

ORACLE

MAGAZINE

ENGINEERING AS A SERVICE

Organizations deploy database as a service in private clouds with Oracle Exadata



The Business of Growing

Land O'Lakes invests in Oracle engineered systems to plant the seeds of change

Record-Breaking

Oracle OpenWorld, JavaOne, and MySQL Connect deliver a week of innovative technology

Information Acceleration Oracle Database

In-Memory option delivers query results 100 times faster and doubles transaction processing rates / **14**

C Is for Cloud, Consolidation, and Customers

Oracle customers drive the genesis and marquee features of Oracle Database 12c / **15 The Next**

Big Wave Explore mobile frontiers with Oracle ADF

Mobile / **38 SQL in PL/SQL Enhancements**

Oracle Database 12c enhances writing and executing SQL in PL/SQL / **51 On Oracle Database 12c,**

Part 2 Our technologist finds a match for his SQL and makes his undo temporary / **55**

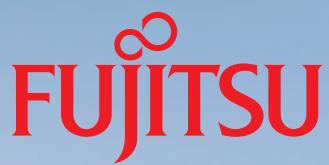




Run your
Oracle
database
faster



shaping tomorrow with you



Fujitsu M10 Servers were born to run your Oracle Database faster.

Leveraging the advantage of closely combined software and hardware, Oracle and Fujitsu engineers have worked together on the Fujitsu M10 servers to help Oracle Database 12c run even faster. The strong collaboration between Oracle and Fujitsu demonstrates our commitment to achieve extreme performance by engineering hardware and software together, bringing you big results in the Big Data era.

©2013 Fujitsu Limited. Fujitsu and the Fujitsu logo are trademarks or registered trademarks of Fujitsu Limited in Japan and other countries. Other company, product and service names may be trademarks or registered trademarks of their respective owners.



ENGINEERING AS A SERVICE

Organizations are turning to Oracle Exadata for consolidation and deployment of database as a service in private clouds. —*David A. Kelly*

/ 28

Cover: I-Hua Chen

Up Front / 4

FROM THE EDITOR / 4

Quintessential and Collaborative —*Tom Haunert*

MASHUP / 5

News, views, trends, and tools

At Oracle / 6

EVENTS / 6

Find out about upcoming technology and industry events.

RESOURCES / 7

Your guide to Oracle webcasts, podcasts, white papers, and more

BRIEFS / 10

The latest product news

NEWS / 14

Information Acceleration

The Oracle Database In-Memory option redefines speed. —*Fred Sandmark*

INTERVIEW / 15

C Is for Cloud, Consolidation, and Customers

Oracle customers drive the genesis and marquee features of Oracle Database 12c. —*Tom Haunert*

Community / 18

PARTNER NEWS / 18

BOOK BEAT / 18

ARCHITECT / 21

Become a Better Architect

Single steps you can take today —*Bob Rhubart*

PEER-TO-PEER / 22

User Group Hug

Three peers tout the benefits of Oracle user groups, new features, and old favorites. —*Blair Campbell*



RECORD-BREAKING



Oracle OpenWorld, JavaOne, and MySQL Connect deliver a week of innovative technology to 60,000 people onsite and 2.1 million people online. —*Tom Caldecott*

/ 24

THE BUSINESS OF GROWING



The second-largest cooperative in the United States, Land O'Lakes invests in Oracle engineered systems to plant the seeds of change. —*Marta Bright*

/ 34

Technology / 38



ORACLE ADF / 38

The Next Big Wave

Explore mobile frontiers with Oracle ADF Mobile. —*Frank Nimphius*

BUSINESS ANALYTICS / 43

Integrate and Analyze

Combine structured and unstructured data for analysis and new insights. —*Mark Rittman*

DATABASE STORAGE MANAGEMENT / 47

Automatic Data Optimization

Learn how to enable information lifecycle management to automatically move data to lower-cost storage tiers and compress it. —*Arup Nanda*

PL/SQL / 51

SQL in PL/SQL Enhancements

Oracle Database 12c enhances writing and executing SQL in PL/SQL. —*Steven Feuerstein*

ASK TOM / 55

On Oracle Database 12c, Part 2

Our technologist finds a match for his SQL and makes his undo temporary. —*Tom Kyte*

Comment / 60

TIME CAPSULE / 60

Flashbacks: Culture. Industry. Oracle. —*Rich Schwerin*



EDITORIAL

Editor in Chief

Tom Haunert tom.haunert@oracle.com

Managing Editor

Jan Rogers jan.rogers@oracle.com

Senior Editor

Caroline Kvitka caroline.kvitka@oracle.com

Associate Editor

Patty Waddington

Contributing Editor and Writer

Blair Campbell

Technology Advisor

Tom Kyte

Contributors

Marta Bright, Jeff Erickson, Fred Sandsmark, Rich Schwerin, Leslie Steere

DESIGN

Senior Creative Director

Francisco G Delgadillo

Senior Design Director

Suemi Lam

Design Director

Richard Merchán

Contributing Designers

Jaime Ferrand, Arianna Pucherelli

Production Designers

Sheila Brennan, Kathy Cygnarowicz

EDITORIAL BOARD

Ian Abramson, Karen Cannell, Andrew Clarke, Chris Claterbos, Karthika Devi, Kimberly Floss, Kent Graziano, Taqi Hasan, Tony Jambu, Tony Jedlinski, Ari Kaplan, Val Kavi, John King, Steve Lemme, Carol McGury, Sumit Sengupta, Jonathan Vincenzo, Dan Vlamis

United States Postal Service Statement of Ownership, Management, and Circulation.

Oracle Magazine, ISSN 1065-3171, is published bimonthly (six issues each year) with a free subscription price by Oracle Corporation. The office of publication and the general business office are located at 500 Oracle Parkway, Redwood City, CA 94065. The publisher is Jennifer Hamilton Bingo; the editor is Thomas Haunert; the managing editor is Jan Rogers; and the owner is Oracle Corporation, all at the above address. Known stockholders owning or holding 1 percent or more of the total amount of stock is Lawrence J. Ellison at the above address. There are no known Bondholders, Mortgagees, or Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. The Issue Date for the following data is September/October 2013. Average No. Copies Each Issue During Preceding 12 months: Total Number of Copies (Net press run): 347,656; Paid/Requested Outside-County Mail Subscriptions stated on Form 3541: 219,403; Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution: 78,394; Total Paid and/or Requested Circulation: 297,798; Free Distribution by Mail: 3,624; Free Distribution Outside the Mail: 44,759; Total Free Distribution: 48,382; Total Distribution: 346,180; Copies Not Distributed: 1,476; Total: 347,656; Percent Paid and/or Requested Circulation: 86.0%. No. Copies of Single Issue Published Nearest to Filing Date: Total Number of Copies (Net press run): 259,244; Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541: 213,970; Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution: 5,939; Total paid and/or Requested Circulation: 219,909; Free Distribution by Mail: 3,548; Free Distribution Outside the Mail: 34,352; Total Free Distribution: 37,900; Total Distribution: 257,809; Copies not Distributed: 1,435; Total: 259,244; Percent Paid and/or Requested Circulation: 85.3%. This Statement of Ownership, Management, and Circulation was filed October 1, 2013 by Karin Kinnear, Associate Publisher and Audience Development Director.

PUBLISHING

Vice President

Jeff Spicer jeff.spicer@oracle.com

Publisher

Jennifer Hamilton jennifer.hamilton@oracle.com +1.650.506.3794

Associate Publisher and Audience Development Director

Karin Kinnear karin.kinnear@oracle.com +1.650.506.1985

ADVERTISING SALES

President, Sprocket Media

Kyle Walkenhorst kyle@sprocketmedia.com +1.323.340.8585

Western and Central US, LAD, and Canada, Sprocket Media

Tom Cometa thomas.cometa@oracle.com +1.510.339.2403

Eastern US and EMEA/APAC, Sprocket Media

Mark Makinney mark.makinney@sprocketmedia.com +1.805.709.4745

Advertising Sales Assistant, Sprocket Media

Cindy Elhaj cindy@sprocketmedia.com +1.626.396.9440, x201

Mailing-List Rentals

Contact your sales representative.

RESOURCES

Oracle Products

+1.800.367.8674 (US/Canada)

Oracle Services

+1.888.283.0591

Oracle Press Books

oraclepressbooks.com



SUBSCRIPTION INFORMATION

Subscriptions are complimentary for qualified individuals who complete the form found online at oracle.com/oraclemagazine. For change of address, mail in label with the new address to: *Oracle Magazine*, P.O. Box 1263, Skokie, IL 60076-8263.

MAGAZINE CUSTOMER SERVICE

oracle@halldata.com Fax +1.847.763.9638 Phone +1.847.763.9635

PRIVACY

Oracle Publishing allows sharing of its mailing list with selected third parties. If you prefer that your mailing address or e-mail address not be included in this program, contact Customer Service at oracle@halldata.com.

Copyright © 2013, Oracle and/or its affiliates. All Rights Reserved. No part of this publication may be reprinted or otherwise reproduced without permission from the editors. ORACLE MAGAZINE IS PROVIDED ON AN "AS IS" BASIS. ORACLE EXPRESSLY DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED. IN NO EVENT SHALL ORACLE BE LIABLE FOR ANY DAMAGES OF ANY KIND ARISING FROM YOUR USE OF OR RELIANCE ON ANY INFORMATION PROVIDED HEREIN. The information is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle. Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Oracle Magazine (ISSN 1065-3171) is published bimonthly with a free subscription price by: Oracle, 500 Oracle Parkway, MS OPL-3C, Redwood City, CA 94065-1600. Periodicals Postage Paid at Redwood City, CA, and additional mailing offices. • POSTMASTER: Send address changes to: *Oracle Magazine*, P.O. Box 1263, Skokie, IL 60076-8263.

Printed by Brown Printing



Quintessential and Collaborative

Conferences and technology are about participation and information.

Oracle OpenWorld San Francisco and an Oracle Database release are quintessential Oracle events, but both are massive and impossible to describe in a single post, blog, or note from the editor. Both events also benefit from growing participation and ever-increasing reporting from a range of sources.

BIGGER AND MORE PERSONAL

Growing participation certainly describes the attendance at Oracle OpenWorld and the colocated JavaOne and MySQL Connect events in San Francisco. A record-setting 60,000 people attended in person, and another 2.1 million folks followed the proceedings online.

And this is just one opinion, but the increased attendance did not make the conference experience less personal. In fact, changes to the setup on Howard Street and new and updated Oracle OpenWorld programming that focused on social media, customer experience, and human capital management services emphasized the importance of collaboration and community.

If you weren't able to participate in real time in Oracle OpenWorld, JavaOne, or MySQL Connect or you were there and want to relive a moment or two, check out "Record-Breaking" in this issue, visit the Oracle OpenWorld blog (bit.ly/19qps2A), and watch on-demand video content on the Oracle OpenWorld Live 2013 channels (bit.ly/1gbKV6w). And when you're done with 2013, sign up to be notified when registration opens for Oracle OpenWorld 2014 (bit.ly/1f6qEAc).

WHAT IS THAT MAGAZINE DOING NOW?

One challenge with reporting on an Oracle Database release is that so much goes into

and so much comes out of that development effort. In the Oracle Database 12c launch webcast, Oracle Senior Vice President Andy Mendelsohn pointed out that 2,500 person-years of development and 1.2 million hours of testing produced more than 500 new features in the new database release. We don't have a practical way to cover all the development years and testing hours in this magazine, but we do have ways of reporting on some of those 500 new features.

You may have noticed (the *Oracle Magazine* editors certainly hope you did) the beginning of our Oracle Database 12c coverage in the September/October 2013 issue. That issue included Oracle Database 12c in the customer-focused "Plug into the Cloud" cover feature; the "Cloud Computing Breakthrough" news story; "Time to Upgrade," from IOUG President Michelle Malcher; and Oracle Database 12c technology deep dives into some of the 500 new database features, by Tom Kyte, Steven Feuerstein, and Arup Nanda.

This issue continues the coverage of Oracle Database 12c with an Andy Mendelsohn interview as well as more technology deep dives into the "Oracle Database 12c 500" by the aforementioned Kyte, Feuerstein, and Nanda. It also includes coverage of the Oracle OpenWorld 2013 announcement of the Oracle Database In-Memory option for Oracle Database 12c (see the "Information Acceleration" news story).

And—spoiler alert!—more Oracle Database 12c content is in the works for the next issue of *Oracle Magazine*.

Tom Haunert, Editor in Chief
tom.haunert@oracle.com

Catch Up on Oracle Editor Videos

Representatives of Oracle's magazines—Editors in Chief Aaron Lazenby, *Profit*; Caroline Kvitka, *Java Magazine*; and Tom Haunert, *Oracle Magazine*—participated in Oracle OpenWorld Live 2013 video programming. Most of the interviews featured Oracle customers and technologists telling their own stories about business and technology success; the interviews are available at bit.ly/177vpkb.

Subscribe to *Profit* magazine, *Java Magazine*, and *Oracle Magazine* at bit.ly/1gbPjCE.

NEXT STEPS

LEARN more about

Oracle OpenWorld

oracle.com/openworld

Oracle Database 12c

oracle.com/database

WATCH Oracle OpenWorld 2013 video

bit.ly/1gbKV6w

SEND MAIL TO THE EDITORS

Send your opinions about what you read in *Oracle Magazine*, and suggestions for possible technical articles, to opubedit_us@oracle.com. You can also follow our [@oraclemagazine](https://twitter.com/oraclemagazine) Twitter feed or join us on Facebook at [bit.ly/orclmagfb](https://facebook.com/orclmagfb).

Letters may be edited for length and clarity and may be published in any medium. We consider any communications we receive publishable.

COMPARISON SHOPPING APPS

Nearly 6 in 10 smartphone owners comparison-shop using a mobile device while in a physical store, according to Parago.¹ If you're holiday shopping, these apps can help.

The Find

In addition to scanning barcodes and comparing prices from major online and physical retailers, this app lets you set price alerts, provides coupons, and locates nearby stores offering your products. Free (iOS). thefind.com

Nextag Shopping

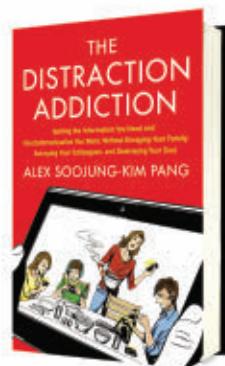
Search for products from thousands of merchants, then sort results by price (including tax and shipping), ratings, and more. The app also includes product reviews and can send price-drop alerts. Free (Android, iPhone, iPad, Windows Phone). nextag.com

PriceGrabber

This companion app to PriceGrabber.com claims to find the lowest price on millions of products from thousands of stores. It includes product and merchant reviews and calculates taxes and shipping. Free (Android, iPhone, iPad). pricegrabber.com

RedLaser Barcode & QR Scanner

Created by eBay, this app compares prices from thousands of retailers, including local stores in the US. It also offers coupons and integrates your credit cards and loyalty cards. Free (Android, iOS, Windows Phone). redlaser.com



"Rather than being forced into a state of perpetual distraction . . . we can approach information technologies in a way that is mindful and nearly effortless and that contributes to our ability to focus, be creative, and be happy."

—Alex Soojung-Kim Pang, author of *The Distraction Addiction* (Little, Brown and Company, 2013)



SCAN IN 3-D

Need to get a realistic printout of your desktop gnome or corporate mascot? The MakerBot Digitizer Desktop 3-D Scanner uses a camera and two lasers to create a standard-format 3-D digital file of any physical object up to 8 inches in diameter, 8 inches tall, and 6.6 pounds in weight. That file can then be printed on a desktop 3-D printer or shared with the growing online 3-D printing community. 3-D modeling or CAD experience is not required. US\$1,400 (without gnome). makerbot.com/digitizer

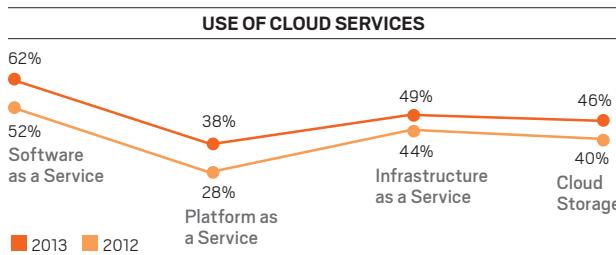
BIG DATA ON THE LIST

Nearly 50 percent of marketers surveyed say that data is the most underutilized asset in their organization. Less than 10 percent currently use the data they have in a systematic way, and just 18 percent have a single, integrated view of customer action. However, 71 percent plan to implement a big data analytics solution in the next two years. More than 2,200 marketers worldwide were surveyed.

Source: Teradata Data-Driven Marketing Survey 2013, teradata.com

Cloud Services Continue to Grow

Use of all types of cloud services steadily increased from 2012 to 2013. Results from a survey of nearly 150 people in June 2013—mostly attendees of Cloud Computing Expo—were compared with results from the same survey conducted a year earlier.



Source: TwinStrata, twinstrata.com/cloud-survey-2013



Get Fit in Style

While personal activity trackers are nearly ubiquitous, the new Misfit Shine adds a stylish touch. Like competing fitness trackers, Shine monitors walking, biking, and sleep, and syncs with a smartphone or computer via Bluetooth. But its polished aluminum finish, and ability to be worn as a wristband, lapel pin, or necklace, lets you take it from marathon to black-tie cocktail party with ease. It even doubles as a wristwatch and uses a standard replaceable battery. Shine is also water resistant. US\$119.95.

misfitwearables.com

¹ Source: Dynamic Pricing in a Smartphone World: A Shopper Showrooming Study, parago.com/news/showroomingstudy

Technology Events

Conferences and sessions to help you stay on the cutting edge



UKOUG Technology Conference 2013

December 2–4, Manchester, England

This annual conference covers major technology topics, including big data, cloud, mobility analytics, virtualization, collaboration, social, and security. Deep dives, labs, and networking activities are on the agenda, as are highlights from Oracle OpenWorld 2013. www.tech13.ukoug.org

JD Edwards INFOCUS

December 2–4, Denver, Colorado

► bit.ly/16J3RU0

This event offers in-depth education about Oracle's JD Edwards EnterpriseOne applications and kicks off year-long special interest group (SIG) programs.

Big Data World Congress

December 3–4, Munich, Germany

► bigdatacongress.com

More than 40 speakers and 500 attendees explore infrastructure for big data, analytics, in-memory computing, machine learning, the Internet of Things, and social data.

ICDM 2013: IEEE International Conference on Data Mining

December 7–10, Dallas, Texas

► icdm2013.rutgers.edu

This international forum is for researchers and developers whose focus includes statistics, machine learning, pattern recognition, databases, data visualization, and knowledge-based systems.

Gartner Data Center Conference

December 9–12, Las Vegas, Nevada

► gtnr.it/16NYDYX

EVENTS LOCATOR

Oracle Events

oracle.com/events

Locate User Groups

oracle.com/technetwork/community

Professionals attending the Gartner Data Center Conference choose from tracks that focus on servers, cloud computing, enterprise mobility, operating systems, IT operational excellence, storage and facilities, business continuity, and disaster recovery.

SANS Cyber Defense Initiative 2013

December 12–19, Washington DC

► bit.ly/16NYDIs

This event covers security, IT auditing, security management, penetration testing, and computer forensics. It also offers hands-on, immersive training on how to mitigate cyber attacks.

National Retail Federation Annual Convention and Expo

January 12–15, New York, New York

► bigshow14.nrf.com

Nicknamed "Retail's BIG Show," this annual gathering includes education and thought leadership on topics ranging from mobile retailing to sustainability.

Oracle Business Intelligence Warehousing and Analytics Summit

January 14–16, Redwood City, California

► biwasummit.com

This summit brings together Oracle ACE experts, customers, Oracle partners, and Oracle product experts. Focus areas include advanced analytics, big data, business intelligence and visualization, enterprise performance management, and spatial technologies.

ORACLE USER GROUPS

Suncoast Oracle Users Group Holiday Event
December 3, Ybor City, Florida
souug.org

Houston Oracle Users Group Christmas Social
December 5, Houston, Texas
houug.org

New Zealand Oracle Users Group Committee Meeting
December 6, Auckland, New Zealand
bit.ly/13yeEOF

South East Michigan Oracle User Professionals Meeting
December 10, Southfield, Michigan
bit.ly/13Pfjv4

Houston Users Group Meeting and Casino Night
December 11, Houston, Texas
bit.ly/14uM6oo

Kansas City Java User Group Meetings
December 11 and January 8, Leawood, Kansas
kcjava.org

Portland Java User's Group Meeting
December 17, Portland, Oregon
pjug.org

Chicago Java Users Group Downtown Meetings
December 17 and January 21, Chicago, Illinois
cjug.org

UKOUG Solaris SIG Meeting
December 18, London, England
ukoug.org

Memphis Java User Group Meeting
December 19, Memphis, Tennessee
memphisjug.org

Chartered Institute for IT, BCS Berkshire Branch Committee Meeting
January 7, Reading, England
bit.ly/15AGXLI

New England Java Users Group Meeting
January 9, Waltham, Massachusetts
nejug.org

PackerLand Users Group Meeting
January 9, Fond du Lac, Wisconsin
bit.ly/14K2LLG

Northeast Ohio Oracle Users Group Business Meeting
January 25, Independence, Ohio
neouug.org

Austin Java Users Group Meeting
January 28, Austin, Texas
austinjug.org

What's New at Oracle

The latest videos, podcasts, blogs, and more

WEBCASTS

"Plug Into the Cloud with Oracle Database 12c"

► bit.ly/149HX9g

Oracle executives and technical experts discuss Oracle Database 12c's innovative multi-tenant architecture.

"Announcing Oracle SuperCluster T5-8: Our Fastest Engineered System"

► bit.ly/18DxJ9r

Learn how Oracle SuperCluster T5-8 accelerates consolidation and private cloud deployments with dramatic performance improvements for a lower TCO.

"Announcing Oracle Cloud Application Foundation"

► bit.ly/19877h9

View a panel discussion by customers and industry leaders, along with demonstrations of Oracle WebLogic Server, Oracle Coherence, Oracle Enterprise Manager, and Oracle developer tools.

"Storage and Applications Engineered Together: Oracle Has It, NetApp Doesn't"

► bit.ly/15K6uEs

Analyst Marc Staimer of Dragon Slayer Consulting and Oracle storage executives discuss why application-engineered storage is essential.

"Online Forum: Oracle Solaris and Oracle's Systems—The Best Platform for Oracle Software"

► bit.ly/165jRkM

Take an in-depth look at how Oracle Solaris is coengineered with Oracle's systems and software to deliver the best possible user experience.

"Virtualization and Cloud Made Simple and Easy with Oracle's Latest Engineered System"

► bit.ly/13F7PNT

Wim Coekaerts, senior vice president of Linux and virtualization at Oracle, unveils a system that

can dramatically enhance data center operations, reduce business risk, lower costs, and support a mix of operating systems and applications.

"Security Inside Out: Latest Innovations in Oracle Database 12c"

► bit.ly/11tcH8b

Hear from experts how Oracle Database 12c keeps businesses ahead of evolving security threats and regulations with security controls such as sensitive data discovery, real-time data redaction, and privilege analysis.

"Identity Auditing: Techniques for Reducing Operational Risk and Internal Delays"

► bit.ly/18LBdDw

Oracle identity management expert Neil Gandhi and representatives from (ISC)² share identity-auditing techniques that reduce operational risk.

"MySQL Cluster 7.3: New Features for Internet-Scale Performance with Carrier-Grade Availability"

► bit.ly/1c8ZisJ

Learn the new features included in MySQL Cluster 7.3 to automatically scale database services while maintaining five 9s availability.

VIDEOS

Developing Applications with Oracle Application Development Framework Mobile

► bit.ly/14DOIWF

View an in-depth, interactive presentation covering mobile development with Java and HTML5.

The Top Five Things to Look For in a Cloud Provider When It Comes to Security, Part 3

► bit.ly/13aHW5r

Deloitte Principal Irfan Said shares how to mitigate risk in the cloud, along with the top five things to look for in a cloud provider.

Identity Governance and Key Identity Management Trends

► bit.ly/145xbYn

Larry Samuels of NEC Australia hosts a round-

table discussion with Oracle experts to discuss key identity management trends and issues.

Linux Containers Explained

► bit.ly/172X8Uz

In this whiteboard presentation, Oracle Senior Product Manager Lenz Grimmer explains how Linux containers work.

E-BOOKS

Database Storage for Dummies, Oracle Edition

► bit.ly/18Dy0tg

Get insight into how to choose the right database storage solutions and how to optimize database storage for maximum performance and efficiency.

WHITE PAPERS

"Oracle Multitenant"

► bit.ly/172iXpz

Get the technical details about Oracle Multitenant, a new option for Oracle Database 12c that simplifies consolidation, provisioning, upgrades, and more.

"Plug Into the Cloud with Oracle Database 12c"

► bit.ly/1f04UBM

Discover the new capabilities in Oracle Database 12c, including multitenancy, optimized storage and compression, continuous access, security, and more.

"Deliver Next-Generation Applications with Industry-Leading Oracle WebLogic Server 12c Release 12.1.2"

► bit.ly/18gUiNR

Read an overview of the new features in the latest version of Oracle WebLogic Server.

"Solving Data Management and Scalability Challenges with Oracle Coherence 12c"

► bit.ly/13KPNNk

Discover how Oracle Coherence is scaling applications with real-time data processing and cache updates to meet mobile and cloud demands.

