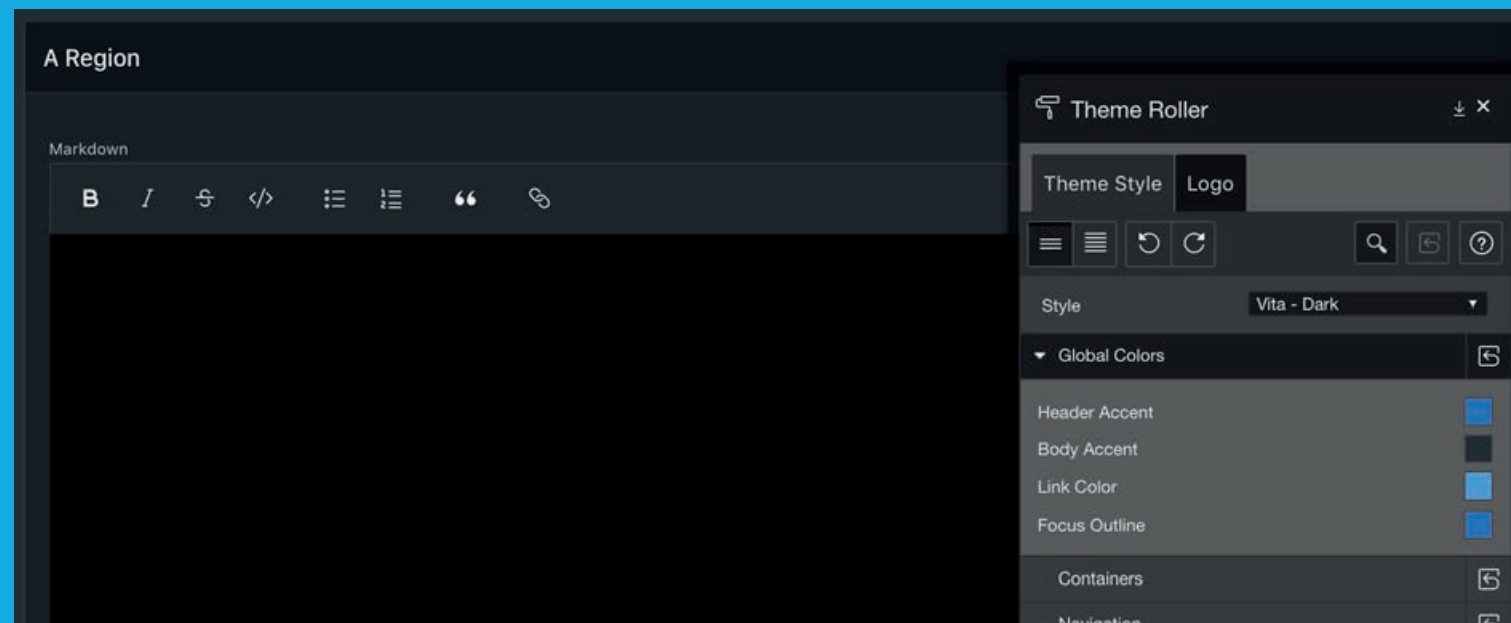

Fig. 10: Dark Mode comes to the Universal Theme

- **JavaScript Library Updates**
  As with each APEX release, underlying JavaScript libraries are updated. APEX 19.2 comes with Oracle JET 7.2.0, jQuery 3.4.1 and jQueryUI 1.12.1. Other open source libraries, like CKEditor, CodeMirror, FullCalendar have also been upgraded to recent releases.

Summary

APEX 19.2 continues the cycle of having two APEX releases per year. Although a "dot-2" release, it contains a number of major new features, like Faceted Search, the new Team Development application or the LOV enhancements.

Besides these marquee features, APEX 19.2 contains a number of minor new features, bug fixes and completions to already existing new features. PL/SQL APIs like APEX_REGION, APEX_DATA_PARSER or APEX_JSON have been extended. It's worth to have a look into these.

More Information
- Information and environment to test-drive APEX 19.2
  http://apex.oracle.com/en
- Blog Posting: Faceted Search in APEX 19.2
  https://blogs.oracle.com/apex/apex-192-faceted-search
- Blog Posting by Adrian Png: Connecting to Oracle Cloud Infrastructure with APEX 19.2
  https://blogs.oracle.com/oraclemagazine/better-file-storage-in-oracle-cloud

About Carsten Czarski

Carsten works for Oracle in Germany since 2001. He started in the Presales organization helping customers and partners regarding database-centric application development. Since March 2016, Carsten is a member of the Application Express development team. Focus of his work is on the new support for REST services in APEX – beyond that Carsten looks after the Calendar component and the Data Loading facility. He is a frequent speaker at international user group conferences.

These days, Artificial Intelligence (AI) and Machine Learning (ML) are a lot like preserving our planet's environment: Almost everyone is talking about what should be done to save it, but very few people have committed to actually *doing* something about it.

This article series will demonstrate how to discover unseen patterns and relationships within sample data – some inside our database, and some outside it – by leveraging the AI and ML capabilities already built into Oracle Autonomous Database. Along the way we'll discuss the basics of what AI and ML promise, analyze data patterns in several dimensions, and build simple visual models that uncover patterns hidden within our data.

Machine Learning: What's All This, Then?

Even though I've been an Oracle DBA for nearly two decades, I spent the first half of my IT career as an application developer. In the mid-1980s, my experiences in health care insurance drove home just how valuable analytic tools like SAS could be to determine unseen trends in patient diagnoses during that decade's AIDS epidemic. In the later 1990s, my work in pharmaceutical sales revealed how the unexpected success of a particular prescription drug for treating chronic insomnia demanded sharp analytic techniques to effectively deploy thousands of salespeople across the USA. And in each case, I'd always wished for tools that were easier to learn, simple to use, and quick to return meaningful results.

One thing that I've noticed this past year at every Oracle conference or user group meeting that I've had the privilege to attend and speak at: There are overflow crowds for any presentation that has the words *artificial intelligence* (AI) or *machine learning* (ML) in its title. I will be the first to admit that my nose has been so close to the grindstone of experimenting

with and advocating technology that makes the job of Oracle Database administration simpler, and that's left me precious little time to invest in learning more about AI and ML.

Fortunately, my role as Senior Enterprise Data Architect for Viscosity North America and my recent volunteer involvement in a local political campaign have refocused my attention on the value that AI and ML can provide. Some recent examples include:

- Over the past two years, I've helped to incorporate the TPC-DS and TPC-E data models into Swingbench - Dominic Giles's **free tool** for workload generation – but now I wanted to delve into how data was *grouped* within various dimensions as well as create more sophisticated *visual representations* of those data.
- I wanted to expand my Oracle *Application Express* (APEX) skill set to include *analysis and visualization* of data I'd captured from a myriad of public sources via web-enabled APIs.
- Finally, in my role as a volunteer on the Data Committee for my US Congressman's 2020 re-election bid, I needed to deploy sharper *analytic tools* and *data visualization techniques* to assist in deploying campaign resources effectively throughout a political unit that represents almost half a million citizens.

ML Is Already Here. If You Know Where to Look.

I've spent most of the last year exploring the best ways to exploit the technology of Oracle's Autonomous Database as a force multiplier for busy Oracle DBAs, and what surprised me is a seeming lack of interest among my DBA colleagues at conferences and user groups in this topic. What I found ironic about this viewpoint is that Autonomous Database already leverages both AI and ML for many of its newest features, especially *Automatic Indexing*.

But one of the neatest and often-overlooked features of Autonomous Database is its built-in AI and ML capabilities. Regardless of whether I'm accessing an Autonomous Data Warehouse (ADW) or Autonomous Transaction Processing (ATP) instance, I can quickly analyze complex data, leverage Oracle Machine Learning (OML) to create forecasts and predictions, and then represent the results of those analyses visually to help interpret findings. As I'll show next, it's incredibly easy to get started with just a few mouse clicks inside Oracle Cloud Infrastructure (OCI).

Creating a Machine Learning User

My first step is to create a Machine Learning user. I'll do this through the Autonomous Database UI under its **Development** tab and choose an appropriate name (`AIMLNOOB`) for my user account.

Just a few moments later, I receive an e-mail asking me to confirm my user account's creation, including a reminder that I'll need to create a new password once I access the account. Note that I could have also created a sufficiently-robust password when I initially created my user account to bypass this requirement.

After I receive e-mail notification that my new user account is ready, I access it through the link provided, reset my password, and connect to my OML environment. I particularly like this method, as it makes short work of providing a new OML user the credentials she needs with only minimal DBA administrative involvement.

Staying Organized: Workspaces, Projects, and Notebooks

Now that I've got an OML user created, it's almost time to build my first OML notebook. But I've got some options to help keep me organized as well, so I'll explore those first.

