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# NoCOUG

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# Weather Tough Times with NoCOUG

## Spotlight on Oracle

*Candid questions get candid answers from Dr. Bert Scalzo. See page 4.*

## Oracle on VMware

*Brian Hitchcock reviews Dr. Bert Scalzo's latest book. See page 6.*

## Bolt-On Power

*Chris Lawson discusses the perils and pitfalls of RAC. See page 18.*

*Much more inside . . .*



# Weather Tough Economic Times with NoCOUG

Stephen Covey gives us a prescription for success in his best-selling book, *The 7 Habits of Highly Effective People*. The seventh habit is “sharpen the saw,” which means “update your knowledge and skills,” among other things.

Oracle Database is a continuously moving target. The Oracle 7.3 SQL reference manual had about 750 pages; the 11g version is twice that size. Later this year Oracle will unveil 11gR2 at OpenWorld 2009.

In tough economic times such as these, it's more important than ever to keep knowledge and skills current and relevant. And where better to widen your horizons than at NoCOUG? Every year NoCOUG brings you four great educational conferences and four great issues of the *NoCOUG Journal*. Where in the world can you find such an outstanding educational value for only \$95 per year?

I hope to see you at our winter conference on February 12 at the Oracle conference center in Redwood Shores. You don't want to miss this opportunity to hear Tom Kyte speak. He'll be delivering the keynote address—speaking about extreme performance—as well as two technical sessions. And do take the opportunity to renew your NoCOUG membership; it's worth every penny. ▲

—Iggy Fernandez, *NoCOUG Journal* Editor

## Table of Contents

President's Message .....	3
Interview .....	4
Book Review .....	6
Developer's Corner .....	10
Compliance Corner .....	16
Performance Corner .....	18
Training Day .....	20
Renewal Notice .....	21
Call for Volunteers .....	22
Sponsorship Appreciation .....	23
Session Descriptions .....	24
Conference Schedule .....	28

### ADVERTISERS

Precise Software Solutions .....	3
Roundstone Systems .....	15
BEZ Systems .....	15
Database Specialists, Inc. ....	15
Princeton Softech .....	15
IT Convergence .....	25
Quest Software .....	25
Embarcadero Technologies .....	25
Network Appliance .....	25
Confio Software .....	27

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# 2009: Yes We Can!

by Hanan Hit



Hanan Hit

**G**reetings, Oracle professionals! A new year presents us with tremendous challenges and opportunities. I would like to start with a special thanks to our president Roger Schrag and past president Lisa Loper, who are stepping down from the NoCOUG board after many productive years of building this organization into what it is and preparing it for the challenges that lie ahead.

NoCOUG is run by a team of volunteers and a single paid staff member who take time out of their busy lives to share with the community and make NoCOUG what it is. I will be your president this year, with Jen Hong at my side as vice president. I would also like to welcome Chen Shapira to the board as training day coordinator. Naren Nagtode is moving into the secretary/treasurer position. Five additional volunteers will continue to serve in the same board roles as last year: Randy Samberg as director of conference programming, Iggy Fernandez as *Journal* editor, Joel Rosingana as membership director, Eric Hutchinson as webmaster, and Claudia Zeiler as track leader.

I thank each of these volunteers for their dedication to helping others in the Oracle profession. It takes a lot of energy and time to manage an organization with over 450 members, four conferences per year, a quarterly publication, and a dynamic website. I would like to thank Nora Rosingana for an outstanding job as NoCOUG accountant.

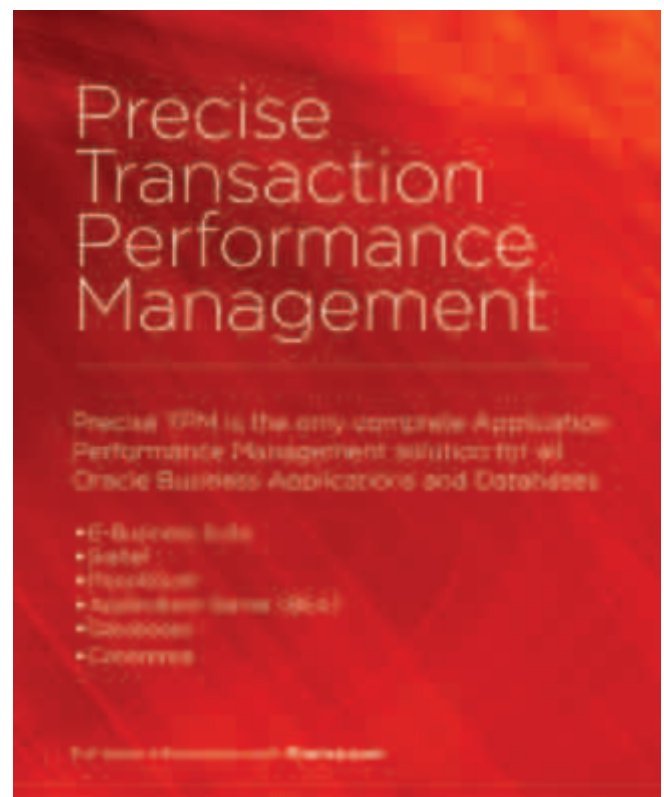
Technology moves so quickly. Over the course of my career, Oracle Database has evolved from v5 to 11g. Successful Oracle professionals never stop learning and networking with their peers, and NoCOUG's mission is to provide them with educational, networking, and leadership opportunities.

In 2009, NoCOUG will continue to provide the best value for career development in Northern California. You can get four days of Oracle education for only \$95—not to mention the valuable information published in the quarterly journal and on the NoCOUG website. Our conferences also offer great networking opportunities. There you can meet scores of fellow Oracle professionals who live and work right here in Northern California.

If you are not yet a NoCOUG member, I encourage you to join online today at [www.nocoug.org](http://www.nocoug.org). I also encourage everyone to spread the word. You can do other Oracle professionals a great favor by introducing them to our users group. Tell your officemates, colleagues, and friends about NoCOUG. Enlarging the NoCOUG membership network benefits all of us.

I look forward to seeing you at NoCOUG's winter conference on February 12 at the Oracle conference center in Redwood Shores. Tom Kyte will kick off the event with a keynote on extreme performance with Exadata; he is an Oracle luminary and an amazing speaker. After the keynote, there will be 10 technical presentations, including two presentations by Tom Kyte and several by NoCOUG members. Iggy Fernandez's subject is best practices for Oracle database administration. Terry Sutton and Richard Headrick will present tools and techniques for remote database support and road warriors. Ahbaid Gaffoor will speak on Data Guard, Pichai Bala on the challenges of data warehouses, and Chen Shapira on the problems of concurrency.

Let's start 2009 on the right foot. I look forward to seeing you on February 12. ▲

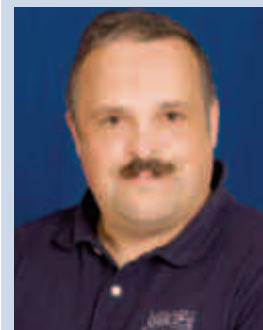


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# Spotlight on Oracle



Bert Scalzo

Bert Scalzo has worked with Oracle databases for well over two decades, starting with version 4. He has an extensive academic background, including a PhD in computer science. He has written six books on Oracle: Oracle DBA Guide to Data Warehousing and Star Schemas, TOAD Handbook, TOAD Pocket Reference, Database Benchmarking: Practical Methods for Oracle & SQL Server, Advanced Oracle Utilities: The Definitive Reference and Oracle on VMware: Expert Tips for Database Virtualization.



**Why Oracle? Enterprise Edition with Partitioning now costs \$59,000 per CPU. The annual support fee is 22% of the purchase price. MySQL has partitioning and it's free.**

I always answer this question using a hopefully clever wordplay of an old *Saturday Night Live* skit: "Oracle been very, very good to me." I chose databases and Oracle way back, and mostly stick with what I think I know. I've presented papers at the MySQL conference—but until their SQL optimizer matures, I'll stick with Oracle's proven track record, maturity, and scalability. But I'm watching MySQL, SQL Server and even PostgreSQL—because things can always change.



**My experience with RAC has been bumpy. Is it just me? Is RAC a bane or a boon?**

RAC is a great technology. But RAC requires teaching us "old dogs" some new tricks. We cannot simply apply SMP-based Oracle rules of thumb to RAC and expect the same results. I've seen numerous RAC "proof of concept" tests fail from this, and thus people sticking with their comfort zone.



**A company I know has been using Oracle 10g for a long time. Is it time for them to upgrade to Oracle Database 11g? Their database is very stable and performance is rock solid. They don't have a support contract anymore and don't seem to need one. The application was written in-house.**

That's a tough question. The technologist in me wants to say 11g—because I like to stay current. The pragmatic consultant in me says don't fix what ain't broke. But I never advise anyone to skimp on Oracle support—and no, I'm not an Oracle stockholder. MetaLink access alone can save many hours' time and real dollars. While Internet searches are very powerful and can find useful stuff—critical wisdom and knowledge resides exclusively within MetaLink. It's worth every penny. Furthermore, as long as Oracle offers new patch sets for your database, it's worth being able to evaluate and deploy them.



**In your latest book, *Oracle on VMware*, you make a case for "solving" performance problems with hardware upgrades.<sup>1</sup> Is Oracle too hard to tune, then?**

No—Oracle is a great database with extensive flexibility. Instead, it's the cost of tuning (whether for database, operating system, and/or application) that has become somewhat cost ineffective. Let me give an example. A decade

<sup>1</sup> Editor's Note: Here's the full quote from Dr. Scalzo's book: "Person hours cost so much more now than computer hardware even with inexpensive offshore outsourcing. It is now considered a sound business decision these days to throw cheap hardware at problems. It is at least, if not more, cost effective than having the staff [sic] tuned and optimized for the same net effect. Besides, a failed tuning and optimization effort leaves you exactly where you started. At least the hardware upgrade approach results in a faster/better server experiencing the same problem that may still have future value to the business once the fundamental problem is eventually corrected. And, if nothing else, the hardware can be depreciated, whereas the time spent tuning is always just a cost taken off the bottom line. So, with such cheap hardware, it might be a wiser business bet to throw hardware at some solutions sooner than was done in the past. One might go so far as to make an economic principle claim that the opportunity cost of tuning is foregoing cheap upgrades that might fix the issue and also possess intrinsic value. Stated this way, it is a safe bet that is where the business people would vote to spend."



ago, tuning the SGA memory allocation and usage was critical—and it still is today. But with dirt-cheap memory, servers that can accommodate tons of memory, and Oracle automatic memory management—just buy more memory. It's often far cheaper to add 16 GB RAM than pay two days' expert database consultation fees. Yes, there are some scenarios where simply adding hardware might make a database bottleneck situation worse. But the odds and cost are now such that it's a worthwhile first step—since you can always tune if that fails. I'm just preaching to try cheap and easy solutions first.



