

**Summer 12 | Issue 47**

**Make Your Voice Heard**

Find out who's on the Council  
and how to lobby your cause

**The Empowered Customer**

Opportunity, challenge  
or both?

**Process Control**

How to make life easier during  
implementation or upgrade

# OracleScene

► Serving the Oracle Community

 Fusion CRM

Journey  
to Fusion  
CRM

Transforming  
Business Processes

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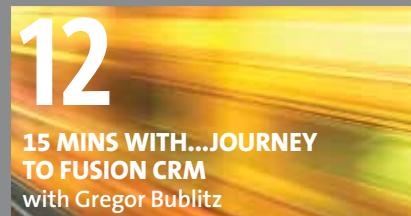
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Thanks to our friends at the Oracle Applications User Group for providing the Collaborate photos on p7.

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# First word

Welcome to this edition of Oracle Scene. As always we've got a good mixture of articles for you that we're sure you'll find useful.

**It seems as though everyone is talking about cloud these days and it looks like the march to cloud everything is inevitable and unstoppable. Whether an enterprise focuses on a public, private or hybrid cloud computing strategy, it's going to be measured on service provision like never before and there are lots of cloud solutions available in the industry to choose from, so enterprises will need to warily choose their enterprise applications and their cloud provider for smooth and secured functioning of their cloud applications.**

Analysts continue to predict that SaaS is the way of the future but at the same time that it won't impact traditionally deployed applications for several years. However it's interesting to see that most of the 250 customers that have licensed Fusion Applications so far have chosen a SaaS deployment model. With the launch of the Oracle Public Cloud at Open World last year,

hot on the heels of Fusion Applications going GA, Oracle have got a game changing SaaS business that they can run profitably and very easily. That puts them in a fantastic position to be the No 1 vendor providing an industrial sized cloud infrastructure running its own enterprise cloud-based applications, so it will be interesting to see how its competitors respond and how things continue to develop in this space. I think we're going to see some big changes in the marketplace over the next few years.

So that's about it from me for this issue other than to say that I hope you have a great summer and enjoy the great sporting fest of the Olympics and the Euros to name but two. Whilst you're relaxing spare Oracle Scene a thought as the content is very dependent on what is sent into us, so we'd really like to hear from you and get your contributions to what is a very valuable resource in our Oracle community. ■



## ABOUT THE EDITOR

### Geoff Swaffer

Senior Capability Lead – Oracle, Capgemini UK

Geoff is the Capgemini Oracle Practice Lead for Applications Outsourcing in the UK where he is responsible for approx 150 people as well as a large number in India. He has worked as a consultant with Oracle products since 1993 in a range of technical and functional roles. Living conveniently near to Snowdonia and the Lake District, Geoff is a very keen fell/mountain walker and also a season ticket holder at Liverpool FC.

Contact the editor: [editor@ukoug.org.uk](mailto:editor@ukoug.org.uk)

# From the President

This latest edition of Oracle Scene will be landing on members' desks and arriving in inboxes around the same time as delegates set off to the Madejski Stadium for the UKOUG CRM Conference.

Debra Lilley, President, UKOUG 

**Customer Relationship Management is integral to many of our businesses. It's about understanding your customer and how they interact with you, then using that data to improve the way you interact back with them and ultimately to sell more or serve them more. UKOUG have always embraced the ethos of this, we want to provide the best service we can to our customers, UKOUG members, so that they see the value of the product and invest their time into attending events, sharing knowledge and networking with others in the community. Serving our members to the best of our ability ensures that renewing their membership is a natural choice.**

**I always enjoy the more strategic presentations at conference as it is something all of us indulge in regardless of what we do for a living**

I find CRM incredibly interesting. I always enjoy the more strategic presentations at conference as it is something all of us indulge in regardless of what we do for a living. We are victims or rather subject to CRM all the time in everything we do. Formally through systems such as from our local councils, on the internet and our supermarkets, loyalty programs being the ultimate CRM system. In exchange for all our information retailers get brand loyalty and are able to market to us directly on what they know we want. This isn't just about product, and Oracle has great CRM products, it is more than that. It is about customer experience... and happy customers buy more. It isn't just about

sales either. In the service arena, you want happy citizens, members etc.

On a much more personal level, we practice CRM principles with everyone we meet. On a first meeting we store information that later we use to our advantage. A first date mentions a love of cinema and you suggest a visit later. If your date mentions they hate dark chocolate you buy flowers instead. When someone gives you their business card you subconsciously store useful facts about that person, or in my case write it on the back. Social media is, in a way, a CRM system we subscribe to and use in different ways. This is where CRM moves into the Big Data arena. All our tweets are stored and analysed by organisations; although I am not sure the airlines are doing this, I am always moaning and occasionally praising about travel experience and it hasn't improved the experience.

**The goal is to help you both on your journey to upgrade and also to make the most of the richness and complexity of Oracle's CRM products**

UKOUG has been listening to its customers and, with its finger on the pulse of the rapid pace of change at Oracle in the CRM domain, has reformatte the CRM community to be both a business and a product community. The goal is to help you both on your journey to upgrade and also to make the most of the richness and complexity of Oracle's CRM products.

As with any organic organisation, UKOUG needs CRM to ensure we know what you want, and equally what you don't. We need to analyse member interest and engagement trends, who attends which SIGs and how they rate them. For example, our newsletters are tailored to your profile interests, so if you don't select an interest in say, JDE, we won't send you that particular community news. Is it effective? Well, only where we have the right profile. Our CRM is through our membership system which is self-service, so we rely on you to keep your profile current. So, if you haven't created one yet, you're missing out.

**The ultimate CRM principle is to improve the interaction and we can do that together**

I heard a term recently about us all being Directors of First Impressions and I am very proud of UKOUG and how we work with our members. The ultimate CRM principle is to improve the interaction and we can do that together. Give us your feedback (see how you can Make Your Voice Heard on p10), make sure your profile is current and encourage your colleagues to create and update theirs too.

I wish you all a great summer, enjoy the Olympics and don't forget to take part in our own membership competition – see pages 20-21. ■



SUMMER 12

## News and Reviews

# Powerful marketing, great lead gen

**For over 20 years, UKOUG's December conference and exhibition has been the UK's largest gathering of Oracle professionals offering solutions and training covering every aspect of the product stack.**

UKOUG 2012 exhibition provides the perfect environment to showcase the Oracle partner community to end users in one place and for partners to position themselves in the community according to their brand and corporate strategy. Our exhibition offers:

**Proven visitor delivery** – backed by a solid marketing campaign that continues to deliver high numbers of visitors year on year.

**Integrated education programme** – more than just an exhibition, UKOUG 2012 provides delegates with over 250 sessions, daily keynotes, round tables, master classes, networking opportunities and much more.

**Fantastic exhibition features** – more details to come as plans are finalised but they will involve lots of networking drinks!

Event sponsorship can also play an integral part in your exhibition strategy and achieving your exhibition objectives. Sponsorship at UKOUG 2012 can help you to:

- Raise your profile at UKOUG 2012
- Build brand awareness
- Drive visitors to your stand
- Convey your company message with clarity
- Stand out from the competition

Secure your space today, call Kerry Stuart:  
+44 (0)20 8545 9685  
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kerry@ukoug.org



## NEWS IN BRIEF

### Get your JD Edwards conference papers in today!

The deadline for submissions is Monday 18<sup>th</sup> June – [www.ukoug.org/jdedwards](http://www.ukoug.org/jdedwards)

### Next content deadline for Oracle Scene is 24<sup>th</sup> August

Plenty of time for you to get working on your EPM & Hyperion, JD Edwards and Technology & E-Business Suite content

### Understanding Fusion Apps in your organisation

Two great tools to help you do just that are accessible via the news section of [www.ukoug.org](http://www.ukoug.org)

# One day, one event, all things CRM

**Don't miss our flagship annual event for CRM customers.  
This is your chance to...**

- See the long awaited Fusion CRM demo
- Hear Oracle Senior Executive Melissa Boxer explain Oracle's CRM product roadmap
- Question a Senior Oracle Executive about your products
- Find out how others are doing it. Customer presentations include Elsevier (A global scientific publishing company) talking about how they use Siebel CRM and ATG eCommerce software in a combined solution
- Exchange ideas and network with other users of Siebel, CRM OnDemand, ATG and other Oracle CRM products

**All this in one day! To stay one step ahead of the rest, can you afford not to be there? [www.ukoug.org/crm](http://www.ukoug.org/crm)**

**UKOUG**  
UK ORACLE USER GROUP



**UKOUG CRM**  
Conference  
2012

Madejski Stadium  
Reading  
28<sup>th</sup> June | 2012  
[www.ukoug.org/crm](http://www.ukoug.org/crm)



# Your Partners, Your Vote!

partneroftheyear  
Awards  
2012/13

**UKOUG Partner of the Year Awards have grown in prestige over the last few years and many Oracle customers now recognise the winners as the 'users choice' when sourcing Oracle suppliers.**

The 2012 awards will provide recognition to Oracle suppliers for the contribution that they have made to Oracle users in a variety of areas.

UKOUG invites all end users to vote for your preferred bronze, silver and gold placed UKOUG partners. Voting for this year's awards will open on the 2nd July 2012 at [www.ukoug.org/vote](http://www.ukoug.org/vote). Voting is exclusively for customers and end-users only and is not restricted to UKOUG members.

# Collaborate? We sure did!

**As ever there were lots of conversations with user group leaders, vendors and Oracle**

Although not an official meeting place of IOUC, like Oracle Open World and the Presidents' Summits, there are always meetings arranged at Collaborate. We had a meeting with the Higher Education User Group (HEUG), a global industry group with a good membership in Europe. The HEUG want to have an EMEA event in the UK in September. Their focus is on how Higher Education uses the Campus Solutions and they work very closely with the development team at Oracle.

One of the benefits of the IOUC is that user groups can work together to avoid conflicts and misunderstanding. By engaging with UKOUG early, the HEUG can ensure they don't clash with any UKOUG events and that we can jointly promote our events. UKOUG doesn't have education specific content, but do have

the technical content that HEUG member organisations can benefit from. Equally some of our members from Higher Education have colleagues who have an interest in Campus Solutions.

The IOUC Product Development Committee had their open meeting on the Sunday afternoon to show users what they are working on. There was a lot of interest in what the committee is doing. It is all about educating users who want to know more than just what the products do and sharing their needs back with development.

One of our greatest achievements at Collaborate this year was securing Steven Chan, the Tom Kyte of Oracle Applications, for our conference in December. We have already confirmed Nadia Bendjedou who

covers EBS technology, and is always a very popular presenter, but to get Steven to come along to UKOUG 2012 with Nadia is fantastic for UK users – thanks Steven. Disappointingly, there were no new announcements at Collaborate. In previous years, Charles Phillips always attended and had announcements to make – both lifetime support and apps unlimited were Collaborate announcements. As far as we know Mark Hurd has yet to attend a user group event. Our congratulations to our friends in the US on another great event and thank you for your hospitality.

Next on UKOUG's international agenda is Oracle Development Tools User Group's KScope conference in June at which Vice President Lisa Dobson will be flying the UKOUG flag.



SUMMER 12

UKOUG: Your Council

# Meet Your Council

Get to know who on the Council is responsible for your area of interest and contact them with any ideas/feedback you have about anything relating to UKOUG or your Oracle products. Find more background information and contact details at: [www.ukoug.org/about-us/governance](http://www.ukoug.org/about-us/governance)

Councillor	Accountable For	How do you contribute to the Oracle user community?	What improvements do you hope to achieve during your Council term?
<b>Rick Anthony</b> Director, DSP Managed Services	E-Business Suite	<ul style="list-style-type: none"> <li>Regular speaker at user group events</li> <li>Supporter of UKOUG community campaigns</li> </ul>	<ul style="list-style-type: none"> <li>Expand the user and membership base by providing alternate ways to participate in events</li> </ul>
<b>Alan Bell</b>	Primavera	<ul style="list-style-type: none"> <li>Primavera SIG committee</li> <li>Co-opted Council member</li> </ul>	<ul style="list-style-type: none"> <li>Investigate the possibilities of an overarching community for Project Programme Management that covers relevant Oracle applications, not just Primavera</li> </ul>
<b>Lisa Dobson</b> (UKOUG Vice President)  IS Specialist, Durham University	Council Chair	<ul style="list-style-type: none"> <li>UKOUG Director</li> <li>Speaker and volunteer since 2004</li> <li>Instigated Northern Server Technology &amp; Back to Basics events</li> <li>Established UKOUG Inspiring Presentation Awards</li> </ul>	<ul style="list-style-type: none"> <li>Encourage community content in the North of England</li> <li>Extend work with the beginner's community to see UKOUG working more closely with Higher Education</li> <li>Continue to drive Council through change</li> </ul>
<b>Carl Dudley</b>  University of Wolverhampton	Server Tech	<ul style="list-style-type: none"> <li>UKOUG SIG Chair</li> <li>Director of the European Oracle User Group</li> <li>Member of International Oracle User Council</li> <li>Regular speaker at user group and Oracle events</li> </ul>	<ul style="list-style-type: none"> <li>Closer involvement with other professional bodies e.g. British Computer Society</li> </ul>
<b>Jeremy Duggan</b> Director, JemKa Consulting Limited	Oracle Development Tools	<ul style="list-style-type: none"> <li>UKOUG Development SIG Chair since 1997</li> <li>Volunteer activities include chairing sessions at conferences, judging papers and setting the agenda for the development streams at events</li> </ul>	<ul style="list-style-type: none"> <li>Understand what grass roots UKOUG members want from their UKOUG</li> </ul>
<b>Kate Forbes</b> Financial Systems Manager, FirstRand	Hyperion	<ul style="list-style-type: none"> <li>Host user events</li> <li>Regular speaker</li> </ul>	<ul style="list-style-type: none"> <li>Communication, content, collaboration</li> <li>Oracle and users working together</li> </ul>
<b>Jonathan Lewis</b>  Consultant, JL Computer Consultancy		<ul style="list-style-type: none"> <li>Past UKOUG Director</li> <li>Regular speaker at UK and international events</li> <li>Frequently published online and in print</li> <li>Contribute frequently to list-servers, forums, or newsgroups about Oracle</li> </ul>	<ul style="list-style-type: none"> <li>Increase the amount of time we spend in SIG meetings making people talk in groups</li> </ul>

<b>Debra Lilley</b> (UKOUG President)  Oracle Alliance Director, Fujitsu	<b>Ireland External communications</b>	<ul style="list-style-type: none"> <li>• UKOUG Director</li> <li>• Deputy Chair 2003 – 2011</li> <li>• Working globally &amp; regionally to ensure UKOUG has influence within Oracle</li> <li>• Oracle User Group Evangelist of the Year in 2008</li> <li>• Regular speaker at user group events worldwide</li> </ul>	<ul style="list-style-type: none"> <li>• Listen to both active members and users outside UKOUG to understand how we can improve</li> </ul>
<b>Fiona Martin</b> Europe Oracle Alliance Executive, IBM UK Ltd	<b>Partners Oracle Scene</b>	<ul style="list-style-type: none"> <li>• UKOUG Partner Forum Chair</li> <li>• Oracle UK Partner Advisory Board</li> <li>• Active UKOUG sponsor across UKOUG events</li> </ul>	<ul style="list-style-type: none"> <li>• Increase innovation and relevance of UKOUG to Oracle and all Oracle Users</li> </ul>
<b>Jon Mead</b> Managing Director, Rittman Mead	<b>Business Intelligence</b>	<ul style="list-style-type: none"> <li>• UKOUG Director</li> <li>• Regular speaker at UKOUG, OOW and other global user group events</li> <li>• BIRT SIG Chair</li> </ul>	<ul style="list-style-type: none"> <li>• Change the perception of UKOUG in the wider marketplace</li> </ul>
<b>Liz Penney</b> IT Business Partner, Ladbrokes		<ul style="list-style-type: none"> <li>• Regular attendance at UKOUG events</li> <li>• Speaker at PeopleSoft conferences</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the number of sessions delivered by customers sharing their experiences &amp; gotchas</li> </ul>
<b>Terry Potter</b> Group IT Director, GS Marketing Ltd	<b>JD Edwards</b>	<ul style="list-style-type: none"> <li>• JD Edwards committee member</li> <li>• Co-opted UKOUG Council member</li> </ul>	<ul style="list-style-type: none"> <li>• Provide ideas on funding around products groups as several appear to operate at a loss</li> </ul>
<b>Peter Robson</b> Retired (DBA and Data Architect)	<b>Scotland</b>	<ul style="list-style-type: none"> <li>• Past UKOUG Board member</li> <li>• Scottish UKOUG committee member for 6+ yrs</li> </ul>	<ul style="list-style-type: none"> <li>• Improve efficiency of Council business processes</li> <li>• Increase user involvement in the user group</li> </ul>
<b>Steve Smith</b> Head of Business Solutions, University of Cambridge	<b>PeopleSoft</b>	<ul style="list-style-type: none"> <li>• Regular speaker at user group events</li> <li>• Member of two UKOUG SIG committees</li> <li>• Committee member for other Oracle related user groups</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate additional ways of delivering value and engaging with the community whilst recognising the wider economic and commercial situation</li> </ul>
<b>Robert Stanton</b> University of Sheffield	<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>• Sharing my experience of the whole of the Oracle Development stack in both PL/SQL and JAVA based products</li> </ul>	<ul style="list-style-type: none"> <li>• Promote JDeveloper/ADF technology within the user community</li> </ul>
<b>Geoff Swaffer</b> UK Oracle Capability Lead, Capgemini UK Plc		<ul style="list-style-type: none"> <li>• Editor of Oracle Scene 2011 – present</li> <li>• Deputy Editor of Oracle Scene 2009-2011</li> </ul>	<ul style="list-style-type: none"> <li>• Increase support and advocacy of UKOUG</li> </ul>
<b>Sue Yates</b> Cognizant	<b>CRM</b>	<ul style="list-style-type: none"> <li>• Modelling, Analysis and Design SIG Chair 1999-2007</li> <li>• Chairing sessions at conference, judging papers and agenda setting</li> </ul>	<ul style="list-style-type: none"> <li>• Keep pace with communities UKOUG supports and ensure the right decisions are reached to effect change for the right reasons</li> <li>• Ensure that UKOUG is fully representative of and for all members</li> </ul>

SUMMER 12

UKOUG: Your Voice

# Make Your Voice Heard

## Engaging with the UKOUG Council



In 2011, the UKOUG member-elected Council was established to fairly represent the needs of every Oracle user community. The 15 member strong Council, made up of customers and partners from a variety of backgrounds, is responsible for setting the strategy for the UKOUG. Providing a channel for communication and influence between Oracle and the Oracle communities, the UKOUG Council provides an unprecedented opportunity for members to directly influence the Oracle decision-making process and the service that the UKOUG provides.

Council members are in place to concentrate on membership needs and requirements. They are elected by members and rely on input from the membership to give them the information they need for the annual planning process. To be able to provide the best possible service to members, there needs to be an ongoing, two-way communication process between the Council and the membership. The Council uses surveys, working groups and questionnaires to garner information around certain topics. However, to be aware of other issues that are of interest or importance to the membership, they rely on members proactively contacting them either directly or through the available channels.

Topics that are often brought to the Council's attention directly from the membership include issues with Oracle

products, a need for clarity around an Oracle product roadmap, concerns around product integration or support, ideas for future product developments, etc. Others can be specifically to do with the UKOUG service; what members would like to see covered in events, how they want the membership to work for them, what other content would be of interest that isn't already being covered.

There are many channels available through which members can bring issues or ideas to the attention of the Council. More than two hundred volunteers help the UKOUG in the organising and delivery of member services, including the Special Interest Groups (SIGs). All of the volunteers are experienced in their area. They use and understand Oracle products and are specialists in their specific field. The SIGs are a great starting point for members to raise issues around Oracle products or the user-group. They also give members the opportunity to connect with others interested in the same issues which can lead to stronger petitioning to include certain topics on the Council agenda. If unable to attend an event, members can pick up the phone, email or even arrange a face-to-face meeting with a SIG representative, staff or Council member who will feed information through to the rest of the UKOUG and Council.

The UKOUG team regularly uses surveys and questionnaires to garner the opinions of the membership. Contributing to these ensures the membership has a voice in the planning and strategy of the UKOUG. The annual Oracle product survey is taken seriously by Oracle and its results have directly impacted Oracle customer support strategy in the past.

Council members are available to be contacted directly by phone or email. With the limited time they are able to spend on UKOUG business, it is important to them that members actively communicate, bringing issues and ideas to them. The Council is committed to listening to the membership and providing them with the best possible service. An active and engaged membership that utilises the available communication channels is the most effective way to help the Council provide a valuable and beneficial service. More information about the Council, Council members and the UKOUG governance structure can be found on our website:  
[www.ukoug.org/about-us/governance/ukoug-governance-structure](http://www.ukoug.org/about-us/governance/ukoug-governance-structure) ■

# If Oracle is at the heart of your business, it needs the right support system to run efficiently

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# 15 minutes

with  
Gregor Bublitz

## ec4u on Fusion CRM: Transforming Business Processes

**Gregor Bublitz, Director Expert Services at ec4u took 15 minutes out of his busy schedule to talk to Oracle Scene about their experience of implementing Fusion CRM.**

### **Can you give us an overview of Fusion CRM capability... what's there, what's missing, when will gaps be filled?**

Fusion CRM in its first version consists of several modules like Sales Planning (Territory Management, Quota Management, Incentive Compensation, and Forecasting), Sales Prospecting (Campaign Management, Lead Management, Sales Predictor, and Sales Campaigns), Sales Productivity (Opportunity Management, Customer Center, Desktop Integration, Mobile Sales) and Sales Extensibility (Channel Management, Customer Data Management, Contracts, Activity Streams). That means sales and marketing processes are fully supported. The support for service processes and other functionality are planned throughout 2012 and beyond.

Another very well integrated functionality is the Oracle Social Network (OSN). The OSN supports all internal and external collaboration processes an organisation needs. You can easily work together with your peers by using the activity streams, chat, real-time working on documents and much more. To see a walk-through visit: <http://www.youtube.com/watch?v=bxUSqvtp0OE>

### **What influenced your decision to adopt Fusion CRM?**

Our strategy of "CRM Excellence in Europe", we wanted to be one of the first to have hands-on experience with Fusion CRM, not only so we can be

prepared for our customers but also to enable us to develop best practices for running successful and efficient Fusion CRM projects. We also needed to solve the problems we were having running our marketing and sales campaigns. We had several data sources and applications involved in our marketing and sales processes; Siebel 8.1 Sales, Projects, Financials, Time, Vacation, etc, Microsoft Dynamics CRM 4, Campaigns, Excel Sheet, newsletter subscription and we buy data lists. Marketing uses all of these sources and applications whilst sales only use Siebel 8.1, though both of the departments input data. Our data quality had reached a critical level, we were losing the marketing ability to act fast enough, people were being contacted multiple times with the same communications and there was an overall lack of synchronisation across systems. The goal for our Fusion CRM project is to be able to run efficient marketing campaigns on clean data and to have an integrated solution with our existing Siebel CRM 8.1 where all our sales processes reside.

### **Regarding the co-existence of Fusion CRM and Siebel, what's been your experience?**

We strongly believe that the co-existence approach is a good one for many customers, not only to realise their investments in their current solutions but also to be able to adopt new functionality with Fusion CRM. It is a good start to begin with the co-existence strategy between your current CRM system (in our case Siebel 8.1) and Fusion CRM.



The real-time synchronisation for the accounts, contacts and addresses was done with the Oracle SOA Suite product. The Fusion Apps product is very open for integration; overall it has more than 11,000 web services. The question here is which web service to use to build your use case? Oracle documented this all in an Oracle Enterprise Repository which can be accessed under <http://fusionappsoer.oracle.com>. There you can find the artefacts which are used to build the Fusion Applications.

#### **What lessons have you learnt throughout your migration journey to Fusion CRM?**

The most important thing we learned is to really get to understand the new data model of Fusion Applications. As Oracle has bought so many application companies (Siebel, PeopleSoft, JD Edwards, etc.) over the last few years, each of which has a different data model underneath, a new modelling concept has been developed to underpin the Fusion Applications and it is absolutely key to familiarise yourself with this model. This is not only important for business logic and UI but also for doing real-time integration when using web services. There are some data migration tools from Siebel or CRM On-Demand to Fusion CRM but they are only available if you have a Fusion CRM On-Premise deployment. Since we run our Fusion CRM in the Oracle data center (Public Cloud) we had to be careful during the data migration from

Siebel. This can be done with the very easy and user friendly file import capabilities of Fusion CRM.

#### **What has been your overall user and developer experience to date?**

##### *User Interface (UI):*

The whole family of Fusion Applications comes with a completely new UI and User Experience philosophy. The UI divides into four areas of which the two surrounding areas on the left and right side can be clicked away to enable the user to have more space. In the global area you will find the navigation through all modules and the personalisation, help and tagging options. The regional area is dedicated to an entity like customer or campaigns. There you will find search capabilities, activity lists and Quick Creates for efficiently doing your daily work. In the local area itself all the transactional work is done, changing data or running through a business process driven by a wizard. In the contextual area you will find additional information according to the data displayed in the local area, e.g. other opportunities, reference stories. The adoption of the Web 2.0 technologies like tagging, discussion forums, activity streams, Google maps integration and social networks are very useful and underline the state-of-the-art UI.

##### *Extensibility:*

When it comes to extensibility you have to distinguish between the On-Premise and

the cloud deployment. In an On-Premise deployment you can use the Oracle JDeveloper Tool to adapt Fusion CRM to your needs with no limitations. In a cloud deployment there are four composers which work inside the browser. The first one is called Application Composer. Here you can adapt standard entities with news fields, create new entities and relations, customise the localisation in different languages, write groovy script and build object workflows. The second one is the Page Composer which is part of the Oracle Web Center product. This is responsible for changing the layout of the UI and doing the personalisation on dashboards. The Process Composer is the web-component of the Oracle BPM Suite and allows you to change or create business processes which can be used inside the Fusion CRM application. The last one is called BI Reports Composer and can be used to change or create BI Reports which then can be used in dashboards or marketing campaigns.