OVERHEARD

"This is a breakthrough release that makes cloud computing better, a lot better. [Oracle Database 12c is] the first multi-tenant database designed for the cloud. Its fundamentally new multitenant architecture enables you to create multiple, pluggable databases to support modern cloud deployments."

—Oracle President Mark Hurd in "Plug Into the Cloud with Oracle Database 12c" (bit.ly/149HX9g)

"Oracle's Internet of Things Platform: The M2M Platform for a Connected World"

► bit.ly/18v9NBc

Read about Oracle's platform to address the Internet of Things and machine-to-machine (M2M) communication.

"Oracle Virtual Networking—Delivering Fabric Virtualization and Software-Defined Networks"

► bit.ly/16AwBxS

This International Data Corporation (IDC) white paper examines the business and technological factors driving network virtualization and profiles the Oracle Virtual Networking products that are used to deliver software-defined networks.

"From Database Clouds to Big Data: 2013 IOUG Survey on Database Manageability"

► bit.ly/18WmsBi

A newly released Independent Oracle Users Group (IOUG) membership survey sheds light on tough database management challenges and makes recommendations for overcoming them.

"READ_ME_FIRST: What Do I Do with All of Those SPARC Threads?"

► bit.ly/16o5F2i

Read this technical white paper to learn how to take advantage of the new SPARC servers, which provide more than 1,000 compute threads.

"Why Use Oracle VM for Oracle Databases?"

► bit.ly/1b9rb01

Read this independent lab validation report comparing Oracle VM to a leading virtualization solution and concluding that Oracle VM is best for Oracle Databases in all performance categories.

"Month in the Life of an Oracle Exadata Admin, Part 2: Operations"

► bit.ly/13DhXJN

Find out what it takes to manage a high-

performance database environment running on Oracle Exadata and what to expect when you move your database operations to a preintegrated engineered system.

 **CALCULATORS**

Business Process Management Maturity Assessment Tool

► bit.ly/1chNtCV

Get a customized report that breaks down your business process management maturity and suggests next steps to help you advance.

Service-Oriented Architecture Maturity Assessment Tool

► bit.ly/14wWm6h

Take an easy online assessment to learn your service-oriented architecture maturity and find out how to move to the next level.

 **RESOURCE CENTERS**

Oracle's Data Integration Resource Center for Oracle Applications

► bit.ly/1912lt1

Access white papers, screencasts, and customer testimonials that describe how to gain more value from your Oracle Applications using Oracle's best-in-class data integration solutions.

Unlock New Big Data Insights with MySQL and Hadoop

► bit.ly/1eqIn7c

View technical articles, white papers, and webcasts to learn how to unlock new insights leveraging MySQL and Hadoop.

 **SOCIAL MEDIA UPDATES**

Oracle ADF Architecture TV

► bit.ly/18xN08j

Discover Oracle Application Development Framework (Oracle ADF) development and satisfy design, architecture, development, deployment best practices, and more.

Oracle Coherence YouTube Channel

► bit.ly/16j8Yti

Watch dozens of new webcasts and video tutorials on how Oracle Coherence can scale your business applications and reduce your operational costs.

Oracle WebLogic YouTube Channel

► bit.ly/13e5MNz

Watch how-to videos that showcase numerous timely topics—such as dynamic clustering, elastic Java Message Service, and more.

MySQL YouTube Channel

► bit.ly/14wVsGX

Subscribe to the official MySQL channel on YouTube and watch informative demos, tutorials, and technical presentations.

 **PODCASTS**

"Upgrade to Oracle E-Business Suite 12 in the Cloud with Oracle Managed Cloud Services"

► bit.ly/1dVOHNu

Hear how Oracle Managed Cloud Services is helping companies like Michael Baker Corporation successfully upgrade straight to the cloud.

WEB LOCATOR

Oracle Blog Center

oracle.com/blogs

Oracle Consulting

oracle.com/consulting

Oracle Events and Webcasts

oracle.com/events

Oracle Newsletters

oracle.com/newsletters

Oracle Podcast Center

oracle.com/podcasts

Oracle University

bit.ly/ouoramag

Oracle on Facebook

facebook.com/oracle

Oracle on Google+

bit.ly/LdGiMO

Oracle on LinkedIn

linkedin.com/company/oracle

Oracle on Twitter

twitter.com/oracle

Oracle Support

oracle.com/support

My Oracle Support

myoraclesupport.com

My Oracle Support Communities

communities.oracle.com

What does 1 hour of downtime cost your business?

RETAIL
>\$9,774.80
per hour

HOSPITALITY
\$1,544.80
per hour

BANKING
\$5,220.80
per hour

MEDIA
\$4,789.60
per hour

INSURANCE
\$14,836.80
per hour



*Reference: Schneider Electric White Paper #52 (assuming 40 employees)

Wake up your network!

Protect switches and routers with APC by Schneider Electric Smart-UPS battery backup.



Reduce human-error downtime, too!

Get guidance in our **FREE** white paper and enter to win a **Google Nexus 10 tablet!**



Visit www.apc.com/promo Key Code **d668u** Call 888-289-APCC x**6561**

Business-wise, Future-driven.™

APC

by Schneider Electric



©2013 Schneider Electric. All Rights Reserved. Schneider Electric, APC, Smart-UPS, and Business-wise, Future-driven are trademarks owned by Schneider Electric Industries SAS or its affiliated companies. All other trademarks are the property of their respective owners.
www.schneider-electric.com • 998-1209030_GMA-US_Nexus

TUTORIALS/VIDEOS

Oracle's SPARC M6-32 Server Virtualization Options

This interactive demo explains the virtualization features of Oracle's SPARC M6-32 server. It includes discussions of dynamic, bounded, and logical domains and explains the differences between hypervisor and logical domains.

[► bit.ly/19fbo1M](http://bit.ly/19fbo1M)

Creating JAX-RS 1.1 Web Services on the Oracle Java Cloud

This tutorial explains the steps required to locally develop a JAX-RS RESTful web service and then deploy it to an Oracle Java Cloud instance.

[► bit.ly/19V0tXr](http://bit.ly/19V0tXr)

Stock Trading and Analysis Using Oracle NoSQL Database

This video discusses the features of Oracle NoSQL Database in terms of managing fast data and big data. It shows a stock trading and analysis application built on top of Oracle NoSQL Database as an example.

[► bit.ly/1hiw1Jk](http://bit.ly/1hiw1Jk)

Publish Your Applications with Oracle Cloud Marketplace

This video illustrates the advantages of publishing applications with Oracle Cloud Marketplace, which provides a targeted channel where independent software vendors and integrators can showcase their products.

[► bit.ly/1eUU9Mj](http://bit.ly/1eUU9Mj)

Oracle Enterprise Manager 12c: Deploy JVM Diagnostics and ADP Engines

In Part 1 of this three-part video series, you will learn how to deploy the JVM Diagnostics Engine and the Application Dependency and Performance Engine in Oracle Enterprise Manager Cloud Control 12c.

[► bit.ly/1eXiHOq](http://bit.ly/1eXiHOq)

DBaaS Private Cloud Using Oracle Enterprise Manager Cloud Control 12c and Exadata Database Machine

In this tutorial, which includes a brief introduction to cloud computing, you will learn about database as a service (DBaaS) and Oracle Exadata Database Machine. Then you will delve into the steps required to establish an Oracle Enterprise Manager Cloud Control 12c DBaaS private cloud on an Oracle Exadata Database Machine.

[► bit.ly/1bp4ysh](http://bit.ly/1bp4ysh)

New SPARC and Oracle SuperCluster Machines Unleashed

Oracle has delivered new systems—the SPARC M6-32 server and Oracle SuperCluster M6-32—that dramatically redefine the price/performance equation in the high-end server market. The SPARC M6-32 server, with up to 32 terabytes of memory and as many as 384 processor cores, can run entire applications and databases in memory to deliver unprecedented performance. The massive memory of the SPARC M6-32—combined with its comprehensive, zero-overhead, no-cost virtualization capabilities—makes it an ideal consolidation platform for mission-critical workloads. It also supports electrically isolated dynamic domains, which provide complete security, service, fault, and resource isolation for maintaining maximum availability and isolation of consolidated workloads.

Oracle SuperCluster M6-32, Oracle's fastest and most scalable engineered system, integrates SPARC M6-32 servers with Oracle Exadata Storage Servers optimized for Oracle Database performance. It can boost performance by 10 to 20 times for business-critical applications such as

financial close, cost management, projections, and planning with Oracle In-Memory Applications to help change business dynamics and enable organizations to discover new growth opportunities, make smarter decisions, and accelerate workloads.

"The SPARC M6-32 server and Oracle SuperCluster M6-32 fundamentally change data center economics by combining high-end computing performance and availability with the cost efficiency of entry-level servers," says John Fowler, executive vice president of systems at Oracle. "With our big memory machines, you can run huge databases and applications in memory to accelerate performance 10 or 20 times and experience mainframe-like reliability without paying the high premiums built into other vendors' high-end systems."

[► bit.ly/14YQNLH](http://bit.ly/14YQNLH)



Oracle Introduces Two StorageTek Devices

Oracle has introduced the StorageTek T1000OD tape drive, which offers up to 8.5 terabytes of native capacity per cartridge and native data rates of 252 megabytes per second, and the StorageTek Linear Tape File System, Library Edition, which helps make tape storage easier to manage, at a lower cost.

"Oracle's new StorageTek T1000OD tape drive clearly demonstrates Oracle's con-

tinued leadership and innovation in enterprise tape storage technology," says James Cates, vice president of hardware development at Oracle. "When you add StorageTek Linear Tape File System, Library Edition, capabilities and Oracle innovations in both data integrity and monitoring, Oracle is taking a commanding lead in storage."

[► bit.ly/1PqOHD](http://bit.ly/1PqOHD)

Oracle Improves Cloud-Enabled Customer Experience

Oracle has made significant enhancements to its cloud-enabled customer experience (CX) portfolio. The enhancements to Oracle Customer Experience Cloud support sales, marketing, commerce, and service organizations by delivering a more interactive, social, and mobile experience.

"Organizations need to be able to easily establish the operational systems and infrastructure

that are required in order to deliver simple, integrated, and relevant experiences across all channels and touchpoints," says Ken Volpe, senior vice president of Oracle product development. "With the social, mobile, and interactive enhancements across the Oracle CX portfolio, we are in a better position than ever to help organizations create great customer experiences. Our customers can take advantage of the new capabilities immediately in the cloud to meet customer demands and increase revenue."

[► bit.ly/GztAH7](http://bit.ly/GztAH7)



Oracle Applications Leverage Oracle Database In-Memory Option

Oracle has announced enhanced in-memory applications that leverage the Oracle Database In-Memory option of Oracle Database 12c, which helps organizations accelerate database performance for analytics, data warehousing, reporting, and online transaction processing (OLTP). Applications that benefit from the new option include Oracle's JD Edwards EnterpriseOne and PeopleSoft applications, Oracle In-Memory Cost Management, and Oracle Value Chain Planning.

JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor enable customers to increase revenue and profitability by making faster and more efficient business decisions.

PeopleSoft In-Memory Project Discovery helps organizations avoid project failures by providing visibility into projects.

Oracle In-Memory Cost Management

delivers real-time insight into all aspects of cost management, enabling organizations to maximize gross margins and profits and enhance product cost structures by optimizing component costs.

Oracle Value Chain Planning applications, including Oracle In-Memory Consumption-Driven Planning and Oracle In-Memory Performance-Driven Planning, help organizations understand and respond to end-customer demand; analyze and plan massive amounts of supply chain data; and get better, more timely business insights.

"The release of Oracle In-Memory Applications will help organizations not only complete load runs faster but also discover new insights for efficiencies that would previously have been overlooked," says Steve Miranda, executive vice president of applications development at Oracle.

► bit.ly/15kNFF7

Oracle Updates Oracle Enterprise Resource Planning Cloud

Extending the industry's broadest and most advanced cloud portfolio, Oracle has delivered updates to Oracle Enterprise Resource Planning Cloud that enable organizations to improve insight, accelerate decision-making with real-time information access, increase productivity through social business objects, and manage controls effortlessly. It includes Oracle Financials Cloud, Oracle Procurement Cloud, and Oracle Project Portfolio Management Cloud.

"In this constantly changing global business environment, it is increasingly important for companies to simplify business processes, increase productivity, and control costs," says Rondy Ng, senior vice president of applications development at Oracle. "Oracle Enterprise Resource Planning Cloud is helping customers drive performance across the enterprise."

► bit.ly/GztvU5

Exalytics In-Memory Machine T5-8 Delivers

Oracle has unveiled Exalytics In-Memory Machine T5-8, an engineered system based on Oracle's SPARC T5-8 server with 4 terabytes of memory per machine to drive extreme performance for business intelligence (BI) and enterprise performance management applications. Built with industry-leading hardware, leading BI software, and in-memory database technology, Exalytics In-Memory Machine T5-8 is designed to deliver the best speed-of-thought analytical in-memory performance for customers wanting to consolidate multiple analytical applications on a single platform.

"Data provides the critical competitive advantage, but only for those who are able to uncover business insights in a timely



manner," says Paul Rodwick, vice president of product management at Oracle. "Exalytics In-Memory Machine T5-8 enables organizations to quickly garner powerful insights into their data, allowing them to make smarter decisions, faster."

► bit.ly/omagexalytics

Oracle Virtual Compute Appliance Unveiled

Oracle Virtual Compute Appliance enables customers to go from power-on to production in about an hour and deploy ready-to-run virtual machines in just a few minutes. This new engineered system enables rapid, repeatable software-defined infrastructure deployment for almost any x86 application and workload. Oracle Virtual Compute Appliance is a "wire-once" system that comes fully assembled and ready to run pro-

duction workloads with minimal, software-defined configuration.

"Oracle Virtual Compute Appliance is unique not only in accelerating virtual infrastructure deployment but also in speeding deployment of the complete application stacks through Oracle VM Templates," says Wim Coekaerts, senior vice president of Linux and virtualization engineering at Oracle.

► bit.ly/16QPs6o

New Oracle ZFS Storage ZS3 Appliances Improve Efficiency

The latest Oracle ZFS Storage Appliance products, the Oracle ZFS Storage ZS3 series, enable organizations to improve operational efficiencies, reduce data center costs, and increase business application performance. The Oracle ZFS Storage ZS3 series takes advantage of Oracle-only storage features and capabilities such as Oracle Intelligent Storage Protocol, introduced in Oracle Database 12c, which automates Oracle Database tuning and administration. It also leverages new heat map and automatic data optimization capabilities of Oracle Database 12c that apply different compression levels through the data lifecycle to deliver consistently high database performance and reduced storage capacity. Finally, the Oracle ZFS Storage ZS3 appliances use Oracle Hybrid Columnar Compression to compress Oracle Database data by 10x to 50x, significantly reducing the amount of storage and bandwidth required.



The Oracle ZFS Storage ZS3 appliances also feature real-time, dynamic application-aware performance and health analytics, which enable organizations to visualize CPU, cache, protocol, disk, memory, networking, and system-related data—all at the same time.

"Oracle's ability to deliver application engineered storage is a major differentiator that enables customers to maximize performance, efficiency, and productivity at a significantly lower cost than the competition," says Scott Tracy, vice president of software development at Oracle. "The new Oracle ZFS Storage ZS3 appliances demonstrate the raw power and value that hardware and software engineered systems can provide."

► bit.ly/x5J4ij

New MySQL Workbench 6.0

MySQL Workbench 6.0 is now available with a redesigned user interface and features that enable users to simplify MySQL database development, design, and administration. Expanding data volumes and web, cloud, and mobile computing growth have increased management challenges for database professionals. This new release helps developers and administrators better manage dynamic data environments.

"To address scalability and performance challenges of web, mobile, and cloud environments, organizations around the world are using MySQL," says Tomas Ulin, vice president of MySQL engineering at Oracle. "MySQL Workbench 6.0 is a major update that features a number of new enhancements based on community feedback. This release makes it easier than ever for administrators and developers to design, develop, and manage their MySQL databases."

► bit.ly/GA2r7m



A BackOffice Associates, LLC
Company

CAN'T GET ACCESS TO REAL-TIME DATA? WE'VE GOT A BETTER WAY!

Change Data Capture for BI & Analytics

- Supports all major databases including Oracle, IBM DB2, MS SQL Server, IBM Informix, MySQL, Sybase, IBM PureData System/Netezza, HP Vertica, Actian Vectorwise, Cloud systems and more
- Real-time data replication
- Change Data Capture with log-reading
- Continuous, automated updates
- Non-intrusive, low overhead, easy to use

T +1.408.345.4001

www.hitsw.com

info@hitsw.com

Gold
Partner

FREE PAPER

"Tips for Change Data Capture
in BI and Analytics"
<http://info.hitsw.com/Oracle20136>



Copyright © 2013 HIT Software, Inc., A BackOffice Associates, LLC Company. All rights reserved. HIT Software®, HIT Software logo, and DBMoto® are either trademarks or registered trademarks of HIT Software and BackOffice Associates, LLC in the United States and other countries. All other trademarks are the property of their respective owners.

Oracle Delivers Near-Zero Data Loss Data Protection

Oracle has unveiled Oracle Database Backup Logging Recovery Appliance, the industry's first backup appliance engineered specifically for database protection. This Oracle engineered system delivers near-zero data loss data protection, minimal impact on user performance, and a massively scalable architecture.

Unlike solutions that require periodic backups of all the data in databases, this new appliance processes and stores only changed data, reducing the impact of backups on production servers and networks while reducing storage costs. It is massively scalable, enabling a single appliance to handle the data protection require-



ments of thousands of databases in a data center or region.

In addition to offering Oracle Database Backup Logging Recovery Appliance for on-premises use, a new Oracle service, Oracle Database Backup Cloud Service, enables organizations to back up their on-premises Oracle Database instances directly to Oracle Cloud or replicate their on-premises Oracle Database Backup Logging Recovery Appliance to Oracle Cloud for added protection.

"Businesses today can't afford to lose critical data, incur long downtimes, or suffer application slowdowns," says Juan Loaiza, senior vice president of systems technology at Oracle. "Oracle Database Backup Logging Recovery Appliance is the first product to move beyond the decades-long paradigm of ineffective nightly backups to deliver a solution that meets the need for complete protection of critical business data."

► bit.ly/GzvOxp

Big Data: More Secure

Oracle Big Data Appliance now includes enterprise-class security capabilities for Hadoop. It offers integrated enterprise security with preconfigured Kerberos authentication, LDAP-based authorization, and robust centralized auditing with Oracle Audit Vault and Database Firewall. In addition, Oracle has introduced new versions of Oracle Big Data Connectors and Oracle NoSQL Database that provide enhanced functionality, performance, and scalability.

"Hadoop systems and NoSQL databases have proven to be groundbreaking technology for big data management," says Çetin Özbüütün, senior vice president of data warehousing and big data technologies at Oracle. "With the latest enhancements to Oracle Big Data Appliance, Oracle is addressing the enterprise-grade security and performance customers require in big data solutions."

► bit.ly/16QOLd2



Polar Bears International is a trusted voice focused on funding scientific research for the survival of this magnificent animal. Polar Bears International also funds educational programs that are inspiring people to reduce their carbon emissions.

Conservation through Research and Education
www.polarbearsinternational.org



Help Us Help the Polar Bear

PHOTO © R&C BUCHANAN

Information Acceleration

The Oracle Database In-Memory option delivers query results 100 times faster and doubles transaction processing rates.

In his opening night keynote address at Oracle OpenWorld 2013 in San Francisco, Oracle CEO Larry Ellison announced the Oracle Database In-Memory option for Oracle Database 12c, which dramatically accelerates database performance.

The Oracle Database In-Memory option accelerates queries on data warehouses and online transaction processing (OLTP) databases such as enterprise resource planning (ERP) systems. Furthermore, it accelerates queries on live transactional data without compromising transaction processing speed. "We figured out a way to not only speed up query processing by a couple of orders of magnitude but at the same time at least double your transaction processing rates," Ellison said.

Combining existing in-memory row and new in-memory column data formats is key to this dramatic improvement in performance. Oracle Database can now maintain data in both row and column formats simultaneously, storing the column data in memory with high compression. Transactional logging (for rollback and other purposes) is done only on the row store. "There's actually very little overhead in maintaining the column store in memory in addition to Oracle's traditional row store," Ellison explained. "Once we have the column store, we can process data at ungodly speeds."

The new in-memory columnar format in the Oracle Database In-Memory option eliminates the need for analytic indexes. This makes analytic queries 100 times faster and



"Once we have the column store, we can process data at ungodly speeds."

—Larry Ellison, CEO, Oracle

OLTP and batch processing two to three times faster than queries and processes executed without the Oracle Database In-Memory option, Ellison said. "The DBA doesn't have to figure out what to index and what not to index," he explained. "The column store covers all the data—everything runs fast. This makes database design much easier, and makes tuning, in this case, unnecessary."

Turning on the Oracle Database In-Memory option requires just three simple steps: one that specifies how much memory will be used by the in-memory column store, one that says which tables or partitions should reside in the column store, and one that drops the existing analytic indexes.

And as simple as it is to activate the Oracle Database In-Memory option, activation is also the end of the configuration process. "Flip a switch, and all your existing applications run much faster," Ellison said. "There are no changes to SQL. There are no changes to your applications. There are no functions that are restricted. Everything that works today works with the Oracle Database In-Memory option turned on. There's no unloading and reloading of data."

"Every application that you wrote, every application that you bought—everything—runs without a single change to the application," Ellison emphasized.

"And the Oracle Database In-Memory option works beautifully with the Oracle Multitenant option in Oracle Database 12c, so all of this technology is cloud-ready," Ellison concluded. "Every database that you have now will be easier to tune, it will run faster, it will be just as reliable and just as secure as it is today." ◀

Fred Sandmark is a freelance technology writer in the San Francisco Bay Area.

NEXT STEPS

WATCH highlights of Larry Ellison's keynote address
bit.ly/1bmPT06

LEARN more about
Oracle Database In-Memory option
bit.ly/18loHut

Oracle In-Memory Applications
bit.ly/15kNfF7

C Is for Cloud, Consolidation, and Customers

Oracle customers drive the genesis and marquee features of Oracle Database 12c.

Andy Mendelsohn, senior vice president of database server technologies at Oracle, sat down with Tom Haunert, Oracle Magazine editor in chief, to talk about the new customer-driven technologies and innovations in Oracle Database 12c. The following is an excerpt from that interview. Listen to a podcast of the full interview at oracle.com/magcasts.

Oracle Magazine: Oracle Database 12c was released in June and launched in July, and the product release numbering has gone from 11 to 12. And the g that stood for grid in 11g is now c, for cloud. What drove the change?

Mendelsohn: Five years ago, when we started designing Oracle Database 12c, our customers wanted a different c: consolidation. They wanted to make it possible to lower the total cost of ownership for running their databases.

And to do that, they wanted to get the kind of benefits people get from virtualization—to reduce the number of servers running their databases—but they also wanted to reduce the total number of databases they had to manage, which was not something they were getting from virtualization.

Our customers asked for consolidation, so we created the multitenant architecture, which enables them to consolidate hundreds of their databases into one physical Oracle Database instance.

This new architecture supports both lower capital expenditures and lower operational costs. So in the original design, the c behind Oracle Database 12c was for consolidation.

Oracle Magazine: Oracle Database 12c includes more than 500 new features. What are some of the categories or focus areas of these new features?

Mendelsohn: From a planning standpoint, cloud and consolidation were a major focus, and that's where the multitenant architecture came from. But we also continued to



Andy Mendelsohn, Senior Vice President, Database Server Technologies, Oracle

focus on traditional key database development areas: high availability, data warehousing and big data analytics, compression and data optimization, performance and scalability, security and compliance.

Oracle Magazine: Tell us more about the multitenant architecture, and what it means for developers, DBAs, and businesses.

Mendelsohn: You can most easily understand the new architecture by comparing it to server virtualization. When you take a piece of hardware and virtualize it, you create logical servers called virtual machines, and those virtual machines look and feel like real hardware servers to applications. Your applications can run on them and not know that they're running on a virtual machine as opposed to a physical machine. And you do this to consolidate—to take hundreds of servers and consolidate them into hundreds of VMs on just one or two servers.

With Oracle Database 12c, we're doing something very similar for the database.

We're taking a database instance—which we now call a container database—and we're virtualizing it. That container can now contain as many as 252 virtual databases, which we call pluggable databases.

So now you can take hundreds of separate databases that could be on 100 separate servers today and consolidate them into one container database. You can move each of these separate Oracle Database 11g or Oracle Database 10g database instances into this one container. Each of the old instances now runs in its own pluggable database, which is essentially a virtual database.

And after you move your schema and your data into this pluggable database, your application runs against the pluggable database as though it were a physical database. The pluggable database looks and feels like a physical Oracle Database instance, so you don't have to rewrite your application to run in this environment.

Everything just works; the only line of code you have to change is the connect string. Everything else is unchanged. It's virtualization for databases.

We understand that a lot of customers have initiatives to implement virtualization of their hardware servers. The good news is that hardware virtualization and multitenant container databases are complementary: the customers can simply create the container database in a VM.

And with pluggable databases, they also get much denser consolidation than they had before, because instead of hundreds of database instances—with all their separate shared memory and background processes and so on—now they just have one container database with one shared memory area and one set of background processes. A container database also enables DBAs to manage many

as one: a single command at the container database level can back up, recover, and create a standby for all the pluggable databases in the container. This greatly lowers the costs of managing the databases.

Oracle Magazine: What is your top-feature list for Oracle Database 12c?

