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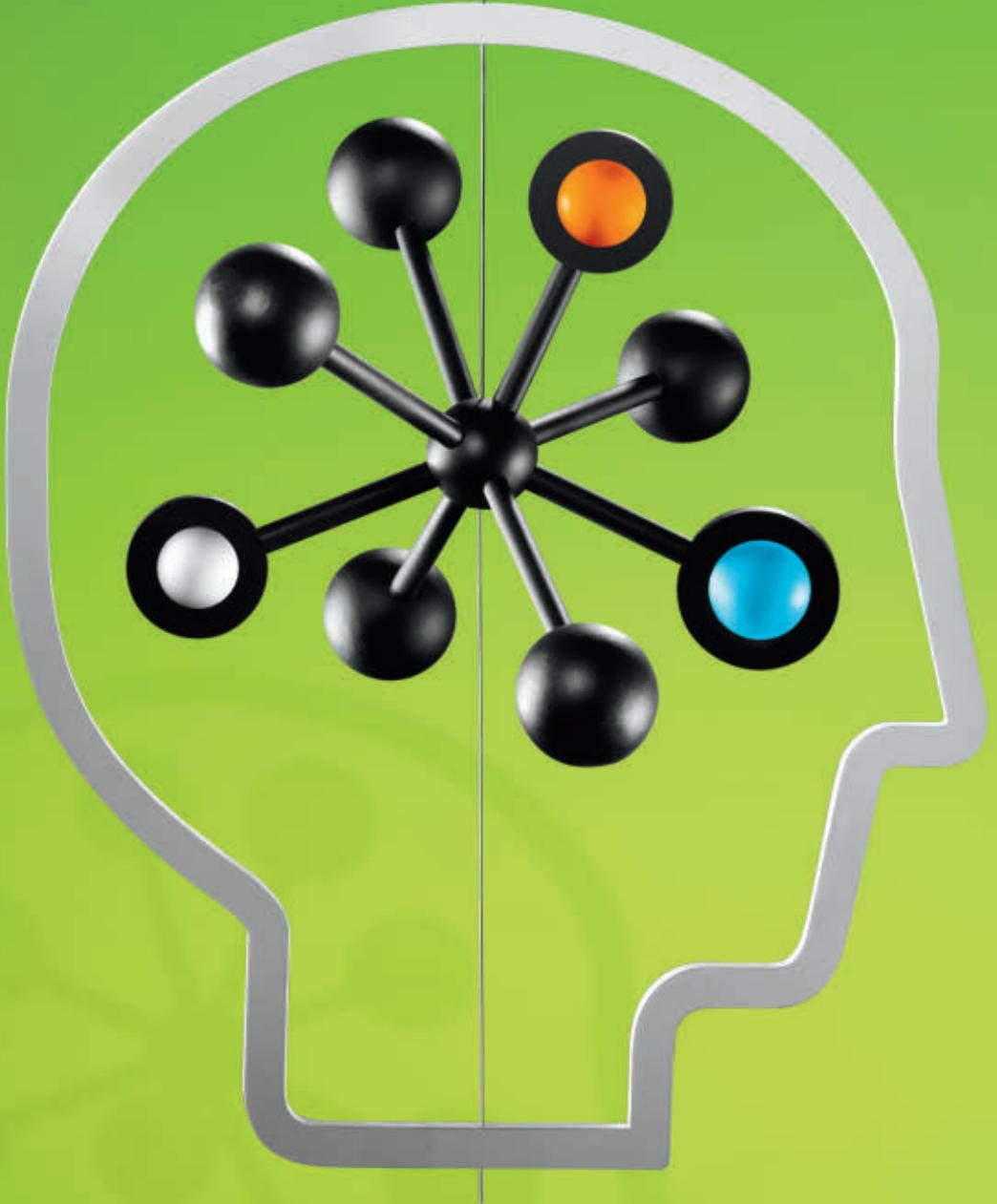
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## LAUNCHING PERFORMANCE

Storage bandwidth has limited the performance of growing data warehouses. Read how Oracle Exadata overcomes storage bandwidth limitations and delivers extreme computing power to the HP Oracle Database Machine and the HP Oracle Exadata Storage Server.

—David Baum /28



Cover: Ron Sellers

## BUILDING ON A SOLID FOUNDATION

Designing the right IT infrastructure is a critical part of ensuring application availability and performance. See how companies rely on an



Oracle grid infrastructure—including Oracle Database and Oracle Real Application Clusters—to provide a solid yet flexible base for their applications.

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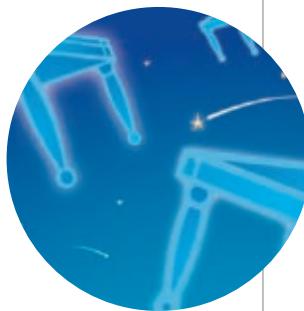
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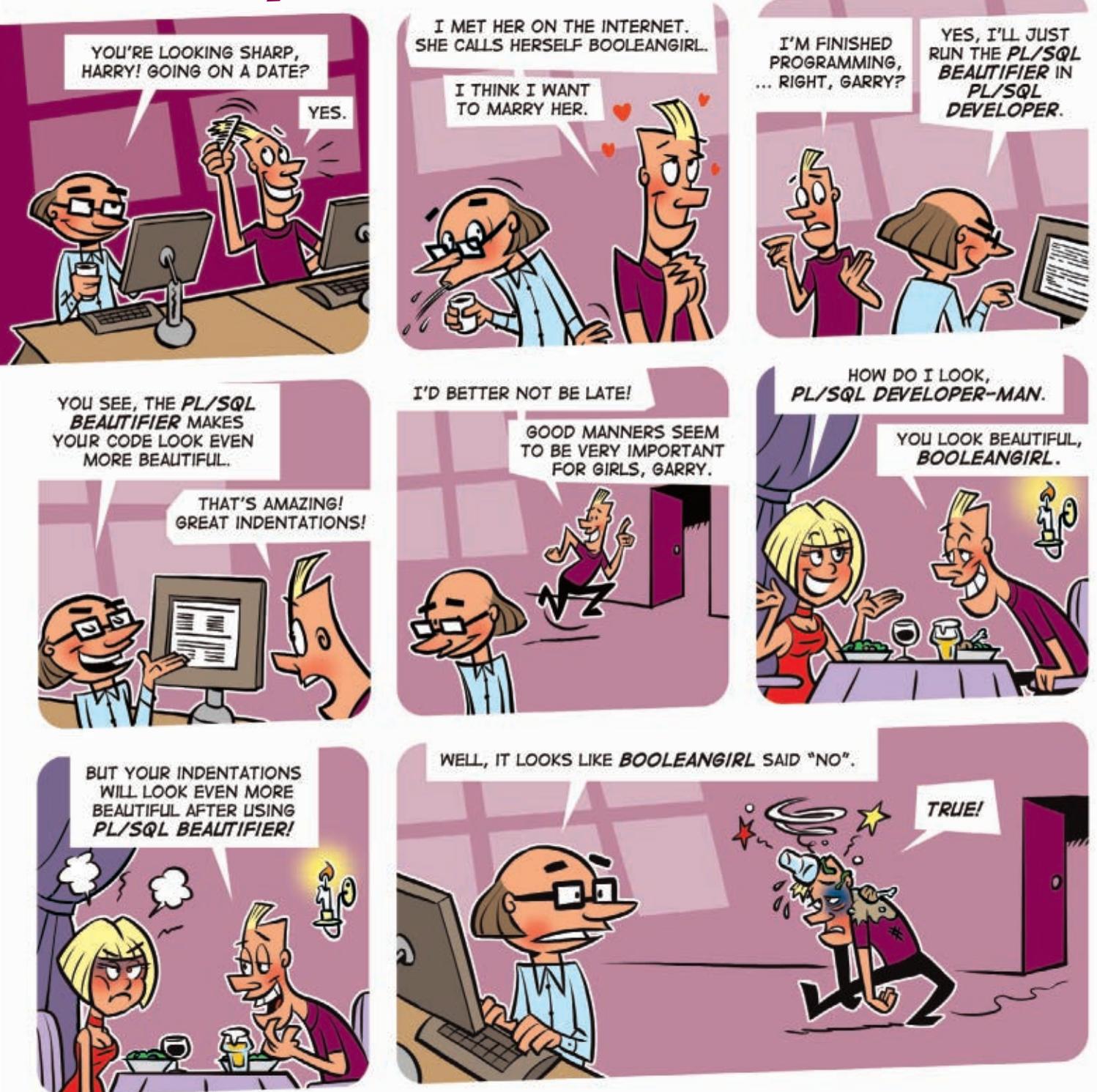
Purchasing criteria should focus on lifecycle security costs. —Mary Ann Davidson

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Embedded databases enable a wide array of information management capabilities.

—David Baum

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wrong in each issue of *Oracle Magazine*, and for  
letting us know what you want to read.**

**TRIGGER HAPPY**

I really enjoyed “The Trouble with Triggers” by Tom Kyte (*Oracle Magazine*, September/October 2008). One thing I thought Kyte overlooked was table maintenance and uptime. If you ever need to perform an operation on the table for which you don’t want the trigger to fire, you would need to disable the trigger. Since the command to do this is data definition language, not data manipulation language, the trigger will be disabled in all user sessions. This will cause all applications that rely on that trigger to be unavailable during the load, seriously impacting perceived database uptime. Yet another reason to dislike the trigger.

Jason Looney  
Jason.Looney@echostar.com

*Tom Kyte replies:* Yes, that is true. If you use `INSERT /*+ APPEND */` to direct path load, the append hint is ignored silently, meaning a trigger will prevent a direct path insert. If you use SQL Loader with `DIRECT=Y`, then SQL Loader disables the trigger in order to perform the load. So, in addition to what I wrote about, triggers do affect other operations as well.

Building on Tom Kyte’s excellent column “The Trouble with Triggers,” I would like to draw everyone’s attention to a simple solution in case the requirement were to enforce that there be at most one primary currency that is not used as a secondary currency. Namely, let an optional column contain Y to indicate the primary currency and a null for the secondary currencies; the job is done by imposing a constraint that allows Y only along with a unique index.

Arnold Bomans  
abomans@eurotransplant.nl

*Tom Kyte replies:* We addressed that in the original asktom.oracle.com-referenced Q&A as a “possible but bad idea.” See [www.tinyurl.com/triggertrouble](http://www.tinyurl.com/triggertrouble).

**MORE INFORMATION, PLEASE**

I wanted to let you know that *Oracle Magazine* is a great resource; keep up the great work! I would like to see more articles devoted to Oracle E-Business Suite, specific to Oracle Projects, Oracle’s cost and billing applications, Oracle Project

Management, and Oracle Project Resource Management. I’d also like to see articles about Oracle Sales, Oracle Daily Business Intelligence, Oracle Time & Labor, Oracle Discoverer, and Oracle Business Intelligence Suite, Enterprise Edition Plus.

In addition to the topics above, how about implementation lessons learned by other companies on these applications?

Rick A. Nania  
rick\_nania@mastercard.com

You have published many columns about Oracle Developer, PL/SQL, and other developer topics. I wish *Oracle Magazine* would focus on Oracle Real Application Clusters to share more information about solutions, design, and tuning performance.

Surachart Opun  
surachart@gmail.com

**GOING SOMEWHERE**

Regarding “On Signatures and Changing WHERE” (*Oracle Magazine*, September/October 2008), after the reference to Listing 2, this code:

```
FOR l_index IN
l_employees.FIRST .. l_employees.LAST
```

should be

```
FOR l_index IN
l_names.FIRST .. l_names.LAST
```

Atul Gupta  
atulgg@gmail.com

*Editors reply:* This has been updated in the online version of the column at [otn.oracle.com/oramag/oracle/08-sep/o58plsql.html](http://otn.oracle.com/oramag/oracle/08-sep/o58plsql.html).

**send mail to the EDITOR**

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# Investing in IT

Information technology is more than a line in the budget—it's an investment in the future.

**S**tories about changing global economic conditions have dominated recent news cycles. Costs are always measured and budgeted, but in the current economic climate, people are scrutinizing personal spending and companies are scrutinizing their operating budgets.

## IT ECONOMICS

IT budgets are not exempt from this scrutiny, and I've seen stories on surveys that predict a drop in IT spending. What I haven't seen—and I take this absence as good news—are stories about budget cuts to critical IT investments due to economic concerns. IT investments are the projects that are going to both lower IT costs in the near term and the future (through operational efficiencies) *and* generate a return to businesses in the form of new profits, competitive advantage, improved service-level agreement offerings, and more.

Investments come in all shapes and sizes, and many core capital investment projects both inside and outside IT involve infrastructure. Recent political campaigns in the U.S. proposed immediate investment in physical infrastructure projects to rebuild existing infrastructure that's crumbling (roads, bridges, and so on) as well as to create new infrastructure for greener energy generation and reduced energy consumption. Now is also an ideal time for investing in IT projects for the rebuilding of legacy IT infrastructures worldwide in order to cut costs and create a new return on investment. It's also an ideal time to build new green IT infrastructures that produce immediate return on investment *and* return for the planet.

## INVESTMENTS IN ORACLE

Let's look at a prototypical Oracle database platform investment in IT infrastructure. Moving from mainframe or legacy hardware and legacy operating systems to x86 hardware running Oracle Enterprise Linux in a grid environment

## nextSTEPS

### READ more about

**Oracle Enterprise Linux**  
[oracle.com/technologies/linux](http://oracle.com/technologies/linux)

**Oracle Real Application Clusters**  
[oracle.com/database/rac\\_home.html](http://oracle.com/database/rac_home.html)

**Oracle VM**  
[oracle.com/technologies/virtualization](http://oracle.com/technologies/virtualization)

**Oracle application grid**  
[oracle.com/products/middleware/application-grid.html](http://oracle.com/products/middleware/application-grid.html)

(running Oracle Real Application Clusters) first eliminates legacy support costs for hardware and operating systems as well as unused capacity. Next, optimizing that grid by investing in and running exactly the capacity (number of nodes) needed and investing in virtualization (Oracle VM) to make the greatest-possible use of all resources while consuming the least amount of electrical power means paying for and powering exactly the right infrastructure for the enterprise. This type of investment in IT infrastructure cuts costs immediately and pays immediate and future fiscal and planetary dividends.

Not all IT investments replace hardware and operating system infrastructure, of course. Investments in middleware infrastructure can help integrate a variety of specialized, current, and legacy applications, cutting costs and improving business efficiencies. For example, a service-oriented architecture and key Oracle Fusion Middleware components, including Oracle WebLogic Server, Oracle Coherence, and Oracle Tuxedo, are investments in an application grid strategy that efficiently provides applications with needed resources—CPU cycles, memory, disc space—while maximizing application performance and reliability. Standards-based Oracle WebLogic Server is a Java Platform, Enterprise Edition, application server for developing and deploying integrated enterprise applications; Oracle Coherence provides an in-memory data grid across multiple servers; and Oracle Tuxedo manages transaction processing for software written in C, C++, and COBOL and extends the life of existing IT investments.

## SPECIFICALLY SPEAKING

Every issue of *Oracle Magazine* includes customer feature articles in which Oracle customers talk about the benefits of their Oracle technology investments. In this issue, Oracle customers talk about cutting costs and creating profits with a single-vendor stack of software technology in one "off-the-shelf" solution featuring Oracle Exadata ("Launching Performance," page 28), choosing an Oracle solution over MySQL to cut costs and minimize support ("Inside Job," page 40), creating an efficient and highly available grid infrastructure with Oracle Real Application Clusters ("Building on a Solid Foundation," page 44), and integrating their business applications with standards-based Oracle WebLogic Server ("Serve It Up!," page 50).

**Tom Haunert, Editor in Chief**  
[tom.haunert@oracle.com](mailto:tom.haunert@oracle.com)

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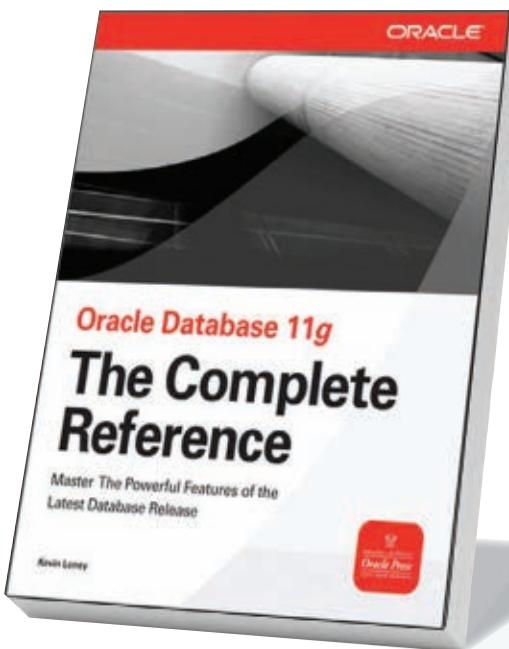
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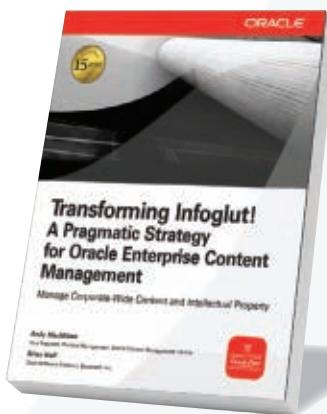
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## Oracle Database 11g: The Complete Reference

Kevin Loney

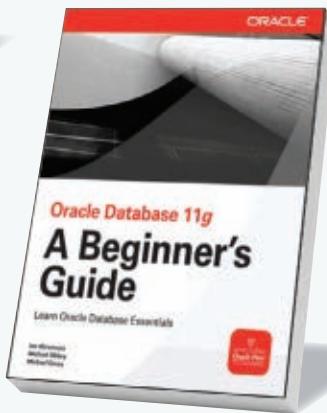
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## Transforming Infoglut! A Pragmatic Strategy for Oracle Enterprise Content Management

Andy MacMillan and Brian Huff

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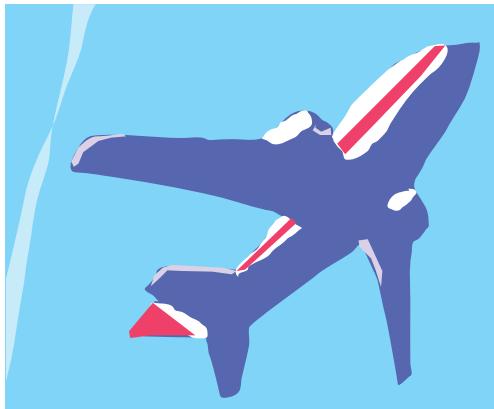
# Technology Events

Conferences and sessions to help you stay on the cutting edge

## Oracle Fusion Middleware Forum

**Beginning in January 2009, various cities**

This global, multicity event for IT executives and managers explores the impact of IT planning and execution on corporate strategy. Join application infrastructure thought leaders for a range of executive keynotes and technical sessions offering strategies and patterns for maximizing operational efficiency and addressing business expansion. Learn from customer case



studies and get in-depth information on Oracle Fusion Middleware product strategy. Check the schedule and register for these free events at [oracle.com/events/fusion-middleware-forum](http://oracle.com/events/fusion-middleware-forum).

## National Retail Federation Convention and Expo

**January 11–14, New York City**

The 98th annual gathering of the National Retail Federation provides 10 educational tracks, including digital retailing, information technology, supply chain, and sustainability. Networking opportunities, an exposition hall, and a design studio round out the activities. See the full schedule and register at [www.nrf.com/annual09](http://www.nrf.com/annual09).

## EUCI Web Self Service for Utilities Conference

**January 13–14, San Diego, California**

At the 4th annual conference of Electric Utility Consultants, Inc. (EUCI), learn how utilities can harness the cost savings promised by customer self-service while boosting customer service effectiveness. Top utilities in Web usability, functionality, and design will share their experiences and best practices. Learn more and sign up at [www.euci.com/conferences/0109-web-self](http://www.euci.com/conferences/0109-web-self).

## European Conference on Software Services and SOKU Technologies

**January 13–14, Brussels, Belgium**

This inaugural conference will set the foundation for an annual European summit on software services and service-oriented knowledge utilities (SOKU) technologies. More than 200 experts will discuss the future of grids and service-oriented architectures in the European community. Get information and sign up at [www.eu-ecss.eu/conference](http://www.eu-ecss.eu/conference).

## EDIST 2009

**January 14–16, Markham, Ontario, Canada**

The Electricity Distribution Information Systems & Technology Conference and Exhibition features keynote speeches, plenary sessions, and three educational tracks. Arrive a day early and attend a special tour of electricity distributor PowerStream's new state-of-the-art control center. Sign up at [www.edist.ca](http://www.edist.ca).

*Continued on page 14.*

## ORACLE USER GROUPS

### Georgia Oracle Users' Group Meeting

January 8 and February 12  
[www.gouser.org](http://www.gouser.org)

**PackerLand Users Group Meeting**  
January 14, Fond du Lac, Wisconsin  
[www.wi-plug.org](http://www.wi-plug.org)

**UKOUG UNIX SIG Meeting**  
January 20, London  
[www.ukoug.org](http://www.ukoug.org)

**Nashville Oracle Users Group Meetings**  
January 21 and February 18, Nashville, Tennessee  
[www.nouug.net](http://www.nouug.net)

**Suncoast Oracle Users Group Meetings**  
January 22 and February 26, Tampa, Florida  
[www.soug.net](http://www.soug.net)

**Northeast Ohio Oracle Users Group Business Meeting**  
January 23, Independence, Ohio  
[www.neooug.org](http://www.neooug.org)

**New York Oracle User Group Special Two-Day Training Session**  
February 3–4, New York City  
[www.nyoug.org](http://www.nyoug.org)

**UKOUG Oracle Financials SIG Meeting**  
February 4, London  
[www.ukoug.org](http://www.ukoug.org)

**UKOUG Hyperion Enterprise SIG Meeting**  
February 5, London  
[www.ukoug.org](http://www.ukoug.org)

**UKOUG Oracle Real Application Clusters and High-Availability SIG Meeting**  
February 11, London  
[www.ukoug.org](http://www.ukoug.org)

**Rocky Mountain Oracle Users Group Training Days**  
February 11–12, Denver, Colorado  
[www.rmoug.org/training.htm](http://www.rmoug.org/training.htm)

**Northern California Oracle Users Group Conference**  
February 12, Redwood Shores, California  
[www.nocoug.org](http://www.nocoug.org)

**UKOUG Scottish SIG Meeting**  
February 24, Edinburgh, Scotland  
[www.ukoug.org](http://www.ukoug.org)

**SouthEastern Oracle Users Conference**  
February 25–26, Charlotte, North Carolina  
[www.seouc.com](http://www.seouc.com)

**UKOUG Human Capital Management SIG Meeting**  
February 26, Slough, England  
[www.ukoug.org](http://www.ukoug.org)



Attend Oracle Develop in Prague, Czech Republic, on February 10 and 11, 2009.

## Gartner Business Intelligence Summit

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## International Conference on Computer Engineering and Technology

**January 22–24, Singapore**

This international forum brings together leading researchers, engineers, and scientists for the presentation of technological advances and research results in the fields of computer engineering and technology. It is held in conjunction with the International Conference on Advanced Computer Control. To learn more, visit [www.icct.org](http://www.icct.org).

## Middle East Information Technology in Healthcare Forum

**January 25–29, Dubai**

This event draws leading international and regional specialists, including experts from the World Health Organization, the Health Authority of Abu Dhabi, the Dubai Health Authority, and King Faisal Specialist Hospital and Research Centre. Interactive workshops will address electronic claims processing, electronic health and patient records, and data storage and security. Learn more at [www.iirme.com/ithealth](http://www.iirme.com/ithealth).

## DistribuTECH

**February 3–5, San Diego, California**

The 19th annual event for energy transmission and distribution professionals also encompasses automation and control systems, information technology, engineering, power delivery equipment, and water utility technology. Twelve conference tracks, 59 educational sessions, and 275 exhibitors will provide valuable information for everyone in the industry. Sign up or learn more at [www.distributech.com](http://www.distributech.com).

## Lean and Six Sigma for Process Excellence in IT and Software Development Conference

**February 3–5, San Francisco**

Learn about the use of Lean and Six Sigma to enable successful project execution; best practice applications of Lean Six Sigma to reduce IT operating costs; bottom-up deployment strategies; and the relationship between ISO, CMMI, Lean, and Six Sigma at this event. Register at [www.wcbf.com/quality/5089](http://www.wcbf.com/quality/5089).

## Oracle Develop

**February 10–11, Prague, Czech Republic**

Learn from world-leading experts about next-generation development trends and technologies. Participate in more than 35 technical sessions; hands-on labs led by industry experts; tracks covering Java and rich enterprise applications, Oracle Database, service-oriented architecture, and more. Keynote speakers include Oracle development leaders Mark Townsend, product management vice president, and Dennis Leung, software development vice president. Register at [oracle.com/events/oracledevelop/prague](http://oracle.com/events/oracledevelop/prague).

## Quest West Conference

**February 11–13, San Diego, California**

Presented in partnership with many affiliate user groups from the western region, this conference brings together 500 customers and vendors for an education and networking program with more than 100 sessions and 50 exhibitors. Learn more at [www.questdirect.org/questdirect/events/quest+west](http://www.questdirect.org/questdirect/events/quest+west).

## TechAdvantage Conference & Expo

**February 11–16, New Orleans**

Designed for electric cooperative management and professionals in engineering, operations, information technology, purchasing, and supply management, TechAdvantage features more than 55 sessions focused on reducing costs, enhancing reliability, and increasing service quality in the energy industry. Get information and register at [www.techadvantage.org](http://www.techadvantage.org).

## IDC Enterprise Social Networking Forum

**February 12, San Francisco**

This event brings together business and technology executives who are interested in learning how their companies can gain from the social networking of their workforce, partners, and customers. Through case studies and end user presentations, attendees will learn how major companies are benefiting from social networking, with examples of return on investment. The latest tools and techniques, as well as the challenges organizations face, will also be discussed. Get information and register at [www.idc.com/events](http://www.idc.com/events).

## Technology for Marketing & Advertising Conference

**February 24–25, London**

This conference caters to the technology needs of marketers, advertising professionals, publishers, customer service people, and sales professionals who deal with everything from back-office customer relationship management and data systems to front-facing creative digital campaigns. Learn more at [www.t-f-m.co.uk](http://www.t-f-m.co.uk).

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# What's New at Oracle

The latest Webcasts, podcasts, courses, and resource kits

## WEBCASTS AND VIDEOS

### *Building and Operating the Next-Generation Data Center*

#### [oracle.com/goto/ngdcwebcast](http://oracle.com/goto/ngdcwebcast)

Oracle Senior Vice President and CIO Mark Sunday and Oracle Chief Corporate Architect Edward Sreven share best practices for building and operating the next-generation data center using advances in virtualization, Linux, grid computing, and energy efficiency.

### *Web 2.0 for the Enterprise: Making It Real*

#### [oracle.com/goto/web20](http://oracle.com/goto/web20)

Vince Casarez, Oracle vice president of product management, and Andrew McAfee, associate professor at Harvard Business School, discuss Web 2.0 versus Enterprise 2.0, the relevance of Enterprise 2.0, and its role in creating competitive advantage.

### *The Six Habits of Highly Effective Data Centers*

#### [oracle.com/goto/datacenterofthefuture](http://oracle.com/goto/datacenterofthefuture)

Is your data center designed to withstand rapid change? Learn how grid-computing techniques can tackle your toughest challenges and inspire your next-generation data center.

### *LG Electronics Oracle E-Business Suite*

#### *Release 12 video*

#### [streaming.oracle.com/ebn/media/6933474.mpg](http://streaming.oracle.com/ebn/media/6933474.mpg)

Find out how upgrading to Oracle E-Business Suite Release 12 enabled LG Electronics to implement a global single instance system.

### *POSCO Oracle E-Business Suite*

#### *Release 12 video*

#### [streaming.oracle.com/ebn/media/6933473.mpg](http://streaming.oracle.com/ebn/media/6933473.mpg)

Hear how upgrading to Oracle E-Business Suite Release 12 supported POSCO's global expansion strategy.

