









































## Operational Model 2: Database Machine Administration (DBMA) Team

This optimal approach enables the relative simplicity of Exadata to be reflected in a simpler, less costly, and more agile support organization. As Oracle pre-integrates and pre-tests all components together, the support team is able to focus more on business initiatives and outcomes, and less on technical administration.

As most of the administrative work is database-centric, this team should be based on the existing Oracle DBA team, with possibly a small number of additional network and storage staff so that it has the skills needed for all administration tasks for all technology components within Exadata. The DBMA team will own Exadata from a management perspective. Specialized expert assistance may be required from time to time, especially while experience with Exadata is being developed and the DBMA team is evolving.

If a single DBMA team is not possible, it may be seen as a target to move towards. It is a suitable approach where

- Exadata is seen as the strategic database platform and, over time, a considerable portion of the Oracle footprint will be consolidated onto it.
- The Oracle database infrastructure is already managed predominantly by the DBA team.
- There is a desire to make the database administration function more agile.

It is possible that the creation of this new team and their ownership of the new technology may cause some disharmony among existing technology support teams. This will have to be considered and managed on a case-by-case basis. Although some restructuring of the support organization will be required to create such a DMA team, from an Exadata perspective, there are major advantages to consider.

## RASCI CHART: DBMA TEAM

TASK	DBA	OS SYSADMIN	NETWORK	STORAGE	CIO	SECURITY
Day-to-day Operation	R				A	C
Testing	R				A	C/I
Monitoring	R				A	C/I
Configuration Management	R		C		A	C/I
Tuning	R		C		A	C/I
<b>Patching</b>						
Storage Cells	R				A	C/I
InfiniBand	R		C/I		A	C/I
Cisco Public Network	R		C		A	C/I
Db Compute Nodes OS	R				A	C/I
Database	R				A	C/I
Backing Up Data	R				A	C/I
Upgrading SW	R				A	C/I
Replacing HW	R				A	C/I
Metering and Charging	R				A	C/I

Legend: R=Responsible, A=Accountable, S=Supportive, C=Consulted, I=Informed

## IMPACT ON THE DBMA TEAM

ACTIVITY	IMPACT	DESCRIPTION
TRAINING COSTS	Med	Only the DBMA team will need training. This will cover Exadata architecture, Linux/Solaris, Storage Servers and InfiniBand networking. New staff from other teams may need some training on Oracle.
MANAGEMENT OVERHEADS	Low	The team will be self sufficient and require minimal coordination with other groups.
AGILITY	High	Planning and execution of all Exadata-related tasks can be carried out with no delays

The DBMA team could be created in one of two ways.

- **Cross-Train Team Members.** Train some or all of the DBAs to bring the team up to speed in other areas (Linux or Solaris, Networks and Exadata storage cells). Storage knowledge is the least significant as Exadata Storage Servers and Exadata Storage Server Software is new technology to anyone and is largely self-managing. Oracle University currently offers an Exadata Database Machine Administration Workshop and a Monitor Exadata Database Machine seminar. For those pursuing certification, an Oracle Certified Expert examination is available. Please refer to Appendix A for Exadata training.
- **Add Team Members and Cross-Train.** Add one or more people with a background in Linux/Solaris, networks, and possibly storage systems to the DBA team, then do cross-training.

### Operational Model 3: Exadata Database Administration (EDBA) Team

In many cases, this is likely to be the most practical operating model, and offers the best of both worlds, as it enables the Exadata machines to blend in with existing systems from a management perspective.

Here we have an Exadata DBA team that is responsible for managing all aspects of Exadata. It should be based on the existing Oracle DBA team, but with Exadata capabilities so that it has the skills needed for basic Exadata administration tasks, but a clear mandate to call on experts in the existing specialized teams to carry out most of the non-database work.

Over time, this EDBA team is likely to become more self-sufficient and closer to the DBMA model described above.

