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# Test tRACK System Overview

## *Why Test tRACK?*

As the emphasis in IT is evolving from hardware to a software and solutions driven industry, Cnetics has expanded our business focus to meet these changes. We developed the Test tRACK, an innovative solution which combines our experience in HP hardware with Oracle and Linux/Unix expertise to create a cutting edge solution for businesses who want to quickly become acquainted with the configuration and functionality of Oracle 10g RAC.

Clustered or grid computing is the future of database technology. Oracle's 10g Real Application Cluster (RAC) on the Linux operating system and Itanium processors provides the most scalable and best performing database computing platform in the market today. Both large and small companies are interested in clustered Linux database computing solutions for mission critical applications.

Recognizing that many businesses choose to evaluate the RAC environment prior to purchase, Cnetics combined the industry's best practices and proven architectures in our Test tRACK. We packaged this RAC architecture in a self contained, rolling configuration which you can use to test drive RAC with your data at your location. Purchasing and staging an equivalent environment would take several months. With our Test tRACK system, you will be up and running within hours after arrival.

### **The benefits of test driving cutting-edge technology include:**

- Your initial investment stays as an operating cost versus a capital cost.
- If you choose not to keep the system, your costs go away.
- After evaluation, you can decide whether or not to implement this cutting-edge grid technology.
- The system is preconfigured enabling you to experiment in a model environment faster.
- You can always pick up the phone and get the support you need from Cnetics' experienced staff.

When your system trial period is complete, you can purchase a similar system or a modified configuration, or we simply come and pick it up with no further obligation on your part. It's that easy!

*Test tRACK gets you to the checkered flag!*



## ***Test Drive on the Grid***

Business is changing. Datacenters are changing too. Test tRACK offers you a low risk way to experience the fastest enterprise grid solution available today.

### **Emerging Trends**

Emerging trends in IT point to grid computing solutions:

- Business requires flexibility from their existing or new computers.
- More software is being written for the sixty-four bit computing architecture.
- Linux, the current open source operating system, continues to grow in popularity and deployment.
- Business insists computing resources are always available when needed.
- Companies need smaller up front computing investments that can be effectively grown as needed.

Real Applications Clustering and grid technology was designed to alleviate many of the challenges of an old system such as:

- System availability
- System scalability
- Expensive upgrades
- Inflexible legacy system
- Idle and underutilized hardware

### **Industry Benchmarks**

The Transaction Processing Council (TPC) conducts and certifies benchmark tests for industry vendors ([www.tpc.org](http://www.tpc.org)). In one database performance benchmark test, TPC-C recently broke the one million transactions per minute mark. The winning technology stack included a sixty-four bit, open source, high availability architecture built to scale.

Specifically the winning database computing architecture consisted of HP servers with 64 bit Itanium chips running RedHat Linux with the Oracle 10g grid computing database platform. This winning architecture is the foundation for Test tRACK.

***So step behind the wheel, strap on your helmet, fasten your seatbelt and enjoy the ride...***



## ***The Test tRACK Test Drive***

The Test tRACK experience allows you to quickly evaluate how Oracle's premier database might provide you with world-class data access.

### **LAP 1: Preparing for your test drive**

Cnetics can assist your staff with preparations necessary to run a successful test on your Test tRACK system.

- Data is collected or a sample database developed by Cnetics is used to execute the test drive
- Data is copied if customer database is to be utilized
- Any configuration changes needed are analyzed and implemented
- Any additional documentation beyond the base set is prepared
- The customer test environment is checked for sufficient power and network connectivity
- Staff is trained on any areas needed
- Test cases are prepared with the customer

### **LAP 2: Help during your test drive**

Cnetics can support your staff during the lease period in various ways.

- Ensure all activities are understood
- Explain any anomalies that occur during the tests
- Aid in measuring and documenting test results
- Provide support as requested, either onsite or remotely
- Prepare order for replacement hardware/software for post-test or ensure current configuration is sufficient for ongoing operation

### **LAP 3: The Winners Circle**

Once the evaluation period is complete, your IT staff will have a thorough understanding of how RAC works and how it can increase productivity while reducing expenses. Or you may choose to not invest in a 10g RAC system at the present time. Either way, you will be armed with the information needed to make an informed decision.

If you decide to move forward, Cnetics will:

- Help configure the new RAC hardware and software to meet specific needs and requirements, including merging any existing hardware into the new configuration
- Order new equipment/licenses if desired at partner prices
- Provide continued support of the configuration as needed with the expectation that customer staff will be trained to take over

If you decide to wait, Cnetics will:

- Pick up the Test tRACK and you are free from all further obligations.

***Our goal is to make evaluating Test tRACK easy and hassle-free.***



## ***The Industry Leading Pacesetters***

Cnetics has partnered with industry leaders to construct a state-of-the-art portable database grid. Combining the best hardware with the best software insures that your run around the track will be a winning experience.

### **Hewlett-Packard Hardware**

Cnetics chose HP hardware for the Test tRACK for three simple reasons:

1. HP develops the technologies that others imitate with nearly \$4 billion spent annually in R&D;
2. HP is a stable, diversified company with a significant presence in all sectors of the marketplace;
3. HP has been deeply committed to global citizenship through philanthropic donations of money, equipment, and time since their inception in 1939.