Mendelsohn: When we designed Oracle Database 12c, we identified what we thought would be the marquee features of the release. Multitenancy—the multitenant architecture—was by far the #1 feature of the release. The development project to design and build the new multitenant architecture was huge. We had to modify virtually all the components of the database product to support it.

As part of the project to support multitenancy, we also enhanced Oracle Real Application Testing, so that now you can do consolidated replays in Oracle Database 12c. You can take multiple database workloads that you want to consolidate into a single database, and you can capture and replay those workloads all together. This enables you to predict how those workloads will behave when they're all running together in a consolidated environment. It's important to note that multitenancy also makes it very easy to implement database as a service and software as a service.

Another marquee feature in Oracle Database 12c is for analytics for big data and data warehousing: SQL Pattern Matching. With SQL Pattern Matching, we've extended SQL so that you now can very easily express queries on time-ordered data to look for patterns in the data. Also, we implemented high-performance algorithms to do this pattern matching.

For example, let's say you're looking at stock trading data patterns. You can look for the classic W pattern—where the stock price peaks, then goes down for a short-term low, and peaks again. SQL Pattern Matching can be applied to web log analysis, financial analysis, data analysis, and telecommunications data analysis. Before SQL Pattern Matching, this type of analysis required thousands of lines of code to implement—now you can do it in a few lines of SQL.

For high availability in Oracle Database 12c, we added a marquee feature called Active Data Guard Far Sync.

"Another marquee feature in Oracle Database 12c is for analytics for big data and data warehousing: SQL Pattern Matching."

—Andy Mendelsohn, Senior Vice President, Database Server Technologies, Oracle

In the past, if you had a standby database more than, say, 100 kilometers [60 miles] away from the primary, you had to use an asynchronous Data Guard configuration, for performance reasons, which meant that if the primary database went down, the standby database potentially could lose the last few seconds' or minutes' worth of transactions.

Now, with Oracle Database 12c and Active Data Guard Far Sync, you can have the standby database across continents, across oceans—thousands of miles apart—and still ensure that there's zero data loss if the primary database goes down. All the transactions will be available on the standby database.

Storage optimization is another big feature area. In Oracle Database 11g, we introduced advanced compression, and this has been a very popular option for Oracle Database 11g customers. The storage optimization feature customers asked for next was better data lifecycle management.

Let's say there's an order processing system and the data starts out really hot: it's being inserted and updated. The orders are hot for the first couple of weeks, then they start cooling off, and then they're read-only. And then after a year, they become very rarely accessed and are retained for compliance reasons only.

In Oracle Database 12c, to understand this data lifecycle, we've introduced the notion of a heat map, where we capture the last time data was read or written in a block or a partition. Based on that data, DBAs can now set up policies that say things like "After the data hasn't been updated for a month, compress the data, using row compression. Or if you're on Oracle Exadata, go compress the data, using columnar compression." And then maybe after the data hasn't been read for six months, you can have a policy that says, "Automatically move that data to a low-cost storage tier."

Or if you're on Oracle Exadata, you can set up a policy that says, "Automatically compress that data, using archive compression" to get

much denser compression. And so this whole storage optimization capability is another marquee feature in Oracle Database 12c.

The last marquee features I'll mention are for data security. We added two very powerful data security features to Oracle Database 12c: the first is something we call "data redaction." Data redaction is a capability that lets a DBA introduce rules into the database that let customers deal with compliance issues.

For example, let's say a call center operator is able to look at the personal information of customers. Then an auditor comes along and finds this out and says, "No, you've got to fix that immediately." In the past, that was a change to an application, to make sure the call center operator couldn't see that data.

In Oracle Database 12c, the DBA can now institute a rule that says, "If somebody with the call center role is looking at this data, always mask the data before you present it as a result of a SQL query." That's data redaction in Oracle Database 12c.

We also added privilege analysis to Oracle Database 12c. Privilege analysis lets us track what kinds of privileges different users of the database need in order to get their jobs done.

There's this notion of the principle of least privilege: always make sure your database users get the least privileges necessary to do their jobs. And with privilege analysis in Oracle Database 12c, we can now see exactly what privileges all the different users are exercising, and then we can, at the push of a button, help DBAs remove privileges that are not needed in the everyday work life of a user. ◀

NEXT STEPS

LEARN more about Oracle Database 12c
oracle.com/database

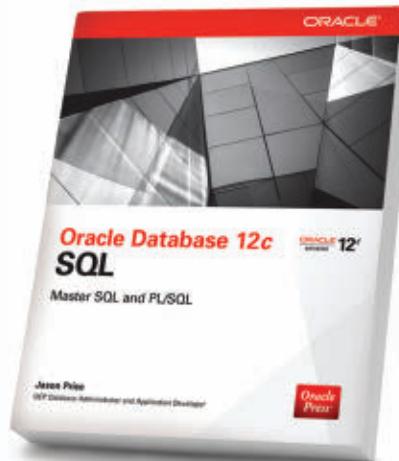
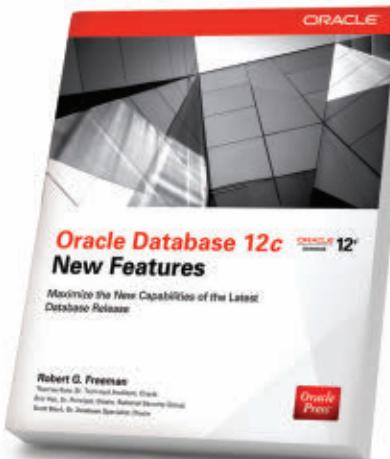
DOWNLOAD Oracle Database 12c
bit.ly/epBiUG

LISTEN to the interview
oracle.com/magcasts

ORACLE PRESS

YOUR DESTINATION FOR ORACLE AND JAVA EXPERTISE

Written by leading technology professionals, Oracle Press books offer the most definitive, complete, and up-to-date coverage of Oracle products and technologies available.



Oracle Database 12c New Features

Robert G. Freeman

Maximize the enhanced capabilities available in the latest database release.

Oracle Database 12c SQL

Jason Price

Find out how to access Oracle databases through SQL statements and construct PL/SQL programs.

Oracle Big Data Handbook

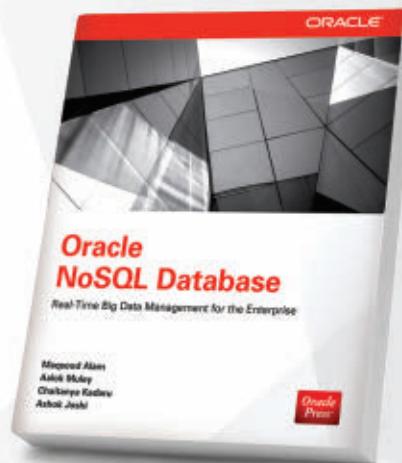
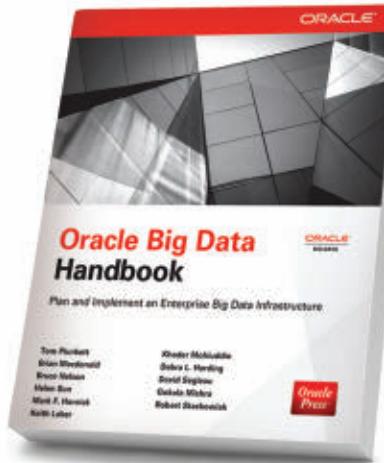
Tom Plunkett et al.

Learn best practices for acquiring, organizing, analyzing, and leveraging unstructured data.

Oracle NoSQL Database

Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi

Find out how to store big data in low-cost, low-impact, highly scalable and available data stores.



Available in print and eBook formats

Join the Oracle Press Community: www.OraclePressBooks.com



@OraclePress



OraclePress

**Oracle
Press™**

Oracle Database 12c: The Complete Reference



By Bob Bryla and Kevin Loney
Oracle Press
oraclepressbooks.com

Oracle Database 12c: The Complete Reference shows readers how to use the new tools and cloud enhancements of Oracle Database 12c to maintain a scalable, highly available enterprise platform and reduce complexity. This authoritative guide covers database installation, configuration, tuning, and administration and shows you how to build and populate Oracle databases, perform effective queries, design applications, and secure data. The book also contains a comprehensive appendix covering Oracle Database commands, keywords, features, and functions. Electronic content includes all code examples from the book and a PDF e-book.

RMAN Recipes for Oracle Database 12c



By Darl Kuhn, Sam Alapati, and Arup Nanda
Apress
apress.com

Oracle's flagship database product includes a wide-ranging set of features to aid database administrators in the all-important tasks of data recovery and safeguarding against data loss. Oracle Recovery Manager (Oracle RMAN) is at the heart of that feature set and is the tool most often used to initiate database backup and recovery operations. *RMAN Recipes for Oracle Database 12c* provides an example-driven approach to database recovery with Oracle RMAN and provides step-by-step solutions for the gamut of backup and recovery tasks that an administrator might need to perform. Readers will also learn how Oracle Database can manage backup files via the Fast Recovery Area, how to automate backup and recovery tasks with scripts, how to troubleshoot Oracle RMAN problems and optimize Oracle RMAN performance, and how to recover a lost control file or online redo log.

Oracle Database 12c: Install, Configure, and Maintain Like a Professional



By Ian Abramson, Michael Abbey, Michelle Malcher, and Michael Corey
Oracle Press
oraclepressbooks.com

Filled with easy-to-follow tutorials, this guide provides detailed coverage of core Oracle Database 12c concepts,

the role of the administrator, and enterprise database capabilities. The book is an essential beginner's resource that walks readers through database configuration, administration, programming, backup and recovery, and high availability. Each chapter includes a list of specific skills, practical exercises for applying those skills, self-assessments for checking projects, expert Q&A sections, and quizzes to test mastery of the material. It also includes in-depth introductions to SQL and PL/SQL, advice for managing large databases, and information on using Oracle's engineered systems.

Getting Started with Oracle WebLogic Server 12c: Developer's Guide



By Fabio Mazzanti Nunes and William Markito Oliveira
Packt
packtpub.com

Getting Started with Oracle WebLogic Server 12c: Developer's Guide provides a practical, hands-on introduction to Oracle WebLogic Server 12c. Written for beginners and intermediate users, the book will help developers create a complete Java Platform, Enterprise Edition 6 application leveraging Oracle WebLogic Server features such as Java Message Service (JMS), SOAP, and RESTful web services. It includes content on Oracle WebLogic Server's key features and step-by-step instructions, with screenshots and code samples, to help readers understand and apply important concepts.

Oracle Big Data Handbook



By Tom Plunkett, Brian Macdonald, Bruce Nelson, Mark Hornick, Helen Sun, Khader Mohiuddin, Debra Harding, Gokula Mishra, Robert Stackowiak, Keith Laker, and David Segleau
Oracle Press
oraclepressbooks.com

Cowritten by members of Oracle's big data team, *Oracle Big Data Handbook* provides coverage of Oracle's products for acquiring, organizing, analyzing, and leveraging unstructured data. The book discusses technologies essential for successful big data implementations—including Apache Hadoop, Oracle Big Data Appliance, Oracle Big Data Connectors, Oracle NoSQL Database, Oracle Endeca solutions, Oracle Advanced Analytics, and Oracle's open source R offerings—and offers strategies for using them. The handbook also includes best practices for migrating from legacy systems to an enterprise big data infrastructure.

Look for other Oracle books at bit.ly/NjG3KM.

Smart ERP Solutions Achieves Oracle Exadata Ready and Oracle Exalogic Ready Status

Oracle Platinum Partner Smart ERP Solutions has announced that its add-on offerings for Oracle's PeopleSoft applications have achieved Oracle Exadata Ready and Oracle Exalogic Ready status. Smart ERP's



release-independent offerings, HCM Solutions 3.0 and Financials Solutions 3.0, provide automated employee and vendor onboarding capabilities and enable intelligent electronic forms capabilities to reduce paper usage.

smarterp.com

AdvancedEPM Consulting Achieves Oracle PartnerNetwork Specialization for Oracle Data Relationship Management

AdvancedEPM Consulting, an Oracle Platinum Partner and Oracle Hyperion consulting firm that focuses on enterprise performance management and master data management, has achieved Oracle PartnerNetwork Specialized status for Oracle Data Relationship Management. This is AdvancedEPM's seventh Oracle specialization.

advancedepm.com

eMeter Achieves Oracle Exadata Optimized Status

eMeter, a Siemens business and Oracle Gold Partner, has achieved Oracle Exadata Optimized status for its EnergyIP



7.6 Smart Grid Application Platform. Oracle Exadata Optimized status demonstrates that EnergyIP has been tested and tuned with Oracle Exadata Database Machine.

emeter.com

Infonova R6 Achieves Oracle Exadata Ready Status

Oracle Gold Partner Infonova has announced that Infonova R6 version 6.4 has achieved Oracle Exadata Ready status. Infonova supports R6 version 6.4 with Oracle Exadata Database Machine, Oracle Solaris 11, Oracle Linux, and Oracle VM. R6 version 6.4 is a

multitenant, fully convergent platform for telco and cross-industry business models. It delivers capabilities for partnering orchestration, monetization, and automated revenue sharing allocation.

 infonova.com

DocVentive and Windward Earn Gold Partnership

Two Oracle partners with document-related solutions have earned Oracle Gold Partner status.

DocVentive, a provider of document publishing services and solutions, earned Oracle Gold Partner status as an authority in Oracle Documaker, Enterprise Edition, and Oracle Documaker, Standard Edition.

DocVentive solutions address document automation requirements in insurance, financial services, and the public sector. The company manages



new Oracle Documaker, Enterprise Edition implementations, and also helps customers migrate from legacy platforms.

Windward, which provides embedded reporting and document generation software solutions, earned Oracle Gold Partner status for delivering enhanced Oracle reports that help Oracle Database users gain insights into their data. OEMs and enterprise customers use Windward's Oracle reporting tools to place Oracle data into templates designed in Microsoft Word and Excel and make them available in a variety of formats.

 docventive.com
 windward.net

Four Partners Earn Platinum-Level Status

Four Oracle partners have earned Oracle Platinum Partner status.

Ataway was recognized for its expertise across five Oracle solution areas, including Oracle SOA Suite; Oracle's PeopleSoft Human Capital Management, PeopleSoft PeopleTools, and PeopleSoft Financials; and Oracle Business Process Management Suite.

IT Convergence was acknowledged for its years of Oracle practice and its expertise in Oracle E-Business Suite 12 and Oracle Fusion Applications. IT Convergence provides consulting, education, development, enterprise cloud, and managed services.

MindStream Analytics was recognized for its expertise and excellence in delivering services for Oracle Hyperion Financial

Management, as well as its expertise in Oracle Business Intelligence Enterprise Edition and Oracle Essbase. MindStream Analytics focuses on helping clients improve business understanding and decision-making.

Novensys Dynamics Srl achieved recognition for its expertise in implementing Oracle products, including Siebel Customer Relationship Management. Novensys provides hardware and software for enterprise resource planning, supply chain management, customer relationship management, and business intelligence.

 ataway.com
 itconvergence.com
 mindstreamanalytics.com
 novensys.com

Intelenex Achieves Oracle Business Accelerators Qualified Status for Oracle E-Business Suite

Oracle Platinum Partner Intelenex, an Oracle Accelerate for Midsize Companies solution provider, has achieved Qualified status on Oracle Business Accelerators for Oracle E-Business Suite. Oracle Business Accelerators

are cloud-based implementation tools that can reduce implementation time and costs. Intelenex delivers consulting and implementation services for Oracle Applications.

 intelenex.com

Three Partners Achieve Oracle Validated Integrations

Three Oracle partners have achieved Oracle Validated Integrations, indicating that their solutions are designed in a reliable, standardized way, have been tested as functionally and technically sound, and operate and perform as documented.

Corporate Screening Services, an Oracle Gold Partner, has achieved Oracle Validated Integration of its background screening solution with Oracle Taleo Enterprise Cloud Service. The solution simplifies background screening for Oracle Taleo customers.

Q Software Global, an Oracle Gold Partner, has achieved Oracle Validated Integration of its security and compliance suite, Q Software Version 5, with Oracle's JD Edwards EnterpriseOne 9.1. Q Software Version 5 enables Oracle's JD Edwards EnterpriseOne customers to create and manage a robust security environment.

Riverbed Technology, an Oracle Gold Partner, has achieved Oracle Validated Integration of its Riverbed Stingray Traffic Manager 9.1 with Oracle E-Business Suite 12.1. The solution is a software application delivery controller that helps optimize end-user services by inspecting, transforming, prioritizing, and routing application traffic.

 corporatescreening.com
 qsoftware.com
 riverbed.com

Performance Architects Launches Oracle Exalytics Discovery Center

Performance Architects, an Oracle Platinum Partner, has launched the Performance Architects Oracle Exalytics Discovery Center.



The new center offers current and prospective customers an environment to evaluate Oracle Exalytics. Performance Architects provides industry-specific, functional, and technical proof-of-concept and pilot services using real customer data.

 performancearchitects.com

Optimize Your Apps for Engineered Systems

"Customers get powerful technology with low TCO."

—Sage

"Allows us to compete and win against larger ISVs."

—IBIS

"It means easy implementation, fast time to market."

—Sterci, a Bottomline Technologies Company

Recognized by Oracle. Preferred by Customers.

ORACLE®

oracle.com/partners/goto/exastack

Become a Better Architect

Single steps you can take today

There is no magic potion or wonder drug that will instantly turn you into a great architect. You still need a unique combination of technical and communication skills and experience to succeed in that role. So you're going to have to work at it, and given the pace of change in information technology, that work will be ongoing.

But that doesn't mean there aren't steps you can take today, right now, to become a better architect. And you'll be happy to know that those steps aren't all that difficult or complicated.

For instance, Anthony Meyer, architecture leader at Westfield Insurance, suggests that you spend more money on coffee. "The major hurdle for IT architects isn't the validity of their approach," says Meyer. "It's in getting buy-in." The problem, Meyer suggests, is in the "foundational misunderstanding" between architects and their partners: the implementers, sponsoring executives, and project managers.

"While a 20-page presentation explaining the technical merits may be needed, buying the right partner a cup of coffee can sometimes be a more effective way to deal with pushback," Meyer says. "I'll be the first to say that coffee won't solve every issue. But in terms of a single step, coffee and conversation can go a long way toward building more-productive relationships and getting ideas adopted."

Hot beverages aren't involved in Oracle ACE Director Lonneke Dikmans' suggestion, but she places a similar emphasis on communication and stresses that buy-in is a two-way street. "Get involved," she says. "Too often I see architects who come up with decisions and rules without committing themselves to the results of those decisions and rules."

Dikmans, a managing partner at Vennster, suggests that architects must understand that their actions can have consequences

"The one single step to being a better IT architect is to stop being an *IT* architect."

—Eric Stephens, Enterprise Architecture Director, Oracle

for other stakeholders. Those consequences must be discussed early and openly with stakeholders so that management, architects, and developers understand why the decisions were made and how they will be implemented. "Know what it takes to create the proposed solution," says Dikmans. "Talk to the developers; participate in the project."

Oracle ACE Director Ronald van Luttikhuizen, also a managing partner at Vennster, echoes his colleague's emphasis on involvement.

"Don't turn your back on something after you have architected and designed it," van Luttikhuizen says. "Keep involved in the realization of the proposed solutions. This will force you to create viable and feasible solutions and avoid ivory tower architecture. Involvement in the realization will improve your insights and experience with new and alternative solutions, other patterns that can be applied, new trends, and unforeseen pitfalls. These experiences can then be applied in new solutions, making you a better and more adaptive architect."

In applying those experiences, it is important to remember that technical skills alone do not make a great architect. "Many architects come from a technical background," says Jeff Davies, a SOA architect, developer, and evangelist and a senior principal product manager at Oracle. "The most important thing they can do is to understand the strategic objectives of their companies. It is only

with this understanding that they will be able to direct their technical skills, and the skills of others in IT, toward better serving the company."

Eric Stephens, an enterprise architecture director at Oracle, takes Davies' suggestion a step further. "The one single step to being a better IT architect is to stop being an *IT* architect," he says. "The most successful IT professionals I know, regardless of title or role, are the ones that are business focused. From an enterprise architecture perspective, the technology is, at best, half of the overall architecture equation."

Stephens sees a trend among many in the community to separate business architecture from enterprise architecture. "I suspect that this is because of an emphasis on technology among enterprise architects. Whether one agrees with that approach is irrelevant. My point is that the better architects are business centric."

You've heard from a quintet of skilled, successful architects. Now it's up to you. ◀



Bob Rhubart

(bob.rhubart@oracle.com) is manager of the architect community on Oracle Technology Network, the host of the Oracle Technology Network ArchBeat podcast series, and the author of the ArchBeat blog (blogs.oracle.com/archbeat).

NEXT STEPS

READ

"**The Most Important IT Career Skill**"
bit.ly/11Lduyr

LISTEN TO

"**Who Gets To Be a Software Architect?**"
bit.ly/11K35Sf

all ArchBeat podcasts
bit.ly/otnarchpod

User Group Hug

Three peers tout the benefits of Oracle user groups, new features, and old favorites.



KAMRAN AGAYEV A.



Company: Azercell Telecom, the leading mobile telecom operator in Azerbaijan

Job title/description: Oracle DBA, responsible for maintaining, tuning, and troubleshooting databases

Location: Baku, Azerbaijan

Oracle credentials: Oracle Certified Master (Oracle Database 10g), Oracle Certified Professional (Oracle9i Database, Oracle Database 10g, Oracle Database 11g), and Oracle Certified Expert (Oracle Real Application Clusters), with 7 years of experience using Oracle products



SUK KIM



Company: NoBreak Company, a provider of consulting services and technical support for security systems and solutions

Job title/description: Senior consultant, responsible for Oracle Solaris system tuning, troubleshooting Oracle Solaris security, and auditing information security, among other tasks

Location: Seoul, South Korea

Oracle credentials: Oracle Certified Associate (Oracle9i Database), Sun Certified Java Programmer (Java 2 Platform, Enterprise Edition 1.2), and Sun Certified System Administrator (Oracle Solaris 8), with 13 years of experience using Oracle products



JASON ARNEIL



Company: e-dba, an Oracle Platinum Partner providing managed services and professional services support

Job title/description: Senior principal consultant, part of a team of Oracle Exadata DBAs focused exclusively on e-dba Oracle Exadata customers

Location: Oxford, England

Length of time using Oracle products: 14 years

What technology has most changed your life?

Oracle Database. Using it has given me the honor of presenting at Oracle OpenWorld, on the APAC OTN Tour, and at TROUG [Turkish Oracle User Group] conferences. I've also blogged about my experiences with Oracle Database [see kamranagayev.com] and helped to establish the Azerbaijan Oracle User Group [AzerOUG]—both of which have expanded my social circle.

How are you using social media in your work? As a blogger, I try to share problems I encounter in my daily job. I also record step-by-step video tutorials and share them on YouTube, Twitter, and Facebook. And whenever I'm at an Oracle-related conference, I tweet from almost every session I attend about anything new.

You've taken Oracle University [OU] classes in the past. What led you to do this? I wanted to learn Oracle from Oracle. OU classes are very well structured. They've really helped me to update my skills and prepare for the Oracle certification exams.

What's your favorite tool on the job? DTrace is a very powerful analysis tool—other similar tools just aren't as intuitive. And performance analysis is so important for ensuring security, which is the focus of my business. I also appreciate the fact that DTrace can be utilized in both Oracle Enterprise Linux and Oracle Solaris.

What are your favorite mobile applications? Evernote and Oracle Hardware Virtual Tour (bit.ly/15AIcuh)—a 3-D product catalog.

What's your favorite Oracle technology user group? The Korea Oracle Solaris User Network. I'm the group's chairman. The technical understanding among our members is high, and we really help each other. As a member, you can get truly valuable technical assistance through the Q&A section of the group's online bulletin board—and that's also a great place to create and share technical documentation. We also promote knowledge sharing through a variety of conferences and offline seminars.

How did you get started in IT? I really got started while pursuing a PhD in nuclear physics in the mid '90s. I was using a Sun workstation and essentially being the system administrator for it. This led me to become a Sun system administrator, and from there I got to work with Oracle technology—and realized that I actually preferred being a DBA.

What's your favorite technique on the job? Using the Oracle wait interface. The Oracle code is well instrumented, and being able to see where a session or statement is spending time is a very useful technique.

Which new features in Oracle Database are you currently finding most valuable? I do a lot of consolidation work with Oracle Exadata, and the pluggable databases in Oracle Database 12c are great for that.

What's your go-to Oracle reference book? *Practical Oracle8i* [Addison-Wesley Professional, 2000] by Jonathan Lewis and *Optimizing Oracle Performance* [O'Reilly Media, 2003] by Cary Millsap and Jeff Holt. These books are more than 10 years old now, but they're still valid today. I know I was a better DBA after reading them. ◀



Reach More than 700,000 Oracle Customers with Oracle Publishing Group

Connect with the Audience that Matters Most to Your Business



Oracle Magazine

The Largest IT Publication in the World

Circulation: 550,000

Audience: IT Managers, DBAs, Programmers, and Developers



Profit

Business Insight for Enterprise-Class Business Leaders to Help Them Build a Better Business Using Oracle Technology

Circulation: 100,000

Audience: Top Executives and Line of Business Managers



Java Magazine

The Essential Source on Java Technology, the Java Programming Language, and Java-Based Applications

Circulation: 125,000 and Growing Steady

Audience: Corporate and Independent Java Developers, Programmers, and Architects



For more information or to sign up for a FREE subscription: Scan the QR code to visit Oracle Publishing online.