### *Oracle Hyperion On Demand Enables Management Excellence*

#### [oracle.com/goto/hyperionondemand](http://oracle.com/goto/hyperionondemand)

Hear how Oracle Hyperion On Demand has enabled customers such as Cabot

Microelectronics to accelerate deployment of Oracle's Hyperion applications to increase business alignment and improve transparency and compliance.

## ORACLE UNIVERSITY

### *Oracle Application Express 3.0:*

#### *Developing Web Applications*

#### [oracle.com/education](http://oracle.com/education)

(Search keyword: Apex)

This introductory course covers Oracle Application Express components and wizards that help users build easy-to-deploy applications and database objects. Learn how to develop a database-centric Web application using the application builder, administer Oracle Application Express workspaces, and deploy and export your application. You will also learn how to take advantage of the utilities and reporting capabilities in Oracle Application Express.

### *Oracle Application Express:*

#### *Advanced Workshop*

#### [oracle.com/education](http://oracle.com/education)

(Search keyword: Apex)

In this advanced Oracle Application Express course, you'll build site maps and dashboards, incorporate Ajax and JavaScript in your application, build a custom tabular form that uses collections and validation, and develop themes and templates. The course also covers extending the application into the areas of PDF printing, e-mail notification, Web services, and integration with other Oracle products.

## RESOURCE CENTERS AND KITS

### *SOA Resource Center*

#### [oracle.com/technologies/soa/center.html](http://oracle.com/technologies/soa/center.html)

Find resources and information to help your organization succeed with service-oriented architecture (SOA), including a free 10-minute SOA assessment.

### *Go Green, Save Green*

#### [oracle.com/goto/linuxgogreen](http://oracle.com/goto/linuxgogreen)

Discover how to optimize resources while

reducing hardware, energy, and facility costs with Oracle VM server virtualization. This three-disc software kit includes Oracle Enterprise Linux 5.2 (64-bit), Oracle VM 2.1.2, and other resources.

### *Oracle SOA Resource Kit*

#### [oracle.com/goto/soa-resourcekit](http://oracle.com/goto/soa-resourcekit)

Going from a rigid, monolithic infrastructure to a highly flexible matrix of discrete, reusable services requires careful coordination of people, processes, and technology. This kit includes white papers, data sheets, Webcasts, software downloads, and more that will help your organization get beyond the SOA buzz and achieve business value.

### *Oracle SOA Governance Resource Kit*

#### [oracle.com/goto/soagov-resourcekit](http://oracle.com/goto/soagov-resourcekit)

Effective SOA governance is an essential

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**OVERHEARD**

**"Enterprise 2.0 is the use of emergent social software platforms by companies in pursuit of their business goals. It's about how software gets used, not how it gets developed, deployed, or integrated."**

— Andrew McAfee, Associate Professor, Harvard Business School, in *Web 2.0 for the Enterprise: Making It Real* ([oracle.com/goto/web20](http://oracle.com/goto/web20))

element in any enterprise transformation strategy. Oracle's SOA governance solution eases the transition to SOA by providing a means to reduce risk, maintain business alignment, and show the business value of SOA. This resource kit includes white papers, analyst reports, and Webcasts that will guide your organization along the path to measurable SOA success.

**Prevalidated Server Solutions for Oracle Real****User Experience Insight**[oracle.com/goto/ruei](http://oracle.com/goto/ruei)

Oracle, Intel, and Net Optics have joined forces to deliver a server solution for Oracle Real User Experience Insight. Customers worldwide can now take advantage of these prevalidated and tested reference hardware configurations to increase agility, receive faster return on investment, and reduce deployment risk. Get this kit to learn more about the partnership and download Oracle Real User Experience Insight.

**WHITE PAPERS****Oracle Grid Computing**[oracle.com/goto/gridwhitepaper](http://oracle.com/goto/gridwhitepaper)

Find out how businesses of all sizes worldwide are using grid best practices to modernize their IT operations and increase performance, availability, energy efficiency, and operational agility.

***It's All About the Salesperson: Taking Advantage of Web 2.0***[oracle.com/applications/social-sales-crm-whitepaper.pdf](http://oracle.com/applications/social-sales-crm-whitepaper.pdf)

This paper examines the challenges salespeople face, the growing Web 2.0 trend in the enterprise, and the drivers for a new breed of social applications that complement traditional customer resource management systems to help salespeople close more deals quickly.

***Application Outsourcing: Leveraging Its Intrinsic Benefits***[oracle.com/goto/idcappsoutsourcing](http://oracle.com/goto/idcappsoutsourcing)

Today the need to innovate and seize new revenue opportunities, lower costs, and improve operational efficiencies is imperative for businesses to succeed. Learn why more executives are embracing the value of application outsourcing as a means to transform their businesses.

**BLOG****SOA Governance @ Work**[blogs.oracle.com/governance](http://blogs.oracle.com/governance)

Get best practices, tips, and insights into different areas related to SOA governance, an area that many consider critical to SOA success.

**PODCASTS*****SOA Governance Misperceptions***[oracle.com/techcasts](http://oracle.com/techcasts)

In the first in a series of three podcasts, Bob Rhubart, architect community manager for Oracle Technology Network, talks with Oracle SOA governance specialists Cathy Lippert, Sharon Fay, and Mike Stamback about some of the misperceptions of SOA governance.

***Dynamic Language Duo***[oracle.com/techcasts](http://oracle.com/techcasts)

Chris Jones and Kuassi Mensah, Oracle's dynamic duo for evangelizing Oracle and dynamic languages, provide an update.

***HP/Oracle Podcast: SOA, Application******Modernization, and High-Performance Computing***[oracle.com/goto/hpmodernizationpodcast](http://oracle.com/goto/hpmodernizationpodcast)

Paul Evans, worldwide marketing lead for IT transformation solutions at HP, and Lance Knowlton, vice president for modernization at Oracle, discuss how IT infrastructure, systems, and software come

together for enterprises moving toward SOA through the HP/Oracle/Intel application modernization initiative.

***Reshaping Your Business with Web 2.0***[oracle.com/profit/audiocasts.html](http://oracle.com/profit/audiocasts.html)

Oracle Vice President of Product

Management Vince Casarez talks about his new book, *Reshaping Your Business with Web 2.0*, and how blogs, wikis, social networking, and information mashups can be extended into the enterprise.

***Scaling Oracle Data Warehouses***[oracle.com/database/podcasts.html](http://oracle.com/database/podcasts.html)

Oracle Vice President Ray Roccaforte

discusses how Oracle's various data warehousing solutions differ, yet all enable customers to easily deploy and scale an Oracle data warehouse.

***Extreme Performance with Oracle Exadata***[oracle.com/database/podcasts.html](http://oracle.com/database/podcasts.html)

Oracle Senior Vice President of Systems Technology Juan Loaiza talks about the HP Oracle Exadata Storage Server and the HP Oracle Database Machine and the performance boosts that customers can achieve over their current Oracle data warehouses.

***What's New in Oracle Business Process Management 10g Release 3***[oracle.com/products/middleware/ofmradio.html](http://oracle.com/products/middleware/ofmradio.html)

Eduardo Chiocconi, senior product manager for Oracle business process management, discusses how Oracle Business Process Management 10g Release 3 increases productivity and provides an enhanced architecture and improved SOA interoperability.

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# It's Good to Be Rich

Build rich-client applications with Oracle Application Development Framework.

The production release of Oracle JDeveloper and Oracle Application Development Framework (Oracle ADF) 11g (11.1.1.0.0) is sure to spark intense interest in what Oracle calls rich enterprise application (REA) development. One reason for this interest is that the Oracle ADF Faces Rich Client and 100-plus Ajax-enabled JavaServer Faces components are now available as part of the Apache MyFaces Trinidad component framework that is an underpinning of Oracle ADF.

Oracle ADF Faces Rich Client is more than just a pretty face, however; features such as support for drag-and-drop and improved reusability, advanced data streaming/improved databinding, and new data visualization components are what put the word "enterprise" in the REA moniker. Its purpose is to help developers build applications that not only give end users a rich-client experience but also meet enterprise standards for performance, security, maintainability, and scalability—while ensuring an efficient development process along the way, of course.

The prevalence of methodology is also an important determining element in the adoption of technology by developers, however. The developer community has already picked up on this point. At the Oracle OpenWorld Unconference in September 2008, for example, scores of developers (organized by Oracle ACE Director Chris Muir) convened to share their development experiences and begin to collaboratively create a new methodology for Oracle ADF, ultimately leading to the establishment of best practices.

With both parts of the adoption equation—technology plus community—now in play, REA development is sure to come on strong in 2009.

To learn more about Oracle ADF Faces Rich Client, Oracle ADF, or Oracle JDeveloper, visit the Java Developer Center on Oracle Technology Network (OTN) at [otn.oracle.com/java](http://otn.oracle.com/java); you'll find many helpful content resources there, in addition to links to software downloads. If you're interested in the work of the Oracle ADF Methodology Group, visit the group's wiki page at [wiki.oracle.com/page/adf+methodology](http://wiki.oracle.com/page/adf+methodology).

## THE CLOUD'S RED LINING

For developers, one of the most exciting announcements at Oracle OpenWorld was the certification/licensing of Oracle products running on Amazon Web Services' Elastic Compute Cloud (Amazon EC2) service, as well as the ability to back up data straight to the cloud via Oracle Secure Backup and Amazon Simple Storage Service (Amazon S3). Even better, Oracle has made virtual machine templates (Amazon Machine Images, in that company's parlance) containing these products freely available—making the barrier to entry ridiculously low.

This new ability to provision supported Oracle Database/Oracle Fusion Middleware/Oracle Enterprise Linux configurations in Amazon EC2 has been welcomed enthusiastically by developers, and for very good reason: if you're one of them, your prototyping options on Oracle just expanded considerably. Instead of taking the time and expense to procure and manage boxes or database access for hot or short-term projects, you can now be up and running very quickly—within 30 minutes, most likely—with little ongoing administration required. Or, if you're simply interested in evaluating Oracle products, you now have a nice, hardware-free alternative to doing an

install, making it even easier to jump on the Oracle bandwagon.

For customers who want to run production applications on the cloud, their current licenses are now transferable to Amazon EC2. And when they need support, Oracle will pick up the phone.

The Oracle Cloud Computing Center on OTN ([otn.oracle.com/tech/cloud](http://otn.oracle.com/tech/cloud)) contains more information, as well as links to the relevant services. For those interested in rolling their own Amazon Machine Image containing Oracle Database Express Edition, or otherwise understanding the internal workings of Amazon Machine Images, read Justin Lokitz' article on this subject, available only on OTN: [otn.oracle.com/pub/articles/lokitz-cloud.html](http://otn.oracle.com/pub/articles/lokitz-cloud.html). ■

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## SECURITY BUDGETS OK FOR MOST FIRMS

80 percent of 350 companies surveyed in September 2008 said that their organization has budgeted sufficiently for information security. Overall, 48 percent of companies indicated that a user machine, network, or server in their organization had been breached in the previous two years, but that number rose to 61 percent among midsize organizations of between 1,000 and 4,999 employees. One in five companies has never had a formal security audit by an outside organization, while 12 percent have audits as often as twice a year.

*Source: Fourth Annual Enterprise IT Security Survey, a survey from VanDyke Software and Amplitude Research [www.vandyke.com/aboutus/news/pressreleases/company/it\\_survey2008.html](http://www.vandyke.com/aboutus/news/pressreleases/company/it_survey2008.html)*

## INSIDERS ARE BIGGEST SECURITY RISKS

75 percent of all data breaches in the U.S. are caused by insiders, while outside hackers are responsible for just 1 percent of breaches, according to a survey of nearly 3,600 IT professionals in France, Germany, the U.K., and the U.S. 41 percent of data breaches occurred in mainframe environments.

*Source: 2008 Study on the Uncertainty of Data Breach Detection, a study from Compuware and the Ponemon Institute [www.compuware.com/pressroom/news/2007/7185\\_eng\\_html.htm](http://www.compuware.com/pressroom/news/2007/7185_eng_html.htm)*

## MOST DBAS DON'T EXPECT BREACHES

20 percent of respondents to a Web-based survey conducted in July and August 2008 said they expect a data breach or incident in the coming year. 25 percent said that they do not encrypt data within their databases. Of the 317 respondents to the survey, 57 percent were DBAs, 9 percent were IT managers, and 7 percent were developers. 40 percent of respondents manage more than 100 databases, and 20 percent manage more than 500.

*Source: Enterprise Data Insecurity: Are Organizations Prepared for the Threat From Within? The 2008 IOUG Data Security Report, a survey by IOUG, Oracle, and Unisphere Research [www.ioug.org](http://www.ioug.org) (available to members only)*

## ORACLE BUSINESS PROCESS MANAGEMENT SUITE RELEASED

**N**ow available, Oracle Business Process Management Suite supports organizations in increasing efficiency, visibility, and agility across a broad range of processes. A new component of Oracle Fusion Middleware, Oracle Business Process Management Suite includes a preintegrated portfolio of modeling tools for business analysts, developer tools for system integration, business activity monitoring for dashboards, integration with Microsoft Office and desktop clients, and a unified portal for process participants.

The suite includes Oracle BPEL Process Manager, a standards-based tool for building and orchestrating processes and Web services; Oracle Business Activity Monitoring, which enables customers to build interactive, real-time dashboards and create proactive alerts; Oracle Business Rules, which allows business analysts to easily define and modify business logic without programming; and Oracle Business Process Management, a set of tools for creating, executing, and optimizing business processes.

"Oracle Business Process Management Suite offers the flexibility that business analysts demand while providing the power IT requires," says Amlan Debnath, senior vice president, Oracle Server Technologies.

## ORACLE WEBCENTER SUITE 10g RELEASE 3 AVAILABLE

**W**ith Oracle WebCenter Suite 10g Release 3, now shipping, organizations can increase productivity and improve user interaction with Enterprise 2.0-enabled portals and applications. A component of Oracle Fusion Middleware, Oracle WebCenter Suite is a user interaction and portal platform that enables organizations to securely deliver extranet and intranet portals along with composite applications that integrate processes, content, business intelligence (BI), and enterprise application information in a single user

interface. Oracle WebCenter Suite also supports delivery of a broad range of Enterprise 2.0 services, such as wikis, blogs, discussion forums, secure search, and RSS feeds.

Oracle WebCenter Suite consists of Oracle WebCenter Framework, a JavaServer Faces framework that accelerates development and deployment of rich, context-driven composite applications; Oracle WebCenter Services, a set of Enterprise 2.0, content, and communication services that can be embedded in existing portals and applications; Oracle WebCenter Interaction, which provides open, extensible, and scalable social computing capabilities for delivering team-based community spaces for heterogeneous environments; Oracle WebLogic Portal, which provides a scalable extranet and e-commerce platform to deliver a targeted user experience; and Oracle WebCenter Anywhere, a set of wireless and desktop services that enable users to connect with Oracle WebCenter Suite applications from any connected device.

"Oracle WebCenter Suite offers the most complete, open, and integrated Enterprise 2.0 solution that allows organizations to leverage existing IT investments while providing users with a better, more personalized experience," says Vince Casarez, vice president, product management, Oracle.

## ORACLE UNVEILS ORACLE ENTITLEMENTS SERVER 10g RELEASE 3

**N**ow shipping, Oracle Entitlements Server 10g Release 3 allows organizations to enforce consistent authorization policies at a granular level across the enterprise and more rapidly deploy applications to help ensure compliance, improve business agility, and reduce IT costs. A component of Oracle Access Management Suite, Oracle Entitlements Server 10g Release 3 externalizes and centralizes fine-grained authorization policies via comprehensive, reusable, and auditable authorization policies and an intuitive administration model.

"While conventional access management technologies such as single sign-on can externalize authentication from applications, authorization logic is still embedded inside applications," says Amit Jasuja, vice president, Oracle Identity Management. "Now with Oracle Entitlements Server, companies can centralize and externalize fine-grained authorization policies from applications. This enables enterprises to deliver granular, entitlement-based authorization as a service and drive a truly service-oriented security environment."

#### **ORACLE ADAPTIVE ACCESS MANAGER 10g RELEASE 3 AVAILABLE**

Oracle Adaptive Access Manager 10g Release 3, another component of Oracle Access Management Suite, is also shipping. Unlike traditional security solutions that only examine user roles and privileges to grant access, Oracle Adaptive Access Manager 10g Release 3 profiles user behavior in real time to detect anomalies and fraud scenarios. It also features advanced fraud prevention and risk mitigation capabilities that help improve security and streamline compliance.

"With the increasing sophistication of internet fraud and regulations governing online data privacy, organizations need a robust security solution," says Amit Jasuja, vice president, Oracle Identity Management. "Oracle Adaptive Access Manager 10g Release 3 validates user identities by using a variety of information including a user's historical behavior, transactional information, and even third-party datasources. With this software, companies can successfully combat the threat of sophisticated security attacks and provide superior levels of protection for their consumers."

#### **ORACLE LAUNCHES ORACLE HYPERION ON DEMAND**

To meet the growing demand for enterprise performance management (EPM) solutions delivered through an on-demand model, Oracle is providing hosting and software management

services for Oracle Hyperion products through Oracle Hyperion On Demand. Oracle Hyperion On Demand supports Oracle Hyperion Financial Management, Oracle Hyperion Planning, Oracle Essbase, Oracle Hyperion Financial Data Quality Management, and Oracle Hyperion Financial Reporting.

"The availability of Oracle services to host and manage Oracle Hyperion is the next logical step in helping our customers maximize the value of their EPM and business intelligence investments," says John Kopcke, senior vice president, business intelligence and performance management, Oracle.

#### **ORACLE BUSINESS INTELLIGENCE SUITE, ENTERPRISE EDITION PLUS INCLUDES NEW INTEGRATIONS**

Now available, Oracle Business Intelligence Suite, Enterprise Edition Plus 10.1.3.4 includes new integrations with three components of Oracle's EPM system. Specifically, integration with Oracle Enterprise Performance Management Workspace enables end users to access and interact with Oracle BI data alongside Oracle EPM data through a single Web interface. Integration with Oracle Hyperion Smart View for Office offers users a common solution for integrating Oracle's EPM system content and Oracle BI content with Microsoft Office applications. Integration with Oracle Smart Space provides Oracle BI content such as dashboards and reports to end users via personalized desktop gadgets to enable real-time information access and collaboration.

Oracle Business Intelligence Suite, Enterprise Edition Plus 10.1.3.4 also features enhancements for service-oriented architecture (SOA) development in Oracle Business Intelligence Publisher and introduces Oracle Application Server Metadata Repository Creation Assistant, a migration utility that accelerates the conversion of Oracle Business Intelligence Discoverer metadata to Oracle Business Intelligence Suite, Enterprise Edition Plus metadata.

"Since the acquisition of Hyperion in 2007, Oracle has worked toward establishing tight integration between Oracle BI and Hyperion applications and Essbase," says Paul Rodwick, vice president of product management, Oracle business intelligence. "This release of Oracle Business Intelligence Suite, Enterprise Edition Plus represents another milestone accomplishment in Oracle's strategy to deliver an integrated EPM system."

#### **ORACLE REAL USER EXPERIENCE INSIGHT UNVEILED**

Now available, Oracle Real User Experience Insight 4.5, a component of Oracle Enterprise Manager, helps IT organizations enhance end-user experiences and maximize the value of SOA and Web-based applications by providing intelligence about users. Oracle Real User Experience Insight includes integrated performance and usage data collection and analysis of Web user activity; a data exchange facility for business analytics solutions; and integrated BI and prepackaged reports that leverage built-in online analytical processing storage. It also provides advanced troubleshooting for issues that Web and SOA-based application users encounter, and enhanced service-level management and reporting.

"With a 360-degree view of end users' interactions, Oracle Real User Experience Insight enables enterprises to isolate and remediate user problems before they impact the business, resulting in increased customer satisfaction, revenue, and productivity," says Richard Sarwal, Oracle senior vice president, product development.

#### **ORACLE LAUNCHES ORACLE INSURANCE**

Oracle has created a new business unit in response to worldwide insurance industry software needs. Oracle Insurance will help insurance companies improve business agility through a complete, modern insurance software solution that manages the entire enterprise—from technical infrastructure to core insur-

ance processing. Oracle's products for the insurance industry support insurers in getting products to market faster, reducing operational costs, strengthening customer and distributor relationships, and meeting compliance requirements as they gain greater visibility into their business operations. These products include Oracle insurance policy administration, Oracle Insurance Insbridge Rating and Underwriting, Oracle Documaker, Oracle's Siebel Insurance Claims, Oracle Insurance New Business, and Oracle Insurance Data Exchange, among others.

Oracle has also introduced Oracle Application Integration Architecture Foundation Pack for Insurance, which will enable insurance companies to accelerate application integration, especially between claims and financial systems, in order to process claim payments, set up claim reserves, and pursue outstanding debt.

"Oracle Insurance has the industry-leading applications and expertise that will help customers shift from legacy systems to modern technology and profitably grow their businesses," says Rick Connors, senior vice president and general manager, Oracle Insurance.

#### ORACLE TO BUY HALEY

Oracle has agreed to acquire RuleBurst Holdings, the parent company of Haley, a leading provider of policy modeling and automation software, to create an end-to-end solution for social services agencies. Social services agencies are moving to commercial software to automate entitlements. With limited resources to serve a growing constituency, these agencies need to administer and distribute entitlements consistently and accurately as defined by the underlying legislation. Haley's policy automation platform translates legislation and policies into defined, automated rules that are deployed in an application.

Together with its enterprise resource planning and customer relationship management applications, Oracle expects to create the first packaged software solution for social services agencies with an enhanced case management application.

"Governments and businesses face significant operating challenges with demographic shifts, globalization, and budget constraints. Haley's patented technology simplifies the process of managing complex legislative and business policies," says Charles Phillips, president, Oracle.

#### ORACLE TO BUY ADVANCED VISUAL TECHNOLOGY

Oracle has entered into an agreement to acquire Advanced Visual Technology (AVT), a leading provider of 3-D visual macro space planning software for retailers. AVT's products enable retailers to collaborate with their stores and supplier partners to design and plan retail floor space in real time with a current photo-realistic view of each store.

The combination of Oracle and AVT will create an industry-leading macro space management solution that will maximize profitability through better allocation of selling space," says Duncan Angove, senior vice president and general manager, Oracle Retail. "This will help enable retailers to gain rapid and profitable ROI from every inch of store space and help Oracle further realize its vision for insight-driven retailing."

#### ORACLE TO BUY PRIMAVERA SOFTWARE

Oracle has agreed to purchase Primavera Software, a leading provider of project portfolio management (PPM) solutions. Primavera's PPM software helps companies propose, prioritize, and select project investments, and plan, manage, and control complex projects and project portfolios.

"Enterprise PPM is moving to the forefront of business strategy for industries managing complex and capital-intensive projects and has emerged as a global driver for value creation and business success," says Charles Phillips, president, Oracle. "With 20 percent of the world's gross domestic product spent annually on projects, the addition of Primavera is expected to extend Oracle's leadership position in the enterprise application space."

#### ORACLE ACQUIRES TACIT SOFTWARE ASSETS

Oracle has acquired the intellectual property assets of Tacit Software. Tacit Software's automated profiling technology is an expertise location solution that helps organizations uncover new opportunities for collaboration.

Oracle plans to integrate Tacit Software into Oracle Beehive, its enterprise collaboration platform.

"The addition of Tacit Software's technology to Oracle Beehive underscores our commitment to a strong, differentiated presence in the collaboration software industry," says Terry Olkin, chief architect and senior vice president, Oracle collaboration technologies. ■

#### webLOCATOR

##### Oracle Business Process Management Suite

[oracle.com/technologies/bpm/bpm-suite.html](http://oracle.com/technologies/bpm/bpm-suite.html)

##### Oracle WebCenter Suite

[otn.oracle.com/products/webcenter](http://otn.oracle.com/products/webcenter)

##### Oracle Entitlements Server

[oracle.com/products/middleware/identity-management/entitlements-server.html](http://oracle.com/products/middleware/identity-management/entitlements-server.html)

##### Oracle Adaptive Access Manager

[oracle.com/products/middleware/identity-management/adaptive-access-manager.html](http://oracle.com/products/middleware/identity-management/adaptive-access-manager.html)

##### Oracle Hyperion On Demand

[oracle.com/ondemand/hyperion.html](http://oracle.com/ondemand/hyperion.html)

##### Oracle Business Intelligence Suite, Enterprise Edition Plus

[oracle.com/appserver/business-intelligence/enterprise-edition.html](http://oracle.com/appserver/business-intelligence/enterprise-edition.html)

##### Oracle Real User Experience Insight

[oracle.com/enterprise\\_manager/user-experience-management.html](http://oracle.com/enterprise_manager/user-experience-management.html)

##### Oracle Insurance

[oracle.com/industries/financial\\_services/insurance.html](http://oracle.com/industries/financial_services/insurance.html)

##### Oracle Application Integration Architecture Foundation Pack for Insurance

[oracle.com/industries/insurance/oracle-insurance-integration-architecture.html](http://oracle.com/industries/insurance/oracle-insurance-integration-architecture.html)

##### Oracle and Haley

[oracle.com/haley](http://oracle.com/haley)

##### Oracle and Advanced Visual Technology

[oracle.com/avt](http://oracle.com/avt)

##### Oracle and Primavera

[oracle.com/primavera](http://oracle.com/primavera)

##### Oracle and Tacit

[oracle.com/tacitsoftware](http://oracle.com/tacitsoftware)

# The Future of Data Centers

The Oracle Utah Compute Facility sets the bar for next-generation data centers.

**W**ith the October 2008 groundbreaking for the Oracle Utah Compute Facility, Oracle Magazine Senior Managing Editor Caroline Kvitka sat down with Oracle Senior Vice President and CIO Mark Sunday to discuss next-generation data centers, green computing, and the new Utah facility. The following is an excerpt from that interview. Download a podcast of the full interview at [oracle.com/magcasts](http://oracle.com/magcasts).

**Oracle Magazine:** What are some of the characteristics of a next-generation data center?

**Sunday:** We're seeing exponential growth in computing and exponential growth in storage requirements, and data centers of the future are going to have to be designed from the ground up to meet the changing needs of business. The ability to optimize the utilization of resources based on ever-changing demands is a fundamental need of the next-generation data center.

With that, businesses are increasingly requiring that their systems simply never go down. The ability to eliminate nonscheduled, but also scheduled, outages is absolutely key. Also, a next-generation data center needs to be *evergreen*. That is, it needs to continue to be expandable, leveraging the latest technologies to once again meet the ever-changing needs of the business. Finally, it needs to be eco-efficient from the ground up and designed for sustainability. Effectively, green computing needs to be a core design element.

**Oracle Magazine:** How does eco-efficiency, or green computing, fit into the next-generation data center?

**Sunday:** The area I put the most focus on is power: 1.5 percent of all the energy consumed in the United States is in the walls of data centers. So it's really critical to optimize the technolo-

By standardizing and virtualizing—managing more effectively—you're dramatically improving resource utilization across everything you're doing.

**Oracle Magazine:** How does the Oracle Utah Compute Facility epitomize the next-generation data center?

**Sunday:** Oracle's focus on taking advantage of the latest data center technologies—from the standpoints of construction, operations, and technology—dates back several years.

For example, our Austin facility was named 2005 Data Center of the Year by AFCOM [an association for data center professionals] and Network World. Oracle was also recognized by the U.S. Environmental Protection Agency in 2007 as a Leading Green Power Purchaser.

So, from the early days of Austin, we've tried to optimize, through dynamic power management, everything we're doing with cooling.

The Austin data center was one of the first facilities to separate the hot and cool air so we could run the facility more efficiently. Additionally, we've been recycling more than 1 million gallons of water a year, reducing the load on the local aquifers.

But taking that to the next level, even though Austin runs at 50 percent of the industry standard for support power requirements, we're going to be able to improve that by another 40 percent in Utah. We're going to accomplish that by taking air from the



Mark Sunday, Senior Vice President and CIO, Oracle

gies for cooling, lighting, and other support services within the facility.

It starts with the physical building: using construction materials that are recycled, manufactured, or fabricated near a site. A lot of hazardous materials are associated with all the computing components in a facility, so how those are managed is also a key part of the design. But everything you do with the physical facility, from a power or construction standpoint, is actually dwarfed by what you do on the floor—that is, how your IT department operates.

