



# RAC For Beginners: The Basics

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An IT Convergence presentation by Dan Norris

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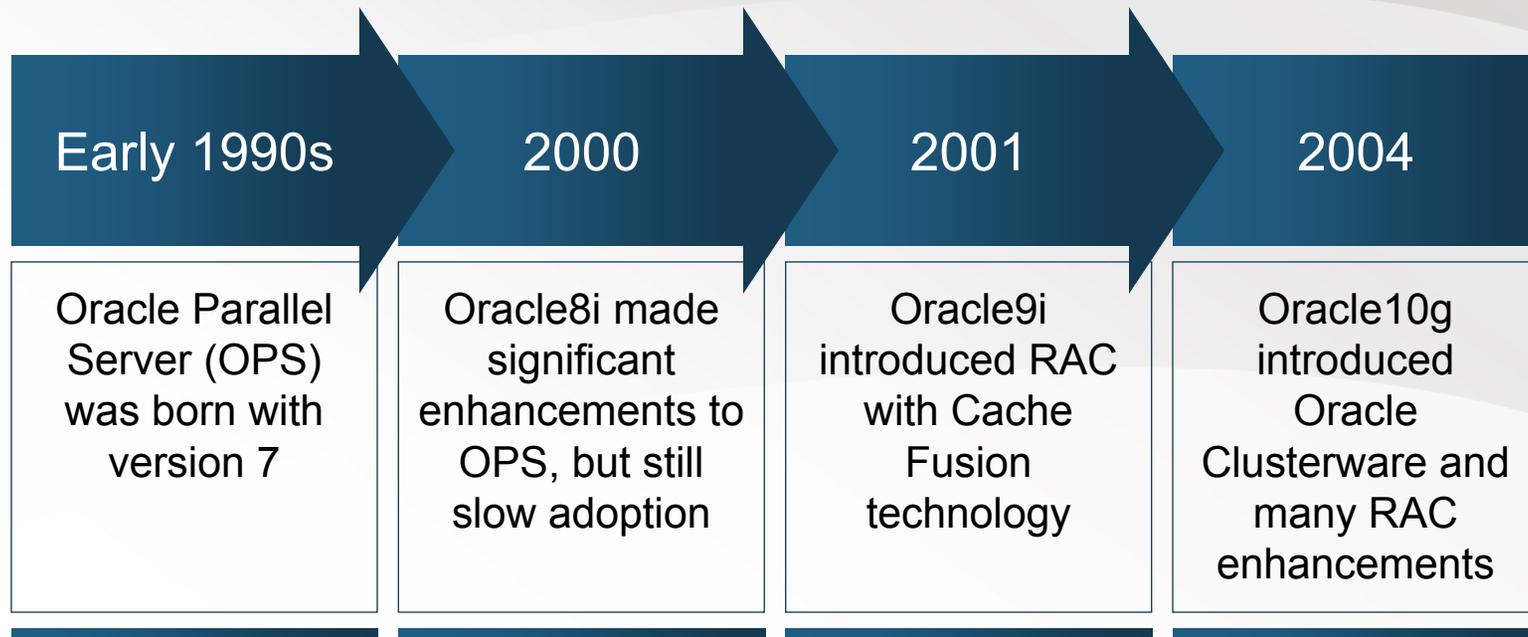
Next Steps & References

# Terminology



Database	Instance	Clusterware	Storage Area Network (SAN)
	Local Storage, Shared Storage	Raw Device, Cluster Filesystem	Automatic Storage Management (ASM)
		Single-instance DB, Multi-instance DB	Oracle Services