ORACLE®



RECORD-BREAKING

Oracle OpenWorld, JavaOne, and MySQL Connect deliver a week of innovative technology.

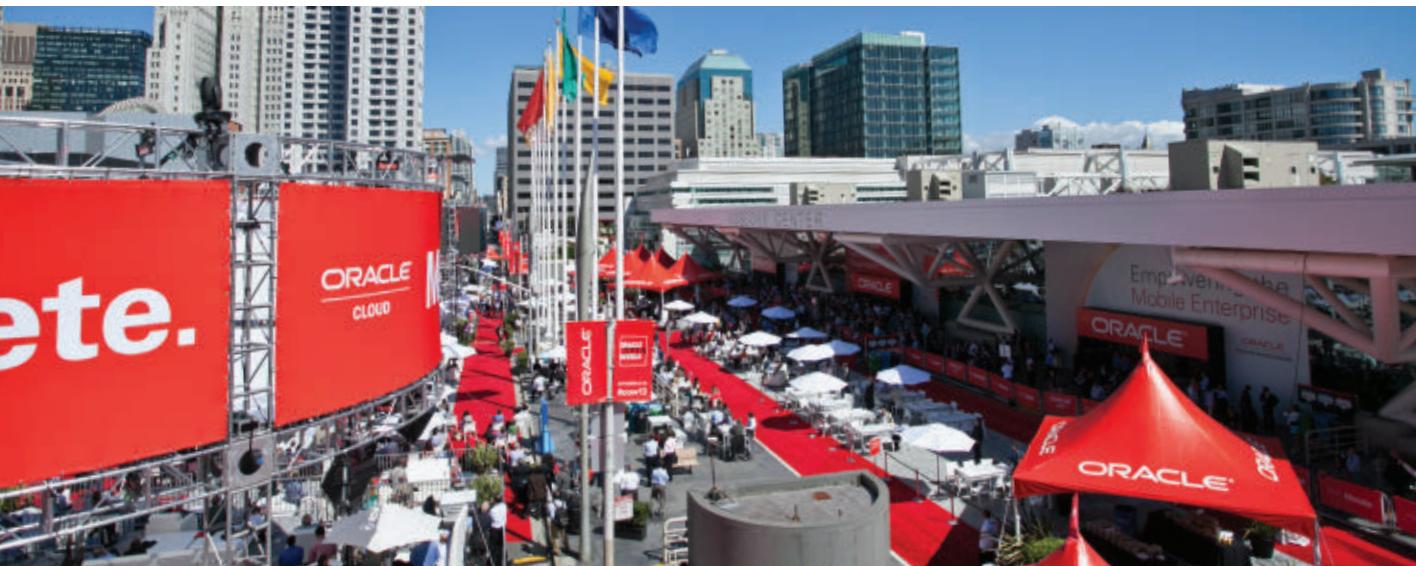
BY TOM CALDECOTT



Oracle President Mark Hurd appeared live from Oracle OpenWorld on CNBC's *Closing Bell* with host Maria Bartiromo.

Conference attendees enjoyed music and spectacular views at the Oracle Appreciation Event on Treasure Island.



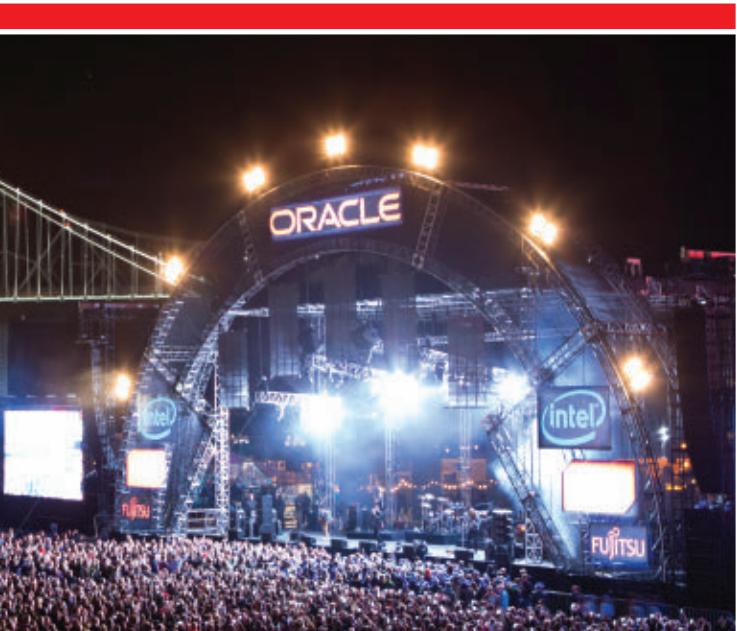


Oracle's San Francisco conferences have come and gone for 2013. But for the 60,000 people from 145 countries who attended and the 2.1 million people who followed the conferences online—a new attendance record—the experience, information, and contacts made were investments in the future.

ORANGE PHOTOGRAPHY/HARTMANN STUDIOS/Flickr

Like past conferences, this year's gathering of business and technology professionals was the place to learn about the latest in technology and trends as well as to network with Oracle experts, partners, and customers. The conferences featured 2,555 sessions, 3,599 speakers, 500 partner and customer exhibits, 408 demos, and a wide variety of hands-on labs and meetups.

Oracle CEO Larry Ellison discussed accelerating queries on data warehouses with the Oracle Database In-Memory option.



Oracle President and CFO Safra Catz talked about Oracle's strategy for simplifying IT at the Leaders Circle @ OpenWorld program.



Hot technology topics included big data and analytics, cloud computing, and the Internet of Things, to name a few. In his opening keynote, Oracle CEO Larry Ellison introduced three Oracle breakthroughs, which were on view at the Engineered Systems Showcase and DEMOgrounds: Oracle Database In-Memory option to Oracle Database 12c, which delivers queries that are 100 times faster for real-time analytics as well as doubling transaction processing rates; the SPARC M6-32 server, with 32 terabytes of dynamic random access memory (DRAM) and double the number of cores of Oracle's previous-generation SPARC M5 servers; and Oracle Database Backup Logging Recovery Appliance, which delivers data protection for near-zero data loss.

As in years past, conferencegoers attended JavaOne; MySQL Connect; and/or Oracle OpenWorld, which included two special programs, Oracle PartnerNetwork Exchange @ OpenWorld for partners, and Leaders Circle @ OpenWorld for partner and customer executives. HCM @ OpenWorld, Cloud @ OpenWorld, and CX @ OpenWorld were among special focus areas at this year's conference as well.

Attendees watched live coverage of keynotes and sessions through Oracle OpenWorld Live, a news and information show that was available on oracle.com and broadcast onsite. This year Oracle OpenWorld Live programming featured 32 segments with customers, partners, and luminaries.

The conferences also offered new attractions for fun and relaxation, including two bocce ball courts, a make-your-own-cupcake bar, and wine tasting, in addition to the always popular Oracle Appreciation Event on Treasure Island, which featured music by Maroon 5 and The Black Keys.

Some of the most significant record-setting events during conference week were not at the conferences but on San Francisco Bay. After being down eight races to one in the 34th America's Cup competition, ORACLE TEAM USA won eight consecutive races to win the cup, setting a record for the greatest comeback in the history of the 162-year event. What better way to finish off an exceptional week? ◀

Tom Caldecott is a writer in Oracle's brand marketing group.

ORANGE PHOTOGRAPHY: HARRMANN STUDIOS; FLICKR: © ORACLE TEAM USA / PHOTO: GUILAIN GRENIER; © ORACLE TEAM USA / PHOTO: SANDER VANDER BORCH

Maroon 5 entertained the crowd at the Oracle Appreciation Event.

After coming back from a seven-race deficit in the 34th America's Cup, ORACLE TEAM USA team members celebrated their historic win.





ENGINEERING AS A SERVICE

Deploy a world-class private cloud with Oracle Exadata.

BY DAVID A. KELLY

Oracle Exadata Database Machine is known for great compute performance, and over the past few years, it has also become known as a great platform for any type of Oracle Database workload, from data warehousing to online transaction processing (OLTP). But now organizations are turning to Oracle Exadata for business efficiencies and private cloud solutions—for consolidation and database as a service (DBaaS).

“DBaaS is essentially the evolution of database consolidation, as organizations reduce the number of different database

servers they have deployed,” says Oracle’s Tim Shetler, vice president of product management for Oracle Database.

DBaaS goes beyond database consolidation, by enabling many databases to share a common platform, so organizations can get much-more-effective utilization of hardware resources while also enabling database self-service capabilities.

“We see DBaaS as a journey. After organizations consolidate on the Oracle Exadata platform, they can reduce costs further by deploying a DBaaS self-service infrastructure on top of the Oracle Exadata platform,” says Shetler.



"We can do backups more quickly. We can back up the entire stack in about an hour. Now, instead of just managing backups, we're working on projects that add value to the university."

—Andy Wattenhofer, DBA Manager, University of Minnesota

CHECKING INTO THE UNIVERSITY OF MINNESOTA'S DATABASE HOTEL

For an inside look at how DBaaS works in the real world, it's worth checking into the University of Minnesota's database hotel.

"We call our implementation of DBaaS a database hotel," says Andy Wattenhofer, DBA manager at the University of Minnesota. "It's just a nicer-sounding way of saying hosted database services."

Regardless of what it's called, the university's DBaaS implementation is having a big and positive effect on both IT and the University of Minnesota's users.

With more than 50,000 students, the University of Minnesota in Minneapolis is one of the largest universities in the United States. The university's centralized IT group not only has to support all those students but also must provide support and services to more than 40 departments and colleges within the university. In the past, each of those departments had its own collection of applications, systems, and databases, many of which the centralized IT group needed to support.

That's why over the past few years, Wattenhofer's team developed its database hotel as a way of providing faster, more flexible, and more efficient database services to all the university departments. Specifically, his organization built an Oracle technology-based infrastructure that consolidated the databases and many servers from the various departments down to two Oracle Exadata systems.

The University of Minnesota currently has two Exadata Database Machine X2-2 half-rack systems from Oracle, with four database nodes each and roughly 30 terabytes of usable disk space for each of the Oracle Exadata systems. The university is using Oracle Real Application Clusters (Oracle RAC) for high availability and the Data

SNAPSHOT

University of Minnesota

umn.edu

Location: Minneapolis, Minnesota

Students: 50,000+

Oracle products: Oracle Database 11g Release 2, Oracle Exadata Database Machine, Oracle Enterprise Manager, Oracle Real Application Clusters, PeopleSoft product family

Guard feature of Oracle Database, Enterprise Edition, for disaster recovery capabilities.

The deployment has been live in production since May 2011.

To create the database hotel, Wattenhofer's team took the individual databases required for different applications and turned them into schemas in a shared Oracle Database instance.

"The database hotel model takes the Oracle Database concept of a schema and positions it more like a database," says

Wattenhofer. "We've taken one large shared instance and created a model where people can create one or more schemas to build their applications. They can have roles, login credentials, security, and all of the standard infrastructure they would expect."

The university's database hotel enables each database schema to share temp spaces, undo spaces, system tablespaces, and the other resources across multiple databases instead of duplicating those resources across many servers and databases. "Now we just have everything in one place, so we're sharing resources and administrative overhead," says Wattenhofer. "We've also reduced resource utilization by not having to build all these memory structures across all the different servers."

Another big benefit for the university is that the centralized IT team is now able to efficiently manage all the database-related backend operations.

"You can go from one database to the next, and it works exactly the same way, so we've really reduced administrative overhead," says Wattenhofer. "And we can do things a lot more quickly. We can patch quickly. We can do backups more quickly. We can back up the entire stack in about an hour."

Oracle Enterprise DBaaS Architecture

Organizations already using Oracle Database can implement a database-as-a-service (DBaaS) solution by using a schema consolidation approach with Oracle Database 11g, or they can step up to the Oracle enterprise DBaaS architecture, which is composed of three core components: Oracle Exadata Database Machine, Oracle Database 12c, and Oracle Enterprise Manager Cloud Control 12c.

"Oracle Database 12c is ideal for DBaaS, because of its multitenant architecture," says Oracle's Tim Shetler, vice president of product management for Oracle Database. "The Oracle Database 12c multitenant architecture provides 'pluggable data-

bases,' which means that organizations can have many databases plugged into the same database container, sharing system resources so that overall resource requirements are significantly lower."

Oracle Database 12c's multitenant architecture is also a great enabler for providing more-efficient DBaaS. In addition to consolidating databases, Oracle Database 12c's multitenant architecture can consolidate many database resource requirements into one common pool of resources. With the multitenant architecture, everything from memory and background processes to backups, patching, and upgrades can be shared and consol-

idated, all while database isolation is maintained.

Oracle Enterprise Manager Cloud Control 12c also provides robust support for DBaaS. The tool includes a service module that enables organizations to easily provision databases without involving the IT department as well as to set up chargeback plans that allocate cost according to what's used.

"The combination of Oracle Exadata as a platform; Oracle Database 12c, with its multitenant architecture; and Oracle Enterprise Manager Cloud Control 12c creates a complete solution that's ideal for providing DBaaS," says Shetler.

But saving on administrative overhead is only one benefit. An important value proposition for the university's Oracle Exadata-based solution was that it would free up valuable IT personnel for more-productive activities, such as creating new applications or working with the users and departments on projects. "Now, instead of just managing backups, we're working on projects that add value to the university," says Wattenhofer. "I wanted to move our staff into more-valuable work that really contributes value to the mission of the university."

COMPRESSION AND PERFORMANCE

Wattenhofer has also found the capabilities of Oracle Exadata's Exadata Hybrid Columnar Compression feature useful. "We identified one database that had around 350 gigabytes of data, and the Oracle Exadata compression brought it down to around 30 gigabytes. On top of that, you can also get a bit of performance gain," says Wattenhofer. "Not only did our performance not degrade because of compression, but we also found that some queries were running faster as a result of compression."

Other key benefits, says Wattenhofer, are Oracle Exadata's Exadata Smart Scan feature and storage capabilities. As one might expect, a university's applications get pummeled during fall and spring registration, when thousands (or tens of thousands) of students are scheduling classes. During the student registration process, the university has a goal of returning results within a few seconds. Although the university has always striven to make the process as efficient as possible, the first time it ever achieved its multisecond goal for returning results was after the university's database was moved to the database hotel running on Oracle Exadata.

INCREASED EFFICIENCY AND STANDARDIZATION

Another big benefit of DBaaS for the University of Minnesota is that it provides an efficient way for the centralized IT group to make it easier for individual departments to manage their own databases yet remove maintenance requirements such as backups and patching. In effect, by using the centralized DBaaS service, departments get a free DBA looking over their shoulder, backing up systems as needed, ensuring that the appropriate patches are installed, and maintaining appropriate security measures. And with database services provided



The University of Minnesota refers to its Oracle Exadata-based database-as-a-service implementation as a database hotel. "We've taken one large shared instance and created a model where people can create one or more schemas to build their applications," says Andy Wattenhofer, DBA manager at the University of Minnesota.

through Oracle Exadata, everyone on the new DBaaS platform automatically inherits benefits such as security standards compliance. "They don't even have to think about it. It's a free add-on for them," says Wattenhofer.

Providing DBaaS also means that the university's departments can create and deploy solutions much faster than in the past, which means that "checking into" the university's database hotel doesn't take a lot of time. "It's pretty easy for us to create a new schema in the database and give credentials to the users. They can just point their application at the new schema," says Wattenhofer. "It takes us about five minutes to spin up a new database."

"I think our ability to manage databases within this single engineered environment really gives us a leg up on our competition."

—Larry Freed, CIO, Overhead Door

At a high level, Oracle's engineered system approach has assisted Wattenhofer's work. "One of the biggest benefits to me is that we didn't have to go through the pain of implementing all the technology that's in Oracle Exadata," says Wattenhofer. "It was already done for us, so we were able to give our users a highly available system over the course of two months, from delivery to production."

USING ORACLE EXADATA TO OPEN DOORS TO CUSTOMERS

When it comes to overhead, revolving, sliding, or other specialty residential and commercial doors, Overhead Door is the worldwide leader. But when Overhead Door needed to open doors with its customers through a better, faster, and more agile IT infrastructure, the company turned to Oracle and Oracle Exadata.

Based in Lewisville, Texas, Overhead Door is a 92-year-old, nearly US\$1 billion company focused on manufacturing, distributing, installing, and servicing a wide range of openers and doors, from residential and commercial garage doors and revolving, automatic sliding, and pedestrian doors to truck doors and ramps. The company manufactures, installs, and services the doors, and the company's products are sold through OEMs; dealers; distributors; and retailers such as Lowe's, Home Depot, and Amazon. Overhead Door is owned by Sanwa Holdings Corporation of Japan and has more than 3,500 employees; 17 manufacturing locations across the United States, Mexico, and the United Kingdom; and about 100 company-owned sales and service centers across North America.

In 2009 Overhead Door acquired its largest competitor, Wayne-Dalton, which meant a significantly larger combined company as well as a more complex IT footprint. The organizations used different legacy ERP systems, and after a strategic business assessment the following year, the leadership of Overhead Door realized that to continue optimizing business processes, it would need to invest in a new IT platform.

"It became evident that our existing technology platforms were not going to get us where we needed to go," says Larry Freed, CIO at Overhead Door.

In 2011 the company embarked on an evaluation and selection process for a best-in-class solution that would support the requirements of the business and align with the strategic initiatives it had committed to. By the end of 2011, the company decided to rip and replace all of its legacy environments with a new Oracle technology-based platform.

"We made a strategic decision to commit to Oracle," says Freed. Specifically, the

company decided to implement the full Oracle stack, from hardware up to Oracle Applications. Overhead Door kicked off its "replatform" effort (known internally as Project Everest) in January 2012, with a global blueprinting process, and started implementation in October 2012. The company's first business unit went live on the new Oracle platform in September 2013, and the company is continuing rollouts to the rest of its business units over the next two years.

"Since the company has grown, and continues to grow, through acquisition, we'd like this to become the platform that enables us to grow," says Freed. "Now, whether we grow through acquisition or organically, we have a very robust set of capabilities we can deploy."

Oracle Exadata Database Machine plays an important part in Overhead Door's new IT and business strategy. The organization has two Exadata Database Machine X2-2s deployed, one in production and one in development and testing. "Because it's an engineered system, Oracle Exadata gives us a leg up on speed, performance, and service to our employees and customers," says Freed. "With Oracle Exadata and Oracle technologies, we've built a private cloud that we can scale and adjust very quickly as business conditions change."

For Overhead Door, an important part of the transformation was enabling closer relationships with its customers, across all its channels. "One of the drivers for us was customer intimacy. We didn't want our infrastructure plumbing to be a problem in achieving that," says Freed. "The Oracle Exadata platform gives us the ability to have really good speed and performance that enables us to be much easier to do business with."

In addition, by upgrading to an Oracle Exadata platform, Overhead Door now has the power to analyze and understand its business and customers in ways it never could before. "This was really a business transformation enabled by a technology platform," says Freed. "And we felt that Oracle Exadata was going to bring that capability to the table for us by enabling us to manage

huge amounts of data effectively as well as provide new services and integration capabilities through a customer portal."

In addition to transforming the business, Oracle Exadata has transformed database management operations. "I think our ability to manage databases within this single engineered environment really gives us a leg up on our competition," says Freed. "It also gives our team the flexibility to be able to manage a very complex database environment without nearly the amount of effort it would have taken with our previous solutions."

In the end, Overhead Door's new Oracle technology-based architecture is less about

SNAPSHOT

Overhead Door
overheaddoor.com

Location: Lewisville, Texas

Employees: 3,500+

Oracle products: Oracle E-Business Suite, Demantra demand management applications, Oracle Transportation Management, Oracle CRM On Demand, Oracle Governance Risk and Compliance, Oracle Identity Management, Oracle Business Intelligence, Oracle Business Intelligence Enterprise Edition, Oracle VM, Oracle Exadata Database Machine, x86 servers, Oracle Fusion Middleware, Oracle Database



Oracle Exadata Database Machine plays an important part in Overhead Door's new IT and business strategy. "With Oracle Exadata and Oracle technologies, we've built a private cloud that we can scale and adjust very quickly as business conditions change," says Larry Freed, CIO at Overhead Door.

technology and more about achieving business objectives. "Our Oracle Exadata-based environment is very powerful," says Freed. "Using Oracle Exadata as our database platform brings us the power and capability we need in order to differentiate ourselves in the marketplace."

DATABASE SERVICES FOR THE FUTURE

As competition continues to increase and the available time to market decreases, organizations have to find new ways to stay ahead. One way to do that is to focus on IT solutions, such as DBaaS, that provide users with more control and the ability to respond more quickly to business change while enabling IT personnel to focus on projects that truly add value to the business.

Staying ahead of the competition also requires being ready for company acquisitions, organic business growth, the continuing explosion of data, and the new business questions that will follow that new data.

"From the growth and scale perspective, Oracle Exadata can meet our needs," concludes Freed. "With the Oracle stack and Oracle Exadata, we now have a single, unified platform that should be able to fit just about anything we bring on board." ◀

David A. Kelly (davidakelly.com) is a business, technology, and travel writer who lives in West Newton, Massachusetts.

NEXT STEPS

LEARN more about Oracle Exadata

oracle.com/exadata

Oracle Database

oracle.com/database

Oracle Private Database Cloud

bit.ly/GBXlkH

Oracle Enterprise Manager 12c

bit.ly/175NHTV



THE BUSINESS OF GROWING

Land O'Lakes invests in Oracle engineered systems
to plant the seeds of change. BY MARTA BRIGHT

WESROWELL



Close to 21 million American farmers produce, process, and sell food and fiber products, and nearly US\$136 billion in farm goods were exported in 2011. Chief among these producers is the Land O'Lakes cooperative, which has been a part of the American landscape for nearly a century.

An iconic brand, Land O'Lakes has grown far beyond its roots as a small cooperative of dairy farmers with forward-thinking ideas about producing and packaging butter. Supported by a variety of technologies, including

Oracle Exadata and Oracle Exalogic, Land O'Lakes has become a Fortune 500 company and is now the second-largest cooperative in the United States, with annual sales of more than US\$14 billion. Over the years, Land O'Lakes has expanded its operations into a variety of subsidiaries, including WinField Solutions (WinField), which provides farmers with a wide variety of crop seeds and crop protection products, and Purina Animal Nutrition, which provides farmers and ranchers with a wide variety of animal nutrition products.



Land O'Lakes and its subsidiaries view the Oracle platform—including Oracle Exadata and Oracle Exalogic—as a powerful consolidation system. "We can essentially do more with less on these engineered systems than we can on traditional platforms," says Land O'Lakes Vice President and CIO Mike Macrie (right), with Land O'Lakes Director of Technology Services Tony Taylor.

FIRMLY ROOTED IN COOPERATION AND TECHNOLOGY

The dairy and farm product giant has been a user of Oracle's JD Edwards EnterpriseOne enterprise resource planning (ERP) applications for more than a decade, and the Oracle footprint extends across Land O'Lakes and the WinField and Purina Animal Nutrition subsidiaries. "We've been a longtime JD Edwards EnterpriseOne ERP customer across multiple divisions," explains Mike Macrie, vice president and CIO at Land O'Lakes. "Our growth into our current Oracle footprint began about four years ago, when we invested heavily in Oracle's technology platform and applications."

For example, back in 2010, Land O'Lakes introduced Oracle's Demantra demand planning applications and Oracle Transportation Management, which the company promptly integrated with its existing JD Edwards EnterpriseOne system to improve shipping and delivery operations. In the case of WinField, the company began focusing more heavily on the Oracle technology stack—including

Oracle Exadata, Oracle Exalogic, and the Oracle WebCenter platform—to handle some of the complexities of the seed business.

Like the Land O'Lakes dairy products business, WinField functions as a wholesaler: it sells seed and crop protection products and services to local co-op members who, in turn, sell to farmers. To support the operation, WinField has grafted an array of Oracle technologies together with existing proprietary systems. This includes the R7 Tool—an interactive web-based, mobile platform that aids agronomic decision-making—and the company's web-based seed ordering system, Connect3.

What makes seed sales unique and challenging is that they are directly tied to seasonal purchasing. "There's somewhat of a Black Friday in the seed business," explains Tony Taylor, director of technology services at Land O'Lakes. "WinField is a US\$5 billion company that sells all of its seed during about a six-week period of time." With such a hugely compressed sales cycle, speed and efficiency in the online ordering experience are essential. Add to that heightened customers' expectations, and if transactions are running in minutes

rather than seconds, customers aren't going to use that system.

To support its co-op members, WinField uses Oracle Endeca Information Discovery technology in its Emerald Extras Equinox program, which helps co-op members better understand behaviors and patterns in the farming market. "We can glean information that tells us, for instance, who has bought 1,000 acres of seed but maybe has bought only 500 acres' worth of protection products such as herbicides, granular micronutrients, adjuvants, and seed treatments," explains Macrie.

Through its partnership with GEOSYS, WinField uses the R7 Tool to gather and analyze huge volumes of imaging data, which it uses to help farmers make smarter agronomic decisions and ultimately gain higher yields.

WinField also drills down into information that, for instance, displays details in January about a particular farmer who typically purchases seed and products in November but has not yet ordered. This

JD Edwards EnterpriseOne

For more than a decade, Land O'Lakes has been running Oracle's JD Edwards EnterpriseOne to meet the enterprise resource planning (ERP) requirements of Purina Animal Nutrition, one of the largest producers of animal feed, and WinField, a business that sells crop protection solutions and seed to farmers. In 2006, the company's dairy foods division was hindered

by the lack of integration between its business units, so it combined its 12 manufacturing plants, 40 third-party warehouses, and 23 contract manufacturing facilities on a single instance of its JD Edwards EnterpriseOne and Oracle Transportation Management solution.