Immediately after logging in, I'm presented with what I like to think of as my "work desktop" for all things OML (**Figure 1**). From here I can execute SQL statements and SQL scripts, create and maintain notebooks, schedule jobs, and – perhaps most important to a newbie like me! – review examples of ML techniques.
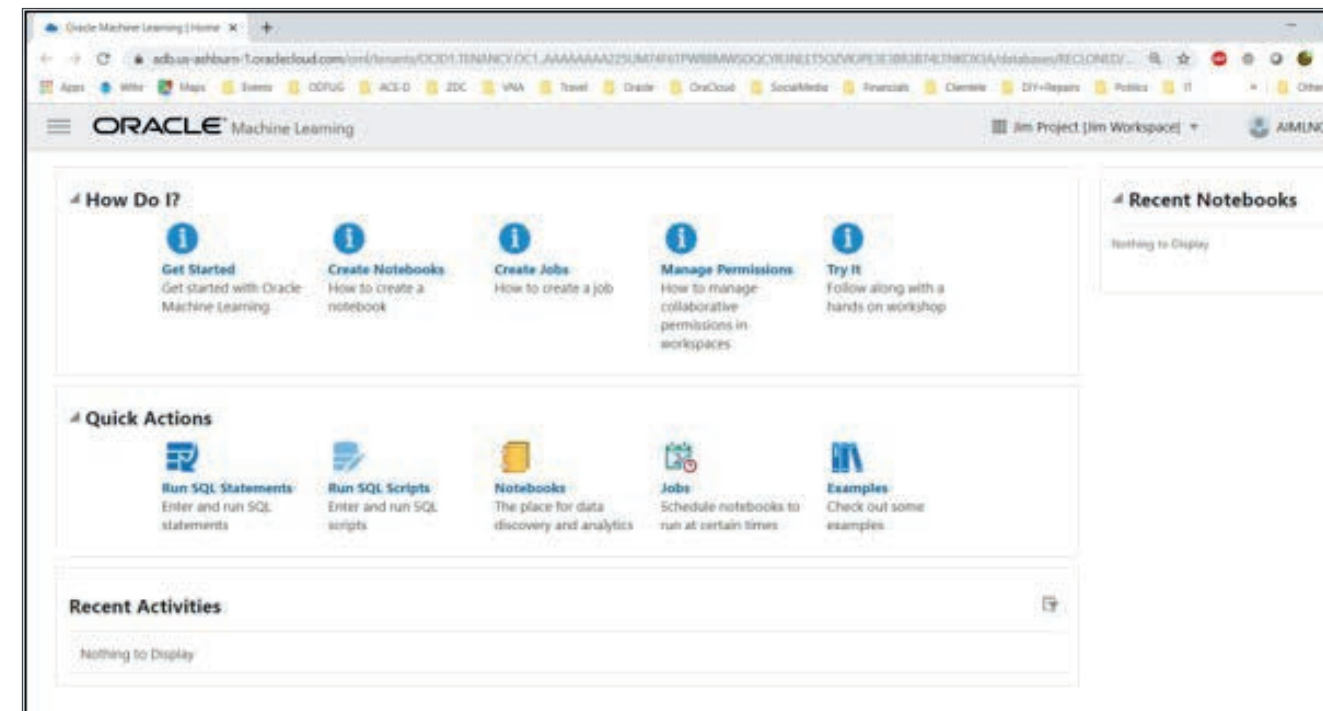

Figure 1. The ML "work desktop"

Just as in Oracle Application Express (APEX), I can create a separate *workspace* for retention of specific ML projects. To keep things simple for now, I'll continue to use my default workspace (*Jim*), but I will create a brand-new OML project by selecting the *New Project* option from the current workspace dropdown and then naming my new project *StockTrends*. My AIMLNOOB user account now owns this workspace, any of its projects, and all notebooks stored within each project as well.

Getting Ready to Notebook
Finally, I'm almost ready to create my very first OML notebook. Oracle provides *Apache Zeppelin* notebook technology for this environment; you can read more about how to leverage Zeppelin's capabilities to create expansive dashboards featuring both tabular and graphic data displays as well as leverage OML data modeling **here**.

Granting Privileges
Before I can access data in my Autonomous database, I need to grant the appropriate SELECT privileges for the AIMLNOOB user. In this example, I leveraged SQL Developer to execute the necessary commands to enable AIMLNOOB to access all tables in the TPCE schema (**Figure 2**).
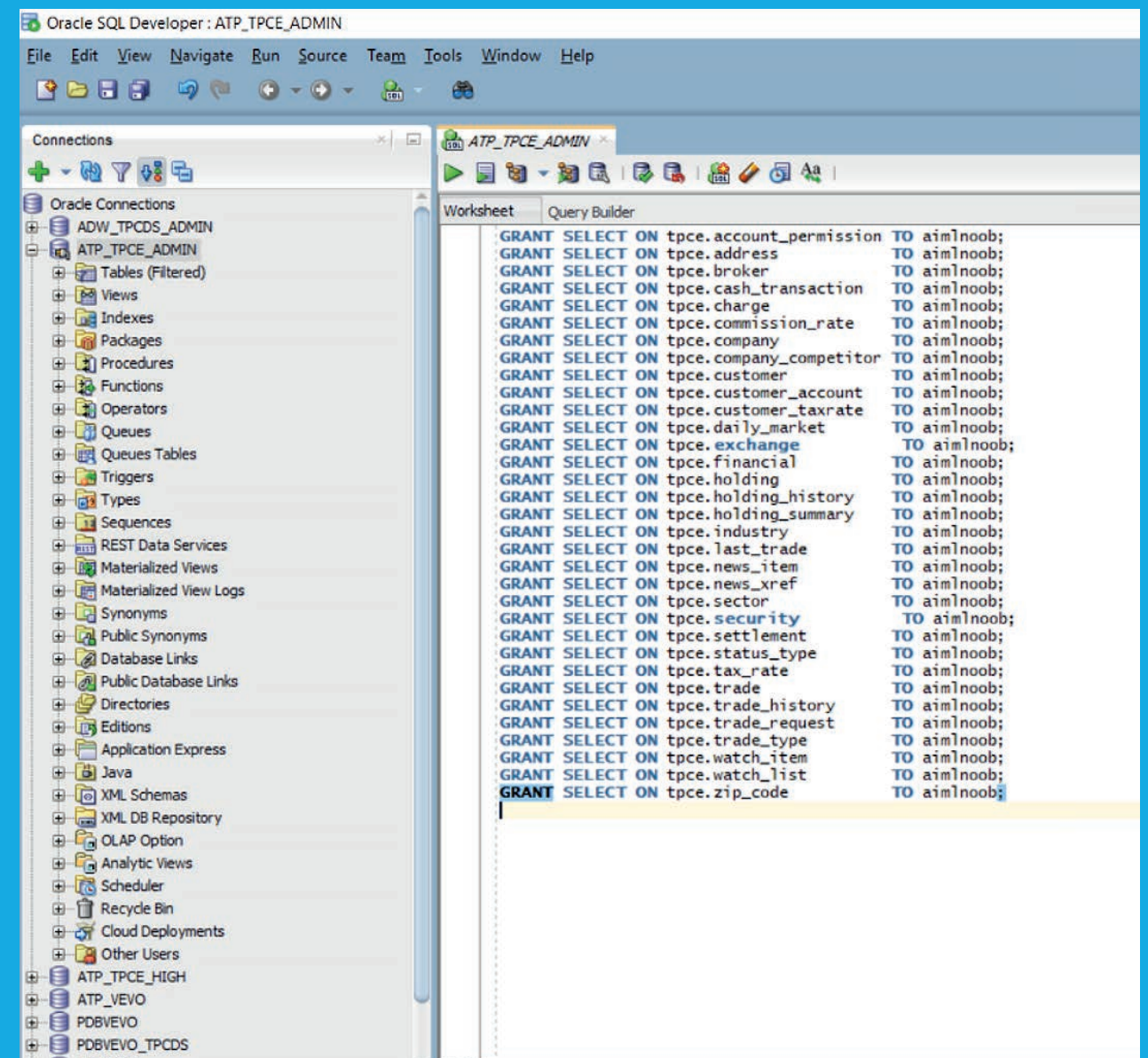