This is a suitable approach where

- There is a significant existing Oracle database environment.
- There is no plan to consolidate the majority of Oracle databases onto Exadata. Although a number of critical systems will use it, there will still be widespread use of Oracle on traditional platforms.
- There is a well-defined structure in which multiple teams already provide effective administration of all aspects of the whole Oracle database infrastructure.
- Business stakeholders are happy with the responsiveness of this operating model.
- The EDBA team has direct and timely access to specifically named personnel in the existing support teams.

RASCI CHART: EDBA TEAM

TASK	DBA	OS SYSADMIN	NETWORK	STORAGE	CIO	SECURITY
<b>Day-to-day Operation</b>	R	S	S	S	A	C
<b>Testing</b>	R	S	S		A	C/I
<b>Monitoring</b>	R				A	C/I
<b>Configuration Management</b>	R				A	C/I
<b>Tuning</b>	R				A	C/I
<b>Patching</b>						
Storage Cells	?	?			A	C/I
InfiniBand	R		S		A	C/I
Cisco Public Network	R		S		A	C/I
Db Compute Nodes OS	R	S			A	C/I
Database	R				A	C/I
<b>Backing Up Data</b>	R			S	A	C/I
<b>Upgrading SW</b>	R	S	S		A	C/I
<b>Replacing HW</b>	R	S	S	S	A	C/I
<b>Metering and Charging</b>	?	?	?		A	C/I

Legend: R=Responsible, A=Accountable, S=Supportive, C=Consulted, I=Informed

IMPACT ON THE EDBA TEAM		
ACTIVITY	IMPACT	DESCRIPTION
<b>TRAINING COSTS</b>	Med	The EDBA team will need some training, covering Exadata architecture and basic Linux / Solaris, storage and networking.  The named person in each of other teams should receive basic Oracle and Exadata training.
<b>MANAGEMENT OVERHEADS</b>	Med	The team will be self sufficient on a day-to-day basis but coordination with other groups will be required for many tasks.
<b>AGILITY</b>	Med	Use of multiple teams with different priorities will inevitably involve some delays. However, these can be minimized by <ul style="list-style-type: none"> <li>• Pre-established contact points and procedures</li> <li>• Use of Oracle Enterprise Manager across all teams</li> </ul>

Please refer to Appendix C: “Operational Models for Exadata” for more information.

## Ongoing Support

Utilizing Oracle or qualified third parties to assist with the administration of your Exadata environment is another option to be evaluated. Benefits of this option may include the following:

- Accelerated installation time
- Leveraging Oracle best practices
- Reduced risk with standard builds
- Pre-optimized configurations for intended use
- Establishing operational baselines and best practices
- Supporting existing staff in operational changes
- Knowledge transfer

There is a broad community of Oracle partners and Oracle, itself, that offers such services in a variety of models. The choice organizations make is generally due to their comfort with the skills that the partner demonstrates and the alignment of their offerings to identified needs. For example, to support an Exadata environment, Oracle’s Advanced Customer Support Services (ACS) provides a number of options based on fixed scope, time and materials, and advanced monitoring and resolution. These options include

- System and software installation and configuration
  - Gather build-sheet data from the customer or Systems Integrator
  - Research Oracle’s configuration best-practices based on the intended use and known reference architecture
  - Update build-sheet to incorporate research results
  - Install required software products and recommended patches

- Optimize configuration based on final build-sheet
- Run tests, verify configuration, and review with customer
- Conduct a review findings and recommendations
- Pre-production readiness and configuration review
- Advanced Monitoring and Resolution
  - 24/7 health and performance monitoring from the database and operating system level down through the physical compute nodes, InfiniBand switches, and storage arrays
- Troubleshooting and resolution of alerts and incidents across the entire Exadata stack
- Proactive Oracle Database 11g support, including review of log files, provisioning, and cloning
  - Reactive patch reviews, recommendations and change management, production, and performance diagnostics review
- Patch review and installation