The HP strategy to offer products, services and solutions that are high tech, low cost and deliver the best customer experience is unmatched. While others may boast, no one else has the portfolio, people and expertise to deliver on all three. Standardizing on HP solutions guarantees our customers access to HP's specialized expertise, a complete portfolio of products and services, and a simplified ownership experience.

A combination of the Intel® Itanium® 2 processor and HP's knowledge of both the architecture and enterprise computing is compelling. Although the Intel Itanium architecture is becoming pervasive and is widely supported by most of the major hardware and software vendors, HP was the first to completely commit to it. HP's foresight has paid dividends ensuring you get leading application performance, price performance, and excellent uptime.

### **Making Linux work for the enterprise**

HP delivers Linux for the Real World - built with best-of-breed software, on standards based server technology and delivered with world-class services. Linux solutions from HP deliver more - enabling enterprises to maximize their return on information technology.

### **Oracle 10g**

As the first database designed for grid computing, Oracle 10g with Real Application Clusters is ideal for environments where proven performance, high availability, and security are critical.

Oracle 10g's unique capabilities with Real Application Cluster (RAC) ensure the availability of mission critical applications. This transparent deployment of a single database image across a cluster of hardware systems segregates applications from both unplanned and planned downtime.

A recent study of Oracle grid computing customers found an average of **150% return on their investment** over a five year period. The study also found that participants achieved on average:



- 123% savings (first year), 278% projected savings (five years) on hardware
- 24% software savings and 10% computing performance improvement

## Linux

IT infrastructures are under pressure. Unexpected demands and compute-intensive applications are forcing IT managers to find better ways of allocating IT dollars and resources. For many years there was little choice between the high cost of proprietary systems and the ineffectiveness of industry standard hardware with an undependable O/S.

Today, however, we have the best of both worlds - industry standard hardware with the dependability of Linux.

Linux is continuing to make headway in the OS arena. IDC indicates that Linux is maintaining its strong growth, posting year-over-year revenue growth of 42.6 percent and unit shipment growth of 31.7 percent. IDC reported that servers running the Linux open-source operating system captured 9.2 percent of the overall market and surpassed \$1 billion for the first time. (IDC, Nov. 2004).

## HP-UX

HP-UX 11i v2 is the newest version of HP-UX 11i for the HP Integrity servers. It is a full-fledged enterprise release of HP-UX 11i, complete with the full range of HP manageability, availability, security and ISU software products ready for deployment.

HP-UX 11i v2 offers:

- Exceptional performance on the HP Integrity Servers in a broad variety of benchmarks.
- Performance capabilities built into the OS - applications could see 15% - 25% increased HP 9000 (PA-RISC) performance by moving to HP-UX 11i v2, due to improvements such as MxN threading, more kernel tunables and cell local memory.
- 1-128-way scaling for Integrity servers
- Even more security features such as Install Time Security
- One common code release for both HP 9000 and Integrity servers

## ***The Cnetics Test tRACK Team***

The Cnetics Test tRACK team is made up of Oracle Certified Professionals and RedHat Certified Technicians (RHCT). We wrote the McGraw Hill book "Oracle Backup & Recovery 101". We have presented classes at the 2004 International Oracle Users Group (IOUG) on "Oracle Environment Security" and at the 2003 IOUG on "Server Based Recovery". Cnetics, a trusted HP and Oracle partner, has combined the industry's best practices and proven architectures to make your job easier.

The Cnetics **Pit Crew** consists of highly qualified and dedicated technicians with a proven track record.

**Kenny Smith** joined Cnetics in the fall on 2002. He brings to the company a wealth of Oracle client experience with users such as AT&T, Coca-Cola, Verizon Wireless, BMW, MCI, BellSouth, IBM, HealthSouth, and Nova Information Systems among others. He began his IT career in 1988 as a customer service engineer at Avnet. In 1991, he began working with Oracle on version 5 at Southern Company. He specializes in Oracle database architecture, database administration and development. He began authoring Oracle technology in 1998 in Oracle Magazine and has published over fifty articles in several industry publications. In the winter of 2002, Kenny co-authored "Oracle Backup and Recovery 101" published by Oracle Press. Kenny has presented papers at Oracle's OpenWorld, HPWorld, the International Oracle User Group's (IOUG) conference and other conferences in the US and Europe. He currently holds the Certified Information Systems Security Professional (CISSP) Certification and is an Oracle Certified Professional – (OCP - Version 7, 8, 9i). Kenny currently serves on the board of the Georgia Oracle Users Group.

**Bob Vance** is a senior technical consultant with over three decades of information technology experience. Bob began working with UNIX in 1985 as a technical engineer with SBM (the parent company of Cnetics). Since that time, Bob has programmed software applications, configured data centers, provided customer support and deployed networking and storage infrastructure for customers across the United States. Customers such as the Coast Guard, State of West Virginia, University System of Georgia, Nova Information Systems, and many others have benefited from Bob's quality of workmanship and insistence on excellence. Bob holds many technical certifications including Cisco CCNA, HP Storage AIS, Linux LPI level 2, HP-UX CSE (Advanced Administration & Advanced High Availability) certifications among others. As a seasoned IT veteran, Bob provides many strengths to Cnetics including experience with high availability, storage, and networking.