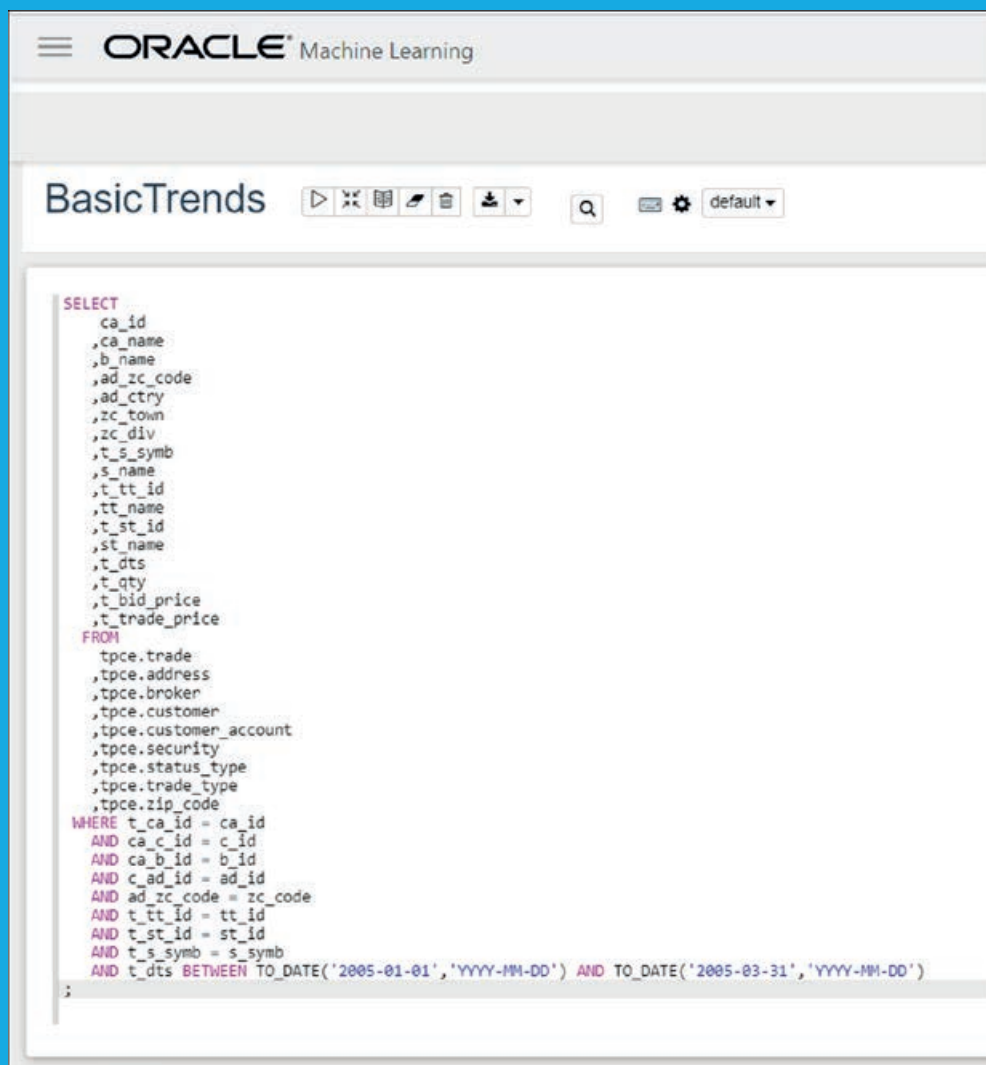
Figure 2. Granting SELECT privileges for the AIMLNOOB user
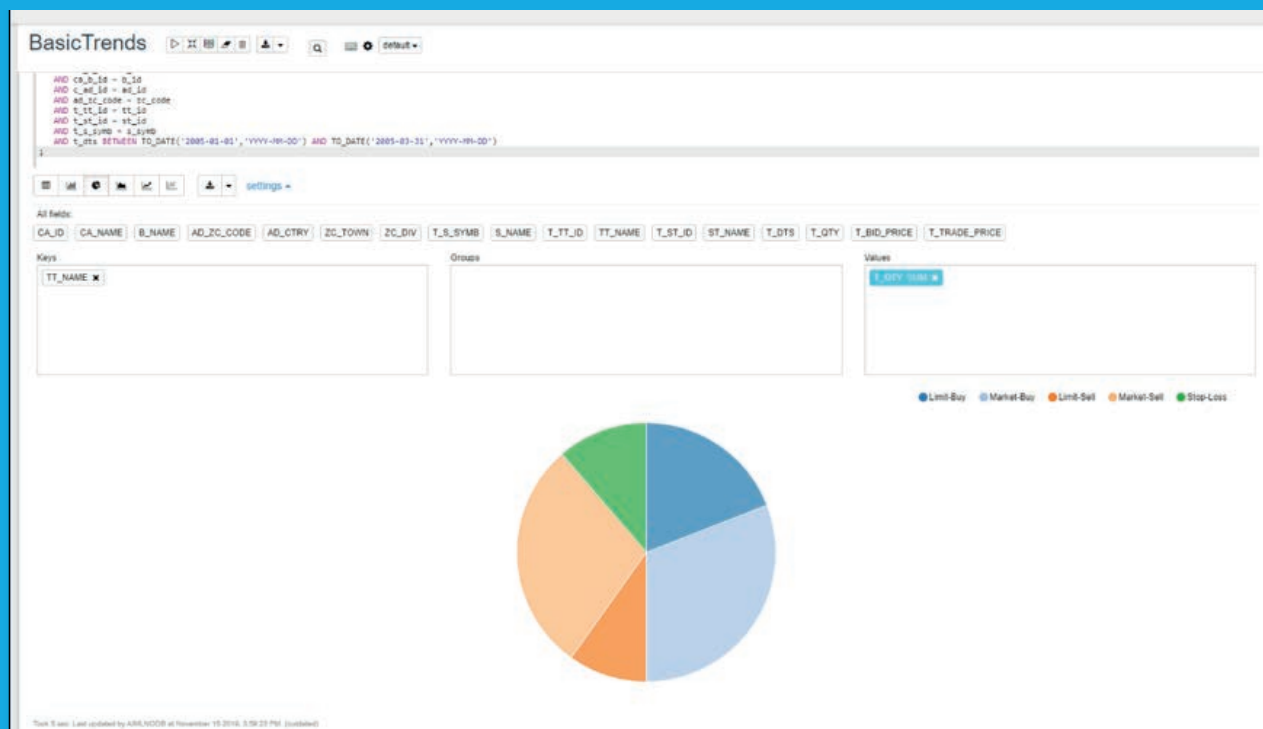
Figure 3. Adding a new paragraph

Figure 4. Visualizing data with a simple pie chart

Building a New Zeppelin Notebook

At last, it's time to create my first new Zeppelin notebook. I first selected the *Notebooks* icon from my ML work desktop, which displayed the Notebook creation interface. I then clicked on the *Create* button and finally named my new notebook *BasicTrends*.

Adding in Data

Zeppelin allows me to specify several different categories of content area called *paragraphs* within the same notebook. As shown in **Figure 3**, I added a new paragraph – in this case, a relatively simple SQL statement – that queries data resident within several tables of the TPC-E standard schema that I'd previously populated in my Autonomous database.

When I click on the arrow in the right upper corner of the paragraph, Zeppelin prompts me to execute all paragraphs and then in just a few seconds displays the results in an interactive worksheet format.

Data Visualization

At this point, you are probably thinking what I was thinking: *Sure, I've retrieved some data from the TPCE schema into a workbook-style grid … but so what? That's not really much better than anything I could've done in an APEX interactive report or even in a simple Microsoft Excel spreadsheet.* But that's where a Zeppelin notebook's powerful data visualization tools distinguish the Oracle ML environment, as I'll demonstrate next.

Visualization Tools: Building Charts

I can apply one of several different and powerful visualizations against the same data I just retrieved from my TPCE schema with a few simple mouse clicks. In **Figure 4**, I've shown the results of clicking on the *Pie Chart* icon and

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then dragging the appropriate columns from my notebook's worksheet – in this case, Trading Type (`TT_NAME`) to the *Key* area, and the sum of share quantities traded (`T_QTY`) to the *Value* area – to create a simple pie chart showing the volume of shares traded within those types.

Adding another layer of detail to the same pie chart is equally simple. All I have to do is drag the appropriate column name – in this case, the country in which the stock transaction occurred (`AD_CTRY`) - into the *Groups* area. The resulting pie chart reflects these changes instantaneously. Finally, what if I don't think that a pie chart isn't an appropriate visualization method to sufficiently differentiate my data? I just click on another icon - say, *Bar Chart* – and Zeppelin responds with a different visual representation of my data.

Activating My Analytic Super-Powers: Applying OML to Results

While I'm sure you'd agree these Zeppelin Notebook visualization tools are simple to leverage and intuitive to use, you're probably just about as non-plussed as I was at this point in my investigations. *After all*, you may be thinking, with *just a bit more work, it's simple to build a Microsoft Excel chart against these data, or leverage a similar third-party visualization tools to obtain equally attractive results.*

But this is the point at which OML comes into play, because up to now I've been querying only *current* results, without the ability to effectively forecast *future* results based on trends that may be hidden deeply inside my data. As a confessed AI/ML newbie, I freely admit I had extremely little foundational knowledge into how to select and then apply the proper algorithm to discover those hidden patterns.