Land O'Lakes plans to upgrade the dairy foods division's JD Edwards EnterpriseOne environment

in the next 12 to 18 months while moving the application tier onto Oracle Exalogic and the back-end Oracle Database instance onto Oracle Exadata. "With everything we've already got in place, combined with future Oracle investments, we think we're going to get all the performance we need for our growing environment," says Tony Taylor, director of technology services at Land O'Lakes.

provides WinField the information it needs in order to perform proactive outreach to farmers to find out if they simply haven't had time to place an order. "We're able to help farmers and our co-op members, even in cases where we're not sure whether it's going to directly benefit Land O'Lakes or WinField," says Macrie. "Because this is truly a cooperative system, these are the people we work for, and we're willing to invest in them."

HARVESTING THE REWARDS

Prior to implementing Oracle technology and applications, WinField was struggling with its legacy web-based sales portal. "It was one of our first custom-built applications, and it was a customer-facing application for WinField," says Taylor. "It didn't have a lot of the functionality we were looking for, so we rebuilt it around the Oracle framework, which includes Oracle Database 11g Release 11.2, Oracle Exadata and Oracle Exalogic, and Oracle Endeca applications, leveraging our JD Edwards EnterpriseOne ERP back end for order processing." WinField also built the front-end order entry component through its Connect3 system, making it accessible through Oracle WebCenter.

According to Taylor, the expansion of the Oracle footprint continued at both WinField and Land O'Lakes as a byproduct of Oracle's own integration strategy. "The continued integration strategy of Oracle is attractive to us, because it not only addresses the application tier but also goes down through the technology stack," says Taylor. "It made a lot of sense for us to leverage the Oracle stack through and through, and eventually that evolved all the way into engineered systems."

WinField considered all of its technology options—regardless of its existing Oracle investments—when it conducted a series of business intelligence technology evaluations, testing other solutions against Oracle Exadata. "When we started to deploy Oracle business intelligence, we had it sitting on our standard HP-UX back end, running our Oracle Database instance, and immediately we started to experience very slow performance in some of the analytics and queries," notes Taylor. "We had this really great tool, and we were giving our customers some really great insights, but because the performance wasn't there, they were just ready to drop it and quit using it. Through all that testing, we couldn't get the performance we desired with any solution other than Oracle Exalogic and Oracle Exadata."

When WinField went live with its Oracle business intelligence solution, it had its application tier on Oracle Exalogic and the database tier on Oracle Exadata. "Since we went live, we've scaled that

SNAPSHOT

Land O'Lakes/Purina Animal Nutrition/ WinField Solutions

landolakesinc.com

purinamills.com

winfield.com

Headquarters: Arden Hills, Minnesota

Industry: Agriculture

Employees: 9,000

Oracle products: Oracle Database 11g Release 11.2, Oracle Real Application Clusters (Oracle RAC), Oracle Advanced Compression, Oracle Partitioning, Oracle GoldenGate, Oracle GoldenGate Veridata, Demandra demand planning applications, JD Edwards EnterpriseOne, Oracle Endeca applications, Oracle Transportation Management, Oracle Enterprise Manager (10g, 11g, and 12c), Oracle Universal Records Management, Oracle WebCenter Imaging, Oracle WebCenter Capture, Oracle SOA Suite, Oracle WebLogic Suite, Oracle WebCenter Portal, Oracle Application Integration Architecture Foundation Pack, Oracle Data Integrator, Exadata Storage Server Software, Exalogic Elastic Cloud Software, Oracle Application Management Pack for JD Edwards EnterpriseOne, Oracle Database Lifecycle Management Pack, Oracle Diagnostics Pack, Oracle Tuning Pack, Oracle SOA Management Pack Enterprise Edition, Oracle Management Pack for WebCenter, Oracle Secure Enterprise Search, Oracle Identity and Access Management Suite, Oracle Management Pack Plus for Identity Management, Oracle Cloud Management Pack for Oracle Fusion Middleware, Oracle Business Process Management Suite

environment probably to a user base that has tripled in size, and the system continues to hold up and perform very well," says Taylor. "WinField is now benefiting from a transaction and analytics environment that is approximately 15 times as fast as it was with its legacy environments."

Both Macrie and Taylor are supportive of taking their Oracle investment to the next level. "We're considering investing in Oracle Exalytics," says Macrie. "With the underlying technologies of the Oracle application platform, we see Oracle Exalytics as a competitive advantage, because it's completely integrated and optimized and built to outperform other industry solutions."

Macrie feels strongly that Oracle Exalytics also has the potential to outperform the improvements already gained with Oracle Exalogic and Oracle Exadata. Moving to Oracle Exalytics would also free the Oracle Exalogic environment for Land O'Lakes to begin virtualizing with Oracle VM. "Our strategy is to virtualize the Oracle Exalogic box and use it as the ERP application platform going forward," he says.

Land O'Lakes and its subsidiaries also view the Oracle platform as a powerful consolidation system. "We can essentially do more with less on these engineered systems than we can on traditional platforms," Macrie says. "The same operations on this integrated platform require less CPU, memory, and floor space than if they ran on a nonintegrated platform."

Both Macrie and Taylor see a great future at WinField with Oracle products. "I think there's real value in what Oracle is doing in the end-to-end integration—from the hardware platform and engineered systems through the middleware stack and up through the applications," says Taylor. "If you're an Oracle customer today and you're not using the combined strength of the total solution, I think you're missing an opportunity." ◀

Marta Bright is a senior writer with Oracle Publishing.

NEXT STEPS

LEARN more about

Oracle Exadata

bit.ly/15GAILn

Oracle Exalogic

bit.ly/14STsU9

Oracle Exalytics

bit.ly/17VK8mu

ORACLE ADF MOBILE

The Next Big Wave

Explore mobile frontiers with Oracle ADF Mobile.



In his article "The Latest Infographics: Mobile Business Statistics for 2012," Mark Fidelman, a contributing writer to the Forbes website, presents several interesting facts and statistics about the current and predicted future usage of mobile devices. A clear trend in this article is that business is "going" mobile and that in only a few years, the number of mobile devices will significantly outnumber that of wired devices and PCs used at work and at home. One message to extrapolate from this is that mobile application development is the next big wave in enterprise application development.

However, enterprise developers adding mobile as an access channel to enterprise business systems need to maintain the same data validation, business logic, and security levels as for traditional applications. And the mobile world is a diverse set of platforms and operating systems—a far more complex landscape than the four or five browsers that developers have had to support in enterprise web-enabled solutions of the past.

For enterprise application developers, a promising strategy for conquering these "go mobile" challenges is to embark on a hybrid mobile development approach that replaces the burden of device-specific native programming with a consistent development model that uses standard technologies such as HTML, CSS, JavaScript, and Java and can be run across multiple platforms. One development tool suited for such a hybrid mobile application strategy is the Oracle ADF Mobile feature of Oracle Application Development Framework (Oracle ADF).

This article introduces Oracle ADF Mobile and presents a hands-on mobile development and deployment exercise.

ORACLE ADF MOBILE OVERVIEW

Oracle ADF Mobile is a declarative development and application runtime environment that uses standards-based technologies—

including HTML, CSS, JavaScript, and Java—to deliver a hybrid solution for building, deploying, and running cross-platform on-device native mobile applications on Apple iOS- and Google Android-powered devices.

As shown in Figure 1, Oracle ADF Mobile applications execute in a specific runtime environment: the *Device Native Container*. This container hosts the Oracle ADF Mobile application, is written in the native language for the target device, and enables applications to access mobile device services such as the address book and the camera. Oracle ADF Mobile enables you to integrate and choose between three user interface technologies according to your requirements and your team's skill sets:

- **Local HTML.** HTML5 pages execute on the mobile device in the context of Oracle ADF Mobile. Data and device interaction is programmed with provided Oracle ADF Mobile JavaScript and Java APIs as well as Apache Cordova APIs.
- **Oracle ADF XML.** The declarative option for building applications in Oracle ADF Mobile

uses JavaServer Faces-like user interface components that are bound to remote or local data through the Oracle ADF binding layer and data controls. Files of this type use the file extension amx.

- **Remote URL content.** This option enables developers to integrate remote web content, such as mobile pages built with Apache Trinidad mobile browser components, with Oracle ADF Mobile applications.

All user interfaces are displayed in a web engine context, the *web view*, which means that views in Oracle ADF Mobile are not compiled to native code but are executed as HTML, JavaScript, and CSS. Developers use the aforementioned user interface technologies in Oracle ADF Mobile *features*—a feature is a reusable module, made up of one or more screens, that executes in its own web view. At runtime, applications can dynamically switch between features, and mobile application users will not be able to tell if they are working with a local HTML page, remote web content, or Oracle ADF Mobile XML (AMX) pages.

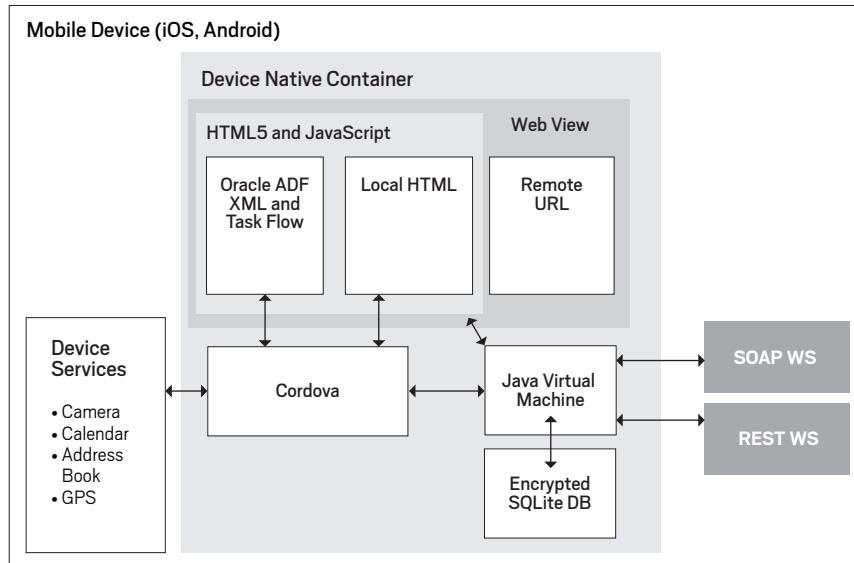


Figure 1: Simplified Oracle ADF Mobile block diagram

Using the open source Apache Cordova libraries, Oracle ADF AMX and local HTML pages can access mobile device services, such as the camera, phone, or address book, and invoke Java executed in the Oracle ADF Mobile Java Virtual Machine (JVM). An encrypted instance of the SQLite database is provided for each application for storing data locally for offline use, which is particularly useful if connectivity cannot be guaranteed. The SQLite database is accessed through Java.

To query and update remote data in mobile application models, Oracle ADF Mobile uses standard SOAP and REST services for CREATE, READ, UPDATE, and DELETE (CRUD) operations.

SAMPLE APPLICATION OVERVIEW

The hands-on instructions in this article use the declarative Oracle ADF development approach in Oracle ADF Mobile and step you through building a two-page application that queries employee data from a provided Oracle ADF Business Components Java API for XML Web Services service. Oracle ADF Business Components is a feature of Oracle ADF that is not an integral part of the Oracle ADF Mobile solution but, rather, provides a convenient set of web services for the mobile application to utilize.

Figure 2 shows the two mobile screens

you build by following the hands-on instructions in this article. The list of employees is categorized by the initial letter of the employee's last name. Selecting (by tapping) the employee with the last name Baer in the image to the left navigates to the detail screen for that employee.

Note that an earlier *Oracle Magazine* article, "Consume Early, Consume Often" (in the September/October 2012 issue, bit.ly/1IDkUTV), explains best practices and recommendations for exposing Oracle ADF Business Components to the service interface.

GETTING READY

Before following the steps in this article, download and install the Studio edition of Oracle JDeveloper 11g Release 2 (11.1.2.4). It is available as a free download on Oracle Technology Network at bit.ly/KDqHjA. You also need access to an Oracle Database instance with an unlocked sample HR schema.

INSTALLING THE MOBILE EXTENSION

Oracle ADF Mobile is not provided with Oracle JDeveloper 11g Release 2 (11.1.2.4). Oracle ADF Mobile must be downloaded and installed separately as an extension. To download and install Oracle ADF Mobile, launch Oracle JDeveloper 11g Release 2, select Help -> Check for Updates, and click

Next in the Check for Update dialog box.

Ensure that Search Update Centers is selected and the Official Oracle Extensions and Updates option is checked, and click Next. Select the ADF Mobile extension, and click Next.

Accept the license agreement, by clicking I Agree, and click Next to download and install the mobile extension. Click Finish after the extension files have been downloaded, and click Yes to restart Oracle JDeveloper.

Note: If you are accessing the internet through a proxy server, you must provide the proxy settings before opening the Check for Updates center. Select Tools -> Preferences -> Web Browser and Proxy to do this.

PREPARING ORACLE ADF BUSINESS COMPONENTS FOR DEPLOYMENT

Download the o53adf-1958733.zip sample application at bit.ly/labVfsj, and unzip the file into a directory that does not contain blank spaces in the name.

Note: The o53adf-1958733.zip file also contains the completed sample application. Refer to the readme.txt file contained in the download for the configurations required to run the completed mobile application. Also note that the completed application contains an additional chart component for displaying the employee salary. (The instructions for building the chart are not part of this article.)

The sample application is an Oracle ADF Business Components model configured for deployment as a JAX-WS SOAP-based web service that the Oracle ADF Mobile application can connect to and consume. The only change needed in the sample application is to the database connection used by the Oracle ADF Business Components Model project to point to your HR database schema. To make the change, follow these instructions:

- In Oracle JDeveloper, select File -> Open and navigate to the directory containing the unpacked sample application.
- Open the Oramag091013/adfBcHrService folder, and select the adfBcHrService.jws file. Click Open to load the workspace.
- Select View -> Database -> Database Navigator, and expand the adfBcHrService node to display hrconn in the Database Navigator node.
- Right-click hrconn, and select Properties

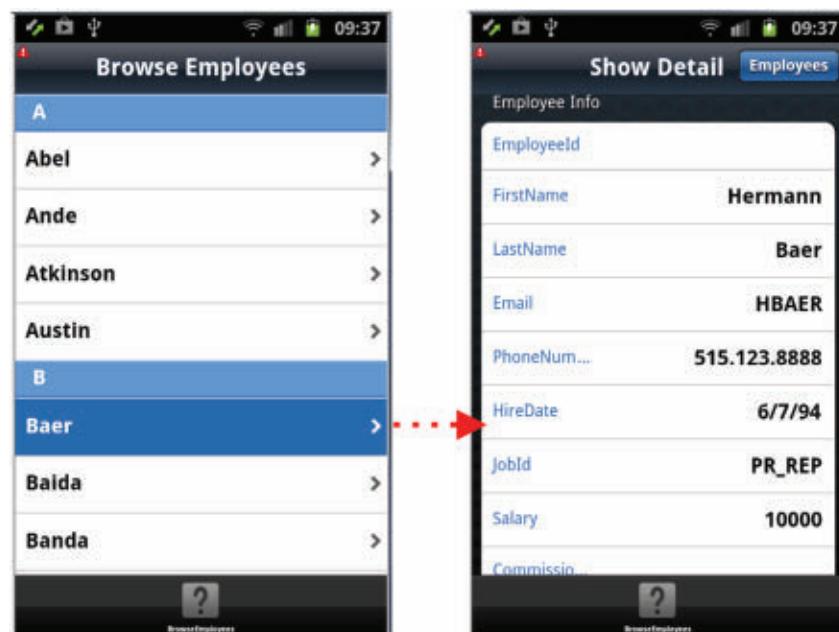


Figure 2: The Browse Employees and Show Detail screens

from the menu. Edit the database connection information to work with your setup. Test the changes, and click OK.

Next, start the Oracle WebLogic Server instance integrated with Oracle JDeveloper. To start the Oracle WebLogic Server, select Run -> Start Server Instance.

If this is the first time you've run the integrated Oracle WebLogic Server, a Create Default Domain dialog box will open. Create a password for the default Oracle WebLogic Server domain.

Note: To ensure that the integrated Oracle WebLogic Server listens for the localhost and the IP address of your computer, don't select an address from Listen Address.

Click OK to save the changes and to create and configure the default domain for Oracle ADF. The Oracle WebLogic Server will create a default domain and then start the server. Wait for the "IntegratedWebLogicServer started." message on the Running: IntegratedWebLogicServer tab before proceeding to the steps in the next section.

DEPLOYING THE MODEL

The Oracle ADF Business Components model provides a deployment profile you can use to deploy the Oracle ADF Business Components service to the Oracle WebLogic Server instance integrated in Oracle JDeveloper or to a standalone Oracle WebLogic Server instance. This article assumes that deployment will be to the integrated server instance. To deploy the Oracle ADF Business Components model:

5. If it is not already open, open the log window, by choosing View -> Log.
6. Choose Application -> Deploy -> ADFBC_ADFBC_HR_SERVICE to initiate the deployment.
7. Select Deploy to Application Server, and click Next.
8. Ensure that the IntegratedWebLogicServer option is selected and the Override modules of the same name box is checked, and then click Next.
9. Ensure that Deploy to all instances in the domain and Deploy as standalone Application are selected, click Next, and then click Finish.
10. Check the deployment process by selecting the Deployment tab in the log

window. After successful deployment, open a browser window and type the following URL into the URL address field: http://<your _IP_address>:7101/adbservice/HrAppModuleService?wsdl. This will display the contents of the Web Services Description Language (WSDL) file in your browser.

11. Copy the URL to the clipboard—you will need it later when designing the Oracle ADF Mobile access to the service.

BUILDING THE WORKSPACE

The following instructions guide you through building the basic skeleton of the Oracle ADF Mobile sample application.

12. In Oracle JDeveloper, choose File -> New and then General -> Applications.
13. Select the Mobile Application (ADF) entry in the Items list, and click OK. (Note that if you don't see the Mobile Application (Oracle ADF) template, that is most likely because you didn't complete installation of the ADF Mobile extension.)
14. On the Create Mobile Application (ADF) screen, provide the following information:

Application Name	OraMagSepOct13
Directory	<Select a folder that has no blank spaces in its pathname.>
Application Package Prefix	oramag.sample.sepoct.thirteen
15. Click Next.
16. Click Finish to accept the default naming and package structures for the two projects that Oracle JDeveloper creates for the Oracle ADF Mobile workspace.
17. When you're finished, Oracle JDeveloper will open the adfmf-features.xml file in the editor. If you don't see this editor, navigate to the ViewController -> Application Sources -> META-INF folder in the Application Navigator and double-click this file.
18. On the adfmf-features.xml tab, click the green plus (+) icon next to the Features label to create a new Oracle ADF Mobile feature.
19. Enter BrowseEmployees in the Feature Name field. Keep all the other default settings, and click OK.
20. Still in the adfmf-features.xml editor, select the Content tab and click the green plus (+) icon next to the File field.
21. Select Task Flow from the list, and enter EmployeeBtf.xml in the File Name field. Click OK. Oracle JDeveloper creates a bounded task flow and opens it on the EmployeeBtf.xml tab.
22. If it is not already open, open the Oracle JDeveloper Component Palette, by choosing View -> Component Palette.
23. In the Component Palette, select the View activity and drag and drop it onto the task flow diagram. Name the activity BrowseEmployees.
24. Drag and drop a second View activity from the Component Palette to the task flow diagram, and name it ShowEmpDetails.
25. Select the Control Flow Case element in the Component Palette, and draw a connection line between the BrowseEmployees and ShowEmpDetails views. Name this connection showDetails.
26. Select the Control Flow Case element in the Component Palette, and draw a connection line between the ShowEmpDetails and BrowseEmployees views. Name this connection browseEmp.
- Note:** It is not necessary to create an explicit connection from ShowEmpDetails to BrowseEmployees, because an implicit connection with the name _back is automatically created. However, if you want to add animation to the navigation transition, using explicit navigation is required.
27. Select the showDetails control flow case, and open the Property Inspector by choosing View -> Property Inspector.
28. In the Property Inspector, change the Transition property in the Behavior category to flipRight to add some animation at runtime.
29. Repeat Steps 27 and 28 for the browseEmp control flow case. This time choose flipLeft as the Transition property value.
- What you did:** In this section, you created a new Oracle ADF Mobile application workspace and added a feature for Oracle ADF-related content. Further, you created

a bounded task flow in which you designed the navigation flow between the two screens used in the sample mobile application.

Next you will create a web service data control connection to the Oracle ADF Business Components service for querying data from the Oracle HR schema.

CREATING THE DATA CONTROL

30. In the Application Navigator, select the **ViewController** project node and choose **File -> New**.

31. Under Categories, select the **Business Tier -> Web Services** node and, under Items, select **Web Service Data Control (SOAP / REST)**.

32. Click **OK** to start the Create Web Service Data Control wizard.

33. Enter **OraMagHrAdfBc** in the **Name** field for the Web Service Data Control, and ensure that **SOAP** is selected.

34. Paste the WSDL URL from earlier into the **URL** field, and ensure that the **Copy WSDL Locally** option is selected. The deployed Oracle ADF Business Components web service is accessible from the following URL:

`http://<your _IP_address>:7101/adbservice/HrAppModuleService?wsdl`.

Note: If you test the mobile application from a native device instead of a simulator, you need to use the IP address or the domain name of the integrated Oracle WebLogic Server to ensure that the server is accessible from the mobile device over the wireless network.

35. Click **Next**.

36. Select all web service methods, by clicking the shuttle button with the two blue right-pointing arrows, and click **Finish** to accept the remaining default settings.

37. Ensure that the **ViewController** project is selected, and expand the **Data Controls** accordion in the Application Navigator. Click the blue arrows (refresh) located on top of the **Data Controls** panel to refresh the view. The **OraMagHrAdfBc** data control entry should appear, together with the Oracle ADF Mobile **DeviceFeatures** and **ApplicationFeatures** data controls.

Note: This article does not dive into all of the available data controls for Oracle ADF

Mobile. "NEXT STEPS" includes a link that points to a follow-up tutorial.

38. Save your work.

What you did: In this section, you created a data control connection to the remote web service for later declarative UI-to-data binding. Next you create the **BrowseEmployees** view.

CREATING THE BROWSEEMPLOYEES VIEW

39. On the **EmployeeBtf.xml** tab, double-click the **BrowseEmployees** activity in the bounded task flow diagram.

40. In the **Create ADF Mobile AMX Page** dialog box, uncheck the **Primary Action** and **Secondary Action** checkboxes and keep the other default settings. Click **OK**.

41. On the **BrowseEmployees.amx** tab, change the **value** property of the **amx:outputText** component from **Header** to **Browse Employees** to change the display title of the mobile screen.

42. Expand the **Data Controls** accordion panel in the Application Navigator.

43. Expand the **OraMagHrAdfBc -> findAllEmployees(Object, Object) -> Return** node.

44. If it is not already open, open the **Structure** window by selecting **View -> Structure**.

45. Click in the **BrowseEmployees.amx** page to ensure that its structure is shown in the **Structure** window.

46. On the **Data Controls** panel, drag the **result** collection element, located in the **OraMagHrAdfBc -> findAllEmployees(Object, Object) -> Return** path, onto the **Panel Page** node in the **Structure** window and drop it. Then choose **ADF Mobile List View** from the list.

47. Keep the default selections in the **List View Gallery**, and click **OK**.

48. Keep the default selections in the **Edit Action Binding** dialog box, and click **OK**.

49. In the **Edit List View** dialog box, under **List Item Content**, select **Last Name** as the value in the **Value Binding** field.

50. For **Divider Attribute**, select **Last Name**.

51. For **Divider Mode**, select **First Letter**, and then click **OK**.

What you did: You created an Oracle ADF Mobile AMX page to list the employee data by employee last name. By dragging the

findAllEmployees result node, you started creating a list view that shows employees by their last name with the first letter of the last name as a group-by condition. Next, you will implement row selection support for the list view.

52. Click the **Bindings** tab at the bottom of the **BrowseEmployees.amx** editor.

53. To pass the selected employee ID to the detail page, you need to extend the Oracle ADF binding used by the list view to include the **EmployeeId** attribute. To do this, first select the **result** entry in the **Bindings** section and click the pencil icon.

54. In the **Edit Tree Binding** dialog box, in the **Available Attributes** list, with the **ctrl** key pressed, select the **DepartmentId** and **EmployeeId** attributes and click the button with the single right-arrow icon to shuttle the attributes to the **Display Attributes** list. This makes the **DepartmentId** and **EmployeeId** values available on the page where they can be referenced from expression language (EL).

55. Click **OK**.

56. Switch back to the source code view, by clicking the **Source** tab at the bottom of the **BrowseEmployees.amx** editor.

57. In the **Structure** window, expand the **List View** item and select the **List Item** entry. Then, if it is not already open, open the **Property Inspector**, by choosing **View -> Property Inspector**.

58. In the **Property Inspector**, for the **Action** property in the **Behavior** section, select **showDetails**.

59. Save your work.

60. If it is not already open, open the **Component Palette**, by choosing **View -> Component Palette**.

61. Expand the **Operations** category in the **Component Palette**, and drag the **Set Property Listener** component from the palette and drop it on top of the **List Item** element in the **Structure** window.