**Igor Ryzhkov** joined Cnetics in the fall of 2003 as a Computer Support Specialist. Igor completed his Bachelor of Science in Computer Technology with High Honors prior to joining Cnetics. He specializes in Linux configuration and has a RedHat Certified Technician (RHCT) certification. He has extensive experience with Oracle installation and configuration on Linux with special concentration on Oracle 9i and 10g Real Application Clusters. Igor is the primary architect of Cnetics successful Test tRACK product with supporting management tools. Igor is a native of Belarus and speaks fluent Russian.



## The Nuts and Bolts

Your Test tRACK comes preconfigured with all the necessary hardware, software and connectivity to run an Oracle 10g RAC database. This section provides a high level description of all the functional components and how they work together. Details on each of these components can be found in the Test tRACK Manual included in this binder.

### Hardware - The Engine and Drive Train

For the required elements of a clustered database, we have researched and selected the most appropriate components for robustness, ease of integration and cost-effectiveness. Please review the diagram below for an example of a typical component configuration.



## Clustered servers

Clustered servers provide flexibility for load sharing and immediate system recovery. During peak times of load, all servers can distribute the requests easily. If a server encounters problems during routine requests, all requests can be channelled to a different server with no interruption of service, until the problem is resolved. In the Test tRACK configuration, our cluster consists of database servers and a cluster interconnect switch.

- Database Servers - For the database servers, Test tRACK uses production level servers. All servers can perform the same functions at any time for each other. Key attributes of these servers are: speed, memory scalability and high availability.
- Cluster Interconnect Switch - All the database servers communicate privately with each other via a Gigabit Ethernet switch for RAC interconnect. A gigabit switch was chosen to provide maximum speed of data transfer with the highest of reliability.

## Shared storage

Shared storage provides an integrated system for access to all data with only a single appearance outside of the array. Each element of the configuration communicates closely with the others to ensure stable transfer of data. Regardless of where the request for the data comes from, the array acts as one. In the Test tRACK configuration, our shared storage consists of a storage array and storage switch.

- Storage Array – The array provides a low-cost, scalable, high performance storage consolidation system for a storage area network (SAN). The basic framework can have a minimal amount of storage initially to be expanded significantly as data storage needs grow.
- Storage Switch - A SAN switch provides fiber channel connectivity to the storage array via a single controller. The controller provides a SAN administrator the capability to manage their entire storage environment through a single-pane-of-glass.