One really neat aspect of the OML features provided with Zeppelin is that there are several cogent examples of exactly how to apply machine learning techniques, such as Anomaly Detection, Association Rules, Attribute Importance, Clustering or Time Series Forecasting. These notebooks provide well-documented examples of how to apply the powerful ML algorithms that are built into the `DBMS_DATA_MINING` package, including all steps necessary to prepare my data sources for effective analyses.

The example code provided makes it simple to experiment with different ML techniques – for example, creating a *Time Series* analysis to project future sales based on current sales patterns – using the venerable Sales History (SH) data warehousing example schema.

To demonstrate, I'll leverage the example code and recommended data preparation methods to build out a similar scenario using the TPC-DS schema that's built into Swingbench. Using several years of historical data for sales made in my organization's brick-and-mortar stores, I'll apply an *exponential smoothing algorithm* (ESM) to forecast sales forward into the future.

Time Series Forecast: Preparations

Since I will be running this model against an ADW instance this time, I first created the `AIMLNOOB` user within that database and then granted SELECT privileges for all tables in the `TPCDS` schema using methods similar to those I used for my ATP database.

Next, I created a new table named **ESM_TPCDS_SETTINGS** in the `AIMLNOOB` schema that I'll use to retain settings specific to the new ML model, as shown in **Listing 1**.

```
-----
-- Drop, then re-create ESM settings for this model
-----
BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE esm_tpcds_settings';
EXCEPTION
  WHEN OTHERS THEN NULL;
END;
/

CREATE TABLE esm_tpcds_settings(
    setting_name  VARCHAR2(30)
   ,setting_value VARCHAR2(128)
);
```

Listing 1. Creating the ESM_TPCDS_SETTINGS table

I then inserted several settings for the corresponding Time Series model, as shown in **Listing 2**.

Let's break down these settings and how they affect the generation of the Time Series model:

- Parameter `ALGO_NAME` specifies the model algorithm my model will use – in this case, ESM (`ALGO_EXPONENTIAL_SMOOTHING`).
- Setting `EXSM_INTERVAL` to `EXSM_INTERVAL_MONTH` tells the model to …
- The `EXSM_PREDICTION_STEP` setting limits the ESM algorithm's number of prediction "steps" to `23`, which means it will project out store sales for 23 months (February 2003 – December 2004) based on historical data available.
- For `EXSM_MODEL`, I've specified `EXSM_HW`, which selects the *Holt-Winters triple exponential smoothing model, additive trend, multiplicative seasonality* model. If you are an AI/ML newbie like me, this **Wikipedia entry** is a great lead-in to the particular efficacies of the exponential smoothing model and the complex math behind it.
- Finally, `EXSM_SEASONALITY` is set to `12` so that the historical data is interpreted within a twelve-month cycle when projecting the 23 months of future store sales.

```
-----
-- Define settings for the ML algorithm selected:
-- Select ESM as the algorithm
-- Set accumulation interval to be quarter
-- Set prediction step to be 23 months
-- Set ESM model to be Holt-Winters
-- Set seasonal cycle to be 12 months
-----
BEGIN
  INSERT INTO ESM_TPCDS_SETTINGS
  VALUES (DBMS_DATA_MINING.ALGO_NAME,              DBMS_DATA_MINING.ALGO_EXPONENTIAL_SMOOTHING);
  INSERT INTO ESM_TPCDS_SETTINGS
  VALUES (DBMS_DATA_MINING.EXSM_INTERVAL,          DBMS_DATA_MINING.EXSM_INTERVAL_MONTH);
  INSERT INTO ESM_TPCDS_SETTINGS
  VALUES (DBMS_DATA_MINING.EXSM_PREDICTION_STEP,   '23');
  INSERT INTO ESM_TPCDS_SETTINGS
  VALUES (DBMS_DATA_MINING.EXSM_MODEL,             DBMS_DATA_MINING.EXSM_HW);
  INSERT INTO ESM_TPCDS_SETTINGS
        VALUES(DBMS_DATA_MINING.EXSM_SEASONALITY, '12');
END;
/
```

Listing 2. Setting Time Series Model parameters

Gathering the Required Data

Capturing the necessary data for my analysis couldn't be simpler: I've created a view named TPCDS_ESM_DATA that captures all historical sales data from the STORE_SALES table and the corresponding formatted date string from the DATE_DIM dimension table, as shown in **Listing 3**.

Creating the Time Series Model

It's now time to generate the Time Series model named ESM_TPCDS_SAMPLE by applying the TIME_SERIES data mining function that's part of the DBMS_DATA_MINING package's CREATE_MODEL procedure (**Listing 4**).

Note that I've designated the column containing the date of each sale as the use case identifier and the sales quantity as the target of the analysis. The model uses the settings I populated within the ESM_TPCDS_SETTINGS table created above to construct the model. Executing the CREATE_MODEL code shown took less than ten seconds to complete – not altogether surprising, as the TPCDS data is stored within an Autonomous Data Warehouse and therefore leverages the inherent efficiencies of Exadata technology.

Validating the Time Series Model

Now that the model is created, I can confirm the parameters used and generated during its execution as well as several diagnostic factors by querying built-in views. **Listing 5** shows three queries that confirm the model settings utilized, some additional model attributes, and any unexpected issues with the model itself during its generation.

```
-----
-- Create view as input into Time Series ML Model Algorithm
-----
CREATE OR REPLACE VIEW esm_tpcds_data
    AS
    SELECT
          d_date
        ,ss_quantity
      FROM
        tpcds.store_sales
        ,tpcds.date_dim
     WHERE ss_sold_date_sk = d_date_sk;
```
Listing 3. Gathering input data for Time Series analysis

```
-----
-- Drop and rebuild Time Series Model
-----
BEGIN
  DBMS_DATA_MINING.DROP_MODEL('ESM_TPCDS_SAMPLE');
EXCEPTION
  WHEN OTHERS THEN NULL;
END;
/

BEGIN
  DBMS_DATA_MINING.CREATE_MODEL(
    model_name          => 'ESM_TPCDS_SAMPLE'
    ,mining_function     => 'TIME_SERIES'
    ,data_table_name     => 'ESM_TPCDS_DATA'
    ,case_id_column_name => 'D_DATE'
    ,target_column_name  => 'SS_QUANTITY'
    ,settings_table_name => 'ESM_TPCDS_SETTINGS');
END;
/
```
Listing 4. Creating the Time Series model from TPCDS data based on algorithm settings

```
-----
-- Show corresponding Time Series model settings and attributes
-----

SELECT setting_name, setting_value
  FROM user_mining_model_settings
  WHERE model_name = UPPER('ESM_TPCDS_SAMPLE')
  ORDER BY setting_name;

SELECT attribute_name, attribute_type
  FROM user_mining_model_attributes
  WHERE model_name = UPPER('ESM_TPCDS_SAMPLE')
  ORDER BY attribute_name;

-----
-- Capture any diagnostics specific to the model generated
-----
SELECT
     name
    ,numeric_value
    ,string_value
  FROM dm$vgesm_tpcds_sample
 ORDER BY name;
```
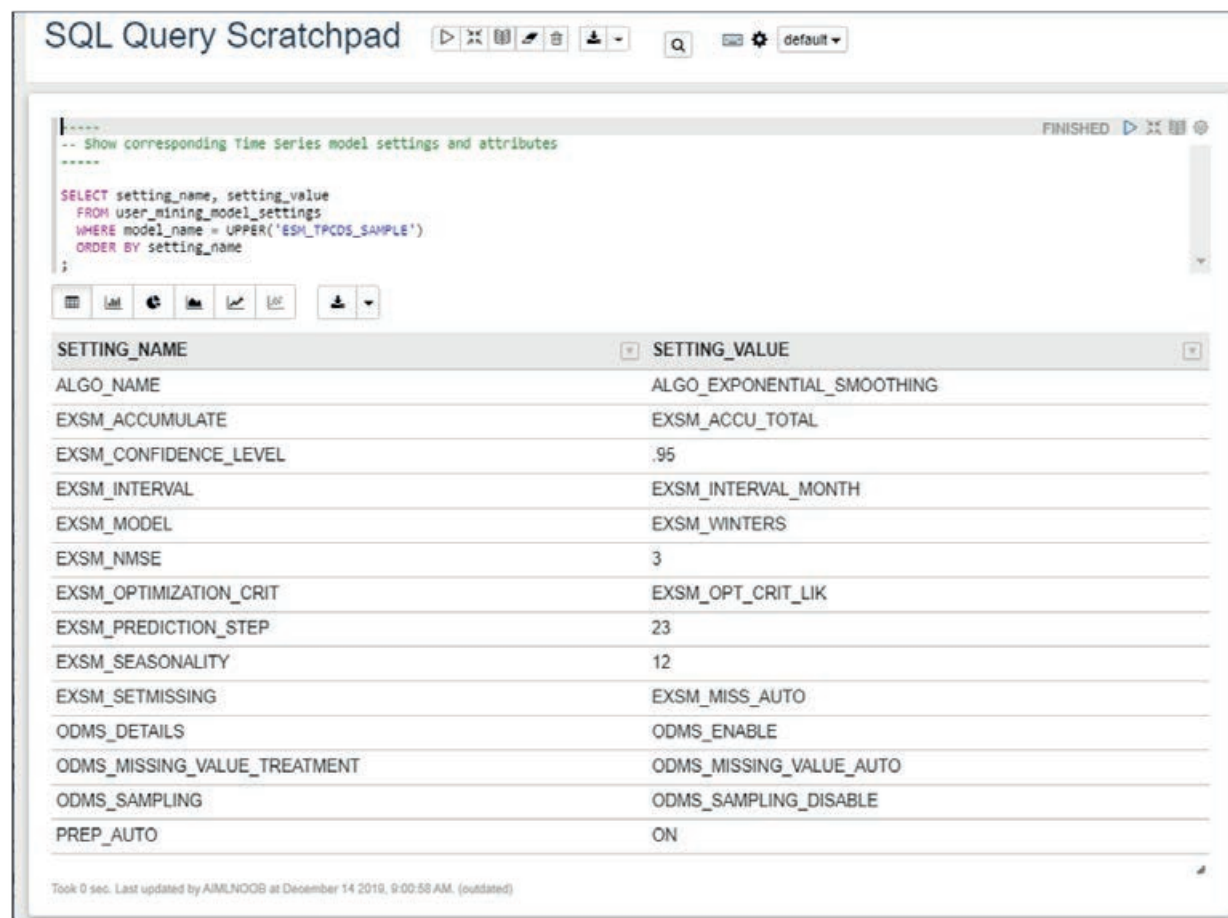*Listing 5. Verifying the Time Series model's creation*

```
SQL Query Scratchpad   ▷ ⌧ ▥ ✎ 🗑 ⬇ ▾   🔍  ⌨ ⚙ default ▾

|-----
-- Show corresponding Time Series model settings and attributes
-----
SELECT setting_name, setting_value
  FROM user_mining_model_settings
  WHERE model_name = UPPER('ESM_TPCDS_SAMPLE')
  ORDER BY setting_name
;
                                                   FINISHED ▷ ⌧ ▥ ⚙
```