62. With the **Set Property Listener** component selected in the **Structure** window, open the **Property Inspector** and provide the following values:

From	<code>#{{row.EmployeeId}}</code>
To	<code>#{{row.EmployeeId}}</code>
Type	action

- 63.** Repeat Steps 61 and 62 for the following values:

From	<code>#{{row.DepartmentId}}</code>
To	<code>#{{pageFlowScope.DepartmentId}}</code>
Type	<code>action</code>

What you did: You implemented behavior in the list view selection. The first behavior triggers navigation following the control flow to the detail page. The second memorizes the employee row's **EmployeeId** and **DepartmentId** values for later use when a user selects an employee.

CREATING THE SHOWEMPDETAIL VIEW

You have one more screen to build before you can run the application on a mobile device or a device simulator. The employee detail page shows information about the employee selected in the *BrowseEmployees* view.

- 64.** Select the *EmployeeBtf.xml* tab to switch to the bounded task flow diagram, and double-click the *ShowEmpDetails* activity to create a new Oracle ADF Mobile AMX page.
- 65.** In the Create ADF Mobile AMX Page dialog box, ensure that Secondary Action is checked and click OK.
- 66.** On the *ShowEmpDetails.amx* tab, change the Value property of the *amx:outputText* component from Header to Show Detail to change the display title of the mobile screen.
- 67.** Expand the View -> Panel Page -> Facet secondary node in the Structure window, and select Button.
- 68.** Open the Property Inspector, and set the value for the Text property to Employees and the value of the Action property in the Behavior section to *browseEmp*. (Note the _back value that is available for the Action property. Using this implicit navigation also brings you back to the *BrowseEmployees* view, but it doesn't allow you to define an animation.)
- 69.** In the Component Palette, expand the Text and Selection category and drag and drop the Output Text component onto the Panel Page node in the Structure window.
- 70.** Use the Property Inspector to set the Output Text component's Value property to Employee Information.

71. Then, back in the Component Palette, expand the Layout category and drag and drop the Panel Form Layout component onto the Panel Page node in the Structure window.

72. Repeat Steps 69 through 71, and set the Output Text component's Value property to Department Information.

73. On the Data Controls panel (in the Application Navigator), drag the result collection element located in the *OraMagHrAdfBc* `getEmployeeByKey(Integer) -> Return` path onto the first Panel Form Layout component in the Structure window and drop it there. Choose ADF Mobile Iterator from the list to create a read-only form.

74. In the Edit Action Binding dialog box, set the Value property of the *empId* parameter to `#{{pageFlowScope.EmployeeId}}`.

75. Click OK and then OK again in the following dialog box to accept all attributes to display in the form.

76. Next, on the Data Controls panel, drag the result collection element located in the *OraMagHrAdfBc -> getDepartmentByKey(Integer) -> Return* path onto the second Panel Form Layout component in the Structure window and drop it there. Again, choose ADF Mobile Iterator from the list to create a read-only form.

77. In the Edit Action Binding dialog box, set the Value property of the *departmentId* parameter to `#{{pageFlowScope.DepartmentId}}`.

78. Click OK and then OK again in the following dialog box to accept all attributes to display in the form.

79. To ensure that the employee and department information is refreshed according to the *EmployeeId* that is passed from the browse employee page, change the refresh behavior of the Oracle ADF iterators. To do this, first click the Binding tab at the bottom of the *ShowEmpDetails.amx* editor.

80. Select *getEmployeeByKeyIterator* in the Executables section, and use the Property Inspector to change the value of the Refresh property (under Advanced) from `<default>(deferred)` to always.

Finally, select the *getDepartmentByKeyIterator* in the Executables section and use the Property Inspector to change the value of the Refresh property (under Advanced) from `<default>(deferred)` to always.

The Oracle-hosted online version of this article at bit.ly/1blvNBO includes instructions for deploying the application to your mobile device.

CONCLUSION

Abstracting the development of mobile applications from the target runtime environment is a sound and future-safe strategy. Oracle ADF Mobile makes it easy for Java Platform, Enterprise Edition (Java EE) and Oracle ADF developers to build cross-platform mobile applications that extend new and existing enterprise web and SOA applications to a mobile channel. Oracle ADF Mobile provides a straightforward strategy enabling Oracle customers to surf the next big wave in enterprise application development—mobile—without getting washed away. ◀

Frank Nimphius is a senior principal product manager for Oracle JDeveloper and Oracle ADF. He is also a coauthor of *Oracle Fusion Developer Guide: Building Rich Internet Applications with Oracle ADF Business Components and Oracle ADF Faces* (McGraw-Hill).

NEXT STEPS

READ online-only article content
bit.ly/16KT7Xi

READ more about Oracle ADF
"Consume Early, Consume Often"
bit.ly/158G1Qr

LEARN more about Oracle ADF Mobile
"Setting Up Oracle ADF Mobile"
bit.ly/13H1wv1

"Building Mobile Applications with Oracle ADF Mobile"
bit.ly/170EnBK

Oracle ADF Mobile Samples
bit.ly/12zvlbz

the official Oracle ADF Mobile blog
blogs.oracle.com/mobile



DOWNLOAD
Oracle JDeveloper and Oracle ADF
bit.ly/KDqHJA

the sample application for this article
bit.ly/1abVfsj

ORACLE ENDECA INFORMATION DISCOVERY APPLICATIONS AND ORACLE BUSINESS INTELLIGENCE ENTERPRISE EDITION 11g

Integrate and Analyze

Combine structured and unstructured data for analysis and new insights.

Oracle Endeca Information Discovery applications enable organizations to create rich, interactive data discovery applications that consume data from all types of datasources, from the more traditional "structured" data sets found in Oracle Database and Oracle E-Business Suite to the unstructured data of documents and social media feeds.

Oracle Endeca Information Discovery Release 3.0 extends this capability by integrating with Oracle Business Intelligence Enterprise Edition 11g, providing the ability to build data discovery applications around the facts, dimensions, hierarchies, and integrated data sets of the enterprise semantic model.

In this article, I take a look at this new integration by creating an Oracle Endeca Information Discovery Studio application that uses the sample application (SampleApp) for Oracle Business Intelligence Enterprise Edition as its datasource; uses Oracle Endeca Information Discovery Integrator to load data from the Flight Delays subject area provided by the SampleApp; and uses the SampleApp subject area table metadata to create an Oracle Endeca Server data domain. I then use Oracle Endeca Information Discovery Studio to create an initial data discovery web application, which you can then extend later with additional, unstructured datasources and data visualization components.

PREREQUISITES FOR THE SAMPLE

If you want to create this article's sample application yourself, you will need to download the following products from the Oracle Software Delivery Cloud website (edelivery.oracle.com), using either your full license or a trial license. Product versions are available for Microsoft Windows x64 and Linux x86-64.

- Oracle Endeca Server (7.5.1.1), with Oracle WebLogic Server 10.3.6, a separate download
- Oracle Endeca Information Discovery Integrator (3.0)

• Oracle Endeca Information Discovery Studio (3.0)

The SampleApp for Oracle Business Intelligence Enterprise Edition 11.1.1.6.2 BP1 (V207), which I will use as the datasource, can be downloaded—preinstalled and pre-configured—as an Oracle VM VirtualBox image, from the Oracle Technology Network website at bit.ly/A9FnZd.

This SampleApp (V207) Oracle VM VirtualBox image comes with several demonstration subject areas, including "X - Airline Delay," which I will use for this example. Using Oracle Endeca Information Discovery Integrator 3.0, I will connect to the business intelligence server component and then create an Oracle Endeca Server data domain, using a selection of the subject

area's tables as a datasource. Then, once the data domain is loaded and ready for use, I will use Oracle Endeca Information Discovery Studio 3.0 to create a web application for exploring the data set.

In addition to the SampleApp Oracle VM VirtualBox image, you will need a Microsoft Windows-based environment in order to use the administration tool (which can also be the environment you use to run Oracle Endeca Information Discovery 3.0). For details on how to download and configure the administration tool to work in a separate Linux-based business intelligence server environment, see "4.5 Admintool access to SampleApp RPD" in the "SampleApp V207 - Virtual Machine Image Deployment Guide" document (accessible at bit.ly/l1K1tYA).

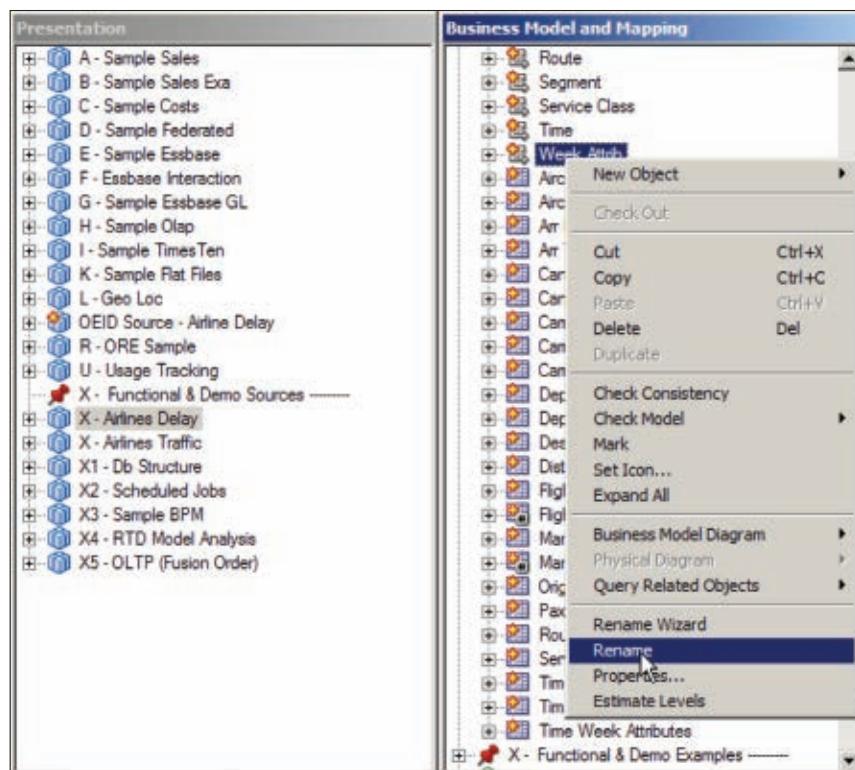


Figure 1: Renaming the duplicate business model's tables to remove numeric table name prefixes

REQUIRED AMENDMENTS

To create an Oracle Endeca Server data domain that gets its data from an Oracle Business Intelligence repository, a wizard within Oracle Endeca Information Discovery Integrator connects to the repository to enable you to select a particular subject area and set of tables to use as the data domain datasource, and then the wizard automatically creates data domain attributes based on the names of the selected tables and columns. However, business model table and column names within the SampleApp repository are prefixed with numbers to aid in referencing them within sample dashboards, so you will need to create a version of these tables without the number prefixes—the Oracle Endeca Server data domain attribute names cannot start with a number.

To create a version of the “X – Airline Delay” subject area and underlying business model that complies with this naming restriction but does not affect any other SampleApp reports that use the original object names, follow these steps:

1. In the Microsoft Windows-based environment into which you have previously downloaded and installed Oracle Business Intelligence’s administration tool, select Start -> Oracle Business Intelligence Enterprise Edition Client -> Administration. When the administration tool opens, select File -> Open Online, select the connection to SampleApp, and enter the login credentials for the repository. For example:

Repository	Admin123
Password:	
User:	weblogic
Password:	Admin123
ODBC DSN:	<<name you gave the Open Database Connectivity (ODBC) connection to the SampleApp server when installing the administration tool>>

2. With the administration tool open and the SampleApp repository’s three layers of repository metadata ready for editing, navigate to the Presentation layer on the far left and, within it, right-click the X – Airlines Delay subject area and select Duplicate with Business Model from the contextual menu. In the Copy Business Model and Subject Area dialog box, click

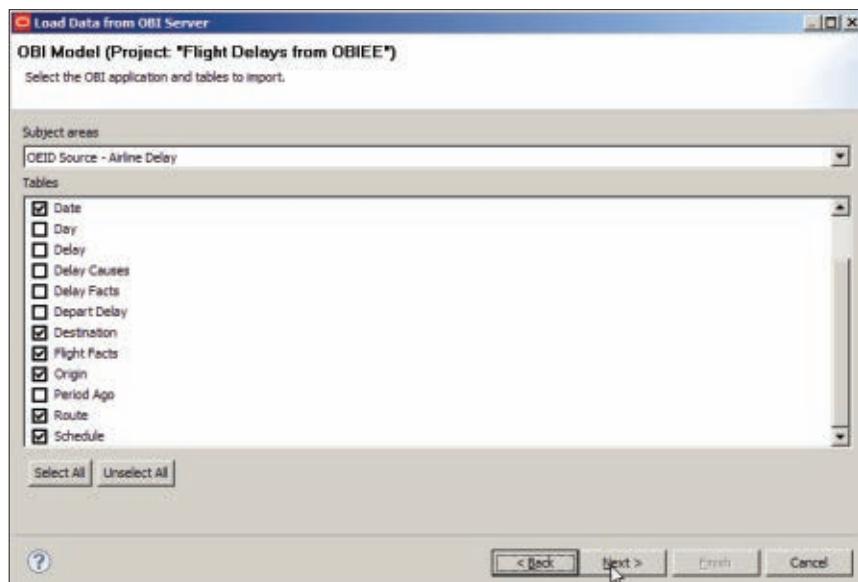


Figure 2: Selecting subject area tables for import into the Oracle Endeca Server data domain

X0 – Airlines / X – Airlines Delay to select it, and then type in the following values to provide names for the duplicate subject area and the underlying business model:

New business model name: OEID Source BM – Airline Delay
New subject area name: OEID Source – Airline Delay

After you’ve entered the new name, click OK to duplicate the repository metadata and close the dialog box.

3. Now, still using the administration tool, but this time working within the Business Model and Mapping metadata layer window, locate the OEID Source BM business model you created in the previous step and rename all the objects to remove the numbers at the start of the object names. Start with the 00 Time logical dimension, right-click it, select Rename, and then remove the numbers from the start of the names, so that, for example, 00 Time becomes Time, 11 Origin becomes Origin, and so on, until none of the table names start with numbers. When you have finished renaming these objects, the business model should look like Figure 1. Finally, to save this updated repository and make it available for the next stage in this process, select File -> Check In Changes,

and for the Do you wish to check global consistency? question, choose No to avoid checking in all the other objects in the SampleApp repository that are not relevant to this example. Finally, select File -> Save and then File -> Close to save the updated repository back to the server and close the administration tool’s connection to it.

CREATING THE DATA DOMAIN

Now that you have prepared the Oracle Business Intelligence repository for use with Oracle Endeca Information Discovery Integrator, you can connect to the Oracle Business Intelligence Enterprise Edition repository and create the first cut of your Oracle Endeca Server data domain. To do this, follow these steps, again based on a Microsoft Windows x86-64 development environment.

1. In Windows, select Start -> All Programs -> Oracle Endeca Information Discovery 3.0.0 -> Integrator.
2. When the Oracle Endeca Information Discovery Integrator application opens, locate the Navigator panel in the top left corner of the application window and select New -> Project. When the New Project dialog box appears, locate the Load Data from OBI Server option within the Endeca Information Discovery folder, click it, and click Next to proceed.

3. The Load Data from OBI Server wizard appears. On the first page of the wizard, select **Create a new project** and type in a name for the project—such as Flight Delays from OBIEE—and click **Next** again to continue.
4. Next, when prompted, enter the connection details for your instance of Oracle Endeca Server and provide a name for the new data domain. For example:

Endeca Server host:	oeid30.mycompany.com <<replace with your own Oracle Endeca Server host name>>
Endeca Server port:	7001
Data domain name:	flight_delays <<suggested value>>

Click **Next** to continue.

5. On the next page, enter the User, Password, OBI Server host, and OBI Server port values to connect to the SampleApp repository and server, replacing the OBI Server host value with the hostname or IP address of your SampleApp Oracle VM VirtualBox virtual machine.

User:	weblogic
Password:	Admin123

OBI Server host:	obieesampleapp.mycompany.com <<replace with your Oracle Business Intelligence Enterprise Edition server host name>>
OBI Server port:	9703

Once you've entered these details, click **Connect to OBI Server** to tell Oracle Endeca Information Discovery Integrator to retrieve the list of subject areas provided by the SampleApp repository, and click **Next** to continue.

6. On the next page of the wizard, select the **OEID Source – Airline Delay** subject area you created in the previous set of steps, and then select the following tables to use as the datasource for your data domain, as shown in Figure 2.

Arrival Delay
Carrier
Date
Destination
Flight Facts
Origin
Route
Schedule

Once you've selected these tables, click **Next** to continue.

7. The next page in the wizard displays the list of Oracle Endeca Server data domain attributes that will be created to contain the imported data. On this wizard page, you can fine-tune the configuration of these attributes.

In the **Search Interface Name** column on this wizard page, type in the following values for the attribute keys listed below to create two initial search interfaces, one for all attributes relating to a flight's origin and another for the flight's destination.

Attribute Key	Search Interface Name
Orig_Airport_Map_Orig_US_State_Name	Origin
Orig_Airport_Orig_Region_Name	Origin
Orig_Airport_Orig_Division_Name	Origin
Orig_Airport_Orig_City_Name	Origin
Orig_Airport_Orig_Airport	Origin
Dest_Airport_Map_Dest_US_State_Name	Destination
Dest_Airport_Orig_Region_Name	Destination
Dest_Airport_Orig_Division_Name	Destination
Dest_Airport_Orig_City_Name	Destination
Dest_Airport_Orig_Airport	Destination

The screenshot shows the Oracle Endeca Information Discovery Studio interface. At the top, it says "ORACLE Endeca Information Discovery | Flight Delays Explorer (Oracle Magazine)" and "Welcome Admin Admin". Below the header is a "New Workspace" button and an "+ Add Page" button. The main area has a "Search Box" containing "new york" and a "Results Table" titled "Carrier". The table has columns: Rec Spec, Carrier, Carrier Code, Carrier Flight #, and Tail Num. There are 136 records selected. The table lists various flight entries, such as Airline 1046, MQ, MQ-2700, N508MQ, and Airline 480, EV, EV-5342, N933EV. The interface also includes a "Refine by" section with dropdowns for Dest US State Name (USA, New York), Orig City Name (New York, NY), Dest City Name (New York, NY), Route Description (Akron, OH - New York, NY, Albany, NY - New York, NY, Atlanta, GA - New York, NY, Austin, TX - New York, NY, Baltimore, MD - New York, NY), and a "Search" section with a "Search for: new york" input field and a dropdown for Date.

Figure 3: The initial Oracle Endeca Information Discovery Studio application

- After entering the key values, click **Edit Finished** and then **Finish** to close the wizard and return to the Oracle Endeca Information Discovery Integrator main window. If you look in the **Navigator** panel now and locate the project you created, you will see that Oracle Endeca Information Discovery Integrator has created a complete project that reads data in from Oracle Business Intelligence Enterprise Edition and uses it to create an Oracle Endeca Server data domain.
- 8.** The flight delays data set in SampleApp contains details of more than 6 million flights, so to keep the resultant data domain manageable small—at least for this initial load—you can add a filter to the extraction SQL query generated by Oracle Endeca Information Discovery Integrator so that only flights from Q1 2010 are extracted and loaded. To add this filter, locate the **data-in** folder within the Navigator view, open it, right-click the **QueryStatement.sql** object within it, and then select **Open With -> Text Editor**. Add the following WHERE clause to the automatically generated SQL statement to restrict the extraction to flights in Q1 2010:

```
where "OEID Source BM - Airline
Delay"."Time"."Dep Qtr" = '2010 Q1'
```

Then use **File -> Save** from the Oracle Endeca Information Discovery Integrator menu to save the changes you've made to this file.

- 9.** Finally, load the SampleApp data into Oracle Endeca Server. Within the **Navigator** panel, locate and open the **graph** folder, and then double-click the **Baseline.grf** graph within the set of graphs to open it in the Oracle Endeca Information Discovery Integrator main window. Click anywhere within the large gray box in the graph to select it, and then select **Run -> Run** from the **Integrator** menu to start the graph execution and load data from Oracle Business Intelligence Enterprise Edition into your data domain.

VIEWING FLIGHT DELAY DATA

To take an initial look at what's in the Oracle Endeca Server data domain you've just

created with Oracle Endeca Information Discovery Integrator, you can quickly create an Oracle Endeca Information Discovery Studio application that enables you to explore the data set and that you can extend afterward to try out more of Oracle Endeca Information Discovery Studio's features. To create this "first cut" Oracle Endeca Information Discovery Studio application, follow this final set of steps:

1. In your web browser, navigate to your Oracle Endeca Information Discovery Studio website—<http://localhost:7002>, for example—and enter the login credentials—`admin@oracle.com/welcome1`, for example—for an Oracle Endeca Information Discovery Studio administrative user.
2. When the Discovery Applications web page appears, navigate to the menu at the top right of the page, click the down arrow, and select **Control Panel**. Then, when the Control Panel page appears, click **Information Discovery -> Data Source** to define a datasource connection. Oracle Endeca Information Discovery Studio will use to connect to the data domain you created in the previous steps.
3. On the Data Source page that appears, click **New Data Source**, and for **Data Source Definition**, enter `Flight_Delays` for **Data Source ID** and enter the following datasource JSON file definition, replacing the `server` parameter value with the name of the server that hosts your Oracle Endeca Server instance:

```
{
  "dataDomainName": "flight_delays",
  "name": "Flight_Delays",
  "port": "7001",
  "server": "oeid30.mycompany.com"
}
```

Click **Validate** to test the connection and then **Save** when you are done. When you return to the main application, click **Back to Home** in the top right corner to return to the Discovery Applications page.

- 4.** Staying on this page, click **New Application** to create your application, and enter the following details when prompted:

Application Name:	Flight Delays Explorer
Data Source:	(Oracle Magazine)
	Flight_Delays

Now click **Create Application** and then **Go to Application** to view the application in your web browser, as shown in Figure 3.

You can use this data discovery application example to navigate and search through the attributes loaded from Oracle Business Intelligence Enterprise Edition into Oracle Endeca Server and see how Oracle Endeca Server's "faceted search" facility enables you to search and refine your target data set.

CONCLUSION

Oracle Endeca Information Discovery applications extend the capabilities of Oracle's business intelligence platform to encompass unstructured and semistructured data-sources, enabling you to use the unique capabilities of Oracle Endeca Server to search, analyze, and aggregate data from any source.

With the ability to now use data from the Oracle Business Intelligence repository alongside database, file, and other data-sources, you can quickly create web-based data discovery applications that build on the work you've already done to model the business data within your organization, ensuring a "single version of the truth" while dramatically reducing the time it takes to bring the core structured data together. ◀



Mark Rittman is an Oracle ACE Director, cofounder of Rittman Mead, and author of the Oracle Press book *Oracle Business Intelligence 11g Developers Guide* and writes for the Rittman Mead blog at rittmanmead.com/blog.

NEXT STEPS

READ more about Oracle Endeca Information Discovery applications
bit.ly/1fx6swU



DOWNLOAD
Oracle Endeca Information Discovery applications
edelivery.oracle.com

SampleApp Oracle VM VirtualBox image
bit.ly/11K1tYA

ORACLE DATABASE 12c

Automatic Data Optimization

Learn how to enable information lifecycle management to automatically move data to lower-cost storage tiers and compress it.

John, the principal database architect at Acme Bank, sips his coffee while listening to his visitors' woes. The storage demand for databases at Acme is rising rapidly, due to the seemingly endless stream of data points. Because data—however old—can be good for marketing analytics, no one wants to purge old data, though. Although Acme does have an information lifecycle management (ILM) policy to put older and infrequently accessed data on lower-cost storage, the implementation has not been very effective, and unclear identification of "infrequently accessed" data is the primary reason.

Everyone agrees on the time period during which the lack of access defines infrequently accessed data but not the exact mechanics of identifying it. The standard approach for identifying the data is to put a trigger on the tables to flag data that hasn't changed, but Acme's DBAs eschew such an approach, because it negatively affects performance. Additionally, everyone agrees that an automated system to move old, unchanged data to lower-cost storage would be ideal. Is there, all want to know, a better approach to achieving Acme's ILM objectives?

There is, responds John: using the Automatic Data Optimization feature of Oracle Database 12c.

SETUP

Acme deals with several currencies, including the British pound, the euro, and the Canadian dollar, in addition to its primary currency, the US dollar. It's vital to record the exact exchange rate of the currencies. The rate can change every day, so the bank stores the rates along with specific dates. Because financial transactions can be made effective as of a different date, past records of exchange rates must be stored and available. The following is what the

Code Listing 1: Checking for free space

```
select t.tablespace_name, 100*sum(f.bytes)/sum(t.bytes) free_pct
from (select tablespace_name, sum(bytes) bytes
      from dba_data_files group by tablespace_name) t,
     (select tablespace_name, sum(bytes) bytes
      from dba_free_Space group by tablespace_name) f
where f.tablespace_name = t.tablespace_name
group by t.tablespace_name;
```

TABLESPACE	FREE_PCT
LATEST_TS	30.00
MIDTERM_TS	99.33

EXCHANGE_RATE table looks like:

SQL> desc exchange_rate

NAME	TYPE
FROM_CURR	VARCHAR2(3)
TO_CURR	VARCHAR2(3)
START_DATE	DATE
END_DATE	DATE
RATE	NUMBER

The FROM_CURR and TO_CURR columns show the codes of the source and target currencies, with the RATE column showing the exchange rate. Because the rate changes, the START_DATE and END_DATE columns show the dates during which that rate is effective. The table is partitioned by range on END_DATE, with one partition per month. The partitions are named in the format YyyMmm, where yy is the two-digit year and mm is the two-digit month. For example, the partition y13m12 holds all data for December 2013. The table and its data can be created by the SQL script in the Online Setup Listing (available in the Oracle-hosted online version of this article). All the partitions of the table exist in the LATEST_TS tablespace. There is another tablespace—

MIDTERM_TS—built on lower-cost storage.