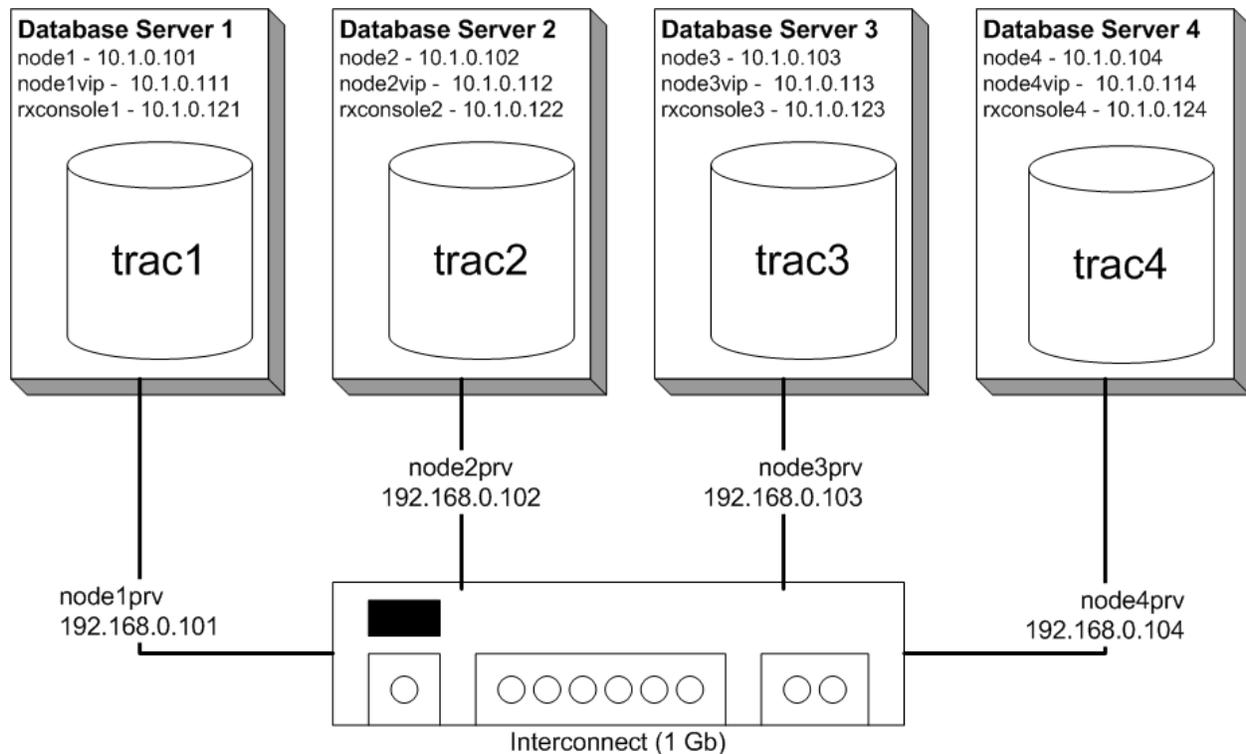
## Cluster management

Cluster management allows a single access point to all components of the RAC. Integrated services can be controlled by a single operator to avoid having to switch between consoles to access different services. In the Test tRACK configuration, our cluster management consists of a management server and network connect switch.

- Management Server – This server consists of an eight port KVM switch with an integrated LCD display, keyboard and mouse. From this console, all hardware and software components can be accessed and managed from a single interface. The programmable hot keys on the keyboard can be programmed to execute up to seven keystrokes taking you directly to the devices most used within the rack. This server operates on a Windows operating system.
- Network Connect Switch - A 12-port 100BaseT switch provides the network connectivity for public clients.

## Software – The Dashboard

Your Test tRACK system is a server cluster whose purpose is to provide a single database on interconnected machines. Several database hosts make up the cluster. Each of these cluster machines stores an operating system and Oracle binaries on internal hard disks. Each of the machines also runs an Oracle 10g instance that participates in the Real Application Cluster. The figure below depicts a typical configuration of the four clustered database servers, the management server and the private interconnect between the database servers.



**Figure 1 - A sample Test tRACK Network Configuration**

Each database server contains two network interface cards. One card handles interconnect traffic between the clustered database servers. The other network interface card handles public and virtual interface traffic from outside the cluster. The private network interface has a single assigned IP address; the public network interface has several assigned IP addresses.

Data passes between machines on a private high-speed network through an interconnect switch. The private IP addresses and hostnames of each machine allow database server processes to quickly communicate with the other database servers in the cluster. The private interconnects normally carry only Real Application Cluster cache fusion communications. Notice that the IP addresses of the private interface card are on a separate network/mask.

The public-facing interface card handles node console traffic, secure shell sessions, file transfer activities and client database connections for Oracle's Net10 traffic. Two public-facing network host names and IP addresses allow for client connectivity directly to the machine and virtually to this machine's participation in the database cluster. Each direct host name has a corresponding virtual name/IP address for Oracle client connectivity.

The final hostname and IP address for each node that begins with the letters 'rx' is an IP address for a telnet connection to the serial console for that node. For server management during boot up and single user mode, you can perform these activities at the console contained within the Test tRACK enclosure. However, this remote console hostname and IP address provides a mechanism for remote management.

## Clustered servers

By having the clustered servers provide separate operating systems, we take advantage of the strengths of each operating system (OS), HP-UX, and Linux, to ensure robust and seamless functionality.

### Cluster server software

The Test tRACK nodes communicate with each other using clustering software provided by Oracle called Oracle Cluster Ready Services (CRS).

Real Application Clusters (RAC) use services to enable uninterrupted database operations. Services are tightly integrated with the Cluster Ready Services high availability framework that supports RAC. When a failure occurs, the service continues uninterrupted on the nodes and instances unaffected by the failure. Those elements of the services affected by the failure are recovered quickly by Cluster Ready Services, and the recovering sessions are balanced across the remaining systems automatically. For planned outages, RAC provides interfaces to relocate, disable, and enable services. The relocation of services migrates the service to another instance, and, as an option, the sessions are disconnected. To prevent the Cluster Ready Services system from responding to an unplanned failure that happens during maintenance or repair, the service is disabled on the node doing maintenance at the beginning of the planned outage. It is then enabled at the end of the outage. These service-based operations, in combination with schema pre-compilation on a service basis, minimize the downtime for many planned outages. For example, application upgrades, operating system upgrades, hardware upgrades and repairs, Oracle patches approved for rolling upgrade, and parameter changes can be implemented by isolating one or more services at a time. The continuous service built into RAC is extended to applications and mid-tier servers. When the state of a service changes (for example, up, down, or not restarting), the new status is notified to interested subscribers through events and callouts. Applications can use this notification to achieve very fast detection of failures, balancing of connection pools following failures, and balancing of connection pools again when the failed components are repaired. For example, when the service at an instance starts, the event and callouts are used to immediately trigger work at the service. When the service at an instance stops, the event is used to interrupt applications using the service at that instance. Using the notification eliminates the client waiting on TCP timeouts. The events are integrated with Oracle JDBC connection pools and Transparent Application Failover (TAF).

CRS on each node have been configured in their own Oracle Home location. Cluster Ready Services are started automatically on startup and can be controlled through various commands detailed in the Test tRACK operations manual.