SETTING_NAME	SETTING_VALUE
ALGO_NAME	ALGO_EXPONENTIAL_SMOOTHING
EXSM_ACCUMULATE	EXSM_ACCU_TOTAL
EXSM_CONFIDENCE_LEVEL	.95
EXSM_INTERVAL	EXSM_INTERVAL_MONTH
EXSM_MODEL	EXSM_WINTERS
EXSM_NMSE	3
EXSM_OPTIMIZATION_CRIT	EXSM_OPT_CRIT_LIK
EXSM_PREDICTION_STEP	23
EXSM_SEASONALITY	12
EXSM_SETMISSING	EXSM_MISS_AUTO
ODMS_DETAILS	ODMS_ENABLE
ODMS_MISSING_VALUE_TREATMENT	ODMS_MISSING_VALUE_AUTO
ODMS_SAMPLING	ODMS_SAMPLING_DISABLE
PREP_AUTO	ON

Took 0 sec. Last updated by AIMLNOOB at December 14 2019, 9:00:58 AM. (outdated)

Figure 5. Time Series Algorithm Settings

View Name	Description
DM$VG[model_name]	Lists the *global statistics* the model used during its creation
DM$VP[model_name]	Contains the *partitioned results* the model generated
DM$VS[model_name]	Describes any *computed* settings for the particular algorithm
DM$VW[model_name]	Shows any *alerts* that may have arisen during creation of the model

Table 1. Data Mining with ESM: Automatically-Created Views

To show the results from the first query above, I used another handy feature of the OML interface – the SQL *Query Scratchpad* – from my OML work desktop to interrogate the settings for the ESM model, as shown in **Figure 5**. I won't delve into these settings deeply here, but it's instructive to note that there are quite a few interesting ones that are set by default, including the model's *confidence level* (0.95), and how it handles *missing values*.

Serendipitously, whenever a new model is created via DBMS_DATA_MINING, it also captures and retains detailed information about resulting statistical factors within automatically-created views specific to the model generated. Each view is prefixed with DM$V and a full list of the views available is contained within the documentation for each algorithm. For example, the information in view DM$VGESM_TPCDS_SAMPLE shows various statistical factors like *alpha, beta, gamma,* and *standard deviation* that this execution of the model produced.

I've captured the list of views available for this particular OML model in **Table 1** below. Each model created via DBMS_DATA_MINING will build a similar set of views specific to the model type.

I will certainly admit that as an AI/ML newbie, I'm not yet completely cognizant of the esoterics of the ML models I'm employing. The good news here is that OML provides plenty of information in these diagnostic views that help me explain and understand how the analyses I'm executing actually *work*, and fortunately, there are ample descriptions of each ESM algorithm in the *Oracle PL/SQL Packages and Types Guide*. For my example, the implementation of various exponential smoothing model algorithms is explained in depth **here**.

Visualizing the Time Series Results

Now that I've successfully built my Time Series model, it's time to leverage Zeppelin's data visualization tools to show the results of that model's projections. I'll first create a new Notebook named *TPCDS Time Series*. Next, I'll add the query in **Listing 7** – which queries the data retained in the partitioned results view for the model I just created – into that Notebook's paragraph and execute it which queries the data retained in the partitioned results view for the model I just created.

I'll then select the *Line Graph* icon for visualization method, the PERIOD column as the key, and choose ACTUAL_AMOUNT_SOLD, PROJECTED_AMOUNT_SOLD, LOWER_BOUND, and UPPER_BOUND columns as the values to be visualized. The resulting graph is shown in **Figure 6** (I've blown up the right-hand side of that graph for a closer look).

At last, here's proof of OML's power as visualized in the resulting line graph: Based on in-store sales from 1996 through early 2003, the Time Series model projected sales for the next 23 months using the ESM forecasting method. Note that model also includes a "confidence boundary" as defined by the values captured in the LOWER_BOUNDS and UPPER_BOUNDS columns. Also, note that I've also selected the *Force Y to Zero* and *Show Line Chart With Fences* options to enhance this display to make it somewhat easier to see the trends presented in the projected line chart.

Autonomous DB and OML: What's Coming Up Next?

The potential power of Oracle Machine Learning – especially in the context of Oracle Autonomous Database – should be quite apparent at this point. So far, I've demonstrated how to:

- Create an *OML user*, configuring it for use against both an ATP and ADW schema in Autonomous Database
- Leverage *Zeppelin Notebook features* for tabular reporting and data visualization tools
- Exploit Oracle's DBMS_DATA_MODEL package to create a simple ML Time Series analysis and visualize the results from applying that algorithm

```
-----
-- Display resulting Time Series data, including actual and forecast sales
-- as well as lower and upper bounds of the forecast's accuracy
-----
SELECT
    TO_CHAR(case_id,'YYYY-MON') period
    ,value actual_amount_sold
    ,ROUND(PREDICTION, 2) forecast_amount_sold
    ,ROUND(LOWER, 2) lower_bounds
    ,ROUND(UPPER, 2) upper_bounds
  FROM dm$vpesm_tpcds_sample
 ORDER BY case_id;
```