Jill, the lead developer, has two objectives:

- When the free space in the LATEST_TS tablespace drops to a certain threshold, 15 percent of the total space allocated, the less-used partitions of the EXCHANGE_RATE table should be relocated to the MIDTERM_TS tablespace. It's important, Jill cautions, that this relocation of partitions should be based on access, not on time. If an older partition is being accessed quite frequently, it should be left in LATEST_TS. Similarly, if a newer partition is accessed less frequently, it should be moved to MIDTERM_TS.
- The partitions that do not see their data modified should be compressed to save space. The choice of segments for compression, Jill further cautions, should be independent of the relocation to a different storage tier. For example, a partition can exist in the LATEST_TS tablespace but be compressed because the data there doesn't get modified. Similarly, a partition may be moved to MIDTERM_TS because it is accessed less frequently, but because the access is mostly write activity, it may not be compressed.

Acme can satisfy both requirements by using Automatic Data Optimization, assures

John. This feature, he cautions, is not available in a pluggable database in a multitenant environment, however, and it's also not available in materialized views and tables with object types.

HEAT MAP

The first step in using Automatic Data Optimization, John explains, is to enable a new feature in Oracle Database 12c called Heat Map. Simply speaking, it shows the popularity or "hotness" of a segment such as a table or a partition, and it is used by Automatic Data Optimization to decide which segments are candidates for action. If

the segment is accessed frequently, it's considered hot and therefore may not be a candidate for some actions, such as relocation to lower-cost and less-efficient storage.

John enables the Heat Map feature by executing the following command as a DBA user:

```
alter system set heat_map = on
scope=both;
```

It is a one-time activity. Using scope=both, John ensures that the parameter is set in SPFILE and therefore will be in effect when the database is restarted.

Code Listing 2: Adding new partitions

```
alter table exchange_rate add partition y13m10 values less than (to_
date('11/01/2013','mm/dd/yyyy')) tablespace latest_ts;
alter table exchange_rate add partition y13m11 values less than (to_
date('12/01/2013','mm/dd/yyyy')) tablespace latest_ts;
alter table exchange_rate add partition y13m12 values less than (to_
date('01/01/2014','mm/dd/yyyy')) tablespace latest_ts;
insert into exchange_rate values ('USD', 'GBP', add_months(sysdate,2),
add_months(sysdate,2),1);
insert into exchange_rate values ('USD', 'GBP', add_months(sysdate,3),
add_months(sysdate,3),1);
insert into exchange_rate values ('USD', 'GBP', add_months(sysdate,4),
add_months(sysdate,4),1);
commit;
```

Code Listing 3: Checking the last access time for a table

```
select
    subobject_name "Part Name",
    to_char(segment_write_time,'mm/dd/yy hh24:mi:ss') write_time,
    to_char(segment_read_time,'mm/dd/yy hh24:mi:ss') read_time,
    to_char(full_scan,'mm/dd/yy hh24:mi:ss') fts_time
from dba_heat_map_segment
where owner = 'FOREX'
and object_name = 'EXCHANGE_RATE'
order by full_scan desc;
```

Part Name	WRITE_TIME	READ_TIME	FTS_TIME
Y13M03	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y12M09	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M04	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y12M11	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M10	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y12M08	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M09	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M02	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M05	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M01	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y12M10	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M11	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 19:48:44
Y13M07	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 00:57:12
Y12M07	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 00:57:12
Y12M12	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 00:57:12
Y13M06	07/14/13 12:23:01	07/14/13 12:24:34	07/15/13 00:57:12

To check the heat map of a specific segment, he looks into the DBA_HEAT_MAP_SEGMENT view. The time stamps of the last activity on the table—UPDATE, SELECT, full table scan, and reference constraint lookup—are recorded in this view. He describes the columns of the view for his listeners:

OWNER	The owner of the segment
OBJECT_NAME	The name of the segment
SUBOBJECT_NAME	The partition name, if applicable
SEGMENT_WRITE_TIME	The time stamp when the segment was last updated
SEGMENT_READ_TIME	The time stamp when the segment was last selected
FULL_SCAN	The time stamp when the segment was subjected to a full table scan
LOOKUP_SCAN	The time stamp when the segment was last used for a reference constraint lookup

ENABLING AUTOMATIC DATA OPTIMIZATION

Before starting the Automatic Data Optimization demonstration, John checks a few things, including the presence of segments in the tablespaces, using the following SQL statement:

```
select partition_name,
       tablespace_name
  from user_segments
 where segment_name =
   'EXCHANGE_RATE';

PARTITION      TABLESPACE
-----  -----
Y13M07        LATEST_TS
...output truncated...
Y12M07        LATEST_TS
```

John directs everyone's attention to the output to confirm that all the partitions are in the LATEST_TS tablespace as expected. Then he checks the allocated and free space in the tablespace by running the script shown in Listing 1.

The output in Listing 1 shows that only 30 percent of the LATEST_TS tablespace is free space, whereas the MIDTERM_TS tablespace—where no partitions are located—is mostly free, with 99.33 percent free space.

Next, John enables Automatic Data Optimization for the EXCHANGE_RATE

table, by executing the following SQL command as the user FOREX (who owns the table):

```
alter table exchange_rate ilm add policy tier to midterm_ts;
```

In this command, John creates an ILM policy on the EXCHANGE_RATE table that tells Automatic Data Optimization that the second storage tier for the table is the MIDTERM_TS tablespace. Data should be relocated to this tablespace if the free space in the original tablespace drops below the default threshold level of 15 percent. Because the current tablespace is 30 percent free now, the ILM policy has no effect on the table—at least not yet—John explains.

As time passes, Acme DBAs will add more

partitions to the table to hold new data, and Listing 2 shows the SQL statements they will use to add the partitions for October, November, and December 2013, named Y13M10, Y13M11, and Y13M12, respectively. To simulate the storage volume growth for that time, John inserts some rows that will go into these partitions, as shown in Listing 2.

With these additional partitions, John points out, the LATEST_TS tablespace is now more populated. He checks the free space again by executing the SQL shown in Listing 1 and reviewing the result:

TABLESPACE	FREE_PCT
LATEST_TS	8.67
MIDTERM_TS	99.33

The free space in LATEST_TS has now dropped to 8.67 percent—below the threshold of 15 percent—so the ILM policy should trigger the relocation of some segments from this tablespace to free up space. John waits for the result of the ILM policy and checks the location of the partitions.

```
select partition_name,
       tablespace_name
  from user_segments
 where segment_name =
   'EXCHANGE_RATE';
```

PARTITION	TABLESPACE
Y13M11	LATEST_TS
... output truncated ...	
Y12M08	LATEST_TS
Y13M07	MIDTERM_TS
Y13M06	MIDTERM_TS
Y12M12	MIDTERM_TS
Y12M07	MIDTERM_TS

John directs everyone's attention to the last four partitions—Y12M07, Y12M12, Y13M06, and Y13M07. Earlier, these partitions were located in the LATEST_TS tablespace, but now they are in MIDTERM_TS. This activity resulted in the freeing up of space in the LATEST_TS tablespace. This relocation of the partitions was done *automatically* without the intervention of the DBAs and only after the free space dropped below the threshold. Jill nods her approval. The DBAs appreciate that the relocation required nothing more than defining the ILM policy on the table. All in all, everyone is happy.

Code Listing 4: Identifying ILM data movement policies

```
select policy_name, action_type, scope, tier_tablespace, condition_days
  from user_ILMDataMovementPolicies;

-----
```

POLICY_NAME	ACTION_TYPE	SCOPE	TIER_TABLESPACE
P21	STORAGE	SEGMENT	MIDTERM_TS

```
select * from user_ILMObjects where object_name = 'EXCHANGE_RATE';

-----
```

POLICY_NAME	SUBOBJECT_NAME	OBJECT_TYPE	INHERITED_FROM	ENA
P21	Y12M01	TABLE PARTITION	TABLE	YES
P21	Y12M02	TABLE PARTITION	TABLE	YES
P21	Y12M03	TABLE PARTITION	TABLE	YES
... output truncated ...				
P21		TABLE	POLICY NOT INHERITED	YES

Code Listing 5: Checking ILM tasks

```
select task_id, task_owner,
       to_char(start_time, 'mm/dd/yy hh24:mi:ss') start_time,
       to_char(completion_time, 'mm/dd/yy hh24:mi:ss') completion_time
  from dba_ilmtasks
 where task_owner != 'SYS'

-----
```

TASK_ID	TASK_OWNER	START_TIME	COMPLETION_TIME
3	FOREX	07/15/13 10:41:37	07/15/13 10:41:43

```
-- Find the task details

select job_name, job_state,
       to_char(start_time, 'mm/dd/yy hh24:mi:ss') start_time,
       to_char(completion_time, 'mm/dd/yy hh24:mi:ss') completion_time
  from dba_ilmresults
 where task_id = 3;

-----
```

JOB_NAME	JOB_STATE	START_TIME	COMPLETION_TIME
ILMJOB18	COMPLETED SUCCESSFULLY	07/13/13 10:41:41	07/13/13 10:41:43

CHECKING THE HEAT MAP

Jill observes that only a few partitions—not all—were relocated to the spillover tablespace. The segments for relocation, John explains, are based on the heat map of the segments, described earlier. The less recently the segment is accessed, the greater the chance that it will be relocated. John shows everyone the heat map of the EXCHANGE_RATE table, by using the SQL statement shown in Listing 3.

Jill examines the output carefully and observes that for the partitions Y13M07, Y12M07, Y12M12, and Y13M06, the full table

scan occurred at 07/15/13 00:57:12, compared to 07/15/13 19:48:44 for the rest of the partitions. These are exactly the same partitions relocated to the MIDTERM_TS tablespace by Automatic Data Optimization. "Was that why these partitions were candidates for relocation?" she asks.

Exactly, John confirms. When Automatic Data Optimization had to choose the least recently accessed segment in the LATEST_TS tablespace, it looked at the heat map of the objects in that tablespace and selected these partitions, because they were the least recently accessed.

ADMINISTRATION

The group—now suitably impressed—wants to know more about managing the ILM policies. "How can I check the threshold at which Automatic Data Optimization kicks in?" asks Jill. To see that and other parameters ILM uses, John looks at the DBA_ILMPARAMETERS view:

```
select * from dba_ilmparameters;
```

NAME	VALUE
ENABLED	1
JOB LIMIT	10
EXECUTION MODE	3
EXECUTION INTERVAL	15
TBS PERCENT USED	85
TBS PERCENT FREE	25

The TBS PERCENT USED parameter specifies the percentage at which the tablespace is considered to be full. The value in this example is 85 percent, so the LATEST_TS tablespace was considered full when the free space earlier fell to 8.67 percent, John explains. This triggered Automatic Data Optimization's relocation of segments to the next tier of storage. "When does it stop relocating?" asks Jill. This is where, John responds, another parameter—TBS PERCENT FREE—comes into play. The relocation of segments out of the tablespace continues until the free space percentage reaches this parameter value, 25 percent in this case. However, John cautions, this is just an estimate; Automatic Data Optimization does not guarantee that there will be that much free space.

"Suppose I want to change the 85 percent used to consider the tablespace full," Jill muses. "Can I change it to, say, 90 percent?" Of course, John answers, and executes the following SQL to change the parameter to 90 percent:

```
begin
  dbms_ilm_admin.customize_ilm (
    dbms_ilm_admin.tbs_percent_used,
    90);
end;
/
```

Likewise, John explains, all the properties listed in the DBA_ILMPARAMETERS view can be changed with the CUSTOMIZE_ILM procedure in the DBMS_ILM_ADMIN package.

Someone else has another question: "After a period of time, we would like to know what tables are under ILM policies and how the second tier of storage has been defined. Is there a way to get that information?" "Yes, there is," John assures. He executes the SQL statements shown in Listing 4 to get that information. From the output, he demonstrates that the policy named P21 is defined on the table EXCHANGE_RATE, with the spillover tablespace being MIDTERM_TS. All the partitions of the table inherit the policy from the table (as shown in the INHERITED_FROM column). The last row in the result shows that the table itself is under the policy but is not inherited.

"What actually moves the segments to a different tablespace?" Jill wants to know. Fair question, John concedes and explains that there is a job that moves the segments when the time comes. The job kicks in during the maintenance window in the database and calls the EXECUTE_ILM procedure in the DBMS_ILM package. To see details of this job, John queries DBA_ILMTASKS, as shown in Listing 5. It shows him the start and end time of the task. To get more details on the task, he executes the second query in Listing 5.

COMPRESSION

Jill is happy to see her first requirement—partition relocation—successfully met. She asks about her second request—to compress unused rows in tables. Although

the exchange rates set in the table are usually immutable, they may occasionally be changed due to a mistake in data entry or a miscommunication. However, changes to data more than seven days old are rare. Therefore, Jill wants to automatically compress rows in the EXCHANGE_RATE table that have not changed for the last seven days.

The Oracle-hosted online version of this article at bit.ly/18ZCi8I demonstrates how to set and monitor compression in an ILM policy.

CONCLUSION

Revisiting the original requirements, John shows how they have been addressed by the new Advanced Data Optimization feature, introduced in Oracle Database 12c. Under the storage-tier-based ILM policy, a segment is moved to a different tablespace (on lower-cost storage) when the free space in the original tablespace falls below a defined threshold. Under the compression-based ILM policy, segments are compressed when the data has not been modified for a specified number of days. And all this is done automatically without DBA intervention. Agreeing on the high value of this feature, the DBAs as well as the developers thank John and leave happy. ◀



Arup Nanda (arup@proligence.com) has been an Oracle DBA since 1993, handling all aspects of database administration, from performance tuning to security and disaster recovery. He was *Oracle Magazine*'s DBA of the Year in 2003 and received an Oracle Excellence Award for Technologist of the Year in 2012.

NEXT STEPS

READ Oracle-hosted online article content
bit.ly/18ZCi8I

READ more about Automatic Data Optimization

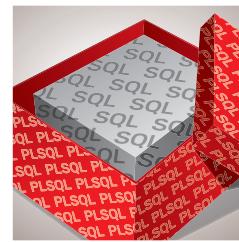
Oracle Database VLDB and Partitioning Guide 12c Release 1 (12.1)
bit.ly/15MYnfe

READ more about Automatic Data Optimization
bit.ly/17Mnn4d

ORACLE DATABASE 12c

SQL in PL/SQL Enhancements

Oracle Database 12c enhances writing and executing SQL in PL/SQL.



With the release of Oracle Database 12c, PL/SQL offers several enhancements for writing and executing SQL statements from within PL/SQL. This article covers new Oracle Database 12c features that enable you to

- Bind values from PL/SQL-only datatypes to SQL statements
- Return result sets from SQL queries implicitly, easing the migration path from languages such as Transact-SQL to Oracle PL/SQL
- Define views that behave more or less like an invoker's rights program unit

PL/SQL DATATYPE SUPPORT IN SQL BINDING

Prior to Oracle Database 12c, whenever you needed to bind a PL/SQL expression by using EXECUTE IMMEDIATE or DBMS_SQL, the datatype of that expression had to be a known SQL datatype. Specifically, you could not bind Booleans and user-defined types declared in a package specification, including records and collections.

Oracle Database 12c removes almost all of these restrictions.

You can now, for example, bind a Boolean value if you use EXECUTE IMMEDIATE to execute a dynamic PL/SQL block. Listing 1 demonstrates the block execution.

You can also bind associative arrays and use them inside a call to the TABLE operator, both impossible before Oracle Database 12c. The code in Listing 2 demonstrates binding and the use of a SELECT statement to retrieve data from an associative array.

And there's more for SQL datatypes.

Prior to Oracle Database 12c, the maximum length of a VARCHAR2 datatype in SQL was just 4,000 bytes, whereas the maximum length in PL/SQL was (and is) 32,767 bytes.

With Oracle Database 12c, the maximum length for VARCHAR2 and NVARCHAR2 is now 32,767 bytes.

Note: the MAX_STRING_SIZE database parameter must be set to EXTENDED to take

advantage of these extended lengths; the default value is STANDARD.

For more information on SQL datatypes, see *Oracle Database SQL Language Reference 12c Release 1 (12.1)*, at bit.ly/16YBTWb.

Code Listing 1: Binding a Boolean value and using EXECUTE IMMEDIATE

```

CREATE OR REPLACE PACKAGE restaurant_pkg
AS
  TYPE item_list_t
    IS TABLE OF VARCHAR2 (30);

  PROCEDURE eat_that (
    items_in          IN item_list_t,
    make_it_spicy_in_in IN BOOLEAN);
END;
/

CREATE OR REPLACE PACKAGE BODY restaurant_pkg
AS
  PROCEDURE eat_that (
    items_in          IN item_list_t,
    make_it_spicy_in_in IN BOOLEAN)
  IS
  BEGIN
    FOR indx IN 1 .. items_in.COUNT
    LOOP
      DBMS_OUTPUT.put_line (
        CASE
          WHEN make_it_spicy_in_in
          THEN
            'Spicy '
          END
        || items_in (indx));
    END LOOP;
  END;
END;
/

DECLARE
  things   restaurant_pkg.item_list_t
  := restaurant_pkg.item_list_t (
    'steak',
    'quiche',
    'eggplant');
BEGIN
  /* Requires Oracle Database 12c or later */
  EXECUTE IMMEDIATE
    'BEGIN restaurant_pkg.eat_that(:1, :s); END;'
    USING things, TRUE;
END;
/

```

IMPLICIT STATEMENT RESULTS

Before Oracle Database 12c, PL/SQL did not support the ability to create a procedure that simply returns the contents of a result set to the screen. To do this in PL/SQL, developers had to write a query, iterate through the result set, and call DBMS_OUTPUT.PUT_LINE to display the results.

In Oracle Database 12c, developers can now create a procedure that returns results directly to the screen in PL/SQL, which will be of benefit primarily to developers and

applications migrating from Transact-SQL to PL/SQL (Welcome, new PL/SQL developers!) and also as a testing aid (because it's now easier to write a quick procedure to verify the contents of a table). Oracle Database 12c implements this capability by adding new functionality to the DBMS_SQL package.

Suppose I want to display the last names of all employees in a given department. I can now write the following, which uses the new DBMS_SQL.RETURN_RESULT procedure:

```
CREATE OR REPLACE PROCEDURE show_emps (
    department_id_in IN
        employees.department_id%TYPE)
IS
    l_cursor    SYS_REFCURSOR;
BEGIN
    OPEN l_cursor FOR
        SELECT last_name
        FROM employees
        WHERE department_id =
            department_id_in
        ORDER BY last_name;

    DBMS_SQL.return_result (l_cursor);
END;
/
```

And when I execute the procedure in SQL*Plus for department ID 20, I see the following:

```
BEGIN
    show_emps (20);
END;
/
PL/SQL procedure successfully completed.
```

ResultSet #1

LAST_NAME
Fay
Hartstein

You can also return more than one result from a single procedure. If you want to retrieve rows from a result from *within* a PL/SQL program, you can call the DBMS_SQL.GET_NEXT_RESULT procedure to get the next cursor and then use other DBMS_SQL subprograms to fetch rows of data. For more information on DBMS_SQL.RETURN_RESULT and DBMS_SQL.GET_NEXT_RESULT, see *Oracle Database PL/SQL Packages and Types Reference 12c Release 1 (12.1)*, at bit.ly/16A6Amb.

INVOKER'S RIGHTS FOR VIEWS—SORT OF

Prior to Oracle Database 12c, if your view executed a function, it was always run under the privileges of the view's owner, not the privileges of the function's owner. So if the function was defined as invoker's rights, the

Code Listing 2: Binding and using associative arrays

```
CREATE OR REPLACE PACKAGE names_pkg
    AUTHID CURRENT_USER
AS
    TYPE names_t
    IS TABLE OF VARCHAR2 (100)
        INDEX BY PLS_INTEGER;

    PROCEDURE display_names (
        names_in    IN names_t);
END names_pkg;
/

SHO ERR

CREATE OR REPLACE PACKAGE BODY names_pkg
AS
    PROCEDURE display_names (
        names_in    IN names_t)
    IS
    BEGIN
        FOR indx IN 1 .. names_in.COUNT
        LOOP
            DBMS_OUTPUT.put_line (
                names_in (indx));
        END LOOP;
    END;
END names_pkg;
/

SHO ERR

DECLARE
    l_names    names_pkg.names_t;
BEGIN
    l_names (1) := 'Loey';
    l_names (2) := 'Dylan';
    l_names (3) := 'Indigo';
    l_names (4) := 'Saul';
    l_names (5) := 'Sally';

    EXECUTE IMMEDIATE
        'BEGIN names_pkg.display_names (:names); END;'
        USING l_names;

    FOR rec
        IN (SELECT * FROM TABLE (l_names))
    LOOP
        DBMS_OUTPUT.put_line (
            rec.COLUMN_VALUE);
    END LOOP;
END;
/
```

behavior could be quite different from what you would have expected.

Oracle Database 12c adds the BEQUEATH clause for views, so you can define a view that will accommodate invoker's rights functions referenced in a view. To help you utilize this feature, Oracle Database 12c offers two new functions that tell you about the invoking user, based on whether invoker's rights or definer's rights are used:

- ORA_INVOKING_USER: Returns the name of the user who is invoking the current statement or view. If the invoking user is defined by the Real Application Security feature of Oracle Database, this function will return XS\$NULL.
- ORA_INVOKING_USERID: Returns the identifier (ID) of the user who is invoking the current statement or view. If the invoking user is a Real Application Security-defined user, this function will return an ID that is common to all Real Application Security sessions but is different from the ID of any database user.

Note that these functions can be called only from within a SQL statement; they are not available natively in PL/SQL.

Let's take a look at how this feature works.

New PL/SQL Features

For Oracle Database 12c Release 1 (12.1), *Oracle Database PL/SQL Language Reference* (bit.ly/15HZFIU) documents new features, including

- Invoker's Rights Functions Can Be Result-Cached
- More PL/SQL-Only Data Types Can Cross PL/SQL-to-SQL Interface
- ACCESSIBLE BY Clause
- FETCH FIRST Clause
- Can Grant Roles to PL/SQL Packages and Standalone Subprograms
- More Data Types Have Same Maximum Size in SQL and PL/SQL
- DATABASE Triggers on PDBs
- LIBRARY Can Be Defined as DIRECTORY Object and with CREDENTIAL
- Implicit Statement Results
- BEQUEATH CURRENT_USER Views
- INHERIT PRIVILEGES and INHERIT ANY PRIVILEGES Privileges
- Invisible Columns

```
CREATE OR REPLACE VIEW emp_counts_v
BEQUEATH CURRENT_USER
```

```
AS
SELECT department_id,
       emps_count (department_id)
       emps_in_dept
  FROM emps_12cemps
/
```

```
GRANT SELECT ON emp_counts_v TO scott
/
```

In the SCOTT schema, I create another emps_12cemps table but populate it with different data:

```
CREATE TABLE emps_12cemps
(
  employee_id      INTEGER,
  department_id    INTEGER,
  last_name        VARCHAR2 (100)
)
/

```

In the HR schema, I create a table, emps_12cemps, and a function, emps_count, that calls the ORA_INVOKING* functions, as shown in Listing 3.

Then I create a view, emp_counts_v, specifying invoker's rights (CURRENT_USER) in the BEQUEATH clause, and I make sure that SCOTT can query that view:

```
BEGIN
  INSERT INTO emps_12cemps
  VALUES (1, 200, 'SCOTT.ABC');
  INSERT INTO emps_12cemps
```

Take the Challenge

Each *Oracle Magazine* PL/SQL article by Steven Feuerstein offers a quiz to test your knowledge of the information provided in it. The quiz appears below and also at the PL/SQL Challenge (plsql-challenge.com), a website that offers online quizzes on the PL/SQL language as well as SQL, Oracle Application Express, database design, and deductive logic.

Here is your quiz for this article.