## Shared storage

Your Test tRACK system includes storage for database files that are shared across the clustered instances. This section describes how this shared storage is configured for a typical Test tRACK system.

### Storage Configuration

Each node of the cluster contains internal disk drives and a fibre channel connection to a shared storage system called a storage area network (SAN). On the internal storage of the database servers, the operating system(s) is installed. To make the database servers boot into different operating systems, the internal hard disks may be partitioned. Operating system binaries are loaded into different partitions. Oracle binaries may also be loaded onto the internal storage of the database servers. The Oracle software may also be configured to run from the shared storage as well. Additional space on the internal disks may be available for backup of other Test tRACK systems.

Shared storage for Test tRACK is a Storage Area Network (SAN). The SAN consists of an HP fibre channel switch and an HP storage array device. The SAN is populated with multiple hard disks. These disks are formatted and configured as a redundant array of inexpensive disk (RAID) configuration. The formatting is done using the native program of the disk device or using graphical program to configure the disks. The disk space is then carved up into logical units (LUN)s suitable for the different shared storage functions for the connected database servers. The shared storage will be needed for the Oracle Cluster Registry (OCR) files, Oracle Cluster File System (OCFS), raw devices or Automatic Storage Management (ASM) disk groups. If the Test tRACK database servers are bootable into multiple operating systems, then the SAN LUNs will be provided for various operating system boots.

The SAN will typically be configured with striping and mirroring for performance and availability. LUNs will be spread across multiple disks. Therefore, disk access is spread across multiple drives, thus avoiding single disk contention. Also, data mirroring across the drives allows the disk system to continue to operate, even if one of the drives fails. The system may be configured with a hot-spare drive allowing the failure of one disk to not compromise the array's redundancy.

A sample configuration is shown in the following figure. This figure show eight partitions represented by the horizontal rectangles. The vertical boxes signify each of the physical drives. The horizontal rectangle enclosing each LUN signifies that the contents of the LUN are spread across all the configured drives. Some of the LUNs in this sample are configured for the HP-UX configuration; other LUNs are configured for Linux. For each LUN, the storage LUN number, the operating system, the disk system (RAW or file system), the LUN usage and the disk capacity are shown.

## Shared Storage Configuration (MSA1000)

Raid 0+1 (6x72GB SCSI Disks)				Spare
0	HP-UX	Raw / Voting Disk	39 MB	
1	HP-UX	Raw / OCR	219 MB	
2	HP-UX	Raw / ASM	50 GB	
3	HP-UX	Raw / ASM	50 GB	
4	Linux	OCFS	50 GB	
5	Linux	OCFS	50 GB	
6	Linux	Raw / Voting Disk	39 MB	
7	Linux	OCFS / OCR & Voting Disk	219 MB	

**Figure 2 - Sample SAN Disk Configuration**

The purpose of the shared storage for Oracle Real Application Clusters is to provide a storage location where each database node can simultaneously perform read and write operations. The clustered disk options for shared storage include a clustered file system, raw devices and automatic storage management.

### Cluster File System

On the Test tRACK system, several database instances simultaneously manipulate database files on a shared storage device. The database files on the shared storage device must exist on a device accessible to all nodes. The database files include datafiles, control files, redo log files, archive log files, server parameter files and others. If these database files reside on a shared file system, that file system must be a clustered file system. If these database files reside in Oracle 10g's automatic storage management (ASM) infrastructure, a clustered file system is not required.

**Oracle Cluster File System (OCFS)** presents a consistent file system image across the servers in a cluster. OCFS allows administrators to take advantage of a file system for the Oracle database files (data files, control files, and archive logs) and configuration files. This eases administration of the Oracle Real Application Clusters.

Test tRACK is configured to automatically mount the OCFS partitions for the Linux version.

Automatic Storage Management is a vertical integration of both the file system and the volume manager built specifically for Oracle database files. It extends the concept of stripe and mirror everything (SAME) to optimize performance, while removing the need for manual I/O tuning (distributing the datafile layout to avoid hotspots). Automatic Storage Management helps manage a dynamic database environment by letting you grow the database size without shutting down the database to adjust the storage allocation. Automatic Storage Management also enables low cost modular storage to deliver higher performance and greater availability by supporting mirroring as well as striping.

The HP-UX version of Test tRACK uses ASM to store shared files for the Oracle database. Oracle files do not show up from file system command such as 'ls'. Oracle files can only be seen from the Oracle database.

### Automatic Storage Management

Prior to Oracle 10g, Oracle database files resided on file systems or raw devices. The database administrators had to manage the storage, create the database files via Oracle, monitor performance and so on. With 10g's automatic storage management (ASM), you can now create disk groups that Oracle will manage. The database datafiles, control files, redo logs, archive redo logs and other files can be managed by Oracle. Automatic Storage Management automates and simplifies the optimal layout of datafiles, control files, and log files. Database files are automatically distributed across all available disks and database storage is rebalanced whenever the storage configuration changes. ASM can also provide redundancy through mirroring across the disk drives. If the external storage is an array which provide redundancy, then the ASM mirroring feature is not used. This Test tRACK does not use ASM mirroring because the MSA array is configured with RAID 0+1. The two primary benefits of ASM are ease of management and increased performance.