***I make a good living adding hints to Oracle queries to improve performance. Does the optimizer really need a hint or is it something the developer or DBA is doing wrong in the first place?***

That's a loaded question. People generally fall into one of two camps: hints are okay and hints are the devil's spawn. So picking one side or the other means 50% of the people will disagree with me, and trying to find a happy middle ground will mean 100% of the people think I'm nuts. Personally, I'm not a huge fan of hints—I'd rather rely on 11g's outstanding plan management features (profiles and baselines). For me, even 10g's stored outlines are often preferable. But I nonetheless often have to use hints to find the needle in the SQL optimization haystack for whatever reason. When I do, I rely on Quest Software's SQL Optimizer. Okay, now I sound like a sales guy—I've mentioned two products from the company I work for. But we used to do a booth drawing where we displayed a SQL statement on a banner and asked people to guess how many rewrites could be done. No ones' guesses ever came close to the 39,000 actual rewrites possible. Any tool that helps to generate and filter through all those SQL coding possibilities and performance ramifications is worth a look. It even suggests structural changes to further extend that research. Do note that I did not mention my tool—Toad. So while I may have mentioned some Quest tools, I did not mention my favorite and my baby. I hope that this helps to retain some of my credibility!



***Is 24x7 really possible? Personally, I've never seen a site that was truly 24x7, and I'm inclined to believe that it's a myth. Is MAA the answer? If it is, it sure looks expensive.<sup>2</sup> Is there a cheaper alternative?***

This is an easy question—heck, no. Nothing is life is absolute. There are few universal truths. So 24x7 is not possible—not even with RAC, Data Guard, and redundant hardware. Remember, the Titanic was unsinkable—and look what publicizing that got them. But we technologists work for the business people—they are our customers. Bear in mind that we (technologists) are just overhead. The customer (who is always right) says they are a 24x7 business. So we have to find an SLA that can satisfy their demands/needs. Look at Internet hosting companies. They generally advertise something like 98.5%

uptime. That's what we too should strive to offer. Then based on their reply, we know what hardware, software, Oracle options, etc., we need to deploy to meet those requirements. Then monitor and improve as needed.



***My manager keeps nagging me to get certified. Certification requires the purchase of at least one instructor-led training course. For the price of a five-day training course, I can buy dozens and dozens of good books. I tried to convince my manager to give me a week off to spend at the beach, reading a good book like Effective Oracle by Design by Tom Kyte, but he wouldn't bite. My manager doesn't take my opinion seriously but he'll listen to you. Is he right about this or am I?***

If you look at my resume, I don't really have any current Oracle certifications. So my answer may seem like sour grapes—but I'm not a fan of certifications. When I got my vision corrected (i.e., Intra-Lasik), I looked for someone who had done it a lot and that pro athletes and other doctors went to. Thus my personal selection criteria were competence and acknowledged experience—not cost or academic credentials. I believe the same in our industry. I have a PhD, but that means nothing to people who hire me. It's what I've done and what I know that counts—not the paper on the wall. But meet your manager halfway, agree to attend the next expert training session for certification held in Hawaii or on a cruise ship. Don't laugh, such events do exist. As for Tom Kyte, you are spot on—his books and blogs are pure gold.



***Thanks for answering all my cheeky questions today. I'm always interested in buying a good Oracle book. Do you have some personal favorites that you can recommend?***

There are tons of people writing Oracle books these days—and four whom I've worked with personally and respect (i.e., I learned a lot). For anything PL/SQL related, Steven Feuerstein is the man. For general DBA texts, Mike Ault is a safe bet. For RAC specific, Murali Vallath is second to none. And for anything performance or tuning related I look to Guy Harrison. In fact, Guy has a new book coming out next year that will become the best single reference book for any Oracle professional. I also like Cary Millsap—especially for his Method R trace file tuning approach. But I've not had the privilege of working with Cary; I've just attended his sessions and classes, and have had numerous lunches with him. There are lots of other great Oracle authors—so don't restrict yourself to my short list. ▲

Interview conducted by Iggy Fernandez

<sup>2</sup> [www.oracle.com/technology/deploy/availability/htdocs/maaoverview.html](http://www.oracle.com/technology/deploy/availability/htdocs/maaoverview.html).

# Oracle on VMware

## Expert Tips for Database Virtualization

A Book Review by Brian Hitchcock

### Details

**Author:** Dr. Bert Scalzo

**ISBN:** 978-0979795145

**Pages:** 232

**Year of Publication:** 2008

**Edition:** 1

**Price:** \$34.95

**Publisher:** Rampant Techpress



### Summary

**Overall review:** Worthwhile as a brief introduction to Oracle databases running on VMware.

**Target audience:** Almost anyone who supports or manages Oracle databases.

**Would you recommend to others:** Yes.

**Who will get the most from this book:** Anyone new to virtualization for Oracle databases.

**Is this book platform specific:** Yes, only Linux and Windows are discussed.

**Why did I obtain this book:** I was asked to review this book for NoCOUG.

### Overall Review

First, I have no experience with VMware. This book discusses VMware using Windows and Linux. Again, I don't have experience with Windows or Linux. My experience is on Solaris. This means that I can't comment on the details of the content that refer to aspects of Linux and Windows, but it also means that I am able to review this book as someone completely new to virtualization. I think many potential readers of this book will be in the same position.

This book is a quick and easy read. For anyone who is wondering what virtualization for Oracle might be like, I recommend reading this book. If you are already in the midst of implementing VMware, this book probably won't tell you much that you haven't already experienced. In addition, I

would recommend this book as a general overview of the issues that not only apply to VMware for Oracle but also will come up for anyone wondering about cloud computing, the grid, or any other setup where you are trying to gain the benefits of multiple databases on multiple shared servers.

On the minus side, the index is minimal and when I tried to look something up, it wasn't in the index. I saw many typos in the text, and there were several places where the same exact string of text was used over again. More thorough editing would have taken care of these issues. At multiple points in the text we are told about the "DVD that is included with the book." The problem is, there is no DVD. Using the URL for the Online Code Depot from page 1 of the book, I found that the contents of the missing DVD are available for download.

### Prologue

Here Don Burleson (the series editor) takes us through the history of virtualization from the early days on IBM mainframes to VMware today. He tells us that the "2nd age of main-frame computing" is arriving soon in the form of large servers split into virtual machines using VMware. Being able to run multiple operating systems on the same physical server is a step toward OS independence. An overview of Oracle's development of its own version of VMware is described, followed by a description of the more common concerns about VMware—which we are told are misconceptions. These include single point of failure and a single application hogging the whole server. Specific shortcomings of Oracle VM are offered, namely resource sharing, overhead, and that DBA jobs will suffer. While I'm concerned about DBA jobs being eliminated, I'm not clear who, if not more DBAs, will determine the overhead imposed by Oracle VM and which applications can coexist in the same physical server, will move applications between servers to attempt to improve performance, and so on. As always, new technologies promise to simplify the IT infrastructure and reduce headcount. From what I've seen of clustered environments and RAC specifically, the promised benefits of simplification and reduced headcount continue to be slightly out of reach.

*"As always, new technologies promise to simplify the IT infrastructure and reduce headcount. From what I've seen of clustered environments and RAC specifically, the promised benefits of simplification and reduced headcount continue to be slightly out of reach."*

## Chapter 1—Introduction

The meaning of virtualization is covered, including platform versus resource virtualization. Five specific types of platform virtualization are illustrated, and the book focuses on the first three. The benefits of virtualization are described, including the usual suspects of lower cost and improved resource utilization. It is pointed out that virtualization is similar to Oracle's RAC and grid products. The overhead needed for virtualization is stated to be 10–20%, but we are told that this isn't an issue because the hardware is ten times faster. From comments made later in the book, I assume the author means that the newest servers are faster and cheaper, and that this will easily cover the overhead due to virtualization. The text doesn't offer any insights into how this figure of 10–20% was generated. There is mention that Oracle hasn't (yet?) certified the database for virtual machines. There is no further discussion of this issue, and while I will assume that this certification has, or will soon, be done, you must verify this if you are about to implement any form of virtualization. The reasons to use VMware, why virtualization is the future, and some details about Oracle VM are covered as well.

## Chapter 2—Architecture

The focus here is on two of the architectures described in the previous chapter. The two are Para-Virtualization using the full-cost VMware ESX hypervisor and Full Virtualization using the freeware VMware Server (GSX). The former is for full installations and the latter is for test and development use. The hypervisor is described as a stripped-down operating system specifically optimized to run virtual machines and nothing else. The 10–20% overhead for virtualization is brought up again, but there are still no details on whether this is a real metric or a number simply to illustrate the author's contention that new hardware is so much faster and cheaper that even a 20% overhead doesn't matter. From my inexperienced viewpoint, virtualization should help reduce underutilized servers, but how much better utilization will I have if I first pay a 20% utilization penalty? I would like to have seen a more thorough discussion of the overall utilization improvement when virtualization, its overhead penalty, and new hardware are all taken into account. We are also told that hardware is now so cheap that it is better to "throw hardware" (this is the author's term) at performance problems before spending person time. This will be controversial for some Oracle tuning experts. Note that I am not taking sides on this issue other than to agree that person time spent on tuning exercises is very expensive.

Next there is a worthwhile discussion about the continuing trend to more and more abstraction. The conclusion from this discussion is well stated: "nothing maps one-to-one anymore." Going back to the subject of tuning, the author offers that it is no longer possible to look for a "hot" disk, and perhaps one should no longer try. More generally, the point is that with virtualization, resources are being allocated dynamically. It becomes very hard to look at tuning one SQL statement in one Oracle database. Most Oracle tuning books still focus on specific ways to tune SQL statements. Is this relevant in the virtualized world? Again, this will be controversial but it is a topic that must be addressed.