## "Our goal is not only to meet the ever-changing needs of the business but also to do so in a cost-effective and sustainable manner."

—Mark Sunday, Senior Vice President and CIO, Oracle

outside 83 percent of the time and using that for cooling the equipment. Additionally, one of the problems of being in the high desert is that the air is very dry, so we're going to have the largest implementation of a system that recycles the hot air coming off the servers to evaporate water to humidify the cool air coming in from outside to run the facility. We expect this facility to be one of the leading facilities in the world in terms of reducing the amount of support power required.

Additionally, we're going to put a tremendous focus on elastic grid computing so that we can dynamically allocate computing resources, based not on physical assets but on virtual assets, which will enable us to significantly improve utilization as well as meet the dynamic needs of our various stakeholders.

**Oracle Magazine:** What benefits is Oracle gaining from implementing next-generation data centers?

**Sunday:** It turns out that with our approach of standardizing all of our equipment on commodity x86 servers running Linux, as well as the heavy use of virtualization, we've been able to significantly increase asset utilization and drive down labor component usage. We have less equipment, are consuming less power, and require fewer people.

But equally important is that we have a lot more agility to provide a higher level of services to our employees as well as our external customers. This commodity-based grid computing approach has been really ideal for running the latest applications based on service-oriented architecture.

For example, during fiscal year 2008, we transformed our Oracle University business, an approximately [US]\$500 million operation, from one that required provisioning 1,200 to

1,400 environments spanning Oracle's entire product line every week to a virtual grid environment with one-sixth the hardware while doubling the number of classes we can deliver. So, again, that's a significant savings in not only the power but also the number of people it takes to run the equipment.

For another line of business, we put a significant focus on consolidating, vir-



An artist's rendering of the Oracle Utah Compute Facility

tualizing, and optimizing the operations. So in our 2008 fiscal year, we were able to reduce the total cost of computing equipment, facilities, labor, overhead—in fact, every aspect of what we're charging them, by 35 percent. Continuing along this path, we expect to take out another 30 percent of computing costs in fiscal year 2009.

**Oracle Magazine:** What can other companies do to transform their data centers into next-generation data centers?

**Sunday:** It starts with the basics: consolidate, standardize, and virtualize. You have to begin by inventorying what you have, plus all the resources you're using: people, labor, power, and so forth. Additionally, take stock of your applications wherever possible, consolidate those, and standardize processes—but then move toward a commodity-based platform running Linux and also virtualize significantly.

Begin with pilot areas. You'll see that you can get some very significant successes and proceed across your entire

application base. In fact, we've been able to extend this approach across twenty thousand servers, supporting Oracle's employees as well as thousands of external customers.

**Oracle Magazine:** What is your long-term vision for computing at Oracle?

**Sunday:** Where I see us heading is toward the ability to configure applications based on software components; being able to dynamically provision those across a computing grid; being able to live-migrate those to other environments, larger or smaller; and meeting the current compute requirements. In fact, if there's a test environment that's no longer needed, we will be able to "park" this environment and reinstantiate it in seconds when it is needed again. If we have a physical server failure, we will leverage the dynamic

grid computing capability to migrate that workload into another virtual environment. In fact, we will be able to manage the virtual environments not only within one physical data center but also across multiple data centers.

So really, my vision for the future is an elastic grid that runs all the applications for the wide variety of stakeholders we support, both internal and external to Oracle. Our goal is not only to meet the ever-changing needs of the business but also to do so in a cost-effective and sustainable manner. ■

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**Caroline Kvitka** is senior managing editor of Oracle Magazine and Profit: The Executive's Guide to Oracle Applications.

## nextSTEPS

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**LEARN** about Oracle's solutions for empowering the green enterprise  
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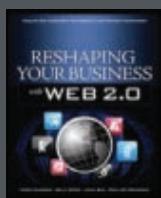


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**the walk starts at [marchforbabies.org](http://marchforbabies.org)**

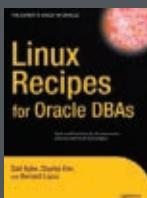


### **Reshaping Your Business with Web 2.0**

By Vince Casarez, Billy Cripe, Jean Sini, and Philipp Weckerle  
McGraw-Hill Osborne Media  
[www.mhprofessional.com](http://www.mhprofessional.com)  
ISBN: 0071600787

Written by a team of Web 2.0 experts, this guide provides a blueprint for leveraging the new culture of participation in an enterprise environment. *Reshaping Your Business with Web 2.0* offers proven strategies for the successful adoption of an Enterprise 2.0 paradigm and covers the technical solutions that best apply in specific situations. The book offers clear guidelines for using Web 2.0 technologies and standards in a productive way to align with business goals, increase efficiency, and provide measurable bottom-line growth.

Coauthor Vince Casarez is an Oracle vice president who focuses on Web 2.0 technology development, Enterprise 2.0, and portal products. Billy Cripe, director of product management at Oracle, focuses on Enterprise 2.0 strategy and enterprise content management products. Jean Sini cofounded the Web 2.0 startup ActiveWeave, which was later acquired by Buzzlogic, where he is CTO. Philipp Weckerle leads the product management efforts on Oracle Reports and content integration at Oracle.



### **Linux Recipes for Oracle DBAs**

By Darl Kuhn, Charles Kim, and Bernard Lopuz  
Apress  
[www.apress.com](http://www.apress.com)  
ISBN: 1430215752

*Linux Recipes for Oracle DBAs* is an example-based book on managing Oracle Database in a Linux environment. Covering commonly used distributions such as Red Hat Enterprise Linux and Oracle Enterprise Linux, the book is written for DBAs who need fast answers to help them get their jobs done. The book is task-oriented, urging readers to look up the task to be performed, see the solution, and then read the detailed explanation.

The authors cover all of the common and not-so-common tasks that DBAs perform on Linux, from terminating user processes to automating DBA jobs to unmarking and renaming Oracle Automatic Storage Management disks.

Coauthor Darl Kuhn is a DBA at Sun Microsystems. Charles Kim is director of database technologies at Novara Solutions. Bernard Lopuz is a senior technical support analyst at Oracle.

Look for Oracle books at [otn.oracle.com/bookstore](http://otn.oracle.com/bookstore).

### **JUNIPER WXC PLATFORM VALIDATED WITH ORACLE E-BUSINESS SUITE**

**J**uniper Networks' WXC 590 application acceleration platform has been validated with Oracle E-Business Suite Release 12. The WXC platform allocates bandwidth and prioritizes Oracle E-Business Suite applications traffic over noncritical data. This reduces the effects of WAN latency, network congestion, and packet loss and improves end-to-end performance of Oracle applications for distributed enterprises.

Testing through the Oracle Application Integration Architecture for Partners Initiative showed that Oracle E-Business Suite functionality is maintained when the WXC platform is inserted in-line between the client and application. In validation testing under this program, the WXC platform compressed HTML, HTTP/HTTPS, and Oracle Forms traffic, reducing payload and improving application response time.

"Many companies and government agencies today rely on Oracle applications to support their business operations," says Ross Roesner, vice president of WAN acceleration at Juniper Networks, an Oracle Certified Advantage Partner. "With Juniper's innovative features that accelerate large volumes of traffic across a broad range of applications, high-performance businesses can use their applications to not only meet strategic objectives but accelerate a competitive advantage."

### **PORTWISE ANNOUNCES IDENTITY AND ACCESS MANAGEMENT INTEGRATION**

**P**ortWise has integrated its identity and access management solutions with Oracle Fusion Middleware 10g products. The PortWise authentication platform works with Oracle Internet Directory, a component of Oracle Fusion Middleware, to provide seamless single-sign-on capabilities. Like Oracle Internet Directory, PortWise uses Security Assertion Markup Language to exchange valid user identities. PortWise can synchronize user, group, and user-attribute

values across applications to improve authorization decisions. It uses Oracle Access Manager, part of Oracle Identity Management, to add, remove, and modify users, groups, and user attributes in Oracle Internet Directory.

"The integrated solution has been proven to allow customers such as global financial institutions to leverage and extend their Oracle investment while providing seamless and secure application access," says Kaushik Thakkar, vice president of strategic alliances at PortWise.

PortWise is a member of the Oracle PartnerNetwork; the Oracle Enterprise Security and Governance, Risk, and Compliance Initiative; and the Oracle Extended Identity Management Ecosystem for Authentication.

### **ORACLE VALIDATES NOETIXVIEWS BUSINESS INTELLIGENCE SOFTWARE**

**N**oetix, an Oracle Certified Advantage Partner, has announced that Oracle has validated NoetixViews business intelligence software for integration with Oracle E-Business Suite, Oracle's Siebel Customer Relationship Management (CRM), and Oracle's PeopleSoft Enterprise applications through the Oracle Application Integration Architecture for Partners Initiative.

The integration validation process for NoetixViews included a series of integration tests across different functional areas within Oracle Applications. NoetixViews demonstrated its ability to dynamically generate easy-to-use business views and reports. The purpose of the validation process is to give customers confidence that Oracle Applications and Noetix solutions work together as designed.

NoetixViews and Noetix' patented technology, Noetix MetaBuilder, can automatically discover metadata and simplify the process of accessing data from Oracle's application databases. Noetix MetaBuilder generates database views tailored to specific Oracle E-Business Suite, Siebel CRM, or PeopleSoft Enterprise application config-

urations and helps nontechnical report writers to create ad hoc queries and custom reports.

"The integration validation process is an important component to Noetix' long-term commitment of providing Oracle Applications customers with the meaningful business intelligence content they need for better insight across the organization," says Morris Beton, Noetix CEO.

#### BROCADE OPTIMIZES DATA CENTER PERFORMANCE FOR ORACLE VM

Oracle partner Brocade is using its Data Center Fabric architecture to optimize Oracle applications and databases running on Oracle Enterprise Linux and Oracle VM. Specifically, Brocade's Adaptive Networking Data Center Fabric technologies can combine with Fibre Channel N-Port virtualization to consolidate, virtualize, and automate the storage infrastructure. Adaptive Networking uses deep network intelligence to anticipate congestion and to dynamically make adjustments in the fabric so that application traffic continues to flow as needed.

Adaptive Networking also simplifies data center network management and lowers costs by reducing the number of dedicated and discrete networks needed for individual applications. In addition, Adaptive Networking technology can be used to migrate applications and databases between virtual servers without compromising quality of service.

"Working closely with Oracle, we are very pleased to be among the first in the data center networking industry to be able to help optimize Oracle applications and database workloads," says Harry Petty, director of marketing for Brocade's server division.

#### VOVICI INTEGRATES WITH ORACLE CRM ON DEMAND

Vovici, a provider of feedback management and online community software, has released the Vovici CRM 2.0 Connector for Oracle CRM On Demand. An add-on module to the

Vovici Enterprise Feedback Management platform, the connector accelerates the integration of customer feedback into Oracle CRM On Demand. Together, Vovici and Oracle provide a 360-degree view of customer attitudes, transactional experiences, and history without the need for custom programming.

The connector automatically scans Oracle CRM On Demand for information, pushes contact and lead opportunities from the Oracle platform into the Vovici platform, and incorporates feedback and survey data into customer relationship management records.

Oracle partner Vovici has also been selected to join the Oracle CRM On Demand "Inner Circle." In this role, Vovici will collaborate with Oracle CRM On Demand product strategy, product management, engineering, and quality assurance organizations, as well as global alliance independent software vendors.

#### F5 OPTIMIZES SIEBEL CRM DEPLOYMENTS

F5 Networks' Application Ready Solution for Oracle's Siebel CRM is now available. Through tested and documented deployment, configuration, and optimization guidance, Application Ready Solution for Siebel CRM delivers LAN-like performance over the WAN. F5's intelligent compression achieves an 87 percent bandwidth reduction and can offload up to 70 percent of Siebel CRM server connections. F5 policies and profiles leverage Secure Sockets Layer offload, caching, and acceleration technologies in F5's BIG-IP application delivery modules.

"In preparing the Application Ready Solution for Siebel CRM, [F5 and Oracle] have worked closely to determine the best practices and ideal configurations for running F5 and Siebel CRM together—resulting in superior deployment benefits and an unparalleled user experience for joint customers," says Jim Ritchings, vice president of business development at F5.

F5, a certified member of the Oracle PartnerNetwork, also offers an

Application Ready Solution for Oracle CRM On Demand.

#### ORACLE AND INQUIRA PARTNER ON CUSTOMER SERVICE SOLUTION

Oracle has formed a strategic partnership with InQuira to provide an integrated solution that drives a seamless and valuable customer service experience across phone, Web, and community-based channels. InQuira is a provider of integrated software applications for Web self-service, agent-assisted support, and enterprise knowledge management. The solution combines InQuira's collaboration and Web self-service applications with Oracle's Siebel E-Support and Oracle's Siebel CRM to provide consumers with a best-in-class Enterprise 2.0 experience.

"This new partnership with Oracle represents a natural evolution as companies adapt to customers' rising expectations to get to answers from the full breadth and depth of all enterprise content," says Mike Murphy, CEO of InQuira. ■

#### webLOCATOR

##### Juniper Networks

[www.juniper.net](http://www.juniper.net)

##### PortWise

[www.portwise.com](http://www.portwise.com)

##### Noetix

[www.noetix.com](http://www.noetix.com)

##### Brocade

[www.brocade.com](http://www.brocade.com)

##### Vovici

[www.vovici.com](http://www.vovici.com)

##### F5 Networks

[www.f5.com](http://www.f5.com)

##### InQuira

[www.inquira.com](http://www.inquira.com)

#### ORACLE CERTIFIED ADVANTAGE PARTNER

Certified Advantage Partner (CAP) is Oracle PartnerNetwork's highest membership level. CAPs consistently demonstrate superior product knowledge, technical expertise, and commitment to Oracle and receive advanced levels of service, training, benefits, and resources. To find a CAP, please visit [solutions.oracle.com/CAP](http://solutions.oracle.com/CAP).

# The Long View

Oracle Database experience informs views on new features—and new ways of communicating.

## Alex Gorbachev

Your experience with Oracle technology goes back to using Oracle7 as a university student. Over the years, what's changed about using Oracle technology? Dealing with multiple customers and projects every day, I have to touch practically every aspect of Oracle database technology, and I especially appreciate the efforts Oracle puts into improving its documentation. This is now our first source of information about new features.

### What stands out in terms of improvements to the technology itself?

The automatic workload repository feature in Oracle Database 10g. It provides unprecedented levels of instrumentation and an unmatched ease of use in Oracle Enterprise Manager.

### How do you use the internet today?

I live it, work it—I practically sleep with it! Virtual private network over the internet is the primary link connecting me with all my customers. I also communicate with customers through extensive use of messaging and Web and video conferencing. In addition, the internet has revolutionized knowledge sharing in Oracle communities.

## Andreas Chatziantoniou

You've taken Oracle University classes in the past. What led you to do

this? "Learn Oracle from Oracle" is still the most compelling reason. These folks know how to teach, and they know their subjects. Usually I take courses in a classroom, because to me the interaction with the teacher offers the most value.

### What would you like to see Oracle, as a company, do more of?

With the large number of products Oracle offers, it is necessary to reach out to the expertise of partners. These peer groups can act as advocates and will make the products better by



## peerSPECS

**Company:** The Pythian Group, a provider of enterprise data infrastructure management services

**Job title/description:** Vice president, East Asia Pacific, leading remote DBA services in the East Asia Pacific region and defining the company's strategy there

**Location:** Sydney, Australia

**Oracle credentials:** Oracle Certified Professional (Oracle8, Oracle8i, Oracle9i, and Oracle Database 10g) and Oracle Certified Developer, with more than 10 years of experience using Oracle products

**Oracle ACE**  
[otn.oracle.com/community/  
oracle\\_ace](http://otn.oracle.com/community/oracle_ace)

giving feedback about a product's use and making enhancement requests.

### If you were going to the International Space Station for six months and could take only one Oracle reference book,

**what would it be?** As books are far too heavy, I'd settle for the DVD with all the Oracle Database 11g and Oracle Application Server 10g documentation. By the way, is the position of space station DBA vacant, and if so, where can I apply?

### What green practices do you use in your work?

I work remotely and use Web conferencing, including whiteboards and video.

## Christian Pfundtner

### How did you get started in IT?

After school, I took a job as a technician in a small IT company. I quickly recognized that I needed a bigger challenge than just installing PCs and Novell servers, so I switched to a company using VMS and interactive Linux. After two years there, I had an interview at Oracle Austria. My experience with databases was rather limited, but Oracle gave me a chance in its Support department, and I soon found that Oracle Database was my calling.

**What's your favorite tool or technique on the job?** To me the best tool for a DBA is SQL\*Plus—whatever the problem is, you can find it and analyze it with SQL\*Plus.

### Which new database features are you finding most valuable?

I'm mostly interested in the performance-relevant features. Within Oracle Database 11g, database replay and pending statistics are my favorites. With database replay, you get the chance to evaluate if changes to the operating databases will attain the expected results, and pending statistics enables you to eliminate the fear that a new statistic will slow down query performance. ■

## peerSPECS

**Company:** Accenture

**Job title/description:** Principal consultant, working on technical architecture, high availability, and identity management

**Location:** Almere, the Netherlands

**Oracle credentials:** Oracle Certified Associate (Oracle Application Server 10g), with 10 years of experience using Oracle products

**Oracle ACE**

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## peerSPECS

**Company:** GNC Akademie GmbH, an Oracle University partner providing DBA training and consulting

**Job title/description:** CEO, trainer, and consultant, responsible for the delivery of Oracle classes

**Location:** Vienna, Austria

**Oracle credentials:** Oracle Certified Professional, Oracle Certified Master (Oracle9i Database), and Oracle Database 10g Real Application Clusters Certified Expert, with 16 years of experience using Oracle products

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is still the most compelling reason. These folks know how to teach, and they know their subjects. Usually I take courses in a classroom, because to me the interaction with the teacher offers the most value.

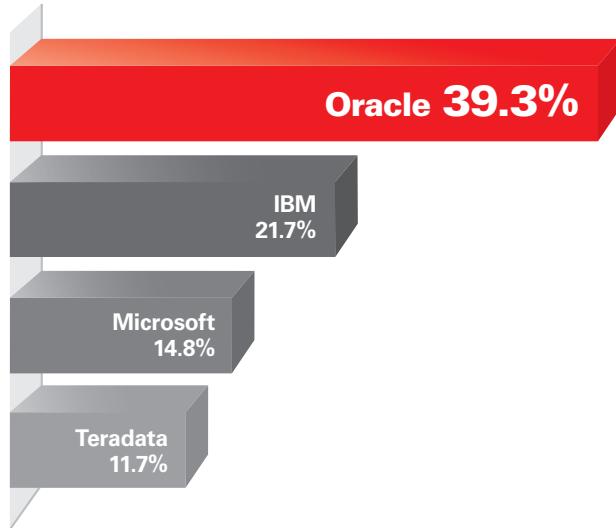
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# #1

# Data Warehousing

*Again...*



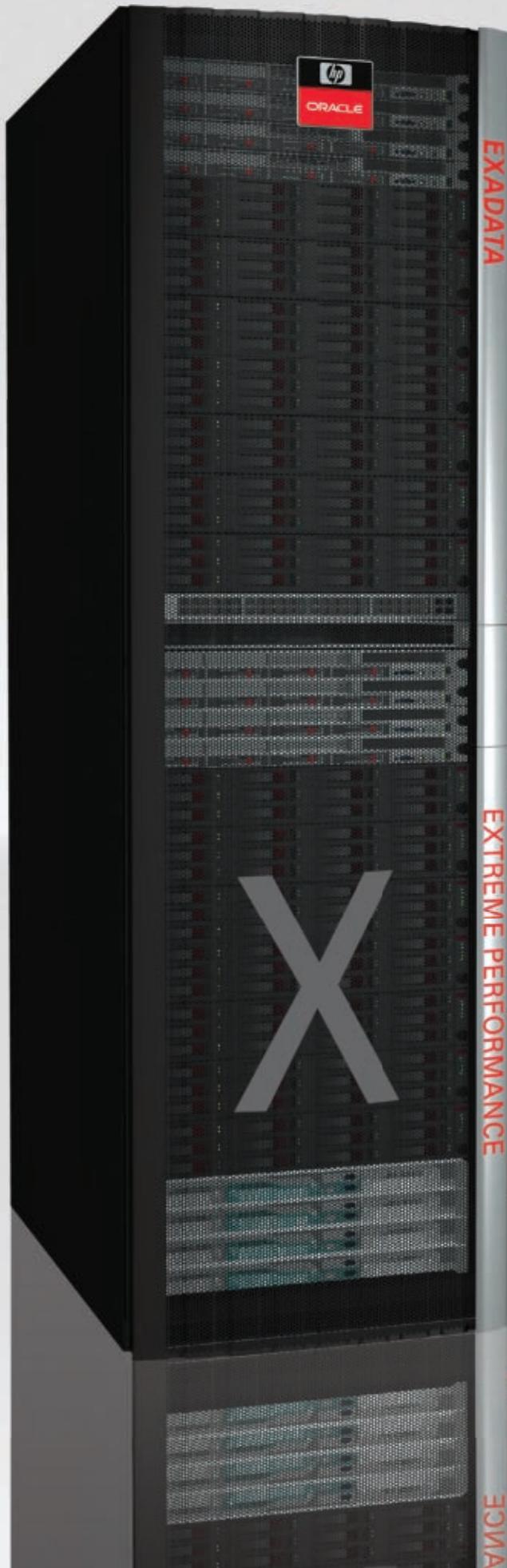
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EXADATA

EXTREME PERFORMANCE

AVANCE



# LAUNCHING PERFORMANCE

Oracle Exadata delivers extreme computing power to the HP Oracle Database Machine and the HP Oracle Exadata Storage Server.

As IT professionals know only too well, the quantities of data that they must manage has been increasing exponentially. In many workplaces, databases triple in size every two years. And although disk storage systems and processor speeds have kept pace with new requirements, data bandwidth has not, which has created a bottleneck between storage and database servers that limits query performance. Companies just can't move data off the disks and into the database servers fast enough anymore.

Those IT pros just got some help: Oracle and HP announced the HP Oracle Database Machine and its key component, the HP Oracle Exadata Storage Server, at Oracle OpenWorld in September 2008.

The HP Oracle Database Machine consists of eight database servers featuring 64 Intel processor cores running Oracle Database 11g with Oracle Real Application Clusters (Oracle RAC) on Oracle Enterprise Linux. The new machine



LGR is tackling explosive data growth in the telecom industry with Oracle Exadata. "We see Oracle Exadata as a perfect platform to scale and absorb this growth," says Grant Salmon, CEO. The company's databases range from 30 to 300 terabytes, with many likely to reach a petabyte scale in 12 to 18 months.

also includes a storage grid of 14 HP Oracle Exadata Storage Servers with 112 processor cores of its own. The storage grid provides up to 168 terabytes of raw storage and delivers 14GB-per-second data bandwidth between the storage servers and the database servers.

The HP Oracle Exadata Storage Server is a combination of smart software from Oracle and industry-standard hardware from HP. Each storage server includes an HP ProLiant DL180 G5 server with two Intel 2.66GHz quad-core processors, 12 disks, 8GB of memory, dual InfiniBand ports, and redundant power supplies. Each storage server adds up to 12TB of raw storage and 1GB per second of data bandwidth to the storage grid. The storage grid also forms a massively parallel query processing engine.

"When it comes to speed, Oracle Exadata technology has changed the game completely," says Grant Salmon, CEO of LGR Telecommunications (LGR), who appeared in a prerecorded segment during Oracle CEO Larry Ellison's announcement at Oracle OpenWorld. "And it's not like we had an old, cluttered-up system before. We build some of the world's largest data warehouses on leading hardware and storage facilities—yet queries that used to take half an hour are now taking less than a minute with this new Oracle Exadata technology."

LGR is an information and communications technology solutions provider that is using Oracle technologies to meet the data-management and information-access needs of large telecommunications operators, including AT&T, Telstra, MTN, and Vodafone, among others. As a global telecommunications company with offices in Atlanta, Georgia; Melbourne, Australia; and Centurion, South Africa, LGR provides data warehousing, analysis, and reporting solutions for telecoms that use billions of call detail records (CDRs)—the computer records produced by a telephone exchange—to gather business information.

#### CALL FOR DATA

The telecom industry is experiencing a data explosion, Salmon says, partly as a result of the processing and storage of CDRs. CDR data plays a critical role in the telecom business because it's the most detailed and accurate record the network has from which to glean business intelligence, detect fraud, perform marketing and financial analysis, and monitor engineering performance, among other activities. "Given the highly competitive business environment, every subscriber is gold. The best way to determine how the subscribers are using the network is from the information in the CDR," says Salmon.

CDR volumes can number in the hundreds of millions or even billions of records per day.

Keeping track of all this data for billing and auditing purposes is a costly task. Already, LGR's databases at various customer sites across the globe can be anywhere from 30 to 300 terabytes, and many of them are likely to reach a petabyte scale in the next 12 to 18 months, Salmon predicts.

"We see Oracle Exadata as a perfect platform to scale and absorb this growth," says Salmon. "It's a plug-and-play system: plug in more disks, and the system just uses those disks. You don't have to reconfigure anything."

That functionality is important. "This tremendous speed and capacity translates into money in the bank for our customers," Salmon says, "since it enables them to establish one source of CDR data to feed multiple business units."

When multiple servers process huge volumes of CDR data, the primary bottleneck is the I/O to and from the database servers. The HP Oracle Exadata Storage Server crunches all of the CDR information on one consistent platform and effortlessly integrates feeds from hundreds of other data points across the enterprise as well. That means that every user views the same data—whether it's for network analysis, handset analysis, or interconnect and revenue assurance.

"We haven't had to change our code at all to offer these new Oracle Exadata systems to our customers," says Salmon.

## "When it comes to speed, Oracle Exadata technology has changed the game completely."

—Grant Salmon, CEO, LGR Telecommunications

"We literally hand the technology straight to the customer, and the customer gets the advantage. They are lining up for this product, and we are already working on a number of high-profile installations around the globe."

### BOOSTING BANDWIDTH

"The data warehousing world wants simplicity, higher performance, and the ability to increase service-level agreements with customers," notes Richard Palmer, HP's director of technology and strategy for industry-standard servers. "Oracle and HP together are meeting customers' needs for simplicity, high performance, and data reliability in one box."

In the HP Oracle Database Machine, Oracle and HP achieved breakthroughs in database performance because the HP Oracle Exadata Storage Server software gives database intelligence to the storage and tightly integrates Oracle Exadata storage with Oracle Database, says Richard Winter, founder of the Winter Corporation, a consulting company specializing in very large databases and database scalability.

"The HP Oracle Exadata Storage Server can perform important database operations—such as filtering out rows and columns not needed to process the query at hand and performing joins where one table is small enough to cache—within the storage tier, which reduces the work to be performed in the database tier," Winter says. "Since an Oracle configuration can have more storage servers than Oracle Real Application Cluster nodes, Oracle Exadata also has the effect of increasing the degree of parallel processing for table scans and some common joins, which reduces query response time."

Another breakthrough involves Voltaire's InfiniBand technology, a high-performance 20Gb-per-second low-latency server and storage fabric that forms the I/O backbone of every HP Oracle Database Machine. An Oracle partner since 2001, Voltaire has supplied high-performance networking technology for Oracle RAC since that technology was first introduced with Oracle9i Database.

"Oracle and HP worked with Voltaire to implement a unified platform to handle both the storage and the clustering traffic between database nodes," says Asaf Somekh, Voltaire's vice president of strategic alliances. "They included four Voltaire InfiniBand switches in every database machine.

### SNAPSHOTS

#### LGR Telecommunications

[www.lgrtelecoms.com](http://www.lgrtelecoms.com)

**Location:** Atlanta, Georgia (headquarters)

**Industry:** Telecommunications

**Employees:** 100-plus

**Oracle products:** Oracle Database, HP Oracle Exadata Storage Server, HP Oracle Database Machine, Oracle Real Application Clusters

#### Mobiltel (M-Tel)

[www.mobiltel.bg](http://www.mobiltel.bg)

**Location:** Sofia, Bulgaria

**Industry:** Communications

**Employees:** 2,500

**Revenue:** US\$6.2 billion

**Oracle products:** Oracle Database, HP Oracle Exadata Storage Server, HP Oracle Database Machine, Oracle Real Application Clusters, Oracle Enterprise Manager

This delivers up to 14GB-per-second data bandwidth, which has a tremendous impact on throughput."

