Highly Available Forms and Reports Applications with Oracle® Fail Safe 3.0

High Availability for Windows NT

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ORACLE

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INTRODUCTION

Today's Internet businesses require high availability business solutions. According to studies by the Gartner Group and other research organizations, system downtime costs companies an average of over $14,000 a minute (for retail brokerages, the cost of downtime can exceed $100,000 per minute), and these costs will only increase with the continued growth of business on the Internet. For these businesses, nearly continuous access to their entire business solutions — to both data *and* application logic — is becoming a competitive necessity.

Oracle Fail Safe 3.0 extends Oracle's technology leadership in providing high availability solutions on Windows NT clusters to include both Oracle8*i*, the Database for Internet Computing, and applications built using Oracle Developer 6.0. Now, developers of Web-based forms and reports applications not only benefit from Developer 6.0's native Java support, but also from the easy-to-use high availability provided by Oracle Fail Safe 3.0. For the first time, a complete Internet business solution, including the Web servers that deliver content, the Forms and Reports Servers that host the application logic, and the back-end Oracle database, can be made fail-safe with Oracle Fail Safe.

Oracle Fail Safe 3.0 provides three major benefits to users of Oracle Developer products:

- *High availability:* Fast, nearly transparent failover of the customer's complete Internet solution
- *Quick deployment:* No modifications to existing applications or clients necessary
- *Ease of use:* Configuration wizards and intuitive drag-and-drop management tools

High availability

Oracle Fail Safe 3.0 minimizes the costly downtime of both planned failures (e.g. system upgrades) and unplanned failures (e.g. unexpected hardware or operating system failures). When a failure occurs, the workload on the failed node is automatically restarted on the surviving node within seconds. By configuring the entire product stack for high availability (including Web servers, Forms and Reports Servers, and Oracle database servers), Oracle Fail Safe allows customers to build complete high availability business solutions with no single points of failure. Considering the high business cost of downtime, a cluster running Oracle Fail Safe 3.0 often pays for itself after the first unplanned failure.

Quick deployment

Existing forms and reports can be made fail-safe without modification—there is no need to update or rebuild applications. Moreover, Fail Safe is completely non-intrusive: clients and end users simply

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connect to a single server at a fixed network address, without requiring any knowledge of the underlying cluster. Because Fail Safe Forms and Reports Servers are accessible at a single network address (regardless of the cluster node on which they actually reside), clients need only reconnect to the same address to continue working after a failure. For example, users of a Web-based form can just click on the reload/refresh button in their browsers.

Ease of use

Ordinarily, configuring servers on clusters and setting conditions for failover and failback are complex tasks that require detailed knowledge of the cluster environment. However, Oracle Fail Safe 3.0 provides an intuitive graphical user interface, Oracle Fail Safe manager, that offers drag-and-drop cluster management, step-by-step configuration wizards, and intuitive property sheets that simplify the setup and management of Fail Safe resources, such as Forms and Reports Servers. The Fail Safe manager also provides default configuration parameters that are optimized to ensure fast failover times, comprehensive verification tools to troubleshoot and fix common problems, and a command line interface to allow scripting and automation of cluster administration tasks. In addition, a detailed tutorial and extensive online help system quickly get new users up to speed.

HOW FAIL SAFE FORMS AND REPORTS WORK

Oracle Fail Safe is layered over the MSCS cluster software (included with Windows NT Enterprise Edition) and tightly integrates with the "shared nothing" cluster environment. A cluster is a group of independent computer systems (nodes) working together as a single system. Nodes may be single CPU systems or multi-CPU SMP systems, and typically communicate with each other via a private heartbeat network connection. In a shared nothing cluster, resources (such as disks or IP addresses) are owned and accessed by only one node at a time. Oracle Fail Safe works with the underlying cluster software to configure and monitor these resources for high availability; when a resource becomes unavailable and cannot be automatically restarted, the software will attempt to *fail* the resource *over* to another node. ("Failover" refers to the transfer of control over shared resources, such as disks, from one cluster node to another.)