If you change something inside these composers no restart or compilation must be done, it is a Design Time=Run Time experience which is very useful and time saving. There are also concepts of sandboxes that enable more than one developer to work together on the adaptions and you also have import and export capabilities for the whole configuration of the extensibility for transporting to other environments. ■



## **ABOUT THE INTERVIEWEE**

### **Gregor Bublitz**

Director Expert Services, ec4u

Gregor Bublitz is co-founder of ec4u expert consulting ag and leads the areas Expert Services and Innovation as a Director. Besides his 15 years of Siebel CRM and SOA-project engagements in various industries he is responsible for the knowledge management process and the corresponding system "TheBrain". Since July 2011 he is running the internal Fusion CRM project as a program manager inside the Early Adopter Program.

# The Empowered Customer

The internet and social media are changing how corporations interact with their customers. The web has traditionally been seen as a broadcast medium for sales and marketing departments. But the emergence of social sites such as Facebook, YouTube and Twitter is forcing brands to respond to the bi-directional nature of today's interactions.

**Simon Mills,**  
IBM UK & Ireland Oracle  
CRM architect

This article describes how customers can transform themselves to respond to this new business model and how they can use CRM products to respond to an evolving future for sales and marketing.

## The age of the empowered customer

Within the last few years we have witnessed unprecedented growth in the choice of channels that customers can use to communicate with a business. What was a fairly straight-forward collection of predictable interactions – face to face, mail, phone, fax, web – has become far more complex with the advent of mobile technology and social media.

Couple this with the complexity of a customer's unrelenting desire for an integrated, end to end multichannel experience – as well as the needs for organisations to shape and manage the right channel mix – and it has never been more urgent to re-write the rule book for connecting with customers.

Indeed, this new breed of customer is precipitating a transformation in the dynamic between buyers and sellers, and is generating an explosion of mobile and social intercommunications. For example:

- There are nearly 6 billion mobile phone connections globally<sup>1</sup>
- There are 600 million + users of Facebook, with founder Mark Zuckerberg targeting 1 billion users<sup>2</sup>
- UK consumers spend 45% of their day using phones and communication devices<sup>3</sup>

- the revenue generated by in-app mobile purchases is expected to jump 477% in 2015<sup>4</sup>

Through the empowerment of technology and transparency, these customers expect to engage with companies when and how they want, through physical, digital and mobile means. They want a consistent experience between all channels. They compare notes and instantly share. And they can champion a brand or tarnish a reputation with the click of a mouse.

## A significant opportunity and challenge for companies

So, this customer and consumer power shift calls for a different approach to commerce and applications such as Oracle's Fusion CRM present an opportunity on which to build on. The typical customer experience with a company extends across multiple channels throughout the sales and marketing lifecycle.

This proliferation of channels and interaction media presents opportunities for the connected corporation...

- To engage with the customer whenever and wherever
- For customers to become part of building your brand
- In collaboration and co-creation of product development and market testing
- To go beyond multi-channel to deliver innovative, personalised experiences across all touch-points

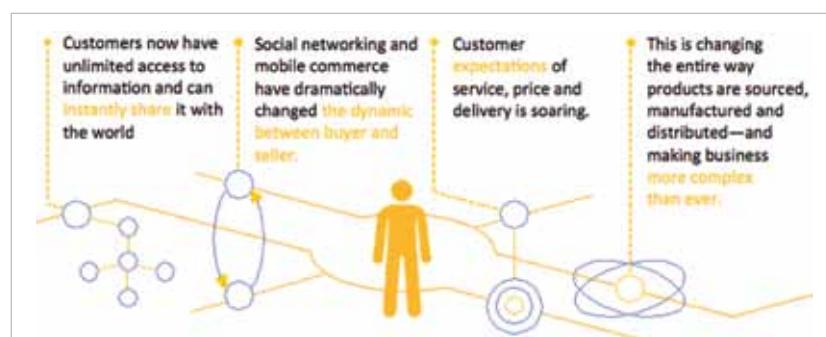


FIGURE 1: CUSTOMER INTERACTION AND EXPECTATION



FIGURE 2: MEETING THE DEMANDS OF THE SMARTER CONSUMER

...but not without challenges...

- There is a significant increase in customer expectations for innovative products and services, cross-channel synergies, personalisation, immediacy, and expecting more for less
- A greater brand exposure and less control over, and ability to manage, the brand
- A generational shift in technology use, driving the need to manage multiple ways to engage
- Gaps in organisational capability and silo-ed departments restrict the ability to deliver true one-on-one experiences.

For example, Fusion CRM addresses these challenges through social tools and analytics that are embedded within Fusion Marketing. Sales reps and marketers can collaborate on campaigns using the Social Network feature, which allows lists to be created from the Fusion Desktop, an email client or a Smartphone. Either department can initiate a campaign to a segmented list or a personal group of contacts. The campaign can then be launched to any of the channels that the customer has requested.

### How does an organisation respond?

By understanding and anticipating customer behaviour through listening to customers and turning insight into action. It's not just about predicting their needs, but also reacting to their needs in a timely manner. Also, it is crucial to adapt your supply chain based on customer demand and orchestrating seamlessly among your trading partners and suppliers. And of course, the crux is to market, sell and fulfil the right product and service, at the right price, time and place. In short, service your customers flawlessly and learn from their behaviour to predict and take action.

Tackling multichannel complexity can seem daunting. The good news is that most organisations are not starting from scratch and are already on the path towards defining and implementing a more customer-centric, multichannel strategy. Whilst most organisations will have to be present in most channels, they will only need to excel in those that are most valuable to them and their most valuable customers.



### ABOUT THE AUTHOR

#### Simon Mills

IBM UK & Ireland Oracle CRM architect

Simon Mills has more than 20 years of technology and international consulting, CRM and project implementation experience. Having worked in IT departments at Honeywell, Lotus Development, Paribas and Merrill Lynch, he joined IBM in 2004. Having learned his CRM skills as a consultant at Siebel for five years, Simon is now the lead CRM architect for IBM UK and Ireland's Oracle practice.

IBM itself is a good example of how to manage the multichannel challenge. Its transformation from field sales to a multichannel model started more than 10 years ago and IBM now has a fully integrated, global multichannel sales and service operation. Like many of its clients, IBM is evolving its customer focused channel strategy to optimise the opportunities that the social media revolution presents and has already enhanced its channels accordingly.

We believe the organisations that navigate this next phase successfully will adopt three key principles:

1. Focus on your long-term, high-value customers and the products and services they desire; ensure there is a clear, compelling alignment to the brand promise in all customer interactions.
2. Understand throughout the entire customer lifecycle which interactions are the 'moments of truth' for your target customers and ensure you get it right.
3. Invest in those channels preferred by these customers that are suitable for the delivery of differentiated interactions, products and services. These are the channels that should be prioritised or 'over indexed' to ensure you excel.

### Summary

Those organisations that decide to embrace the changes posed by channel complexity will have great opportunities for growth and innovation. But designing the right channel mix and executing it successfully is likely to require significant change across the entire organisation. This transformation will demand strong executive ownership and commitment to succeed.

Every organisation's channel strategy will differ according to its customer profile, product or service offering, and brand positioning. There is no one-size-fits all solution. However, any organisation's 'ideal solution' will be formulated by accepting that the customer is in control and that channels should be brought into the core of the business with a unified customer experience. The organisation must also realise that their customers actively select how they interact so it is important to attain excellence in only those channels that drive its target customers' perception of differentiating value. ■

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UKOUG: Summer of SIGs

# Summer of SIGs

14<sup>th</sup> June

UKOUG Development SIG Meeting

ORACLE CITY OFFICES, LONDON

3-tier Integration using the Oracle SOA Suite 11g – using real life examples to demonstrate practical techniques to allow ADF and PL/SQL to be seamlessly integrated within a SOA landscape

**Special Interest Group (SIG):** A group of people with an interest in advancing a specific area of knowledge, learning or technology where members cooperate to affect or to produce solutions within their particular field. Source: Wikipedia



20<sup>th</sup> June  
UKOUG Application Express (APEX) SIG Meeting

BLYTHE VALLEY PARK,  
SOLIHULL



# June

OUG Ireland BI & EPM and Applications Joint SIG Meeting  
Oracle Office, East Point, Dublin

19<sup>th</sup> June

UKOUG Database Server SIG Meeting

BLYTH VALLEY PARK, SOLIHULL

3.10pm - Jonathan Lewis on new strategies for statistics in 11g – find out a faster stats collection option and how to identify opportunities for better quality stats

19<sup>th</sup> June

UKOUG Primavera SIG Meeting

THE CENTRE, BIRCHWOOD PARK

Managing contracts in NEC3, P6 Analytics and more... this SIG provides a forum to maximise user benefit from the systems

UKOUG Supply Chain &amp; Manufacturing (SCM) SIG Meeting

Blythe Valley Park, Solihull

20<sup>th</sup> JuneUKOUG Solaris SIG Meeting  
Oracle City Office, London

**SIG****July**3<sup>rd</sup> July

### UKOUG Availability Infrastructure & Management SIG Meeting

THE MET, LEEDS

Includes a critical look at a leading NoSQL database, a Q&A panel discussion with the committee around your experience with Oracle RAC and the first few things you need to know about Exadata

19<sup>th</sup> July

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# Bridging the Gap Between Hadoop and Oracle using Big Data Connectors

On any Big Data project, one of the biggest challenges is the integration between the data stored on the Hadoop system and the traditional database engine, which will enable the data to be accessed and analysed using well known tools and solutions.

Antonio Rivas,  
BI Consultant, ClearPeaks

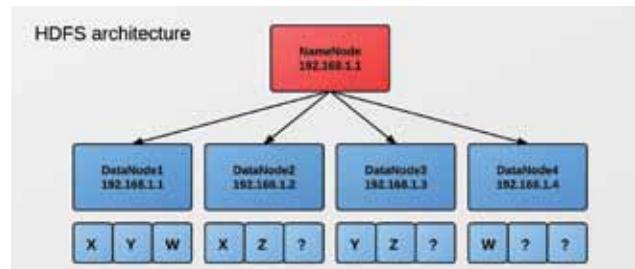
**In this article, we are going to review the architecture of a Big Data project and how we can leverage our existing IT infrastructure using Oracle Big Data Connectors to create a bridge between the unstructured data stored in Hadoop and a relational database.**

## Big Data 101

We all agree that there is a lot of interesting data out there waiting to be analysed, but some data has been traditionally left behind because either it was too big, or refreshed too quickly, or just too unstructured to offer real value. However, old technologies like Hadoop have been helping enterprises to deal with huge amounts of data in a quick and scalable fashion. So, why don't we use it? After all, we only need to acquire unstructured and unpredicted data, load them somewhere, organise and transform the data in order to understand its value and finally load back the refined results to a traditional database to perform analysis on it. Sounds great, but how do we do it?

Trying to understand the Big Data puzzle takes some time. There are simply too many new key players in the field. One of the most important is Hadoop, but really Hadoop is just a set of technologies under the Apache Foundation umbrella. When talking about Hadoop we have to mention Hadoop Distributed File System (HDFS), which is the technology foundation for storing information in Hadoop. HDFS allows us to store in a distributed environment any kind of data on a Hadoop cluster, or as a stand-alone general purpose file system. It can be implemented using commodity hardware and it is fault tolerant, scalable, and extremely simple to expand.

Of course, HDFS is just the tip of the Hadoop iceberg. MapReduce is a software framework for distributed processing of large



data sets on clusters and alongside HDFS it forms the basic infrastructure of any Hadoop project. In addition, we can use a number of satellite products in order to ease the way that we deal with Big Data. Products such as HBase offer us a distributed database that supports structured data storage for large table data sets, while Hive is a data warehousing application on top of HDFS that provides data summarisation and ad hoc querying. There are many more sub products that are quickly evolving thanks to the efforts of the great community behind these open source projects.

## Connecting to the HDFS using Oracle for Big Data Connectors

Oracle has developed a set of connectors that delivers a high performance Hadoop to Oracle database integration solution. This means that by using these connectors, we can access HDFS data from the database using SQL, or load information that resides in the Hadoop cluster into our Oracle database. They also enable optimised analysis through open source R language directly on Hadoop data.

The four available connectors are:

### Oracle Direct Connector for Hadoop Distributed File System

With this connector, we can access data stored in HDFS directly

from our database using external tables. These tables can then be joined with others and loaded into the database. This offers us a very simple way to access the information on the HDFS. This approach can be useful if we store meaningful information, but usually the information is stored in an unstructured format. This necessitates some transformation work before accessing it from the database.

The Oracle Direct connector for HDFS only works in Oracle 11gR2 for Linux and requires Apache Hadoop 0.20.2, which can be found in the Cloudera Hadoop Distribution (CDH3).

#### **Oracle Loader for Hadoop (OLH)**

Oracle Loader for Hadoop is an efficient and high performance loader for the movement of data from HDFS to a table in an Oracle database. The main difference from the previous Oracle Direct connector for HDFS is that previously it was necessary to create an external table that pointed to the location where the data is located, whereas now it is possible to extract the data from the HDFS and load it into the database using a MapReduce job.

Oracle Loader for Hadoop works with 10g and 11g versions of the database and requires Hadoop 0.20.2 and Hive 0.7.0 to work. The installation of the connector is very straightforward, but in order to use it, it is necessary to develop input format interfaces in Java and then invoke the Oracle loader MapReduce job. These operations are not easy and require expert programming knowledge.

#### **Oracle Data Integrator Application Adapter for Hadoop**

To overcome the complexities of the Oracle Loader for Hadoop, we can use the Oracle Data Integrator Application Adapter that allows developers to easily integrate and transform data within Hadoop, thanks to the following capabilities:

- Loading data into Hadoop from a local file system and HDFS
- Performing validation and transformation of data

within Hadoop

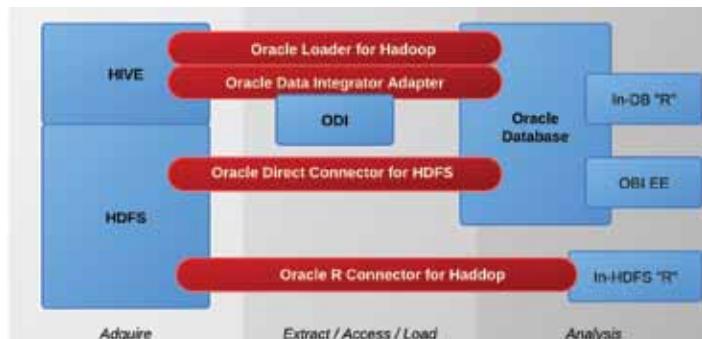
- Loading processed data from Hadoop to an Oracle Database for further processing

The ODI Adapter for Hadoop requires Hive to be running, as it uses Oracle Loader for Hadoop, but thanks to the custom knowledge modules shipped with the 11g release of ODI, the code for loading the data is automatically generated for us. However, we still need to write the custom scripts to perform transformations or validations using, for example, Perl or Python scripting languages, which again requires programming skills.

#### **Oracle R connector for Hadoop**

R is a free software environment for statistical computing and graphics. Analysts typically use R on a PC, with the memory limitation associated to the machine itself. Oracle R Connector for Hadoop provides an interface between the local environment and the Hadoop HDFS, removing the existing hardware constraints. In order to use the R Connector, the necessary components have to be installed in all of the machines within the Hadoop cluster, as well as on the machine running the R interface.

When using the Oracle R Connector, we can upload data stored in our local file system to the HDFS for calculations, schedule an R script via MapReduce parallel jobs and then download the results back to a file on our PC.



## Conclusion

Companies are beginning to realise that the unanalysed data they have may provide an insight that would allow them to overtake their competitors. However, integrating Big Data within a company is a challenging process that will require expertise in several IT fields.

Thanks to the new Oracle Connectors for Big Data, we can bridge the gap in such a way that will allow us to connect both structured and unstructured sets of data and run conformed analysis across them.



## ABOUT THE AUTHOR

**Antonio Rivas**  
BI Consultant, ClearPeaks

He has been working as BI consultant for ClearPeaks since September 2011. Graduated on computer science engineering, and has four years of experience with Oracle BI stack of applications and data warehouse design. Passionate about technology, keeps learning and testing the latest advances on the BI field to provide always the best advices and solutions in the projects he is involved.

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# Oracle's Magic Black Box for Enterprise Decision Making

Companies and their employees make thousands of decisions a day that have a direct impact on their profitability. The speed and information used to make these decisions and the quality of decisions made may ultimately decide if a company succeeds or fails.



## Automated business decisions

Within Oracle's Business Intelligence realm lives a product called Real-Time Decisions (RTD). The great thing about RTD is that it allows companies to optimise and automate many business decisions across multiple channels.

RTD employs self-learning and business rules to provide its decision making platform. It also allows business users to set and adjust business goals. For example, at the start of the financial year you might want to maximise acquisitions, but towards the end of the financial year where you are trying to achieve budget targets you might want to maximise income from existing customers or minimise the cost of promotional activity.

You can think of RTD as a Q&A box, which can answer any question. In order to do this, you need to provide the system with all the possible answers or choices and input data (for example, customer data). Each time the system is asked for a decision it will provide the most relevant choice by scoring all of the available choices based on the input data. Sounds simple, but under the covers there is a ton of clever stuff going on and lots of clever solutions that you can provide through its use.

## Benefits

RTD implementations have proved so successful that companies don't want to share their stories as they see them as providing a major competitive advantage that they don't want their competitors to have. As well as having been responsible for RTD implementations, I've also been fortunate enough to spend time with other companies that have implemented solutions and can share the following details with you regarding RTD success stories:

- A global financial services organisation making 250 million recommendations to 10 million customers in one month, generating 100% click and conversion uplift.
- 25% lift in sales rates compared to control for one of the largest US retailers with over 70,000 products.
- 6% increase in monetary value per contract and 240% lift in click rates for anonymous visitors for Fortune 50 financial company.

These figures appear too good to be true and hence written off as typical sales blurb, but in this example the numbers are cause to pay attention.

Obviously the uplift that can be gained depends on your start point, but in the case of these examples, the companies had previously optimised through a number of other techniques. These companies have also used quantifiable methodologies to measure impact.

### How it works

So how are these companies gaining these benefits? They are doing it by moving away from 'one size fits all' solutions to tailoring their customers experience at every touch point across multiple channels.

Let's use a specific example to explain. Let's assume I'm a retailer who wants to recommend products to customers visiting my website. As you can see in Figure 1 there are a number of data inputs we could take into consideration for the decision. Inputs into RTD can come from multiple sources with various refresh rates. In this example we have a number of inputs providing RTD with the information from which to make a decision:

- Data from the website, providing context information about what the customer is doing on the site.
- Customer data. This could be from a transactional database and/or data warehouse.
- Product information, including availability.

The magic black box (RTD) then uses the information about customers and products

to provide relevant recommendations to individual customers, in this example on the website. RTD learns what factors are important to particular people and makes recommendations based on a number of factors, such as age, gender, country of residence and products previously purchased. RTD continually learns through feedback allowing it to adapt to changes in customer behaviour or product availability.

So RTD isn't a black box it's using statistics and Bayesian logic. Which means you can lift the lid and look inside the black box to see what it's doing and why it's doing it. Information can also be output to other systems, such as data warehouse and web analytics tools, in order to allow further reporting on the impact of the RTD implementation. You can also take the information from RTD and use it for other purposes, for example, to run a targeted email campaign or provide a promotion for a particular product to customers that are likely to be interested.

So this is great for cases where we have lots of data and for existing customers. Yes, but it can also be used for prospect customers or where there is limited data. For example, for prospect customers, a decision can be made on the product to recommend to them based on IP address, time of day, search term and other factors.

### Example use cases

Due to the flexibility of RTD, there are numerous opportunities for its deployment. In fact anywhere where there is a decision to be made on various choices and data is available as input to make the

decision. You could also combine it with other systems such as content management, BI and CRM to create solutions. Here are a few other examples of possible implementations:

- Integrating with CRM solution to decide which marketing campaigns to target to individual customers and over which channels.
- Automating the identification of fraud.
- Personalising emails, whether that be the subject heading, template, content or all of these.
- Product recommendations to call centre operatives.
- Deciding which banners to display to customers on website.
- Carrying out A/B or MVT testing. Although RTD can also take you to the next level, in that you no longer have to ultimately select one best option, you could, for example, always have three different home pages and let RTD decide which one is most relevant for each individual customer.
- Optimise logistical decisions in order to maximise performance and minimise costs.
- Personalising mobile content. Potentially more important than personalising web experience due to the limited screen space.

### Why RTD?

So why use Oracle RTD instead of another product? There are a number of reasons, but some that stand out are:

- The predictive analytics within RTD mean that the system continually learns and adapts to changes. The ability to add business rules, allows control where appropriate.
- The system can recognise differences in time, for example hour of day or day of week and use this in its recommendation process.
- Performance and scalability have been proven at large organisations.

&gt;&gt;

FIGURE 1: EXAMPLE OF RTD PRODUCT RECOMMENDATION ON WEBSITE

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## Business Intelligence: James Knight

- Provides opportunities for multiple use cases due to the fact it's a decision engine rather than being designed to solve one business problem.
- The system's ability to integrate within any channel and the ability to make decisions across multiple channels.
- Identification of unknown correlations, not only power implementation success, but these correlations can be identified and used by companies outside of the RTD solution.
- Ability to easily add new data inputs and identify and remove those not making a difference to decisions.

### Technical stuff

Okay, so the business benefits are clear, but what's required for an installation?

Inside the magic black box, shown as RTD in Figure 1, RTD contains two main components a decision service that makes the real-time decisions and a learning server that builds models then pushes these out to the decision service. An additional component decision center is a web-based application producing reports, providing the insight into what the solution is doing. A minimum production deployment of RTD could be made up of two boxes, one for the decision server and one for the learning server. Although a possible production deployment for scalability and high availability is shown in Figure 2.

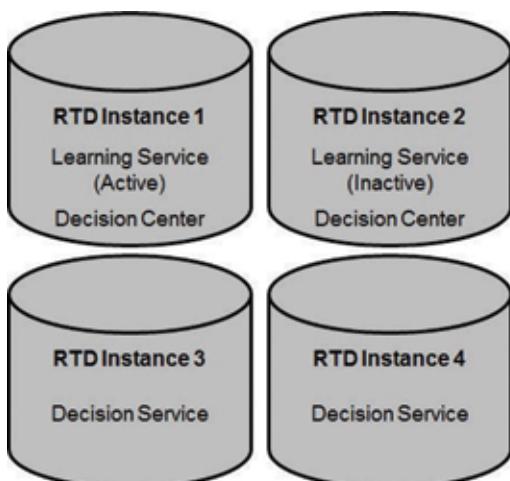


FIGURE 2: POSSIBLE PRODUCTION SETUP

The hardware required is nothing special and doesn't cost a fortune, with server specifications as follows:

2+GHz CPU, 2GB RAM, 2 or more processors recommended, hard disk – 20GB plus space for log files.

RTD can be integrated in an easy and stable way with other systems through the use of Java, .NET and JSP Smart Clients or via Web Services. Enabling integration with enterprise applications both on the front end (such as CRM or CMS applications) and on the back end (such as enterprise data stores). Oracle RTD also includes other helpful loading and debugging tools.

In reference to Figure 1, the Java Smart Client could be used to pass context information from the web session into RTD. There could be customer data coming from a data warehouse or transactional database, and product information from another database. We might choose to load the customer data every 24 hours and the product information every few minutes in order to pick up information on stock levels and any new products that become available. This information would be loaded into the RTD database.

In the example, the website would use the Smart Client to ask for a recommendation by passing in a customer identifier and would receive back a product reference. This product reference would then be used to present

the relevant image on the website. The Smart Client would also be used to pass success feedback to RTD for learning purposes, this success feedback could be the purchase of the recommended product or someone clicking on the image of the recommendation.

Obviously it depends on what is trying to be achieved, but typically an RTD project, such as the one depicted in Figure 1 takes three months and can be achieved with a small project team.

One final thing, it's quick, with response times for decisions measured in milliseconds. Obviously, critical in the example used, when making real-time product recommendations to customers on your website.

### Conclusion

So, it's not a black box, but RTD works. The fact that we can understand what it is doing and why it makes the decisions it does actually makes it more powerful. All of the companies using it can point to quantified success. Also, companies implementing RTD solutions follow the same path, starting with consultants with RTD experience for their first implementation and then building their own internal teams and implementing numerous solutions once they see results from the first implementation. ■

## ABOUT THE AUTHOR

**James Knight**  
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James Knight is a Principal Consultant at Rittman Mead focusing on Oracle RTD and Business Intelligence solutions that drive measurable competitive advantage. James is a respected expert and speaker in his field, and has previously held both product and technology focused roles. James has a background of supplier selection and implementation across a variety of enterprise solutions.

# Implementing and Delivering Quality Oracle Packaged Applications: Best Practices in Test Data Management

Organisations continue to be challenged with implementing and delivering quality Oracle packaged applications such as Siebel CRM, PeopleSoft etc. By creating realistic test data, organisations can build and deliver quality Oracle packaged applications. What is test data management? Test data management is creating targeted, right-sized test environments instead of cloning entire production environments. Development and test environments are then more manageable speeding up testing and delivering quality applications.

**Swati Moran, InfoSphere Optim Product Marketing Team Lead**

**The following best practices in test data management can help build and deliver quality Oracle packaged applications.**

#### **Step One: Discover test data**

In test data management where you may have several production databases, you need to first find the right test data for your test cases including any sensitive information. You need a 360 degree view of test data assets through understanding the data relationships across the complex, heterogeneous environment for test data management. This could be across multiple related applications and databases. For example, it could be a “customer” record from Siebel CRM, together with related details on purchased items from a PeopleSoft Enterprise Inventory system. You want to capture the end-to-end business process and associated test data which will enable you to subset the appropriate data needed for the test case.