It's this combination of greater data bandwidth and smart storage software that delivers extreme query performance, according to Oracle Senior Vice President Andy Mendelsohn. "By pushing SQL processing to the HP Oracle Exadata Storage Server, all the disks can operate in parallel and return a filtered query result set rather than all rows of tables," says Mendelsohn. "This reduces the amount of data sent to the database servers. In addition, each InfiniBand connection has a data transfer rate of 20Gb per second, which means we're widening network pipes as well."

Mendelsohn says an HP Oracle Database Machine with a grid of HP Oracle Exadata Storage Servers revo-

lutionizes the way large volumes of data can be analyzed by Oracle Database. "For example, with previous data warehousing solutions, a retailer is limited in its ability to understand the sales-transaction-level behavior of individual customers," he says. "The retailer may be able to analyze customer behavior only for a period of several months before the time it takes to run these queries becomes prohibitive. Now the HP Oracle Database Machine with HP Oracle Exadata Storage Servers can analyze 10 to 50 times more data to get a better understanding of customer behavior at the sales transaction level."

### QUESTION OF COST

LGR anticipates cost savings associated with purchasing an integrated database management platform, where the servers, storage devices, and database are optimized to work together. LGR's Salmon believes that the reduced IT staffing requirements for Oracle Exadata will play a significant role for companies, since they spend less time developing, deploying, and maintaining custom data warehouses and more time meeting critical business needs.

"In the past, [data warehousing] solutions required storage architects, storage support people, networking people, software developers, and OS experts," Salmon says. "By moving the processing power close to the memory, Oracle has automated much of what these people do. We estimate that automation can equate to as much as a 70 percent reduction in cost of ownership for installing this

## "With the HP Oracle Exadata Storage Server, we're getting tens of times better performance on queries. It's a huge business advantage."

—Plamen Zyumbulev, Lead DBA, Mobilteil

[Oracle Exadata] box and keeping it going."

Better still, because Oracle and HP have such broad market penetration, the labor resources that companies need to implement and maintain Oracle Exadata products are easy to come by. Analyst Winter believes this ready availability of IT talent will help drive acceptance for the solution.

"The computer industry has seen preconfigured database appliances before, but not based on a platform that is a standard for so many companies," Winter says. "The most important difference is that the Oracle Exadata products run with, or provide database storage for, a database management system that is widely used and has a mature, robust complement of database capabilities."

Voltaire's Somekh agrees that Oracle customers will benefit from a preintegrated solution. "All the setup and configuration is done by Oracle and HP, which saves customers a lot

of trouble and expense," he says. "It's simpler for customers because they're just buying it by the rack."

LGR's Salmon concurs. "Oracle's already there. We just piggyback on their success," he says. "We literally put our CDR live application onto an Oracle Exadata box and drop it, shrink-wrapped, onto the customer's floor. It simplifies the whole sales cycle. The hardware, the software, the database—everything is bundled together as one single commercial off-the-shelf solution. It has changed us from being a software provider to being a solutions provider."

### RAPID ROLLOUT

The turnkey nature of Oracle Exadata was a motivating factor for Mobilteil (M-Tel), a telecommunications company that has relied on Oracle technology since 2001. Part of the Mobilkom Austria Group and the wireless segment of

## Oracle Exadata

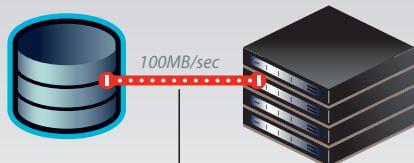
Oracle Exadata is a family of high-performance, smart-storage software from Oracle and industry-standard hardware from HP that can improve data warehouse query performance by a factor of 10 or more.

### Traditional Storage

 Key to fast query performance for data warehouses is sufficient processing power, storage capacity, and network bandwidth. Data warehouses can scale on grids with Oracle Database 11g, Oracle Real Application Clusters, and Oracle Partitioning.

### Traditional Storage

### Oracle Database Server Grid

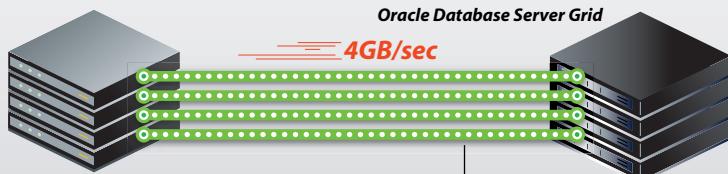


### Storage Network Bandwidth

For large-scale data warehouses, traditional storage network bandwidth averaging 100MB/sec can limit query performance and concurrency, especially when data volumes and user demand continues to grow.

### Oracle Exadata

 Oracle Exadata employs a massively parallel architecture that dramatically increases data bandwidth between the database server and storage using InfiniBand connections. Query processing is handled closer to the data, and less data is moved through wider network connections.



Each HP Oracle Exadata Storage Server has InfiniBand connections delivering up to 1GB/sec data bandwidth between storage servers and database servers. Incrementally adding HP Oracle Exadata Storage Servers linearly scales data warehouse storage capacity, processing power, and network bandwidth (for example: 4 HP Oracle Exadata Storage Servers equals 4GB/sec).

### HP Oracle Exadata Storage Server

The HP Oracle Exadata Storage Server is a fast, reliable, high-capacity, industry-standard storage building block complete with its own processing capacity and smart software that can quickly process database queries, returning only relevant rows and columns to the database server.



For MobilTel, having a fast, scalable, and dependable database management system is essential to its business. "Going with Oracle Exadata was a natural choice for us. Oracle provides rich functionality and addresses reliability, scalability, and performance," says Simeon Dimitrov, head of enterprise resources management (right), pictured with Plamen Zyumbulev, lead DBA.

Telekom Austria, M-Tel is the GSM market leader in Bulgaria and one of the most successful mobile operators in Europe. Over the last 10 years, M-Tel has become an integral part of Bulgarian society by providing a portfolio of mobile, convergent, fixed, and location-based communications services.

M-Tel was a beta test site for the HP Oracle Exadata Storage Server and is evaluating running the entire HP Oracle Database Machine to store CDR information. While testing the HP Oracle Exadata Storage Server, M-Tel achieved on average a 28 times performance improvement compared to an existing production system.

"Going with Oracle Exadata was a natural choice for us," says Simeon Dimitrov, head of enterprise resources management for M-Tel. "Oracle provides rich functionality and addresses reliability, scalability, and performance. Our business runs on the information in the CDR database. Having fast access to a single source of information is critical."

According to Plamen Zyumbulev, M-Tel's lead DBA, when M-Tel started building its CDR database in 2001, the company had 600,000 subscribers. Today M-Tel has 5 million subscribers and stores 65 billion records. Having a fast, scalable, and dependable database management system is essential to its business.

"The most important thing that Oracle offers us is performance," Zyumbulev says. "With the HP Oracle Exadata Storage Server, we're getting tens of times better performance on queries. It's a huge business advantage. We can react quickly to the market."

Dimitrov sees the relationship with Oracle as mutually beneficial. "Working with Oracle has exposed us to state-of-the-art innovation, and the partnership brings Oracle closer to its clients," he says. "This is just the beginning of our common journey." ■

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*David Baum (david@baumcomm.com) is a freelance business writer based in Santa Barbara, California.*

## next STEPS

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**READ more about Oracle Exadata**  
[oracle.com/exadata](http://oracle.com/exadata)

**LEARN more about Oracle data warehousing**  
[oracle.com/bi](http://oracle.com/bi)

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[otn.oracle.com/software/products/database](http://otn.oracle.com/software/products/database)

## SPECIAL PARTNER SECTION

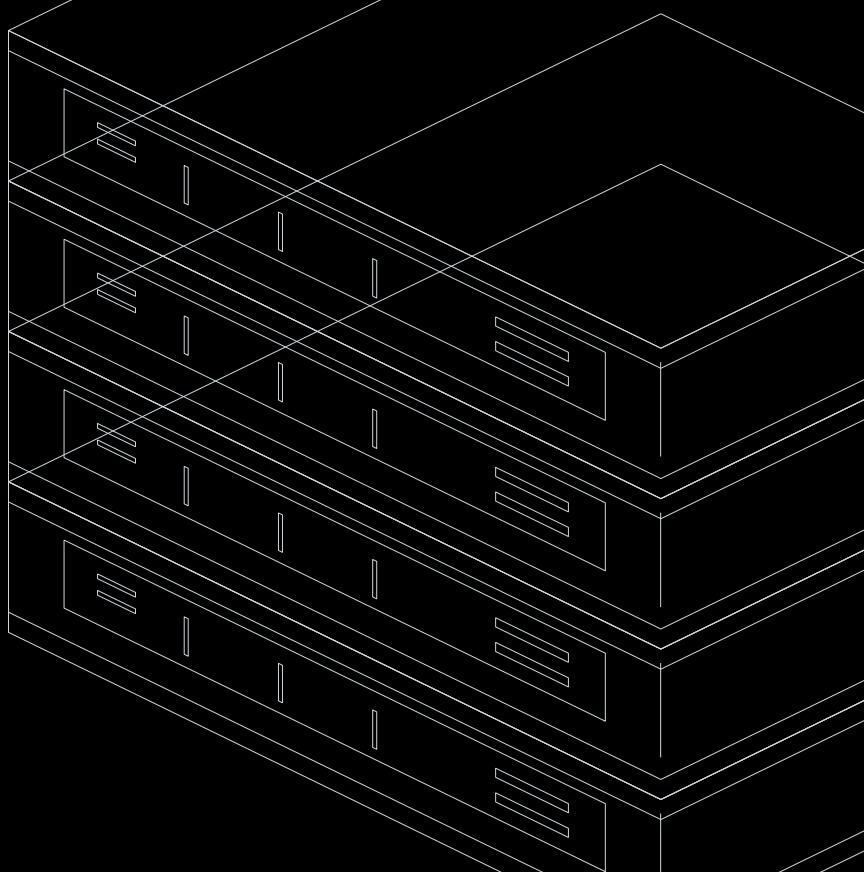
# STORAGE

Storage plays an increasingly important role in managing IT costs, reducing risk and improving performance. The following section highlights a number of companies that help Oracle customers address today's vital storage challenges.

### PARTNER INDEX

- EMC
- FUJITSU SIEMENS COMPUTERS
- PILLAR DATA SYSTEMS
- DELL
- HP

To read Oracle and partner white papers on storage solutions, please visit [www.oraclewhitepapers.com](http://www.oraclewhitepapers.com)



## Symmetrix: Bringing Flash Technology to Oracle Users

**T**oday, taking cost out of IT while delivering solid performance is critical. For more than a decade, EMC and Oracle have collaborated to help companies do just that.

EMC and Oracle collaborate on a variety of joint engineering efforts that draw on EMC's expertise in storage for performance, efficiency, scalability, and security. This relationship has resulted in numerous solutions, blueprints, and best practices, and more than 70,000 joint installations—including some at EMC and Oracle themselves. Oracle runs a number of its mission-critical systems on EMC, and EMC's IT group operates one of the five largest Oracle Database and applications environments in the world. "That means that we are able to look at each other from a 'tough customer' perspective, in that we demand the best in terms of how we build out these infrastructures," says Rich Wells, chief solutions officer at EMC.

As part of its emphasis on Oracle, EMC incorporated enterprise flash drive (EFD) technology into its powerful EMC Symmetrix DMX-4 storage systems—the first solution of its kind to offer the applied use of EFDs for specific Oracle application environments. EFDs provide a cost-effective alternative to using expensive synchronous dynamic random

access memory (SDRAM)-based flash technology or I/O accelerators, and are ideal for a wide range of Oracle application environments. Symmetrix DMX-4 with flash drives provide Oracle users with:

- **High performance.** Symmetrix DMX-4 with flash drives provide submillisecond application response time and up to 30 times more I/O operations per second than the fastest available disk drives.
- **Support for consolidation and energy efficiency.** A single flash drive can be used to replace or consolidate many fibre channel drives, and require no mechanical components. Flash drives consume significantly less energy per I/O operation than traditional disk drives.
- **Enhanced information lifecycle management.** Flash drives add a new tier 0 level of high-performance infrastructure for Oracle environments, and they can easily be integrated into an overall information lifecycle management strategy that tiers data based on performance requirements.

Oracle and EMC continue to work together on a number of projects. These projects, says Wells, "are all focused on putting the right data in the right place at the right cost at the right time."

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# Storage for a Dynamic World

As organizations cope with rapid data growth, the need to drive increased agility while reducing complexity and cost has become one of IT's great challenges.

For Fujitsu Siemens Computers—the leading European IT infrastructure provider and a major storage supplier—the answer to that challenge is dynamic infrastructures. This comprehensive strategy is designed to provide companies with a choice of infrastructure delivery models, including products and services, packaged solutions, managed infrastructures, and infrastructure-as-a-service approaches.

As part of that strategy, Fujitsu Siemens Computers focuses on data center infrastructures that combine computers and storage into pools that can be managed as a single resource. This concept is based on three principles: *virtualization*, which is key to pooling resources; *automation*, which ensures that resources can flow quickly to wherever they are needed; and *integration*, which guarantees a systematic, unified infrastructure.

"The aim is to get past piecemeal approaches and unite different technologies into end-to-end solutions," says Helmut Beck, vice president of the storage business at Fujitsu Siemens Computers. "That means that storage is a key element of dynamic infrastructures." For example, the principles of virtualization, automation, and integration are at the heart of the company's CentricStor storage system—the first virtual tape solution that provides intelligent data protection by storing all enterprise backup data autonomously on disk or on tape.

## PARTNERING FOR TODAY AND TOMORROW

Fujitsu Siemens Computers believes that effective storage depends on more than any single product or technology. As a result, the company collaborates with leading storage vendors, drawing on the best components available in the market to provide complete storage solutions from a single source. "This approach makes us the storage vendor with the broadest portfolio for managing information across its lifecycle," says Beck.

This partnering approach is especially evident in the company's work with NetApp, a provider of innovative storage and data management solutions. Over the past decade, the two companies have worked together on a number of joint initiatives, many of which focus on Oracle technologies. Fujitsu Siemens Computers is NetApp's largest partner globally, incorporates NetApp storage in many of its solutions, and has shipped more than 5,000 NetApp storage filers in recent years.

Both companies also have close relationships with Oracle.

Fujitsu Siemens Computers has worked with Oracle for more than 15 years in areas such as middleware and joint solutions, and is the only company that supports three out of five strategic Oracle development platforms—Linux, Windows, and Solaris running on its Unix/SPARC-based SPARC Enterprise Servers and Intel Architecture-based PRIMERGY servers. For its part, NetApp works with Oracle on a range of joint testing, integration, validation, and support efforts, and NetApp technology is used to store more than 10 petabytes of data in support of Oracle's critical development, quality assurance, and hosting operations at Oracle's Austin, Texas, data center.

## THE POWER OF PARTNERSHIP

Drawing on their synergistic relationships, Fujitsu Siemens Computers and NetApp have cooperated on initiatives such as

- **Providing service.** The two companies have developed comprehensive service offerings, including managed storage options, for Oracle environments. In addition, Fujitsu Siemens Computers is authorized to provide service and maintenance to NetApp users, and provides professional services on behalf of NetApp.
- **Sharing expertise.** The two companies have established a joint competence center at Oracle, where dedicated engineers create optimized blueprints for the reliable, high-performance, Oracle-based IT infrastructures.
- **FlexFrame for Oracle.** This solution brings together Oracle, NetApp, and Fujitsu Siemens Computers technologies in one preconfigured and certified offering. It allows users to consolidate storage, add server and storage resources to an Oracle Database or Oracle application service online, and allocate resources as needed.
- **High-speed backup for Oracle.** This jointly developed solution uses Fujitsu Siemens Computers' Sparc Enterprise Servers and NetApp filers to let Oracle users perform backups in seconds, reduce the number of tapes required for backup, and free the database server from having to back up data files.

Looking ahead, the two companies expect to continue to work closely to help deliver the end-to-end solutions needed for dynamic infrastructures. "In a world of changing technology and business requirements, no single IT infrastructure will meet every organization's needs," says Beck. "We are continuing to look for new ways of optimizing the infrastructure, so that each organization can use IT [in a way] that best matches its particular needs and its specific means and skills—and drive greater efficiency, reduced risk, and agile support for the business."



# Pillar Data Systems

## A New Class of Storage

**W**ith explosive growth in their database applications, companies need to ensure that storage performance can keep pace efficiently. To help in that effort, Pillar Data Systems provides end-to-end solutions that seamlessly unite storage area networks (SAN) with network-attached storage (NAS) to deliver highly efficient green storage.

Pillar pioneered the use of Application-Aware Storage™, which enables storage systems to dynamically adjust performance to meet the specific needs of various applications within a single storage platform. "Application-Aware Storage lets administrators guarantee performance while making more-effective use of capacity," says Paul Veilleux, Pillar's executive director of global alliances. In fact, the Pillar Axiom storage system guarantees 80 percent disk utilization, the highest in the industry and double the industry average for Oracle environments. And because Pillar systems support application-specific tuning, companies can leverage their overall storage investment by managing data warehouses and applications on the same platform—an approach that is in line with Oracle's grid strategy and that eliminates the need to purchase purpose-built storage devices.

### DRIVING GREATER EFFICIENCY

Resource limitations, such as energy and space, are becoming an increasing concern for data centers. In response, Pillar—a member of the Green Grid consortium—has developed the Pillar Storage Efficiency Quotient (EQ™). This measurement factors in the key elements of data storage efficiency, including capacity, performance, power, and space. The EQ of Pillar storage, which consumes low levels of space and energy, is nearly double that of competing storage systems.

In an effort to maximize storage efficiency, companies often provision data to the appropriate tiers of storage, with the highest-performance storage reserved for mission-critical data. However, this typically leads to increased complexity, as well as the need to maintain a variety of different storage devices. The Pillar Axiom, on the other hand, dynamically provisions data into multiple tiers on a single system, making it possible to meet the specific input/output requirements of each tier and perform policy-based prioritization of multilayered data in a single array. Pillar also lets companies consolidate SAN and NAS systems onto a single scalable platform.

### A CLOSE FIT WITH ORACLE

The Pillar Axiom storage infrastructure can be managed using Oracle Automatic Storage Management. This seamless integration provides DBAs with a policy-driven

framework to monitor, provision, and manage diverse storage and database resources with a single interface, and without having to rely on system administrators, saving time and increasing productivity. "The ability to manage consolidated, multiple-tier storage through a single interface is key to achieving the holy grail of true storage virtualization," says Veilleux.

Pillar also offers a number of Application-Aware Storage profiles for Oracle. These profiles essentially capture the input and output of Oracle solutions in configuration parameters. When administrators choose a profile from the Axiom drop-down menu, the Axiom will literally tune itself.

Pillar also provides the only solutions that can write 1MB data stripes—the preferred width for Oracle applications—across multiple spindles. This results in better database performance and higher throughput between Pillar storage solutions and applications running in Oracle environments. Pillar solutions can perform synchronously with Oracle Automatic Storage Management, which is particularly important for input/output-intensive tasks such as batch reporting and data warehousing. "No other storage system on the market today offers this for Oracle Databases and applications," says Mike Brewer, Pillar's chief architect.

### PROVEN APPROACHES

Pillar has a close working relationship with Oracle, and the Oracle and Pillar internal IT organizations use each other's technology in their operations. What's more, Pillar is the only storage vendor that is certified to deliver complete, end-to-end solutions for all tiers of storage in support of Oracle Database environments. The Axiom solution has been rigorously tested with almost all Oracle software platforms and supports all major versions of Oracle Database.

"With the validated configurations, customers experience the benefits of standardization, scalability, and reliability without the cost and delays of testing or the risk of untested configurations," says Kim Kershenstein, vice president of engineering at Pillar. Pillar also collaborates with Oracle to offer fixed-price accelerator services, which combine the expertise of the Oracle Expert Services and Pillar Professional Services teams to assess requirements, deploy best practices, and transfer knowledge.

"With these types of features and capabilities, Pillar has created an entirely new class of storage," says Pillar CEO Mike Workman. "The combination of the world-class power of Oracle and the world's most-efficient storage from Pillar results in unparalleled cost reduction and simplified management across the database and storage layer."



# Dell EqualLogic™: Bringing Simplified Sophistication to Storage

For many organizations, the data managed by Oracle Databases is both critical to the business and growing rapidly, which puts greater and greater demands on storage. IT professionals need cost-effective storage that delivers optimal performance and that can be easily managed and scaled.

To help IT organizations keep up, Dell provides a family of tested and validated Dell Oracle solutions for servers, storage, and networking infrastructure, including software, drivers, OS patches, and deployment best practices. A key component in Dell's storage lineup is the Dell EqualLogic PS Series family of solutions. Built on a patented virtualized peer storage architecture, Dell EqualLogic PS Series lets companies consolidate Oracle Database storage resources in an internet small computer system interface (iSCSI) storage area network (SAN) that is affordable and easy to manage—and that provides intelligent, automated management tools and a comprehensive set of enterprise data services. With the PS Series peer architecture, components and arrays work together to share resources, evenly distribute loads, optimize application performance, and provide comprehensive data protection. "Dell really represents a new way of approaching storage—one that helps Oracle users reduce IT costs and complexity," says Kevin Wittmer, senior manager of Dell EqualLogic Marketing. "Its online, on-demand scalability; ease of management; and innovative, all-inclusive pricing model recast storage economics to help reduce total cost of ownership."

## GROW WITHOUT DISRUPTION

Dell EqualLogic PS Series helps companies support Oracle Databases by providing virtualized and tiered pools of storage managed via a single, intuitive user interface. The PS Series tiering capability enables administrators to prioritize applications within a SAN by placing them on separate storage resources, with each application optimally configured for the required service level. Administrators can configure separate storage pools within a single SAN to help build an efficient, flexible, easy-to-manage storage environment. Using this "SAN within a SAN," they can consolidate storage and at the same time easily separate workloads as needed: by application, service level, disk type, cost, or even department within an organization.

Dell EqualLogic PS Series also lets administrators seamlessly add storage online as more capacity is needed. The system's intelligent software automatically configures the storage array without disrupting Oracle Database's access to the storage pool—eliminating complex and cumbersome manual set-up tasks. What's more, the necessary ports and controllers are included in the

PS Series' arrays, helping to ensure linear performance improvements as capacity is increased. Arrays can be combined to create a virtualized SAN that scales to hundreds of terabytes with a single management interface.

## STREAMLINED, COST-EFFECTIVE MANAGEMENT

Just as important, this scaling of the storage infrastructure can be done without increased complexity. Dell EqualLogic PS Series encompasses a number of innovative features, such as automatic storage tiering and thin provisioning, that help streamline administration. For example, the system's automated load-balancing capabilities spread workloads across active storage resources, helping to maximize performance by intelligently optimizing the available network connections, cache, controllers, and drives. As a result, each PS Series array can support high transactional workloads for Oracle Database applications.

In terms of keeping data safe, Dell EqualLogic enables administrators to easily create and manage Oracle Database snapshots, clones, and replicas for full or differential copies. These low-overhead, point-in-time database copies can be transferred between local servers and/or multiple remote locations. This enables administrators to quickly set up realistic application-development and testing environments. It also enables administrators to perform backups using Oracle Recovery Manager without having to keep the database in hot backup mode during the entire process. In the event of logical corruption or an outage, the Oracle Database environment can be easily restored from a prior point-in-time database copy. And if there is a primary site failure, Dell EqualLogic PS Series built-in replication can facilitate failover/failback between locations.

This range of automated features and administrative efficiencies helps IT organizations control costs—as does the PS Series use of gigabit Ethernet technology. "It lets you utilize the cabling, switches, and network adapters installed in the standard Ethernet network, and leverages the existing IP networking knowledge of your IT staff," says Suresh Jasrasaria, senior solutions consultant at Dell EqualLogic Marketing. And unlike traditional storage arrays, Dell EqualLogic PS Series comes with all the available software features needed to create and run an enterprise-class SAN. There is no additional software to be installed or purchased.

"With Dell EqualLogic PS Series unique packaging model, and its ease of use and automated intelligence, Dell enables IT organizations to take an innovative approach to storage," says Jasrasaria. "This approach delivers high performance, scalability, and advanced data protection—and a solid return on investment for Oracle solutions."



# Storage: Collaboration, Performance, and Choice

With the recently released HP Oracle Exadata Storage Server and the HP Oracle Database Machine, Oracle brings hardware and software together to create robust, cost-effective data warehouse solutions that help their customers meet their most demanding business challenges. To help deliver these solutions, Oracle chose HP for its trusted infrastructure and long-time Oracle expertise.

These new Oracle offerings have gained a lot of attention recently—but in fact they represent a quarter century of collaboration between Oracle and HP and their work with more than 140,000 joint customers around the globe. “We collaborate in several areas,” says Mary Hynes, director, HP StorageWorks, Connectivity and Solutions Lab. “HP storage products are developed with Oracle integration in mind and tested for Oracle customer environments. HP is also a leading partner in the Oracle Validated Configuration program, with the most-recommended configurations and the only storage offering spanning storage blades to enterprise arrays.” Recommended configurations include Oracle Enterprise Linux and Oracle VM. “This joint development and testing with Oracle helps ensure that HP solutions perform as companies expect to simplify the infrastructure, increase productivity, and reduce storage maintenance costs,” says Hynes.

Many of HP’s storage offerings are designed to accelerate Oracle solutions and integrate with Oracle products. HP offers a number of reference configurations for Oracle and HP StorageWorks solutions that target compliance, business continuity, and storage resource management implementations. In addition to its work with joint customers and technologies, HP has extensive close-to-home experience with Oracle software, having used it internally to consolidate some 80 data centers into three sites.

HP’s range of storage offerings is complemented by the company’s overall experience with the entire IT infrastructure, including solutions for storage, servers, software, and services. “Our extensive experience and expertise across these technologies lets us take a big-picture perspective of storage, rather than a narrowly focused view,” says Andrew Manners, director, HP StorageWorks Business Development. “That means we can work effectively with various companies to help them determine how to use storage to meet their specific technology and business needs.”

## POWERFUL STORAGE FOR MIDSIZE BUSINESSES

HP’s storage solutions support companies of all sizes, but an increasingly important element in that mix is the midsize business segment. Midsize businesses are not all the same, and they have varying needs. HP has developed several solutions that are designed to help meet those needs.

For example, HP created a scalable network attached

storage (NAS) for Oracle solution, which lets companies leverage the economics of industry-standard server and storage components to build a high-performance, fault-tolerant file-serving cluster for database consolidation. The result is one of the only file-serving solutions that is validated by Oracle to meet the performance and availability requirements of mission-critical Oracle Databases.

The scalable NAS for Oracle solution provides next-generation scalability and integrated high availability in a high-performance network file system (NFS) serving system. As needs grow, a cluster can be scaled from as little as a pair of dual-processor servers to a set of 16 servers with multiple gigabit Ethernet and fibre channel connections—all without interrupting client service. With the solution’s symmetrical cluster file system, every server sees all the data, enabling key benefits such as shared Oracle HOME, single point of backup, seamless server failover, and linear performance scaling.

The scalable NAS for Oracle solution helps midsized businesses simplify storage. With NAS and NFS—Oracle’s preferred protocol—there is no host-based volume management or file system administration, and the simple connectivity of NFS means that it is as easy as Ethernet. Overall, the solution provides fast, fault-tolerant storage at a much lower price than storage area networks (SANs). There is no need for expensive switches or SAN management costs, and companies can often amortize costs over dozens of database servers.

## CLUSTERING: AFFORDABLE AND EASY

Like large corporations, midsized businesses have an increasing need to store, share, manage, and protect rapidly growing pools of data. To help them do so, HP offers the HP StorageWorks All-in-One (AiO) system for Oracle Real Application Clusters (Oracle RAC) on Linux.