There are three major components of the Oracle Fail Safe 3.0 architecture: Oracle Fail Safe resource DLLs (Dynamically Linked Libraries), Oracle Fail Safe server, and Oracle Fail Safe manager (see Figure 1). Every type of resource that can be made fail-safe (e.g. databases, Web servers, Forms and Reports Servers) requires an Oracle Fail Safe resource DLL, which provides resource-specific configuration, verification and management information (such as resource dependencies, start-up requirements, and failover policies) to the Oracle Fail Safe server. Oracle Fail Safe server manages internode communication and works with the underlying cluster software to ensure fast failover of Fail Safe resources during both planned and unplanned node outages. Together, the Fail Safe resource DLLs and Fail Safe server provide distributed configuration, verification, and management of Forms, Reports, and Web servers across a cluster. Oracle Fail Safe manager automates the configuration of Oracle Forms and Reports servers, and provides an easy-to-use interface for performing cluster-related management, troubleshooting, and static load balancing.
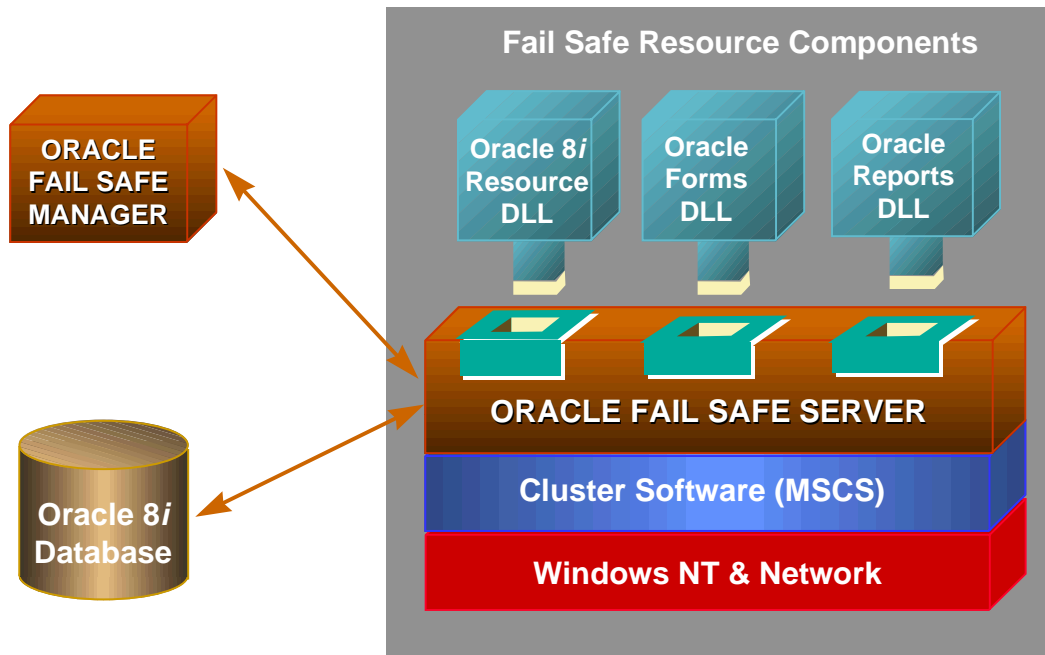
Figure 1: Oracle Fail Safe 3.0 Architecture

FAIL SAFE CONCEPTS

A Fail Safe group is a logical container of cluster resources, such as disks or database servers. All resources in a group share the same availability characteristics and can be owned by only one cluster node at a time. A group is the minimal unit of failover (i.e. all the resources in a group fail over together). If a group has a virtual address (composed of a network name resource and IP address resource), it becomes a virtual server accessible at a fixed network address regardless of the physical cluster node that owns the group. For example, a virtual server containing a Web-based form or report can be accessed at the same URL both before and after a failover.

No changes are required for existing client applications to work with Forms and Reports Servers deployed with Oracle Fail Safe. From the client perspective, each Fail Safe group appears as a highly available server. Failover of Forms and Reports servers appears to clients as a quick node reboot, typically taking only a few seconds. After a failover, clients reconnect to the fixed virtual server address (e.g. users can simply click on the 'reload' button in their Web browser) and resume work. While quick failovers ensure that applications remain almost continuously available, transient state in Forms and Reports Servers (or more specifically, in the runtime engines) will not survive a failover; uncommitted work is lost and the application or end user will need to reissue these transactions. Jobs scheduled against Fail Safe Reports Servers, however, will survive a failover — because the job queue is placed on the shared cluster disk, it can be accessed from any cluster node.