#### **Step Two: Automate creation of realistic “right sized” test data**

How are our enterprises creating test data today? They are either creating it manually or just cloning their entire production system to obtain their test database. The downside of cloning your entire production instance is that you now have a data growth problem and that will use significant storage. In addition, you have privacy issues because you have now exposed sensitive data to developers

and testers using production data for testing. It's critical to subset based off your production environment, from which you can then create test databases for various types of testing.

#### **Step Three: Mask sensitive information for compliance and protection**

In non-production environments, we need to mask the data to ensure that if stolen, it cannot be used. When testing an application, for example, the tester has access to the application, logs in as a real user and acts like one. If they were to copy down the account numbers shown on their screen with the addresses, names, etc, they would now have the data they need for theft. Data masking provides development teams with meaningful test data, without exposing sensitive private information. Masking takes real data and makes it realistic but fictional so that names don't match addresses, or match different credit card numbers, for example.

#### **Step Four: Refresh test data speeding testing and application delivery**

As organisations are looking to shorten iterative test cycles and accelerate time to market of applications, testers and developers need access to test data in a timely fashion. Organisations are embracing agile development, which relies on agile testing. Agile testing means continuous access to test data in order to run tests and builds, and run them again until the functionality

works. Organisations can streamline test data delivery by enabling testers and developers to refresh test data that has been created and masked by database administrators (DBAs). This improves operational efficiency while providing more time to test, and enabling releases to be delivered more quickly.

Your organisation depends on business applications to drive results. Creating realistic Oracle packaged application development and testing environments is critical to delivering quality solutions for the business. ■



## **ABOUT THE AUTHOR**

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Swati is currently responsible for product marketing for InfoSphere Optim solutions. Swati has held various positions in IBM Rational Software responsible for product strategy, product marketing, sales and implementation. Swati has a M.B.A. in Technology Management and B.S. in M.I.S.



# Process Control

## How to make your life easier during an Oracle Implementation or Upgrade Project

Generally speaking, intelligent and skilled people are suspicious of systems of control. The very word raises hackles. There's a feeling that any kind of prescribed method of going about things somehow inhibits problem solving, stifles thinking and imposes unnecessary restrictions on potential approaches to a task. But consider Raphael's work, which decorates the grandest rooms in the Vatican.

David Taylor, Senior Technical Consultant, Mokum Change Management

It's hugely creative – but it's also just huge. Raphael – who wasn't short on intelligence and skill – didn't paint it all himself. He had a team to help. And as soon as you have a team working on a large and complex project, you need a process to organise it. Raphael knew better than to simply text a mate saying, "Luigi, I'm out Thursday but drop by the Pope's place and daub something Renaissancey on the wall." There must have been a deployment plan, a proven process and system of control by which

the background was painted first, the figures were defined and carefully placed, and the colours were agreed before a single brushstroke was laid over the wallpaper that the Pope was sick of. However smart we think we are, if we don't stick to a well-defined and clearly-understood process during the course of an Oracle project (or any project, for that matter), things tend to get very difficult indeed. The controls, in fact, free an experienced and skilled team from having to think about the mundane stuff, so that

they can concentrate on the clever part of the delivery.

Three process areas for the control and deployment of patches and custom code are discussed in this article. These concepts could actually apply to any technology and/or software, but, of course, my examples are Oracle-specific. Please drop me a line if you have any questions, or would like further information. I'd also be interested in your feedback and experiences.

## 1. Environment strategy

During an Oracle upgrade or implementation project, and for ongoing support and development, a family of Oracle Applications environments are required to manage the eventual release of changes into a production system (PROD). Each environment has a specific purpose, and is subject to a certain level of control (i.e. access restriction) to protect that environment's **system setup**, **patch-level** and **custom code versions**.

### Environment types

Oracle environments can be grouped into the following categories:

- PATCH DBA/Patching environment
- DEV Development environment
- TEST System/Functional Test Environment
- UAT User Acceptance Test environment
- PROD Production/Live environment

There should be at least one environment per category. During the latter stages of a project there may be a need for multiple TEST and UAT environments.

**Note:** there may also be environments which fall outside the release management process and which therefore fall outside of these categories. Examples may include a dedicated **Reconciliation** environment, or a **Training** environment.

### Environment access and control

The environment type determines the level of user-access or control (more control equals less user-access).

DEV and PATCH environments can be relatively unrestricted, whereas a UAT environment should have access restrictions comparable to a PROD environment. Because significant time and effort is invested in user acceptance testing, the UAT environment should be strictly controlled.

For a given Oracle Applications environment, access restrictions should be applied to the following tasks:

- Patch Application
- Custom Code Release
- Unix Access
- Database Access
- Application Access

The restrictions for each type of environment are summarised in the following table. You will note that developers have read-only database access to all but the "lowest" (i.e. least controlled) environments.

### Environment refreshes

Rules of thumb:

- Environments should always be refreshed from a more controlled ("higher") environment.
- The higher the level of access control, the more frequently the environment is refreshed, since it should correspond as closely as possible to PROD.

### Environment owners

Each environment should have a designated "owner". This person is the single point-of-contact for that particular environment, and he or she should co-ordinate any required downtime, system refreshes or restores, or essential maintenance which may be required.

Environment owners are usually designated as follows:

Environment Type	Owner
PATCH	DBA
DEV	Development-Team Lead
TEST	Functional- or Project-Team Lead
UAT	Functional- or Project-Team Lead
PROD	Client Lead

The environment owner is also expected to agree and sign-off any changes before they are deployed to his or her environment. In other words, their approval should be sought by the support or project teams before changes are made to the owner's environment. This control step provides a "sense-check" before installing custom code into a controlled environment, for example:

- Has the developer adhered to the correct naming conventions?
- Has the code version been tested and signed off in a lower environment?
- Is the correct build version being installed? (See Section 2.)

## 2. Source and version control

### Source/Version control principles

At a simple level, a source control tool could be a directory structure on a shared file system. But it's better to use a dedicated source control application, such as Synergy or Tortoise SubVersion (SVN).

Environment Type	Patch Application	Custom Code Release	UNIX Access	Database Access	Application Access
PATCH	DBA only	DBA only	DBA only	Unrestricted	Unrestricted
DEV	DBA only	Unrestricted	Unrestricted	Unrestricted	Unrestricted
TEST	DBA only	DBA only	DBA only	Read only	Unrestricted
UAT	DBA only	DBA only	DBA only	Read only	Restricted
PROD	DBA only	DBA only	DBA only	Read only	Restricted

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A source/version control system should be used to perform the following tasks:

- To store a single “master” version of each program file. This should represent a single “source of truth”, and developers should take code from here to make changes, not copy the source file from a specific environment. When a large number of customisations require changes to the same component (e.g. CUSTOM.pll) this component should be moved to its own custom development reference – it should not appear in multiple code sets.
- To lock the source-controlled program file when a developer is working on it, to prevent changes being made to the same program concurrently by more than one developer, causing unwanted synchronisation problems later on.
- To store a commented history for each individual program file, including the date, the developer name and a brief description of the change(s) made.
- To group source files together into logical units of work, or “code sets”.
- To store incremental BUILD versions for a given code set.

### Setting up a source/version control system

To set up a source/version control system from scratch, first divide your custom programs into logical groups (by module and function, e.g. AP, Scanned Invoices Interface), and assign a unique reference number. For example **MOKAP999**.

Then devise, and stick to, a sensible naming convention, both for the code set itself (i.e. **MOKAP999 Scanned Invoices Interface**), and for the individual components. Prefix all component files with the unique reference number. For example:

<b>MOKAP999 Scanned Invoices Interface</b>	
MOKAP999.install	Automated install or “driver” file (see Section 3)
MOKAP999_TB1.sql	Database table creation script
MOKAP999_TB1_ALTER.sql	Database table ALTER script
MOKAP999_SYN.sql	Synonym creation script
MOKAP999_PKH.sql	PL/SQL package header creation script
MOKAP999_PKB.sql	PL/SQL package body creation script
MOKAP999_CPldt	Concurrent program FNDLOAD file
MOKAP999_DD.ldt	BI Publisher data definition FNDLOAD file
MOKAP999_XDO_T.rtf	BI Publisher template file
MOKAP999_XDO_DT.xml	BI Publisher data template file

### Always use FNDLOAD!

Wherever possible, system setup should be stored and deployed automatically using Oracle’s FNDLOAD utility. Manual setup steps in the target environment are thus completely eliminated (or at least kept to an absolute minimum). A sensible .ldt file naming convention will help to identify the entities stored in each file, without having to view the file contents. For example:

<b>Example .ldt filename</b>	<b>Oracle Applications Entity</b>
MOKAP999_ALT.ldt	Alerts
MOKAP999_LKP.ldt	Lookups

MOKAP999_DFF.ldt	Descriptive Flexfields
MOKAP999_KFF.ldt	Key Flexfields
MOKAP999_CPldt	Concurrent Programs
MOKAP999_VS.ldt	Value Sets
MOKAP999_PROF.ldt	Profile Options
MOKAP999_RGRP.ldt	Request Groups
MOKAP999_RGUNIT.ldt	Request Group Unit
MOKAP999_RS.ldt	Request Sets
MOKAP999_RESP.ldt	Responsibilities
MOKAP999_MENU.ldt	Menus
MOKAP999_MSG.ldt	Messages
MOKAP999_BNE_INTG.ldt	Web ADI Integrators
MOKAP999_BNE_CNT.ldt	Web ADI contents
MOKAP999_BNE_MAP.ldt	Web ADI mappings
MOKAP999_BNE_LAYOUT.ldt	Web ADI layout
MOKAP999_BNE_PARM_LST.ldt	Web ADI parameter list
MOKAP999_BNE_COMP.ldt	Web ADI component
MOKAP999_BNE_SO.ldt	Web ADI secured object
MOKAP999_FUNC.ldt	Functions
MOKAP999_PS.ldt	Printer Styles
MOKAP999_USR.ldt	Users
MOKAP999_XMLP_DD.ldt	XML Publisher Data Definition and Templates

### Create incremental BUILD versions

The source/version control system should comprise two areas:

- The master code set, containing the latest version of each program component (this would be stored in the “Trunk” folder in SubVersion). For example:

Trunk	► AP	► MOKAP999 Scanned Invoices Interface	v4
		► MOKAP999.install	v1
		► MOKAP999_TB1.sql	v1
		► MOKAP999_TB1_ALTER.sql	v1
		► MOKAP999_SYN.sql	v1
		► MOKAP999_PKH.sql	v2
		► MOKAP999_PKB.sql	v4
		► MOKAP999_CPldt	v3
		► MOKAP999_DD.ldt	v1
		► MOKAP999_Template.rtf	v4
		► MOKAP999_Data_Template.xml	v4

- Incremental versions of the whole code set (“BUILDs”). These are the code sets which have been released into controlled environments. (In SubVersion, these are stored in the “Tags” folder, and are created using the Branch/Tag functionality.) For example:

Tags	► AP	► MOKAP999 Scanned Invoices Interface	
		► BUILD1.0	
		► MOKAP999.install	v1
		► MOKAP999_TB1.sql	v1
		► MOKAP999_TB1_ALTER.sql	v1
		► MOKAP999_SYN.sql	v1
		► MOKAP999_PKH.sql	v1
		► MOKAP999_PKB.sql	v1

► MOKAP999_CP.ldt	v1
► MOKAP999_DD.ldt	v1
► MOKAP999_Template.rtf	v1
► BUILD1.1	
► MOKAP999.install	v2
► MOKAP999_TB1.sql	v1
► MOKAP999_TB1_ALTER.sql	v1
► MOKAP999_SYN.sql	v1
► MOKAP999_PKH.sql	v2
► MOKAP999_PKB.sql	v2
► MOKAP999_CP.ldt	v1
► MOKAP999_DD.ldt	v1
► MOKAP999_Template.rtf	v1
► BUILD1.2	
► BUILD1.3 etc.	

DBAs must always take code sets from the specific BUILD folder to install into a controlled environment.

Developers must only modify individual programs in the master code set. After successful unit testing in the DEV environment, the developer will create a new BUILD version, with the next incremental BUILD number.

Once a BUILD has been released to a controlled environment, it should never be modified again. It provides an exact roll-back point, should a major problem be encountered with the modified code set.

**Note:** BUILDs should contain all code components, whether or not they have been modified. PATCH releases (containing only the modified components for a particular enhancement or bug fix) should be avoided at all costs. If the custom code version needs to be rolled back to a point in time, this could require the application of multiple PATCH releases, which can be difficult to manage.

### 3. Code Release

A clearly defined release-process-flow from environment-to-environment, which is understood and adhered to by the entire project team, is essential to ensure that only successfully-tested code releases are progressed to higher environments, and, eventually, to PROD.

#### Custom code release process schematic

The flow of custom code from source/version control to PROD is shown in Figure 1.

#### Release types

During any Oracle implementation or upgrade project, many releases will need to be applied to environments to resolve issues. A release, in this context, could be...

- A patch, supplied by Oracle, or a data fix
- A customisation

#### Patches and data fixes

Generally, patches cannot be backed out or removed from an environment once they have been applied. So releasing them to a dedicated PATCH environment first minimises the risk of applying unwanted patches to controlled (and hence more critical) environments.

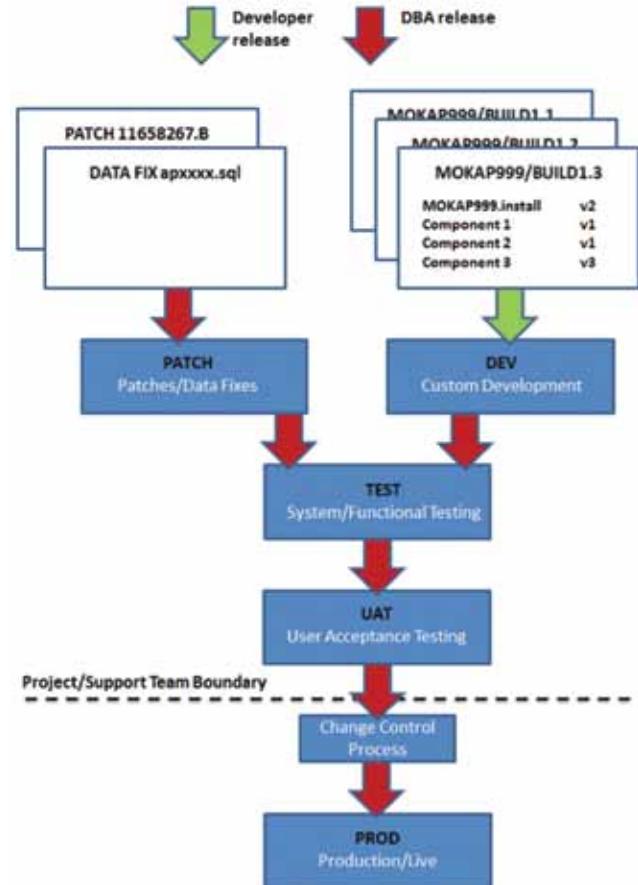


FIGURE 1: CUSTOM CODE RELEASE PROCESS SCHEMATIC

Since the PATCH environment is only used by the DBA team, it can be refreshed from UAT or PROD as-and-when required.

If the patch or data fix is successfully applied and unit-tested in PATCH, it can then follow the normal release cycle of TEST > UAT > PROD, following the successful testing and sign-off at each stage.

If testing fails at any stage, the patch or data fix will not be progressed to the next environment.

It's worth remembering that if unwanted patches are applied to TEST or UAT environments, it is likely that a restore from backup will be required.

Before releasing a data fix, the database objects to be updated should be backed up to provide a roll-back point if the data fix is not successful (ideally the data fix script should include the object backup commands, and SQL\*Plus commands to spool information to a log file when it is run).

Patches and data fixes should subsequently be applied to DEV, to keep the set of environments in sync.

The DBA is responsible for recording the patches released to each environment. Patches should always be cross-referenced >>

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## E-Business Suite: David Taylor

with a support reference number, an originating requestor and an Oracle Service Request (where applicable).

### Customisations

**Only the DBA can deploy custom code releases to TEST, UAT and PROD!**

Customisations should be developed in DEV, and unit tested by the developer. Once a customisation has been successfully unit tested it is committed to source control system.

This version of the whole code set (e.g. MOKAP999) is then used to create the first build version ("BUILD1.0"), in the source control system. This build must not be modified further.

Following approval by the environment owner, BUILD1.0 is exported from the source control system by the DBA, and promoted to TEST, for functional/system testing.

Code is deployed from the source control system only – the source-controlled code set corresponds exactly with what is installed in the target environment. The DBA shouldn't receive a code set from the developer via email!

If the customisation fails system testing, the developer will check out the faulty components from source control, lock them, modify them in DEV, and repeat the unit testing.

When the remedial work is complete, the modified components are then committed back to the source control system, and BUILD1.1 created, before being released to TEST by the DBA for functional/system re-testing.

The testing/sign-off cycle is repeated, deploying from DEV > TEST > UAT, until user acceptance testing is successfully completed and signed off. At this point, the signed-off build version (BUILD1.x) is ready to release to PROD by the DBA.

The DBA is responsible for recording which BUILD versions have been released to which environments.

### Automated custom code installation

The automation of the code installation process provides the following benefits:

- Manual code installation steps are reduced (or eliminated), speeding up the promotion of code to "higher" environments.
- Installation standards (file naming, source file locations, etc.) are imposed automatically.
- Releases will be exactly identical from environment-to-environment, which guarantees that a release which has been tested (and signed off) in a UAT environment will behave exactly the same when it is installed in PROD.
- The reliance on detailed code installation documents (e.g. AIM MD.120) is greatly reduced, since entire code sets can be installed via a single UNIX command.

A custom code installation tool is principally a UNIX shell script which uses an installer (or "driver") file for the code set being installed. The driver file contains the list of source files, and a corresponding set of shorthand install commands. Mokum has a "Generic Installer" tool, which has been tailored for several of our clients (Channel4, MacMillan, etc).

To install a specific code set, the DBA issues a single UNIX "installer" command, which performs the following tasks:

1. Checks that all source files exist in the install directory
2. Backs up existing source files (if the customisation has been installed previously)
3. Copies source files to standard \$CUSTOM\_TOP directory locations
4. Installs/compiles source code
5. Checks for the existence of valid database objects
6. Writes a date/time-stamped log file to the install directory to provide a code installation audit trail

### Conclusion

By applying controls and a process to implement projects, we can minimise risk, predict outcomes, audit progress and deliver to plan. Not only is this vital for the success of your Oracle project, it will also help when you decide to paint a Pokemon mural on your kids' bedroom wall. ■



### ABOUT THE AUTHOR

#### David Taylor

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David is a Senior Technical Consultant at Mokum Change Management with more than ten years of experience in Oracle Applications Development. In addition to core Oracle technical work, his project roles have included project management and planning, technical team lead, business analysis, technical design and estimation, training and support. David is a published author of numerous scientific papers, has presented technical subject matter at Oracle User Group meetings, and has also published Oracle-related white papers via organisations including the Oracle Contractors Network.

# Implementing XBRL in Oracle

**XBRL based financial regulatory compliance has gained significant momentum in recent years with more countries making it mandatory as part of the annual returns process. Undoubtedly, XBRL offers tremendous potential to the regulators and analysts to quickly assimilate and dissect the financial information cutting down processing time. However, from an organisation point of view, it is indeed challenging. Most companies are relying upon third party solutions incurring additional costs and overheads to the financial reporting process for the sake of statutory compliance. Reliance on third party service providers casts a shadow on efficiency and control since additional review and approval processes have to be put in place, whilst ensuring accuracy of submissions involving sensitive data. This article evaluates the implementation approach and the various options available for integrating the XBRL reporting and filing process within Oracle applications**

Srinivasan Ayyamoni, Principal Consultant, Infosys Limited

## Background

Extensible Business Reporting Language or popularly known as XBRL is a language for electronic communication of business and financial data for standardised business reporting around the world, with harmonised interpretation by multiple stakeholders such as analysts, investors and regulators. For example, an Equity research firm can easily compare results across an industry based on the report published in accordance to the XBRL standards. This used to be a time-consuming exercise in the Pre-XBRL world. XBRL enables unique identifying tags to be applied to items of financial data, for example 'Net-Income', and append a range of information about the item, such as, whether it is a monetary item, percentage or fraction.

In XBRL, information is not treated as a static block of text or set of numbers. Instead, information is broken down into unique items of data (e.g. total

liabilities = 100). These data items are then assigned mark-up tags that make them machine-readable. For example, the tag <Liabilities>100</Liabilities> enables a computer to understand that the item refers to "Liabilities", and it has a value of 100. XBRL tags are defined and organised using categorisation schemes called taxonomies. From regulatory compliance perspective, separate taxonomies exist based on the accounting standard adopted by the regulator's country. Thus, XBRL language uses different taxonomies, to define the specific tags used for each standard. In summary, taxonomy enables systems to:

- Understand what the tag is (e.g. whether it is a monetary item, a percentage or text);
- What characteristics the tag has (e.g. if it has a negative value);
- Its relationship to other items (e.g. if it is part of a calculation).

This additional information is called metadata. When information that has been tagged with XBRL is transmitted, the metadata contained within the tags is also transmitted.

## Methodology

Implementing the XBRL reporting within an enterprise systems typically involves below steps:

1. Reports restructuring  
The first step towards XBRL implementation will be to align the corporate financial reports in accordance with the applicable regulatory format. The objective is to tag every reporting item with the corresponding item in the XBRL mandated report.

2. Taxonomy assignment  
The assignment process involves the creation of an XBRL schema document >>

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by tagging with the relevant taxonomy elements with the predesigned report arrived at the earlier step. In case any information is present in the financial statements for which a corresponding tag/element is not available in the taxonomy, then the same needs to be captured in the next-best-fit element in the taxonomy or should be included under the corresponding 'Others' element.

### 3. Validation and submission

The Schema validation is an important step to identify and correct the exceptions. In general, the validation should identify exceptions such as incorrect signage, missing and inaccurate tagging, compliance with the latest version of taxonomy and adherence to business rules specified by the regulator. Generally validation tools are available for download from the regulator websites and data can be previewed before submission.

### 4. Maintenance and rollover

Taxonomy maintenance is a continuous process. Structural changes to the financial reports should be analysed and the tagging modifications should be made before every periodic submission.

### Implementation options in Oracle

Two different options are available to deploy XBRL reporting within Oracle E-Business Suite. Let us now examine these in detail:

#### Financial Statement Generator (FSG)

A rather simplistic approach available within Oracle General Ledger to enable XBRL reporting is through its Financial Statement Generator (FSG). The picture (Figure 1) below depicts the data flow.

Creating XBRL through FSG involves the below steps:

##### 1. Loading taxonomies

The XSD file applicable for the specific XBRL taxonomy should be downloaded

from the regulator website into a specific Oracle directory. These files can be suitably modified to address specific requirements. Old and redundant taxonomies can be removed before updating the revised taxonomies.

##### 2. Elements mapping

FSG row sets should be linked with the XBRL taxonomy elements, and column sets for numeric contexts such as Amount Type, Period, and Currency. This step is crucial to tag the organisation's unique chart of accounts to the standardised elements of the XBRL taxonomy. The mapping exercise is a manual and effort intensive exercise and it is imperative to follow the methodology steps enumerated above.

##### 3. XBRL output generation

FSG reports in XBRL format can be generated by specifying the output option. This process will create valid XBRL instance documents. The output can also be generated as Text or Excel verification purposes. Also, the XBRL instance documents can be viewed and analysed using the XBRL-compliant tool available in the regulator website.

#### Effectiveness of FSG for XBRL reporting

In the initial days of XBRL reporting, when compliance was by choice and not by mandate, FSG was adequate as a tool for reporting. However, the fundamental premise of XBRL is that it is extensible and evolves in conjunction with industry and regulatory needs. For example, there is considerable stress on environmental accounting and for organisations having mandate for 'Green' compliance, it is necessary to include such variables in their reports. FSG has rigid boundaries and extensions to the reports would warrant complex workarounds and high maintenance. Therefore, for routine time bound submissions with complex reporting structures, FSG is not a scalable solution and the filers would eventually resort to third party service providers / tools for this purpose.

### Oracle Disclosure Management

Oracle has recently introduced a new Microsoft Office based tool with full XBRL and inline XBRL (iXBRL) capabilities. Incidentally, iXBRL is the enhanced version of XBRL mandated by UK HMRC for financial report submissions. The tool can be installed as an add-on to the Microsoft Office applications (version 2003 and higher) in conjunction with Oracle Smart View add-on for MS Office. In fact, it is considered as an extension of Oracle Smart View. Oracle Disclosure Management can either be deployed:

- As an integrated solution with Oracle's Hyperion Financial Management or;
- As a standalone solution for financial reports published through Microsoft Excel from Oracle General Ledger.

The high level process flow typically involves below steps:

- XBRL taxonomies from the regulator website (SEC, HMRC etc.) are uploaded into Hyperion Disclosure Management. This will be a centralised location for storing the XBRL tags.
- Leveraging the Web Centre content of Oracle Disclosure Management, the upload can be a controlled process incorporating features such as version control, approval routing etc.
- The report identified for XBRL can be mapped at data source level with the downloaded XBRL taxonomy. This will essentially create the required XBRL template. The mapping can be done at taxonomy concepts, contexts, units and footnotes.
- For instances that do not use Hyperion Finance Management, financial statements can be published out of general ledger from FSG to Excel using spread sheet format and mapping can be done at report level.
- In cases where Hyperion Financial Management is implemented, the report data can be refreshed using Smart View and XBRL instance document can be generated.
- The instance document can be verified in human readable format using Instance document viewer. This feature also facilitates publishing in iXBRL format required by HMRC.
- For certain submissions such as US SEC Edgar Filing Manual, HMRC Joint Filing Checks and the IFRS Global Filing Manual, the validation rules are seeded and exceptions are identified on the fly.
- Verified documents are then exported using the button in Excel add-on for internal consumption or to a regulatory body such as the HMRC.