This out-of-the-box solution enables midsized businesses to take full advantage of Oracle RAC and improve storage utilization and the management of business applications. It combines NAS, SAN, and data-protection functions within a single enclosure, providing an integrated solution that is customized for Oracle Real Application Clusters environments.

AiO for Oracle RAC on Linux provides high availability, eliminating single-point-of-failure issues and enabling the backup of business-critical applications. It also scales easily, allowing midsized businesses to add NAS or SAN storage nodes to match the Oracle environment. The combination of the HP AiO solution and Oracle RAC delivers a shared architecture design that makes it easy to add HP BladeSystem c3000 enclosures, HP ProLiant Servers, external internet small computer system interface (iSCSI) devices, or additional storage to existing clustered environments.

The solution simplifies management by letting companies manage clusters as a single system. Deployment is streamlined because everything is in one chassis, and because available best practices and tested quick reference specs make it easy to identify configurations that best match the business environment. And HP software enables key operational functions such as remote management, fault monitoring, and power management, as well as the scheduling of backups and snapshots and the replication of hosted application data and shared folders.

Finally, the solution is low cost thanks to its integration of industry-standard HP servers and HP StorageWorks storage blades, which reduce not only initial purchase costs but ongoing maintenance costs, as well. Energy-efficient HP technology lowers server power consumption by up to 30 percent. And the solution's single point of management and simple user interface increase productivity by allowing IT staff to focus on mission-critical operations.

#### **ARRAYS FOR INCREASED FLEXIBILITY**

HP has developed a new family of products that provide a choice of host connect interfaces ideally suited for the application environments at midsize businesses.

These products—the HP StorageWorks 2000 Modular Smart Array family (MSA2000)—are a new generation of fibre channel, iSCSI, and serial attached SCSI (SAS) storage arrays for SAN implementations that feature the latest in functionality and technology at affordable prices. They support simultaneous accommodation of enterprise-class, dual-ported SAS drives and archival-class serial advanced technology attachment (SATA) drives. And they help ensure access to data through high-availability features such as redundant hardware components.

With the HP MSA2000, companies can grow their storage as demand increases. The MSA arrays are easily managed with a Web-based or command line interface. And all models support optional software that enables controller-based snapshot and cloning functionality for increased data protection.

HP also offers the HP StorageWorks 4400 Enterprise Virtual Array (EVA4400), an easily deployed enterprise-class virtual storage array for midsize businesses at an affordable price. With built-in virtualization, it is designed to improve capacity utilization and be easy to manage, which lowers the cost of ownership. "It essentially gives companies a more-affordable and less-complex solution than traditional arrays," says Kyle Fitze, director, HP StorageWorks Life Cycle Product Marketing.

With the EVA4400, companies can expect 99.999

percent availability due to a dual-redundant architecture of high-end arrays. The solution also supports robust local and remote replication capabilities, providing midsize businesses with disaster tolerance and the ability to keep applications online during backup and restore operations.

The EVA4400 provides broad operating system support and proven integration with major applications, including Oracle and Microsoft Exchange. EVA4400 solution blocks provide blueprints that encompass server, storage, and application components, which midsize businesses can use to quickly deploy business intelligence, disaster recovery, and mail and messaging applications.

The EVA4400 is easy to install, repair, and upgrade, and simplified maintenance means that companies can spend less time managing storage and more time managing the business. In a TCO analysis performed by the Edison Group, the HP EVA required 76 percent to 79 percent less time than competing systems to perform a series of standard administrative tasks, and demonstrated up to five times the management efficiency of competing systems, depending on the operation performed. Looking at the metric of terabytes per full-time employee, the Edison Group reported that organizations using the HP system "can conservatively expect an administrator to manage at least twice and possibly three times the terabytes of storage than with the other platforms."

#### **STORAGE FOR RESULTS**

HP's storage offerings address a variety of issues and needs, but overall, they are designed to help Oracle users leverage their storage to target benefits such as

- Greater agility and an improved ability to respond more rapidly to changing business conditions, opportunities, and competitive threats
- Increased productivity and lower maintenance costs
- Increased business value with less risk
- Easier IT management with complete server and storage management from a "single pane of glass"
- Superior scalability with investment protection

"The HP Oracle Exadata Storage Server and the HP Oracle Database Machine are just a sampling of how these two companies are collaborating to meet the evolving needs of their joint customers," says Manners. "HP Oracle Exadata is a great example of how a joint offering is able to add to the breadth of HP storage solutions so that companies have [a] choice. They can select the approach to storage that helps them achieve their goals for performance, manageability, and cost-effectiveness, and keep in step with business growth and changing technology."





A vertical strip on the left side of the page features two black silhouettes against a light background. The top silhouette shows a doctor wearing a white coat and stethoscope, holding a clipboard. The bottom silhouette shows a woman in a tank top standing at a desk, looking at a mobile phone.

BY JEFF ERICKSON

# INSIDE JOB

ORACLE EMBEDDED DATABASES LIVE AND WORK AT THE CORE OF HARDWARE AND SOFTWARE.

**O**n Monday morning, you stop at the corner store to buy a coffee. Back in your car, the indicator light tells you that it's time for an oil change. Your phone chimes with a text message from the office telling you to hurry in. When you get there, you sign in to your company's intranet and get to work. You have just used at least five embedded databases. They are working inside the software and hardware around you.

An embedded database sits inside a software application or hardware device and works behind the scenes to manage data. It doesn't require day-to-day management by a DBA, and the end users are often unaware that they're even using data management technology.

"An embedded database can serve as the data management layer for a small device, or it can manage data in a large application running on a UNIX server," says Carl Olofson, research vice president of information management and data integration software at IDC. "ISVs [independent software vendors] that embed databases need to find the database that fits their form factor and the way their system works."

I-HUA CHEN



"Oracle Berkeley Database fulfills all our particular needs," says Iris Chiang, product marketing director at FEC. "But we had other reasons to choose it: brand recognition and service."

Rex Wang, vice president of product marketing at Oracle, says that embedded databases meet varying requirements—such as a small footprint, robust feature set, or extreme performance—depending on the product into which each fits. "Oracle offers a choice of databases, from nimble Oracle Berkeley Database to superfast Oracle TimesTen In-Memory Database, up to Oracle Database," he says.

Firich Enterprises Co. (FEC), a worldwide leader in point-of-sale (POS) terminals for the retail, hospitality, lottery, medical, and entertainment markets, needed a small-footprint, embedded database for an inexpensive terminal designed for the small grocery stores and coffee shops that dominate retail in much of Asia. "Our customers for this product can't pay the cost of a major back-end system," says Iris Chiang, product marketing director, FEC. "But they still want to be able to customize their point-of-sale terminal to run promotions, honor coupons, and gather intelligence on their business."

After looking at other database solutions, including MySQL, FEC chose Oracle Berkeley Database for its VIVIPOS terminal. "We were looking for an off-the-shelf database with the features we needed and a reputation for reliability," says Roger

Jang, a technical consultant to FEC. "We didn't choose MySQL because it has a larger footprint, it's more expensive, it's more complicated, and it requires more support."

FEC developers created a simple application program interface around Oracle Berkeley Database that allows end users or ISVs to quickly customize the terminal. "The advantage of [Oracle] Berkeley Database is that there is no schema, so it's easy to add and modify fields, which we needed for our customizable design," says Jang. "Plus, it's really small, and it's fast for what we need."

"[Oracle] Berkeley Database fulfills all our particular needs," says FEC's Chiang. "But we had other reasons to choose it: brand recognition and service. We've got a toll-free line from Oracle to call when we need help, and even our ISVs can use the toll-free line if they have questions." FEC believes it gains from its association with the Oracle brand. "We are primarily a hardware vendor," says Chiang, "so having the Oracle name as part of our software is good, too."

#### END-TO-END CONNECTIVITY

While FEC measures the vital signs of a business, Toumaz Technology's Sensium technology measures the vital signs of a patient. To build its system, Toumaz wanted to concentrate on its expertise—the ultra-low-power silicon devices and body area network (BAN) wireless connectivity layer.

"We didn't want to write a database," says Keith Errey, CEO and cofounder of Toumaz Technology. "We wanted to help our customers provide better care for patients and know for sure the data system will work."

By partnering with Oracle, the result was an end-to-end monitoring system that connects the ultra-low-power wireless platform to the back-end database and allows healthcare providers to monitor patient vital signs in real time with wearable sensors.

"With the Sensium system, we capture real-time data from patients with our extremely low-powered technology and seamlessly integrate it into an Oracle Healthcare Transaction Base. From there it can be made available to the appropriate medical personnel," Errey says.

The Sensium technology can be incorporated into a wide range of BAN devices, including a disposable "smart patch" that is stuck to the skin like an adhesive bandage. Once applied, it monitors heart rate, temperature, and respiration and transmits these vital signs wirelessly to a network node. "We use wireless to cover that first meter—or few meters—between the patient and the network node," says Errey.

The network node is a key point in the end-to-end system. It is where mul-

#### SNAPSHOTS

##### **Firich Enterprises Co. (FEC)**

[www.firich.com.tw](http://www.firich.com.tw)

**Location:** Taipei, Taiwan

**Industry:** Point of sale

**Revenue:** US\$100 million

**Employees:** 302

**Oracle product:** Oracle Berkeley Database

##### **Toumaz Technology**

[www.toumaz.com](http://www.toumaz.com)

**Location:** Abingdon, England

**Industry:** Healthcare

**Employees:** 42

**Oracle products:** Oracle Database Lite 10g, Oracle Database Express Edition, Oracle Healthcare Transaction Base

##### **Amcom Software**

[www.amcomsoftware.com](http://www.amcomsoftware.com)

**Location:** Minneapolis, Minnesota

**Industry:** Communications software

**Revenue:** US\$43 million

**Employees:** 200

**Oracle product:** Oracle Database 10g

**"We didn't want to write a database. We wanted to help our customers provide better care for patients and know for sure the data system will work."**

—Keith Errey, CEO and Cofounder, Toumaz Technology

multiple Sensium devices are controlled and where data enters the network, which may be wired (such as Ethernet) or wireless (such as WiFi or any cellular network). The network node can be a fixed, wall-mounted unit, or it can be a mobile smart phone or wireless PDA. "With Oracle Database Lite 10g embedded in the network node, we achieve a seamless, end-to-end system between the patient and the Oracle Healthcare Transaction Base," says Errey.

#### **ENTERPRISE-CLASS EMBEDDED**

Critical information flows are also important to Amcom Software, a company that provides systems for organizations that need to automate, centralize, and standardize mission-critical communications. One of its solutions is a response system for emergency incident management and mass notification. This system initiates, monitors, and manages emergency communications of all types, automatically delivering messages, collecting responses, and logging activities for reporting and analysis. Other applications facilitate intelligent communications with and between critical-care providers and government personnel in operator-assisted and automated systems.

"Our customers are a 'who's who' of government, healthcare, hospitality, and education organizations, from Cleveland Clinic to Stanford University to Caesar's Palace and top military and government agencies," says Ed Hixon, Amcom's director of product management. "They are typically very large, geographically dispersed organizations that require high availability and extreme security." Thus, Amcom's solutions must meet stringent U.S. Department of Defense requirements and certifications and pass rigorous audits in the healthcare setting. "We had to embed a true enterprise database to manage the data and business intelligence areas of the platform," he says.

Amcom chose Oracle Database 10g to capture in its data structure the rules these government and healthcare requirements impose, as well as Oracle's business intelligence solution for dashboard-type reporting. "We couldn't capture the information we need with a less-sophisticated database engine," says Hixon. "We had to have the capabilities that Oracle Database 10g gives us to store and execute the service and application logic."

That business logic can be simple or complex. "It can be as simple as a directory listing about which building a nurse is in," says Hixon, "up to where [leaders] have complex sets of rules to help them make a medical, first-response, or national-security decision. We pride ourselves on being able to capture



**"With Oracle Database Lite 10g embedded in the network node, we achieve a seamless, end-to-end system between the patient and the Oracle Healthcare Transaction Base," says Keith Errey, CEO and cofounder of Toumaz Technology.**

those kinds of specialized rules around how that communication must happen."

To build its solution, Amcom takes an initial feed of data from its customer, which is a snapshot of that customer's information for all facilities and personnel. "Once we get onsite, we get fresh production data and then go from there," says Hixon.

At the customer site, Amcom does all the patching and manages all the database security. "Our customers are using Oracle Database, but they don't necessarily know it. They never have to log in to Oracle [Database]. Otherwise they might have an IT guy who decides that he's going to take down the server today to do some maintenance, and then stuff hits the fan," says Hixon. "That's why embedded is the way to do it."

Oracle's Wang agrees. "As CPU speeds and memory increase, there are more scenarios where embedded databases make sense," he says. "They're in our mobile devices, but they're also in our cars, home appliances, and enterprise software." ■

*Jeff Erickson is a senior editor with Oracle Publishing.*

## **nextSTEPS**

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# BUILDING ON A SOLID FOUNDATION

Companies rely on an Oracle grid infrastructure to provide a solid yet flexible base for their applications.

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BY DAVID A. KELLY



**B**uilding a house directly on top of soft, shifting earth won't give you the same result as building a house with a solid concrete foundation, poured over an iron rebar grid. It's the same with your enterprise applications.

Building the most-effective business application solution requires a solid, scalable foundation that includes enterprise databases, efficient middleware, and a grid computing infrastructure that can support dynamic

growth, unexpected changes, and robust services. In short, applications work better when they have the right infrastructure underneath them.

"Applications rely on infrastructure to run, so when you're deploying applications it's important to have an IT architecture with the right levels of reliability, scalability, manageability, and flexibility," says Gene Phifer, managing vice president, Gartner. "For



Oracle Real Application Clusters is key to Embarq's server-consolidation strategy. "In just one project, we've reduced 40 servers to 4 in an Oracle grid environment," says Don Eyberg, manager of mainframe and midrange database services, Embarq.

example, reliability is a critical aspect for application infrastructure, and if you want an application with a high level of reliability, the underlying infrastructure needs to have an even higher level of reliability."

It may seem counterintuitive, but the flexibility of a computing grid can be the key to reliability, high availability, and scalability. "By running applications on a grid, an organization has increased flexibility, which enables it to increase performance on an as-needed basis," says Erik Peterson, technical manager, Oracle.

"In a grid environment, as you add more machines, you get a higher level of availability, because for each machine you lose due to a failure, you lose only that portion of availability," he adds. "And from a scalability perspective, when an organization needs to keep expanding its grid environment, a solution like Oracle Real Application Clusters [Oracle RAC] provides increased flexibility and foundation for continued growth."

In addition, Oracle Database features such as Oracle Automatic Storage Management provide similar storage flexibility, so organizations can add storage to their environments when they need additional I/O capacity, without interrupting the online operation of the database.

## "By consolidating onto a single hardware and software infrastructure, we gain tremendous productivity benefits."

—**Don Eyberg**, Manager of Mainframe and Midrange Database Services, Embarq

"Today many companies are taking a best-of-suite approach that allows organizations to buy an integrated collection of infrastructure components from a single vendor for a particular purpose and plug that into their broader infrastructure," says Gartner's Phifer, "so typically you'll see the best level of integration across the components of a stack from a single vendor, rather than taking a best-of-breed approach."

### CONSOLIDATION FOR BETTER COMMUNICATION

A good example of how the right enterprise infrastructure can benefit business applications is the experience of Embarq, a large telecommunications provider offering local and long-distance home phone service, high-speed internet, and satellite TV.

Embarq had an IT infrastructure designed so that many applications had their own set of application, development, and test servers. As a result, the company had hundreds of servers that, on average, were not highly used. At close to 2,500 servers, the company has been transitioning to a consolidated server infrastructure, including Oracle Database 10g and Oracle Database 11g, Oracle RAC, and Oracle Automatic Storage Management, for most of its consolidated database servers.

"We've been on an aggressive path over the last year to consolidate our database servers into an Oracle RAC environment, as well as consolidate our applications," says Don Eyberg, manager of mainframe and midrange database services at Embarq. "We've already had significant success in our development environment, where in just one project, we've reduced 40 servers to 4 in an Oracle grid environment. We'll continue to drive our server count down by 50 percent over the next few years as we consolidate them in grids."

Embarq also has an aggressive application rationalization program, which entails reducing the number of applications that it needs to run the business. As Embarq rationalizes its applications, it moves them into one of its Oracle RAC/grid environments so they will be on a single hardware and software platform. "By consolidating onto a single hardware and software infrastructure, we gain tremendous productivity benefits," says Eyberg. "Our people can specialize in a narrower technology stack, and we don't have to dilute our resources by being a 'jack of all trades.'"

Since starting down the grid computing road in July 2007, Embarq has also made better use of its storage area network (SAN). "One of the things we're finding with Oracle Automatic Storage Management is that when we tie these servers together in a grid, we also tie the storage together in a much larger pool, so we can better manage the use of

storage between applications almost in real time—allocating or de-allocating space across applications based on who needs it at any specific time. It's turned out to provide some tremendous storage savings," says Eyberg.

#### KEEPING POTENTIAL OPEN

Flexibility, high availability, and integrated management are three goals for Chesapeake Energy, a Fortune 500 company and the largest producer of natural gas in the United States, focusing on domestic gas and oil exploration.

Chesapeake is the country's foremost driller, with approximately 145 rigs currently operating throughout the U.S. The company accounts for about 15 percent of all daily drilling information generated in the nation.

To support multiple corporate subsidiaries and business groups, Chesapeake Energy's IT group delivers packaged and custom solutions tailored to the needs of a fast-growing enterprise. In addition, Chesapeake's IT operations group provides consistent back-end centralization for many IT needs, including server support, database support, and common networking infrastructure.

## SNAPSHTOS

### Embarq

[www.embarq.com](http://www.embarq.com)

**Location:** Overland Park, Kansas

**Industry:** Telecommunications

**Oracle products:** Oracle Database 11g; Oracle Real Application Clusters 11g; Oracle Clusterware; Oracle Business Intelligence Suite, Enterprise Edition Plus; Oracle's PeopleSoft applications, including general ledger, payables, supply chain management, and project costing applications; Oracle's Siebel Case Management. Plans are in place to implement customer relationship management and unified change management applications.

### Chesapeake Energy

[www.chk.com](http://www.chk.com)

**Location:** Oklahoma City, Oklahoma

**Industry:** Oil and gas

**Employees:** 7,500

**Oracle products:** Oracle Database 10g; Oracle Real Application Clusters 10g; Oracle Enterprise Manager Grid Control; Oracle Clusterware; Oracle's PeopleSoft Human Resources, PeopleSoft Enterprise Learning Management, and PeopleSoft Expenses; Oracle Essbase

### Allstate Insurance

[www.allstate.com](http://www.allstate.com)

**Location:** Northbrook, Illinois

**Industry:** Financial services

**Employees:** 37,000 (plus 14,800 independent agents and financial specialists)

**Oracle products:** Oracle Database 10g, Oracle Real Application Clusters 10g, Oracle Clusterware, Oracle's Siebel Contact Center



For Chesapeake Energy, being able to increase flexibility without a lot of overhead is a core success factor. "Running our applications on an Oracle RAC clustered environment really helps. It gives us a lot of flexibility in how we manage the back-end systems and how we grow them," says Stephen Taylor, director of infrastructure.

Because of the diverse needs of the different business units, Chesapeake's IT group tailors IT solutions based on business need and value. "We focus on delivering the right solution for our business as opposed to forcing a technology architecture. We want to find the right fit for a particular business need, and then we will integrate it on the back end," says Stephen Taylor, Chesapeake's director of infrastructure.

The company has been running Oracle RAC for close to three years. Over that time, Chesapeake has experienced accelerated growth, expanding from roughly 2,500 employees three years ago to 7,500 employees today.

"Our company is built to be flexible to quickly capitalize on opportunities and respond to changing market conditions," says Taylor. "That's where running our applications on an Oracle RAC clustered environment really helps. It gives us a lot of flexibility in how we manage the back-end systems and how we grow them."

The company uses an Oracle Database back end for many of its custom and packaged applications and deploys several of those applications, including Oracle's PeopleSoft applications, on an Oracle RAC 10g environment for scalability and availability. "One of the biggest benefits we've gotten on the PeopleSoft side from running our infrastructure on Oracle RAC has been high availability," says Taylor. "PeopleSoft deals with Oracle RAC high-availability processes really well, so that if a particular hardware component fails, PeopleSoft can continue operating seamlessly. That's critical for some of our business processes, such as payroll."

Another benefit for Chesapeake is integrated management. The company has a number of development and test environments for its PeopleSoft applications, and by using Oracle RAC and Oracle Enterprise Manager Grid Control, it has an integrated management infrastructure to manage all instances in a common environment.



**Application availability is critical for Allstate Insurance. With an Oracle RAC-based infrastructure, Allstate can help customers faster and more efficiently, says Nick Giannakopoulos, director of architecture services/information architecture.**

"We can balance our development, testing, and production environments on demand across the whole infrastructure," Taylor says, "without the necessity of adding hardware to accommodate fluctuations in resource needs."

Chesapeake has already realized business benefits from running its applications on an Oracle infrastructure—benefits that enable the company to meet its growth objectives effectively. "Being able to increase our flexibility without a lot of overhead is very critical for us since we're continuing to grow and expand rapidly," Taylor says. "We need the ability to react quickly, and running our applications on a clustered environment gives us greater flexibility to react to business changes."

#### BUILDING AN AVAILABLE COMPANY

Responsiveness and availability aren't just critical IT attributes—they can also be critical attributes of business success. Nowhere is this more true than in the insurance industry, where customers often judge their insurance companies on their availability and responsiveness after a disaster hits.

That's why Allstate Insurance has been rearchitecting its traditional mainframe-based solutions to run on a highly available Oracle-based architecture. For example, Allstate recently rolled out a new enterprise document management system based

on Oracle RAC, to enable the company to help its customers faster and more efficiently.

"We've moved pretty far down the path of making Oracle our primary database for mission-critical applications," says Nick Giannakopoulos, director of Allstate's architecture services/information architecture. "We're migrating many of our applications onto an Oracle RAC environment for availability and scalability benefits, and we're very pleased with the way they've been scaling."

Not only has the Oracle RAC environment enabled Allstate's enterprise document management system to keep up with user requirements, but it's also helped increase application availability.

"We've already had a situation with one of our Oracle RAC-based applications where we had a hardware problem, and one of the four nodes went down," says Giannakopoulos. "The other three nodes kept the application up and running, so we know that Oracle RAC delivers on higher availability."

For a service-oriented company like Allstate, availability is critical. "One of the most-important business processes we have at Allstate is to make sure we're here for the customer," says Giannakopoulos. "So it's extremely critical for us to make sure that our applications are up and running. That's why Oracle RAC is an important part of our application infrastructure."

#### THE USERS WILL JUDGE

While business applications are what users see, the IT infrastructure determines if the application stays up and can grow as demand increases. Designing the right IT infrastructure is an important part of ensuring overall application availability and performance. As Chesapeake Energy's Taylor says, "Running our business applications on Oracle RAC gives us much better availability than we would otherwise have."

Embarq's Eyberg agrees. "Oracle RAC allows us to provide built-in high availability, where we can take our applications and define them on multiple servers in the cluster," he says. "That really opens up a lot of possibilities in terms of enhanced application uptime, rolling patch upgrades, and other maintenance activities. It's pretty exciting for our business, because with the Oracle RAC infrastructure, the applications will be up more." ■

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

## nextSTEPS

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# SERVE IT UP!

Oracle WebLogic Server delivers an open platform for integrating applications and building relationships.

Different lines of business require different applications, and the applications that define lines of business can become barriers to providing consistent service across the company. Overcoming those barriers and serving a variety of applications to both internal users and customers requires an integration strategy and a powerful application server platform.

FedEx, the global shipping and business solutions giant, was having growing pains. As the company added to its operational network, integrating everything from order processing and shipment tracking to billing and customer support became time-consuming and labor-intensive.

"We wanted a single way of doing shipping; we wanted a single customer number across application codes; and we wanted a single invoice," says Tim Robertson, IT manager at FedEx. "FedEx felt that it was imperative from both a competitive and an operational standpoint to eliminate the lines

separating each operating company wherever those lines impacted customer satisfaction or employee productivity."

Robertson knew that aligning this project with prevailing standards, unified by an open application server platform, would make this massive development project much easier. It's a familiar realization. According to Tony Baer, a senior analyst at Ovum, an application server creates a common middle-tier layer that makes it easier to integrate applications, services, and business processes and expose them on the Web.

"Middleware assets embodied in today's application server platforms are critical because applications are increasingly being composed rather than developed," Baer says. "It's all about extending and integrating, rather than developing."

The result was a group of applications called FedEx Unified Strategic Information Optimization Network, or FUSION. Its three entities are

Shipment FUSION, Customer FUSION, and Revenue FUSION. The solution ties together the shipment systems of each business unit to provide internal and external users with a single resource for all shipment tracking and account reporting. These applications depend on Oracle WebLogic Server Enterprise Edition, a core foundational component of Oracle Fusion Middleware.

Oracle WebLogic Server helps FedEx developers by simplifying and removing some of the programming effort and lets them concentrate on solving business problems rather than managing infrastructure. It brings consistency to how developers interface their core business applications with the databases, eliminating the concern of how many connections they have to make or how they retrieve information.

"We've been a WebLogic shop for many years," Robertson



FedEx relies on Oracle WebLogic Server to support shipping and account reporting. "This software gives us the performance and reliability we need to manage millions of transactions daily," says Tim Robertson, IT manager.

says. "This software gives us the performance and reliability that we need to manage millions of transactions daily. It also provides the scalability we need to grow with our business and is based on open standards to help us maintain flexibility."

Robertson appreciates the continued relationship with Oracle. "I'm very encouraged by the technical direction that I've seen from Oracle," Robertson notes. "Our companies have a history together, and we look forward to that relationship strengthening."

#### DRIVING BETTER RELATIONSHIPS

While FedEx must move packages with precision, speed, and reliability, online matchmaker eHarmony deals in a more abstract commodity: love. Based in Pasadena, California, the online company was launched in 2000 and is now the internet's No. 1 trusted relationship

## THE APPLICATION GRID

**G**rid computing is the pooling and sharing of computing resources so that they can be more effectively allocated and adjusted across a set of needs. The application grid applies grid computing at the level of middleware—the infrastructure on which applications run. An application grid architecture provides applications with the resources they need—CPU cycles, memory, disc space—in a way that makes efficient use of the resources while maximizing application performance and reliability.

The application grid approach is well suited for applications that are data-intensive or that keep large amounts of data in memory. It provides a flexible foundation for applications that require fast response or low latency and demand predictable behavior.

Key products form the foundation of an application grid architecture, and their usage enables application grid operation. The following Oracle Fusion Middleware technologies can accelerate the development of an application grid approach:

*Oracle WebLogic Server* is a powerful and scalable Java Platform, Enterprise Edition, application server that offers the clustering features required for an application grid. In addition, sophisticated diagnostics and memory-leak detection can help prevent application disruption by getting to the root cause of performance bottlenecks, poor memory use, and other configuration anomalies. As the core of the Oracle WebLogic Suite, it provides a comprehensive platform for developing and deploying integrated enterprise applications.

*Oracle Coherence* provides a distributed cache, or in-memory data grid, for Java, .NET, and C++ applications. The in-memory data grid automatically and dynamically partitions data across multiple

servers for much greater performance, reliability, and scale in an application's working memory.

*Oracle Tuxedo* provides mainframe-class scale and performance on open, distributed systems for software written in C, C++, and COBOL. Oracle Tuxedo provides an excellent platform for "rehosting" mainframe applications on mainstream hardware. Oracle Tuxedo extends the life of existing IT assets by allowing them to work as part of a modern architecture, such as service-oriented architecture (SOA).

*Oracle JRockit*, a family of Java runtime technologies, includes Oracle JRockit Real Time, a foundation for predictable, low-latency, event-driven SOAs that have extreme transaction processing needs, and Oracle JRockit Mission Control, a set of tools for monitoring, managing, profiling, and eliminating memory leaks in Java applications.

*Oracle Enterprise Manager* provides real-time visibility and monitoring into application infrastructure in the data center. It provides predictive alerts, details, real-time root-cause analysis, and the ability to analyze historical data for component usage and load performance.