Finally, virtualization means that the DBA will have to deal

***"We are told that hardware is now so cheap that it is better to "throw hardware" at performance problems before spending person time. This will be controversial for some Oracle tuning experts."***

with more and more people to get things done. To implement a database in such an environment, the DBA may have to work with administrators for storage, network, OS (one or more?), virtualization, and perhaps an infrastructure architect. This also means that the environment is more complex. Remember how virtualization was going to reduce DBA headcount and simplify the environment?

## Chapter 3—Host Setup

Here we see that the performance of the host, i.e., the physical server that is hosting all the virtualized Oracle servers, is the limiting factor on the performance of the Oracle databases. The author tells us that any database server that is a guest on the host server can't be more optimized (tuned) than the host server itself. This means that you must set up the host correctly, and then, when there are database performance problems, you need to look at the host server first. This assumes that you know how to correctly set up the host, and it will cause issues for DBAs that want to tune any database issue by looking for the SQL statement that is consuming the most resources within the database. We are also told that if you can improve host server performance by 10%, this will improve all the hosted databases by 10%. I'm not sure this is true. I think it's an assumption that all databases will be using the same host resources in the same way at the same time. No details or examples are given to support this. I'd like to see some detailed studies of this issue to see exactly what the relationship is between changes in host server performance and changes in database performance for a selection of differently configured databases (OLTP, data warehouse, IO intensive, memory intensive, etc.).

More discussion of the need for lots of hardware follows—specifically the recommendation for as much CPU and memory as budget will allow, since the author believes that adding hardware to solve performance issues is cheaper than the cost of the person hours to attempt to tune the existing hardware. The author brings up a good point that many people will start to evaluate virtualization using old hardware that isn't up to the task and then conclude that virtualization isn't a good solution. It's one of many chicken-and-egg situations in the real world. Until you know enough about virtualization to competently choose and configure the needed hardware, you can't do a competent evaluation of virtualization, which is something to keep in mind when you think you will just add "evaluate virtualization" to your group's project task list. Despite the marketing claims (simple! faster! fewer DBAs!), it really is more complex, and it will not be simple to evaluate for your business. The rest of this chapter has many specific details for



***“Virtualization means that the DBA will have to deal with more and more people to get things done. To implement a database in such an environment, the DBA may have to work with administrators for storage, network, OS (one or more?), virtualization, and perhaps an infrastructure architect. This also means that the environment is more complex. Remember how virtualization was going to reduce DBA headcount and simplify the environment?”***

installing, configuring, and optimizing the Linux (or Windows) host operating system to support virtual machines.

#### **Chapter 4—Guest Setup**

This chapter focuses on creating and configuring the virtual machines, the operating system installations that are guests on the host server. Specifics are covered for both Linux and Windows. The author describes how virtualization provides more options when database performance is lacking. Instead of moving the database to a different server, you can assign more host server resources to the existing guest virtual machine. And while this new level of flexibility is more complicated, the author suggests that this is a good thing because it means the DBA has more job security. I’m confused, but that isn’t unusual. I guess this means that the DBAs that don’t get laid off have more security.

The process of creating the virtual machines is covered in great detail, including screen shots of the windows seen in VMware during the process. The importance of the DBA understanding and having input in the selection of the VM settings is emphasized. The DBA will have to learn some new tricks to have the aforementioned increase in job security. ’Twas ever thus! One of the windows tells us that the maximum memory that can be assigned to a virtual machine is 3580 MB. I hope I’m misunderstanding this, because many databases will require much more than 3.6 GB of memory, and I assume the virtual machine will require some of this memory itself.

Once installed, the steps for tuning the virtual machine for virtualization and the Oracle database are covered. This covers optimization of CPU, memory, IO, and network resources. Specifics are given for both Linux and Windows. There is an

<sup>1</sup> Editor’s note: Brian meant “skillssets” of course. NoCOUG editor Karen Mead asked if database administrators use frying pans in their work. Perhaps Brian wrote this review right after eating breakfast!

interesting section that explains that neither Linux nor Windows is superior in terms of TPC performance, and therefore the choice of which to use for the virtual machine is more a matter of available skillsets<sup>1</sup> in your organization. Again, I won’t take sides.

#### **Chapter 5—Oracle 11g Setup**

This chapter offers a process to create a demo installation for 11g, including VMware on minimal hardware such as a laptop. The reason this is needed is that the DBA needs to tune the virtualized database installation and then use this “golden” installation as a source of files for further installations. I can see why you would need demo systems—perhaps for training, for instance—but I’m not clear that time spent tuning Oracle on a laptop would directly apply to the full-up installations of Oracle that will be needed for the real servers. Because the installation is being done on a laptop, details are given for choosing BIOS settings along with all the other aspects of the operating system and the database. I wonder how many DBAs are qualified to tinker with BIOS settings. I’m told that I should only install the minimum Windows services needed. More things for the DBA to know about. The installation of 11g is also covered in great detail.

#### **Chapter 6—Pseudo RAC setup**

Similar to the previous chapter, here we see how to set up a RAC installation on a single node (a laptop). We are told that this is for demo and learning purposes. The fact that Oracle doesn’t support this is explained, which leaves me unclear on how this will be useful for the actual RAC setup of 11g on VMware. As an aside, the author offers statistics that 70% of users currently using 9i or 10g don’t plan to move to 11g, and therefore the database version installed in this chapter will be 10g. But we installed 11g in the previous chapter, didn’t we?

#### **Chapter 7—True RAC Setup**

We start with the issue of RAC and VMware compatibility. We are told that most database servers are overpowered in terms of CPU because database performance is limited by I/O. Therefore, these database servers have underutilized CPU capacity, and virtualization will allow better use of these servers’ CPUs. I’m curious about whether most database servers are underutilizing their CPUs by more than 20%. If virtualization takes 10–20% overhead (as described earlier), then we need to be sure that our RAC database servers have more than 20% CPU available before we can be sure that RAC on VMware will indeed provide more CPU resources.

This results in a figure that shows nodes of multiple RAC installations installed on a single physical server. Each virtual machine on the server is one node of a RAC installation. I would like to see a discussion of how this would all play out as the various RAC nodes failover. What would happen to performance if all the RAC clusters failed over to the same physical server?

The process of setting up virtualized servers for a true RAC setup is described, and this is characterized as a “complex technical undertaking.” One of the more complex aspects is the host’s network setup, in which you need to establish public, private, and storage networks. Clearly I don’t have the necessary background, as I couldn’t understand the sections



describing virtual switches and NIC Teaming. Again, virtualization will require more technical resources.

It's clear that the process of setting up RAC on virtualized servers is complicated. We are told, again, that if (when?) there are performance issues, the best approach is simply to move the entire virtualized database to another physical server to see if performance improves. I don't see moving a complete RAC setup from one set of virtualized servers to another as an easy task. Do you have the resources to be ready at any time to perform such a move? Further, who will know exactly which node of which RAC database is running on which physical server? Who will know which other physical servers have enough spare capacity to support such a move? How many "extra" physical servers do you keep in reserve to support moves like this? Aren't spare servers, by definition, underutilized? How many such servers would represent enough underutilized capacity to offset the utilization gains promised by virtualization? I assume some of my concerns would be addressed by cloud computing, where you assume a third party will have spare resources at all times. But then you are relying on this third party to always have the spare servers you may need, along with the ability to quickly move your database between servers.

#### Chapter 8—Performance Comparisons

This chapter tells us that the performance of a database on a virtualized host is similar to that of a non-virtualized host. Most of the chapter is spent describing the benchmarking process; it covers some benchmarking myths, best practices, and how to select a benchmark. The results of all this show that while virtualization does add some overhead, the database performance is only slightly reduced due to virtualization.

#### Chapter 9—Additional Tuning Thoughts

While virtualization adds another layer of abstraction, the material here tells us that most of what you already know about database performance tuning still applies. Tuning methodologies are broken down into two basic approaches, measuring and reducing ratios, and measuring and reducing response time. While the author prefers the response time method, a third way is also described wherein a consultant can ask simple questions and make simple changes to improve performance in a single day. Several additional tuning issues that are specific to virtualization are then discussed.

One of the specific issues addressed is very interesting. We are told to examine the workload characteristics of each of the virtualized databases running on the physical server to see if they are compatible. First, how will you determine this? A single physical server could be hosting many virtual databases,

and those databases may have changing workloads. Second, if you have to know the specifics of each database on each physical server, doesn't this contradict the flexibility that virtualization is offering? How can you simply apply additional (or reassign existing) resources when you must first determine exactly what is using the resources? What happens when you use cloud computing where, in theory, you have no idea what is running, which server it is running on, etc?

#### Chapter 10—Oracle Virtual Appliances

Here we are told that since virtualization is quickly becoming mainstream, it will soon lead to other innovations. One of these is software delivery. Instead of installing new software, you will simply copy the files for the entire virtual machine and start the application. Similarly, vendors that deliver large data sets to customers could simply supply a complete database ready to run in your virtualized environment. Other possibilities would affect training and education. The contents of the DVD, which include a virtual machine with Linux and Oracle 10g database already installed, are described in detail at the end of the chapter.

#### Conclusion

This book is worth reading to gain an understanding of what virtualization will require of your organization. There is a great deal of detail that isn't covered, but for someone new to the subject, the amount of information in this book is about right. I would like to have seen some discussion of support and maintenance of a real-world virtualized environment. I wonder how it will really work when you need to apply patches to the hypervisor, which supports multiple virtualized databases. When the time comes to troubleshoot problems, I wonder who will know all the details of what runs where, how each physical server and each virtual machine are configured, and what to change. I am also curious to see a detailed study of the overall reduction of unused server capacity that results after the overhead of virtualization and the need for extra resources to handle future performance needs are taken into account. ▲

*Brian Hitchcock has worked at Sun Microsystems in Newark, California, for the past 11 years. He is a member of a DBA team that supports 2400+ databases for many different applications at Sun. He frequently handles issues involving tuning, character sets, and Oracle applications. Other interests include Formula One racing, finishing his second Tiffany Wisteria lamp, Springbok puzzles, Märklin model trains, Corel Painter 8, and watching TV (TiVo rules!). Previous book reviews by Brian and his contact information are available at [www.brianhitchcock.net](http://www.brianhitchcock.net).*

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***“We are told that since virtualization is quickly becoming mainstream, it will soon lead to other innovations. One of these is software delivery. Instead of installing new software, you will simply copy the files for the entire virtual machine and start the application. Similarly, vendors that deliver large data sets to customers could simply supply a complete database ready to run in your virtualized environment.”***

# Socket Interceptor

## Setting Query and Connect Timeouts

by Joel Thompson



Joel Thompson

In this article we'll discuss how to develop your own Socket Interceptor. What is Socket Interceptor? I'm glad you asked. Have you ever noticed that you can set query and connect timeouts in JDBC, but Oracle's JDBC driver doesn't set this on the socket, but rather handles it on the Oracle Server side. For our environment, this was a short-coming, as we would sometimes "hang" for an indefinite period of time, waiting for Oracle to time out. Or worse, if the network was the problem, then we'd hang indefinitely, and we needed a way to break the request from the client side. Thus we created Socket Interceptor to wrap around a socket and intercept connect/read calls, and set the socket timeouts accordingly. This article discusses how you can write your own Socket Interceptor and plug it into the java.net.Socket system. Socket Interceptor can also be used to monitor and log traffic at the socket layer, yet this is left as an exercise for the reader.