I create and populate a table as follows:

```
CREATE TABLE plch_autos
(
  auto_name  VARCHAR2 (100),
  auto_type   VARCHAR2 (100)
)
/
BEGIN
  INSERT INTO plch_autos
  VALUES ('Corvette', 'Sports');

  INSERT INTO plch_autos
  VALUES ('Yugo', 'Not Really');

  INSERT INTO plch_autos
  VALUES ('Carrera', 'Sports');

  COMMIT;
```

END;
/

Which of the choices will display "Carrera" followed by "Corvette" after execution?

a.

```
CREATE OR REPLACE PROCEDURE
plch_show_autos (
  auto_type_in  IN plch_autos.auto_
type%TYPE)
IS
BEGIN
  FOR rec IN (  SELECT auto_name
                  FROM plch_autos
                 WHERE auto_type = auto_
type_in
                  ORDER BY auto_name)
  LOOP
    DBMS_OUTPUT.put_line (rec.auto_
name);
    END LOOP;
END;
/
BEGIN
  plch_show_autos ('Sports');
END;
/

```

b.

```
CREATE OR REPLACE PROCEDURE
plch_show_autos (
  auto_type_in  IN plch_autos.auto_
type%TYPE)
IS
  l_cursor  SYS_REFCURSOR;
BEGIN
  OPEN l_cursor FOR
    SELECT auto_name
      FROM plch_autos
     WHERE auto_type = auto_type_in
    ORDER BY auto_name;

  DBMS_SQL.return_result (l_cursor);
END;
/

```

c.

```
SELECT auto_name
  FROM plch_autos
 WHERE auto_type = 'Sports'
ORDER BY auto_name
/
```

```

VALUES (2, 200, 'SCOTT.DEF');
INSERT INTO emps_12cemps
VALUES (3, 400, 'SCOTT.123');
COMMIT;
END;
/

```

Then I turn on serveroutput and select all the rows from the emp_counts_v view. Here's the output of the query:

```
SQL> SELECT * FROM hr.emp_counts_v
2 /

```

DEPARTMENT_ID	EMPS_IN_DEPT
100	0
100	0
200	2
SCOTT	

Code Listing 3: Creating a table and a function to test the BEQUEATH clause

```

CREATE TABLE emps_12cemps
(
    employee_id      INTEGER,
    department_id    INTEGER,
    last_name        VARCHAR2 (100)
)
/

BEGIN
    INSERT INTO emps_12cemps VALUES (1, 100, 'abc');
    INSERT INTO emps_12cemps VALUES (2, 100, 'def');
    INSERT INTO emps_12cemps VALUES (3, 200, '123');
    COMMIT;
END;
/

CREATE OR REPLACE FUNCTION emps_count (
    department_id_in IN INTEGER)
    RETURN PLS_INTEGER
    AUTHID CURRENT_USER
IS
    l_count      PLS_INTEGER;
    l_user       VARCHAR2 (100);
    l_userid     VARCHAR2 (100);
BEGIN
    SELECT COUNT (*)
        INTO l_count
        FROM emps_12cemps
        WHERE department_id = department_id_in;
    /* Show who is invoking the function */

    SELECT ora_invoking_user INTO l_user FROM DUAL;
    SELECT ora_invoking_userid INTO l_userid FROM DUAL;
    DBMS_OUTPUT.put_line (l_user);
    DBMS_OUTPUT.put_line (l_userid);

    RETURN l_count;
END;
/

```

107
SCOTT
107
SCOTT
107

As you can see, the data returned by the view is from HR's table (there is a department ID value of 100), but the totals returned by the emps_count function call reflect data in SCOTT's table. And the ORA_INVOKING* functions return SCOTT's information.

Note that BEQUEATH CURRENT_USER does not transform the view itself into an invoker's rights object. Name resolution within the view is still handled with the view owner's schema, and privilege checking for the view is done with the view owner's privileges.

The primary benefit of this feature is that it enables functions such as SYS_CONTEXT and

Answer to Previous Challenge

The PL/SQL Challenge question in last issue's "PL/SQL Enhancements" article focused on program unit enhancements to PL/SQL in Oracle Database 12c. That challenge tested your knowledge of the use of WITH FUNCTION to enable referencing a package constant in SQL without building a "getter" function in the package itself. Choices (b) and (c) were both correct.

USERENV to return consistent results when these functions are referenced in a view.

NEXT UP: THE REST OF THE FEATURES

In the next issue of *Oracle Magazine*, I will explore the remaining and most interesting new features in the Oracle Database 12c PL/SQL language. These include the UTL_CALLSTACK package—which gives much-more-detailed information about the execution call stack, error stack, and error backtrace—and the new DBMS_UTLILITY.EXPAND_SQL_TEXT procedure—which recursively replaces any view references in the input SQL query with the corresponding view subquery. ◀



Steven Feuerstein

(steven.feuerstein@software.dell.com) is Dell's PL/SQL evangelist. He is an Oracle ACE Director; widely read author; and creator of PL/SQL Challenge, a quiz site for Oracle technologists. More information is available at plsqlchallenge.com.

NEXT STEPS

DOWNLOAD Oracle Database 12c
bit.ly/fherki

TEST your PL/SQL knowledge
plsqlchallenge.com

READ more Feuerstein
bit.ly/ormagplsql

READ more about
Oracle Database 12c
oracle.com/database

PL/SQL
oracle.com/technetwork/database/features/plsql

SQL datatypes
bit.ly/16YBTWb

DBMS_SQL
bit.ly/16A6AmB

ORACLE DATABASE 12c

On Oracle Database 12c, Part 2

Our technologist finds a match for his SQL and makes his undo temporary.

Usually I take three or four user-submitted questions from the past two months and present those questions and my answers here in each Ask Tom column. In the previous column and the next three, however, I take a look at some key Oracle Database 12c features. These features are all part of the “12 Things About Oracle Database 12c” presentation I gave at Oracle OpenWorld 2012 in San Francisco. (You can find the slides for that presentation on asktom.oracle.com on the Files tab.) The first three Oracle Database 12c features I looked at last time were improved defaults, bigger datatypes, and top-n queries. In this issue, I take a look at a new row-pattern-matching clause and how undo for temporary tables has changed in Oracle Database 12c.

ROW PATTERN MATCHING

In the beginning, SQL provided the ability to look left and right in a result set. That is, you could look at a row of data, possibly the result of a join of many tables, and apply predicates to that row. You could compare any column in that row with any other column in that row. However, you could not look up and down in a result set. The ability to look up and down was included in Oracle8i Database in the form of analytic windowing functions. Using these analytic functions, you could look not only left and right in a result set but also up and down, using windowing functions such as LAG, LEAD, FIRST_VALUE, LAST_VALUE, and NTH_VALUE. These windowing functions are extremely powerful, and they opened up a whole new way of analyzing data with SQL. As powerful as they are, however, they had some limitations.

Often when processing data, you want to recognize a pattern in an ordered stream of

data. For example, you might have an audit trail of data, with columns representing the username, an event that took place, and a time stamp representing when that event took place. You might be interested in finding all the people in that audit trail who used “application X” then “application Y” and then “application Z” and, finally, went back to a specific part of “application X.” Preceding, following, and in between those events might be countless other events. For some users, there might be no events between their interesting actions, but for other users, there might be hundreds or thousands of events. Trying to find such a pattern with analytic windowing functions falls short. You don’t know how many rows backward or forward in the result set you would have to look—LAG and LEAD analysis won’t really help. At the very least, you would have to make multiple passes on the data, use multiple self-joins, or resort to scalar subqueries. The query you’d need to write would be extremely complex, and the cost of executing it would be extremely high.

Enter row pattern matching, implemented via the MATCH_RECOGNIZE clause in Oracle Database 12c. This clause enables you to take a set of data (a result set—your audit trail, for example); partition it into nonoverlapping sets of data (by username in your audit trail); sort these sets (by time stamp in your audit trail); and then look for a pattern that spans many rows in that partitioned, ordered set. With the audit trail example, you would query all records for applications X, Y, and Z. You would partition the records by username and sort within each username by time stamp. Then you would look for one or more Xs, followed by one or more Ys, followed by one or more Zs, and finally followed by the specific part of application X you were inter-

ested in. You can do all this processing in a single pass through the data—no self-joins, no Cartesian joins, and no scalar subqueries are required. The query would be relatively easy to code—the MATCH_RECOGNIZE clause is very compact—and the performance of this query would be much better than that of one written without the MATCH_RECOGNIZE clause.

To demonstrate this new feature, I am going to analyze a set of stock data. Stock analysts are often interested in seeing a V- or W-shaped pattern in stock data. That is, they would like to know at which points in time a stock hits a high value, followed by a series of drops in price and then followed by a series of rises in price. They’d like to know when the pattern that defines the V shape started, when it hit the bottom, and when it hit the top again. I’ll start this example by defining a simple stock table:

```
SQL> create table stocks
  2  ( symbol    varchar2(10),
  3    tstamp    date,
  4    price     number,
  5    primary key (symbol,tstamp)
  6  )
  7  organization index
  8  /
```

Table created.

Now I’ll create a bit of data to analyze:

```
SQL> declare
  2    l_data sys.odciNumberList :=
  3      sys.odciNumberList
  4        ( 35, 34, 33, 34, 35,
  5          36, 37, 36, 35, 34, 35,
  6            36, 37 );
  7    l_cnt number := l_data.count;
  8    begin
```

```

8   for i in 1 .. l_cnt
9   loop
10    insert into stocks
11      ( symbol, tstamp, price )
12    values
13      ('XYZ', sysdate-l_cnt+i,
14          l_data(i) );
15  end loop;
16  commit;
17 /
PL/SQL procedure successfully completed.

```

Because this set of data is so small, I can analyze it with ASCII art in SQL*Plus easily, as shown in Listing 1.

This set of data is only 13 rows, so using a brute force method to analyze it works and I can readily see the pattern I am looking for. I can see clearly two V shapes in this data. I can see that on September 1, I have the beginning of a V, which bottoms out on September 3 and peaks again on September 7. I can see the second V easily, too; it begins on the 7th (the beginning of the second pattern is the end of the first—think about how you'd report on that with basic SQL), bottoms out on the 10th, and peaks again on the 13th. I am interested, therefore, in getting two rows of data—each with the three relevant dates. I would like you to think about how you might write a SQL statement in Oracle Database 11g Release 2 and how, before that, you might output two rows (repeating September 7, which is tricky) with the information I am looking for. It can be done, but it is rather complex and the performance would be questionable at best.

With the MATCH_RECOGNIZE clause, this is rather easy to query. For example:

```

SQL> SELECT *
2  FROM stocks MATCH_RECOGNIZE
3  ( PARTITION BY symbol
4  ORDER BY tstamp
5  MEASURES
6    STRT.tstamp AS start_tstamp,
7    LAST(DOWN.tstamp) AS
8        bottom_tstamp,
9    LAST(UP.tstamp) AS end_tstamp
10 ONE ROW PER MATCH
11 AFTER MATCH SKIP TO LAST UP
12 PATTERN (STRT DOWN+ UP+)

```

Code Listing 1: Displaying ASCII art patterns

```

SQL> select symbol, tstamp, price,
2       rpad(' ',price,' ') hist
3   from stocks
4  order by symbol, tstamp;

```

SYMBOL	TSTAMP	PRICE	HIST
XYZ	01-SEP-12	35	*****
XYZ	02-SEP-12	34	*****
XYZ	03-SEP-12	33	*****
XYZ	04-SEP-12	34	*****
XYZ	05-SEP-12	35	*****
XYZ	06-SEP-12	36	*****
XYZ	07-SEP-12	37	*****
XYZ	08-SEP-12	36	*****
XYZ	09-SEP-12	35	*****
XYZ	10-SEP-12	34	*****
XYZ	11-SEP-12	35	*****
XYZ	12-SEP-12	36	*****
XYZ	13-SEP-12	37	*****

```

12  DEFINE
13    DOWN AS
14      DOWN.price < PREV(DOWN.price),
15 ) MR
16  ORDER BY MR.symbol,
           MR.start_tstamp;

```

SYMBOL	START_TST	BOTTOM_TS	END_TSTAM
XYZ	01-SEP-12	03-SEP-12	07-SEP-12
XYZ	07-SEP-12	10-SEP-12	13-SEP-12

I'll walk through this query line by line. The first two lines define the query that defines the result set I'll partition and order and then apply my pattern to. This query can be any query—with joins, aggregation, and so on. The MATCH_RECOGNIZE clause starts on the end of line 2 and is contained in lines 3 through 15.

On lines 3 and 4, I set up my partitions and order this stream of data. I partition by the stock symbol, and within each of these stocks, I order the data by time stamp, from oldest to newest. Note that my result set is deterministic here. Because my primary key is SYMBOL, TSTAMP, the set of rows will be deterministic from run to run of this query. This fact is typically very important in pattern matching—you want to know that the rows that form your pattern are being observed in a "stable" state, a deterministic state. Otherwise, two executions of the

same query might return different answers! See bit.ly/Z6nxLL for a further explanation and examples of why this deterministic behavior is desirable, and usually necessary, for correct results.

Now I'm going to skip ahead a bit to the pattern part of the query:

```

11  PATTERN (STRT DOWN+ UP+)
12  DEFINE
13    DOWN AS
14      DOWN.price < PREV(DOWN.price),

```

I'm interested in a data pattern in which I have any record, followed by one or more records in which the price of the stock goes down, followed by one or more records in which the stock price increases. That is what my pattern on lines 11 through 14 represents. I'm looking for a starting record—any record—followed by one or more "down" records, followed by one or more "up" records. To identify "any record," I use the correlation name STRT, short for start. (That name is rather arbitrary—I could have used any valid identifier.) Because STRT is not in the DEFINE, the definition section, it can match any record—every record in the result set could potentially match and become a STRT record. For a record to become the STRT record, however, it must be followed by a DOWN record, at least one and possibly more (that is the meaning of the + after

DOWN). Now, DOWN does have a definition in this case: a record can be considered a DOWN record if and only if the price of that record is less than the price of the previous record in the result set (remember, it is a deterministically ordered stream of data). As long as I have records that match this definition, I'll be matching DOWN records. When I ultimately get to a record that no longer meets the criterion for being a DOWN record, I'll continue the pattern matching in the hopes that it is an UP record. An UP record is defined as any record whose price is greater than the previous record's price.

Now I'll walk through the pattern in lines 11 through 14 with my actual data set. I start by processing the first record, for September 1. That record meets the criterion for being a STRT record, because there is no defining criterion. The first record can be the STRT record of a pattern match only if the following record is a DOWN record. So, I advance in the result set, get the second record, and apply the definition of DOWN to it. Is its price of 34 less than the prior record's price, 35? Because it is, I am still matching my pattern; I can advance to the third record and apply the definition again. It is another DOWN record. Then I get to the fourth record—which is not a DOWN record—so I've finished matching the STRT DOWN+ portion of the pattern. I must now verify that the fourth record conforms to the definition of UP in my definition. And sure enough, it does. I've found the pattern—I know I have some record followed by one or more DOWN records followed by at least one UP record, but the pattern won't stop here. Much as with regular expressions, I am going to continue matching to find the largest conforming pattern. I take a look at the fifth, sixth, and seventh records and find that they are all UP records, so they become part of the pattern. Then I get to the eighth record, and it does not match the definition of UP anymore, because its price is not greater than the prior record's price. I am done with the first pattern, and the set of rows that match this pattern are September 1 through 7. I am now ready to output this information.

Going back to the MATCH_RECOGNIZE clause, a MEASURES clause starts on line 5. This identifies the outputs of my query, and

in this case, I have asked for the rows in the pattern to be tagged with STRT.timestamp, the timestamp associated with the starting record, the beginning of my pattern. I also asked for LAST(DOWN.timestamp)—the last DOWN time stamp—and LAST(UP.timestamp)—the last UP time stamp. Those three values represent the beginning, the bottom, and the end of the V-shaped pattern. Line 9 of the query—ONE ROW PER MATCH—makes the MATCH_RECOGNIZE clause work very much like an aggregate function. For this one big pattern that spans seven rows of data, I'd like one row to be output with my three measures in it. This will help me analyze the data as I turn millions of rows into tens or hundreds or thousands of rows, which is something I can get my head around.

Now that I've found the first pattern, I'm ready to start looking for the next one. The question now becomes, "Where do I start looking for the next pattern?" I could start looking for the next pattern in the second row, but that wouldn't make sense for this pattern, because I'd find V shapes inside of V shapes over and over again, which is not very interesting. Where I would like to start the search for the next pattern is on the last row of the first pattern. I want to pick up where I left off, and line 10 of the query—AFTER MATCH SKIP TO LAST UP—accomplishes that. It permits the last row of the first pattern in this case to potentially become the first row of the next pattern. And as you can see by the output, September 7 does, in fact, become the first row of the next pattern. September 7 is effectively output twice in this result set. (Think about what you would have to do in regular SQL to get a single row output twice in a result set!)

And that's it. I take all the pattern matches, order them by the stock symbol and the starting price, and display them. In this case, I've taken 13 rows and turned them into 2 rows, each of them representing three points of data. It becomes very easy now to see these patterns and start to interpret them. You can see how you might further analyze and aggregate this data to answer questions such as "What is the average period of time elapsed in a V for a given stock symbol?" "What is the max time?" "How many V shapes do you usually see in a year?" "Is there any common

time over the years or months when a stock bottoms out?" and so on.

For detailed information on the MATCH_RECOGNIZE syntax, see bit.ly/15x5p0o. In particular, the "SQL for Pattern Matching" chapter in *Oracle Database Data Warehousing Guide 12c Release 1 (12.1)* at bit.ly/1d1lhAP is an excellent resource to get started with.

TEMPORARY UNDO

I'll now take a look at a new way to process undo for global temporary tables in Oracle Database 12c.

Many DBAs and developers used to be surprised to discover that their operations on global temporary tables—such as INSERT, UPDATE, MERGE, and DELETE—generated redo: less redo than they observed on a regular, permanent table but still a sizable amount. Their first question was, "Where does this redo come from?" The answer was that it comes from the undo that Oracle Database has to generate on that global temporary table. The undo for global temporary tables must be generated—the database needs it in case an application issues a rollback and to provide for read-consistent results. For situations in which a developer inserts some information into a global temporary table and then issues a SELECT statement against it, followed by an UPDATE or a DELETE, the rules of read consistency state that the SELECT statement cannot see the effects of the UPDATE or DELETE. To make that possible, the database needs that undo. (See bit.ly/12ONB0w for more information on read consistency, one of the core tenets of Oracle Database).

So a modification of a global temporary table needs to generate undo, and the undo tablespace must be protected by redo. In the event of an instance crash, the database needs the redo information in order to recover the undo tablespace so it can then roll back any transaction that was in process but not yet committed when the instance failed. And furthermore, before Oracle Database 12c, the undo tablespace did not distinguish between undo for temporary objects and undo for permanent objects.

But starting in Oracle Database 12c, temporary undo can be stored in the temporary tablespace and undo for permanent objects

12 for 12

Tom Kyte has picked his top 12 features of Oracle Database 12c and put them into a presentation. Here are his picks:

- Even better PL/SQL from SQL
- Improved defaults
- Increased size limits for some datatypes
- Easy top-n and pagination queries
- Row pattern matching
- Partitioning improvements
- Adaptive execution plans
- Enhanced statistics
- Temporary undo
- Data optimization capabilities
- Application Continuity and Transaction Guard
- Pluggable databases

Kyte's "12 for 12" presentation is part of the Oracle Database 12c launch webcast at bit.ly/1bH8OgC.

Kyte covered improved defaults, increased size limits for some datatypes, and easy top-n and pagination queries in the September/October 2013 issue of *Oracle Magazine*, and he covered row pattern matching and temporary undo in this issue.

Spoiler alert: Kyte covers more of the top 12 in this column in upcoming issues.

can be stored in the undo tablespace. What this effectively means is that operations on temporary tables will no longer generate redo. If you have large batch operations that utilize global temporary tables, you may well discover that the amount of redo you generate decreases by a large amount. Furthermore, you'll be generating less undo in your undo tablespace. And that means you'll be able to support a longer UNDO_RETENTION time with a smaller undo tablespace.

Another pleasant side effect of this new change is that global temporary tables can now be utilized in a read-only Oracle Active Data Guard database. Yes, you can now have a read-only database in which you can read and write global temporary tables. Because one of the uses of a global temporary table has historically been in reporting systems—for storing intermediate query results—this makes a read-only Oracle Active Data Guard reporting database that much more viable.

How undo is generated in Oracle Database 12c for global temporary tables is controlled by a new init.ora parameter: TEMP_UNDO_ENABLED. It has two settings: TRUE and FALSE. By default, this parameter is set to FALSE and undo will be generated in the same fashion it was in the past. For example:

```
SQL> alter session
set temp_undo_enabled = false;
```

Session altered.

```
SQL> insert into gtt
  2  select *
  3    from all_objects;
87310 rows created.
```

Statistics

```
...
      566304  redo size
...
```

```
SQ> update gtt
  2  set object_name =
     lower(object_name);
87310 rows updated.
```

Statistics

```
...
      8243680  redo size
...
```

As you can see, the INSERT generates about half a megabyte of redo (566,304 bytes) while the UPDATE generates upwards of 8 MB of redo (8,243,680 bytes). If I enable temporary undo, however:

```
SQL> alter session
set temp_undo_enabled = true;
```

Session altered.

```
SQL> insert into gtt
  2  select *
  3    from all_objects;
87310 rows created.
```

Statistics

```
...
      280  redo size
...
```

```
SQL> update gtt
  2  set object_name =
     lower(object_name);
87310 rows updated.
```

Statistics

```
...
      0  redo size
...
```

the redo is either trivial or nonexistent.

In a read-only Oracle Active Data Guard database, the redo would be entirely nonexistent. This means you'll potentially be shipping less redo, applying less redo, and enjoying a longer undo retention period in your primary database. ◀



Tom Kyte is a database evangelist in Oracle's Server Technologies division and has worked for Oracle since 1993. He is the author of *Expert Oracle Database Architecture* (Apress, 2005, 2010) and *Effective Oracle by Design* (Oracle Press, 2003), among other books.

NEXT STEPS**ASK Tom**

Tom Kyte answers your most difficult technology questions. Highlights from that forum appear in this column.
asktom.oracle.com

FOLLOW Tom on Twitter

@OracleAskTom

READ more Tom

bit.ly/omagasktom

Expert Oracle Database Architecture: Oracle Database 9i, 10g, and 11g Programming Techniques and Solutions, Second Edition
amzn.to/ckGXaR

DOWNLOAD Oracle Database 12c

bit.ly/epBiUG

LEARN more about**Oracle Database 12c**

oracle.com/database

deterministic behavior

bit.ly/Z6nxLL

MATCH_RECOGNIZE syntax

bit.ly/15x5p0o

SQL pattern matching

bit.ly/1d1thAP

read consistency

bit.ly/120NB0w

FOLLOW Oracle Database on Twitter

@oracledatabase

on Facebook

facebook.com/oracledatabase

Partner Excellence!

2013 Specialized Partner Award Winners—Global



Applications



Engineered Systems



Industries



Database and
Middleware



Server and Storage
Systems

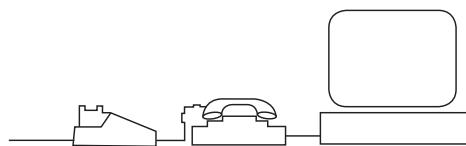
Specialized. Recognized. Preferred.

ORACLE®

partner.oracle.com

Oracle
Excellence
Awards

1969

**CompuServe**

Richard M. Nixon was President of the United States. Aldrin and Armstrong landed on the moon. And in Columbus, Ohio, Compu-Serv Network started renting time on its DEC PDP-10 midrange computer.

1979

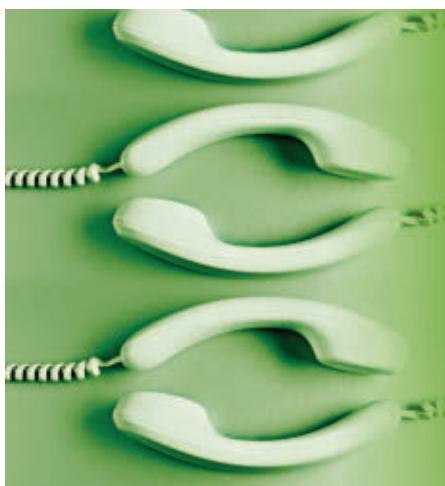
Starting a Thread

Started by a pair of Duke University graduate students and still in widespread use today, Usenet allows users to read and post threaded messages to newsgroups organized into hierarchies of subjects.

Pop quiz:

Name the "Big Nine" hierarchies of Usenet.

Answers:
bit.ly/17Z2MYu



1980s

Dial-up Online Services

With CompuServe leading the way, dial-up online services in the '80s included Prodigy (1984); General Electric's GEnie (1985); and Quantum Computer Services (1985). Quantum doesn't ring a bell? In 1989, Quantum launched a service called America Online. These early online services connected communities and enabled conversations.

1998

You've Got Mail

"The odd thing about this form of communication is that you're more likely to talk about nothing than something. But I just want to say that all this nothing has meant more to me than so many somethings."

—Kathleen Kelly (Meg Ryan) in an e-mail to Joe Fox (Tom Hanks), *You've Got Mail*, Warner Bros., 1998

1999 Weblogs

 Remember user-generated content? As a "user" of the World Wide Web, you can now generate your own content on weblog platforms LiveJournal and Blogger; WordPress joins them four years later. Then: What's a weblog?
Now: Hey, I read your blog post, and I completely disagree....

2000s

Media Gets Social

Were the 2000s the social media decade?

Friendster (2002)

MySpace (2003)

LinkedIn (2003)

Digg (2004)

Facebook (2004)

Twitter (2006)

Tumblr (2007)

and more debut.



2011

Cloud Collaboration

Launched during Oracle OpenWorld, Oracle Social Network is a secure enterprise social network that connects business processes, enterprise applications, and content in Oracle Cloud.

2013

Java Tweets

With Java at its core, Twitter supports more than 400 million Tweets per day #performance

—Tweet via @java; article via Java Magazine at ow.ly/nyk2R

THE FIRST SOCIAL NETWORK I JOINED WAS

We asked our Facebook fans, and here are the most popular social network firsts:

**YOUR TURN**

Twitter, Facebook, LinkedIn. Will today's social media network powerhouses become tomorrow's Prodigy? Tell us what you think the future of social media holds in store. Visit Facebook/OracleMagazine and let us know. bit.ly/orclmagfb

20 of the 20 Top Supply Chains

Get Better Results With Oracle

ORACLE®

oracle.com/goto/supplychain
or call 1.800.ORACLE.1