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EXPLOITING TECHNOLOGY for your advantage.

## **RAC For Beginners: The Basics**

Dan Norris

ESA Practice Manager

# Who is Dan?

- Virgo
- Scuba Diver (PADI Advanced OW)
- Over 21, under 35
- Oracle DBA & UNIX Admin background
- Certifiable: OCM, ACE Director, RHCE
- Consultant, mostly fixing things that are broken
- Active IOUG participant: RAC SIG, SIG Council, DBA Track Manager
- ESA Practice Manager at Piocon Technologies



# Agenda

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Next Steps & References

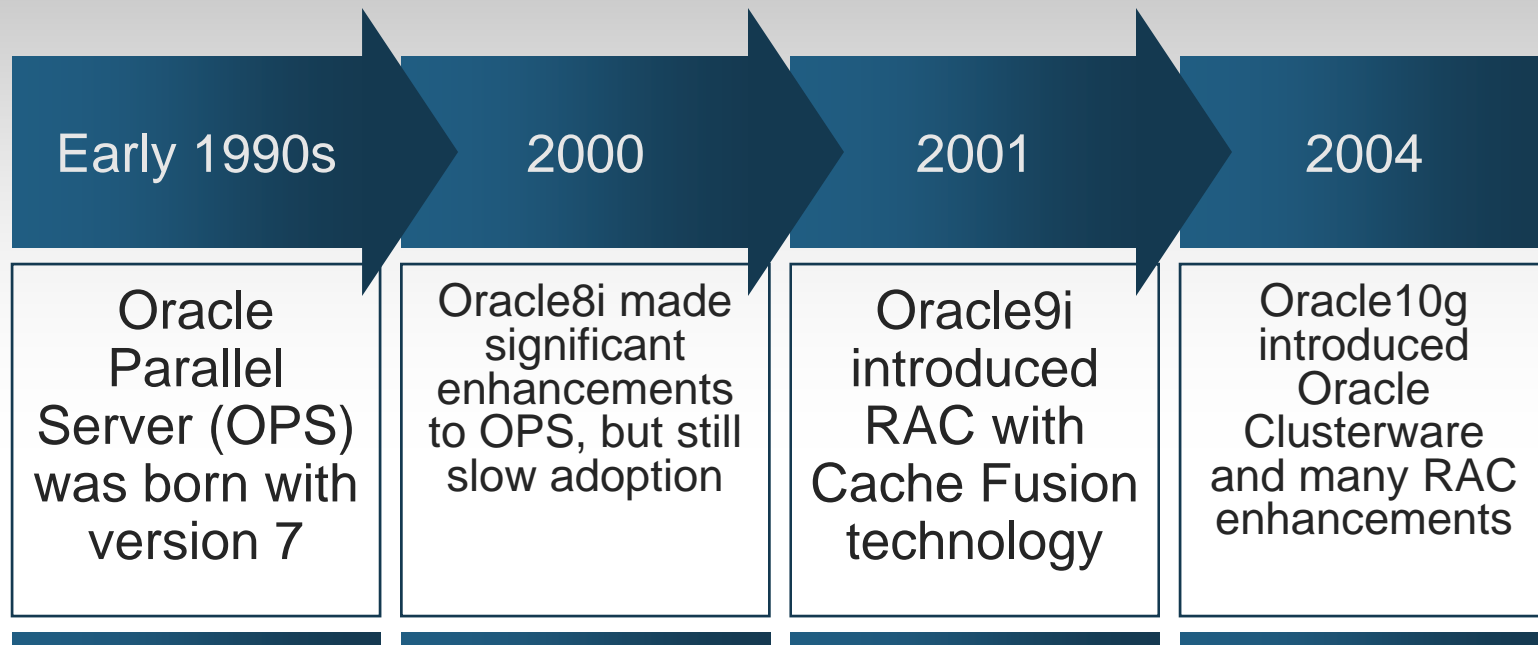


# Terminology

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



# Brief History of RAC



# What RAC is NOT

NOT

NOT always the best choice for the given situation

NOT “production only” technology

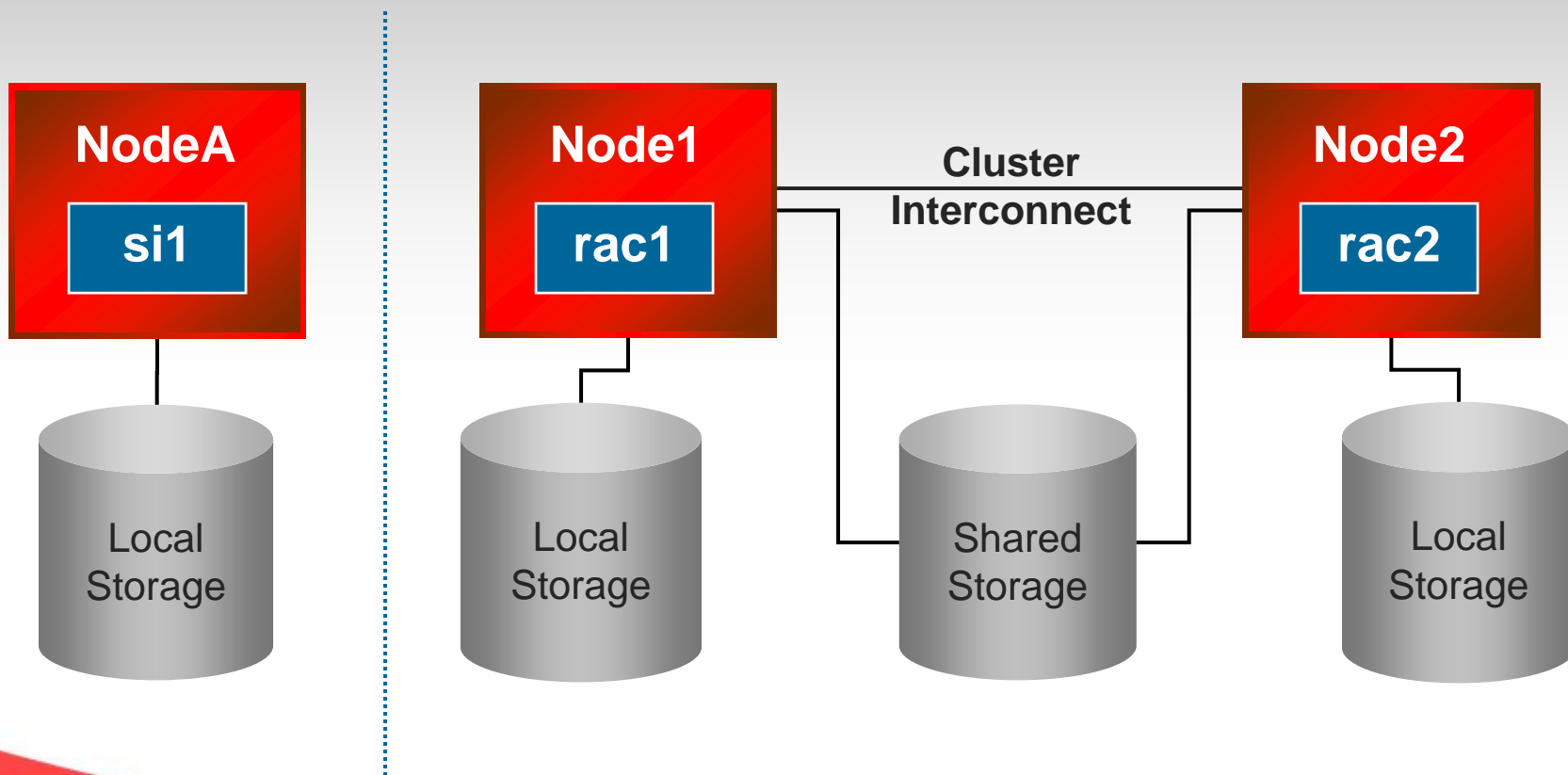
NOT something easy to learn only by doing  
(without also studying)

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

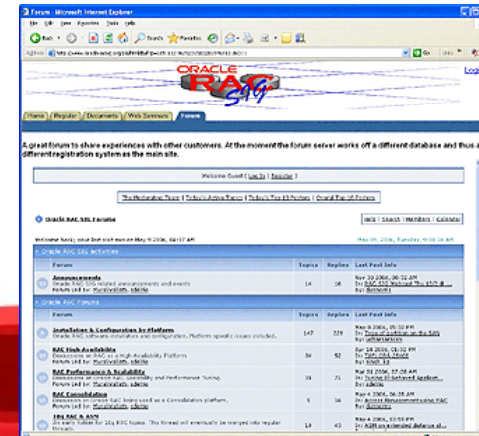
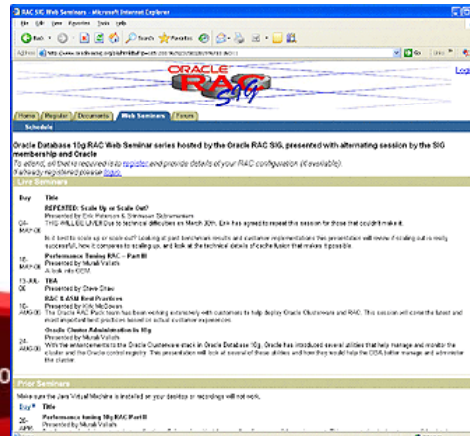
- The most important mentionable here is that vendor-provided applications usually certify RAC as a separate database platform
- Don't presume that when a vendor supports Oracle 10.1.0.4.0, that they also support RAC 10.1.0.4.0
- RAC is specifically certified for PeopleSoft, SAP, Oracle EBS, Siebel, 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
  - Sunday 4p, RAC SIG Birds of a Feather
  - Monday 12:30p, RAC SIG Customer Panel
  - Tuesday 10:45a, RAC COTS Panel
  - Tuesday 12:15p, RAC SIG Expert Panel
- Join the RAC SIG at [www.oracleracsig.org](http://www.oracleracsig.org)!



Save the Date!



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  - Discussion Forums:
  - Access to Local and Regional Users Groups:
  - 5 Minute Briefing: Oracle
  - Volunteer Opportunities



**Thank You!**

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The following sessions are available for survey. Please click on session title to take session survey.

ID	Session Title	Speakers
S292927	<a href="#">IOUG RAC SIG: High Availability Options for Oracle Database</a>	<a href="#">Dan Norris</a> , Piocon
S292939	<a href="#">IOUG MiddleWare SIG Meeting: Is that really you? Prove it!</a>	Matt Topper, IT Convergence

Done

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