For example, to demonstrate the problem, if you wrote the following code to connect to your database, you could be waiting as much as 45 seconds to determine that that IP address is incorrect or there is no listener on that port.

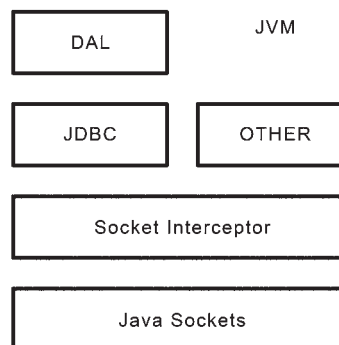
```
Connection conn = null;
try
{
    //make sure that ojdbc14.jar is in your classpath.
    Class.forName("oracle.jdbc.driver.OracleDriver").newInstance();
    conn = DriverManager.getConnection(
        "jdbc:oracle:thin:scott/tiger@" +
        "192.168.1.1:1521:XE");
}
catch (SQLException sqle)
{
    //will timeout in 45 seconds, if 192.168.1.1 is not available.
    System.out.print("Exception: " + sqle);
}
```

And for the following long-running query, it may take a minute or two to complete—which is more time than you'd like to spend.

```
String sql="select product_id, count(amount) from orders " +
    " where cust_id=5 having count(amount) >= 20 " +
    " group by product_id";
Statement stmt=conn.createStatement();
ResultSet rs=stmt.executeQuery(sql);
while (rs.next()) {
    ...
}
```

Again, there is a solution to this problem provided in JDBC, yet it relies on Oracle's server timing out and not on socket timeouts. While I can't provide the code for the entire Socket Interceptor, as that would violate my trade agreement with my current employer, I will tell you how to build your own SI and you can take it from there.

First I'd like to point out some basic requirements of SI and then give you the general overall design. After that I'll get into some details about the code itself.



### Basic requirements

1. SI is JVM local, meaning that we are not replacing the OS's socket behavior. SI will run in your JVM, intercepting all socket calls within that JVM.
2. SI must be thread safe and defined in a threadLocal context.
3. SI must be controllable on a per-query basis and a per-connection basis.
4. The consumers of SI services must not have to alter existing SQL to use SI.

### Design

The java.net.Socket class delegates all its calls to the SocketImpl, and Socket class provides a mechanism to set a Factory to allow a custom SocketImpl class (we'll call it MySocketImpl) to be returned.

We will use the socket's setSocketImplFactory method to set the Factory that creates the SocketImpl to our own MySocketImplFactory. When a new socket is created, it will ask the MySocketImplFactory for its impl, and we'll return our own MySocketImpl and thus be plugged into to all socket calls.



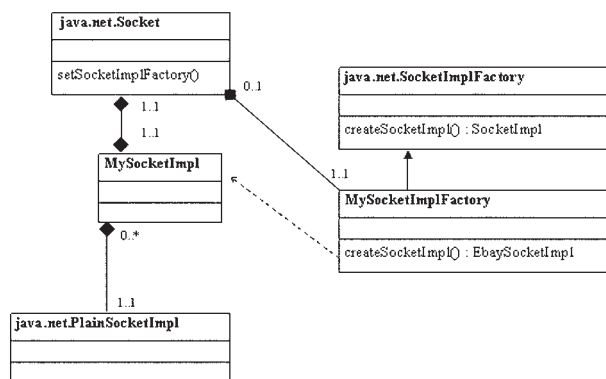
In order to intercept all reads and writes, thus allowing us to set the “read timeout,” we’ll also need to implement `MyInputStream` and `MyOutputStream` for a “write timeout.” Note, however, that we cannot implement a “write timeout” with `MyOutputStream`, since write timeouts are not supported by `java.net.Socket`.

We could write `MySocketImpl`, `MyInputStream`, and `MyOutputStream` from scratch, or we could try to extend the functionality of existing classes. For instance, we might think to extend `SocksSocketImpl` or `PlainSocketImpl` (since `SocksSocketImpl` is the class that is used by default in `Socket`), and just provide methods to “intercept” calls prior to passing to its super class. However this won’t work, since both of these classes are declared with package protection in `java.net`, and as such we can’t extend them.

We could add to or replace appropriate classes in `java.net`; however, this would lead to build/deploy and maintenance dependencies that we do not want to deal with.

So instead, we’ll opt for a trick with reflection and delegation to circumvent these package restrictions. This way we don’t have to code these new classes by hand from scratch. For instance, our `MySocketImpl` class will extend `SocketImpl` (as that is a requirement of the `Factory`), and we’ll create a member variable called `plainsocketimpl`, instantiate it through reflection, and pass all calls to our delegate `plainsocketimpl` object. The same thing will be done with `MyInputStream` and `MyOutputStream`.

We will set up our `Context` prior to using `JDBC` calls for connections and queries. This `Context` will be referred to by our own `MySocketImpl`, `MySocketInput`, and `MySocketOutput` to get the per-connect/query settings that we’d like to use. We’ll provide a way to end socket tracking.



## The Code

Next is the pseudo-code—I’m calling it “pseudo-code,” since I have not tested this code as it is—and it should be used to guide your actual implementation. I tried to make this as accurate as possible, and I have implemented this code in like-kind with my current employer, so I know conceptually that it will work. Please refer to the comment code inside the code itself to provide additional insight.

```

/*
    Instantiate an object of this class and pass it to
    "beginSocketInterceptor" in MySocketImplFactory.
*/

```

```

public class MyContext
{
    public int connect_timeout;
    public int read_timeout;
}

public class MySocketImplFactory implements SocketImplFactory {
    {
        private static ThreadLocal activeContext = new ThreadLocal();

        /*
            typical singleton pattern, so only one factory object exists.
        */

        static {
            /*
                once the factory is established, don't mess with
                it by nulling it out and reestablishing... You
                can't assign a new factory to Socket, once one
                is already established.
            */
            factory=new MySocketImplFactory();
        }

        private MySocketImplFactory() {
        }

        public MySocketImplFactory getFactory() {
            return factory;
        }

        public static synchronized void initialize() {
            /*
                Register this factory with Socket class
            */
            Socket.setSocketImplFactory(
                MySocketImplFactory.getFactory());
        }

        /*
            Call this method to "start" socket interceptor.
            Here you pass the read_timeout and
            connect_timeout in the context.
        */
        public void beginSocketInterceptor(MyContext ctx) {
            setActiveContext(ctx);
        }

        public void endSocketInterceptor() {
            activeContext.remove();
        }

        private static void setActiveContext(MyContext context) {
            activeContext.set(context);
        }

        public static MyContext getActiveThreadContext() {
            return (MyContext) activeContext.get();
        }

        /*
            the factory must implement this method since it
            implements the SocketImplFactory interface.
        */
        public SocketImpl createSocketImpl() {
            MySocketImpl socketImpl = new MySocketImpl();
            return socketImpl;
        }
    }
}