# Brief History of RAC



## What RAC is NOT

**NOT**

NOT always the best choice for the given situation

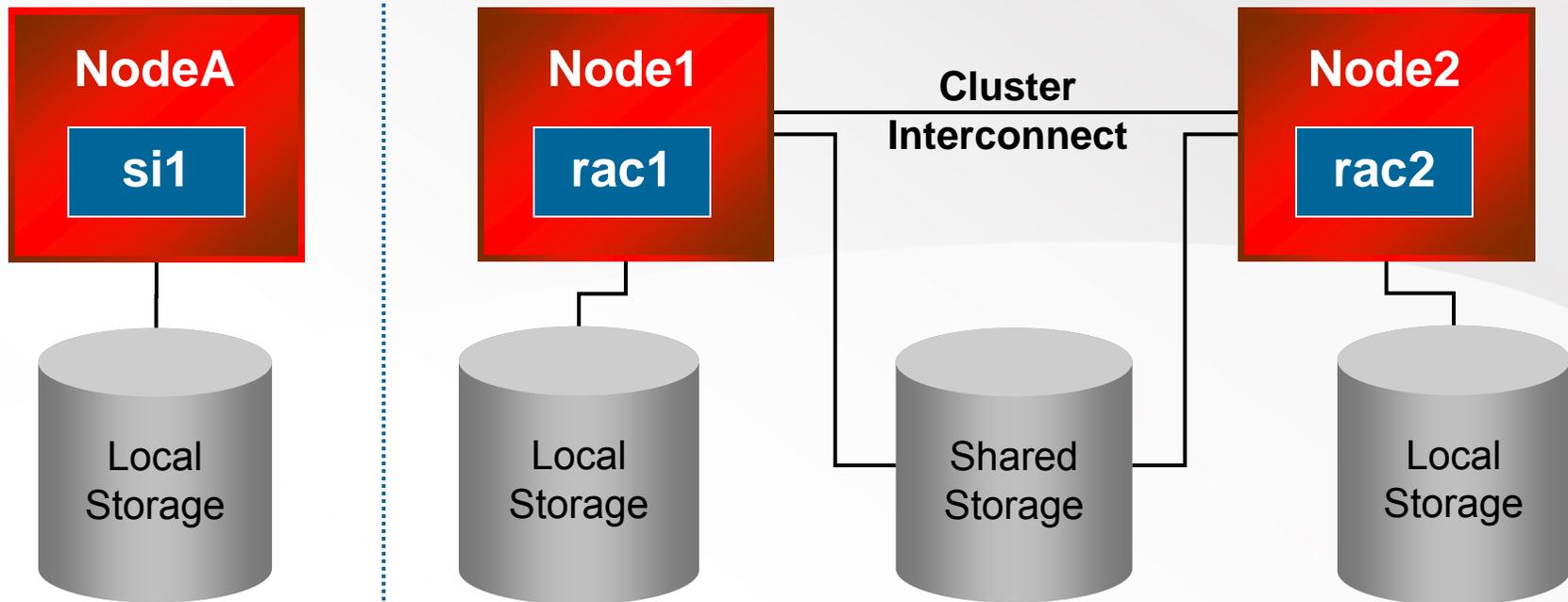
NOT “production only” technology

NOT something easy to learn only by doing  
(without also studying)

NOT a “set it and forget it” environment

NOT a transparent change for some applications

# Single-Instance vs. RAC: System Architecture



# Single-Instance vs. RAC: Database Configuration

- ▶ Shared Database Components
  - ▶ Control Files, Temp Tablespace, Application Tablespaces, spfile
  
- ▶ Unshared Database Components (still reside in the database)
  - ▶ Online Redo Logs, Undo Tablespaces, Rollback Segments (if not using AUM)
  
- ▶ Locally-Managed Tablespaces & Automatic Segment Space Management (ASSM)
  
- ▶ Server Parameter File

## Single-Instance vs. RAC: Database Access Considerations

- ▶ Services should be designed and thought out
- ▶ There are benefits to using multiple services for a single database
- ▶ Do we load-balance all users on all nodes, or segregate workload to groups of nodes?
- ▶ Can we use runtime connection load balancing and/or FCF?
- ▶ Will we configure Transparent Application Failover (TAF)?