*Oracle WebLogic Operations Control* is a module for Oracle Enterprise Manager that automates the adaptive management of applications with a controller that dynamically allocates and de-allocates resources to applications or services by invoking the deployment capabilities of the underlying infrastructure.

"[Oracle is committed] to delivering the industry's most comprehensive foundation for developing, deploying, and integrating enterprise applications," says Thomas Kurian, senior vice president, Oracle Fusion Middleware. "Oracle is driving its application grid strategy forward and delivering immediate benefits to customers, partners, and developers."

services provider. Combining science and psychology, eHarmony's patented Compatibility Matching System matches eHarmony members with similar people with whom they are likely to enjoy a long-term relationship. Every day an average of 236 U.S. couples marry as a result of being matched on eHarmony.

Enabling these couples to find each other depends on a Web site that is fast and available. "Our company is driven by technology," says Gary Rudolph, director of engineering at eHarmony. "It's paramount to the future of eHarmony. Everything hinges on our IT presence."

The company's Web traffic is very heavy, ranking in the top 1 percent of U.S. companies. The eHarmony Web site guides members through the process of finding compatible matches and building lasting relationships. The company's custom questionnaire application collects data on members, analyzes that data, performs calculations, and applies the data to a model for compatibility. An additional service provides secure calling, so that members can go beyond online discussions and talk with other members through secure partners without giving up their privacy.

When eHarmony needed to update its infrastructure to meet escalating traffic, Oracle WebLogic Server fit the bill. "[It] has become the fundamental building block of our business," says Gary Rudolph, director of engineering.

However, as the company expanded, its Web site initially failed to keep up. Exponential growth in membership and usage of the Web site over the last several years threatened to overwhelm eHarmony's IT infrastructure.

"We had to take a close look at our existing platform and consider our long-term needs and how we were going to scale," says Rudolph. "We needed to scale 10 times or beyond." A rewrite of the company's custom application a few years ago required a new application server that could support Java Message Service and Enterprise JavaBeans. The company also needed a more sophisticated infrastructure and a reliable system that could manage an escalating load with automated failover and fault tolerance.

Oracle makes this possible. The company's custom appli-



cation set is based on Oracle Database 10g with Oracle Real Application Clusters (Oracle RAC) and Oracle WebLogic Server.

According to Rudolph, eHarmony had compelling reasons for selecting Oracle. Oracle RAC supports eHarmony's 64-CPU database cluster, giving the company plenty of room to support its rapid growth. In conjunction with this database cluster, Oracle WebLogic Server provides automatic failover. If one server fails, another can pick up the processing load with complete consistency of session states—so a customer won't get cut off just before finding the

match of his or her dreams.

"Installed on 120 servers, [Oracle] WebLogic Server has become the fundamental building block of our business," says Rudolph. "This Oracle software connects our customers with each other and with the historic thread of their interactions."

eHarmony saw an instant 20 percent performance boost after implementing Oracle WebLogic Server. This helped postpone a planned hardware build-out for six to nine months, providing more working capital for other IT projects. Today, with Oracle WebLogic Server firmly in place, eHarmony is experiencing superior uptime for its relationship services.

"What really distinguished Oracle WebLogic Server for us was its reliability, fault tolerance, and failover support," says Rudolph. "Every minute of downtime represents a monetary value, so that's extraordinarily important to us. Thanks to the hot-swap capabilities of this application server software, we can bring up new releases of our software about 10 times faster."

Rudolph foresees even greater synergy between Oracle WebLogic Server and Oracle Database 10g. "We can handle failovers more effectively and interact with the database more efficiently," he says. "We see a huge benefit to the tight integration that you get when two essential products are under the same corporate umbrella and developed by a single vendor." ■

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## next STEPS

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# Easier Interactive Data Entry

Improve the end-user experience with declarative LOVs and automatic partial page refresh.

This column shows you two new features in Oracle Application Development Framework (Oracle ADF) 11g that make data entry easier and more efficient for end users. You'll configure a declarative list of values (LOV) with an autocomplete feature (similar to what you may have used in Oracle Forms). In the process, you'll see how the automatic partial page refresh (auto-PPR) capability simplifies delivery of interactive pages that automatically update to reflect changed data.

To begin, download the starter workspace at [otn.oracle.com/oramag/oracle/09-jan/o19frame.zip](http://otn.oracle.com/oramag/oracle/09-jan/o19frame.zip) and ensure that you're using the studio edition of the Oracle JDeveloper 11.1.1.0.0 (production) release, available as a free download on Oracle Technology Network (OTN) at [otn.oracle.com/software/products/jdev](http://otn.oracle.com/software/products/jdev). Start by extracting the contents of the o19frame.zip file and opening the FrameworksJanFeb2009.jws workspace in Oracle JDeveloper. The Model project in the workspace defines an **Emp** entity object; **EmpView** and **EmployeeList** view objects; and an HRModule application module with a view instance, named **Employees**, of type EmpView.

By following the steps in this column, you'll complete the **EditEmployees.jspx** page in the ViewController project. This page will feature an interactive input field with autocomplete LOV functionality. Before proceeding, adjust the properties of the connection named scott in the **Application Resources** zone of the Application Navigator until you can successfully test a connection to a SCOTT schema. If you need to create the tables in SCOTT, use the provided CreateDeptEmpTables.sql script.

## ADDING REFERENCE INFORMATION TO A VIEW OBJECT

End users often find it helpful to see reference information related to numerical foreign key values. As an example, I'll show you how easy it is to pull in the name and salary of an employee's manager for reference.

Start by double-clicking the **EmpView** view object in the Application Navigator to open the View Object Editor. Select the **Entity Objects** page, and note that this view object currently includes employee information from a single **Emp** entity usage. Select the **Attributes** page, and note that it includes the **Mgr** attribute, which represents the employee ID of the current employee's manager but doesn't include this manager's name. Back on the **Entity Objects** page, select the **Emp** entity object from the **Available** list. Click the **Add** arrow button to add a second entity usage to the view object—you'll use it to show reference information about each employee's manager. With the newly added **Emp1** entity usage highlighted in the **Selected** list, change the alias below to **Manager** to reflect the role the second entity usage plays in this query. Note that the **Reference** box is checked, indicating that attributes from this entity usage will be treated as reference information and automatically kept in sync when the foreign-key value (**Mgr**) changes. The **Association** and **Source Usage** lists confirm that the association named **Manages** relates the **Emp** entity usage to the **Manager** entity usage.

Next you choose which attributes related to the manager will appear in the query. Select the **Attributes** page in the View Object Editor, and click **Add from Entity**. Hold down the Ctrl key, and in the **Attributes** dialog box, select

the **Ename** and **Sal** attributes, indented under the **Manager** entity usage in the **Available** list; then click the **Add** arrow button to add both attributes to the **Selected** list. Note that the manager's **Empno** was automatically added as well, because Oracle ADF requires the primary-key attribute for each entity usage in the view object to appear in the **Selected** list. Click **OK** to return to the **Attributes** page.

Note that Oracle JDeveloper added the number 1 to the end of the new attribute names to make them unique. Now let's change them to more-meaningful names. Right-click the **Ename1** attribute in the **Attributes** table, and select **Rename**. When the Rename **Ename1** dialog box appears, enter **MgrEname** as the new name and click **OK**. Repeat these steps to rename **Sal1** to **MgrSal** and to rename **Empno1** to **MgrEmpno**.

The **MgrEmpno** attribute duplicates the information in the base employee's **Mgr** attribute, so you'll mark **MgrEmpno** as hidden so that it won't appear in the user interface. To do this, first ensure that the Property Inspector is displayed. (If necessary, select **View -> Property Inspector** to make it appear.) Then, in the View Object Editor, select **MgrEmpno** from the **Attributes** table and expand the **UI Hints** section of the Property Inspector to reveal the **Display Hint** property. Use the list to set this property's value to **Hide**. Later, when you create the edit form for this EmpView, you'll notice that the **MgrEmpno** attribute doesn't appear on the page.

Next, you add a calculated attribute that shows how the salary of an employee compares to the salary of that person's manager. In the View Object Editor, at the top of the **Attributes**

page, click the green plus (+) sign to add a new attribute. For the new attribute's name, enter **PercentOfManagerSal**; for its type, select **Number**; and for its value type, select **Expression**. Enter the Groovy expression (**MgrSal==null||Sal==null?***null*:**Sal/MgrSal**) for its **Value** property, uncheck the **Queryable** box, and then click **OK**.

Your next step is to double-click the **PercentOfManagerSal** attribute in the **Attributes** table. When the Attribute Editor dialog box appears, select **Dependencies**, Ctrl-select **Mgr** and **Sal** from the **Available** list, and click the **Add** arrow button to shuttle them into the **Selected** list. This information is used at runtime to recalculate the **PercentOfManagerSal** attribute automatically whenever **Mgr** or **Sal** changes. Select **Control Hints** in the dialog box, set **Format Type** to **Number**, and enter **###.##%** for **Format Mask**. Click **OK**.

#### **DEFINING THE LOV ON A REFERENCE ATTRIBUTE**

Next you define an LOV for the **MgrName** attribute. Because the manager name and salary are related to an entity usage that's marked as reference information, these attributes are read-only. However, Oracle ADF still lets you define an LOV on **MgrName** so the end user can use the more meaningful employee name to look up the appropriate manager. Such an LOV requires an additional return item to be defined to return the selected manager's **Empno** value into the current employee's **Mgr** attribute; as you'll see shortly, Oracle JDeveloper automates this task.

In the View Object Editor, select the **MgrEname** attribute from the **Attributes** table and click the green + sign in the **List of Values: MgrEname** section below. When the List of Values dialog box appears, note that the list for **List Data Source** is empty. Click the green + sign to the right of this list to define a new view accessor that will provide the valid choices for the LOV. When the View Accessors dialog box appears, select **EmployeeList** from the **Available View Objects** list, click the

**Add Instance** arrow button to shuttle the selection to the **View Accessors** list, and then click **OK**. Back in the List of Values dialog box, ensure that **EmployeeList1** is selected for **List Data Source** and select **Ename** from the **List Attribute** list. Note that in the **List Return Values** section below, Oracle JDeveloper has automatically

can be overwhelming in many cases. Typically, only a few attributes are useful for the user to search on in an LOV. To control which attributes appear in the LOV's search region, you can define a view criteria on the view object used for your LOV data-source and select that criteria from the **Include Search Region** list. The **EmployeeList** view object in the example project has a view criteria named **ManagerLOVSearch**, which includes only the **Empno**, **Ename**, **Job**, and **Deptno** attributes. Select **Use ManagerLOVSearch** from the **Include Search Region** list. The **Query List Automatically** box controls whether or not the LOV dialog box will initially display queried rows. Leave that box unchecked, so users can enter some search criteria before performing a query to find a manager. Click **OK** to complete the LOV definition.

## **Oracle ADF 11g's new automatic partial page refresh (auto-PPR) capability simplifies delivery of interactive pages that automatically update to reflect changed data.**

added an extra return value to assign the **Mgr** attribute in the view object the **Empno** value from the employee selected in the LOV.

Next you configure the type of LOV you'd like to see in the user interface. In the List of Values dialog box, click the **UI Hints** tab and set **Default List Type** to **Input Text with List of Values**. This choice corresponds to an input field with a button for displaying the List of Values dialog box so users can search for the name of a particular manager. This type of component is appropriate when the list of valid values is long and users would find it convenient to search for their choice. In the **Display Attributes** section, select **Ename** from the **Available** list and click the **Add** arrow button to shuttle it into the **Selected** list. Repeat to add the **Deptno** attribute to the **Selected** list.

The List of Values dialog box includes an **Include Search Region** list, whose default is **All Queryable Attributes**. Although this choice can provide flexible search options for end users, the number of attributes

#### **CONFIGURING THE LOV FOR AUTOCOMPLETION**

Next you build a data entry form for employees and then configure its **MgrName** LOV field to enable autocompletion. In the ViewController project, double-click the **EditEmployees.jspx** page to open it in the visual editor. Expand the **Data Controls** section in the Application Navigator, and expand the **HRModuleDataControl** node. Drag the **Employees** data collection, and drop it onto the **EditEmployees.jspx** page (in the editor). When the **Create** menu appears, choose **Forms -> ADF Form**. In the Edit Form Fields dialog box, note that the hidden **MgrEmpno** field is left out of the list of components to create and that the **Component to Use** column shows that an **ADF List of Values Input** component will be used for the **MgrEname** attribute. Check the **Include Navigation Controls** box, and click **OK** to create the form.

To add a **Commit** button so that users can save their changes, expand the **HRModuleDataControl** data control's **Operations** folder, drag the **Commit** operation into the Panel

Group Layout area containing the navigation buttons, and drop it to the right of the **Last** button. When the **Create** menu appears, choose **Operations -> ADF Button**. Repeat the preceding step to drop a **Rollback** operation as a **Rollback** button. To ensure that the **Commit** and **Rollback** buttons are never disabled, set their **Disabled** property to **false**: Hold down the Ctrl key, and select both the **Commit** and the **Rollback** buttons. Expand the Property Inspector's **Behavior** section, click the down-pointing arrow to the right of the **Disabled** property, and choose **Reset to Default**.

The **MgrEname** LOV will perform autocompletion only when the component's **AutoSubmit** property is set to **true**, so you'll configure that next. Select the **inputListOfValues** component on the page. (It looks like a text field with a magnifying glass icon to the right.) In the Property Inspector, expand the **Behavior** category and set the **AutoSubmit** property to **true**. In the same way, set the **AutoSubmit** property to true for the **Mgr** and **Sal** input fields.

Now right-click **EditEmployees.jspx** in the Application Navigator and choose **Run**. Because the data is sorted by **Empno** value, the employee in the first row that appears when the page appears in your browser should be SMITH, whose manager is FORD. If you update the value of the **Mgr** attribute to **7839** and tab out of the field, note that the reference information for **MgrEname** (KING) and **MgrSal** (5000) will automatically be updated on the page. Also note that the calculated attribute for the percentage of the manager's salary updates to reflect the percentage of KING's salary.

Click the magnifying glass icon to the right of the **MgrEname** field to open the LOV dialog box. To search for a manager, enter **manager** in the **Job** field in the **Search** region and click **Search**. Select the row for CLARK in the table, and click **OK**. Again, note how the LOV's return-item definitions ensure that the **Mgr** field is set to reflect CLARK's employee ID

and that the reference information for this new **Mgr** value is updated, in turn, to reflect CLARK's **MgrSal** and **MgrEname** values. Again, the **PercentOfManagerSal** calculated field is updated to reflect the new percentage. Next, erase the CLARK value for the **MgrEname** field, type **BL** into the field, and press the Tab key. Because only a single employee has an **Ename** value starting with **BL**, the **MgrEname** field changes to **BLAKE** and all the related fields are updated. Finally, if you change the current employee's salary from 800 to some other nonzero value and press the Tab key, the percent-of-manager-salary calculation will immediately be reflected again. You've built this slick, interactive data entry form completely declaratively.

### SEEING DATA CHANGES REFLECTED AUTOMATICALLY

In this example, Oracle ADF changes the **MgrEname** and **MgrSal** values when the new **Mgr** foreign-key value is either entered directly or selected from the LOV. The Groovy-calculated attribute is also recalculated when either the **Sal** or the **Mgr** attribute changes, thanks to the attribute dependency information you configured for the **PercentOfManagerSal** attribute.

In earlier Oracle JDeveloper/Oracle ADF releases, you could achieve interactive partial page refreshes of this type only by manually configuring the **PartialTriggers** property for the components you knew required refreshing. To configure that property, you needed to understand and remember all the possible ways back-end business logic might trigger a change in other attributes' values—a configuration headache for all but the simplest kinds of pages.

Oracle ADF 11g's new auto-PPR feature relegates such drudgery to the past. To enable it, you must set a single property on the iterator binding in the page definition where you want it to take effect. To see the property, click the **Bindings** tab at the bottom of the visual editor for the **EditEmployees.jspx** page. Select the **EmployeesIterator** binding

in the **Executables** box, and expand the Property Inspector's **Advanced** section. In the Active Events group at the bottom, note that the value of the **ChangeEventPolicy** property is set to **ppr**. In some cases, such as when you add navigation buttons to a form, Oracle JDeveloper design time automatically configures this property for you. In other situations, you need to set it yourself on the iterators where you want the feature to take effect.

With the new capabilities you've learned about in this column, you'll soon be building data entry pages that are even more attractive and functional. For more information, see Section 5.11, "Working with List of Values (LOV) in View Object Attributes," in *Oracle Fusion Developer's Guide for Oracle ADF 11g*. ■

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# On Emulating FINALLY

Code PL/SQL to function like the Java FINALLY section.

I just moved over from the Java world to PL/SQL. One thing I really miss from Java is the FINALLY section of a method. How can I get the same behavior out of PL/SQL?

Unlike Java, PL/SQL does not support a FINALLY section. You can, however, emulate much of what this section does, through careful and disciplined use of local subprograms.

First, I'll look at how FINALLY works in Java, then I'll explore why it would be useful in PL/SQL, and last I'll show how to emulate it.

In Java, the FINALLY section *always* executes when the TRY section of a method exits—even if an unexpected exception has been raised. The FINALLY section ensures that cleanup logic is not bypassed or ignored, regardless of where or how a program terminates. The programmer does not have to specifically invoke this section or call the code in it. The Java engine automatically runs it before returning control from a method.

## CLEANUP NEEDED ON THE PL/SQL AISLE

In the PL/SQL world, there are several actions that require *explicit* cleanup statements, including the following:

### Opening a file by using UTL\_FILE.FOPEN.

I must then close the file by using UTL\_FILE.FCLOSE; otherwise, the file will remain open until my connection is terminated or until I call UTL\_FILE.FCLOSE\_ALL to close *all* the files opened in my session.

### Opening a cursor by using DBMS\_SQL.

**.OPEN\_CURSOR.** I must close the cursor by using DBMS\_SQL.CLOSE\_CURSOR, or that cursor will remain open until my connection is terminated.

### Allocating memory for package-level variables.

Variables declared at the package level retain their values (and the memory allocated for those values) for the duration of my session, even if the

block in which the value was assigned has been closed. If I don't want that memory to continue to store the variable values, I must explicitly release that memory.

Let's take a look at a program that works with files and dynamic SQL—and the problems that can arise when you don't clean up properly after yourself. I will use the typical and ubiquitous quick-and-dirty methodology to throw together a program (exec\_sql\_from\_file) that reads a file and executes its contents as a single SQL statement using DBMS\_SQL. I'm assuming that this is a method one dynamic SQL statement (DDL or DML and without any bind variables).

Here is an explanation of the exec\_sql\_from\_file procedure in Listing 1:

**Lines 12–22.** Use UTL\_FILE to open the specified file, and read its contents into an array, which is declared by use of a DBMS\_SQL type.

**Lines 18–21.** When UTL\_FILE.GET\_LINE reads past the end of the file, it raises the NO\_DATA\_FOUND exception. It traps that exception and then uses the NULL statement to tell the program to continue.

**Lines 24–32.** Use the overloading of DBMS\_SQLPARSE (which accepts an array of strings) to parse the entire contents of the file, and then execute the cursor. These lines perform the dynamic SQL operation. This use of dynamic SQL and array overloading will work in all releases of Oracle Database, but note that

## codeLISTING 1: exec\_sql\_from\_file (before FINALLY emulation)

```

1 PROCEDURE exec_sql_from_file (
2     dir_in    IN    VARCHAR2
3     , file_in   IN    VARCHAR2
4 )
5 IS
6     l_file      UTL_FILE.file_type;
7     l_lines      DBMS_SQL.varchar2a;
8     l_cur       PLS_INTEGER;
9     l_exec      PLS_INTEGER;
10 BEGIN
11     BEGIN
12         l_file := UTL_FILE.fopen (dir_in, file_in, 'R');
13
14     LOOP
15         UTL_FILE.get_line (l_file, l_lines (l_lines.COUNT + 1));
16     END LOOP;
17     EXCEPTION
18     WHEN NO_DATA_FOUND
19     THEN
20         /* All done reading the file. */
21         NULL;
22     END;
23
24     l_cur := DBMS_SQL.open_cursor;
25     DBMS_SQL.parse (l_cur
26                     , l_lines
27                     , l_lines.FIRST
28                     , l_lines.LAST
29                     , TRUE
30                     , DBMS_SQL.native
31                     );
32     l_exec := DBMS_SQL.EXECUTE (l_cur);
33 END exec_sql_from_file;

```

in Oracle Database 11g, both DBMS\_SQL.PARSE and EXECUTE IMMEDIATE accept a CLOB, so you will no longer have to use this array overloading for very large (greater than 32K) SQL statements.

So in PL/SQL I needed just 33 lines of code to implement a procedure that reads the contents of a file and executes it as a SQL statement. Unfortunately, this is very messy code. I have neglected to implement the cleanup steps: close the file and close the cursor. As a result, the file remains open for the duration of my session (or until I call UTL\_FILE.FCLOSE\_ALL). The cursor also remains open until I disconnect.

### EMULATING FINALLY

Now I will show you how to emulate as closely as possible the behavior of a FINALLY clause in PL/SQL, using a locally defined cleanup subprogram.

To ensure that I clean up properly and close any open resources, I need to add two lines before the end of my procedure (between lines 32 and 33 in Listing 1):

```
UTL_FILE.fclose (l_file);
DBMS_SQL.close_cursor (l_cur);
```

Am I done, then? Only if I never have any problems running this program.

In the real world, every possible thing that could go wrong does go wrong. So in the case of exec\_sql\_from\_file, I need to add an exception handler to trap errors, log error information as specified by my application standards, clean up from the effects of the program, and raise the exception again.

The following adds the previously mentioned cleanup logic and an exception section before the end of the exec\_sql\_from\_file procedure (between lines 32 and 33 in Listing 1):

```
UTL_FILE.fclose (l_file);
DBMS_SQL.close_cursor (l_cur);
EXCEPTION
  WHEN OTHERS
    THEN
      log_error ();
      UTL_FILE.fclose (l_file);
      DBMS_SQL.close_cursor (l_cur);
      RAISE;
```

I now have a fairly robust procedure that cleans up after itself, whether it ends successfully or with an error. But I would rather not duplicate the cleanup logic in multiple places.

Furthermore, my exception section code assumes that both the file and the cursor have been opened. If I encounter a problem in reading the file, I will never even get to the dynamic SQL portion of my program (lines 24 through 32). Thus, I might try to close a cursor that is not open and raise an exception. The error that will be raised depends on the version of Oracle Database. (If I am running Oracle Database 11g, this action will disable the use of DBMS\_SQL entirely for my session, requiring me to reconnect.)

I really should close my resource only if it is open, and that further complicates the cleanup code I need to write. I could simply add that code to the exception section, but what if I need to trap a specific exception? I will need to clean up there too and duplicate even more code. My program will be much more elegant and easy to maintain if I can consolidate all my cleanup logic into one reusable subprogram.

So I implement a small local subprogram *inside* exec\_sql\_from\_file that performs all my cleanup operations:

```
PROCEDURE exec_sql_from_file (
  dir_in  IN VARCHAR2
, file_in IN VARCHAR2
)
IS
  ... declarations as before ...

PROCEDURE cleanup
IS
BEGIN
  IF SQLCODE <> 0
  THEN
    log_error ();
    END IF;
  IF UTL_FILE.is_open (l_file)
  THEN
    UTL_FILE.fclose (l_file);
    END IF;
  IF DBMS_SQL.is_open (l_cur)
  THEN
```

```
    DBMS_SQL.close_cursor (l_cur);
  END IF;
END cleanup;
```

I call this cleanup program at both exit points of my exec\_sql\_from\_file procedure: successful completion (the end of my executable section) and the occurrence of any error (in the WHEN OTHERS clause). The following code assumes that the cleanup procedure has been added to the exec\_sql\_from\_file procedure and replaces the last line of exec\_sql\_from\_file in Listing 1 with

```
cleanup ();
EXCEPTION
  WHEN OTHERS
    THEN
      cleanup ();
      RAISE;
END exec_sql_from_file;
```

Listing 2, available in the online version of this column, at [otn.oracle.com/oramag/oracle/09-jan/o19plsql.html](http://otn.oracle.com/oramag/oracle/09-jan/o19plsql.html), shows the revised exec\_sql\_from\_file procedure, with FINALLY emulation.

This approach of segregating all cleanup logic into a single subprogram and then calling it at the end of the executable section and in each exception handler is the closest you can come to emulating the Java FINALLY clause in PL/SQL. ■

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# Easy Application Attachments

Incorporate BLOB support in Oracle Application Express.

**D**o you have an existing Oracle Application Express application to which you want to add attachments such as Microsoft Word documents, presentation files, or images? Oracle Application Express 3.1 makes it simple to add attachment support and manage binary large objects (BLOBs) within the database.

Including one column of type BLOB allows a file to be stored in a database table, but with this single column, it may be difficult to effectively manage files being uploaded and downloaded and to display them correctly in the application. Therefore, creating a new table in the application with a BLOB column and additional columns that support BLOBs is valuable because

- A MIME-type column ensures that the application correctly displays the file.
- A filename column provides the correct name when the file is being downloaded.
- A last-update column enables the application to cache the image until it is updated.

This article provides the steps required to modify an existing Oracle Application Express application to store BLOBs, using a new table to store both the BLOBs and additional information. You can run through the steps on a local instance or on the hosted instance of Oracle Application Express, at apex.oracle.com. (You must request a free workspace to use this hosted instance.)

## PRELIMINARY APPLICATION LOADING

Let's start by downloading and installing the asset manager packaged application.

1. Download the asset manager application from [otn.oracle.com/products/database/application\\_express/packaged\\_apps/asset\\_manager\\_1.0.zip](http://otn.oracle.com/products/database/application_express/packaged_apps/asset_manager_1.0.zip), and unzip it.
2. Install the application in your local Oracle Application Express instance or

in the public instance at apex.oracle.com. In Oracle Application Express (Home), select **Application Builder** -> **Import** -> **Application**, click **Browse**, select the **asset\_manager\_installer\_1.0.sql** file from the downloaded application files, click **Open**, and then click **Next** to import the file.

3. Click **Next** and **Install** to install the application.
4. After the installation is complete, you will be prompted to install supporting objects. Select **Yes**, and click **Next**.

## CREATING THE ATTACHMENTS TABLE

Using SQL Workshop, we now add a new table to hold the files (in the BLOB column) and additional information.

1. In Oracle Application Express (Home), click **SQL Workshop**.
2. Click **Object Browser**. A list of your existing tables appears.
3. Click **Create**.
4. Click **Table**.
5. Enter **EBA\_ASSET\_ATTACHMENTS** for **Table Name**, and set up the following columns:
  - **id**. Select **NUMBER** as the type.
  - **asset\_id**. Select **NUMBER** as the type.
  - **description**. Select **VARCHAR2** as the type, and enter **100** as the scale value.
  - **content**. Select **BLOB** as the type.
  - **mimetype**. Select **VARCHAR2** as the type, and enter **255** as the scale value.
  - **filename**. Select **VARCHAR2** as the type, and enter **255** as the scale value.
  - **last\_update**. Select **DATE** as the type, and then click **Next**.
6. Select **Populated from a new sequence**, select **ID(NUMBER)** for **Primary Key**, and click **Next**.
7. Select **Cascade Delete**, select **ASSET\_ID** from the **Select Key Column(s)** list, click the right arrow (pointing to the **Key Column(s)** list), select **EBA\_ASSET\_ASSETS** from the **References Table** list, select **ID** from the **Select Reference Column(s)** list, click the right arrow, and click **Add**. Click **Next**.
8. Click **Finish**.
9. Click **Create**.

## MAINTAINING THE ATTACHMENTS

The next step is to build a new application page to maintain the file attachments. We create two regions: the first is for inserting, updating, and deleting attachments, and the second will be visible only if an attachment is an image (and the region will show the image).