```

Again, I'll point out that the `MySocketImpl` class will extend `SocketImpl`, but no functionality will be used from this base class. This inheritance is only in place to support the "createSocketImpl()" method from the factory. `MySocketImpl` will delegate all the method calls to the `plainsocketimpl` object of type `PlainSocketImpl` and its super class `SocketImpl`. Therefore, with the help of reflection, we need to get handles to the methods in both these classes. You only need to provide methods for the most visible method. The key methods that are the main feature of this SI are listed in the code below. They are "connect", which will get the context from the factory in order to retrieve the current read/connect timeouts, and "getInputStream", which will return our `MyInputStream` so that we can intercept the READ calls and set up the perquery read timeout on the socket. You will have to look up the other methods for `PlainSocketImpl` and `SocketImpl` and provide method handlers for each method as mentioned earlier.

```
import java.net.*;

public class MySocketImpl extends SocketImpl {
    /*
     * The underlying PlainSocketImpl object used to
     * implement the functionality of this class.
     */
    private Object plainsocketimpl = null;

    /*
     * member variable to hold the context for this thread.
     * initialized on "connect".
     */
    MyContext context=null;

    /*
     * Reference to the PlainSocketImpl class.
     */
    private static Class psiClass = null;

    /*
     * Reference to the SocketImpl class.
     */
    private static Class siClass = null;

    /*
     * Constructor for the PlainSocketImpl class.
     */
    private static Constructor psiConstructor = null;
    private static Constructor psiConstructorFd = null;

    /*
     * PlainSocketImpl methods.
     */
    private static Method psiConnectSiMethod = null;
    private static Method psiConnectAiMethod= null;
    private static Method psiConnectSAiMethod= null;
    private static Method psiGetInputStreamMethod = null;

    ... LIST ALL THE METHODS IN PlainSocketImpl HERE.

    /*
     * Do a static initialization of
     * constructors and methods
     */
}
```

```
static {
    try {
        /*
         * setAccessible(true) is called to indicate
         * that the reflected object should suppress
         * Java language access checking when used.
         */
        psiClass = Class.forName("java.net.PlainSocketImpl");
        psiConstructor = psiClass.getDeclaredConstructor(
            new Class[] {});
        psiConstructor.setAccessible(true);

        psiConstructorFd = psiClass.getDeclaredConstructor(
            new Class[] { FileDescriptor.class });
        psiConstructorFd.setAccessible(true);

        psiConnectSiMethod = psiClass.getDeclaredMethod(
            "connect", new Class[] { String.class, int.class });
        psiConnectSiMethod.setAccessible(true);

        psiConnectAiMethod = psiClass.getDeclaredMethod(
            "connect", new Class[] { InetAddress.class,
                                    int.class });
        psiConnectAiMethod.setAccessible(true);

        psiConnectSAiMethod = psiClass.getDeclaredMethod(
            "connect", new Class[] { SocketAddress.class,
                                    int.class });
        psiConnectSAiMethod.setAccessible(true);

        psiGetInputStreamMethod =
            psiClass.getDeclaredMethod(
                "getInputStream", new Class[] {});
        psiGetInputStreamMethod.setAccessible(true);

        ... DO THE SAME FOR OTHER PlainSocketImpl
        Methods AND FOR SocketImpl and its methods.

    } catch (Exception e) {
        ...
    }
}

/*
 * Delegate constructors
 */
public MySocketImpl(FileDescriptor fd) {
    /*
     * Construct the underlying PlainSocketImpl object.
     */
    try {
        plainsocketimpl = psiConstructorFd.newInstance(
                                                    new Object[] { fd });
    } catch (Exception e) {
        ...
    }
}

public MySocketImpl() {
    /*
     * Construct the underlying PlainSocketImpl object.
     */
    try {
        plainsocketimpl = psiConstructor.newInstance(
                                                    new Object[] {});
    } catch (Exception t) {
        ...
    }
}
```



```

    }
}

/*
    helper method to invoke the proper method with args.
*/
private final Object callPlainSocketImpl(Method method,
                                         Object[] args)
                                         throws IOException {

    try {
        /*
            Call the delegate object, plainsocketimpl method
            and return the result.
        */
        Object ret= method.invoke(plainsocketimpl, args);
        return ret;
    } catch (Exception e) {
        ...
    }
}

protected void connect(String host, int port) throws IOException {
    realConnect(host, port);
}

protected void connect(InetAddress address, int port)
                    throws IOException {
    realConnect(address, port);
}

protected void connect(SocketAddress address, int timeout)
                    throws IOException {
    realConnect(address, timeout);
}

private void realConnect(String host, int port)
                    throws UnknownHostException, IOException {
    realConnect(InetSocketAddress.createUnresolved(host,
                                                    port), 0);
}

private void realConnect(InetAddress address, int port)
                    throws IOException {
    realConnect(new InetSocketAddress(address, port), 0);
}

private void realConnect(SocketAddress address, int timeout)
                    throws IOException {

    /*
        get the connect timeout from the context, iff not null.
        note: this will override the parameter "timeout" passed.
    */
    context = MySocketImplFactory.getActiveThreadContext();
    try {
        if (context != null) {
            if (context.connect_timeout > 0) {
                timeout = context.connect_timeout;
            }
        }
    }

    callPlainSocketImpl(
        psiConnectSAIMethod,
        new Object[] { address, new Integer(timeout) });

} catch (Exception e) {
    ...
}

```

```

}

private final InputStream realGetInputStream()
                    throws IOException {

    return (InputStream)
        callPlainSocketImpl(
            psiGetInputStreamMethod,
            new Object[] {});
}

/*
    This is where we "intercept" the InputStream and can
    interact with it, using the MyInputStream class.
*/
public synchronized InputStream getInputStream()
                    throws IOException {
    InputStream is=this.realGetInputStream();
    if(context!=null) is= new MyInputStream(this,is);
    return is;
}

}

/*
    MyInputStream is the wrapper class for the Socket's.
    InputStream All reads will go through this class, and
    we setup a read timeout on Each "read" call.
*/
public class MyInputStream extends InputStream {
    InputStream is = null;
    SocketImpl socketImpl=null;

    public MyInputStream(SocketImpl p_so,InputStream pis) {
        socketImpl=p_so;
        is = pis;
    }

    public int read() throws IOException {
        int amt = 0;
        try {
            _setTimeout();
            amt = is.read();
        } catch (Exception e) {
            socketImpl.close();
            ... & rethrow
        }
        return amt;
    }

    public int read(byte b[]) throws IOException {
        int amt = 0;
        try {
            _setTimeout ();
            amt = is.read(b);
        } catch (Exception e) {
            socketImpl.close();
            ... & rethrow
        }
        return amt;
    }

    public int read(byte b[], int off, int len) throws IOException {
        int amt = 0;
        try {
            _setTimeout ();
            amt = is.read(b, off, len);
        } catch (Exception e) {
            socketImpl.close();
        }
    }
}

```

```

    ... & rethrow
    }

    return amt;
}

/*
This method reads from the thread-local context to get the
read timeout, and then sets up the socket to have that read
timeout. This is the key procedure to setting up per query
timeout.
*/
private void _setTimeout ()
    throws SocketTimeoutException, IOException {

    MyContext context =
        MySocketImplFactory.getActiveThreadContext();

    if (context != null) {
        socketImpl.setOption(SocketOptions.SO_TIMEOUT,
            context.read_timeout);
    } catch (Exception e) {
        socketImpl.close();
        ... & rethrow
    }
}

}

}

}

public class MyOutputStream {
    ... this class is not shown, since we don't have a write_timeout
    ... available from the java socket. however, if you wanted to do
    ... something prior to writing, then you could implement the same
    ... pattern as done in MyInputStream.
}

```

Now for the fun part—calling our Socket Interceptor with our Java code. I'll use the same example code I showed earlier, except with Socket Interceptor now integrated.

```

Connection conn = null;
MyContext ctx=new MyContext();
try
{
    ctx.read_timeout=5000; //milliseconds
    ctx.connect_timeout=10000; //millis

    MySocketImplFactory.beginSocketInterceptor (ctx);

    //make sure that ojdbc14.jar is in your classpath.
    Class.forName("oracle.jdbc.driver.OracleDriver").newInstance();
    conn = DriverManager.getConnection("jdbc:oracle:thin: " +
        "scott/tiger@" +
        "192.168.1.1:1521:XE");
}
catch (SQLException sqle)
{
    // NOW will timeout in 10 seconds, if 192.168.1.1 is not available.
    System.out.print("Exception: " + sqle);
}

```

The following long-running query may take a minute or two to complete—which is more time than you'd like to spend.

```

String sql="select product_id, count(amount) from orders " +
    " where cust_id=5 having count(amount) >= 20" +
    " group by product_id";
Statement stmt=conn.createStatement();

/*
Will now timeout in 5 seconds.
*/
ResultSet rs=stmt.executeQuery(sql);

while (rs.next()) {
    ...
}

MySocketImplFactory.endSocketInterceptor ();

```

## Concluding Remarks

In conclusion, we created Socket Interceptor to help with breaking the connection/timing out from the client side. This helps with network problems or Oracle hanging on normal JDBC timeouts.

To implement Socket Interceptor, basically we provided our own set of classes (MySocketImpl, MyInputStream) that delegate all behavior to underlying java.net classes. The MySocketImplFactory is registered with the Socket class by calling `Socket.setSocketImplFactory(MySocketImplFactory)`, and when a new `Socket(...)` class is created the Socket class calls this Factory to get its `SocketImpl` (in this case `MySocketImpl`). `MySocketImpl` is what the Socket class uses for all its work. We provide the timeout parameters to `MySocketImpl` and `MyInputStream` via `MyContext`. `MyContext` is stored in a thread-local variable in `MySocketImplFactory`. All `InputStream` read operations reference this context to get the current timeout and then call `Socket`'s `setOptions` to set the timeout prior to calling "read" on the underlying stream.

A slight word of warning, `ServerSocket` may not work properly with this solution. It's a long story, but basically `ServerSocket`'s `implAccept (...)` method accesses the address and fd fields from `SocketImpl` and JNI code directly when setting up the returned socket. The solution to this is to copy these attributes to the delegated `plainSocketImpl` from the `MySocketImpl` before and after `bind` is called on the socket.

I hope you find this article interesting and useful. I know it's a lot of work to set up the delegated methods, but at least you know that this is a workable solution that can provide you with the timeouts you need.

If you have any questions on this article, please feel free to email me at [joel@rhinosystems.com](mailto:joel@rhinosystems.com). ▲

*Joel Thompson currently works as a senior programmer at eBay Corp. However, he can be reached at [www.rhinosystems.com](http://www.rhinosystems.com), and via email at [joel@rhinosystems.com](mailto:joel@rhinosystems.com). He has programmed in Java/J2EE since 1997, and prior to that he worked as a senior programmer and development manager at Oracle Corporation beginning in 1989. He resides in Auburn, CA, with his wife and three children, and enjoys snowboarding, jogging, tennis, and many other outdoor activities.*

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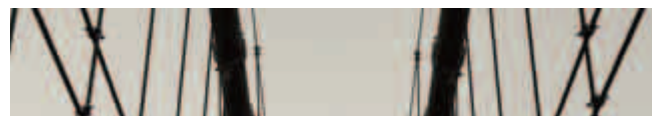
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# How to Design a Compliance Data System

by John Weathington



*John Weathington*

**D**esigning a Compliance Data System (CDS) is not a difficult task, especially when you consider that you do not have to start from scratch. In the last article, we talked about how Bill Inmon and his Corporate Information Factory provided the roots of modern day data warehouse architecture and design. We further highlighted the more salient components of the Corporate Information Factory: the Enterprise Data Warehouse, Operational Data Store, and Data Mart, and started our discussion on design by showing how the design concepts of the operational data store can be leveraged to serve the purpose of enterprise-wide compliance.

## Compliance Operational Data Store

The operational data store is a good place to start, because in traditional data warehouse architecture it's typically the first phase of transformation from your source systems. Once your compliance operational data store is complete, you should have a clear snapshot of your company's compliance profile at any given time. If done properly, your compliance operational data store should be able to answer the question, "Are we in compliance right now?" The time frame for "right now" is dependent on the refresh rate (commonly referred to as "class") of your compliance operational data store. Under most circumstances a daily refresh (class 3) is sufficient, so in effect your compliance operational data store should be able to answer the question, "Were we compliant yesterday?" or more accurately, "How compliant were we yesterday?"

At the atomic level, the question of compliance resolves to a Boolean answer: yes or no. For instance, if your company's policy is to have all transactions over \$5,000 authorized by a senior manager, for every single transaction we can determine in black-and-white terms whether or not this policy is being followed. As we start aggregating the data, we can represent the degree of compliance with a proportion or percentage of compliant transactions to total transactions. For instance, if your company processed 1,000 transactions yesterday and two \$5,000 transactions were not authorized by a senior manager, this could be represented as a daily compliance rate of 98.8%.