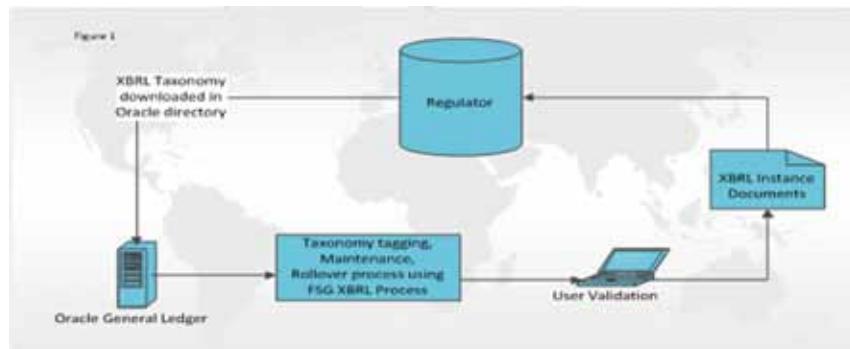


FIGURE 1

### Conclusion

Oracle has delivered a state of art solution in Oracle Disclosure Management for handling the complex XBRL reporting process. For an organisation that has implemented Oracle E-Business Suite, Disclosure Management offers a quite number of value propositions. Other solution options in the form of third party integration or Financial Statement Generator (FSG) are not seamless and involve intensive recurring efforts.

Therefore, it makes strategic sense to deploy Disclosure Management and internalise the XBRL reporting process as part of financial close. ■

### References:

1. <http://www.xbrl.org/>
2. Oracle Disclosure Management User Guide



### ABOUT THE AUTHOR

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Snri is a Chartered Accountant with 15 years of professional experience in IT consulting spread across industries in Retail, Banking and Manufacturing. As a Principal Consultant at Infosys, he has been part of many Business Transformation engagements based on Oracle and PeopleSoft applications in Financial Management and Procurement areas.

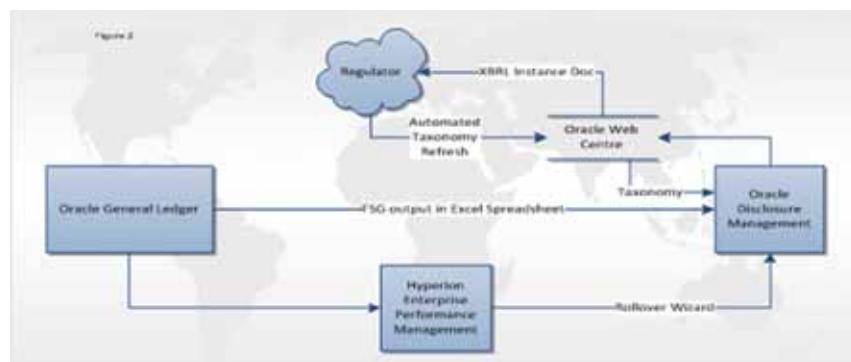


FIGURE 2

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# All About Joins

## An Introduction

Joining tables is one of the most important parts of the SQL processing engine. The basic idea is simple but there are a lot of variants and complications.

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### Tables to work with

We will be discussing joins on four tables in this article. Here they are:

T1	T2	T3	T4
C1	C2	C3	C4
1	2	3	4
2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

Table T1 has a single numerical column, C1 and there are five rows. Each of the other three tables also has one numerical column and five rows but the contents differ slightly.

I will denote a join as follows:

**T1 → T2**

This means that table T2 is being joined to T1. When we discuss join methods it will be clear that  $T1 \rightarrow T2$  is different from  $T2 \rightarrow T1$ , hence the arrow. I will call the table on the left of the arrow the *driving* table and the table on the right the *probe* table. Don't attach too much meaning to these terms as they don't always make sense and in some cases will be in contradiction to accepted use. I just need a way to name the join operands.

When there are more than two tables being joined then the operands of the join operation aren't always tables but intermediate results. So for example,  $((T1 \rightarrow T2) \rightarrow T3)$  means:

- Join T2 to T1 creating an intermediate result
- Join T3 to this intermediate result

Because of this we use the term row source to refer to the operands of a join

operation. A row source could be a table or an intermediate result of an earlier join. It might also be the result of a subquery of some kind.

In an execution plan, the driving row source is always shown above the probe row source.

### Inner joins

The majority of SQL queries use only inner joins and they are most frequently written using the original "comma-join" syntax. Here is an example:

```
SELECT *
  FROM T1
    ,T2
    ,T3
    ,T4
 WHERE   T1.C1 > 3
        AND T1.C1 = T2.C2
        AND T2.C2 = T3.C3
        AND T3.C3 < T4.C4
        AND T2.C2 < 6;
```

QUERY 1

There is always one less join in a query than there are tables. There are four tables in this query and therefore three joins. When there are only inner joins in a query the optimiser is free to choose any join order it wishes and although

performance may vary the result will always be the same. Note that there is no distinction between the predicates used in the joins, called join predicates, and other predicates called selection predicates. Logically, the query returns the result of joining the tables together without any predicates (a Cartesian join) and then applying all the predicates as selection predicates at the end. That is why this syntax is so appropriate for inner joins as it avoids any unnecessary specification of join order or predicate classification and leaves it all up to the optimiser.

### Join methods

Before we start to talk about other types of join let us briefly discuss the four basic join methods that can be used to join tables together. Let us assume we start with  $T1 \rightarrow T2$  in Query 1 above. The four methods are:

#### Nested loops

With a nested loop we process each row in the driving row source  $T1$  that matches the selection predicate  $T1.C1 > 3$  one by one. Let us assume we start with the row where  $T1.C1=4$ . We then identify the matching rows in the probe table  $T2$  that match the join condition  $T1.C1=T2.C2$ . So we look for rows where  $T2.C2$  is 4 and find exactly one. We then apply the selection predicate  $T2.C2 < 6$  and find that the row is to be retained. We then move onto the next row in  $T1$ , namely the one where  $C1$  is 5, and repeat the process. The pseudo-code looks something like this:

```
For each row in T1 subset
LOOP
  For each matching row in T2
    LOOP
      ...
    END LOOP
  END LOOP
```

Hence the term nested loop.

Nested loops have the desirable property that they usually scale linearly. By that I mean that if  $T1$  and  $T2$  double in size the nested loop will take twice as much time (as opposed to much more). However, nested loops have several undesirable performance properties:

- Unless the probe table is very small an index is required on the joined column or columns, in this case  $T2.C2$ . If this isn't done then we will need to visit every row in  $T2$  for every row in  $T1$ . Not only is this often very costly in itself it also wrecks the scalability property of the join: if we double the size of  $T1$  and  $T2$  the loop takes four times as long because we scan  $T2$  twice as often, because  $T1$  is twice as big, and each scan takes twice as long, because  $T2$  is twice as big. Note that indexing is not possible if the probe row source is an intermediate result or a subquery. For this reason, when joining a table and an intermediate result using a nested loop the driving row source will almost always be the intermediate result and the probe row source will almost always be the table.
- Blocks in the probed table may be visited many times picking out the same or different rows each time.

#### Hash joins

A hash join operates by placing all the rows that match the selection predicate on the driving table,  $T1.C1 > 3$ , into an in memory hash table based on a hash of  $T1.C1$ . We then make a single pass through the probe table  $T2$  and for each row that matches  $T2.C2 < 6$  we apply the hash to  $T2.C2$  and find any matching rows in  $T1$ .

Hash joins have the following advantages over nested loops:

- Every row in the probe table that matches the selection predicates is visited exactly once and not potentially multiple times as with a nested loop.
- No index is required on the join column in the probe table.
- If a full table scan (or fast full index scan) is used multi-block reads can be used that are much more efficient than single block reads through an index.
- Join inputs can be swapped.

However, hash joins have the following disadvantages:

- If a block in the probe table contains no rows that match any of the rows in the driving row source it is still visited. So, for example, if the probe table was 1TB and there was no selection predicate and only two rows that matched the join predicates, we would scan the whole 1TB table rather than picking out two rows through an index.
- If the probe row source gets too big the hash table will spill onto disk ruining the linear performance properties.
- Hash joins can only be used with equality join predicates.

When an index is available on the probe table it may be that a nested loop will visit some blocks multiple times and some not at all. Deciding between the nested loop and the hash join that visits all rows exactly once can be difficult. The optimiser uses the selectivity of the join predicate in conjunction with the clustering factor of the index to help determine the correct course of action.

#### Merge joins

A merge join is very similar to a merge sort. Both the driving and probe row sources are sorted to start with and we then proceed in a similar way as for a nested loop: for each row in the driving row source we look for all the rows in the probe row source that match that one row in the driving row source. In the case of an equality join predicate such as  $T1.C1=T2.C2$  we can step through the two sorted sets in step. However, merge joins can also take advantage of range predicates such as  $T1.C1 < T2.C2$ . In this case, we may need to "backup" the point at which we examine the sorted probe row source as we advance through the driving row source.

Merge joins are a relatively rare choice of join mechanism these days but they can be useful under one or more of the following conditions:

- The row sources are already sorted avoiding the need for an extra step.
- There is no index on the joined columns and/or the selectivity/clustering factor is weak (making nested loops unattractive).
- The join predicate is a range predicate (ruling out hash joins).
- Both row sources being joined are so large that neither can be hashed into memory (making hash joins unattractive). Note >>

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that merge joins can also spill onto disk but the impact may not be as bad as for hash joins that spill onto disk.

### Cartesian joins

Cartesian joins are very similar to merge joins (they appear as MERGE JOIN CARTESIAN in the execution plan). This is the join of last resort and is only used when there is no join predicate available (unless you use the undocumented and probably useless USE\_MERGE\_CARTESIAN hint!). This join method operates just like a merge join except that as every row in the driving row source matches every row in the probe row source no sort takes place. It may seem like a sort occurs because you will see a BUFFER SORT operation in the execution plan but this is misleading. There is buffering but no sorting. If there are m rows in the driving row source and n rows in the probe row source then there will be mxn rows returned by the join. Cartesian joins should not be a performance concern providing that mxn is small and/or either m or n is zero or one.

### Left outer joins

There are three flavours of outer join. Let me begin by discussing the LEFT OUTER JOIN. Here is an example of its use:

```
SELECT *
  FROM t1.c1 LEFT OUTER JOIN t2 ON t1.c1 = t2.c2 AND t1.c1 > 4
 WHERE t1.c1 > 3
 ORDER BY t1;
```

#### QUERY 2

The left operand of the join is called the preserved row source and the right operand the optional row source.

What this query (logically) says is:

- Pick a subset of the rows in T1 that have a value of C1 > 3
- Identify combinations of rows in the T1 subset and T2 that match the criteria T1.C1 = T2.C2 AND T1.C1 > 4
- For all rows in the T1 subset that do not match, output them with NULL for the columns in T2
- Order the result by T1.C1

The result is:

C1	C2
4	
5	5

Notice that there is now a big difference between a selection predicate and a join predicate. The selection predicate T1.C1 > 3 resulted in the elimination of rows from T1 but the join predicate T1.C1 > 4 just resulted in the loss of column values from T2.

Not only is there now a big difference between a join predicate and a selection predicate but the optimiser doesn't have complete freedom to reorder joins. Consider this query:

```
SELECT c1
      ,c2
      ,c3
      ,c4
   FROM   (   t3
          LEFT JOIN
          t4
         ON t3.c3 = t4.c4)
          LEFT JOIN
          (   t2
             LEFT JOIN
             t1
            ON t1.c1 = t2.c2)
           ON t2.c2 = t3.c3
  ORDER BY c3;
```

#### QUERY 3

To make things a little clearer I have added optional parentheses so that you can see the intention. Note also that the keyword OUTER is also optional and I have omitted it here.

With the exception of hash join input swapping, which we will discuss in a later article, Oracle always uses the left operand of the join (the preserved row source) as the driving row source in the join. Therefore, Oracle has limited choice in what join order to use here. The join order we specified ourselves was  $((T3 \rightarrow T4) \rightarrow (T1 \rightarrow T2))$ .

Note that both the operands of the final join are intermediate results. The optimiser deals with this by treating the  $(T1 \rightarrow T2)$  part of the query as an inline view. This means that a nested loop is unlikely to be selected as the final join mechanism as the  $(T1 \rightarrow T2)$  join would be repeated for every row generated from  $(T3 \rightarrow T4)$ . The actual execution plan used for the sample tables uses hash joins throughout:

Id	Operation	Name
1	SELECT STATEMENT	
2	SORT ORDER BY	
3	HASH JOIN OUTER	
4	HASH JOIN OUTER	
5	TABLE ACCESS FULL	T3
6	TABLE ACCESS FULL	T4
7	VIEW	
8	HASH JOIN OUTER	
9	TABLE ACCESS FULL	T2
10	TABLE ACCESS FULL	T1

This is the result:

C1	C2	C3	C4
3	3	3	
4	4	4	4
5	5	5	5
	6	6	6
		7	7

The optimiser did, in fact, have a choice of five join orders. All the predicates mandate are that:

- T3 precedes T4 in the join order
- T2 precedes T1 in the join order
- T3 precedes T2 in the join order

As an example, we could have written Query 3 using the order  $((T3 \rightarrow T2) \rightarrow T1) \rightarrow T4$  to get the same result as follows:

```
SELECT c1
      ,c2
      ,c3
      ,c4
   FROM t3
  LEFT JOIN t2
    ON t3.c3 = t2.c2
  LEFT JOIN t1
    ON t2.c2 = t1.c1
  LEFT JOIN t4
    ON t3.c3 = t4.c4
 ORDER BY c3;
```

QUERY 4

Because the “comma-join” syntax has no provision for separating join conditions from selection conditions or for differentiating preserved from optional tables it can’t be used for queries that contain outer joins<sup>1</sup>.

The new syntax is usually referred to as ANSI join syntax and can be used for inner joins as well. Consider this query:

```
SELECT *
   FROM T1
  LEFT JOIN T2
    ON T1.C1 = T2.C2
 JOIN T3
   ON T2.C2 = T3.C3
CROSS JOIN T4;
```

QUERY 5

The join with T3 is an inner join (you can explicitly add the keyword INNER if you want) and the join with T4 is a Cartesian join; ANSI uses the keywords CROSS JOIN denote a Cartesian join.

### Right outer joins

A right outer join is just syntactic sugar. A right outer join preserves rows on the right instead of the left. Consider this query:

```
SELECT c1, c2, c3
   FROM t1
  LEFT JOIN
    t2
  LEFT JOIN
    t3
    ON t2.c2 = t3.c3
   ON t1.c1 = t3.c3
 ORDER BY c1;
```

QUERY 6

This specifies the join order ( $T1 \rightarrow (T2 \rightarrow T3)$ ) but could have been written as:

```
SELECT c1, c2, c3
   FROM t2
  LEFT JOIN t3
    ON t2.c2 = t3.c3
  RIGHT JOIN t1
    ON t1.c1 = t3.c3
 ORDER BY c1;
```

QUERY 7

Personally, I find the latter syntax easier to read but it makes no difference to either the execution plan or the results.

### Full outer joins

As you might guess a full outer join preserves rows on both sides of the keywords. Here is an example:

```
SELECT *
   FROM t1 FULL JOIN t2 ON t1.c1 = t2.c2
 ORDER BY t1.c1;
```

QUERY 8

The result is:

C1	C2
1	
2	2
3	3
4	4
5	5
	6

### Wrap up

I hope you found this introduction to joins useful. There is a lot more to say about joins. There are partitioned outer joins, semi-joins, anti-joins, null aware anti-joins, index joins and bitmap joins. Did I mention star transformations? The story of joins continues on my blog: [tonyhasler.wordpress.com](http://tonyhasler.wordpress.com). ■

<sup>1</sup> Oracle was an early implementer of outer joins and devised a notation of using “(+)” as an extension to the “comma-join” syntax. This is severely limited in ability (queries 6 7 and 8 in this article can’t be expressed in this syntax) and difficult to read so I strongly advise against its use.



## ABOUT THE AUTHOR

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Tony Hasler is an independent software consultant specialising in helping companies improve Oracle related services. During his thirty years of experience Tony has led operating systems development teams, represented the British Standards Institute internationally, and filed a patent relating to optimisations of distributed transactions.

# Flashback Data Archive in Oracle 11g

In 11g RDBMS, Oracle extended the existing flashback technology to allow us to keep a persistent record of older versions of data online and available in the database. This feature is known as “Flash Back Data Archives” (FBDA) and is part of the “Oracle Total Recall” Enterprise Edition option. In this article I talk about the new FBDA functionality and look at some basic performance tests.

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## Keeping old data, would we need it?

In many industries there are pressures to retain old data for a set length of time; sometimes the business wants to be able to track who changed data, perform historical analysis for marketing or have the ability to get back data deleted maliciously or in error. In other cases it is down to financial audit regulations where a failure to be able to supply older data for audit purposes can result in both financial penalties and damage to business reputation.

Keeping old versions of data hanging about can be at odds with our wishes to “get rid of old data” in order to keep our databases healthy (Every company has a well thought out data archiving strategy right?). In the past it has added additional complications to maintaining the databases and the applications running within them.

Prior to 11g, typical solutions included coding data retention functionality directly into the application, mining redo logs or more commonly implementing a “before-update/delete” trigger on each table to copy away a version of the data pre-change. All these methods worked but had their shortcomings whether due to complexity, maintainability or to high performance overhead; for example if a column in a tracked table changed definition then this may require code changes in the capture process to cope with the new definition and also made getting historical data from before the column change rather messy.

So, what should the ideal solution look like so we have criteria against which to judge Flashback data archive functionality? The two key requirements are that it should guarantee that all required data is captured and tracked and that this history is secure and cannot be retroactively modified. Without this, the solution is useless. We would want it to be simple to implement, have a low impact to performance and storage and

to be easily retrofitted to 3rd party applications. The capture process should be transparent to the running application, be low maintenance and ideally self-managing with regard to retention periods. What I want to do is compare FBDA against these high ideals and see how it pans out.

## An overview of FBDA

The Flashback Data Archive feature is a part of the 11g Total Recall option and allows us to store historical values for data that has been amended or deleted with no need for additional triggers or bespoke coding. In effect it is an extension to the idea of having older data residing in the UNDO tablespace but with the data being persistent.

Within the database, a Flashback Archive is a new logical object, assigned to a tablespace, given a name and a “retention period” which defines how far back in time it needs to keep audited data. A database table is associated with a flashback archive which simply means that if a row is modified, its before-update version is saved away.

Flashback Data Archives guarantee that all updates, deletes and truncates are captured and stored away. The data itself is kept available for querying for as long as required (whether that's days or years), and is accessed using usual “Flashback Query” methods. If we want different data to have different retention durations – i.e. the warehouse department want to keep 3 years history for but Accounts want 7 years history of financial data – then it's simply the case of creating multiple Flashback Data Archives and assigning the relevant tables to them.

Behind the scenes the audited versions of the data are stored in tables in the flashback archive tablespace in a compressed and partitioned form to speed up access and to reduce

storage costs. These data archive tables are essentially copies of the tracked table with a few additional columns used internally for tracking. It is not possible to run DML against these tables so the captured data is guaranteed to be secure against tampering. You never need to query these archive tables directly as we query the old data using the standard techniques used with Flashback query (demos later!).

The actual capturing of the changes is done asynchronously in the background and the mechanism is built into the Oracle kernel itself so is transparent to the application and (according to Oracle) shouldn't cause any delay in the original DML. In its literature, Oracle states that the CPU overhead of capturing the old data is typically 5%. If you consider that the trigger-based method we might have used doubled the amount of writes and so could impact on the applications performance, this should be of benefit. We are going to examine some basic performance tests later.

Each FBDA has a defined retention period for which it will keep historic data. Once data has "aged" outside of the retention period, Oracle automatically clears out that unneeded data. This gets the rather grandiose name of "Data Shredding" but you get the idea.

In theory then, FBDA looks good against the criteria – let's look at how it works behind the scenes.

### FBDA architecture

Behind the scenes, FBDA boils down to a new background process, a couple of additional dictionary tables plus one archive table per monitored table. For each table assigned to an FBDA, Oracle creates an archive table named in the format `SYS_FBA_HIST_<parent-object-id>` which is a duplicate of the tracked table with a few additional columns used for tracking (See Fig.1). This archive table is both compressed and partitioned to reduce storage requirements and to aide in the performance of the data shredding job. The archive table is created with no indexes but you \*can\* add your own indexes. This makes sense as you may want to access old data in a different manner to current data and hence have different indexing requirements.

History is stored in <code>SYS_FBA_HIST_&lt;ID&gt;</code>		
Name	Null?	Type
RID		VARCHAR2 (4000)
STARTSCN		NUMBER
ENDSCN		NUMBER
XID		RAW (8)
OPERATION		VARCHAR2 (1)
CHILD_NAME		VARCHAR2 (100)
SANTA_RATING		NUMBER (2)

FIGURE 1. `SYS_FBA_HIST` EXAMPLE

It has always been the case that before an update or delete, the unmodified version of the block is copied in memory and copied to the UNDO tablespace before the original is modified. What is different here is that the undo block is saved away and used to populate the archive table effectively making the old data persistent.

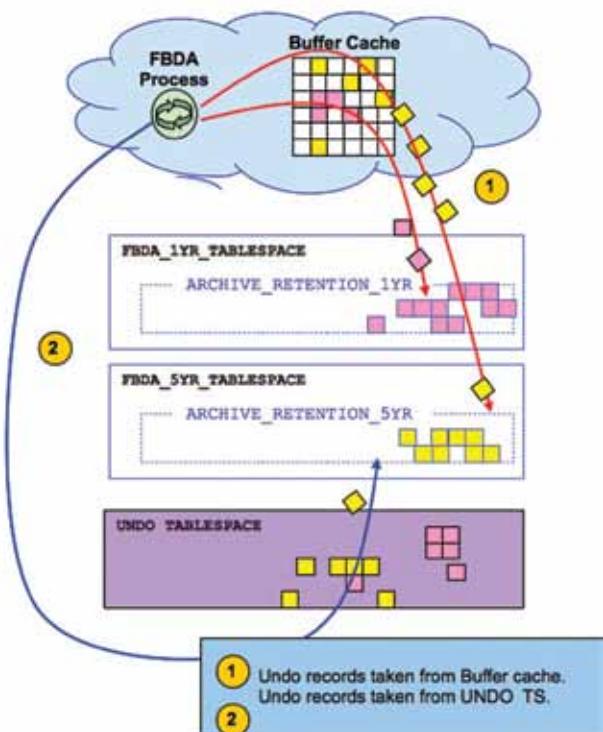


FIGURE 2. HOW FBDA GRABS OLD DATA

This capturing process is performed by a new process named `ora_fbda_<sid>` (Flashback Data Archiver) which itself may spawn up to 10 slaves. The `ora_fba_process` sleeps and awakes every 5 minutes to check for new undo data in the buffer cache that is associated with a table in a flashback archive. Any relevant data it finds is written out to the relevant FBDA. If the undo data had already been flushed from the buffer cache out to disk since the last time `ora_fba` looked, then the process will take a look in the UNDO tablespace itself and write any required blocks away that it finds. A result of this is that if you have tables within a flashback archive, Oracle will not overwrite relevant blocks in the UNDO tablespaces that have yet to be archived away – even if the underlying transaction has committed. It's really important to make sure you have an appropriate value set for `UNDO_RETENTION` and monitor UNDO tablespace usage to help keep FBDA performant.

The `ora_fba_process` is "load aware"; its sleep duration starts at 5 minutes but is tuned based upon the amount of undo being generated; the faster that undo is produced, the smaller the sleep time. Ultimately the aim is to aid performance by getting undo from the buffer cache (memory) rather than having to physically read blocks already flushed to disk in the undo tablespace.

### FBDA architecture – Internal tables

There are a number of internal tables that Oracle uses to implement FBDA, some documented some not. In Figure 3, you can see that for the single table added to an archive under schema "ELVES", three tables have been created plus a table partition. Although undocumented, my guess is that >>

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the “COLMAP” table is there to support structural changes to the parent table, and the TCRV table appears to be used for tracking transactions. The SYS\_FBA\_\* tables owned by SYS look like they contain information that already appears in the DBA\_views but may be useful for digging about.

OWNER	OBJECT_NAME	OBJECT_TYPE
ELVES	SYS_FBA_DDL_COLMAP_83194	TABLE
ELVES	SYS_FBA_HIST_83194	TABLE
ELVES	SYS_FBA_HIST_83194	TABLE PARTITION
ELVES	SYS_FBA_TCRV_83194	TABLE
SYS	KU\$_FBA_T	TYPE
SYS	KU\$_FBA_VIEW	VIEW
SYS	SYS_FBA_BARRIERSCN	TABLE
SYS	SYS_FBA_DL	TABLE
SYS	SYS_FBA_FA	TABLE
SYS	SYS_FBA_PARTITIONTS	TABLE
SYS	SYS_FBA_TRACKEDTABLES	TABLE
SYS	SYS_FBA_USERS	TABLE

FIGURE 3. INTERNAL TABLES

### Monitoring and errors

It's really important to monitor the tablespaces hosting the Flashback archive; If this fills then old data cannot be archived and updates/deletes on the original data will be prevented – remember that FBDA guarantees to capture before-images and so everything stops..

When an FBDA reaches 90% of its capacity, messages will appear in the alert log.