# Licensing

- ▶ Included with Oracle Database Standard Edition
  - ▶ Maximum 4 CPUs per cluster
  - ▶ Must use ASM for all database storage
  - ▶ Must use \*only\* Oracle Clusterware (no 3<sup>rd</sup> party clusterware)
  
- ▶ An option added to Oracle Enterprise Edition
  - ▶ Required for higher CPU counts
  - ▶ Required to use EE-only features with RAC

# Installation Process

- ▶ First, prepare the hardware environment
  
- ▶ There are four major installation tasks:
  - ▶ Plan the installation, particularly storage
  - ▶ Install Clusterware
  - ▶ Install ASM
  - ▶ Install RDBMS

## Installation Process: Prepare

- ▶ Hardware needed usually includes:
  - ▶ More than one private interconnect network
  - ▶ Shared storage, usually fibre channel or iSCSI
  - ▶ Multiple servers, same OS, same packages and patches
  
- ▶ Storage can be configured as:
  - ▶ Oracle Cluster Filesystem (OCFS)
  - ▶ ASM
  - ▶ Raw
  - ▶ Other 3rd-party cluster filesystems (i.e. GPFS, VxFS)
  
- ▶ Determine storage for each component
  
- ▶ Study the installation guide for your platform

## Installation Process: Clusterware

- ▶ The OUI checks node connectivity
- ▶ For UNIX hosts, use SSH key pairs to allow transparent logins to remote hosts
- ▶ For Windows hosts, use the same username/password on all hosts
- ▶ The OUI prompts for location of Oracle Cluster Registry (OCR) copies. You can have 1 or 2 of these
- ▶ The OUI also asks for the voting disk location(s). You can have 1 or 3 of these

## Installation Process: ASM

- ▶ The ASM installation should reside in a separate ORACLE\_HOME per best practices
- ▶ The OUI should recognize the cluster
- ▶ Configure as much storage as you'll need in order to avoid rebalancing operations later
- ▶ Use at least two disk groups: data & flash recovery area
- ▶ If using Oracle Standard Edition, ASM is required for all database data

## Installation Process: RDBMS

- ▶ The OUI should recognize the cluster
- ▶ Shared or local ORACLE\_HOME?
- ▶ Complete the install without database creation (software only)
- ▶ Install patches (patch sets, CPU); OPatch is cluster-aware
- ▶ With all patches applied, then use DBCA to create the database

## Installation Process: Testing

- ▶ Failure testing
- ▶ OS crash
- ▶ Backup & recovery testing
- ▶ Disaster recovery testing (Data Guard, storage replication, etc)
- ▶ Client failover testing (TAF, FCF, load balancing)
- ▶ Don't cut corners on testing time

## Services & Workload Management

- ▶ A service is an entity to which users connect
- ▶ Usually designates a module or application used by a specific group of users
- ▶ Technically, a service is listed in the `service_name` parameter for an instance (Note: You should not edit the `service_name` parameter in a RAC environment.)
- ▶ Clusterware processes alter the `service_name` parameter on the fly to relocate services (according to policies)
- ▶ Stats in 10g are also gathered per service

# Services & Workload Management



- ▶ Services can be available via one or more instances
- ▶ Failover policies are set per service

## Tuning RAC

- ▶ Good news! The first step is to do all the normal single-instance tuning
- ▶ Tuning RAC can pose special challenges, but don't abandon what you know
- ▶ Examining bottlenecks on the interconnect is the most common RAC-specific activity
- ▶ Statspack, ADDM, and AWR are RAC-aware and RAC-friendly
- ▶ OEM 10g Database Control has good tuning information

## RAC Backup & Recovery

- ▶ Multiple threads of redo means media recovery is more complicated
- ▶ There is just one database (often useful to remember in recovery situations)
- ▶ A cluster filesystem can help simplify the backup & recovery processes
- ▶ If using ASM, RMAN is your best friend. ASMCMD does not currently offer backup capabilities
- ▶ Test, test, test

## New RAC DBA Recommendations

- ▶ Read and **understand** the concepts guide (not RAC-specific, but a good foundation for understanding RAC)
- ▶ RAC is much easier to debug and troubleshoot if you understand concepts, not procedures
- ▶ Metalink and OTN have several “how to” articles on RAC and they are excellent guides for beginners
- ▶ Take advantage of the RAC SIG and other online sources for information. The pool of RAC knowledge online is growing quickly.