Your compliance operational data store needs to store both atomic and aggregated compliance metrics. The atomic transactions are required for, among other things, auditability. The aggregated compliance metrics are necessary for reporting and compliance improvement efforts.

## Compliance Enterprise Data Warehouse

Although the compliance operational data store is a vital component of the Compliance Data System, the system cannot survive on this component alone. The data's next stop in a traditional data warehouse's design is the Enterprise Data Warehouse. Architecturally, the key difference between the operational data store and the enterprise data warehouse is volatility. This means that every time the operational data store is loaded, the existing data is wiped out and the new data comes in to represent the new snapshot of period activity. In contrast, once data is written to the enterprise data warehouse, it is never deleted or updated. This characteristic of the enterprise data warehouse makes it an ideal component of your compliance data system, to provide point-in-time (historical) data, and change data (what has changed and when did it change), both of which are also vital requirements to satisfy in a properly constructed compliance data system.

The question your compliance enterprise data warehouse answers is "How compliant were we on this date in history?" This is the most functional component of your compliance data system, for the purpose of satisfying audits. When an auditor is conducting an audit, there is typically a fiscal boundary to reference (i.e., the last fiscal quarter or month). Also, it's quite common for an audit to last several days, and you wouldn't want your data changing as the audit is being conducted.

To construct your compliance enterprise data warehouse, you must be able to tie together time, policy, and compliance status. This is essentially what an audit is all about: based on a point-in-time reference, were you in compliance with the stated policy? As noted earlier, your compliance operational data store should clearly capture compliance status, so this can easily be downstreamed by the enterprise data warehouse. Policy data can exist in a source system or pass through the operational data store. My recommendation is to pass it through the operational data store, even if it's unchanged there. This will consolidate the downstream points and give you greater reporting flexibility. Tying in time will be done with your change data capture process.

Change data capture is an absolute must in a compliance data system. You must be able to know what has changed in your source systems and when it was changed. Never, ever trust data owners of source systems that claim their data never changes. You must have a technical solution in place that guarantees the accuracy of your assertions.

To design this, your source data must have a key that uniquely identifies each row (this is also a fundamental rule of normalization for transactional systems). On each load cycle of your enterprise data warehouse, your transformations must compare the keys it currently has to the keys that are being loaded. If a new key is found, this row is tagged as an “insert.” If a key is missing, this row is marked as a “delete,” but it is not physically deleted. All other rows are marked as “update,” but instead of doing a physical update in the enterprise data warehouse, the existing row is archived and the new row is inserted with the current data. Of course, everything in the enterprise data warehouse includes a timestamp as part of its unique index. In this way, a history of all changes is maintained in the enterprise data warehouse.

In an ideal architecture, your compliance enterprise data warehouse’s single source would be your compliance operational data store. In this way, change data capture can be localized to just one source. If this strategy is followed, ensure that your change data capture requirements flow back all the way to the source systems. In most cases, it’s not good enough to disclose changes that happened solely in your operational data store. The auditors will need to know when the data changed in the source system. Make sure this requirement is covered by making sure adequate source system detail flows through your compliance operational data store to your compliance enterprise data warehouse. Another way to accomplish this is to have a staging area that performs change data capture prior to loading your compliance operational data store. Doing things this way however, may make your audit trail a little complicated.

### Compliance Data Marts

With the compliance enterprise data warehouse in place, you should be in good shape to survive an audit; however, there is one more component of the Corporate Information Factory that we will leverage for our Compliance Data System—the Data Mart.

Up until this point, we’ve been dealing with architectures that are subject oriented. This means that the tables and table groupings are organized by entities, similar to a transactional system. In a typical compliance data system, you may have some entities that resemble the source systems like “orders” and “invoices.” However, you will also have entities that cater to the needs of your compliance requirements, like “reconciliations” and “approvals.” These types of architectures are perfect for answering questions about specific operational information, such as “What was the status of order XYZ on January 23?”

A Data Mart has a different orientation and solves a different type of question. Where the previous architectures answer tactical questions, the data mart answers strategic questions, like “How many total compliance violations did Germany generate in the last fiscal quarter.” To answer this question, you would need to consolidate all types of compliance violations into one place, and tie in (at a minimum) geography and fiscal calendar information. A data mart does this by organizing the data into facts containing metrics that we want to report on, and dimensions containing the data that we want to slice and dice it by. This architecture is commonly

referred to as a “star schema.” Data marts answer strategic questions about a very specific business problem.

Compliance data marts can serve a few purposes in the construction of your compliance data system. From the perspective of surviving audits, separate data marts can be constructed for each type of audit that your company is expecting. Each data mart can be constructed specifically for the audit that it serves, based on the audit plan that will be followed when the auditor shows up.

In addition, since data marts are perfect for slicing, dicing, and aggregating data, they can be used to aid compliance improvement efforts. This can be accomplished by capturing compliance facts (e.g., the number of daily compliance failures) and organizing as many dimensions (time, geography, source, type, etc.) as possible to analyze and highlight the root causes of problem spots, or to validate and quantify the results of your improvement efforts.

As a final consideration, compliance data marts can be used as an early warning signal to prevent potential compliance failures. Leading indicators of compliance failure can be analyzed for their validity in a data mart and then productionalized as a real-time warning system. Prevention is always the best control, as the easiest compliance failure to handle is the one that never happens. This is exactly how the mortgage industry uses your FICO score to prevent a mortgage default.

### More Architecture to Consider

Although the Corporate Information Factory gives us a good base of design to drive from, there are other architectures that you’ll need to consider when constructing your compliance data system. Although a traditional data warehouse is a read-only system, your compliance data system should include some way for your system owners to insert custom data. This is useful for introducing terms and concepts that don’t appear in the existing source systems. Additionally, consider a tracking system for remediation through compliance violations, and a robust system for capturing and storing hard-copy evidence like invoices and approvals.

By no means does this constitute the complete list of architectural considerations; however, in my mind it covers the fundamentals. By coupling the overriding principles of compliance data system construction with these simple design considerations, you can dramatically improve your company’s compliance profile. ▲

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*John Weathington is a management consultant who helps finance executives save money, reduce stress, and avoid penalties and fines. His San Francisco Bay Area-based company, Excellent Management Systems, Inc., has helped companies all over the world, including Sun Microsystems, Silicon Graphics, Hitachi Data Systems, and Hogan and Hartson, LLP. He is a Project Management Professional (PMP) and a Six Sigma Black Belt, as well as an Oracle DBA and Business Intelligence Architect. He runs an expert blog for Quest Software called John Weathington’s Quest for Compliance, a monthly newsletter called Flawless Compliance™, and a public blog called Hard-Boiled Compliance. For more information, please access his website at [www.excellentmanagementsystems.com](http://www.excellentmanagementsystems.com).*

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# Real Application Clusters—Bolt-On Power?

by Chris Lawson



Chris Lawson

It's tempting to think that "bolting-on" RAC automatically improves scalability and alleviates performance problems. Alas, that simply isn't the case. Just like many Oracle features, you need to understand the strengths and limitations of the particular technology so that you can optimize the advantages and avoid potential pitfalls. RAC can indeed provide better scalability—as long as you address the key issues that may obstruct these gains. If you ignore the limitations, you could get worse performance after migrating to RAC.

Although RAC offers significant advantages, distributing processing across multiple nodes does not happen without a cost. Let's take a look at that cost. Later, we'll also explain good ways to avoid performance pitfalls. Let's first take a look and see why RAC can lead to better performance (or at least help maintain existing performance).

## RAC Expands CPU Potential

A key point to keep in mind is this: Installing RAC does not cause things to run faster; rather, RAC provides the potential for faster performance by allowing potentially more CPUs to be employed. For OLTP applications, this simply means having more CPUs available. For batch jobs, data warehouses, and large reporting systems, this likely means increasing the number of threads (or alternatively, increasing Oracle parallelism, which is not the same thing).

## OLTP

Let's first consider OLTP applications: disk reads are often minimal—that is, the application is CPU limited. The SQL is usually very efficient, with each query accessing data via a very selective index. Many blocks are cached at either the Oracle or SAN level. Thus, it is very common for simple OLTP queries to average less than a single disk read per execution.

For example, recently I analyzed the most-run queries on a very large OLTP application. The most frequent query consumed just one disk read every 3,000 executions. Clearly, this application is CPU bound. Using RAC and adding more CPUs

will indeed increase the capacity of the system. Of course, individual queries will not actually run faster (unless the new nodes have faster CPU speeds.)

## Batch Jobs

Batch jobs are trickier to analyze, but will likely also benefit from RAC. Most batch jobs tend to be disk I/O heavy, or I/O limited. For example, in a major financial system application I analyzed recently, two-thirds of the elapsed time was spent waiting for disk I/O. At first glance, it may appear that RAC would be of little value, since RAC doesn't directly change the disk system. After all, if the batch job is not waiting for CPU cycles in the first place, how can adding more CPUs help?

Nevertheless, expanding the CPU capacity can improve these batch jobs as well. Here's why: Overall disk throughput for a given job is directly tied to the number of threads (or degrees of parallelism) that are causing the disk retrievals. So, getting blocks off disk at a faster rate likely means adding more threads—even though little CPU will actually be consumed from the new threads! I am assuming, of course, that we have not reached the overall throughput of the disk system.

An interesting corollary of this is that the increased performance for these disk I/O-limited jobs may be achievable even without RAC. We could simply add the extra threads, knowing that most of the new resources consumed will be from the disk system, not CPU cycles.

## Queries May Degrade a Little

The nature of RAC is multi-node, with each node contributing CPU power. Various sessions—whether OLTP, reports, or batch jobs—can potentially run on any node. That's the beauty of RAC. However, this RAC strength also contains the seed for performance degradation. Here's why: Every time a session accesses an Oracle block, RAC must ensure that the session is provided the correct version of the block—which may actually reside on a different node. When this occurs, there is a slight, but not negligible delay, as the block is trans-

*"RAC can indeed provide better scalability—as long as you address the key issues that may obstruct these gains. If you ignore the limitations, you could get worse performance after migrating to RAC."*

ferred via the cache fusion technology. Additionally, if the sending node has modified the block but not yet written the transaction to the redo log, there is a further delay while the redo block is written.