By configuring ASM and disk groups, no cluster file system such as Veritas or HP Service Guard with RAC extension was necessary.

The ASM disk group contents do not show up to the operating system. You will not be able to list database file contents or copy files using typical operating commands. Therefore, Test tRACK uses Oracle Recovery Manager for backup and recovery of the database contents.

### Cluster management

Your Test tRACK system includes a server used for cluster management called a management server or a management station. This server runs Windows OS and contains a variety of management functions. Windows is required for the management server because some software tools and configuration utilities only execute on a Windows client. Various tools have been loaded and configured on the management station.

### Database

A database is a collection of data typically organized to make common retrievals easy and efficient. Test tRACK utilizes the database software available as well as powerful tools to manipulate and test it.

**Oracle 10g Enterprise Database** - Oracle Database Enterprise Edition offers industry-leading scalability and reliability in both clustered and single-system configurations. It provides the most-comprehensive features for OLTP and business intelligence and delivers the lowest total cost of ownership.

Enterprise Edition includes:

- High-performance business intelligence services such as ETL, data warehousing, OLAP, and data mining
- Comprehensive, open access to Web services through SQL, Java, XML, and standard Web interfaces
- Continuous availability despite system failures, site failures, disasters, human errors, and planned maintenance

The Test tRACK system has been configured with several database tools to operate and manage the clustered database. The inventory and description of each Test tRACK system is described in that system's operating manual.

The Test tRACK database has been installed in an optimal flexible architecture (OFA) best practice. This section defines important files, directories and environment variables pertaining to the database and cluster software install. All subdirectories are under a top-level ORACLE\_BASE. The ORACLE\_HOME and admin directories are also located under ORACLE\_BASE. The database files are stored on shared storage on either a cluster file system or using automatic storage management (ASM).

This table shows the hierarchical directory tree of a sample OFA-compliant database for RAC on UNIX-based systems:

Root	Second-Level	Third-Level	Fourth-Level	Fifth-Level
\$ORACLE_BASE				/opt/oracle The default ORACLE_BASE directory.
	\$ORACLE_HOME			/product/db10_1_0 The default name of the Oracle home.
	/admin			Administrative directory.
		/trac		Database unique name
			/bdump /cdump /hdump /pfile /udump	Dump destinations for database server.
		/bin		Subtree for Oracle binaries.
		/network		Subtree for Oracle Net.
	<i>\$CRS_Home (also \$ORA_CRSHOME)</i>			/product/crs10_1_0 The default name of the CRS home.
		/bin		Subtree for Oracle binaries.
		/network		Subtree for Oracle Net.

**Table 1 - Sample Test tRACK Database File Structure**

Your Test tRACK system has been delivered with a working database. This generic database can be used for testing your applications and database functions. The database was created with Oracle's 10g database configuration assistant (DBCA). The database has all the needed tablespaces, schemas and connectivity included to immediately begin testing. The instances have been set up for transaction management (OLTP) but can be configured for decision support or general database activities. You can use this database or create another database on the Test tRACK using the database configuration assistant (DBCA).

You will want to load your own application data on the system to test functionality and performance of your application. To do so, create tablespaces needed for your application(s) and load your data into those tablespaces. Avoid loading your data into existing tablespaces such as SYSTEM or USERS.

Though you can create another database instance on Test tRACK using DBCA or custom scripts, Cnetics recommends using the preconfigured database because it has been fully validated and will typically suit your needs for application testing.

## ***Operations – The Driving School***

During your prototype testing of your Test tRACk system, you will need to operate the hardware components and the various operating system components of the system. You'll need to turn on and off the system, start and stop the software and backup the software changes.

As part of the Test tRACk offering, Cnetics staff will provide detailed instructions for the operation of your specific system. You will also receive some basic hands-on training and assistance to get the system up and running at your location. When the Test tRACk is delivered to your facility, Cnetics staff will configure each server to work within the existing network of your company.

Cnetics will construct backup mechanisms for the potential of system or operational failure. During delivery of the system, these scripts and processes will be tested and deployed.

## Fuel Boosters – Additional Reference Material

This section provides links to our partners should you need more details on the RAC approach and architecture. Any specific hardware reference materials for your Test tRACK can be found in the Test tRACK Manual portion of this binder. Some references may appear in multiple places, because of the integration of these components.