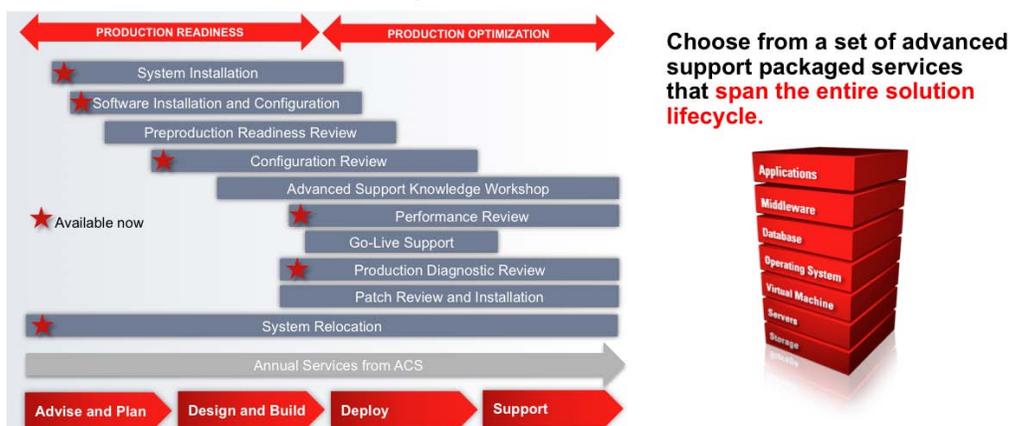


Figure 3. Oracle Fixed Scope Services

Fixed scope services may be discrete or bundled into a support pack to supplement a Solution Support Center or Advanced Monitoring and Resolution.

Production readiness services help to ensure that you are operationally ready to support your system in production. These services include hardware and software installation and configuration services, as well as readiness reviews. Services are focused on enabling you to accelerate your ROI and reducing downstream risk by streamlining your deployment and ensuring Oracle best practices are implemented up front.

Production Optimization services are designed to help you achieve maximum availability, reliability, and performance. Many of these post-productions services are available on a recurring basis. For example, performance reviews and patching services. These services focus on the

continual improvement of mission critical production systems to maximize system availability and to optimize performance.

For additional information on Oracle Advanced Services and Oracle Consulting Services, please see Appendix B: Suggested Reading.

## Conclusion

The Oracle Exadata Database Machine will have very positive productivity implications for IT and also help deliver better service levels to the business. Some roles will change within IT, including the following:

- Enterprise architects
- Management DBAs
- Development DBAs
- Storage managers
- Systems and network administrators

In each of these roles, there is a great opportunity to spend more time on delivery of new solutions and less time on day-to-day maintenance. The end result of understanding the change and operational management required when deploying Exadata will be better operations, management, minimized cost of ownership, improved team satisfaction, and an increased likelihood of success for everyone involved.

The deployment of one of Oracle's engineered systems will create the need to rethink how you will approach the management and maintenance of an engineered system within your environment and may be different than your current systems management approach. It also provides you an opportunity to better align your datacenter operations resources around a growing industry trend in consolidation, virtualization, and cloud computing. By introducing an Oracle engineered system to your environment, you'll take the steps to better aligning your operations resources toward the new datacenter paradigm of cloud computing.

## Appendix A: Staff Training—Oracle University (OU)

There are a number of pre-defined learning paths available for Exadata, depending on your current knowledge level and experience. The chart below shows the learning path developed by Role within the IT Operations organization. The roles described in the chart are:

- Database Administrator for Exadata
- Linux System Administrator for Exadata
- Oracle Solaris System Administration for Exadata
- Oracle Solaris Network Administration for Exadata
- Oracle Solaris Storage Administration for Exadata

For details on the learning paths and the courses, please visit [oracle.com/education/exadata](http://oracle.com/education/exadata)