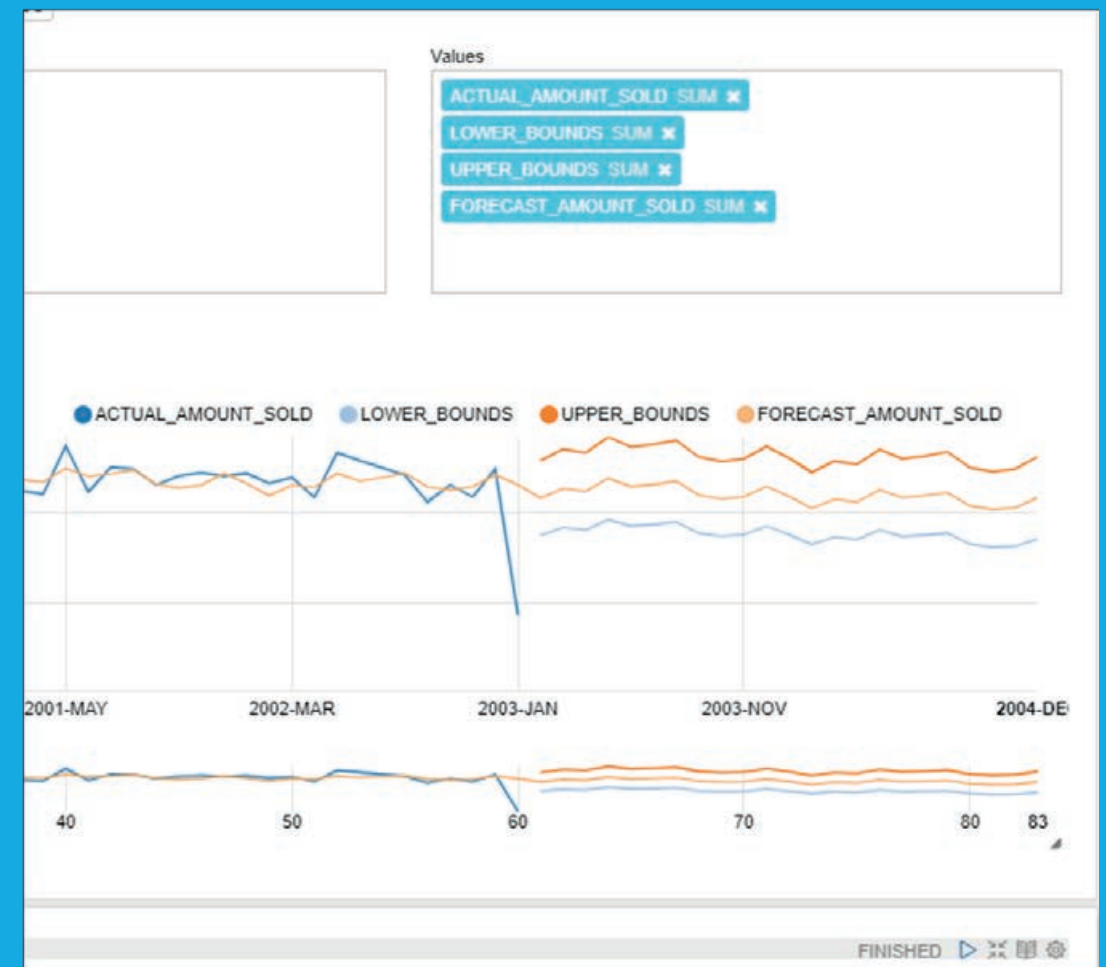*Listing 7. Querying TPCDS Time Series forecast results*

Figure 6. Data Visualization: A Closer Look

Now that the basics of leveraging OML and Data Mining within an Autonomous DB environment have been covered, in the next article in this series I'll delve much deeper into leveraging more sophisticated data mining tools and analytic functions already built into Oracle Database to discover heretofore unseen patterns hiding in plain sight within my data. I'll also take a look at how to leverage the features of Oracle Analytic Cloud (OAC) to prepare, analyze, and visualize diverse data with elegant simplicity.

References

These reference guides are invaluable to understanding more about how to leverage OML within Oracle Autonomous Database and gain an initial foothold to understanding the extensive Data Mining capabilities built into Oracle Database 19*c*.

- Zeppelin Notebooks Guide for ADW:
  https://docs.oracle.com/en/cloud/paas/autonomous-data-warehouse-cloud/user/create-dashboards.html#GUID-56831078-BBF0-4418-81BB-D03D221B17E9
- Oracle 19*c* Data Mining Concepts:
  https://docs.oracle.com/en/database/oracle/oracle-database/19/dmcon/index.html
- Oracle 19*c* Data Mining API Guide:
  https://docs.oracle.com/en/database/oracle/oracle-database/19/dmapi/index.html
- Oracle 19*c* Data Mining User Guide:
  https://docs.oracle.com/en/database/oracle/oracle-database/19/dmprg/index.html
- Oracle 19*c* DBMS_DATA_MINING Package Documentation:
  https://docs.oracle.com/en/database/oracle/oracle-database/19/arpls/DBMS_DATA_MINING.html#GUID-7B9145D4-831F-46B3-977F-01AF77ACA4A1

A slightly different version of this article has also been published on **ODTUG's TechCeleration page**.

About Jim Czuprynski

Jim has nearly four decades of professional experience in IT, serving diverse roles at several Fortune 1000 companies before becoming an Oracle DBA in 2001. He has been an Oracle ACE Director in 2014 and is a sought-after public speaker on Oracle Database technology features.

Jim has authored over 100 articles on facets of Oracle DB administration since 2003 at databasejournal.com and IOUG SELECT. His **Generally ... It Depends** contains regular observations on all things Oracle and the state of the IT industry. He is currently the Senior Enterprise Data Architect for Viscosity North America.

DOUG members at the Copenhagen leg of the Tour (credit: Sandesh Rao)

Kim Berg Hansen

Groundbreakers Nordic Tour 2019

October 2019 was a month of Groundbreaker Tours. First the EMEA Tour and after that the Nordic Tour of 4 countries in 4 days.

I was one of the travelling speakers of the **Groundbreakers Nordic Tour 2019**. It was my first time on one of these Tours, and I thank Jennifer Nicholson of the Oracle ACE Program for making it possible, as well as Mathias Magnusson of SweOUG for arranging for me to be part of it.

Monday, 2019-10-21

I headed for Copenhagen the afternoon of the day before the conferences started. I would have done that anyway in order to be ready early Tuesday, but we'd also decided to take the opportunity and sightsee half an afternoon. So, I met Sai Penumuru and Sandesh Rao and took them for a 1½-hour walk of some of the classic sights of Copenhagen.

In the evening, the Danish Oracle User Group (DOUG) hosted a speaker dinner for us and their Board of Directors, where we were joined by Rita Nuñez, completing the traveling international speaker group. Sandesh had been doing the Groundbreakers EMEA Tour and would only be doing the Copenhagen leg of our tour, but Rita, Sai and I were to speak in all 4 cities of the Nordic Tour.

Tuesday, 2019-10-22

Our speaker group found our way to the Oracle Denmark offices in Hellerup, the venue of our first tour day. Oracle Denmark had just moved to these premises a couple of weeks before we came, and it was a very nice venue for this one-day conference.

DOUG had arranged a two-track conference, database and developer, mixing presentations by us and by local speakers. I was speaking on SQL topics, my usual field of expertise, so I was in the developer track. My two presentations were about twisting data (pivoting, unpivoting and delimited strings) and match_recognize (a SQL tool not only for pattern matching).

Sandesh, Sai, Rita and I in Copenhagen (credit: Sandesh Rao)

This tour being a tradition for some years now, DOUG had foresight to plan the last sessions of the day with only local speakers, so that the travelling group could leave for the airport after the afternoon coffee break.

After a quick hop from Copenhagen to Oslo, we got to our hotel and met with Ann-Sofie Often of OUGN for a chat.

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View over Oslo Fjord (credit: Rita Nuñez)

Concentrated audience in Oslo (credit: Kim Berg Hansen)

Helsinki speaker dinner (credit: Rita Nuñez)

Wednesday, 2019-10-23

To get at least some fresh air and enjoy the view over Oslo Fjord, we walked from the hotel to Felix conference center in Aker Brygge, where the Oracle User Group Norway (OUGN) hosted the Oslo leg of the tour.

I did my two presentations and so did Rita and Sai. Rita talked about taking the first steps with an Oracle ATP database and about Enterprise Cloud Computing. Sai presented on accelerating application development and on harnessing the power of Autonomous DB.

Even though it was only the second leg of the tour, it was almost routine that the travelling speakers left the venue at coffee break time to get to the airport on time, leaving a local speaker to wrap up the day for the attendees.

The evening flight went from Oslo to Helsinki. In Helsinki we were joined by Julian Dontcheff, who would be speaking with us on the last two legs of the tour. Julian, together with Pasi Jaakkola and Sakari Lindholm of OUGF, met us at the hotel for a nice speaker dinner.

Helsinki Library (credit: Kim Berg Hansen)

Thursday, 2019-10-24

Again, we were within walking distance of the Oracle User Group Finland (OUGF) event, which took place in Accenture's Liquid Studio offices. It's nice to start the day with a walk before an entire day in a conference venue.

Julian kicked it off by talking about automatic indexing and other new features of Oracle Database 19c, before Rita, Sai and I each did our two tour presentations. It was an experience for me to note, even though our talks were the same on all four days, how a speaker can adapt a talk along the way, for example swapping content slightly to avoid too much overlap between two speakers.

Lunch on this day was slightly less routine, as it was not at the venue itself, but at the nearby restaurant Amarillo. So near, in fact, that it was just a matter of going down the stairs, out the front door, and in the next door. Even so, I felt that it gave the lunch break an extra refreshing dimension when we left the venue for it. This is not often possible, typically it would take too much time, but when it is possible, I think it is a good idea.