### Undo Considerations

RAC adds additional complication when nodes are variously updating, inserting, or querying the same block. A typical scenario would be programs that insert rapidly but perform infrequent commits. Any node doing a query of these active blocks must undo the un-committed changes—wherever they originated from, local or remote. Thus, the requesting node must request, wait for, combine, and apply undo changes from multiple nodes. Shipping of undo blocks can thus potentially add significant delays.

### Full Table Scans Issue

Delays due to full table scans can be exacerbated in RAC. When a block is not found cached in the local node, Oracle first attempts to find the block in a remote node (before resorting to a disk read). Potentially, these extra calls lead to longer delays.

### Large Inserts May Degrade a Lot

There are special performance concerns when performing large inserts. In a recent RAC study I analyzed, this was the #1 performance drag. When multiple nodes are performing massive inserts, there may be a lot of high-water mark adjustments. Before a node can adjust the high-water mark, however, it must acquire the HWM enqueue. This leads to delays if a node must wait for the enqueue. Of course, avoiding small extent sizes is a good solution to this issue.

### Wait Events

Oracle captures RAC-unique delays in a set of wait events. The wait event names can be bewildering, but they all identify different delays in transmitting the requested block to the requesting node. Here are some typical RAC wait events that you will almost certainly see in your RAC implementation (there are others, but these are typical):

- gc current block busy
- gc current grant busy
- gc current block 2-way
- gc buffer busy
- gc cr multi block request
- gc current grant 2-way
- gc cr block busy

### Optimize Single-Node Performance First

If you have performance problems on a single node, you will experience even worse performance problems with RAC. Using RAC can't possibly fix a performance problem—at best, it may get only slightly worse. Here's one of the lessons learned during a recent Siebel-RAC implementation study:

*“RAC is not a silver bullet for your performance/scalability problem. An application must be tuned to perform and scale on a single-node database before scaling on RAC.”*

—OpenWorld 2007 presentation  
Siebel on RAC: Customer Experience by James Qiu.

***“RAC is not a silver bullet for your performance/scalability problem. An application must be tuned to perform and scale on a single-node database before scaling on RAC.”***

### Minimize Interaction Between Nodes

Many RAC performance issues relate to minimizing delays due to shipping blocks back and forth between nodes—or worse, some form of inter-node block contention, such as happens during massive inserts occurring simultaneously.

In an ideal setup, we would like the blocks used by one node to rarely be needed by another. This means that we somehow partition users or data to minimize areas of overlap. While 100% node decoupling is probably not achievable, you may be able to partially accomplish this.

One simple way is to partition oft-used tables based on geographical regions. Then route users to a node based on their region, so that any given partition is only accessed by a single node. This could possibly be as simple as setting up East-West partitions.

### Minimize Block Contention

You will not be able to completely prevent all block contention, but here are some good ways to avoid it:

- Distribute data by node.
- Use reverse key indexes.
- Deploy multi-threaded batch jobs based on block id.
- Make blocks sparser.
- Use large cache size and NOORDER for sequences.
- Use larger block size on high-DML objects.
- Focus on Likely Problem Areas

It is important to note that RAC-induced contention will likely correlate with contention that already occurs. That is, you can probably project some of the problem areas ahead of time.

For example, a recent analysis showed a particular insert statement in a non-RAC production environment with substantial buffer busy waits. With RAC, this translated into a global buffer busy wait. So RAC simply amplified contention that was already occurring. A local buffer busy wait turned into a gc buffer busy wait.

For a detailed explanation of using STATSPACK and AWR reports to predict potential RAC problem areas, see my white paper, *Using AWR Reports for RAC Performance Analysis* available at [www.OracleMagician.com](http://www.OracleMagician.com). ▲

*Chris Lawson is an Oracle Performance Consultant and Oracle Ace who lives with his family in Dublin, California. He is the author of Snappy Interviews: 100 Questions to Ask Oracle DBAs and The Art & Science of Oracle Performance Tuning, both available on Amazon. Chris' website is [www.OracleMagician.com](http://www.OracleMagician.com). In his spare time, Chris enjoys golf, choral singing (bass), and throwing frisbees to Morgan, the resident border collie.*

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NoCOUG presents

# Oracle Performance for Developers

with Cary Millsap and Karen Morton

Pleasanton, May 19–20

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Member discount code: NOCOUG20

## Overview

Developers are often taught to treat the database merely as a “data store,” a black box that the developer should neither want nor need to understand. However, two facts that we observe over and over again in the field lead to an inevitable contradiction:

- By far the most important performance leverage in any application is in the hands of those who design and write the application.
- Developers who have an appreciation for how the Oracle Database works write better applications that go faster, require less hardware, and make people happier.

This course approaches Oracle Database performance directly from the developer’s perspective. It shows how the code path you create influences the performance of your software. It shows bad and good ways to accomplish the same specifications, using examples from several different application development languages. It teaches you how to find out for yourself whether the code you’re writing is efficient.

This is not a features course with version-specific tips that evaporate over time. It is a *fundamentals course* that opens your eyes to smarter ways of using the Oracle Database so that it will provide services to your software more quickly and with less overhead than you may have thought possible.

## Agenda

- Oracle performance overview: Performance is response time, response time is code path; Oracle Call Interface (OCI) model; instrumenting your code.
- Oracle code paths: Preparing SQL; fetching rows; buffer access (logical and physical I/O); connecting and disconnecting; network I/O.
- Case studies.
- Discussion and conclusions.

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\$1,250 for non-members,  
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## How to Write Correct SQL and Know It: A Relational Approach to SQL

Dallas, April 27–29

Chris Date is a great pioneer and educator in the relational database field. In this special seminar, he will show you how to write SQL code that is logically correct, how to avoid various SQL traps and pitfalls, and how to use SQL as if it were a true relational language. NoCOUG members can use discount code DFW20 to get a 20% discount. Register at [www.method-r.com](http://www.method-r.com).





Four and twenty lucky winners at the free raffle at the fall conference!

## It's Registration Time Again!

I know the year just zoomed by. I'm sure it's due to the great 2008 NoCOUG program. The board has another stellar year planned for you. Please register early to continue getting this award-winning *Journal* and streamline your conference registration. For our 2008 members who have not yet registered for 2009, this issue of the *NoCOUG Journal* is complimentary. We know you plan to register.

Check the address label on the back of the *Journal*. If there is an asterisk (\*) affixed to your name, you are already registered for 2009. Keep in mind that the mailing list was pulled on 1/26/09. The (\*) status indicator will only be used on this issue.

All 2008 members should have received an email or U.S. mail reminder by now. That will include your NoCOUG ID for online registration at [www.nocoug.org](http://www.nocoug.org). Contact me with any questions at [membership@nocoug.org](mailto:membership@nocoug.org).

Hope to see you at the coming conferences!

—Joel Rosingana  
NoCOUG Membership Director

# Teamwork at NoCOUG



(PHOTO COURTESY OF CALCYCLING)

**N**oCOUG is a successful organization with more than 500 members, and there's no way it could run without teamwork. We have a full and active Board of Directors, plus other volunteers who contribute regularly. All the people on the NoCOUG team contribute in both big and small ways, depending on what they have time for. And it's all of us working together as a team that makes for the great conferences, training days, and other benefits.

But volunteering your time is far from without rewards. In fact, volunteering with NoCOUG offers opportunities to meet and talk with speakers, authors, and other professionals in the Oracle field, as well as other activities. In fact, if your day-to-day job has become routine or doesn't offer you the chance to use some of your other skills—interacting with people, writing, organizing events, etc.—volunteering is a great way to utilize those skills. It's surprisingly fun once you get started. You'll find we are a welcoming bunch of people, and most volunteers say their favorite aspect of volunteering is the people they meet. So, if you would like to get involved but don't know where to start, here are some quick things you can do that don't take much time:

- Contribute an article to the *NoCOUG Journal*
- Volunteer to speak and share your knowledge at a conference
- Recruit a knowledgeable Oracle colleague to speak at a conference or contribute an article
- Help with registration on the day of our quarterly conference
- Assist with marketing our conferences and training days

And, there are plenty of other opportunities to help out. Remember, it takes a lot of teamwork to keep our successful organization growing and providing value to its members. So, if you want to be part of a great team, just send an email to [board@nocoug.org](mailto:board@nocoug.org) and let us know how you want to get involved.

What are you waiting for. Join the NoCOUG Team! ▲

*"I have met many wonderful people during my years of volunteering. Some long-term friendships have developed. Every quarter brings new friends. This is what I enjoy about NoCOUG volunteering."*

*"A big reason for volunteering is the give-back factor. I have received a great deal of valuable experience as a NoCOUG member. I feel it's important to give something back to the organization."*

**—Joel Rosingana**

NoCOUG Membership Director  
and Past President  
Independent Consultant

*"Volunteering with NoCOUG helped me round out my professional skill set by augmenting my technical skills with the 'soft' skills that I think are so very important. During these last eight years, I have held a variety of positions ranging from webmaster to president and I've learned a lot that I would never have learned just being an Oracle DBA or application developer. I've learned a lot about working with people, about how the whole is so much more than the sum of the parts, about how to get things done that are too big to do all by myself."*

**—Roger Schrag**

NoCOUG Past President

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## TREASURER'S REPORT

Jen Hong, Treasurer

### Beginning Balance

October 1, 2008

**\$ 36,371.97**

### Revenue

Membership Dues	1,780.00	
Meeting Fees	780.00	
Vendor Receipts	6,500.00	
Advertising Fee	—	
Training Day	—	
Sponsorship	—	
Interest	37.30	
Paypal balance	—	
<b>Total Revenue</b>		<b>\$ 9,097.30</b>

### Expenses

Regional Meeting	7,681.88	
Journal	6,056.80	
Membership	65.28	
Administration	971.55	
Website	—	
Board Meeting	587.35	
Marketing	100.00	
Insurance	—	
Vendors	116.60	
P.O. Box	86.00	
Training Day	—	
Accounting	—	
Miscellaneous	—	
<b>Total Expenses</b>		<b>\$ 15,665.46</b>

### Ending Balance

December 31, 2008

**\$ 29,803.81**



# NoCOUG Winter Conference

## Session Descriptions

For the most up-to-date information, please visit [www.nocoug.org](http://www.nocoug.org).

### Keynote

#### Extreme Performance—Exadata

Tom Kyte, *Oracle Corporation*. . . . . 9:30–10:30

Data warehouses are tripling in size every two years and supporting ever-larger databases with ever-increasing demands from business users to get answers faster, requiring a new way to approach this challenge. Oracle Exadata overcomes the limitations of conventional storage by utilizing a massive parallel architecture to dramatically increase data bandwidth between database and storage servers. In this keynote, we'll examine these limitations and demonstrate how Oracle Exadata delivers extremely fast and completely scalable enterprise-ready systems.