Database Administrator For Exadata	Linux System Administrator For Exadata	Oracle Solaris System Administration for Exadata	Oracle Solaris Network Administration for Exadata	Oracle Solaris Storage Administration for Exadata
Oracle Database Introduction to SQL	Oracle Database Introduction to SQL	Oracle Database Introduction to SQL	Oracle Database Introduction to SQL	Oracle Database Introduction to SQL
Unix and Linux Essentials	Unix and Linux Essentials	Unix and Linux Essentials	Unix and Linux Essentials	Unix and Linux Essentials
Oracle Database 11g: Administration Workshop I	Oracle Linux System Administration	Oracle Solaris 11 System Administration	Oracle Solaris 11 System Administration	Oracle Solaris 11 System Administration
Oracle Database 11g: Administration Workshop II	Oracle Database 11g: 2 Day DBA	Oracle Solaris 11 Advanced System Administration	Oracle Database 11g: 2 Day DBA	Oracle Database 11g: 2 Day DBA
Oracle 11g: RAC and Grid Infrastructure Administration Accelerated	Oracle 11g: RAC and Grid Infrastructure Overview	Oracle Database 11g: 2 Day DBA	RAC & Grid Infrastructure for Oracle Solaris System Admin	RAC & Grid Infrastructure for Oracle Solaris System Admin
Exadata Database Machine Administration Workshop	Oracle Grid Infrastructure 11g: Administer ASM	RAC & Grid Infrastructure for Oracle Solaris System Admin	Exadata Database Machine Administration Workshop	Exadata Database Machine Administration Workshop
	Oracle Grid Infrastructure 11g: Manage Clusterware and ASM	Exadata Database Machine Administration Workshop	Coming Soon Oracle Solaris 11 Network Administration	Oracle Solaris 11 ZFS Administration

Required

  Optional

Figure 4. Oracle University learning paths by role

For certification details, please see [oracle.com/certification](https://oracle.com/certification). Use the Finder: select “Database Administrator”, select “Systems”.

You will see the webpage with details for Oracle Certified Expert, Oracle Exadata Database Machine Administration.

## Appendix B: Suggested Reading

The Oracle public Website has an extensive amount of information on our engineered systems platforms. A simple search provides a large amount of material related to this subject.

However, we might suggest the following topics:

- **Enterprise Manager 12c.** You'll want to checkout Oracle Enterprise Manager 12c to help you manage the Exadata platform:  
[www.oracle.com/us/products/enterprise-manager/index.html](http://www.oracle.com/us/products/enterprise-manager/index.html)
- **Exadata Blogs.** You should find the blogs by Rene Kundersma helpful:  
<https://blogs.oracle.com/XPSONHA/>
- **Best Practices for the Oracle Exadata Database Machine.**  
[www.oracle.com/us/solutions/exadata-maa-best-practices-155385.html](http://www.oracle.com/us/solutions/exadata-maa-best-practices-155385.html)  
**Oracle Exadata Start-Up Pack.** Bundled services provided by Oracle Consulting and Oracle Advanced Customer Support  
[www.oracle.com/us/support/library/exadata-start-up-pack-ds-192654.pdf](http://www.oracle.com/us/support/library/exadata-start-up-pack-ds-192654.pdf)
- **Oracle Expert Services for Oracle Engineered Systems**  
[www.oracle.com/us/products/consulting/resource-library/engineered-systems-ds-1367830.pdfw](http://www.oracle.com/us/products/consulting/resource-library/engineered-systems-ds-1367830.pdfw)  
**Remote Fault Monitoring and Update Services (Oracle Platinum Services)**  
[www.oracle.com/us/support/premier/engineered-systems-solutions/platinum-services/overview/index.html](http://www.oracle.com/us/support/premier/engineered-systems-solutions/platinum-services/overview/index.html)
- **Oracle Real Application Testing.**  
[www.oracle.com/au/products/database/options/real-application-testing/index.html](http://www.oracle.com/au/products/database/options/real-application-testing/index.html)
- **On-Demand Webcast: Managing Oracle Exadata with Oracle Enterprise Manager.**  
<https://www.techwebonlineevents.com/ars/eventregistration.do?mode=eventreg&F=1003109&K=CAA1AC>
- **Oracle Data Guard: Disaster Recovery for Oracle Exadata Database Machine.**  
[www.oracle.com/technetwork/database/features/availability/maa-wp-dr-dbm-130065.pdf](http://www.oracle.com/technetwork/database/features/availability/maa-wp-dr-dbm-130065.pdf)
- **Exachk: Healthcheck for Exadata.**  
[https://blogs.oracle.com/XPSONHA/entry/exachk\\_healthcheck\\_for\\_exadata](https://blogs.oracle.com/XPSONHA/entry/exachk_healthcheck_for_exadata)