HOW TO CREATE FAIL SAFE FORMS AND REPORTS

Making a fail-safe Forms or Reports application requires the following steps (assuming that Microsoft Cluster Server and Oracle Fail Safe server have been installed on each node):

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1. Ensure that Oracle Developer Server (for Forms and Reports Servers) and Oracle Application Server (for Web servers) have been installed in the same location on both nodes of the cluster.

2. Copy the Web pages and the Forms or Reports files (i.e. the .html files and the .fmx or .rdf files) to cluster disks attached to the shared storage interconnect between the nodes.

3. Invoke the Create Group Wizard in the Fail Safe manager to create an Oracle Fail Safe group for your Forms or Reports application. When you finish creating the group, Fail Safe will automatically invoke the Add Virtual Address to Group Wizard.

4. Add one or more virtual addresses to the group using the Add Virtual Address to Group Wizard. Clients will always access your fail-safe application at this address.

5. Invoke the Add Resource to Group Wizard once to create a fail-safe Oracle Web Listener that will host your fail-safe application.

6. Invoke the Add Resource to Group Wizard a second time to create a fail-safe Forms or Reports Server (or to make an existing Forms or Reports server fail-safe).

Figure 2 illustrates some of these steps with screen shots from the Create Group and Add Resource to Group Wizards. When you add a resource to a Fail Safe group, Oracle Fail Safe populates a cluster group and builds the appropriate dependency tree. All specified failover and failback policies are defined and registered with the cluster software, and the group is tested to verify that resource will correctly fail over and restart on each cluster node.
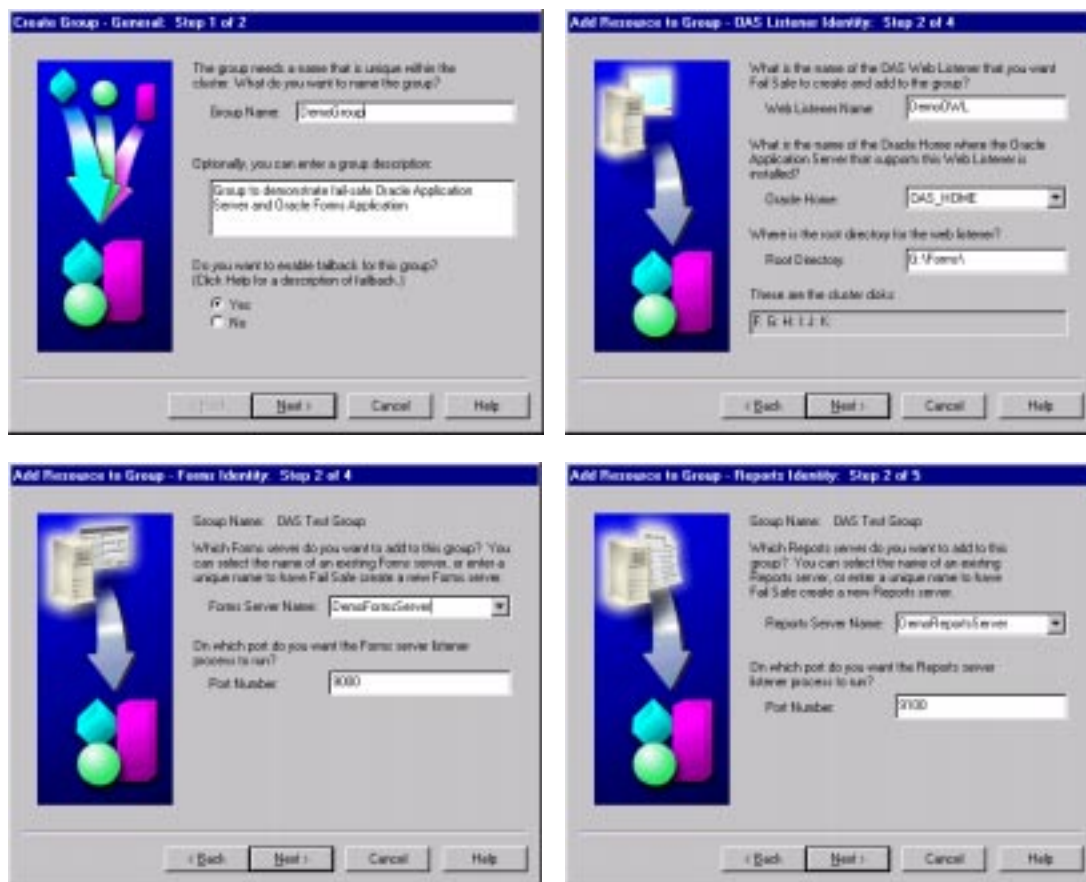
Figure 2: Create Group and Add Resource to Group Wizards