*Tom Kyte is a Vice President in Oracle's Public Sector division. Before starting at Oracle, Kyte worked as a systems integrator building large-scale, heterogeneous databases and applications, mostly for military and government customers. Kyte spends a great deal of time working with the Oracle database and, more specifically, working with people who are working with the Oracle database. In addition, Kyte is the Tom behind the AskTom column in Oracle Magazine, answering people's questions about the Oracle database and its tools ([asktom.oracle.com](http://asktom.oracle.com)). Kyte is also the author of Expert Oracle Database Architecture (Apress, 2005), Expert One on One Oracle (Wrox Press, 2001/Apress 2004), Beginning Oracle Programming (Wrox Press, 2002/Apress 2004), and Effective Oracle by Design (Oracle Press, 2003). These are books about the general use of the database and how to develop successful Oracle applications.*

### Auditorium

#### Reorganizing Objects—When and How

Tom Kyte, *Oracle Corporation*. . . . . 11:00–12:00

"Do I need to reorganize/rebuild indexes and tables?" is a hotly debated question. We will discuss the times when a reorganization or rebuild is relevant, how to measure what you've done (to verify that the work performed did something useful), and the best techniques for performing a reorganization of data.

#### Empowering Extreme Scalability, Availability & Efficiency for Your Applications

Erik Peterson, *Oracle Corporation*. . . . . 1:00–2:00

A large majority of mission-critical application implementations are deployed on an Oracle Grid stack (RAC, ASM, and Clusterware) and attempt to follow Oracle's Maximum Availability Architecture. While any application implemented

on the Grid can benefit from gains in scalability and availability, a fuller integration will offer significant gains from empowering performance management (including debugging performance problems), better ability to meet service levels efficiently, and the potential for even higher levels of availability. This presentation will help you understand potential gains and best practices in how to achieve them.

#### Oracle Data Integration for Data Warehouse Appliances

Jeff Pollock, *Oracle Corporation*. . . . . 2:30–3:30

Data warehousing and business intelligence are must-have solutions for the business, but what is the best way to get all of that business data from applications into them? This session will provide an overview of Oracle's complete line of data integration solutions, with special emphasis on the data warehousing and warehouse appliance problem domain. Learn how the Oracle data integration solution can give you the fastest possible loading solution—in batch or real time—for your data warehouse. Learn how the Extract, Load and Transform (ELT) architecture is the best way to ensure high performance, easy maintainability, and low cost for your warehouse operations. This session will include a hands-on demonstration for setting up an integration job and loading your data warehouse appliance.

#### All About Encryption

Tom Kyte, *Oracle Corporation*. . . . . 4:00–5:00

From the `dbms_obfuscation_toolkit` to `dbms_crypto` to transparent data encryption at the column level to tablespace encrypt and data pump encryption, we'll cover them all. We'll investigate which technique should be used and under what circumstances they should be used. We'll see how the keys are managed by the Oracle Database. We'll discuss why you encrypt and when encryption just does not apply.

### Room 102

#### Best Practices for Oracle Database Administration

Iggy Fernandez, *Database Specialists*. . . . . 1:00–2:00

What are the deliverables of the database administration role? How likely is it that the deliverables will be met if we cannot articulate them? In *The Tao of Pooh*, the clever little bear Winnie the Pooh says, "If you don't know which to do, of all the things in front of you, then what you'll have when you are through, is just a mess without a clue." Deliverables are not the same as current priorities or assigned tasks, because priorities and assigned tasks change from day to day. In this session, we discuss ten specific deliverables that do not change from day to day. The first is databases that meet the needs of the business. One of the ten deliverables is a maintenance

(continued on page 26)

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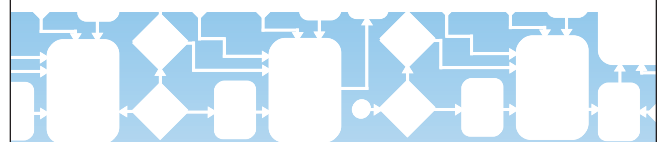
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schedule, and therefore we give special attention to the subject of database maintenance, including backups, statistics, archiving, log file management, rebuilding, auditing, user management, capacity management, and patching.

### Performance Challenges and Tuning a Very Large Data Warehouse

Pichai Bala, *IBM* ..... 2:30–3:30

As DBAs, it seems we are obsessed with hidden parameters, new features, hints, cunning code, and so on. But we often forget that the Data Warehouse is for business customers, and for them, ease of use, data accuracy, data quality, and predictive performance are of utmost importance. This presentation will share some successful strategies, challenges faced, and how we overcome the challenges using partitioning, materialized views, space management, optimal storage strategies, statistics collection methodologies, and views.

### Hack Your DB Before the Hackers Do

Slavik Markovich, *Sentrigo* ..... 4:00–5:00

Personal identifiable information (PII) of employees and veterans is being stolen from databases at an alarming rate. With tens of thousands of records containing sensitive data stored within vulnerable databases, government agencies and other organizations within the public sector are prime targets for data theft. Slavic Markovich will discuss how different attack vectors can be used to own the database, including exploits that are freely available on the Web and require no training. We will also explain emerging technologies and demonstrate ways of protecting against database attacks. Learn about:

- Secure coding practices
- Database hardening methodology
- Deep-scanning database activity monitoring
- Achieving complete visibility into user activities on all monitored databases

## Room 103

### DBA's Guide to Physical Data Guard

Ahbaid Gaffoor, *Amazon.com* ..... 1:00–2:00

This presentation covers the basics of setting up and configuring a physical Data Guard standby database. Oracle Data Guard allows a standby database to be in constant recovery. The standby database is activated in the event of a failure at the primary database. A live demo will be presented using VMware-based machines. A quick how-to on VMware and some VMware gotchas will be presented. Creation of a physical standby with minimal downtime will be demonstrated. We then distinguish between standby database maintenance and Data Guard offerings. Failover and switchover scenarios will also be discussed. Attendees should leave this presentation with the knowledge needed to set up, tune, monitor, and manage a Data Guard-based standby database.

### Tools and Techniques for Remote Database Support and Road Warriors

Terry Sutton and Richard Headrick

*Database Specialists* ..... 2:30–3:30



*Oracle performance expert Jonathan Lewis delivering the keynote address at the winter conference. Were you there?*

Your world is flat. Your databases are behind a firewall in a data center far away, you work from home most of the time, and your colleagues are in different time zones or in different countries. Do you have the right tools for the job? Is the firewall stopping you from using Oracle Universal Installer, Toad, SQL Developer, and Enterprise Manager? This presentation will cover tools and techniques for remote database support such as VNC, rdesktop, virtual private networks, and port forwarding

### Seven Sins of Concurrency

Chen Shapira, *Hewlett Packard* ..... 4:00–5:00

**Editor's Pick**

Databases are normally high-concurrency environments, where the number of concurrent processes ranges from tens to thousands. Yet many developers are either ignorant of the complexities and traps that are inherent in multi-process systems or wrongly assume that all of the problems will be correctly handled by the database. There are many ways in which code that ran correctly on the developer's workstation will slow down, crash, give wrong results, or otherwise fail to scale when it is deployed in production environments. In this session, Chen Shapira will present seven common concurrency mistakes that are well known in computer science theory, yet are often ignored by database developers. She will show test cases that reproduce each problem within Oracle and give tips on how to identify the problem when it occurs in a production environment. ▲





Sometimes the  
problem is obvious.

**Usually, it's harder to pinpoint.**

**Amazing what you can accomplish once you have  
the information you need.**

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# NoCOUG Winter Conference Schedule

February 12, 2009, at Oracle Conference Center, Redwood Shores, CA

Please visit [www.nocoug.org](http://www.nocoug.org) for updates and directions, and to submit your RSVP.

**Cost:** \$50 admission fee for non-members. Members free. Includes lunch voucher.

8:00–9:00 a.m.	Registration and Continental Breakfast—Refreshments served
9:00–9:30	<b>Welcome:</b> Roger Schrag, NoCOUG president
9:30–10:30	<b>Keynote:</b> <i>Extreme Performance—Exadata</i> —Tom Kyte, Oracle Corporation
10:30–11:00	<b>Break</b>
11:00–12:00	<b>Parallel Sessions #1</b> <b>Auditorium:</b> <i>Reorganizing Objects—When and How</i> —Tom Kyte, Oracle Corporation <b>Room 102:</b> No Session <b>Room 103:</b> No Session
12:00–1:00 p.m.	<b>Lunch</b>
1:00–2:00	<b>Parallel Sessions #2</b> <b>Auditorium:</b> <i>Empowering Extreme Scalability, Availability &amp; Efficiency for Your Applications</i> —Erik Peterson, Oracle Corporation <b>Room 102:</b> <i>Best Practices for Oracle Database Administration</i> —Iggy Fernandez, Database Specialists <b>Room 103:</b> <i>DBA's Guide to Physical Data Guard</i> —Ahbaid Gaffoor, Amazon.com
2:00–2:30	<b>Break and Refreshments</b>
2:30–3:30	<b>Parallel Sessions #3</b> <b>Auditorium:</b> <i>Oracle Data Integration for Data Warehouse Appliances</i> —Jeff Pollock, Oracle Corporation <b>Room 102:</b> <i>Performance Challenges and Tuning a Very Large Data Warehouse</i> —Pichai Bala, IBM <b>Room 103:</b> <i>Tools and Techniques for Remote Database Support and Road Warriors</i> —Terry Sutton and Richard Headrick, Database Specialists
3:30–4:00	<b>Raffle</b>
4:00–5:00	<b>Parallel Sessions #4</b> <b>Auditorium:</b> <i>All About Encryption</i> —Tom Kyte, Oracle Corporation <b>Room 102:</b> <i>Hack Your DB Before the Hackers Do</i> —Slavik Markovich, Sentrigo <b>Room 103:</b> <i>Seven Sins of Concurrency</i> —Chen Shapira, Hewlett Packard
5:00–	NoCOUG Networking and Happy Hour

Session descriptions  
appear on page 24.

**RSVP online at [www.nocoug.org/rsvp.html](http://www.nocoug.org/rsvp.html)**

**NoCOUG**

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