**ORA-55617: Flashback Archive "string" runs out of space and tracking on "string" is suspended.**

Once Flashback archive is 100% full, operations on the tracked data will be blocked and the following error will be seen;

**ORA-55623: Flashback Archive "string" is blocking and tracking on all tables is suspended.**

SQL> SELECT owner_name, flashback_archive_name, retention_in_days FROM dba_flashback_archive;				
OWNER_NAME	FLASHBACK_ARCHIVE_NAME	RETENTION_IN_DAYS		
SANTA	FBDA_7_YEAR	2555		
SQL> SELECT * FROM dba_flashback_archive_tables;				
TABLE_NAME	OWNER_NAME	FLASHBACK_AR	ARCHIVE_TABLE_NAME	STATUS
NAUGHTY_NICE_LIST	ELVES	FBDA_7_YEAR	SYS_FBA_HIST_83194	ENABLED
SQL> SELECT * FROM dba_flashback_archive_ts;				
FLASHBACK_ARCHI	FLASHBACK_ARCHIVE#	TABLESPACE_NAME	QUOTA_IN_MB	
FBDA_7_YEAR	1	FBDA_RETENTION_7YR		

FIGURE 4. CONTENTS OF MONITORING VIEWS

There are a number of DBA views to be aware of for monitoring FBDA; DBA\_FLASHBACK\_ARCHIVE gives basic information on what archives exist and their retention periods. DBA\_FLASHBACK\_ARCHIVE\_TABLES tells us which tables have archives and gives us the name of the related underlying archive table. DBA\_FLASHBACK\_ARCHIVE\_TS can be queried to show us what tablespaces are being used for archiving and the quotas associated with an archive – see Fig 4.

### Restrictions

Several restrictions exist for using FBDA and a few are version specific. The instance must be running Automatic Undo Management and the database using Automatic Segment Space Management. Also, be aware that it's also part of an Enterprise Edition option so there are additional license costs.

For a table to be a candidate for inclusion in a FBDA the table cannot have LONG or NESTED columns and must be “Basic”; i.e. cannot be a nested, clustered, temporary, remote or external table. We cannot drop schemas that contain tables associated with an archive nor can we drop the tables themselves. It's not possible to move or exchange partitions with a table associated with a FBDA.

A slightly odd issue is that Datapump doesn't export the history if FLASHBACK\_TIME/SCN is specified. In 11.1 there are a raft of version specific restrictions – to the level that you can't even TRUNCATE or rename a table, or drop or rename a column; bottom line here is just don't use FBDA before version 11.2!

### Setting up FBDA with a walkthrough

So, it's now summer, Santa is worried about corruption in the Elven workshop community due to minimum wages and the nature of the seasonal work. He wants to make certain that changes to the naughty-nice register are all tracked in case elves are being bribed to amend a child's Niceness-Score...

Setup is really dead simple. There is a single Object and a System privilege to be aware of and grant. The first is “FLASHBACK ARCHIVE ADMINISTER”, a system privilege that allows the grantee to create/alter/drop/purge and generally manage a Flashback Data Archive. “FLASHBACK ARCHIVE” is an object privilege and allows the user to associate tables with the relevant archive.

One thing to note is that you can associate a table with a flashback archive with the “Flashback Archive” privilege, but need the “Flashback Archive Administer” system privilege to switch the functionality off. This is one reason that I feel there is a business role in Auditing that should own this function.

First off let's create tablespaces, schemas etc;

```
CONN / as sysdba
CREATE TABLESPACE FBDA_RETENTION_7YR DATAFILE SIZE 1G;
CREATE USER santa IDENTIFIED BY santa;
CREATE USER elves IDENTIFIED BY Elves;
GRANT CREATE TABLE, CREATE SESSION, UNLIMITED TABLESPACE TO Elves;
GRANT FLASHBACK ARCHIVE ADMINISTER, CREATE SESSION,
UNLIMITED TABLESPACE TO santa;
```

FIGURE 5.

Next, Santa creates the archive **FBDA\_7\_YEAR** and gives the elves permission to associate objects with the archive.

```
CONN santa/santa
CREATE FLASHBACK ARCHIVE FBDA_7_YEAR
TABLESPACE FBDA_RETENTION_7YR RETENTION 7 YEAR;
GRANT FLASHBACK ARCHIVE on FBDA_7_YEAR TO elves;
```

FIGURE 6.

Finally, the elves can create their table within the archive. Remember that even though the elves schema owns the table, it cannot modify the FBDA or disassociate the table from the FBDA once assigned!

```
CONN elves/Elves
CREATE TABLE naughty_nice_list
(
    child_name      VARCHAR2(100),
    santa_rating    NUMBER(2)
)
TABLESPACE USERS FLASHBACK ARCHIVE FBDA_7_YEAR;
CREATE INDEX child_name on naughty_nice_list(child_name);
Note that you can associate an existing object with an
archive using "ALTER TABLE"
ALTER TABLE CHILD_PRESENT_MAPPING FLASHBACK ARCHIVE FBDA_7_
YEAR;
```

FIGURE 7.

### Querying FBDA

Having the historic data is pretty pointless unless we can get at it. To do this we use the standard flashback querying techniques that have been about since Oracle 9i; – all that has changed is that we can go back in time and query the data “as of” any date within the retention period defined for the archive rather than only being able to go back as far as the history in the undo tablespace.

Hence you can query your data using “as of scn” or “as of timestamp” syntax, or use some of the PLSQL built-ins to set your session to be at a particular timestamp (DBMS\_FLASHBACK.ENABLE\_AT\_SYSTEM\_CHANGE\_NUMBER or DBMS\_FLASHBACK.ENABLE\_AT\_TIME)

### Getting some basic timings

Oracle's own documentation suggests that the overhead of using FBDA should be low; in reality does that stack up? There are a number of bugs that affect performance including one that can make commit performance spiral into the minutes range.

For a quick test I put together a bit of PLSQL that would perform a million inserts, updates, deletes against a table and a truncate and compared the results between the table being in an FBDA and not. Results were variable but overall inserts and updates took about the same time. Deletes took up to 40% longer and truncate performance seemed to perform particularly poorly.

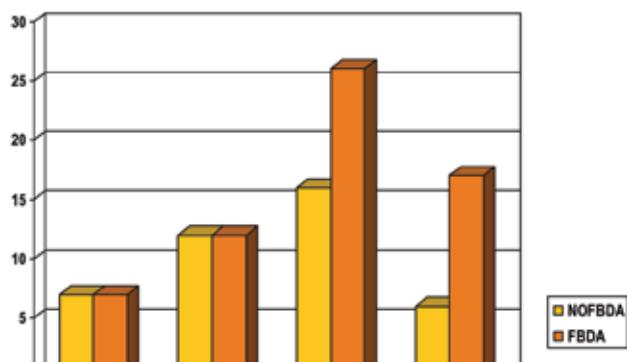


FIGURE 8. BASIC TIMINGS

For the most part, querying data from a period in the past was a comparatively slow operation. The reasons for this are two-fold. Firstly when Oracle performs its flashback query it has to examine both the “current” table along with the historic data that had been updated/deleted etc. Further, the FBDA\_SYS\_table itself is not indexed by default so out of the box you get a full table scan. It is supported though to add your own indexes to the archive table to speed retrieval, and in my example in Fig 9 I had already added an index against the NAME column and call it FBDA\_NAME to match the parent table.

By looking at the explain plan in Fig 9 we can see another reason why retrieval may be slow. There are table scans going on against SYS\_FBA\_TCRV\_83194. So far in my testing, indexes added to this table have been ignored and it's always been full scanned. Note that when running the same query, but without accessing the FBDA, the query runs in 0.01 seconds and consumes just 5 physical reads... as opposed to taking 3 seconds and 18500 physical block reads. Even with the additional index in place the FBDA query performance went from zip to 3 seconds. So, the bottom line here is that yes you can get at data going back in time, but that there may be a performance impact you want to consider.

Now, to be fair the majority of my tests didn't perform quite so poorly – Fig 9 however demonstrates why it's so important to thoroughly test new features with real systems and workloads!

>>

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```
SQL> SELECT * FROM naughty_nice_list
  2 AS OF TIMESTAMP TO_TIMESTAMP('28-10-2011 09:30:00', 'DD-MM-YYYY HH:MI:SS')
  3 WHERE child_name = 'Knowles, Lauren';
```

Elapsed: 00:00:03.00

Id   Operation		Name	Rows	Bytes	Cost	(%CPU)	Time
0   SELECT STATEMENT			2	130	5244	(1)	00:01:03
1   VIEW			2	130	5244	(1)	00:01:03
2   UNION-ALL							
* 3   FILTER							
* 4   TABLE ACCESS BY GLOBAL INDEX ROWID	SYS_FBA_HIST_83194		1	25	9	(0)	00:00:01
* 5   INDEX RANGE SCAN	FBDA_NAME		6		3	(0)	00:00:01
* 6   FILTER							
* 7   HASH JOIN OUTER			1	42	5235	(1)	00:01:03
* 8   TABLE ACCESS BY INDEX ROWID	NAUGHTY_NICE_LIST		1	15	4	(0)	00:00:01
* 9   INDEX RANGE SCAN	NAME		1		3	(0)	00:00:01
* 10   TABLE ACCESS FULL	SYS_FBA_TCRV_83194		46680	1230K	5230	(1)	00:01:03

## Statistics

```
69 recursive calls
  0 db block gets
18620 consistent gets
18527 physical reads
  0 redo size
502 bytes sent via SQL*Net to client
415 bytes received via SQL*Net from client
  2 SQL*Net roundtrips to/from client
  3 sorts (memory)
  0 sorts (disk)
  1 rows processed
```

FIGURE 9. SAMPLE PLAN FOR QUERYING AN ARCHIVE

## Bugs!

You should of course test any feature before being used in a production system and FBDA is no different with a number of interesting bugs that can trip you up. I wouldn't recommend using FBDA before 11gR2 due to the sheer number of show-stopping bugs that make it risky at best and practically unusable at 11.1 – ranging from ORA-600s, commits start taking a really long time to complete, through to really unpleasant ones where undo data is lost or the instance just crashes out. The majority of the really nasty ones are fixed by 11.2.0.2.

## Conclusion and thoughts

It's worth saying again - Just don't use this at 11gR1 as it's just too buggy. You must test this option with workload before

implementing into live. One thing I haven't mentioned is the concept of a "default FBDA" – don't bother with one; use a named one and be explicit. While Oracle says there is little or no overhead in using this option, there is, and it scales with how many objects and updates you are tracking.

Use this feature selectively against tables that you really care about tracking to reduce the performance impact.

The bottom line is that while much of the functionality in a Flashback Data Archives can be replicated using home-grown archive code, what you are paying for with the additional license is ease of use, ease of maintenance, plus the fact that it's so simple (although sometimes slow) to get back at old data. ■



# ABOUT THE AUTHOR

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Bob Mycroft is an Oracle DBA with over 17 years of experience with Oracle Technologies as developer and DBA. He works for Capgemini in their Applications-Outsourcing arm as a Senior Oracle DBA and was awarded “Oracle ACE” status in 2009 by OTN for his articles and presentations for the UKOUG.

# The Tools of Fusion: Oracle JDeveloper and Oracle ADF

# Fusion Development is such a cliché



The story goes that in the old days of movable type printing presses, where each letter was set individually, standard or common phrases were created as a single slug of metal. The sound made when setting this stereotype became known as “cliché”.

**Grant Ronald,**  
**Senior Group Product**  
**Manager,**  
**Oracle Application**  
**Development Tools**

Of course the meaning has evolved over time to refer to an overused phrase where the original meaning may even have been lost or has almost become a parody. Think of “sick as a parrot” or the fact that in any Paris movie scene you can always see the Eiffel tower in the background.

So what has this got to do with JDeveloper and developing Fusion applications like CRM? Quite a lot actually. The needs of the original typesetters sitting at a printing press are very similar to those of developers building modern IT systems. The original requirement for the cliché came from a need to do things faster, with less effort and with fewer mistakes. Now doesn’t that sound like a feature you would like in your development IDE?

#### Templates and auto complete

Oracle’s Fusion Applications are written in Java. Like any programming language there is a learning curve and some aspects of the language you might be using more regularly than others. But whether you are a novice or a Java whiz kid, JDeveloper provides a whole raft of features to make sure you write the correct code as rapidly as possible. Code templates is a feature where a quick key press will automatically bring up a template of the coding construct you need. Can’t remember the format of a case statement? Simply type “**case**” and hit **<ctrl><enter>**. Or find you spend too much time writing a try/catch block? Type “**try**” and **<ctrl><enter>** and a code template appears. You can even create your own code templates for those common coding patterns you find yourself writing time after time.

JDeveloper is even clever enough to try and help you complete the statement you are writing. As you type a class or method name, JDeveloper can present to you a list of valid options that dynamically change as you type. For example, for an Orders view object you need to get the current order. As you type the object name JDeveloper shows you the list of methods on that object. As you start to type the method name “**get**” (because you know you have to get something) the list of methods is reduced to show only those starting with “**get**”. Not only does this save you keystrokes, it helps you avoid typos and can also bring up the parameter list for the method without you having to refer to documentation. Apart from anything else, this feature is a great discovery aid. You might not know exactly which object method will meet your needs so a quick scroll of the list (and remember if a method returns an object you can also see the methods available on that object) can be a lifesaver when coding.



FIGURE 1. CODE INSIGHT SHOWING RELEVANT METHODS AS YOU TYPE

#### Getting it right

Code templates only go so far in helping you write code. You still have to fill in the blanks and there is plenty of opportunity to mess up your code, unless the code editor is busy in the background keeping an eye on you. A useful feature of the JDeveloper code editor is automatic

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syntax checking. JDeveloper will tell you if anything you type doesn't make sense. It will even offer a quick fix for your code by showing valid options to resolve the problem. For example, in Figure 2 a red wavy underline indicates a problem with the reference to the declaration of **cancelOrder** and the reference to **ORDER\_OPEN**. Moving the cursor over the indicator displays a tip telling you that the method declaration requires a semicolon on the line before, and, as shown in figure 2, that **ORDER\_OPEN** is a variable that needs to be declared.

The screenshot shows a Java code editor with syntax highlighting. A red wavy underline is under the word 'cancelOrder' in the **if** block, and another is under 'ORDER\_OPEN'. A tooltip appears over the 'cancelOrder' underline with the text 'Type or variable 'cancelOrder' not found.' The code includes static String declarations for ORDER\_COMPLETED and ORDER\_CANCELLED, and a method cancelOrder() that checks the status of an OrderRowImpl object.

```

static String ORDER_COMPLETED = "Complete";
static String ORDER_CANCELLED = "Cancelled";

public boolean cancelOrder(){
    OrderRowImpl cr = (OrderRowImpl)getCurrentRow();

    if (cr.getOrderFilled().equals(ORDER_OPEN)) {
    } else {
        return true;
    }
}

```

FIGURE 2. JDEVELOPER HIGHLIGHTING CODING ERRORS AS YOU TYPE

JDeveloper even has a code auditing feature. This means it can flag up code that is syntactically correct, but is maybe considered poor programming practice. And as with many of these features, those audit rules can be customised for your own projects to ensure specific coding best practices are being followed – just check out **Tools > Preferences**

### Managing your code

A common developer cycle is once you've written some code and trialled a few concepts, you may need to go back and tidy up some of your more esoteric method or variable names and maybe push some code you've written into a common utilities class. Again, JDeveloper is on hand to help you. Right-click on a method name and JDeveloper displays a menu of refactoring options. Chose "**Rename**" and not only can you rename your method, but every instance where that method is called will also change. Found that a method you wrote might be better pulled into the super class? Not a problem "**Pull Members Up**" will allow you to quickly move specified methods into the super class. So as you test and build your code, JDeveloper gives you the ability to easily rework that code to make it more readable and more reusable.

### Layout, formatting and making it pretty

Of course, coding is an art form, and as such, should be beautiful and pleasing to the eye as well... or is that asking too much? Regardless, at some time in the future, someone is going to have to read your code and so ensuring a consistent and easy to follow layout is a valuable aid to development.

For the haphazard coders amongst us, help is at hand in ensuring your code is formatted in a readable fashion. **<ctrl><alt>** I will layout your code with consistent indentation, nesting, brace positions and line wrapping. You'll get automatic keyword highlighting and you can even choose block highlighting to distinguish different block structures, such as an **if**, **case** or **switch** block. This last feature is an invaluable

The screenshot shows a Java code editor with color-coded blocks. The **if** block and its body are highlighted in yellow. The **try** and **catch** blocks are highlighted in pink. The **else** block is highlighted in light blue. The code itself is in white text on a black background. It includes a **getPrice()** call and a **setAttributeInternal()** call.

```

//Get the price before you change it
Number oldPrice = getPrice();

//When adding a new line you won't have an oldPrice
if (oldPrice == null) {
    oldPrice = new Number(0);
}

else {
    setAttributeInternal(PRICE, value);
    setQuantityShipped(value);
    //Need to ship the order now
    try {

    } catch (Exception e) {
        // TODO Add catch code
        e.printStackTrace();
    }
    break;
    // Need to set the order status if all was ok
    if (true) {
    }
}

```

FIGURE 3. AUTOMATIC BLOCK HIGHLIGHTING AND KEYWORD COLOURING

aid when you start nesting blocks of code and you can easily see, as shown in figure 3, that your **try catch** block for shipping an order, and the **if** statement for setting the order status, are all part of a higher-level **else** statement.

However, cleanly formatted code is only half of the story. You'll typically be writing many lines of code spread across many different files so viewing and navigating is a potential challenge. Not so with JDeveloper. A feature called code folding gives you the ability to collapse down whole blocks of code that might not be relevant to the current job in hand (see figure 4 where **getPrice** is collapsed to only show the method signature and comment). Navigation to the declaration of a method is only a right-click "**Go to declaration**" or even "**Go to JavaDoc**" away. Just think; your desk full of documentation manuals could be a thing of the past. And speaking of documentation, as a good citizen programmer you comment your code, right? Well you have no excuses not to anymore. From the top-level menu you can select **Source -> Add Javadoc Comments** allowing you to quickly document a method with its input parameters and return value. You can even add a special **TODO** comment to indicate a task that needs to be completed at a later date, and then keep track of these outstanding tasks via the task list window (figure 4).

The screenshot shows the JDeveloper interface with code folding. The **getPrice()** method is collapsed, showing only its signature and a comment. Below the code editor is a **Tasks** window listing two items: "Add catch code" and "We probably need to recalculate the total". The "Add catch code" item is marked as "High" priority and is associated with the file **ItemEOImpl.java** at line 256. The "We probably need to recalculate the total" item is also marked as "High" priority and is associated with the file **ItemEOImpl.java** at line 224.

Done	Description	Priority	File	Line
	Add catch code	High	ItemEOImpl.java	256
	We probably need to recalculate the total	High	ItemEOImpl.java	224

FIGURE 4. CODE FOLDING AND TODO TASK LIST

## Conclusion

You will possibly find that many of the user group sessions you attend that extol the virtues of developing Fusion applications with Oracle ADF and JDeveloper will focus on the declarative and “drag and drop” framework features that absolve the developer from the drudgery of coding. Of course, the reality of software development is that someone somewhere will be writing code: whether it is database triggers, Apex code, Forms PL/SQL or good old Java. Whilst Oracle ADF does give you a massive productivity boost through its declarative framework features; the same focus on productivity is still required at the coding coalface. This is where JDeveloper excels by providing a coding environment for the Fusion developer to quickly access the language constructs, application classes and methods in way that promotes clean, correct, readable and easily maintainable code. And that is definitely not a cliché! You can watch a demo of the JDeveloper IDE features described in this article at [http://download.oracle.com/otn\\_hosted\\_doc/jdeveloper/11gdemos/JDeveloperEditor/JDeveloperEditor.html](http://download.oracle.com/otn_hosted_doc/jdeveloper/11gdemos/JDeveloperEditor/JDeveloperEditor.html)



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Grant Ronald is a Senior Group Product Manager working for Oracle's Application Development Tools group responsible for Forms and JDeveloper where he has a focus on opening up the Java platform to Oracle's current install base. Grant is author of the “Quick Start Guide to Oracle Fusion Development: JDeveloper and Oracle ADF”, published by McGraw-Hill.

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# Harnessing the Power and Performance of GlassFish Tuning for High Availability

Oracle GlassFish Server, the reference implementation of the Java EE specification, is highly regarded for being a fast, lightweight application server. Tuned improperly, however, and performance gains quickly evaporate. In this article we will show how to tune your GlassFish environment for maximum performance and availability. We will show how to address the key performance challenges such as load), scalability and safety margins to ensure high availability. Detailed best practices regarding server, JVM and operating system tuning, as well as critical monitoring and testing strategies, will also be discussed.

René van Wijk, ♠ Oracle ACE

## Some notes up front

Some concepts that can affect performance are:

- **Load** - the number of concurrent sessions, that are measured as, for example, the number of transactions and requests per a certain time span. We have to determine the performance capacity of a particular configuration and specify the resources that are required to sustain a specified load. A first step would be to determine the load a single processor can handle, by setting up a test environment that uses the application and load.
- **Scalability** - transaction rate measured on a CPU
  - Vertical Scalability* - percentage gain per additional CPU. By running a series of tests in which CPUs are added gives insight in the vertical scalability characteristics of the system. In this case the back-end systems (such as database resources) must be properly tuned as well such that they do not skew the results.
  - Horizontal Scalability* - percentage gain per additional server (also provides fail-over capabilities).
- **Safety Margins**
  - High Availability Requirements - if the system must cope with failures, such as losing a server, the environment must be sized such that the load can be handled. Usually this means that servers must not run at their peak, there must still be a safety margin, when one of the servers fails.

## Java EE systems

When talking about tuning a first start would be the application itself. The book - Effective Java written by Joshua Bloch, gives the

reader an excellent insight in how to make the most effective use of the Java programming language and its fundamental libraries. It consists of seventy-eight items, each of which conveys one rule. The rules capture practices generally held to be beneficial by the best and most experienced programmers. The items are loosely grouped into ten chapters, each concerning one broad aspect of software design.

When designing servlets some suggestions are:  
 To minimise the use of synchronisation and not to use the single thread model. In the default servlet multi-thread model, a single instance is created for each GlassFish Server instance, i.e., all requests share the same servlet instance. This can lead to thread contention when synchronised blocks are used. The reason to use synchronised would be if we had some class variables that are shared and modified, so it is in general bad practice to use such variables in servlets. Initialise expensive resources by using the `init` method.

## HTTP Sessions

One thing to note is that session creation is not free. This means that if we do not need a session, we should not create one. Also when a created session is no longer needed we should invalidate the session. The reason for this is that session objects consume memory, i.e. they increase the number of live objects and as such lead to longer garbage collections.

When we do need to create HTTP session objects, we have to keep these objects small not only for the garbage collector, but also to keep response times small. With small we mean below 7 kilobytes.

Avoid large object graphs in a **HttpSession**. When a change is made in the object graph and **setAttribute** is called, the whole graph is serialised and replicated to a secondary server when we are using a cluster. This replication adds to the response time.

When using enterprise beans some suggestions are:

- Cache as many beans as possible. Stateful session bean instances are created as they are needed to service client requests. Between requests these instances reside in a bean-specific cache in the active state, ready for the next request.
- Stateless session bean instances are maintained in a pool. This pool improves performance, because a client request can be handled immediately by any free initialised EJB instance. The same rule applies as for the caching: pool as many beans as possible.

Beans in pools and caches consume memory, which can lead to a performance degradation for the garbage collector, so we have to find an optimum. In this case we have to weigh the number of requests against cache and pool demands. Tuning involves charting the behavior of the cache and pool over a period of time. For example, if too many passivations are happening in the case of a stateful bean and there is room on the JVM heap, we can increase the **max-cache-size** and the **cache-idle-timeout-in-seconds** by using the **glassfish-ejb-jar.xml** deployment override.

To improve performance of enterprise beans we have to use high-performance beans as much as possible. This means that we have to resort to stateless sessions beans or message driven beans and forget about the others (stateful session beans and entity beans). Another thing to note is that enterprise beans are not simple Java objects, i.e. they are components with semantics for remote call interfaces, security and transactions. So we have to keep in mind not to decompose an application into too many enterprise beans.

Enterprise beans can either have remote or local interfaces. Calls to remote interfaces require marshalling arguments, transportation of the marshalled data across a network, unmarshal the arguments and dispatch at the receiving end, i.e. remote interfaces introduce some significant overhead. Local interfaces are more efficient as it does not require the argument marshalling etcetera. In general, pass-by-value semantics are used to call remote interfaces. When the clients are local to the enterprise bean we can use call-by-reference semantics. This can be accomplished by using **pass-by-reference** in the **glassfish-ejb-jar.xml** file.

When enterprise beans use transactions it is in general preferred to use container-managed transactions for better performance and consistency. When methods do not need any transactional requirements it is beneficial to declare those methods with **NotSupported** or **Never** transaction attributes. When multiple methods are called in a single transaction it is beneficial to use Required as the transactional attribute, this makes sure the same transaction will be used. When JDBC resources are used in a transaction that uses more than one resource (also JMS for example). It is beneficial to use last agent optimisation, which allows one of the resources in a distributed transaction as a one phase commit. The overhead is much higher for JDBC resources when used in a distributed transaction than for a message queue. To take advantage of last agent optimisation we configure the

JDBC resource as a one phase commit resource and leave the JMS resources as they are. It is also advisable to only use XA type data source when needed, i.e. when two or more data sources are going to participate in a transaction.

## Operating system

Some operating system tweaks are worth considering when we do not want to run against system restrictions:

### Packet loss minimisation

The operating system buffers must be large enough to handle incoming network traffic while the application is paused during garbage collection. Usually UDP (User Datagram Protocol) is used in order to transmit multicast messages to server instances in a cluster; to limit the need to retransmit UDP messages the size of the operating system buffers must be set appropriately to avoid excessive UDP datagram loss.

### Maximum number of open file descriptors

Most operating systems handle sockets as a form of file access and use file descriptors to keep track of which sockets are open. To contain the resources per process, the operating system restricts the number of file descriptors per process. Linux limits the number of open file descriptors per process, by default this is equal to 1024.

### TCP/IP

On some systems the default value for the time wait interval is too high and needs to be adjusted. When the number approaches the maximum number of file descriptors per process, the application's throughput will degrade, i.e. new connections have to wait for a free space in the application's file descriptor table.

### Timesources

Linux has several timesources to choose from; the fastest being TSC (time stamp counter) and is used by default. However, if during start-up inconsistencies are found, Linux switches to a slower timesource. This can have a negative performance impact.

### Network interface card (NIC)

Configure the network card at its maximum link speed and at full duplex.

### Swapping

Swapping, also known as paging, is the use of secondary storage to store and retrieve data for use in RAM. The Linux memory handler manages the allocation of physical memory by freeing portions of physical memory when possible. All processes use memory, but each process does not need all its allocated memory all the time. Taking advantage of this fact, the kernel frees up physical memory by writing some or all of a process' memory to disk until it is needed again. The kernel uses paging and swapping to perform this memory management. When pages are written to disk, the event is called a page-out, and when pages are returned to physical memory, the event is called a page-in. A page fault occurs when the kernel needs a page, finds it does not exist in physical memory because it has been paged-out, and re-reads it in from disk. When the kernel detects that memory is running low, it attempts to free up memory by paging out. Though this may happen briefly from time to time,

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if page-outs are plentiful and constant, the kernel can reach a point where it is actually spending more time managing paging activity than running the applications, and system performance suffers.

### Large pages

Large pages are essentially blocks of contiguous physical memory addresses that are reserved for a process - Large pages improve performance of applications that access memory frequently. When large pages are used the application uses the translation look-aside buffer (TLB) in the processor more effectively. The TLB is a cache of recently used virtual-to-physical address space translations stored in the processor memory. To obtain data from memory, the processor looks up the TLB to find out the physical addresses (RAM or hard disk) that hold the required data. In the case of large pages, a single entry in the TLB could represent a large contiguous address space and thereby potentially reducing the TLB look-up frequency and avoiding frequent look-ups in the hierarchical page table stored in-memory.

## Tuning the JVM

When using GlassFish (or any other application server for that matter) it is beneficial to tune for application throughput, i.e. when using JRockit we can use:

```
-jrockit -Xms1024m -Xmx1024m -Xgc:throughput
-XX:+UseCallProfiling -XX:+UseLargePagesForHeap
```

By choosing throughput as the optimisation strategy the following defaults are present:

- The nursery size (**-Xns**) is automatically sized to 50% of free heap.
- The compaction is configured as  
**-XXcompaction:abortable=false, percentage=6.25, heapParts=4096, maxReferences=299900.**
- The thread local area size is configured as  
**-XXtlasize:min=2k, preferred=16k, wastelimit=2k.** Note that the preferred size depends on the heap size and lies between 16k and 64k.

Additional tuning may be necessary when compaction causes long garbage collection pauses. To find out the impact compaction has on the garbage collection pause time, we can run a flight recording and examine the compaction pause parts of old garbage collections. In general, compaction pause time depends on the compaction ratio (**percentage** or **externalPercentage** and **internalPercentage**) and the maximum number of references.

In multi-threaded applications where threads allocate lots of objects, it might be beneficial to increase the TLA size. Caution must be taken, however, to not make the TLA size too large as this increases the fragmentation and as a result more garbage collections need to be run in order to allocate new objects.

When using HotSpot we can use:

```
-server -Xms1024m -Xmx1024m -XX:NewRatio=2 -XX:+UseParallelGC
-XX:ParallelGCThreads=2 -XX:MaxGCPauseMillis=200
-XX:GCTimeRatio=19 -XX:+UseParallelOldGC -XX:+UseTLAB
-XX:LargePageSizeInBytes=2048k -XX:+UseLargePages
```

In both configurations we have enabled large pages. Note that large pages must be configured in the operating system.

## Tuning the server

We can improve the performance of a server by adjusting a few deployment and server configuration settings. When using the Oracle GlassFish Server a performance tuner is provided to help to reach an optimal configuration. The performance tuner performs a static analysis of server resources and throughput requirements.

### Deployment

Our first step is to disable auto-deployment. Note that when auto-deployment is enabled the reload poll interval can have an impact on performance. To disable auto-deployment, open the admin console and navigate to the domain node and click the applications configuration tab (disable the auto deploy option). Another option to disable is dynamic reloading. In this case the server periodically checks for changes in deployed applications and automatically reloads the application with the changes. To disable dynamic reloading of classes, open the admin console and navigate to the domain node and click the applications configuration tab (disable the reload option).

### Logging

In general, writing to log files slows down performance and increases disk access. To change the log level for the server in the admin console, navigate to the configurations, configuration-name, logger settings page. For production systems a log level of warning suffices in most cases.

### Web container

The web container settings can be adjusted (in the admin console, configurations, configuration-name, web container). The session timeout determines how long a session is maintained by the server. The default is 1800 seconds. Setting a large value for the session timeout degrades performance by causing the server to maintain too many sessions in the session store.

### EJB container

The EJB container caches and pools enterprise beans for better performance (in the admin console, configurations, configuration-name, EJB container). The difference between a pooled bean and a cached bean is that pooled beans are equivalent. Cached beans, on the other hand, contain state that is specific for its user.

By default, the pool grows on demand. This can be controlled with the **steady-pool-size** and **max-pool-size** deployment descriptor parameters. The stateless session bean pool can also shrink in size. A bean instance will be removed if it has been idle for more than the value of **pool-idle-timeout-in-seconds** which is 600 seconds by default. The default value of 0 for **steady-pool-size** is fine for most stateless session bean deployments. We may wish to set **steady-pool-size** higher if the stateless session bean is expensive to initialise so that we force the initialisation of a number of bean instances at deployment time, and we ensure that pool shrinking does not discard these beans. The default value of 32 for **max-pool-size** could be somewhat low under heavy load. The number of beans to be created or deleted is controlled by the **resize-quantity** attribute. By default, the **resize-quantity** is set to 8 and needs to be adjusted when the maximum pool size changes.

Stateful session bean instances are created as they are needed to service client requests. Between requests these instances reside in a bean-specific cache in the active state, ready for the next request. The size of the cache is limited by the **max-cache-size** element in the **glassfish-ejb-jar.xml** deployment descriptor file. The default value is 512. So long as the application never requires more than **max-cache-size** instances of the stateful session bean at any given time to service all concurrent clients, there is no contention for the cache and performance is optimal. If we limit the number of beans in the cache, GlassFish may be forced to manage the cache in a fairly active manner using the following rules:

- If the cache is full, bean instances that are not being used at that moment for client requests are subject to passivation. Setting the **cache-idle-timeout-in-seconds** parameter has no effect on this rule because the server must make room for additional instances.
- If bean-managed transaction demarcation is used, a transaction may not be committed or rolled back at the end of a business method call. This leaves the bean instance associated with the transaction, pinned in the cache, and not eligible for passivation. Applications that keep transactions open between stateful session bean calls do not scale well and are difficult to manage.
- If the cache is full and all instances are currently pinned in the cache fulfilling client requests an exception is thrown, the server will not block and wait for an instance to become available for passivation. If container-managed transaction demarcation is used, this condition cannot occur if the **max-cache-size** setting is higher than the maximum number of request threads configured for the thread pool and the processing of each client request uses a single stateful session bean.
- Passivation logic is controlled by the **victim-selection-policy** and **cache-idle-timeout-in-seconds** elements in the descriptor. The default setting for **victim-selection-policy**, not recently used (NRU), passivates beans only when the number of active beans approaches the **max-cache-size** setting. An alternative **victim-selection-policy** value, least recently used (LRU), passivates based on both the maximum cache size and when the bean has not been used for longer than the value of the **cache-idle-timeout-in-seconds** setting. The NRU strategy is lazy; the LRU strategy is eager. Although the LRU setting can be a convenient way of enforcing idle timeouts on the resources the objects encapsulate, it requires the container to keep track of the bean's access time and maintain an ordered list that gets updated after each bean access. Unless we have a good reason to need idle timeouts strictly enforced, most applications should retain the default NRU algorithm.
- The **removal-timeout-in-seconds** is the timeout value for passivated instances. Passivated instances that have been unused for longer than this timeout are subject to removal from the backup store. The default value is 5400 seconds.

The application should always call a **@Remove** method to delete the active bean instance from the cache when a client is through using the instance. Failure to call a **@Remove** method leaves the bean instance in the active state and consumes one slot in the cache, requiring eventual passivation during cache management to make room for additional client beans.

The **cache-idle-timeout-in-seconds** setting is very

important in cache management. The bean is subject to passivation once the timeout expires, assuming the LRU algorithm is being used, and may be removed from storage completely after the **removal-timeout-in-seconds** passes. The default timeout value, 600 seconds, may be too short if users are likely to pause between requests for a longer period of time. When using stateful session beans with a web application, it might make sense to set this timeout value equal to the **HttpSession** timeout value for the web application, for example, to be more consistent. Otherwise, review the business requirements and set the **cache-idle-timeout-in-seconds** to the lowest value possible that still meets the application's requirements.

Message-driven beans provide a bridge between JMS and EJBs by listening on JMS destinations and invoking EJBs. Message-driven beans are pooled in a manner very similar to stateless session beans. The initial and maximum number of message-driven bean instances can be controlled by using the **steady-pool-size** and **max-pool-size** parameters in **glassfish-ejb-jar.xml**. Limiting the number of instances provides a simple mechanism to throttle the processing of incoming JMS messages. We may wish to do this to match the availability of resources used by a message-driven bean, for example, the number of JDBC connections in a connection pool.

### Network listener

For machines that use only one network interface card, it proves beneficial to set the network address equal to the IP address of the machine, instead of using the default **0.0.0.0**. If an IP address is specified the server will make one less system call per connection. If the machine has multiple network interface cards, we need to create a network listener for each network interface card.

The max connections (default 256) on the HTTP tab controls the number of requests that a client can make over a keep-alive connection. This value should be adjusted based on the number of requests a typical client makes. The number of connections specified is divided equally among the keep alive threads. When domain service name (DNS) look-up is enabled the server performs DNS look-ups whenever a client accesses the server. If the server responds to many requests the load can be reduced by disabling the DNS look-up. The timeout option specifies the maximum time in seconds that a server holds an HTTP keep alive connection open. A client can keep a connection open so that multiple requests can be serviced by a single network connection. One thing to note is that the number of open connections is limited for a particular server, i.e., a high number of open connection prevents new clients from connecting. The default value for timeout is 30 seconds.

### Thread pool

Two parameters are of interest max thread pool size and min thread pool size:

- The max thread pool size parameter specifies the maximum number of simultaneous requests the server can handle. The default value is 5. When the server has reached the limit, it defers processing new requests until the number of active requests drops below the maximum amount. In practice, clients connect to the server and do not complete their requests. In these cases, the server waits the time specified by the timeout parameter. The thread count value must be adjusted to meet the load and the length of time for an average request. Suitable request max thread pool sizes

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range from 100 to 500, depending on the load. If the system has some extra CPU cycles to spare, we can increase the thread count until the performance saturates.

- The min thread pool size parameter specifies the minimum number of threads the server initiates upon start-up. The default value is 2. The min thread pool size parameter specifies a hard limit for the maximum number of threads that can run simultaneously. By specifying the same values for the minimum and maximum threads allows the server to use an optimised thread pool. This configuration should be considered unless the load on the server varies significantly.

### Resources

When using database-intensive applications the JDBC connection pools must be tuned. Connection pools contain a number of live database connections that are reused in order to reduce the overhead of creating and destroying database connections. To obtain connection pool statistics we have to enable it first (configurations, configuration-name, monitoring).

The following attributes are monitored:

- The number of connections that failed validation (`numConnFailedValidation`).
- The number of connections that have been used (`numConnUsed`).
- The number of connection free in the pool (`numConnFree`). When this value is constantly zero the number of connections in the pool must be increased as requests are waiting in order to full-fill their requirements, such as, for example obtained data from the database.
- The number of connections in the pool that have timed out (`numConnTimedOut`).

Parameters that can be tuned are:

- Pool size**
  - Initial and minimum pool size - the size of the pool when it is created and the minimum number of connections in the pool.
  - Maximum pool size - the maximum number of connections in the pool.
  - Pool resize quantity - number of connections to be removed when the idle timeout expires.
- Timeout**
  - Max wait time – the amount of time the code requesting a connection will wait before getting a connection timeout. The default is 60 seconds. A value of zero forces an indefinite wait. To improve performance set max wait time to zero. This will block the thread until a connection becomes available. It also allows the server to track elapsed wait time such that performance can be increased.
  - Idle timeout – the time in seconds a connection can be idle in the pool. After this time the pool can close the connection. In general, the idle timeout should be kept shorter than the timeout configured on the database server, such that unusable connections are not accumulated in the pool.

## Server deployment

When talking about server deployment we have to ask ourselves about the cluster structure, i.e. how many servers can run a specific machine, and how many machines do we need to meet a particular service level agreement; which comes down to one word: scalability.

We have two scaling options: vertical and horizontal scaling. Vertical scaling relates to adding more CPUs to a machine. To better utilise the server hardware we can add more GlassFish instances to the machine that could lead to increased application throughput. To determine if this is indeed the case we need to benchmark. Benchmarking for scalability is about measuring resource utilisation. Good scalability means that service levels can be maintained while the workload is increased. If an application does not scale well, it is not fully utilising the hardware. Consequently, throughput will degrade. Ideally, a linear load increase should lead to a linear degradation in service levels and performance. Linear scalability can be approached when so-called share nothing clusters are used. The nodes provide the same functionality and know nothing about other nodes in the cluster (no HTTP session replication). In this case, the computing ability of the cluster increases almost linearly as more nodes are added to the cluster, if the back-end information systems, such as a database, are powerful enough.

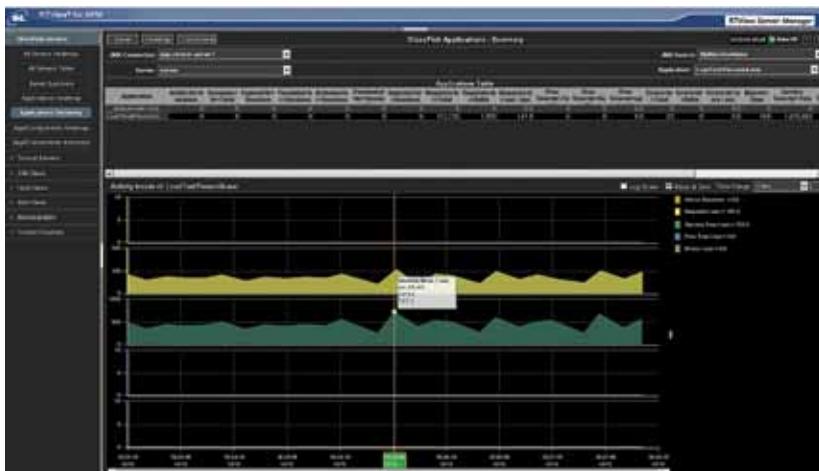
Applications that 'share nothing' are usually sharing state through the database. The application-tier can scale as far as when the database becomes a bottleneck. In general, relying on a single shared resource will eventually cause contention for that resource and thus limit the scalability. Caching is a good resolution. When we cache data at the application-tier we avoid calls to the database (and also avoid relational data to object data conversions).

Caching solutions, such as Coherence, provide different kind of caching, i.e., replicated and partitioned. Replicated does not scale well when cache writes are involved as the data needs to be replicated across all the nodes in the grid. A partitioned cache, on the other hand, scales very well when cache writes are involved as data ownership is spread throughout the cluster (the system automatically rebalances the data when the number of nodes in the grid changes - we do not need to decide on how to partition the data, it comes out of the box). Another plus is that access to the cache means at most one network trip, this in order to maintain linear scalability. An optimisation on read-access can be made when data can be obtained locally (sticky access) in this case a hybrid solution such as the near cache can be applied.

Horizontal scaling relates to adding more machines to the environment, which gives a fail-over capability that we cannot get with vertical scaling. A good approach is to combine both scaling techniques to obtain better CPU utilisation and fail-over capability.

## Monitoring

To monitor we can use the real-time visibility tool (RTView) from SL Corporation. The tool visualises the run-time management beans GlassFish provides, for example, it gives insight as a function of time in the number of requests being processed, and the time it takes to process requests for a particular server in the cluster.



We can also view the same information on an application level or how a particular servlet in the application is performing. ■



## ABOUT THE AUTHOR

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René is a graduate of the Delft University of Technology. Since then he has been working with Electromagnetism, Minimum Description Length, Statistical Independence Coherence, Hibernate, JRockit, Spring and Weblogic Servers. René transfers his knowledge and experience regularly through training, publications, and presentations at seminars and conferences.

See you at UKOUG 2012... save the date!

# Using STREAMS to Disable a Trigger for a Single Session

With gratitude to Pam Welford for inviting me into the world of Oracle streams.

Eter Pani, Senior Oracle DBA, TSYS

The ability to gain control at a lower level of granularity within Oracle's internals is probably the dream of most DBAs working within 24\*7 environments. Unfortunately, due to the breadth and complexity of the technology – as any DBA will know, these opportunities are not always available, however sometimes we are presented with the opportunity to drill down, investigate and exploit acute areas of Oracle's architecture. In my case one of these opportunities presented itself with the chance to explore the possibility of trigger control, more specifically the concept of disabling a trigger for a single session.

If we search online for something along the lines of: "how to disable a trigger in a single session?" - within a short amount of time innumerable links to various articles and papers are returned, yet not one with any real information or technical solutions in line with the actual question.

One of the most relevant and accurate solutions that can be found reads as follows:

**"Code the trigger to check for a global variable or for a context variable to not execute the logic when it's set to a specific value; That way any session can be used to perform data patching when required by setting the variable."**

Based on personal experience, in essence I would say that this attitude is correct, however it still needs to be expanded upon and a number of areas require additional consideration. For example;

- 1) Code (in this case – the trigger) could be managed by a different team or even different companies
- 2) Ascertaining the global context is by no means a 'cheap' operation – of course this is my own opinion and no doubt opinions differ from my own, nevertheless no one wants operations executing on their database that could waste available resources and could otherwise be avoided.

With the above two points in mind, this was an approach that I was uncomfortable with and therefore started to delve deeper and look at alternatives.

Before we start speaking about solutions, let's elaborate more on the issues that prompted me to start this investigation in the first place.

The environment that I am currently working on uses databases as a consolidated resource, i.e. different clients use the same

database schema, access is to the data dissected through the use of Oracle Row Level Security (aka; VPD – Virtual Private Database). In environments like this it is paramount to minimise the 'knock-on effect' to all clients that could be unintentionally caused when making adjustments in the database that were only intended for a single client.

An example of a common scenario that frequently causes issues would be patching data in tables linked by various, relatively complex trigger mechanisms and constraints, where changes made to rows in one table will result in one or more triggers firing, causing changes in other tables that were not intended or required.

Constraints can easily be deferred at session level by issuing the following command, but wouldn't it be useful would it be if oracle provided the same level of control over triggers?

```
ALTER SESSION SET CONSTRAINTS = DEFERRED;
```

Further information on deferring constraints can be found on Tim Hall's website (<http://www.oracle-base.com/articles/8i/ConstraintCheckingUpdates.php>).

Prior to writing this article, when our application development teams faced a scenario similar to that previously mentioned, they were forced to stop all database activity, disable triggers, update the data and then re-enable the triggers. This approach was both technically laborious and disfavoured by the business as extended periods of downtime are a huge issue.

My initial investigation into a better solution was almost hopeless due to a lack of documentation or articles that had (or in this case - had not) been published on the subject. The only promising lead came from the name of a procedure in the DBMS\_DDL package – "SET\_TRIGGER\_FIRING\_PROPERTY".

Oracle documentation (Oracle® Database PL/SQL Packages and Types Reference) states the following:

---

**"This procedure sets the specified DML or DDL trigger's firing property whether or not the property is set for the trigger. Use this procedure to control a DML or DDL trigger's firing property for changes:**

- Applied by a Streams apply process
- Made by executing one or more Streams apply errors using the EXECUTE\_ERROR or EXECUTE\_ALL\_ERRORS procedure in the DBMS\_APPLY\_ADM package.
- Applied by a Logical Standby apply process”

By default if a ‘normal’ session makes a change then a trigger is set to “fire once”, however if the change was initiated by the streams Apply process then the trigger will not fire.

The name of the parameter “FIRE ONCE” in the procedure “SET\_TRIGGER\_FIRING\_PROPERTY” comes from the replication mechanism, when the trigger fires once on the master site but doesn’t fire on the respective slave site. For a basic replication configuration this makes sense, the trigger generates changes on the master site that would be replicated by the Streams process, if any triggers on slave site did fire then they would double any changes and brake data consistency. Even if the original purpose of this parameter is replication it still can be used differently. To progress my investigation, I needed to somehow mimic or fake the Oracle Apply process with an aim to order to stop any triggers from firing.

Standard Streams architecture is composed of three processes: CAPTURE, PROPAGATION and APPLY, I concentrated my efforts looking at the Oracle Streams Apply process but by populating the incoming queue for this process manually. Due to this artificial source of changes we will in fact only need to consider the Apply process. Skipping the main replication function of Streams gives right environment and a degree of flexibility to run generic scripts, placing these scripts into the queue messages and then processing the scripts using a Custom Apply Handler.

To test this concept, I create two separate schemas. The first containing modifiable objects:

```
CREATE USER JAMES identified by v14d1m1r QUOTA UNLIMITED ON USERS;
GRANT CREATE SESSION TO JAMES;
GRANT CREATE TABLE TO JAMES;
GRANT CREATE TRIGGER TO JAMES;
GRANT CREATE SEQUENCE TO JAMES;
CREATE SEQUENCE JAMES.LIBRARY_SEQ;
```

This schema was then populated with a number of simple objects, a single row is inserted into the main table ‘FOLDERS’, simply to ensure that the trigger did in fact work and populate the ‘BOOKS’ table.

```
CREATE TABLE FOLDERS
  (ID NUMBER NOT NULL PRIMARY KEY, PARENT_ID NUMBER, NAME varchar2(30))
TABLESPACE USERS;
/
CREATE TABLE BOOKS
  (ID NUMBER NOT NULL PRIMARY KEY, FOLDER_ID NUMBER NOT NULL, DESCRIPTOR varchar2(4000))
TABLESPACE USERS;
/
CREATE OR REPLACE TRIGGER FOLDERS_ITRG
  AFTER INSERT ON FOLDERS FOR EACH ROW
  BEGIN
    INSERT INTO BOOKS (ID, FOLDER_ID, DESCRIPTOR)
      VALUES (LIBRARY_SEQ.NEXTVAL, :new.ID, 'Empty Folder');
    END order_info_insert;
/
INSERT INTO FOLDERS VALUES (LIBRARY_SEQ.NEXTVAL, 0 , 'Root')
/
```

ID	PARENT_ID	NAME
1	0	Root

ID	FOLDER_ID	DESCR
2	1	Empty Folder

As we can see above, the trigger fires and a second row appears in the child table - ‘BOOKS’. Everything is as expected.

Next a separate user (ANNA) was created and granted a number of unconventional privileges (see below). This user essentially has a subset of the permissions granted to the generic Streams Administrator. In my own opinion, this subset of permissions is a safer approach as fewer potentially ‘destructive’ privileges that are otherwise not required have not been provisioned.

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```
CREATE USER ANNA identified by i0s1f QUOTA UNLIMITED ON USERS;
GRANT CREATE SESSION TO ANNA;
GRANT SELECT,INSERT,UPDATE,DELETE ON JAMES.FOLDERS TO ANNA;
GRANT SELECT,INSERT,UPDATE,DELETE ON JAMES.BOOKS TO ANNA;
GRANT SELECT ON JAMES.LIBRARY_SEQ TO ANNA;
GRANT CREATE TYPE TO ANNA;
GRANT CREATE PROCEDURE TO ANNA;
GRANT CREATE ANY EVALUATION CONTEXT TO ANNA;
GRANT CREATE ANY RULE SET TO ANNA;
GRANT CREATE ANY RULE TO ANNA;
GRANT EXECUTE ON SYS.ANYDATA TO ANNA;
GRANT EXECUTE ON SYS.DBMS_AQ TO ANNA;
GRANT EXECUTE ON SYS.DBMS_AQADM TO ANNA;
GRANT EXECUTE ON SYS.DBMS_STREAMS_ADMIN TO ANNA;
GRANT EXECUTE ON SYS.DBMS_APPLY_ADMIN TO ANNA;
```

We can't directly program the apply process to run a generic script for us. Therefore to progress our requests using the apply process we need to put them into a queue. To avoid any problems with existing application queues I created and configured a separate queue for my own investigation.

```
BEGIN
  dbms_streams_adm.set_up_queue(
    queue_table => 'NOTRG_QTBL',
    storage_clause => ' TABLESPACE USERS ',
    queue_name => ' NOTRG_QUE',
    queue_user => 'ANNA');
END;
/
```

By default the Apply process runs as the Streams Admin user but in this case I have set the 'Apply' user (ANNA) manually and therefore will have to configure the following additional elements. We need to grant access on the NOTRG\_QUE queue to the Apply user, Create a subscriber who is allowed to read messages from the queue and associate this subscriber with the Apply User.

```
BEGIN
  -- Grant access to the queue
  SYS.DBMS_AQADM.GRANT_QUEUE_PRIVILEGE(
    privilege => 'ALL', queue_name => 'NOTRG_QUE', grantee     => 'ANNA');
  -- Create the agent to enqueue messages
  SYS.DBMS_AQADM.CREATE_AQ_AGENT(
    agent_name => 'NOTRG_ENQ');
  -- Associate the agent with the database user
  DBMS_AQADM.ENABLE_DB_ACCESS(
    agent_name => 'NOTRG_ENQ', db_username => 'ANNA');
END;
/
```

Up until this point the majority of this work is documented in the Oracle® Streams Advanced Queuing User's Guide but from here on we start deviating from this and looking at more solution specific implementation.