In the afternoon, Sai experienced a speaker nightmare – the HDMI port of his laptop appeared to be toast. Being an experienced speaker, he continued on my laptop, which of course didn't have his accounts saved for his cloud demos. But he did it well and for his second talk somebody found a USB-C converter he could borrow.

The departure time for the next flight was a little later, which enabled Sai and me to take a quick walking tour in Helsinki and see the cathedral and the library. The library is a beautiful place and I wish I had had the time to just sit and relax there for some time.

The flight from Helsinki to Stockholm was instantaneous with same arrival time as departure time, since the flight took one hour and there was one-hour difference in time zone.

Friday, 2019-10-25

Our by now customary morning walk took us from the hotel by the central station in Stockholm to the venue Convendum, where the Swedish Oracle User Group (SweOUG) hosted their event, which was the fourth and final one of the tour. Julian would have taken the early morning flight and joined us, alas illness had overcome him, so he had to stay in Helsinki.

We overcame the missing speaker by rescheduling the last presentation of the day, one of mine, to the forenoon slot that should have been Julian's. This enabled everyone, including attendees, to have an hour earlier start to the weekend. As we were told, the 25th of the month is pay-day in Sweden, so having just got paid on a Friday meant many people would go out for a nice evening in town.

Rita had left us after lunch, headed for the airport to fly directly back to Buenos Aires for the birthday celebration of her husband. Sai and I went to a pub with Mathias Magnusson and a couple more from SweOUG, since for once we were not in a hurry to get to the airport.

After a beer for me and an orange juice for Sai, the two of us walked around Stockholm and Gamla Stan for bit, before finding us a place to eat.

Dan and Mathias of SweOUG, Rita, Sai and I (credit: Rita Nuñez)

Attentive meetup audience in Stockholm (credit: Kim Berg Hansen)

Until we meet again, Cheers! (credit: Kim Berg Hansen)

Saturday, 2019-10-26

Both Sai and I had flights leaving mid-afternoon, so before lunch we could visit some more cathedrals in Stockholm and do a little shopping in Gamla Stan to bring home to our families.

At the airport we went our separate directions, Sai to Newcastle and me to Copenhagen. A short week over, but filled with impressions of airports, hotels and conference centers. However, luckily also filled with meeting lots of nice people, gaining new friends, chatting about the stuff that interests us.

All in all, a great experience. Thanks to all involved.

About Kim Berg Hansen

Kim is a database developer from Middelfart in Denmark. Originally wanting to work with electronics, he almost coincidentally tried computer programming and discovered where his talent lay. He has worked extensively with Oracle SQL and PL/SQL since 2000, utilizing the SQL language to the fullest.

Kim shares knowledge by blogging, presenting at conferences, and being the SQL quizmaster at the Oracle Dev Gym. He is an OCE (Oracle Certified Expert) in SQL, and an Oracle ACE Director. Outside the coding world, Kim is married, loves to cook, and is a card-carrying member of Danish Beer Enthusiasts Association.

Oracle Groundbreakers EMEA Tour 2019
A Speaker's Journal by "The Selfie Guy" Sandesh Rao

The Groundbreakers Tour for EMEA started in Tajikistan, followed by Istanbul, Baku, Portoroz and Rovinj before ending in Bucharest. The tour speakers among others were me, Heli Helskyaho, Kamran Agayev, Oren Nakdimon, Rodrigo Mufalani and Ludovico Caldera.

My trip began in Istanbul where I joined the team and we were welcomed by **Gurcan** who organized this event. He started with information on the user group, how they have grown over the years and encouraging people to network and absorb as much knowledge as they can. Then, **Javed Mohammed** gave an update on the Oracle ACE program. Javed covers the overall program including the path to becoming an ACE and Groundbreaker Ambassador. Throughout the day, he continued to do interviews among the people in the Istanbul user group. The technical sessions started off with Heli talking about AI and Machine Learning and its basics and how it can help DBA's and Developers extract value out of their data. She showed different methods of Machine Learning and examples of how to apply this to use cases. This included how companies like Facebook have projects using AI and Image Recognition, NLP or text processing – an interesting and captivating session for the audience!

After this solid dose of Machine Learning from Heli, I took over with a complementing session covering Machine Learning models and the lifecycle of MLOps among other things. This was followed up by interesting Troubleshooting tips and tricks: I showed how DBA's have become rock star DBA's doing things that used to take days within minutes. My talk also covered the free DBA tools that are available for performance tuning and log analysis.

Kamran Agayev continued covering the changing role of the DBA. He explained what different Data Scientist roles mean and which skills are necessary to separate the role of the Big Data Administrator. This was a very good presentation for DBA's to see what their career can evolve into. Kamran is also a jujitsu expert: He mentioned that in the case of tough questions he could take it outside... A bit of fun and laughs with the audience and we wrapped up Istanbul. The airport is

Selfie with the Istanbul audience

one of the largest and newest airports we have been to and we got lost multiple times when trying to find a decent meal but it's one of the coolest airports to pass through.

The next stop was Baku in Azerbaijan. Located near the Caspian Sea, Baku has a rich history: oil, struggles for independence, modern infrastructure and a young and dynamic population engaged in fields like Data Science, Machine Learning and Big Data. This is **Kamran Agayev**'s hometown and the welcome was grand. After Kamran's opening speech, Javed explained the Oracle ACE and

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The Shirvanshah restaurant in Baku

Groundbreaker Ambassador program, followed by Heli speaking about AI and Machine Learning – conceptual methods with examples of Clustering, Regression and Classification, going into Deep Learning Neural Networks and how to use Oracle Machine Learning within the Database to analyze and build AI on top of BI. Heli also introduced a basic image recognition system she had developed that has built-in ghost detection software. Then I continued with my Machine Learning conversation for DBA's.

Coffee breaks were a fun time to interact with the audience as the Azerbaijan folks were definitely not shy and we had a good chat on projects and features. Students made up a good part of the audience. They talked about what they were doing and

came up with questions on how to use the technologies we covered. Rodrigo Mufalani presented on Database Backups, RMAN and tips and tricks on how to make the process simpler, faster and adaptable to the cloud. Then, **Rustam KhodJaev** talked about education initiatives and the role of Oracle Academy in the same as well as his experiences with the Tajikistan Oracle User group and how it can be expanded and its resources could be used in other places.

The evening ended with a visit to a restaurant called Shirvanshah. This used to be the favorite place of a millionaire but it is also a location where passer-bys could take refuge for the night like an Airbnb – it can accommodate 1,000 people for dinner. Thanks to Kamran we got a free tour of the restaurant.

A room with a view from the hotel – this place is amazing and one of the best conference venues.

The cool part of this conference is while some speakers present, some have just finished their sessions and head to the city for some R&R. Here is the local boat to do precisely that.

Later, me, Rodrigo, Javed and Rustam walked around the historic Old Town Baku which hosts many restaurants as well as the Palace of the Shirvanshah's and the Maiden Tower.

The next stop of the tour was Portoroz. I skipped this city and rejoined the group in Rovinj. This is a quaint town in Croatia with a population of around 15,000. It has multiple islands around it, one of which has the Istra Hotel where the HROug conference was being held. After a 20-minute ride on a boat from the pier at Rovinj we landed at the venue of the Croation user group. On the island more than 400 attendees participated in a 5-day packed agenda with hundreds of sessions and speakers. What got me excited about this conference is that this is the single place where most of the Oracle ACE's I had co-presented with in various countries converged, so it offered an amazing networking opportunity.

There is a walking trail around the island attached to another small island where birds tend to come. It's encouraged to take some bread to feed the birds while enjoying pristine nature. So, bask in the knowledge when you can and take a break when you want to. Also, attendees were seen taking a dip into the water around the island.

The evening kicked off with some live music. The aim of the conference is to learn, have fun and make the guests as comfortable as possible to encourage networking in a venue which is conducive for it.

The next day included a session by **Oren Nakdimon**, who talked about editioning and showed how to how to upgrade applications with no downtime. Julian Dontcheff held a keynote to a packed audience about the state of the RDBMS and technology changes in the industry.

Kamran covered Big Data, Hadoop, Oracle and how to move data across these different Data Lakes and how to use each technology for what it's good at and achieve your Data Wrangling goals. **Kamil** did another excellent session on Database Security and why companies don't do enough, Database Vault and TDE were covered too.

I had two sessions in Rovinj: one detailing why AI and Machine Learning are important to Oracle and how we use them for several different use cases, and another one on how DBA's can become rock stars by using some cool Troubleshooting tips and tricks with tools like exachk and TFA (Trace File Analyzer).