1. In Oracle Application Express (Home), click **Application Builder**.
2. Click **Asset Manager 1.0**.
3. Click **Create Page**.
4. Click **Form**, and click **Next**.
5. Click **Form on a Table or View**, and click **Next**.
6. Select the table/view owner, and click **Next**.
7. Select **EBA\_ASSET\_ATTACHMENTS** for **Table/View Name**, and click **Next**.
8. Change the page name to **Maintain Attachments**, change the region title to **Maintain Attachment**, select **Breadcrumb** from the **Breadcrumb** list, and click **Next**.
9. Click **Use an existing tab set and reuse an existing tab within that tab set**, and click **Next**.
10. For **Use Tab**, select **T\_ASSET\_REPORT**; click **Next**.
11. Click **Next**.
12. For **Source Type**, select **Existing Sequence**; for **Sequence**, select **EBA\_ASSET\_ATTACHMENTS\_SEQ**; and click **Next**.
13. In the **Select Column(s)** box, while depressing the Shift key, click **ASSET\_ID**, **DESCRIPTION**, **CONTENT**, and **MIMETYPE**; click **Next**.

14. Click **Next**.
  15. Select **3 Asset Details** (3) for both branches, and click **Next**.
  16. Click **Finish**. A Success page allows you to run or edit the new page.
  17. Click **Edit Page**. The new page should be page 16; if it is not, substitute your page number in subsequent steps.
  18. Under Items, click **P16\_ASSET\_ID**, and under Name for **Display As**, select **Hidden and Protected**; click the right arrow.
  19. For **P16\_DESCRIPTION**, under Element, change the **Width** value to 100; click the right arrow.
  20. For **P16\_CONTENT**, under Source, click **BLOB Download Format Mask** and enter and select values as follows:  
 BLOB column: **CONTENT**  
 MIME Type column: **MIMETYPE**  
 Filename column: **FILENAME**  
 BLOB Last Updated column: **LAST\_UPDATE**  
**Content Disposition:** **Inline**  
**Download Link Text:** **Download**  
 Click **Apply**, and click the right arrow.
  21. For **P16\_MIMETYPE**, under Name for **Display As**, select **Hidden**; click **Apply Changes**.
  22. Click the create (region) icon (the rightmost button at the top of the Regions area).
  23. Click **Report**, and click **Next**.
  24. Click **SQL Report**, and click **Next**.
  25. Enter **Image** for **Title**, and click **Next**.
  26. Enter the following in the **SQL Query** box:
- ```
SELECT ID, DBMS_LOB.  
GETLENGTH(CONTENT) Content  
FROM EBA_ASSET_ATTACHMENTS  
WHERE ID = :P16_ID
```
- and then click **Next** twice.
27. For **Condition Type**, select **PL/SQL Expression**; enter **INSTR(:P16\_MIMETYPE, 'image') = 1** in the **Expression 1** box; and click **Create Region**.
  28. In the Regions area, click **Image** and the **Report Attributes** tab. Change the headings type to **Custom**, and uncheck the **Show** check box for the **ID** column.
  29. To remove the heading of the **CONTENT** column, click the **Edit** icon for the **CONTENT** column; in the

Column Formatting section, enter

```
IMAGE:EBA_ASSET_ATTACHMENTS:  
CONTENT:ID::MIMETYPE:FILENAME:  
LAST_UPDATE::inline:Download
```

in the **Number/Date Format** box; and click **Apply Changes** twice.

#### INTEGRATING ATTACHMENTS INTO THE REPORT PAGE

The last step is to integrate a new region into the **Asset Details** page to display the attachments associated with a specific asset and call the new page for maintaining the attachments.

1. Navigate to page 3, **Asset Details**.
2. Click the create (region) icon (the rightmost button at the top of the Regions area).
3. Click **Report**, and click **Next**.
4. Click **SQL Report**, and click **Next**.
5. Enter **Attachments** as the title, change the sequence to 20, and click **Next**.
6. Enter the following in the **SQL Query** box:

```
SELECT ID, FILENAME,  
LAST_UPDATE, DESCRIPTION, DBMS_LOB.  
GETLENGTH(CONTENT) Content  
FROM EBA_ASSET_ATTACHMENTS  
WHERE ASSET_ID = :P3_ID
```

and then click **Create Region**.

7. Click **Attachments** in the Regions area, and click the **Report Attributes** tab. Click the **Edit** icon for the **ID** column, navigate to the Column Link area, click **[Icon 2]** to set the **Link Text** value, enter 16 in the **Page** box, enter 16 in the **Clear Cache** box, enter **P16\_ID** for **Item 1 Name** and **#ID#** for **Item 1 Value**, and click **Apply Changes**.
8. Click the **Edit** icon for the **CONTENT** column. Under Column Formatting, enter

```
DOWNLOAD:EBA_ASSET_ATTACHMENTS:  
CONTENT:ID::MIMETYPE:FILENAME:  
LAST_UPDATE::inline:Download
```

in the **Number/Date Format** box, and click **Apply Changes** twice.

9. Click the create (button) icon (the

rightmost button at the top of the Buttons area).

10. Select **Attachments** (1) 20, and then click **Next** twice.
11. Enter **NEW\_ATTACHMENT** for both **Button Name** and **Label**, select the **Action** option **Redirect to URL without submitting page**, and click **Next** twice.
12. Select **Region Template Position #EDIT# for Position**, and click **Next**.
13. Enter 16 as the **Page** value, 16 as the **Clear Cache** value, **P16\_ASSET\_ID** as the **Set these items** value, and **&P3\_ID** for **With these values**, and click **Create Button**.
14. Navigate back to page 1, and run the application.

#### CONCLUSION

Oracle Application Express makes it easy to maintain files as BLOBs in the database. The example in this column demonstrated how you can manage multiple attachments for an existing table by implementing a new related table.

Note that if you are running Oracle Application Express with Oracle Database 11g, you can also take full advantage of Oracle SecureFiles capabilities to compress, deduplicate, and encrypt BLOBs within the database.

Finally, for more information on BLOB support in Oracle Application Express, refer to "About BLOB Support in Forms and Reports" in *Oracle Application Express Application Builder User's Guide*, chapter 15, "Advanced Programming Techniques." ■

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# Encrypting Tablespaces

Encrypt tablespaces transparently—without affecting performance.

In an era when data security is critical in almost every type of business, databases are particularly important. This is where the organization's crown jewels live—credit card numbers, Social Security information, names and addresses—the list is endless. The data security risk increases when business data leaves the security of an organization's databases in the form of backup tapes. Historically, these offsite tapes have been the source of many data thefts. And because the tapes can be restored on any equivalent machine, attackers can browse the data at their leisure, and there is nothing the organization can do to protect the data then.

How can you prevent this from happening? The simple answer is *encryption*—encrypt the data in the database and store the encryption key in a different place. Thieves might be able to access the backup tapes and restore the database on a different server, but without the encryption key, they won't be able to see the data.

Oracle introduced transparent data encryption (TDE) *column encryption* in Oracle Advanced Security with the release of Oracle Database 10g Release 2. (For more information, see "Transparent Data Encryption" in the September/October 2005 issue of *Oracle Magazine*, at [otn.oracle.com/oramag/oracle/05-sep/o55security.html](http://otn.oracle.com/oramag/oracle/05-sep/o55security.html).) Although this feature enables you to encrypt columns of a table without writing a single piece of code and helps with several key compliance regulations, it can negatively affect performance in

applications when an encrypted column is used in range scans or as a foreign key. Column encryption is performed transparently within the database SQL layer, and indexes on an encrypted column are built on the encrypted

data, the server process moves the data from storage to the buffer cache and subsequently to the user's session. The data is decrypted before being loaded into the buffer cache, so it's always in cleartext (unencrypted) inside the buffer cache. Almost all types of data access—including index scans, table joins, and so on—happen in the buffer cache, so the performance of operations involving data from the encrypted tablespace is no different from that involving data from a normal, unencrypted tablespace.

With tablespace encryption, before data buffers are written back to disk (as a result of the checkpoint process), they are encrypted by DB Writer processes (DBWn), as shown in Figure 2. Operations, such as direct path inserts and reads that manipulate the data directly in the database, perform encryption inline. When the log buffers are written to the redo logs by the log writer process, they are encrypted as well, so the initial and subsequently archived redo logs contain only encrypted data.

Encryption requires at least two things: an encryption key and an algorithm. TDE uses what is known as a two-tier key architecture: both column and tablespace encryption keys are stored in the database but are encrypted with another key called the *master key*. The master key is stored outside the database in a special container called an *external security module*, which can be something as easy to set up as an Oracle wallet or as sophisticated as a hardware security



values. Because encrypted values look random and disconnected, range scan operations on encrypted columns are not effective. Although column encryption occurs quickly, the range scan limitation is a real challenge in many real-world situations.

## ENTER TDE ENCRYPTED TABLESPACES

The Oracle Advanced Security option for Oracle Database 11g introduces a nifty new TDE feature—*tablespace encryption*—that allows a whole tablespace to be encrypted and therefore addresses the range scan and foreign key limitation of column-level encryption. The new tablespace is created as encrypted, and the data, whether tables or indexes, is stored encrypted in that tablespace, as shown in Figure 1. When a user selects that

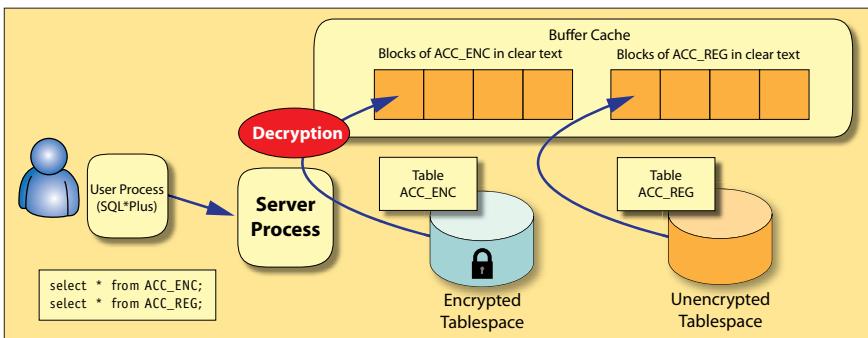


Figure 1: Loading of data buffers

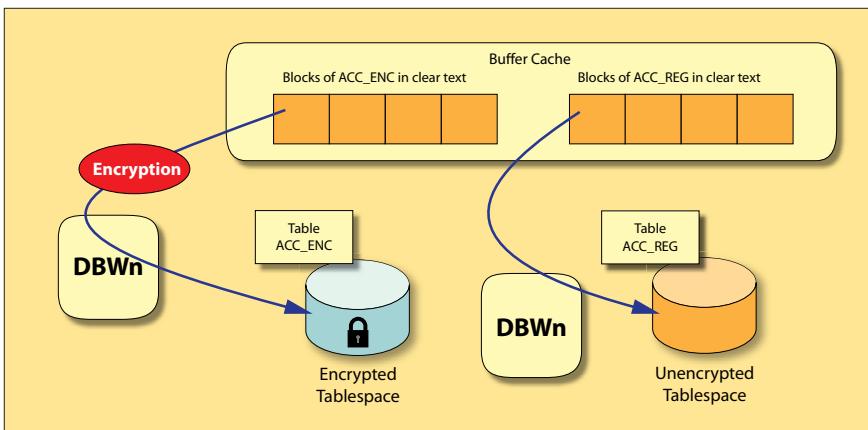


Figure 2: Flushing of buffers from cache to disk

module device. The Oracle wallet is a file formatted according to Public Key Cryptography Standard No. 12 and encrypted with a password. For using the wallet as the external security module, a password must be provided to make the master key accessible to the database. Unless the right password is supplied, the wallet can't be opened and the encrypted data can't be retrieved. The wallet is automatically closed when the database instance is shut down and must be reopened by a security officer when the instance starts. So although thieves might be able to restore a database from tapes, without the wallet and the password, they will not be able to view the encrypted data. (In the hardware security module case, the hardware device must be made available to the database in a manner specified by the vendor of the device.)

#### TABLESPACE ENCRYPTION SETUP

Let's look at how to set up TDE tablespace encryption, using a file-based wallet. Note

that the compatibility of the database must be set to 11.1 or higher. First, if you don't have one, create the wallet:

1. Make sure the ORACLE\_BASE variable has been set. If it has not, set it by issuing

```
$ export ORACLE_BASE=/opt/oracle
```

2. Change to the ORACLE\_BASE directory and then to the admin subdirectory for that instance. In my case, the instance is named prolin1, so I issue

```
$ cd $ORACLE_BASE/admin/prolin1
```

3. Create a directory called "wallet" to hold the wallet:

```
$ mkdir wallet
```

4. Create the wallet, along with a secure password, preferably containing a mix of alphanumeric characters, such as "T45rustMe54":

```
$ sqlplus / as sysdba
```

```
SQL> alter system set encryption key identified by "T45rustMe54";
```

The password is case-sensitive.

The preceding step will create the wallet as well as open it. You need to create the wallet only once. After the database is opened, the wallet remains open until either the wallet is explicitly closed or the database is shut down, at which time the wallet automatically closes. You can reopen this wallet after the database is restarted, by using

```
SQL> alter system set wallet open identified by "T45rustMe54";  
System altered.
```

Now that the wallet is set up, you can create the encrypted tablespace.

1. The following code sets up an encrypted tablespace named enc128\_ts:

```
create tablespace enc128_ts  
datafile '/u01/oracle/database/  
enc128_ts.dbf'  
size 1M autoextend on next 1M  
encryption using 'AES128'  
default storage (encrypt)  
/
```

Note the special `encryption using 'AES128'` clause, which indicates that the AES algorithm is to be used with a 128-bit key. You can also use the values AES192 and AES256 (in place of AES128, the default value) to use 192- and 256-bit keys, respectively.

2. Once the tablespace is created, you can create objects in it. For instance, the following code creates a table called ACCOUNTS\_ENC:

```
create table accounts_enc (  
ACC_NO      NUMBER      NOT NULL,  
FIRST_NAME  VARCHAR2(30) NOT NULL,  
... other columns ...  
)  
tablespace enc128_ts;
```

That's it; no special clause is required. All the columns of the table (or anything else created in this tablespace) will be encrypted.

To confirm encryption, you can

## codeLISTING 1: Index scan on table in unencrypted tablespace

```
SQL> set autot on explain stat
SQL> set timing on
SQL> select first_name
  2  from accounts_reg
  3  where first_name like 'D%'
  4 /
... the rows come here ...
50161 rows selected.
Elapsed: 00:05:36.38
Execution Plan
Plan hash value: 966430551

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		210K	1442K	513  (1)	00:00:07
* 1	INDEX RANGE SCAN	IN_ACC_REG_FN	210K	1442K	513  (1)	00:00:07

Predicate Information (identified by operation id):
1 - access("FIRST_NAME" LIKE 'D%')
      filter("FIRST_NAME" LIKE 'D%')

Statistics
1 recursive calls
0 db block gets
3458 consistent gets
127 physical reads
...
```

insert a record with a value “David” for FIRST\_NAME and search the datafile you created for the enc128\_ts tablespace for that value:

```
SQL> insert into accounts_enc values (1,
'David', ...);
$ strings enc128ts_ts.dbf | grep David
```

This will not show any output, because the “David” value has been stored in an encrypted tablespace. Searching for a cleartext value found nothing, as expected. (Note that if you do a string search in a file of an unencrypted tablespace, a successful search will return the cleartext from the file.)

### TABLESPACE ENCRYPTION AND PERFORMANCE

An issue with any encryption method is the negative impact on performance. For example, searches for patterns in the values in an encrypted column may

or may not be able to use indexes. That is exactly where TDE tablespace encryption excels—it allows data to be in cleartext in the buffer cache, where all the searching occurs.

To accurately ascertain the performance impact of encryption in the tablespace, we can do a small test. First, let's create one normal tablespace:

```
create tablespace normal_ts
datafile '/u01/oracle/database/
normal_ts.dbf'
size 1M autoextend on next 1M;
```

Next, let's create two identical tables—ACCOUNTS\_REG and ACCOUNTS\_ENC—in tablespaces normal\_ts and enc128\_ts (the encrypted tablespace we created earlier), respectively, and populate the tables in the same way. Finally, let's create an index on each of the tables on

the FIRST\_NAME column. The code for creating the tables and populating the data is available in the sample code download for this article, at [otn.oracle.com/oramag/oracle/09-jan/o19tte.zip](http://otn.oracle.com/oramag/oracle/09-jan/o19tte.zip).

With the data set up, we run a query against one table, ACCOUNTS\_REG, to find all the first names starting with D. This query uses an index on the FIRST\_NAME column, as shown in Listing 1. Next, we run the same query but replace ACCOUNTS\_REG with ACCOUNTS\_ENC, as shown in Listing 2. The execution time is approximately the same for the query in both the unencrypted and encrypted tablespaces, with about the same number of blocks fetched in both cases. This shows that there is no significant performance penalty for querying tables in encrypted tablespaces.

### COMPARISON OF TABLESPACE AND COLUMN-LEVEL ENCRYPTION

Column-level TDE allows you to encrypt data in a specific column only. This is how to encrypt the FIRST\_NAME column in the ACCOUNTS\_REG\_ENC table, created from the ACCOUNTS\_REG table:

```
create table accounts_reg_enc
nologging as
select * from accounts_reg;

alter table accounts_reg_enc
modify first_name encrypt using 'AES128'
no salt;
```

After this modification, the FIRST\_NAME column values will be stored *encrypted* in the ACCOUNTS\_REG\_ENC table. All other columns will be in cleartext. However, because the blocks of this table in the buffer cache will be replicas of the table, the FIRST\_NAME column will still be encrypted in the buffer cache. So, there will be a severe impact on the performance of the index scans using FIRST\_NAME.

Let's examine the impact by running a small test. We issue a query against the ACCOUNTS\_REG\_ENC table (which is in an unencrypted tablespace but with its FIRST\_NAME

**codeLISTING 2:** Index scan on table in encrypted tablespace

```

SQL> set autot on explain stat
SQL> set timing on
SQL> select first_name
  2  from accounts_enc
  3  where first_name like 'D%'
  4  /
... the rows come here ...
Elapsed: 00:05:33.85
Execution Plan
Plan hash value: 399953395

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		210K	1442K	513    (1)	00:00:07
* 1	INDEX RANGE SCAN	IN_ACC_ENC_FN	210K	1442K	513    (1)	00:00:07

Predicate Information (identified by operation id):
1 - access("FIRST_NAME" LIKE 'D%')
   filter("FIRST_NAME" LIKE 'D%')

Statistics
1 recursive calls
0 db block gets
3427 consistent gets
127 physical reads
...

```

column encrypted). We search for first names starting with D, and the query uses the index. We repeat the query against the ACCOUNTS\_ENC table (in the encrypted tablespace). Then we examine the impact of the encrypted column on query performance, by issuing `autotrace on explain stat`, which shows the optimization plan used as well as statistics such as consistent gets. Listing 3 shows the commands and the output.

Consider the difference. The access path changed from INDEX FAST FULL SCAN for the table with the encrypted column (ACCOUNTS\_REG\_ENC) to INDEX RANGE SCAN for the table in the encrypted tablespace (ACCOUNTS\_ENC), which resulted in a reduction of consistent gets from 13,963 to a mere 120—less than 1 percent of the original value. This means that the query against the encrypted tablespace table generated just 1 percent of the logical

I/O of the query on the table with the encrypted column.

A second major difference is in column restrictions. Certain datatypes can't be encrypted with TDE column encryption, columns under TDE can't be used for foreign keys, only B-tree indexes can be created against the columns under TDE—and these are just some of the limitations of TDE column encryption. However, there is no restriction on these objects in an encrypted tablespace.

TDE column encryption has additional space requirements. Typically, encrypted values are larger than unencrypted values, causing a table with column encryption to be larger overall. To check for the exact increase, we can use the `show_space` procedure to show the space inside the tables—ACCOUNTS\_REG (the table in the unencrypted tablespace), ACCOUNTS\_ENC (the table in the encrypted

tablespace), and ACCOUNTS\_REG\_ENC (the ACCOUNTS\_REG table with only the FIRST\_NAME column encrypted). Listing 4, available with the online version of this article, at [otn.oracle.com/oramag/oracle/09-jan/o19tte.html](http://otn.oracle.com/oramag/oracle/09-jan/o19tte.html), shows the output. Note that the space consumption (of full blocks) is about the same for both forms of the table—in the unencrypted and encrypted tablespaces. However, the table in the unencrypted tablespace with the encrypted column takes about 15K full blocks, against about 10K in the table in the encrypted tablespace—about 50 percent more space. So, not only is the performance better with TDE tablespace encryption, but there is also no discernible additional space consumption, which, in turn, boosts performance by reducing I/O.

**ENCRYPTED TABLESPACE ADMINISTRATION**

This article has demonstrated how to use the command line to create encrypted tablespaces, but you can also create encrypted tablespaces via Oracle Enterprise Manager. To create an encrypted tablespace in Oracle Enterprise Manager, from the main Database page, choose the **Server** tab and then click the **Tablespaces** link under **Storage**. On the page, click **Create**, which brings up a screen similar to the one shown in Figure 3 (available with the online version of this article). Check the **Encryption** check box, and click **Encryption Options**. That will lead to a new screen where you can specify the type of encryption algorithm.

Different database views can help you monitor encrypted tablespaces by indicating the tablespace number, the encryption algorithm, and whether a tablespace is encrypted. The ENCRYPTED column in the DBA\_TABLESPACES data dictionary view shows whether a tablespace is encrypted (YES or NO). If a tablespace is encrypted, the relevant information is shown in a different view: V\$ENCRYPTED\_TABLESPACES.

The V\$ENCRYPTED\_TABLESPACES view includes the following columns:

### codeLISTING 3: Query comparison of column-level and tablespace encryption

```
/* Run a query on the ACCOUNTS_REG_ENC table (in the unencrypted */
/* tablespace, but with the encrypted first_name column): */

SQL> set autotrace on explain stat
SQL> set linesize 120
SQL> select count(1) from accounts_reg_enc
2  where first_name like 'D%';
```

| Id   Operation             | Name          | Rows  | Bytes | Cost (%CPU) | Time     |
|----------------------------|---------------|-------|-------|-------------|----------|
| 0   SELECT STATEMENT       |               | 1     | 7     | 686 (5)     | 00:00:09 |
| 1   SORT AGGREGATE         |               | 1     | 7     |             |          |
| * 2   INDEX FAST FULL SCAN | IN_ACC_REG_FN | 50000 | 341K  | 686 (5)     | 00:00:09 |

Predicate Information (identified by operation id):

```
2 - filter(INTERNAL_FUNCTION("FIRST_NAME") LIKE 'D%')
```

#### Statistics

```
0 recursive calls
0 db block gets
13963 consistent gets
...
...
```

```
/* Now, run the same query on the ACCOUNTS_ENC table (in the encrypted tablespace): */

SQL> select count(1) from accounts_enc
2  where first_name like 'D%';
```

| Id   Operation         | Name          | Rows | Bytes | Cost (%CPU) | Time     |
|------------------------|---------------|------|-------|-------------|----------|
| 0   SELECT STATEMENT   |               | 1    | 7     | 513 (1)     | 00:00:07 |
| 1   SORT AGGREGATE     |               | 1    | 7     |             |          |
| * 2   INDEX RANGE SCAN | IN_ACC_ENC_FN | 210K | 1442K | 513 (1)     | 00:00:07 |

Predicate Information (identified by operation id):

```
2 - access("FIRST_NAME" LIKE 'D%')
filter("FIRST_NAME" LIKE 'D%')
```

#### Statistics

```
0 recursive calls
0 db block gets
120 consistent gets
...
...
```

- **TS#.** The tablespace number
- **ENCRYPTIONALG.** The encryption algorithm, such as AES128
- **ENCRYPTEDTS.** Indicates whether the tablespace is encrypted (value is YES or NO)

Note that when you recover an encrypted tablespace, the wallet must be open, and you can transport an encrypted tablespace to a different

database, but the other database must have the same wallet (and therefore the same master key). The wallet password for the other database can be different, but the wallet must be the same. If you transport an encrypted tablespace across platforms, the target platform must have the same endianness for encrypted tablespaces.

Finally, note that you can only

create encrypted tablespaces; you cannot modify existing tablespaces to encrypt them. So, when you need existing data in encrypted tablespaces, the best solution is to first create encrypted tablespaces and then move the objects from the unencrypted tablespaces to them.

### CONCLUSION

In general, encryption solves a security issue while introducing a new one: degraded performance. The latter is not acceptable in many real-world situations, so many organizations have little choice but to sacrifice encryption in favor of performance. With transparent tablespace encryption, however, degraded performance is no longer an issue—the performance in an encrypted tablespace is on a par with cleartext performance in unencrypted tablespaces while the data is protected at the storage level via encryption. And best of all, encryption is done transparently without your having to write a single line of code.

Transparent tablespace encryption is an example of a feature that lets you have your cake and eat it too. ■

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# Managing Database Resources

New features in Oracle Database 11g help you assess performance and limit I/O usage.

The database resource manager prioritizes and manages the distribution of resources among database sessions, by controlling the execution schedule inside Oracle Database. In releases before Oracle Database 11g, the database resource manager could manage only the CPU; now it can also manage input/output (I/O).

Let's look at some of Oracle Database 11g's new database resource manager features that can help you assess storage system performance and limit I/O usage per session. Then test your understanding with sample questions you might encounter in the Oracle Database 11g: New Features for Administrators exam, which enables Oracle Certified Professionals who are certified on Oracle Database 10g to upgrade their certifications to Oracle Database 11g.

## I/O CALIBRATION

Oracle Database 11g introduces the I/O calibration feature, which enables you to assess storage subsystem performance and determine whether I/O performance problems are caused by the database or the storage subsystem. I/O calibration uses software libraries to issue I/O to the database files to test the throughput. Using this feature, you can determine I/O metrics such as I/O per second (IOPS), megabytes per second (MBps), and I/O latency. You can access the I/O calibration tool from the **Performance** tab of Oracle Enterprise Manager or by running the CALIBRATE\_IO procedure of the DBMS\_RESOURCE\_MANAGER package. Listing 1 shows the syntax for the CALIBRATE\_IO procedure.

The CALIBRATE\_IO procedure accepts two parameters: NUM\_PHYSICAL\_DISKS (the number of physical disks) and MAX\_LATENCY (the maximum latency for disk access,

## LISTING 1: Syntax for the CALIBRATE\_IO procedure

```
DBMS_RESOURCE_MANAGER.CALIBRATE_IO (
    num_physical_disks      IN PLS_INTEGER DEFAULT 1,
    max_latency              IN PLS_INTEGER DEFAULT 20,
    max_iops                 OUT PLS_INTEGER,
    max_mbps                 OUT PLS_INTEGER,
    actual_latency            OUT PLS_INTEGER);
```

in milliseconds). It also has three OUT parameters: MAX\_IOPS, the maximum number of I/O operations per second; MAX\_MBPS, the maximum number of megabytes per second; and ACTUAL\_LATENCY, the actual latency observed during the test.

You can query the calibration status in the V\$IO\_CALIBRATION\_STATUS view at any time during the I/O calibration process. After the I/O calibration finishes, you can view the results in the DBA\_RSRC\_IO\_CALIBRATE table.

## Which two statements correctly describe the I/O calibration process?

- A. It is used to assess the I/O performance of the storage system of the database servers.
- B. It uses the CALIBRATE\_IO procedure to collect statistics.
- C. The execution time of the CALIBRATE\_IO procedure is always the same, irrespective of the number of disks.
- D. It issues I/Os sequentially, using Oracle datafiles to access the storage media.

The correct answers are A and B. I/O calibration uses CALIBRATE\_IO to ascertain the I/O performance of the storage system of the database servers. Answer C is incorrect because the execution time depends on the number of disks in the storage subsystem and increases with the number of nodes in the database. Answer D is incorrect because, unlike other external I/O calibration tools that issue I/Os sequentially, the I/O calibration feature of Oracle Database issues

I/Os randomly, using Oracle datafiles to access the storage media.

## What are the prerequisites for running the I/O calibration procedure?

- A. Asynchronous I/O must be disabled.
- B. TIMED\_STATISTICS must be set to TRUE.
- C. The user must be granted the SYSDBA privilege.
- D. TIMED\_STATISTICS must be set to FALSE.