The next step was to create a special 'Type' object to hold my bespoke scripts. This is a basic Type that will support scripts up to 4000 characters in length. If you require something more complicated like dependency between multiple scripts then this will need to be considered when designing the Type.

```
CREATE OR REPLACE TYPE SCRIPT AS OBJECT (
  p_script      VARCHAR2(4000));
/
```

System created rules and rulesets use the built-in context SYS.STREAMS\$\_EVALUATION\_CONTEXT. In this scenario we could not use this, therefore generated our own. Streams use contexts for a number of reasons: LCR transformation in subsets and user-defined rules, enqueue and execute directives for the apply process and evaluation rules that reference external variables or database objects. In our case we use table aliases to match a message with a row in a queue table.

```
DECLARE
  v_table_alias      SYS.RE$TABLE_ALIAS_LIST;
BEGIN
  v_table_alias := SYS.RE$TABLE_ALIAS_LIST( SYS.RE$TABLE_ALIAS('tab', 'NOTRG_QTBL'));
  DBMS_RULE_ADM.CREATE_EVALUATION_CONTEXT(
    evaluation_context_name => 'NOTRG_EVAL_CONTEXT', table_aliases => v_table_alias);
END;
/
```

Each Streams process has to have at least one positive ruleset with one positive rule, otherwise this process would be useless and unable to process any messages. Each message has to pass through at least one positive rule to be processed.

In this example we have just one rule and expect all messages to be checked positively by it. Each message has to be checked for a defined condition. To define this condition we use a special function that takes 'ANYDATA' as an input parameter. This function analyses incoming messages and returns a positive number for only those messages of a specific type. Again this is another point where you can further develop your application logic and extend the selection criteria, for example based on the number returned by this function you could run some statements by one apply process and others by a secondary apply process. Some statements could even be propagated to different databases.

```
CREATE OR REPLACE FUNCTION NOTRG_ACTION (p_event IN ANYDATA)
RETURN NUMBER
IS
  v_msg      SCRIPT; -- our precreated type
  v_rc       NUMBER; -- return code variable
  v_type_name VARCHAR2(61); -- type variable
BEGIN
  v_type_name := p_event.GETTYPENAME;
  -- we check that the input message is of our custom USER type
  IF v_type_name = 'SCRIPT' THEN RETURN 1;
  ELSE RETURN 0; -- if message has different format then we will not process it by our handler
  END IF;
END;
/
```

Now that the above function has been created we need to define the rule for using it. We only want to process only messages where the 'NOTRG\_ACTION' function returns values greater than 0. The rule can't be assigned to the Streams process directly; it has to be part of the Ruleset. In this example we have created the ruleset 'APPLY\_CUSTOM\_RS' for only one rule; 'APPLY\_ACTION'. Next we create create a rule and wrap it into the positive ruleset:

```
BEGIN
  DBMS_RULE_ADM.CREATE_RULE_SET(-- create ruleset
    rule_set_name      => 'APPLY_CUSTOM_RS', evaluation_context => 'NOTRG_EVAL_CONTEXT');
  DBMS_RULE_ADM.CREATE_RULE( -- create rule using our evaluation function
    rule_name        => 'APPLY_ACTION', condition  => 'NOTRG_ACTION(tab.user_data) > 0 ');
  DBMS_RULE_ADM.ADD_RULE(-- put rule into our ruleset
    rule_name        => 'APPLY_ACTION ', rule_set_name      => 'APPLY_CUSTOM_RS ');
END;
/
```

At this stage most important procedure is created—the handler that will execute our commands and convert them into real actions. Considering non-LCR messages are being used, we can't rely on the standard Apply process as it doesn't know what to do with such messages. For non-LCR message processing, Oracle provides the ability to use Custom Apply Handlers, which in this case will allow us to extract a script from the message and call it.

```
CREATE OR REPLACE PROCEDURE CUSTOM_APPLY_HDLR ( p_evt in SYS.ANYDATA)
IS
  v_rc PLS_INTEGER;  v_type_name      VARCHAR2(61);  v_script SCRIPT;
BEGIN
  v_type_name := p_evt.GETTYPENAME;
  if v_type_name='ANNA.SCRIPT' then - check that we process our script message
    v_rc := p_evt.GETOBJECT(v_script);
    EXECUTE IMMEDIATE v_script.p_script; -- execute the script
    COMMIT; -- autocommit mode for simplifying the logic
  end if;
END;
/
```

The final step is to create and start a Private Apply Process in order to consolidate each element previously created into a single system.

```
BEGIN
  DBMS_APPLY_ADM.CREATE_APPLY( - create the apply process using
    queue_name      => 'NOTRG_QUE', - our queue
    apply_name      => 'NOTRG_APPLY',
    rule_set_name   => 'APPLY_CUSTOM_RS', - our custom ruleset
    message_handler => 'CUSTOM_APPLY_HDLR', - our procedure as DML handler
    apply_user      => 'ANNA', -- our APPLY user
    apply_captured  => false);
  DBMS_APPLY_ADM.SET_PARAMETER( -- ignore apply errors, optional step
    apply_name      => 'NOTRG_APPLY',
    parameter      => 'disable_on_error',
    value          => 'n');
  DBMS_APPLY_ADM.START_APPLY( -- start apply process
    apply_name      => 'NOTRG_APPLY');
END;
/
```

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To check that the apply process has been created correctly and is functioning properly the following script can be run:

```
SELECT 'apply' AS name, status, error_message, status_change_time,
       (SELECT COUNT(*) FROM dba_apply_error WHERE apply_name='tctdbs_apply') num_errors
  FROM dba_apply
 WHERE apply_name='NOTRG_APPLY'
/
```

Great we have a working system, let's test it!

The below script will be used to simply insert a new folder into JAMES's schema;

```
"INSERT INTO JAMES.FOLDERS SELECT JAMES.LIBRARY_SEQ.NEXTVAL, 0 , ''No Trigger' FROM JAMES.
FOLDERS"
```

To place this script into the apply queue, the following is run:

```
DECLARE
  v_enqopt      DBMS_AQ.ENQUEUE_OPTIONS_T;
  v_mprop       DBMS_AQ.MESSAGE_PROPERTIES_T;
  v_enq_eventid RAW(16);
  v_message     SCRIPT;
  v_recipients   DBMS_AQ.aq$recipient_list_t;
BEGIN
  -- wrap our script into custom type
  v_message := SCRIPT('INSERT INTO JAMES.FOLDERS
                        SELECT JAMES.LIBRARY_SEQ.NEXTVAL, 0 , ''No Trigger'' FROM JAMES.FOLDERS ');
  -- associate the message with the specific agent that has privileges to enqueue
  v_mprop.SENDER_ID := SYS.AQS_AGENT('NOTRG_ENQ', NULL, NULL);
  -- mark that the message can be dequeued by Apply process
  v_recipients(1) := SYS.aq$agent('NOTRG_APPLY', NULL, null); -- send it to apply proc
  v_mprop.recipient_list := v_recipients;
  -- place all elements together into the queue
  DBMS_AQ.ENQUEUE(
    queue_name      => 'NOTRG_QUE',
    enqueue_options => v_enqopt,
    message_properties => v_mprop,
    payload         => ANYDATA.CONVERTTOOBJECT(v_message),
    msgid          => v_enq_eventid);
  commit;
END;
/
```

For a short period of time this message can be seen in the queue by querying the AQ\$<QUEUE\_TABLE> view. The state should show as either 'READY' (i.e. ready for processing by the Apply process) or 'PROCESSED' (i.e. the row has been inserted and is now waiting for a garbage collection job to erase the message from the table).

```
SELECT QUEUE, MSG_ID, MSG_STATE, MSG_PRIORITY FROM AQ$NOTRG_QTBL;
QUEUE                         MSG_ID
MSG_STATE        MSG_PRIORITY
-----
NOTRG_QUE          A856A17F98F2004EE043AC197F4F004E      PROCESSED      1
```

As result of the script execution we see the following:

```
> select * from JAMES.folders;
   ID  PARENT_ID NAME
-----
   1      0 Root
   3      0 No Trigger

> select * from JAMES.books;
   ID  FOLDER_ID  DESCRIPTOR
-----
   2      1          Empty Folder
```

We can see that the record inserted using the queue has not made the trigger fire. Our original objective has now been achieved—suppressing the trigger for a single session.

This method may look like an overcomplicated approach to managing the control over triggers for a single session but as we all know, a right answer is not always a simple one is not always right.

Furthermore, this level of control over The Streams environment gives us a powerful instrument for our application requirements. The inclusion of additional logic in the Streams rules can define exactly how the statement should be executed or dealt with, again as previously mentioned we could even put the scripts into our own dependency tracing using the user created type.

A major practical application of this work relates to data migration scenarios, when we have to populate tables with an enormous amount of data avoiding as many constraints and checks as we can (in my case I use the same mechanism to avoid not only trigger firing but also VPD policy checks). ■



## ABOUT THE AUTHOR

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Eter has been working with Oracle databases for 15 years. His wife best understands his single-minded passion for working with all-things Oracle was his first love.



## EDITED BY

**Matthew Daniels**  
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Junior DBA from 2010 at TSYS. Worked as asp.net web developer moving on to working with Oracle.



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# On the Wire Compression

For many releases now, the database has been silently compressing data on the network. When you array fetch data from the database, SQL\*Net will write the first row in its entirety on the network. When it goes to write the second row however, it will only transmit column values that differ from the first row. The third row written on the network will similarly be only the changed values from the second row, and so on. This compression therefore works well with repetitive data - of which we have a lot typically! Additionally, the compression works even better with data that is sorted by these repeating values so that the repeating values are near each other in the result set.

**Tom Kyte, Senior Technical Architect, Oracle Corporation**

We can observe this rather easily – I'll start by creating some data to play with:

```
ops$tkyte%ORA11GR2> create table t
  2  as
  3  select *
  4    from all_objects;
Table created.

ops$tkyte%ORA11GR2> begin
  2      dbms_stats.gather_table_stats( user, 'T' );
  3  end;
  4 /
PL/SQL procedure successfully completed.
```

Now, this newly created table is about 8MB in size and consists of 1,031 blocks in my database (your numbers might be a little different – but you'll observe the same effects if you run this example yourself). Additionally, this table stores about 70 rows per block – there are about 72,000 rows on 1,031 blocks. What I'm going to do next is select the entire contents of the table over the network using SQL\*Plus with autotrace enabled to see the amount of data transferred:

```
ops$tkyte%ORA11GR2> set arraysize 15
ops$tkyte%ORA11GR2> set autotrace traceonly statistics
ops$tkyte%ORA11GR2> select * from t;
72228 rows selected.

Statistics
-----
 5794  consistent gets
 8015033 bytes sent via SQL*Net to client
 53385 bytes received via SQL*Net from client
 4817  SQL*Net roundtrips to/from client
 72228  rows processed
```

I'd like to point out that I started by setting the arraysize in SQL\*Plus to 15 – which is the default size used by SQL\*Plus so my setting the value explicitly wasn't really necessary – I just wanted to show the reader explicitly how many rows we were retrieving at a time.

Now, in looking at the numbers we can see that about 8MB of data was transferred from the server back to the client. That represents our table. Furthermore, we can see that 5,794 blocks were accessed (the consistent gets). Previously I said that there were 1,031 blocks in my table – that might raise the question "How or why did we perform 5,794 IO's on a table that has only 1,031 blocks?!" The answer to that has to do with how the database server retrieved data for this query. This query entailed a simple "FULL SCAN" which would allow the database server to retrieve the data as needed from the table directly. In order to retrieve the first row of this result set, the database server would only have to retrieve the first block, get the first row, and return the row's data to the client. In order to get the first 15 rows, all the server has to do is retrieve the first block of the blocks retrieved by the query from the buffer cache, read 15 rows from the block and return them. That would be one consistent get. In order to retrieve the next 15 rows, the database server would read the block out of the buffer cache again, get rows 16 through 30, and return them. To get the next 15, it would repeat the process. Since the block contains about 70 rows, we would have to read each block about five times, sometimes less, sometimes more! If you look at the consistent gets again and multiply the number of blocks in the table by a number close to five, you'll see that fact played out. We did about five times as many consistent gets against the table as we had blocks in the table.

So, in short, we did 5,794 IO's and transferred about 8MB of data. Now, let's see what happens if we modify the query slightly. I will add an order by clause to the query. The order by clause will sort the data by the TIMESTAMP column. Now, a couple of facts about this TIMESTAMP column are of note. Firstly, it is NOT NULL for every row in the table. Secondly, it is always 19 characters wide. Thirdly, more than 50% of the rows in the table have the same value (it repeats a lot). And lastly, of the remaining 36,000 rows, there are only about 1,500 unique values; it really repeats a lot. So in short, it is a not null, wide field with a ton of repetition. So, let's see what happens when we run this modified query:

```
ops$tkyte%ORA11GR2> select * from t order by timestamp;
72228 rows selected.

Statistics
-----
 1031 consistent gets
 3427630 bytes sent via SQL*Net to client
 53385 bytes received via SQL*Net from client
 4817 SQL*Net roundtrips to/from client
 72228 rows processed
```

That is a very different set of statistics from the ones obtained previously. It is the same data entirely. The only difference in the query is that the latest version specifies a sort order. The two numbers that pop out immediately are the consistent gets and the amount of data transferred. We went from 8MB of data down to about 3.4MB of data! This difference is due to the repeating TIMESTAMP attribute. Every time we array fetched 15 rows, we sent the TIMESTAMP column value approximately once (sometimes a little more than once) but nearly once per array fetch. The consistent gets also dropped considerably which has nothing to do with SQL\*Net, but rather the way this query had to be processed. In order to get the first row out of this result set, the database had to have read the entire table and sorted it. (Remember, there are no indexes in place. Furthermore, even if there were, the database, by default, would not use an index to read an entire table!). This means that, in order to get the first row, all 1,031 blocks were read and sorted in temporary space – either in memory or on disk. Then, to retrieve rows from this result set, we would be reading from temporary space, not from the buffer cache. A read from Temp is not a logical IO. It is not a consistent get. Hence the consistent gets stop at 1,031 as the entire query is read from Temp space.

Now, you may have heard a rule of thumb (ROT) pertaining to query tuning. It is one I've written myself in the past and it goes something like this:

*In general, when tuning a query, you are looking for approaches that will reduce the logical IO's the query performs. That will, in general, lower the CPU used by the query and tend to lower the possible physical IO's it might have to perform.*

Note however the use of the phrase "In general", for that is important. Here we have an example of a query that needs 5,794 consistent gets and another query that retrieves the same exact data (albeit in a different order but that doesn't matter since the first one didn't specify any order) using only 1,031 consistent gets. But ask yourself the following question, "Which of these two queries is more "tuned", the one without an order by or the one with an order by?" I would definitely vote for the one without an order by! This is just one example where a particular rule of thumb is not true (this is one reason why I'm not a huge fan of ROT! You have to be very careful and know when it applies and when it does not apply).

Going one step further with our query, what if we added a little more "order" to it. We know that the OWNER attribute in ALL\_OBJECTS repeats a lot; I have about 35 distinct owners in my database. Since TIMESTAMP repeats a lot (and half of the rows have the same value), we can hypothesise that within a given TIMESTAMP value there would be a lot of rows with the same OWNER value. If we execute the following query:

```
ops$tkyte%ORA11GR2> select * from t order by timestamp, object_type, owner;
72228 rows selected.

Statistics
-----
 1031 consistent gets
 3280011 bytes sent via SQL*Net to client
 53385 bytes received via SQL*Net from client
 4817 SQL*Net roundtrips to/from client
 72228 rows processed
```

We can observe that the amount of data transferred dropped from approximately 3.4MB to approximately 3.2MB. Adding the extra order by did, in fact, have a measurable effect. But again, I would ask you to ask yourself which query is most "tuned" at this point? Unless you are on a dial up 56k modem (remember those from the 1990s?), I would say the first query is still likely the most tuned.

Now I'd like to see what happens if we increase the array fetch size. In my experience, in general again, the "best" array fetch size has been a number between 100 and 500. There are exceptions to this assertion, where a larger array size could be useful and that is usually in a bulk data loading process (where the array is going from the client to the server). So, let's try out an array size of 100 and re-execute the first query:

```
ops$tkyte%ORA11GR2> set arrayszie 100
ops$tkyte%ORA11GR2> select * from t;
72228 rows selected.

Statistics
-----
 1842 consistent gets
 7482943 bytes sent via SQL*Net to client
 8362 bytes received via SQL*Net from client
 724 SQL*Net roundtrips to/from client
 72228 rows processed
```

Ok, that was pretty dramatic. Our consistent gets went from 5,794 down to 1,842! How did that happen? Well, if you remember the original description of how the data for this query would be fetched, it should make sense. When we asked for the first 100 rows, the database server retrieved the first block from the cache and obtained approximately 70 rows from it. Then it retrieved the second block and obtained approximately 30 more rows. It only read the first block ONCE, not five or six times. In order to get rows 101-200, the database server retrieved the second block again and obtained approximately 40 rows from it, after which it retrieved the third block and obtained approximately 60 rows. It read the second block twice, not five or six times. When asked to retrieve rows 201-300m the database server might read the third block again, but it might not; we may have exhausted the third block already. In short, we might read every odd block just once (sometimes twice) and every even block just twice (but probably never more than twice). If you look at the number of blocks in the table (1,031) and the number of blocks accessed (1,842) the math works out pretty close.

Additionally, you can see the amount of data transferred dropped from 8MB down to approximately 7.4MB. This result was caused by two things. First of all, the number of roundtrips to the server decreased a lot due to the larger array fetch size. So the SQL\*Net

&gt;&gt;

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## Technology: Tom Kyte

protocol overhead dropped as well. Every time the database server responded to a fetch call, there were some extra bits and bytes sent over the wire to describe the data that was coming back. If we make fewer fetch calls, we'll have less protocol overhead. Secondly, there is the chance that in a fetch call of 100 rows data will repeat more often than in a fetch call of 15 rows. There were more opportunities for compression to kick in.

However, what you should take away from this discussion, so far, relates to query tuning. Notice that we have, in fact, "tuned" this query. We've reduced the logical IO's down to approximately 30% of the original. And we did so without touching the SQL! We did have to modify the way the application interacted with the database, but that is true of many tuning sessions. If you want big changes in performance, you'll be diving into the application and looking at how it interacts with the database, not just tweaking a query here and there. The correct way to tune this particular query was not to add an order by, but to modify the array fetch size.

Now let's see what happens with our other two queries given this larger array fetch size:

```
ops$tkyte%ORA11GR2> select * from t order by timestamp;
72228 rows selected.

Statistics
-----
 1031  consistent gets
2907819  bytes sent via SQL*Net to client
 8362  bytes received via SQL*Net from client
   724  SQL*Net roundtrips to/from client
 72228  rows processed

ops$tkyte%ORA11GR2> select * from t order by timestamp,
object_type, owner;
72228 rows selected.

Statistics
-----
 1031  consistent gets
2760200  bytes sent via SQL*Net to client
 8362  bytes received via SQL*Net from client
   724  SQL*Net roundtrips to/from client
 72228  rows processed
```

As you can see, the first query dropped from approximately 3.4MB down to 2.9MB and the second from 3.2MB to approximately 2.7MB. This result displays a modest improvement just like the first query. And it is an improvement that was caused by exactly the same circumstances, less protocol overhead and the potential for more repeating data. To summarise these numbers:

	No Order 15	Some Order 15	Very Ordered 15	No Order 100	Some Order 100	Very Ordered 100
Bytes Sent	8MB	3.4MB	3.2MB	7.4MB	2.9MB	2.7MB
% size of original	100%	43%	41%	93%	36%	34%
Consistent Gets	5794	1031	1031	1842	1031	1031

Now, you may be asking "What would happen if we increased the array size even more? If going from 15 to 100 was so good, what would going from 100 to 1,000 do for me?" In short, not much. I re-ran the above SQL statement with an array fetch size of 1,000 and the numbers were as follows. (I've replaced the array fetch size of 15 numbers with the array fetch size of 1,000 numbers)

	No Order 1000	Some Order 1000	Very Ordered 1000	No Order 100	Some Order 100	Very Ordered 100
Bytes Sent	~7.4MB	~2.9MB	~2.7MB	7.4MB	2.9MB	2.7MB
% size of original	92%	35%	33%	93%	36%	34%
Consistent Gets	1105	1031	1031	1842	1031	1031

As you can see, increasing the array fetch size by an order of magnitude had little to no effect on the size of the data transferred. I observed about a 1% drop, as opposed to the 7% drop we saw when going from an array fetch size of 15 to 100. Diminishing marginal returns definitely kicked in. Furthermore, we saw a relatively modest drop in the number of consistent gets. When we changed the array fetch size from 15 to 100, we dropped our number of consistent gets by about 4,000. When we changed the array fetch size from 100 to 1,000, we dropped our number of consistent gets by about 700.

So, in summary, we have seen how the SQL\*Net protocol compresses data, on the wire, by removing repetitive data. I am not suggesting you go out and add order by clauses to all of your SQL statements, however! You should just be aware of this fact. You'll find most of your result sets will be able to take advantage of this feature naturally. For example:

```
select dept.dname, emp.empno, emp.ename, emp.sal
  from scott.emp, scott.dept
 where emp.deptno = dept.deptno
   and dept.loc = 'BOSTON'
 order by dept.dname, emp.ename
```

This query would naturally take advantage of this compression as DEPT.DNAME would tend to repeat. In fact, if you look at your application queries, you might find most of them probably have an order by clause on them and the order by action tends to group repeating values together.

We've also seen how the array fetch size can have an impact on certain types of queries, queries that can read the data right out of the table as it is requested, as opposed to queries that tend to build the result set in Temp and retrieve it from there. The array fetch size can dramatically lower the consistent gets for those types of queries.

Lastly, we've seen how ROT (rules of thumb, also referred to as best practices!) can be misleading sometimes. They are never universally true; they apply only in certain cases. It takes a bit of understanding how things work in order to apply them successfully. ■



## ABOUT THE AUTHOR

**Tom Kyte**

Senior Technical Architect, Oracle Corporation

Tom Kyte is a Senior Technical Architect in Oracle's Server Technology Division. Tom is the Tom behind the AskTom column in Oracle Magazine, answering people's questions about the Oracle database and its tools (<http://asktom.oracle.com/>). He is also the author of Expert Oracle Database Architecture (Apress, 2005/2009), Expert One on One Oracle(Wrox Press, 2001/Apress 2004), Beginning Oracle Programming (Wrox press, 2002/Apress 2004), and Effective Oracle by Design (Oracle Press, 2003). These are books about the general use of the database and how to develop successful Oracle applications.

- We are delighted to announce that Tom Kyte will be joining us this year at...

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# Delivering Software Projects Ahead of Schedule with Test-on-Demand

The principle of Test-on-Demand is to execute automated tests (functional and regression) whenever you want in any environment on-demand.

**David Hunt,**  
Independent Director

Test-on-Demand enables testing to focus on delivering the technology for business transformation by increasing the efficiency and effectiveness of the software development process while reducing risks.

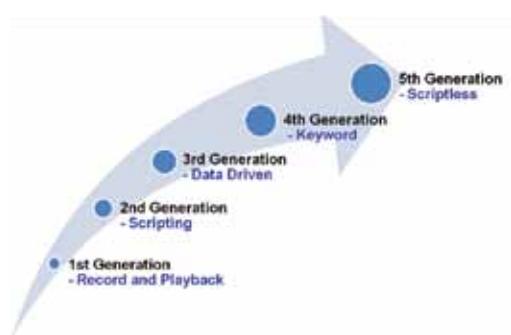
**Why use test automation?**  
 Change is critical to business innovation and enterprises often face the dilemma of balancing costs, resources and business risks when rolling out business transformation underpinned by technology. The CIO is more than ever being pressured to deliver measurable results for the business such as greater effectiveness and greater efficiency with fewer resources. By implementing software test automation correctly you can significantly increase the speed and accuracy of the testing process, provide a higher Return on Investment (ROI) from software projects, become more agile allowing you to cope with change more frequently and speed up project delivery; all while reducing risks.

The 3 key drivers for change are summarised below:

Driver for change	Caused by
1. Business Drivers	<ul style="list-style-type: none"> <li>• Changed business processes</li> <li>• M&amp;A / Reorganisation</li> <li>• New product / Vendors</li> </ul>
2. Compliance Drivers	<ul style="list-style-type: none"> <li>• Governance</li> <li>• Risk Management</li> <li>• Compliance</li> </ul>
3. Technology Drivers	<ul style="list-style-type: none"> <li>• Maintenance</li> <li>• New functionality</li> <li>• Upgrades</li> <li>• (Global) roll-outs</li> </ul>

These change events impact the lifecycle of most enterprise solutions.

How has test automation evolved?



## 1st Generation – Record and playback

The Record and Playback approach uses tools that record the actions of a tester in a manual test, and allow tests to be run unattended for many hours each day, greatly increasing test productivity and eliminating the tedious repetition of manual testing. However, even small changes to the software under test require that the test be recorded manually again. Therefore this first generation of tools is not efficient or scalable and ROI is never realised.

## 2nd Generation – Scripting (Use / Re-use of functions in test scripts)

Scripting, a form of programming in computer languages used in software test automation, alleviates many issues with capture/ playback method. However, the developers of these scripts must be highly technical and specialised programmers who work in isolation from the testers actually performing the tests.

Scripting is best suited for GUI testing and doesn't lend itself easily to embedded, batch, or other forms of systems. As changes to the software under test require complex changes to the associated automation scripts, maintenance of ever-larger libraries of automation scripts becomes an overwhelming challenge. The ROI using this approach is difficult to achieve as well.

### 3rd Generation – Data driven scripts/functions

Data-driven testing is often considered separately as an important development in test automation. This approach simply but powerfully separates the automation script from the data to be input and expected back from the software under test. While this approach greatly extends the usefulness of scripted test automation, it requires stable processes to be defined so cannot be used early in the SDLC. In addition the huge maintenance chores required of the automation programming staff remain. The test automation footprint is often 20-25%; if it is any higher then ROI cannot be realised.