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**DEPLOYING HIGHLY AVAILABLE FORMS AND REPORTS**

There are a number of different configuration options for deploying highly available forms and reports applications with Oracle Fail Safe 3.0, depending on the customer's workload and business needs. The four main ways to deploy highly available forms and reports applications are: Active/Passive, Active/Active, Partitioned, and Multitiered.

While each of these solutions differ in the way work is allocated between the cluster nodes, all share the following features:

- One or more Oracle Homes are created on a private disk (e.g. the system disk) on each node

- All necessary Oracle product executables are installed in the Oracle Home(s) on each node

- All database, Forms, Reports, and Web files (e.g. database data files, database log files, Forms executable files, PL/SQL files, Reports definitions files, and Web pages) are placed on the shared cluster disks, so they can be accessed by both nodes.

Active/Passive Configuration

In an active/passive (or standby) configuration (Figure 3), one node hosts the Oracle Fail Safe server, Oracle database server, and one or more Forms, Reports, and Web servers, while the other node remains idle, ready to pick up the workload in the event of a failure. The standby configuration provides the fastest failover response time, but at the cost of requiring the second node to sit idle. However, this solution is still less expensive than traditional standby solutions because there is only one copy of the data (kept on the group's cluster disks) — there is no need to purchase a second complete disk farm and the extra network bandwidth required for real-time data replication.
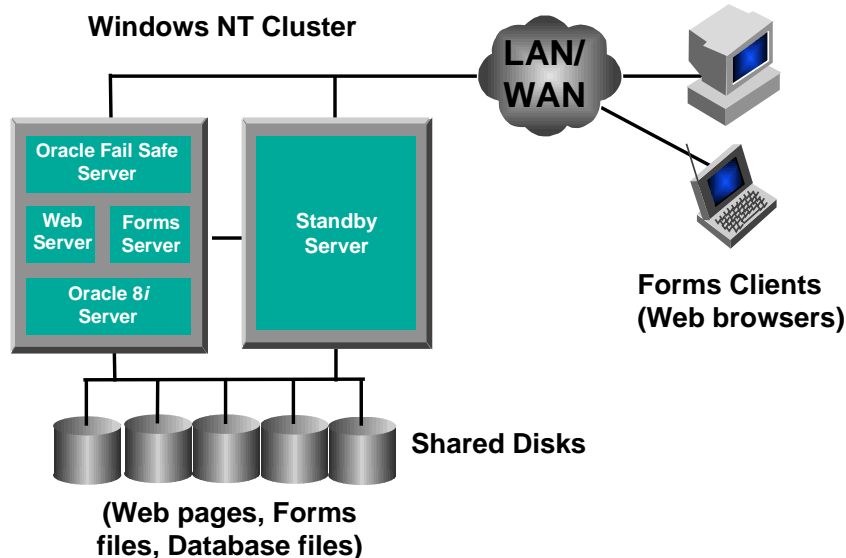

Figure 3: Active/Passive (Standby) Configuration

Active/Active Configuration

In the active/active solution shown in Figure 4, a Fail Safe server, an Oracle database, and one or more Forms/Reports/Web servers reside on each cluster node. Each node backs up the other in the event of