The correct answers are B and C. The latency time is computed only when the TIMED\_STATISTICS initialization parameter is set to TRUE, and the user must have the SYSDBA privilege before executing this procedure. Answer A is incorrect because asynchronous I/O must be enabled before execution of this procedure; otherwise, it returns this error message:

**ORA-56708: Could not find any datafiles with asynchronous i/o capability**

## PER-SESSION I/O LIMITS

In previous releases of Oracle Database, DBAs could specify the maximum amount of time a session could run before some action—such as aborting the call, killing the session, or migrating the session to a new consumer group—was taken. In Oracle Database 11g, you can configure the database resource manager to take the same set of actions for sessions that exceed I/O resource consumption limits. You can specify the maximum number of I/O requests or the

maximum number of megabytes of I/O a session can issue before the session is automatically switched to another consumer group or is killed.

This feature is used for two purposes: to identify runaway queries automatically and to move sessions executing long-running calls to lower-priority consumer groups. When you create a resource plan directive, you can specify the I/O resource limits by providing values to the switch\_io\_megabytes argument, which specifies the amount of I/O (in megabytes) a session can issue before an action is taken, or the switch\_io\_reqs argument, which specifies the number of I/O requests a session can issue before an action is taken. In both cases, the default is NULL, which means an unlimited number of I/O requests.

**You issued the command in Listing 2. When—and for which session or call—does the database resource manager switch the resource consumer group from oltp\_group to batch\_group?**

- A. It switches the resource consumer group for any session that exceeds 180 seconds of usage time.
- B. It switches the resource consumer group for the current session when it exceeds 180 seconds of usage time *and* the number of I/O requests exceeds 3,000 *and* the amount of I/O requested exceeds 2,048MB.
- C. It switches the resource consumer group when any session exceeds 180 seconds of usage time *or* the number of I/O requests exceeds 3,000 *or* the amount of I/O requested exceeds 2,048MB.
- D. It switches the resource consumer group for the current call within the session if the usage time exceeds 180 seconds *or* the number of I/O requests exceeds 3,000 *or* the amount of I/O requested exceeds 2,048MB.

The correct answer is D. The switch is applicable only for the current call within the session. The database resource manager switches this call from OLTP\_GROUP to BATCH\_GROUP when it exceeds the limits of any of the thresholds: elapsed time, number of I/O requests, or amount of I/O requested.

**Which statements are true about limiting I/O per session?**

## codeLISTING 2: Switching from oltp\_group to batch\_group

```

BEGIN
  DBMS_RESOURCE_MANAGER.create_plan_directive (
    plan          => 'my_plan',
    group_or_subplan => 'oltp_group',
    comment        => 'Auto Conditional Switch from
                        OLTP group to batch_Group',
    mgmt_p1       => 70,
    switch_group  => 'batch_group',
    switch_time   => 180,
    switch_io_reqs => 3000,
    switch_io_megabytes => 2048,
    switch_for_call => TRUE);
END;

```

- A. It allows automatic consumer group switching based on I/O thresholds.
- B. It can kill or abort a session based on any combination of elapsed time, I/O requests, and I/O (in megabytes).
- C. It stops the session from using further I/O resources but does not switch to another consumer group or kill the session.
- D. It limits the I/O consumption for the session only when there is a resource shortage and the session tries to exceed the limit.

The correct answers are A and B. By using the switch\_io\_reqs, switch\_io\_megabytes, and switch\_time parameters, you can control the I/O usage per session and switch to another consumer group or kill or abort a session if it reaches the threshold. Answer C is incorrect because the limiting of I/O per session either switches the session to another consumer group or kills the session but does not retain the session within the consumer group. Answer D is incorrect because I/O consumption per session is limited, irrespective of the availability of the resources.

### I/O STATISTICS

Oracle Database 11g introduces a set of virtual views that collect statistics for all I/O issued from an Oracle instance. Virtual views show cumulative statistics for each operation type: the number of corresponding requests; the number of megabytes; the total I/O wait time, in milliseconds; and the number of total waits. Component and consumer group statistics are transformed into automatic workload repository metrics that are stored in the repository.

**Suppose you maintain a PROD database that has a single instance. You need to collect statistics of all I/Os issued from this instance. Which three virtual views will help you achieve this?**

- A. V\$IOSTAT\_FILE
- B. V\$IOSTAT\_FUNCTION
- C. V\$IOSTAT\_CONSUMER\_GROUP
- D. V\$IOSTAT\_NETWORK

The correct answers are A, B, and C. V\$IOSTAT\_FILE displays information about disk I/O statistics of database files (including datafiles, temp files, and other types of database files). V\$IOSTAT\_FUNCTION displays disk I/O statistics for database functions (such as LGWR and DBWR). V\$IOSTAT\_CONSUMER\_GROUP displays disk I/O statistics for consumer groups. If the database resource manager is enabled, I/O statistics for all consumer groups that are part of the currently enabled resource plan are captured. Answer D is incorrect because V\$IOSTAT\_NETWORK collects network I/O statistics related to accessing files on a remote database instance. ■

**Sushma Jagannath** is a certification exam development manager at Oracle. She has been with the company since 2000.

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# On Dynamic Sampling

Our technologist samples dynamically, considers usage, and sets levels.

**M**y questions are related to dynamic sampling. What does it really do, when would I consider using it, and what are the meanings of all the different levels it can be set to?

Dynamic sampling first became available in Oracle9i Database Release 2. It is the ability of the cost-based optimizer (CBO) to sample the tables a query references during a hard parse, to determine better default statistics for unanalyzed segments, and to verify its “guesses.” This sampling takes place only at hard parse time and is used to dynamically generate better statistics for the optimizer to use, hence the name dynamic sampling.

The optimizer uses a variety of inputs to come up with a plan. It uses any and all constraints defined on the table; system statistics—information about your server's I/O speeds, CPU speed, and the like; and statistics gathered from the segments involved in the query. The optimizer uses statistics to estimate cardinalities—the number of rows each step in a given plan is expected to return—and those cardinalities are a major variable in computing the cost of a query. When cardinalities are incorrectly estimated, the optimizer may choose an inefficient query plan. The No. 1, and some might say only, reason for an inefficient plan's being generated by the optimizer is inaccurate cardinality estimations. I like to say “right cardinality equals right plan; wrong cardinality equals wrong plan.”

So, “right” is the motivation behind dynamic sampling: to help the optimizer get the right estimated cardinality values. Feeding the optimizer more information and more-accurate information, specific to the query itself, will help the optimizer come up with the optimal execution plan.

Dynamic sampling offers 11 setting levels (0 through 10), and I'll explain the different levels, but note that in Oracle9i Database Release 2, the default dynamic sampling level value is 1, whereas in Oracle Database 10g Release 1 and above, it defaults to 2.

## WAYS DYNAMIC SAMPLING WORKS

There are two ways to use dynamic sampling:

- The OPTIMIZER\_DYNAMIC\_SAMPLING parameter can be set at the database instance level and can also be overridden at the session level with the ALTER SESSION command.
- The DYNAMIC\_SAMPLING query hint can be added to specific queries.

In this column, I'm going to use the hinting capability to demonstrate the effect of dynamic sampling, but you may well use the session-level capability to increase the use of dynamic sampling, especially in a reporting or data warehouse situation.

As stated before, dynamic sampling is used to gather statistics for unanalyzed segments and to verify “guesses” made by the optimizer. I'll look at each of these uses in turn.

## UNANALYZED SEGMENTS

The optimizer will use default statistic values if a segment is not analyzed and you do not use dynamic sampling to get a quick estimate. These default

## codeLISTING 1: Disabling dynamic sampling to see default cardinalities

```
SQL> set autotrace traceonly explain
SQL> select /*+ dynamic_sampling(t 0) */ * from t;
```

### Execution Plan

Plan hash value: 1601196873

| Id   Operation                                            | Name   Rows | Bytes | Cost (%CPU) | Time |
|-----------------------------------------------------------|-------------|-------|-------------|------|
| 0   SELECT STATEMENT     16010   437K  55 (0)  00:00:01   |             |       |             |      |
| 1   TABLE ACCESS FULL  T   16010   437K  55 (0)  00:00:01 |             |       |             |      |

## codeLISTING 2: More-realistic cardinalities with dynamic sampling enabled

```
SQL> select * from t;
```

### Execution Plan

Plan hash value: 1601196873

| Id   Operation                                             | Name   Rows | Bytes | Cost (%CPU) | Time |
|------------------------------------------------------------|-------------|-------|-------------|------|
| 0   SELECT STATEMENT     77871   2129K  56 (2)  00:00:01   |             |       |             |      |
| 1   TABLE ACCESS FULL  T   77871   2129K  56 (2)  00:00:01 |             |       |             |      |

### Note

- dynamic sampling used for this statement

cardinality values are documented in *Oracle Database Performance Tuning Guide* ([download.oracle.com/docs/cd/B28359\\_01/server.111/b28274/stats.htm#i41866](http://download.oracle.com/docs/cd/B28359_01/server.111/b28274/stats.htm#i41866)). These default statistic values are typically not very realistic, because using them is a one-size-fits-all approach. The estimated row counts are based on guesses at the number of blocks of data in the table and an average row width. Without dynamic sampling, these guesses will be off—by a large amount. Consider:

```
SQL> create table t
  2  as
  3  select owner, object_type
  4  from all_objects
  5 /
Table created.

SQL> select count(*) from t;
COUNT(*)
_____
68076
```

Now I'll look at the estimates for a query that accesses this unanalyzed table. To see the default cardinalities the optimizer would use, I have to disable dynamic sampling (it is enabled by default in Oracle9i Database Release 2 and above). I achieve this via the DYNAMIC\_SAMPLING hint, with a level of zero—zero being the value that disables dynamic sampling—as shown in Listing 1.

As you can see, the estimated cardinality is 16,010, which is very far off from the real cardinality, about 68,000. If I permit dynamic sampling, I get a much more realistic cardinality estimate, as shown in Listing 2.

Now, 77,871 is not exactly 68,000 (obviously), but it is much closer to reality than 16,010 was. In general, the optimizer will choose better query plans for queries accessing this unanalyzed table when using dynamic sampling.

An inaccurate cardinality estimate can swing either way, of course. In Listing 1, I showed the optimizer radically underestimating the cardinality, but it can overestimate as well. Consider the

### codeLISTING 3: Overestimating cardinalities

```
SQL> delete from t;
68076 rows deleted.

SQL> commit;
Commit complete.

SQL> set autotrace traceonly explain
SQL> select /*+ dynamic_sampling(t 0) */ * from t;

Execution Plan
_____
Plan hash value: 1601196873

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		16010	437K	55    (0)	00:00:01
1	TABLE ACCESS FULL	T	16010	437K	55    (0)	00:00:01

SQL> select * from t;
Execution Plan
_____
Plan hash value: 1601196873

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	28	55    (0)	00:00:01
1	TABLE ACCESS FULL	T	1	28	55    (0)	00:00:01
```

#### Note

- dynamic sampling used for this statement

### codeLISTING 4: Creating the "FLAG" table and gathering statistics

```
SQL> create table t
  2  as select decode( mod(rownum,2), 0, 'N', 'Y' ) flag1,
  3        decode( mod(rownum,2), 0, 'Y', 'N' ) flag2, a.*
  4  from all_objects a
  5 /
Table created.

SQL > create index t_idx on t(flag1,flag2);
Index created.

SQL > begin
  2      dbms_stats.gather_table_stats
  3      ( user, 'T',
  4        method_opt=>'for all indexed columns size 254' );
  5  end;
  6 /
PL/SQL procedure successfully completed.
```

estimate in Listing 3.

Think about what might happen if the optimizer guessed 16,010 rows instead of 1 row in this case. For queries accessing table T, the optimizer would grossly overestimate the rows that will be returned from T and generate incorrect plans as a result.

So, where would dynamic sampling

be useful? First and foremost, dynamic sampling is useful when you are accessing any table that has been created and loaded but not yet analyzed. Starting in Oracle Database 10g Release 1, the CBO is the only supported optimizer, and it needs accurate statistics to perform its job correctly. If a table exists that hasn't had statistics gathered yet, the optimizer

## codeLISTING 5: Good cardinality estimates, looking at half of the table data

```
SQL> set autotrace traceonly explain  
SQL> select * from t where flag1='N';
```

Execution Plan

Plan hash value: 1601196873

| Id   Operation             | Name   Rows                      | Bytes | Cost (%CPU) | Time |
|----------------------------|----------------------------------|-------|-------------|------|
| 0   SELECT STATEMENT       | 33479   3432K  292 (1)  00:00:04 |       |             |      |
| * 1   TABLE ACCESS FULL  T | 33479   3432K  292 (1)  00:00:04 |       |             |      |

Predicate Information (identified by operation id):

1 - filter("FLAG1"='N')

```
SQL> select * from t where flag2='N';
```

Execution Plan

Plan hash value: 1601196873

| Id   Operation             | Name   Rows                      | Bytes | Cost (%CPU) | Time |
|----------------------------|----------------------------------|-------|-------------|------|
| 0   SELECT STATEMENT       | 34597   3547K  292 (1)  00:00:04 |       |             |      |
| * 1   TABLE ACCESS FULL  T | 34597   3547K  292 (1)  00:00:04 |       |             |      |

Predicate Information (identified by operation id):

1 - filter("FLAG2"='N')

## codeLISTING 6: Poor cardinality estimates, looking at a quarter of the table data

```
SQL> select * from t where flag1 = 'N' and flag2 = 'N';
```

Execution Plan

Plan hash value: 1601196873

| Id   Operation             | Name   Rows                      | Bytes | Cost (%CPU) | Time |
|----------------------------|----------------------------------|-------|-------------|------|
| 0   SELECT STATEMENT       | 17014   1744K  292 (1)  00:00:04 |       |             |      |
| * 1   TABLE ACCESS FULL  T | 17014   1744K  292 (1)  00:00:04 |       |             |      |

Predicate Information (identified by operation id):

1 - filter("FLAG1" = 'N' AND "FLAG2" = 'N')

will be flying blind. Dynamic sampling gives the CBO the information it needs in order to operate correctly.

The second use for dynamic sampling is with global temporary tables. Often global temporary tables do not have statistics, and dynamic sampling can provide the optimizer with information about these tables. Your application

would load the global temporary table, and the first hard parse of any query that utilized the temporary table would dynamically sample it to ascertain the correct size of the temporary table.

### WHEN THE OPTIMIZER GUESSES

In addition to providing the optimizer with necessary statistics when it is

accessing unanalyzed segments, dynamic sampling may also help the optimizer to validate any of its guesses. The optimizer has access to statistics about “single things” in general; when you gather statistics by using DBMS\_STATS, the optimizer receives information about

- The table, the number of rows, average row widths, and the like.
- Each individual column, the high value, the low value, the number of distinct values, histograms (maybe), and the like. (Oracle Database 11g can even gather statistics on an expression, but it is still a single expression). Additionally, Oracle Database 11g can gather statistics on groups of columns, and these statistics can be used in equality comparisons.
- Each individual index, the clustering factor, the number of leaf blocks, the index height, and the like.

So, given a table with various columns, the optimizer has lots of information to work with, but it is missing some vital information, including statistics about how the various columns interact with each other and statistics about any correlations in column values. For example, suppose you have a table of census information that includes a record for everyone on the planet. One of the table’s attributes—MONTH\_BORN\_IN—is a character string field containing each person’s birth month. Another column—ZODIAC\_SIGN—contains character strings with the name of each person’s zodiac sign.

After gathering statistics, you ask the optimizer to estimate how many people were born in December, and it would almost certainly be able to come up with a very accurate estimate of 1/12 of the data (assuming a normal distribution of birth dates). If you asked the optimizer to estimate how many people are Pisces, it would again likely come up with an accurate estimate of 1/12 of the data again.

So far, so good. But now you ask, “How many people born in December are Pisces?” All Pisces were born in either February or March, but the optimizer isn’t aware of that. All the optimizer knows is that December will retrieve 1/12 of the data and that Pisces

**codeLISTING 7:** Good cardinality estimate, looking at only six rows

```
SQL> select /*+ dynamic_sampling(t 3) */ * from t where flag1 = 'N' and flag2 = 'N';
```

## Execution Plan

Plan hash value: 470836197

| Id                                 | Operation | Name | Rows | Bytes | Cost (%CPU) | Time          |
|------------------------------------|-----------|------|------|-------|-------------|---------------|
| 0   SELECT STATEMENT               |           |      | 6    | 630   | 2           | (0)  00:00:01 |
| 1   TABLE ACCESS BY INDEX ROWID  T |           |      | 6    | 630   | 2           | (0)  00:00:01 |
| * 2   INDEX RANGE SCAN             | T_IDX     |      | 6    |       | 1           | (0)  00:00:01 |

## Predicate Information (identified by operation id):

```
2 - access("FLAG1"='N' AND "FLAG2"='N')
```

will retrieve 1/12 of the data; it assumes that the two columns are independent and, using very simple logic, says, “The number of people born in December who are also Pisces will be 1/12 times 1/12, or 1/144, of the data.” The actual number of rows—zero—will be very far off from the optimizer’s guess of 1/144th of the rows in the table, and the result is typically a suboptimal plan, due to the poor cardinality estimates.

Dynamic sampling can help solve this. When it is set high enough, to level 3 or above, the optimizer will validate its guesses by using a dynamic sample.

To demonstrate this, I’ll create a table with some very specific data. Note that in this table, if the FLAG1 column has a value of Y, the FLAG2 column will have a value of N, and vice versa. All the data is either Y, N, or N, Y—there are no Y, Y records and no N, N records. Listing 4 shows the creation of the table and the gathering of statistics.

So I have the table and have gathered statistics, including histograms for the FLAG1 and FLAG2 columns. The following shows the number of rows in the table, half the number, and a quarter of the number:

```
SQL> select num_rows, num_rows/2,
num_rows/2/2 from user_tables
where table_name = 'T';
```

| NUM_ROWS | NUM_ROWS/2 | NUM_ROWS/2/2 |
|----------|------------|--------------|
| 68076    | 34038      | 17019        |

the levels mean?” The answer is pretty straightforward and documented in *Oracle Database Performance Tuning Guide* (at download.oracle.com/docs/cd/B19306\_01/server.102/b14211/stats.htm#i43032).

The online version of this column, at otn.oracle.com/oramag/oracle/09-jan/019asktom.html, continues with an explanation of the different dynamic sampling levels and concludes with recommendations for when to use dynamic sampling.

**MORE INFORMATION**

In addition to the Oracle documentation at otn.oracle.com/documentation, Jonathan Lewis’ excellent book *Cost-Based Oracle Fundamentals* (Apress, 2006) and my book *Effective Oracle by Design* (Oracle Press, 2003) provide more information on dynamic sampling and other optimizer topics. ■

**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: 9i and 10g Programming Techniques and Solutions* (Apress, 2005) and *Effective Oracle by Design* (Oracle Press, 2003), among others.

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# Keeping Up

Make sure that your knowledge is current and cutting-edge.

**K**eep up, or the world will leave you behind. It's an old saying but still true. As Oracle professionals, we need to learn, network, and do everything we can to ensure that we and our organizations take the fullest advantage of our technology investments. We need to keep up so we can anticipate future problems and solutions.

One area that changes constantly and gets only more important is security. Recently, the Independent Oracle Users Group (IOUG) conducted a survey and subsequently published a report—*Enterprise Data Insecurity: Are Organizations Prepared for the Threat From Within? The 2008 IOUG Data Security Report*—which shows that 20 percent of respondents expect a data intrusion in the coming year, either from within their own organization or from an external source. 31 percent feel that internal misuse of data is a high risk.

Data is at risk. Many users today have access to a lot of data, especially business intelligence data, which may include sensitive financial or trade information about an individual or organization. Yet somehow many organizations still allow their "super" users to have unfettered access to data. Even if we trust our users, controlling access to data and monitoring identification and authorization controls, as well as actions and activities, is important.

Detecting threats is one example of what to do to mitigate risk. By keeping up with your Oracle knowledge, you will know that Oracle Audit Vault can do exactly this kind of monitoring in a consolidated environment.

The security survey also shows that 25 percent of databases do not encrypt identity information. Oracle Database, Enterprise Edition, includes many security features, including encryption,

within the base product, so be sure you know what your database can do.

If you want to learn more about security and encryption, the IOUG is partnering with the SANS Institute, a leading security organization, and in 2009 the IOUG will be bringing leading technology education to the membership at a great discount. This is a terrific example of how the user community provides vital information.

## GO TO COLLABORATE

If your training and education dollars are scarce, try the one place where you can get the most-comprehensive educational experience, created by real users: COLLABORATE 09, to be held May 3 through 7 in Orlando, Florida. More than 7,500 customers and business partners will converge for a full array of Oracle technology and applications sessions and demos to help attendees keep up.

COLLABORATE 09 helps users of Oracle technologies and business applications gain greater value from their Oracle investments by showing real solutions to business issues that can save their companies money. The event offers customer-to-customer interaction and insights from technology visionaries and Oracle strategists. Every user event helps attendees understand what's coming and how their organizations can make the most of it.

For instance, the recent announcements of the HP Oracle Database Machine, Oracle Exadata, and Oracle's support for cloud computing are important as we move toward the adoption of new solutions to improve our business efficiencies. These events bring us together; the advantage of learning from our peers is, as we hear often, "priceless."

Keeping up financially has never been more important. *What Data Professionals Earn: The 2008 IOUG*

Salary Survey illustrates that people who understand how to interpret business and translate that into technology solutions will earn more money. In addition, the survey shows that members of user groups earn more than nonmembers. This result isn't a surprise; members tend to be leaders in the community and in their organizations. The user community is the place to stay on the leading edge and ensure that you maximize your earning and learning potential.

As technology and the economy both change, we know that we need to keep up. One way to do that is to become a member of the IOUG or join your local user group to network in your own backyard. These are the places you will share knowledge with your fellow Oracle professionals, but most important, you will learn from the experiences of others. Your participation will allow you to be an Oracle user leader and let you stay ahead of the pack. ■

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# Changing the Market

Purchasing criteria should focus on lifecycle security costs.

I've been known to say often over the course of my career that there are no new security problems, just the same old problems with new protocols. (True statement: the application firewall market developed after people got the bright idea to start overloading HTTP to—wait for it—get through firewalls. Kind of like letting in everyone who knocks on your front door and checking IDs only after they are all in your living room.) George Santayana's oft-quoted statement that those who cannot remember the past are condemned to repeat it was never truer than when it is applied to information security.

That said, the information security market has changed in the last five years, and the driver for security change has been customer demand as much as or more than a "vendor awakening." Software assurance, in particular, has moved from the theoretical to the practical as more vendors disclose (or are forced to disclose) their secure development practices—if they are not outright competing over them. The market shift has been led by critical customer segments that are focused on their lifecycle security costs as never before and that are demanding more from their suppliers, in part because "unexpected security events" have become a large and unpredictable part of any organizations' IT budget.

Whether it is a matter of locking software configurations down upon installation or disclosing development practices to the nth degree, the security landscape for vendors has shifted from "nobody will pay more for better security" to competing in Snow White contests to be the universal response to "Mirror, mirror on the wall, who is the most security-minded vendor of them all?" Vendors respond to customer demand, and customers can change and are changing the

marketplace for secure software.

The U.S. government is one of the significant players in changing the security marketplace. Cost considerations are leading to heavy use of commercial off-the-shelf software (COTS) as never before, but to feel comfortable about using COTS in critical systems, U.S. agencies want far more transparency to know what they are getting from a security standpoint, including not only *how* the code was developed but also its provenance (*where* it was developed). The Department of Homeland Security, in addition to its many other functions, runs a software assurance forum in which a broad tent of industry players, academics, and customers collaborate on better software development practices. Among other achievements, the participants have produced a draft acquisition guide to help U.S. government procurement officers determine *how* a supplier has built security into its software. The mere fact of asking suppliers questions related to secure development practice will "signal the marketplace," as economists say, that security is important and will change the market dynamic.

More development practice transparency is good, not only to move the market but also to let security-aware customers know what they are getting. There are third parties that analyze software binaries for security vulnerabilities as a service. This is contributing, I suspect, to the fact that vendors themselves are making increased use of various vulnerability-finding tools. (Why pay a third party when, really, you need to be doing that sort of vulnerability finding yourself *before* you ship product?)

Secure configurations are another area in which market expectations have changed because of customer demand. A draft bill amending the Federal

Information Security Management Act requires agencies to procure "built-in, not bolted-on" security. The Office of Management and Budget has already mandated that federal agencies lock down their desktops per the Federal Desktop Core Configuration (FDCC) for Microsoft Windows Vista and Windows XP. The result is that many vendors must certify that their products run on FDCC-compliant desktops. I suspect that the FDCC will be the first of many such programs that change the market expectation from "Hey, customer, it's your problem to configure this product securely" to "My product installs more securely than my competitor's." It makes a lot of sense for a vendor to do once (lock down its default installation) what customers would otherwise spend time and money doing (locking down individual products).

Having customers make "better security at a lower lifecycle cost" a purchasing criterion is something I've advocated for some time. Better security at lower cost—what's not to like? ■

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**Mary Ann Davidson** is the chief security officer of Oracle, responsible for secure development practices and security evaluations and assessments. She represents Oracle on the board of directors of the Information Technology Information Security Analysis Center (IT-ISAC), has served on the U.S. Defense Science Board, and is on the editorial review board of SC Magazine.

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# Getting Ubiquitous

Embedded databases enable a wide array of information management capabilities.

**O**racle Magazine spoke with Carl Olofson, research vice president of information management and data integration software at IDC, about how embedded database management systems are affecting our lives at work and at home.

**Oracle Magazine:** Let's start at the top—what is embedded software technology?

**Olofson:** Embedded software technology resides inside another software product or a hardware product—take, for example, an embedded Oracle Database within a packaged software application. These special-purpose applications, devices, and equipment often depend on embedded software that can run unattended and manage its own data in a self-contained manner. Users of these applications typically don't even realize that they're using a database.

**Oracle Magazine:** What kinds of applications, devices, and equipment use embedded database software?

**Olofson:** There are all kinds of embedded database technologies and all kinds of companies using them. For instance, some cell phones have databases built in for storing calling data, messages, contact directories, and personal data, some of which might be replicated to a back-end server. Televisions, set-top boxes, and digital video recorders use embedded databases to store user preferences and program information, and network switches host databases to track information about the status of a computer network. Many types of packaged applications, including patient information systems, parts inventory systems, and order control systems, and so forth, use embedded databases.

**Oracle Magazine:** How much knowledge of database technology do people need to use an embedded database?

**Olofson:** An embedded database appears

to be part of the application. You never interact with it directly. When you install the application, the database is installed automatically. When you turn on the application, the database is available.

Thus, there's a fairly high bar in terms of reliability. These databases are pre-configured and self-managing, so you don't need a DBA. That's one of the defining characteristics of an embedded database.

**Oracle Magazine:** How do database vendors make their embedded solutions accessible to independent software vendors [ISVs] and other solution providers?

**Olofson:** Database vendors such as Oracle create management APIs so that applications can automatically perform basic administrative functions normally handled by a DBA. Vendors also configure the database installation procedure so that it's automatic, and they supply a version of the database that can run in unattended mode.

Oracle offers several options here, including an embedded version of Oracle Database; an embedded version of Oracle TimesTen In-Memory Database for high-performance requirements; and Oracle Berkeley Database for simple data structures, such as in a vending machine. ISVs must be careful to match the performance characteristics of an application with the user requirements and then select the right database for the task at hand.

**Oracle Magazine:** What types of advancements do you foresee in this sector over the next two or three years?

**Olofson:** Cheaper and more-powerful computers will make embedded technology more self-managing, affordable, and ubiquitous. Databases are being embedded in household appliances such as refrigerators. Once there is an effective way to put something like an RFID tag

on the products you get in the supermarket, your refrigerator will be able to keep track of what groceries you have, including the expiration date and so forth. You'll simply look at a readout to see what you need at the grocery store or even print a grocery list. We are also starting to see microwave ovens that can download recipes from the internet, tell you when to add ingredients, and step you through each stage of preparing a meal.

At IDC, we believe that everything that plugs into a wall will potentially be part of a computer network. Your home entertainment system, your personal accounting applications, and the systems you use for browsing the Web will all be one system with different interfaces and form factors. Many of these devices will include embedded databases to do their job. Clearly, we'll continue to see new embedded database technologies emerge as our needs evolve and change. ■

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*IDC* ([www.idc.com](http://www.idc.com)) is a global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets.

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