### 4th Generation - Action word/keyword scripts/functions

This is a functional test automation system based on the concept of creating test cases from re-usable business components.

The keyword based approach ensures that the maintenance is performed at the keyword level. Any change to a keyword is reflected in all the places where it is being used. This is still quite a low-level approach to building reusable assets though.

Using this approach some customers have managed to implement test automation successfully. However, executives are still reticent to sanction spending on what is perceived to be a high-risk, high reward venture. The main issue is that these frameworks are often developed from scratch and can take up to 12-18 person months development with no guarantee of success.

### 5th Generation – Scriptless or test inspection

With scriptless test automation a test analyst does not need to create an automated test script. Neither does a test automation developer need to create action word functions to implement an action word test case. It is, however based upon an evolution of the keyword based test design and automation approach.

Whilst this technology is a great enabler, Infuse Consulting has invested considerably and built upon 5th generation principles with a more sophisticated and cost-saving evolution that has enabled it to develop and deliver to its customers an automated “Test-on-Demand” service incorporating advanced test inspection.

### So what is Test-on-Demand?

Often automated test cases can only be executed on the environment they were created on because of compatibility issues with object repositories or the time to modify scripts and functions. So, although they execute tests quickly in the system test or system integration test environment, they are hardly, if ever, used within the development environment from where 50% of software faults originate (see diagram below).

Once faults are found within the test environment, the costs of conformance are between 5-10 times of finding this in development.

If faults are found in production then costs of conformance rise to 50 times or higher compared to detecting faults earlier in the development cycle.

The principle of Test-on-Demand is to execute tests when you want in any environment. Test-on-Demand incorporates service excellence, next-generation technology from Infuse and process in which automated test cases are rapidly created, easily maintained and can be executed within any environment i.e. development, system test, system integration test, pre-production and production using the same scripts with no modifications at all.

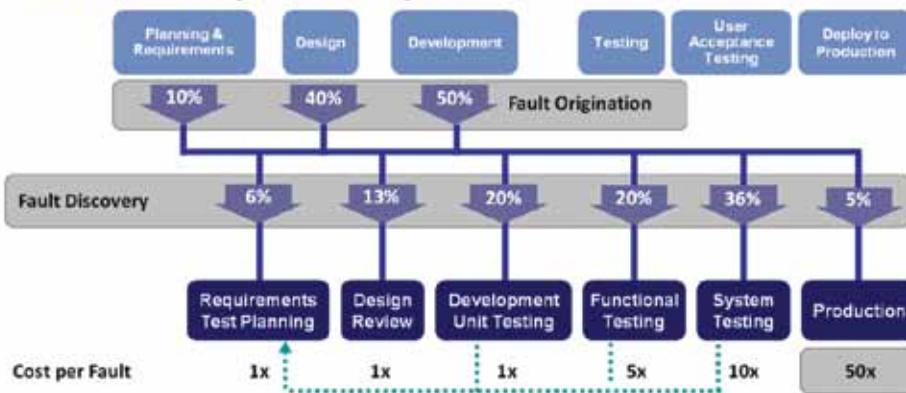
So for releases from development to testing, Infuse recommends an automated “Intake” test set. An Intake test set is a subset of end-to-end business process tests executed in the development environment on-demand. These test cases determine the minimum level of quality development that is acceptable for your business.

If the tests pass, then the release is taken into the formal testing phase for automated validation. If the tests do not pass then the defects are found, captured and fixed in the development environment. As they are fully automated, the cost of execution is minimal, fast and the quality consistent. More importantly - the cost of conformance is less (at least one-fifth of the cost of finding it in the testing environment, reporting and examining a defect and then fixing it).

When the service is mature (within 3-6 months) and in full-flow the Infuse Test-on-Demand service can often enable you to run full automated tests in development within 2 hours and certainly in no more than 24-hours, thereby working well with continuous integration environments.

Such quality gates can only be applied this effectively and efficiently using the Infuse automated Test-on-Demand approach, as recommended by Oracle's Quality Assurance team. >>

### Software Development Lifecycle



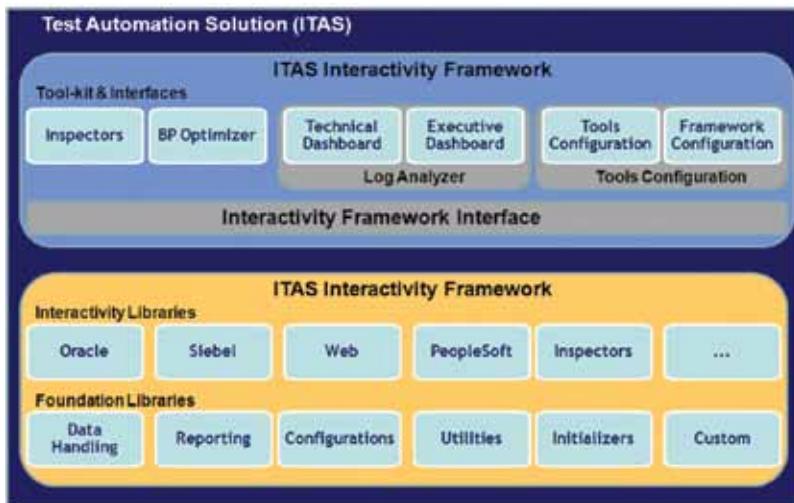
Source: Carnegie Mellon University

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## Technology: David Hunt

### Is there a better way?

Until now, test automation approach and technology has meant that automated tests have normally been at least one release behind, and manual tests are only automated once a business process is fully tested manually several times. Tradition has also meant test automation is used for regression testing at the end of the release.



The Test-on-Demand methodology and technology breaks that mould and enables businesses to have automated test scripts in sync with their current release and have the ability to automate testing within the development cycle. This not only rapidly accelerates ROI significantly but makes test automation work within a collaborative agile framework.

Test-on-Demand is fully integrated with market-leading testing platforms and works out of the box for:

- Oracle Siebel
- Oracle E-Business Suite (Oracle Financials)
- Oracle PeopleSoft
- Oracle JD Edwards EnterpriseOne (planned)
- Oracle Hyperion
- Web / Web 2.0
- PowerBuilder

... thereby dramatically accelerating your Return on Investment in these tools.

### Critical components

Critical to the success of the delivery of Test-on-Demand is ITAS - Infuse Test Automation Solution. The ITAS utility consists of the following components:

- Foundation libraries - for handling data, business level reporting, exception handling and test initialisers
- Interactivity libraries – application specific libraries (plug-ins) that contain all the technical information to drive a test case
- Interactivity Interface – the XML interfaces that allow the libraries to talk to the tool-kit and interfaces
- Tool-kit and Interfaces comprising:
  - Application Inspector – The Inspector that creates all the get, set and verify components for the application under test
  - BP Optimizer – The Business Process Optimizer that enables reusability and speeds-up execution

- Log Analyzer – For debugging and executive level reporting of test results
- Configuration – For configuring the tool-kit and interfaces for specific applications

Test-on-Demand uses ITAS to rapidly create robust, reusable test cases that are then executed using market leading test tools.

The ITAS framework helps the tester create all the action objects for a given GUI technology to create automated tests out-of-the-box that can then be dragged-and-dropped together to create test cases.

Test-on-Demand using the ITAS architecture is the ability to assemble business processes on the fly via components. Components are simply building blocks used to assemble different business processes. The components don't change with each business process test script; it is the order in which they are placed that determines the different script flows. Using components, subject matter experts can quickly create multiple user scenarios, validate each one, and optimise the business process flow without ever having to touch any procedural code or keywords.

### How does Test-on-Demand work?

The initial step is to use ITAS to inspect the application to create the Component Libraries that map to the Application under test. It doesn't matter to what level the customisation has taken the application away from its Vanilla state; the Inspector can handle this and will create a setup of components to get values, set values and verify values on a form.

Once a library of components has been created by the Inspector this is imported into the test management tool repository. The components are now visible and can be used to drag and drop into robust business process tests in a matter of minutes. Business process tests can be further consolidated into single components for use in other tests. For example – you may have dragged-and-dropped 10 components together for the “sales order” business process.

Now you can compile this test into one component and reuse it across other tests rather than dragging and dropping components all the time. This speeds up execution and enables re-use much like an object orientated framework would. The tests are now available to add to your “Test-on-Demand” test set.

Execution takes place utilising test tools which acts as an engine to drive the test script, providing a much more detailed and targeted series of reports specifically for your business.

### Summary and conclusion

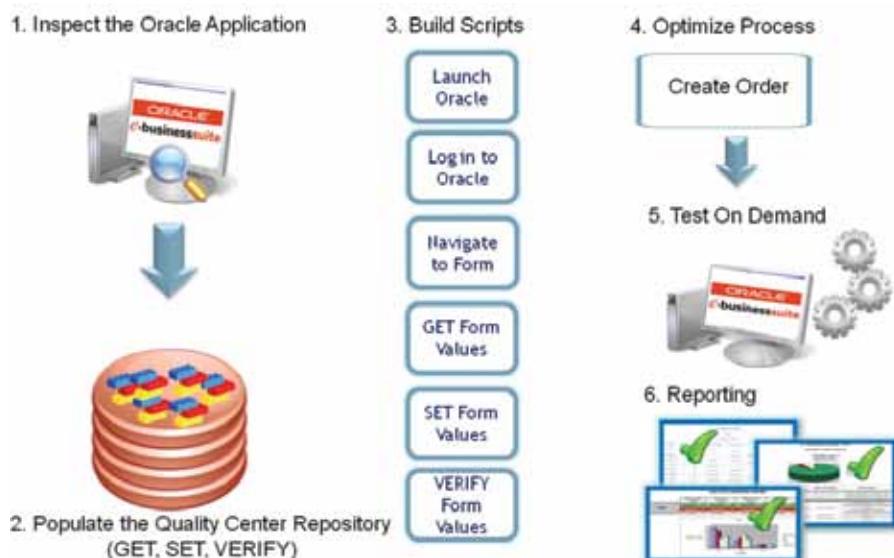
In the world of dynamic software, which changes every day to adapt to customer demands, the quality is always of prime concern, especially if the consequences of software failure could have serious detrimental impact on your organisation.

The next generation of Test-on-Demand services is well proven to deliver rapid and significant measurable Return

on Investment whilst both reducing your business risk and improving the agility of your software delivery capability. Test-on-Demand is a groundbreaking approach that truly helps the CIO and QA Manager deliver added value for their organisation to drive better efficiencies and effectiveness for their software projects.

### Key benefits

- Increase efficiency of the software development process by:
  - Reducing time to market
  - Reducing cost of testing
  - Reducing effort of testing
  - Supporting more frequent release cycles
- Increase the effectiveness of the software development process by:
  - Finding defects earlier in the software lifecycle
  - Allowing the business to add more functionality sooner
  - Testing more often with the same or less effort
  - Improving the release delivery process
- Complements HP Application Lifecycle Management (HP Quality Center, HP Performance Center). ■



### ABOUT THE AUTHOR

**David Hunt**  
Independent Director

David Hunt is an independent director providing services to several customers, including Infuse Consulting, the leading Oracle Gold Partner and HP Gold Partner specialising in software test automation solutions for Oracle applications, and The CIO Partnership who provide World Class CIOs on a portfolio basis to clients who have a part-time or temporary need for access to highly skilled CIOs.

# Testing Times

Throughout my involvement with Siebel projects across the last 7 years the question that is most often asked by clients when discussing the subject of testing is what exactly is the difference between System Testing and User Acceptance Testing or UAT?

Helen Peebles,  
CRM Solutions Manager  
Enigen UK Ltd

Whilst it may seem obvious that UAT requires the involvement of end users, pinpointing any finer differences seems to cause much confusion and can lead to inappropriate decisions being made about exactly when to start including end users in test execution and what is required in terms of producing appropriate test documentation for each test phase. My own testing experience includes suggestions from other Project Team Members that end users might be responsible for system testing and that system-testing documents be re-used during UAT.

In this article I hope to illustrate why such approaches are usually inappropriate and how best to handle these two distinct phases of testing to achieve success.

## 1. System Testing

The main purpose of System Testing is to verify that each system included in the overall project scope is working as expected.

By 'system' I of course mean each individual application that is included in the entire project solution. For a Siebel implementation this will include Siebel itself although there may also be an OBIEE/Analytics implementation taking place and Siebel may be required to integrate with other applications for example; an ERP application for order fulfilment and invoicing or Quick Address Software for address verification processes. Each individual application that is being newly implemented or re-configured as a result of the project requirements will need to be included in the System Testing phase.

Each of the individual applications is tested in isolation to ensure that the features and functions of that application are in line with the functional requirements drawn from the business requirements. So how is this approached?

System Testers should be responsible

for reviewing the functional designs for the system to determine specific test cases ensuring each specified feature is adequately covered. Depending on the implementation methodology for the project the functional designs can vary from extensive functional specifications to ad hoc design discussions with other members of the project team. Depending on the scope of the project the System Test team may need to be large or small. The important point is that the System Testers will perform an analysis of the system design to create the appropriate test documentation based on exactly what the system is supposed to do in response to a variety of triggers; manual user inputs, automated inputs such as workflow processes and, possibly, data loads. The System Testers will take each feature or function in turn and consider it in relation to positive inputs, or what the outcome should be if the correct and expected input is provided, and negative inputs, or what the outcome should be if an incorrect or unexpected input is provided.

To perform this role System Testers should be experienced and practised in the art of testing as designing tests based on functional designs is not particularly easy if you haven't done it before and should ideally have some knowledge of the system in question as this will help them to produce informed test cases and test scripts based on how they already know the system behaves in certain circumstances and what typical defects might present themselves given the 'right' triggers. In my experience the end users within a project don't have the skills needed to cope with these role requirements and so, at this stage, it usually isn't appropriate to seek testers from the end user base.

System Testers are not usually concerned with the end to end business process flows that users will execute in the system, during which a large number of individual system features and functions may be invoked. Instead they will examine in some depth each of the

described features and functions to ensure that each is working as required. End users are, of course, very concerned with end to end business processes and can therefore find it strange to break a system down into its' component parts for test purposes. This can seem like too technical an exercise for most users and so gaining their engagement at this stage is probably going to be tricky.

Given that, in most projects, each application is delivered into System Testing in a piecemeal manner with only some features made available by the Development Team in each release, System Testers must respond to the build plan accordingly and prepare for testing in a similarly fragmented manner. If System Testers were to require a fully completed end-to-end business process to be configured and released to the test environment they could find themselves idle across a number of releases. This is not an optimal approach as each release usually allows for some degree of testing even if such testing might seem meaningless to an end user.

End users may also find the System Testing documentation inaccessible as the test cases and test scripts prepared by the System Testers are likely to be written in reasonably technical language and may include SQL queries if data loads are being included in the scope. As the System Testers are required to exhaustively verify system behaviours each test script is likely to include a number of repeated steps where the tester makes one small change in the input trigger to see if the expected outcome is achieved. Let's look at an example of a System Test script to see the type of language and repetition used:-

The sample test script in Figure 1 is verifying the behaviour of the Account Address MVG field in the Account List applet in Siebel. The tester is repeating steps to ensure that the field behaviours are expected given slightly different data inputs; for example when no address is selected, when one address is selected, when two addresses are selected. Notice that the language of the test script assumes knowledge of the Siebel application, referring to features such as 'pick shuttle applet' and 'MVG field'. The test script is guiding the tester to perform a deep test on one small feature in the Siebel application based on a specific detail in the functional design which might read

something like this:-

'The system should prevent the user from removing the primary address for an account once selected'.

Finally, System Testers will be appreciative of the fact that early test execution is likely to uncover many defects, some which may halt the continuation of testing until an emergency release is deployed to the test environment. The piecemeal and repeated execution of test cases and test scripts is quite normal for a seasoned System Tester but could cause frustration and loss of confidence in end users who may find this the perfect opportunity to spread the word amongst their colleagues about how unreliable the new system is. My advice is to minimise end user exposure to the test environment until a more stable release is available for them.

## 2. User Acceptance Testing

The main purpose of User Acceptance Testing is to validate that end-to-end business processes can be successfully executed through the entire solution. The entire solution will include each of the systems and their integrations included in the scope of the project.

This of course means that, prior to UAT, each of the systems have been tested and verified by the System Testers and integrations have also been tested and verified. Integration testing is usually wrapped up within System Testing and referred to as SIT or System and Integration Testing.

The UAT team should always consist of business users and each business function that will be impacted by the project should be represented within the team.

UAT is non-technical testing and should be focussed on business process execution. Ideally, the project will have mapped out the 'To-Be' business processes that the solution is aiming to deliver and it is these processes that are to be validated during UAT. This can be achieved by considering each business process scenario and converting it to a test scenario and corresponding test cases all of which are described in business terminology as described in figure 2.

Step ID	Step Description	Expected Outcome
T5_EX_001	Verify that the 'Address' MVG field is displayed on the Account List Applet.	The field exists as expected
T5_EX_002	Verify that the field is read only.	The field is read only as expected
T5_EX_003	Invoke the pick address shuttle applet from the 'Address' MVG field and verify that there are no records displayed in the 'Selected' pane.	The pick address shuttle applet can be invoked and the 'Selected' pane displays no records.
T5_EX_004	Verify that the 'Remove' and 'Remove All' buttons are disabled between the 'Available' and 'Selected' panes and the 'Add' button is enabled.	The buttons are displayed as expected.
T5_EX_005	Add the first address provided on the test case to the 'Selected' pane using the enabled 'Add' button.	The required address can be located, selected and added.
T5_EX_006	Verify that the 'Primary' flag is automatically set for the selected address in the 'Selected' pane.	The 'Primary' flag is auto set as expected.
T5_EX_007	Remove the 'Primary' flag from the selected address.	The flag cannot be removed.
T5_EX_008	Close the pick address shuttle applet and verify that the selected address is displayed in the 'Address' MVG field on the Account List Applet.	The pick address shuttle applet can be closed and the selected address is displayed in the field.
T5_EX_009	Click into the 'Address' field and delete the displayed address.	The data cannot be deleted from the 'Address' field.
T5_EX_010	Invoke the pick address shuttle applet from the 'Address' MVG field and verify that the 'Remove' button is enabled.	The 'Remove' button is enabled in addition to the 'Add' button
T5_EX_011	Click the 'Remove' button.	The selected address is removed from the 'Selected' pane and the 'Remove' button is disabled.
T5_EX_012	Add the first and second addresses provided on the test case to the 'Selected' pane using the enabled 'Add' button.	The required addresses can be located, selected and added.
T5_EX_013	Verify that the 'Primary' flag is automatically set for the first selected address in the 'Selected' pane.	The 'Primary' flag is auto set as expected.
T5_EX_014	Verify that when the Primary address is highlighted in the 'Selected' pane, the 'Remove' button is disabled and when the non-Primary address is highlighted in the 'Selected' pane the 'Remove' button is enabled.	The behaviour of the 'Remove' button is as expected.
T5_EX_015	Remove the 'Primary' flag from the selected address.	The flag cannot be removed.
T5_EX_016	Set the 'Primary' flag against the second address	The flag can be set
T5_EX_017	Stop off the address record	The 'Primary' flag is deselected from the first address and set for the second address

FIGURE 1: FIGURE SYSTEM TEST SCRIPT SAMPLE

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## CRM: Helen Peebles

Business Process Scenario	Test Scenario	Test Cases
Existing customer places repeat order for goods	Existing customer places repeat order for goods	Upfront Payment with Credit Card
		Delayed Payment Terms - 30 day invoicing
		Delayed Payment - Sending Cheque
		New Delivery Address for repeat order
		Delayed delivery requested

FIGURE 2: UAT TEST SCENARIO WITH TEST CASES

Within this single test scenario a number of features and functions will be invoked across potentially multiple systems including Siebel, any ERP system for order fulfilment and invoicing and perhaps QAS for address management. Additionally, the single feature that was used as an example in System Testing (changing the primary flag for an address) could also be touched upon during this test scenario but the Business Testers should expect that the System Testers have verified the intricacies of this feature allowing them to add just a couple of steps to a test script being prepared to make up this end to end test scenario.

Re-using the System Test script would be pointless in UAT. If the System Testers have passed the script then it can't possibly fail during UAT so you would be unnecessarily repeating a test, which is surely a waste of time? Plus of course your Business Testers would almost certainly feel alienated by a document that refers to 'Pick shuttle applets' and 'MVG fields' and has them constantly repeating steps just to make sure Minibuttons are enabled and disabled correctly. These tests are the responsibility of the System Testers. I would instead expect UAT scripts to contain test steps that only represent the clicks and

tabs that a user will perform to work their way through their process and to use language such as 'Open up the address field to add a new address for the customer' instead of 'Invoke the pick shuttle applet from the Address MVG field'.

As UAT is focussed on validating end-to-end business processes it is necessary to ensure that end-to-end business processes are ready to be executed in the test environment. If UAT execution has been scheduled in the project plan too early this won't be possible and the end result will be that the UAT test scripts fail. Whilst System Testers will expect their test scripts to fail during the early cycles of testing, Business Testers will be expecting theirs to pass; after all the objective here is to gain acceptance of the solution as quickly as possible.

My recommendation is to ensure that UAT starts once it is expected that the test scenarios being included in the test phase are likely to pass. If the System Testers are still finding significant numbers of defects and failing their test scripts then it's probably worth shifting the UAT cycles in the project plan. Remember that Business Testers are far less experienced in the software development life cycle than the System Testers and are far less likely to accept when it comes to executing testing with workarounds in place because outstanding defects are preventing the execution of true test scenarios.

So, testing times? Surely not so difficult if you follow these reasonably simple guidelines and let the experienced System Testers do the up front, repetitive, technical testing until it's possible to execute the business process tests and only then hand over to the Business Testers to accept the solution as quickly as possible using their own test documents which speak the language of the business. Your user adoption strategy will be all the better for it! ■



### ABOUT THE AUTHOR

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SUMMER 12

Column: Mogens Nørgaard



# The Emperor's New Clothes or should that be Dictator's?

**Here's a story for you: While writing this I'm holidaying in Egypt way down South by the Red Sea at a dive camp. The weather is warm, the water is warm, and the beer is cold. Life as a CEO is hard work, non-stop.**

**During a dive today at a place known for its many sharks, my dive guide told me a story after we got back into the Zodiac: he couldn't understand why divers from other parties were pointing in our direction and taking pictures. When he turned around he couldn't see anything interesting.**

Then he realised that they were pointing at me, and taking pictures of me! Turns out that they've never seen anyone doing deep dives (or any dives) down here in swim trunks and a t-shirt. They all wear dive suits of 3-5 millimeters or more – or even dry suits.

Well, around 1975 when I took my first diver certificate, we simply didn't have dry suits, so we used wet suits all year without a problem. I guess we didn't know we had a problem, unless we were in cold water for a very long time.

When I started diving again in 2006, it wasn't really a thought from my side to buy a dry suit, although everybody has them now. They're expensive, and stuff can happen if you get a cut in them (they're not fun with water inside – they can take a lot of it), or their valves have technical issues. Besides, I didn't do that much non-stop, hour-long diving in cold waters anyway. I've done diving under ice in my wet suit without any problems whatsoever besides the 42 comments per minute from worried co-divers in Very Warm Dry Suits.

So when I started diving in the Caribbean I bought myself a 3mm wet suit for the warmer waters, but had to shed it after the first dive. It was way too hot for me. Since then I've used what I call my Bahama Dive Suit consisting of my swim trunks and a white t-shirt that says "ENGLAND" and "7" on the back. And that's what I use here in Egypt, too. Several instructors have asked me if I'm really OK with that, and refuse to believe it's not cold. Well, one French instructor finally said: "Ah, but you're from Denmark...". Ah, that explains it then: I know nothing, I'm from Barcelona; I swim naked, I'm from Denmark.

And it made me think of some of the IT solutions I see today. How simple, sturdy, safe and cheap solutions are replaced by a myriad of more advanced thingies put together in a "platform" or "solution". And how hard-won knowledge is forgotten by the next generation out of college. But hey, there's SO much more (dive!) stuff and technical thingies you can buy nowadays, and we guys love to shop gear.

(Which is why it's usually a good idea for a company to have a female IT boss – she doesn't see the need to buy gear you actually don't need. Guys will buy ANYTHING that has a bigger number on some component...)

Back to the future:

- Vital systems run on a cluster, with the cluster having un-mirrored disks underneath it.
- RAID-5-systems being implemented like 30 years ago ("Nope! There are NO problems anymore with RAID-5! All that is old stuff. It was fixed a long time ago!").
- Code takes up more space to do trivial tasks than anything I've seen in any "old" computer language.
- Fewer code lines per coder than ever.
- WAY more "test" and "Q&A" than ever - and more bugs.
- And of course no direct interactions between the real end-users and the coders. Of course.
- Oh, and a LOT of arguments against "old", simple solutions that would still do the job far simpler and better (I shall call it the IT Wet Suit Syndrome).

I've covered this before, I know: how entropy/chaos increases (second law of thermo-dynamics) in systems. How good it is for our hourly rates, since we thrive (financially speaking) on problems. That there is no way to change this, so why not enjoy the ride (and have a lot of laughs with the Old Boys now and then).... I know.

But being photographed as a Great White by divers down here in the Red Sea just because I preferred the simple, sustainable, cheap and comfortable solution of swim trunks and a t-shirt? Man! ■

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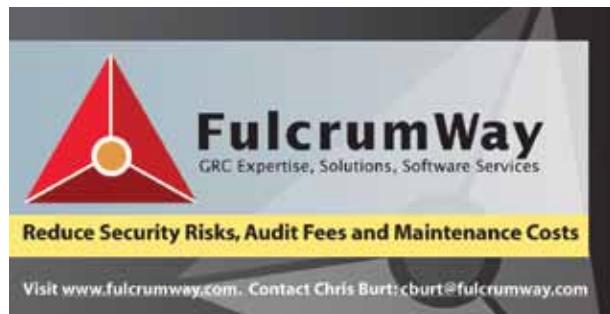
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