Rovinj is a beautiful city, there was so much to see. Coupled with a good venue and HrOUG president Davor Ranković running an excellent show, good content, and entertainment to help people relax and network, this is probably one of the coolest places to visit.

The final stop was the vibrant city of Bucharest. The first impression was shaped when we reached the university which served as our venue. The main hall where we were to present would get us to a new level of energy. The event was kicked off by Mirela Ardelean and Ciprian Onofreiciuc leading into the sessions by **Maria Colgan**. Maria covered the differences between various Autonomous Database solutions and examined which one might be the right one for you, illustrating a comparison of the features and the audience including when to use Dedicated and Serverless. It was fun to get back with the team and work on this venue, Javed back to his interviews and Mirela handling the event, including delicious food.

I presented on Troubleshooting tips and tricks for DBA's, from change management to data collection for SR's, and other topics. After a brief coffee break, Oren Nakdimon talked about

Me and Javed walking the streets of Rovinj to the church that dominates the skyline and is also the place for a beautiful sunset.

Users & Groups

Maria speaking in the main hall of the university in Bucharest

Then it was a wrap – an amazing venue, an active crowd along with some good speakers made this a successful tour in EMEA. As you may have recognized, selfies are a big part of my travels, so there was a ton of them throughout this trip. I am called "the selfie guy" and truly so: It's important to highlight the role of community in this whole trip and how all these people come together to build the next generation of Oracle Applications using technologies like Oracle Autonomous Database, APEX and Machine Learning.

About Sandesh Rao

Sandesh is a VP running the AIOps Automation for the Autonomous Database Group at Oracle Corporation specializing using AI/ML for different use cases from predicting faults before they happen to Anomaly Detection within log data and metrics data.

His previous positions have focused on performance tuning, high-availability, disaster recovery and architecting cloud-based solutions using the Oracle Stack. With more than 20 years of experience working in the HA space and having worked on several versions of Oracle with different application stacks he is a recognized expert in RAC, Database Internals, PaaS, SaaS and IaaS solutions and solving Big Data related problems.

Most of his work involves working with customers in the implementation of public and hybrid cloud projects in the financial, retailing, scientific, insurance, biotech and the tech space. He is also responsible for developing assessments for best practices for the Oracle Grid Infrastructure 19c including products like RAC (Real Application Clusters), Storage (ASM, ACFS).

constraints. I never thought this topic was this deep and everyone learned something new. Then, Kamran covered his topic on Big Data and Big Data Cloud Service and how to utilize it to perform data analysis and Machine Learning with a demo.

After lunch, Maria had the hard task of waking people up after that yummy food. She talked about explain plans and how to optimize your queries along with the data you get analyzing the plans. She also did a quiz that had most people stumped. Javed covered the Oracle ACE program and how to be part of the community.

Next, Kamran talked about the changing roles of DBA's – what is available in tow like a Data Scientist or Data Modeler, and what each role consists of including Tom (of Tom and Jerry fame) being the first to lose his job to AI.

Users & Groups

The Oracle Groundbreakers EMEA Tour 2019 Stop in Bucharest, Romania

Impressions from RoOUG President Ciprian Onofreiciuc

After a couple of months delay, the tour was finally announced in May for autumn and Bucharest was one of the stops thanks to Mirela Ardelean, RoOUG vice-president, who advocated for Romania. Usually, for such an event, there is a call for papers for the whole tour. The local groups get to choose speakers and presentations and the organizer decides who will go with the tour. After the CFP was closed, we started to debate the list of speakers and managed to have a final list in mid-July. In August, the Oracle community announced a hands-on-lab to take place during the event in Bucharest with the help of community engagement manager Bianca Grecu.

In September, the speakers got approval for travel and booked their planes and hotels. At that moment, we at RoOUG knew for sure that the tour was going to come to Bucharest. We announced the conference on our social channels and started to organize every detail of the event – promotion, partnerships and logistics. Luckily, we had help from traditional RoOUG partners: the Bucharest University of Economic Studies (ASE București) through Oracle Center of Excellence of Faculty of Economic Cybernetics, Statistics and Informatics (the hall, volunteers), and Oracle for speakers support and event catering.

On October 17, one day before the conference, we had 128 persons registered for the event and every detail was on a to-do-paper that I passed to the organizers (Mirela, Cati, and Tatiana) so we could work in parallel on several tasks. At 8 am, we were at the main hall, arranging the last details regarding the registration, coffee or conference bags with help from 6 volunteer students.

At 6 pm, after 8 technical presentations and a workshop, we finished the conference and went for an appreciation dinner with speakers and event partners.

Last thoughts on the event:
- CONS: We could have promoted the event better and could have started the effective organization earlier in order to reach to more developers and companies. This is my major regret on the event, that we couldn't bring more people.
- PROS: The speakers were extraordinary with very current and well-put content; the attendees were very happy with it. The event went smooth without any problems.

Call for Papers

LUXOUG 2020

February 17, 2020
Luxembourg
https://www.papercall.io/luxoug2020

AOUG User Conference

March 1, 2020
Vienna, Austria
https://www.aoug.at/Event/530

OUG Scotland

March 13, 2020
The Studio, Glasgow, Scotland
https://ukoug.org/page/ougscotland2020

RoOUG ConTech 2020

March 15, 2020
Bucharest, Romania
http://www.rooug.ro

Oracle Groundbreakers EMEA Tour 2020

March 16 - May 3, 2020
EMEA
http://ogbemea.com/

BGOUG Spring 2020

April 15, 2020
Pamporovo, Bulgaria
https://bgoug.org/en/become-a-speaker

Past & Future

Events

ILOUG Tech Days

February 3 - 4, 2020
Petah Tikva, Israel
https://www.iloug.org/program/

OUG Ireland 2020

March 12 - 13, 2020
The Gresham, Dublin, Ireland
https://ukoug.org/page/ougireland2020

APEX World 2020 'Autonomous APEX'

March 16 - 17, 2020
SS Rotterdam, Rotterdam, The Netherlands
https://www.nloug.nl/page.aspx?event=1476

JavaLand 2020

March 17 - 19, 2020
Phantasialand, Brühl, Germany
https://www.javaland.eu/en/home

CloudLand Pre-Event 2020

March 19, 2020
Phantasialand, Brühl, Germany
https://www.cloudland.org/de/home/

Spring Seminar 2020

March 19 - 21, 2020
Color Fantasy (Cruise Ship Oslo-Kiel)
http://www.ougn2020.com

POUG Workshop

March 27, 2020
Warsaw, Poland
https://www.poug.org

LUXOUG 2020

March 28, 2020
Luxembourg
https://www.papercall.io/luxoug2020

Events

COLLABORATE 20

April 19 - 23, 2020
Mandalay Bay Resort and Casino, Las Vegas, Nevada, USA
https://questoraclecommunity.org/collaborate/

APEX Alpe Adria

April 24, 2020
Maribor, Slovenia
https://www.aaapeks.info/home/

APEX connect 2020

May 5 - 7, 2020
Phantasialand, Brühl, Germany
https://apex.doag.org/de/home/

Full Stack Developer Conference

May 19 - 20, 2020
Helsinki, Finland
http://www.fsdc.fi/

OUG Scotland

May 20, 2020
The Studio, Glasgow, Scotland
https://ukoug.org/page/events2020

DOAG 2020 Datenbank

May 25 - 26, 2020
Düsseldorf, Germany
https://datenbank.doag.org/de/home

RigaDevDays 2020

May 26 - 28, 2020
Riga, Latvia
https://rigadevdays.lv

RoOUG ConTech 2020

June 3, 2020
Bucharest, Romania
http://www.rooug.ro

UKOUG Technology Summit

June 3, 2020
Birmingham, UK
https://ukoug.org/page/events2020

Past & Future

Events

BGOUG Spring 2020

June 5 - 7, 2020
Pamporovo, Bulgaria
https://bgoug.org/en/

UKOUG Business Applications Exchange

June 15 - 16, 2020
The Oval, London, UK
https://ukoug.org/page/bax20

AOUG User Conference

June 22 - 23, 2020
Vienna, Austria
https://www.aoug.at/Event/530

Kscope 20

June 28 - July 2, 2020
Boston, Massachusetts, USA
https://kscope20.odtug.com/

RECONNECT 20

July 21 - 23, 2020
Hyatt Regency St. Louis At The Arch, St. Louis, Missouri, USA
https://questoraclecommunity.org/reconnect

INFOCUS 20

August 25 - 27, 2020
Sheraton Downtown Denver, Denver, Colorado, USA
https://questoraclecommunity.org/infocus/

POUG2020

September 11 - 12, 2020
Wroclaw, Poland
https://poug.org/

Oracle Groundbreakers EMEA Tour 2020

October, 2020
EMEA
http://ogbemea.com