## RAC Recommendations for Managers

- ▶ "Grid is not RAC, RAC is not grid."  
<http://tkyte.blogspot.com/2006/02/so-what-was-answer-part-iii.html>
- ▶ RAC requires additional DBA training (or at least training time)
- ▶ It is dangerous to have a production-only RAC environment without a non-production environment

## RAC and Vendor-Provided Applications

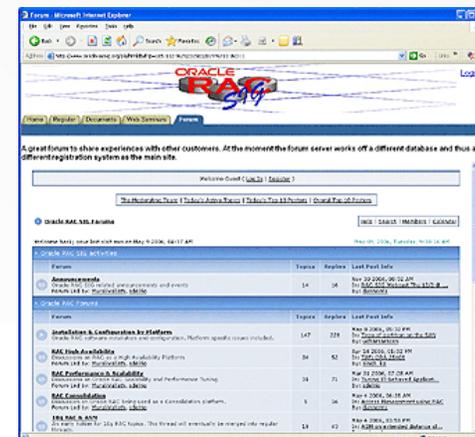
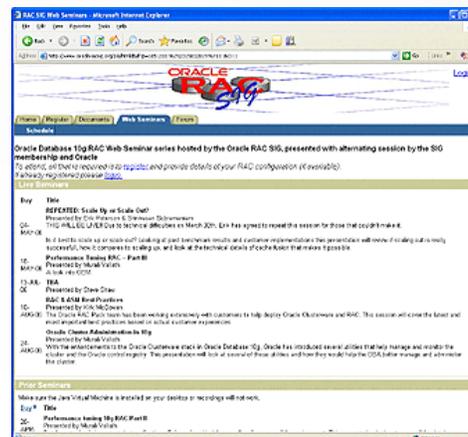
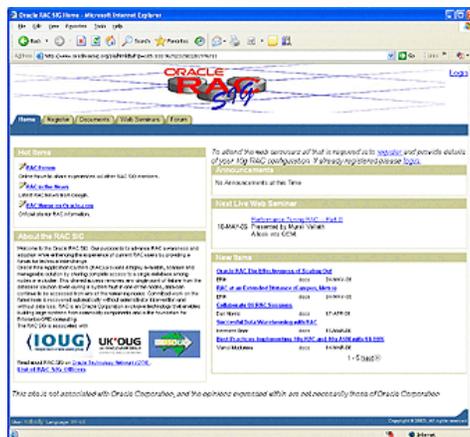
- ▶ The most important mentionable here is that vendor-provided applications usually certify RAC as a separate database platform
- ▶ Don't presume that when a vendor supports Oracle 10.1.0.4.0, that they also support RAC 10.1.0.4.0
- ▶ RAC is specifically certified for PeopleSoft, SAP, Oracle EBS, Siebel, and many other applications as well
- ▶ Some vendors require additional patching

## High-Availability Alternatives to RAC

- ▶ Other clusters providing high(er) availability than standalone, single-instance database servers:
  - ▶ Microsoft Cluster Server (w/ Oracle Failsafe)
  - ▶ Veritas Cluster Server
  - ▶ PolyServe Matrix Server (now Novell's)
  - ▶ Red Hat Cluster Server
  - ▶ HP MC ServiceGuard
  - ▶ IBM HACMP

# RAC SIG Events

- ▶ See [www.oracleracsig.org](http://www.oracleracsig.org) for details
  - ▶ **Monday, April 16 @ 10:30 am: RAC SIG Expert Panel**
  - ▶ **Tuesday, April 17 @ 1:45 pm: RAC SIG Birds of a Feather Mixer**
  - ▶ **Wednesday, April 18 @ 11:00 am: RAC SIG Customer Panel**
- ▶ Join the RAC SIG at [www.oracleracsig.org](http://www.oracleracsig.org)!



# Save the Date!



Oracle OpenWorld San Francisco  
November 11-15, 2007

See you there!

**IT**Convergence

# Save the Date!



April 13 - 17, 2008  
Colorado Convention Center  
Denver, CO

## Submit to present for the IOUG!

- ▶ Share your expertise with the greater Oracle community. Solidify your reputation as an Oracle expert! The IOUG is looking for presentations in the following tracks: **Architecture, Database, Development, and Middleware.**
- ▶ Submit your abstracts no later than (not yet announced—usually mid-November).
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**Thank You!**



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