The following links are provided as additional resources for Oracle Database High Availability Best Practices 11g Release 2 (11.2):

- [Understand Availability and Performance SLAs](#)
- [Implement a High Availability Environment](#)
- [Validate Your Performance and Availability SLAs](#)
- [Set up and Use Security Best Practices](#)
- [Establish Change Control Procedures](#)
- [Provide a Plan to Test and Upgrade for Recommended Patches and Software](#)
- [Use Proper Testing and Patching Practices](#)
- [Execute Data Guard Role Transitions](#)
- [Establish Escalation Management Procedures](#)
- [Configure Monitoring and Service Request Infrastructure for High Availability](#)
- [Check the Latest MAA Best Practices](#)

## Appendix C: Operational Models for Exadata

	Multiple Support Teams	EDBA Team	Unified DBMA Team
Well-suited when	<ul style="list-style-type: none"> <li>Large existing Oracle environment</li> <li>Formal, specialized admin teams exist</li> <li>Exadata is one of many database platforms</li> <li>Current agility is acceptable</li> </ul>	<ul style="list-style-type: none"> <li>There is an existing Oracle environment</li> <li>Formal, specialized admin teams exist</li> <li>Good cross-team procedures exist</li> <li>No firm plan to consolidate</li> </ul>	<ul style="list-style-type: none"> <li>Exadata is totally strategic and the plan is to consolidate onto it</li> <li>Improved agility is of value</li> </ul>
Training Needs	<ul style="list-style-type: none"> <li>High—all teams need training</li> </ul>	<ul style="list-style-type: none"> <li>Medium—DBAs on Exadata, members of other teams on Oracle + Exadata</li> </ul>	<ul style="list-style-type: none"> <li>Medium—Team as a whole must have good skills in all areas, including Exadata</li> </ul>
Organizational Changes	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Ensure EDBA team has access to named specialist skills</li> </ul>	<ul style="list-style-type: none"> <li>Add one or two specialists to the DBMA team</li> </ul>
Change Management	<ul style="list-style-type: none"> <li>Complex</li> </ul>	<ul style="list-style-type: none"> <li>Medium</li> </ul>	<ul style="list-style-type: none"> <li>Simpler—Team is self-sufficient</li> </ul>
Management Overhead	<ul style="list-style-type: none"> <li>High</li> </ul>	<ul style="list-style-type: none"> <li>Medium</li> </ul>	<ul style="list-style-type: none"> <li>Low</li> </ul>
Agility	<ul style="list-style-type: none"> <li>Low</li> </ul>	<ul style="list-style-type: none"> <li>Medium</li> </ul>	<ul style="list-style-type: none"> <li>High</li> </ul>



Operational Impact of Deploying an Oracle  
Engineered System (Exadata)

October 2012

Contributing Authors:

Jules Lane

Vince Pulice

David Rabo

Scott Hamann

Bob Skolnik

Pete Werner

Bob Stackowiak

Heather Hughes

Oracle Corporation  
World Headquarters  
500 Oracle Parkway  
Redwood Shores, CA 94065  
U.S.A.



Oracle is committed to developing practices and products that help protect the environment

Copyright © 2012, Oracle and/or its affiliates. All rights reserved. This document is provided for information purposes only and the contents hereof are subject to change without notice. This document is not warranted to be error-free, nor subject to any other warranties or conditions, whether expressed orally or implied in law, including implied warranties and conditions of merchantability or fitness for a particular purpose. We specifically disclaim any liability with respect to this document and no contractual obligations are formed either directly or indirectly by this document. This document may not be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without our prior written permission.

Oracle is a registered trademark of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.