### Software References

#### Real Application Cluster References

Document	Link
<a href="#">Search the 10g Release 1 Documentation</a>	<a href="http://otn.oracle.com/pls/db10g/portal.portal_demo3?selected=2">http://otn.oracle.com/pls/db10g/portal.portal_demo3?selected=2</a>
<a href="#">Real Application Clusters Administrator's Guide</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10765/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10765/toc.htm&amp;remark=portal</a> Requires free Oracle Technology Network User account
<a href="#">Real Application Clusters Deployment and Performance Guide</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10768/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10768/toc.htm&amp;remark=portal</a> Requires free Oracle Technology Network User account
<a href="#">High Availability Architecture and Best Practices</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=server.101/b10726/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=server.101/b10726/toc.htm&amp;remark=portal</a> Requires free Oracle Technology Network User account
<a href="#">Platform Specific Documentation and Installation Guides</a>	<a href="http://otn.oracle.com/documentation/database10g.html">http://otn.oracle.com/documentation/database10g.html</a>

#### HP-UX References

Document	Link
<a href="#">HP-UX 11i v2 for Integrity Servers</a>	<a href="http://www.hp.com/products1/unix/operating/choice/hpux_itanium.html">http://www.hp.com/products1/unix/operating/choice/hpux_itanium.html</a>

#### Oracle References

##### Oracle RAC 10g new installation and configuration features

- Cluster Ready Services (CRS) provides Oracle Database RAC 10g high availability components that provide many system management features. CRS components also

interact with the vendor clusterware, if present, to coordinate cluster membership information.

- The Oracle Database 10g installation requires you to perform a two-phase process in which you run the Oracle Universal Installer (OUI) twice. The first phase installs Oracle Cluster Ready Services and the second phase installs the Oracle Database 10g software with RAC. The installation also enables you to create and configure services for your RAC environment.
- Support for virtual IP addresses for each RAC instance.
- Support of ASM as new storage type for database files.
- A new auxiliary, system-managed tablespace called SYSAUX contains performance data and combines content that was stored in different tablespaces (some of which are no longer required) in earlier releases. This is a required tablespace for which you must plan disk space.
- The 'gsdctl' commands are obsolete. The CRS installation process stops any existing GSD processes.
- The Oracle Database 10g version of the srvConfig.loc file is the ocr.loc file. The Oracle 9i version of srvConfig.loc still exists for backward compatibility.

Document	Link
<a href="#">Oracle Grid Computing</a>	<a href="http://www.oracle.com/technology/tech/grid/index.html">http://www.oracle.com/technology/tech/grid/index.html</a>
<a href="#">Oracle Database 10g: The Top 20 Features for DBAs</a>	<a href="http://www.oracle.com/technology/pub/articles/10gdba/index.html">http://www.oracle.com/technology/pub/articles/10gdba/index.html</a>
<a href="#">Oracle on Linux</a>	<a href="http://www.oracle.com/technology/tech/linux/index.html">http://www.oracle.com/technology/tech/linux/index.html</a>
<a href="#">Oracle10g* Test Drives on Intel® Architecture</a>	<a href="http://www.intel.com/cd/ids/developer/asmo-na/eng/149957.htm">http://www.intel.com/cd/ids/developer/asmo-na/eng/149957.htm</a>
<a href="#">Oracle Cluster File System</a>	<a href="http://oss.oracle.com/projects/ocfs/">http://oss.oracle.com/projects/ocfs/</a>
<a href="#">HP &amp; Oracle Alliance</a>	<a href="http://h71028.www7.hp.com/enterprise/cache/4281-0-0-225-121.aspx">http://h71028.www7.hp.com/enterprise/cache/4281-0-0-225-121.aspx</a>
<a href="#">Oracle 10g Real Application Cluster Home Page</a>	<a href="http://www.oracle.com/technology/products/database/clustering/index.html">http://www.oracle.com/technology/products/database/clustering/index.html</a>
<a href="#">Oracle Real Application Cluster Home Page</a>	<a href="http://www.oracle.com/database/rac_home.html">http://www.oracle.com/database/rac_home.html</a>

## Official Oracle Database 10g Documentation

For more details, please check the official Oracle documentation that is available at <http://www.oracle.com/technology/documentation/database10g.html>.

Oracle 10g documentation, specific to the OS, available at this site:

<b>Oracle Database 10g Release 1 (10.1) Documentation for Linux x86-64</b>	
B14399-01	Oracle Database Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14400-01	Oracle Database Client Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14401-01	Oracle Database Companion CD Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14402-01	Oracle Database Quick Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14403-01	Oracle Database Client Quick Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14404-01	Oracle Database Companion CD Quick Installation Guide 10g Release 1 (10.1.0.3) for Linux x86-64
B14405-03	Oracle Database Release Notes 10g Release 1 (10.1.0.3) for Linux x86-64
B14406-01	Oracle Real Application Clusters Installation and Configuration 10g Release 1 (10.1.0.3) for Linux x86-64
<b>Oracle Database 10g Release 1 (10.1) Documentation for HP-UX Itanium</b>	
B13754-01	Oracle Database Quick Installation Guide for HP-UX Itanium
B10811-05	Oracle Database Installation Guide for UNIX Systems
B10812-06	Oracle Database Administrator's Reference for UNIX Systems
B10886-06	Oracle Database Companion CD Installation Guide for UNIX Systems: AIX-Based Systems, HP-UX, hp Tru64 UNIX, Linux, and Solaris Operating System (SPARC)
B12087-05	Oracle Database Client Installation Guide for UNIX Systems
B13765-01	Oracle Database Companion CD Quick Installation Guide 10g Release 1 (10.1) for HP-UX Itanium
B13766-01	Oracle Database Client Quick Installation Guide 10g Release 1 (10.1) for HP-UX Itanium
B10766-08	Oracle Real Application Clusters Installation and Configuration Guide
B13755-06	Oracle Database Release Notes 10g Release 1 (10.1.0.2.0) for HP-UX Itanium

## Operation References

This section provides more references from an operational perspective as it relates to the individual components.

### Operations related aspects for RAC

<a href="#">To Search the 10g Release 1 Documentation</a>	<a href="http://otn.oracle.com/pls/db10g/portal.portal_demo3?selected=2">http://otn.oracle.com/pls/db10g/portal.portal_demo3?selected=2</a>
<a href="#">Real Application Clusters Administrator's Guide</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10765/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10765/toc.htm&amp;remark=portal</a>
<a href="#">Real Application Clusters Deployment and Performance Guide</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10768/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=rac.101/b10768/toc.htm&amp;remark=portal</a>
<a href="#">High Availability Architecture and Best Practices</a>	<a href="http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=server.101/b10726/toc.htm&amp;remark=portal">http://otn.oracle.com/pls/db10g/db10g.to_toc?pathname=server.101/b10726/toc.htm&amp;remark=portal</a>
<a href="#">Platform Specific Documentation and Installation Guides</a>	<a href="http://otn.oracle.com/documentation/database10g.html">http://otn.oracle.com/documentation/database10g.html</a>

### Operations related aspects for all components of Test tRACK

<a href="#">Oracle Grid Computing</a>	<a href="http://www.oracle.com/technologies/grid/index.html">http://www.oracle.com/technologies/grid/index.html</a>
<a href="#">Oracle Database 10g: The Top 20 Features for DBAs</a>	<a href="http://www.oracle.com/technology/pub/articles/10gdba/index.html">http://www.oracle.com/technology/pub/articles/10gdba/index.html</a>
<a href="#">Oracle on Linux</a>	<a href="http://www.oracle.com/technology/tech/linux/index.html">http://www.oracle.com/technology/tech/linux/index.html</a>
<a href="#">Oracle10g* Test Drives on Intel® Architecture</a>	<a href="http://www.intel.com/cd/ids/developer/asmo-na/eng/149957.htm">http://www.intel.com/cd/ids/developer/asmo-na/eng/149957.htm</a>
<a href="#">Oracle Cluster File System</a>	<a href="http://oss.oracle.com/projects/ocfs/">http://oss.oracle.com/projects/ocfs/</a>
<a href="#">HP &amp; Oracle Alliance</a>	<a href="http://h71028.www7.hp.com/enterprise/cache/4281-0-0-225-121.aspx">http://h71028.www7.hp.com/enterprise/cache/4281-0-0-225-121.aspx</a>
<a href="#">Oracle 10g Real Application Cluster Home Page</a>	<a href="http://www.oracle.com/technology/products/database/clustering/index.html">http://www.oracle.com/technology/products/database/clustering/index.html</a>
<a href="#">Oracle Real Application Cluster Home Page</a>	<a href="http://www.oracle.com/database/rac_home.html">http://www.oracle.com/database/rac_home.html</a>

## Oracle MetaLink Materials

Please note, you must have a valid MetaLink account to access these links, which can only be acquired by customers who have an Oracle Support contract.

The website access can be found at:

<http://www.oracle.com/support/metalink/index.html>

### CRS (Cluster Ready Services):

- CRS and 10g Real Application Clusters; [Note: 259301.1](#)
- How to Clean Up After a Failed CRS Install; [Note: 239998.1](#)
- How to Stop the Cluster Ready Services (CRS); [Note: 263897.1](#)
- Stopping Reboot Loops When CRS Problems Occur; [Note: 239989.1](#)
- Troubleshooting CRS Reboots; [Note: 265769.1](#)



- CRS 10g Diagnostic Collection Guide; [Note:272332.1](#)
- What Are The Default Settings For MISSCOUNT In 10g RAC ?, [Note 300063.1](#)
- CSS Timeout Computation in 10g RAC 10.1.0.3; Note:[294430.1](#)

#### VIPs / Interconnect / Public Interface:

- How to Configure Virtual IPs for 10g RAC; [Note:264847.1](#)
- How to change VIP and VIP/Hostname in 10g ; [Note:271121.1](#)
- Modifying the VIP of a Cluster Node; [Note:276434.1](#)
- How to Change Interconnect/Public Interface IP Subnet in a 10g Cluster; [Note:283684.1](#)
- Troubleshooting TAF Issues in 10g RAC; [Note:271297.1](#)

#### OCR / Voting:

- How to Restore a Lost Voting Disk in 10g; [Note:279793.1](#)
- Repairing or Restoring an Inconsistent OCR in RAC; [Note:268937.1](#)

#### ASM:

- ASM Instance Shuts Down Cleanly On Its Own; [Note:277274.1](#)

#### Migration:

- How to migrate from Oracle 9i RAC to Oracle 10g RAC; [CTC Technical Paper](#)

#### Adding/Removing Nodes:

- Adding a Node to a 10g RAC Cluster; [Note: 270512.1](#)
- Removing a Node from a 10g RAC Cluster; [Note:269320.1](#)