a failure. Compared to the Active/Passive configuration, the Active/Active configuration offers better performance (higher throughput) when both nodes are operating, but slower failover and possibly reduced performance when one node is down. If each node runs at 50% capacity, this solution is similar to a standby solution (the equivalent of an entire node remains idle), but it makes better use of network bandwidth, since client connections are distributed over two nodes. It is also possible to run both nodes at higher capacities by enabling failover only for mission-critical applications. Oracle Fail Safe's flexible architecture allows many variations to the basic active/active configuration. Because each cluster node can host multiple virtual servers, each database, Forms server, Reports server, and Web server running on the node can be configured with its own failover and failback policies. Users can also combine the scripting support of Oracle Fail Safe (using the FSCMD command-line interface) with a system monitoring tool, such as Oracle Enterprise Manager, to automate the movement of groups for load-balancing purposes.
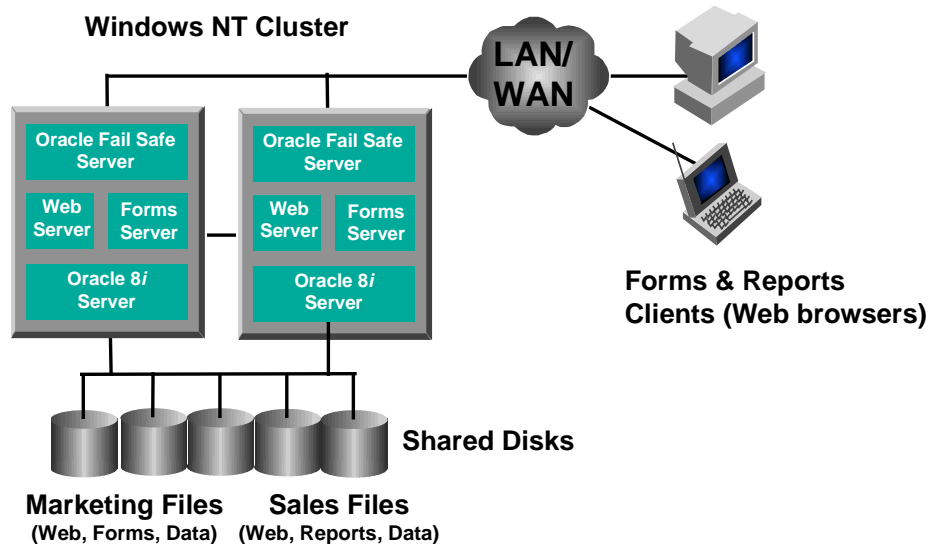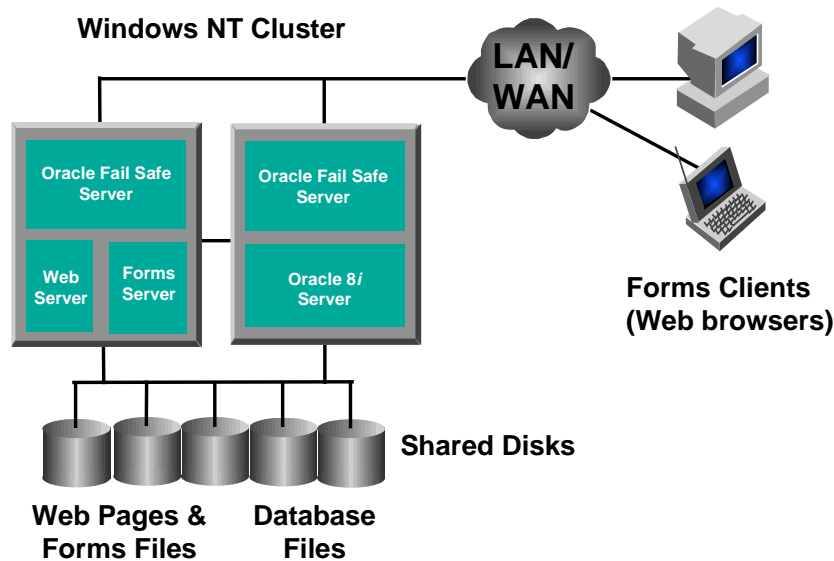

Figure 4: Active/Active Configuration

Partitioned Workload Configuration

The partitioned workload solution, shown in Figure 5, is a variant of an active/active solution, in which the application workload resides on one node and the database workload resides on the other. In this example, Node 1 serves the Fail Safe Forms/Reports/Web servers, while Node 2 serves an Oracle Fail Safe database. Each node backs up the other in the event of failure. If the private heartbeat network connection between the nodes has high bandwidth, then the Forms or Reports server may be able to optimize database transaction processing by using the private network, rather than the public network, to communicate with the database. Because the bandwidth requirement for internode heartbeat communication is small, the application server can take advantage of what is effectively a dedicated network link to the database.

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Windows NT Cluster

Oracle Fail Safe Server

Oracle Fail Safe Server

Web Server

Forms Server

Oracle 8*i* Server

LAN/ WAN

Forms Clients (Web browsers)

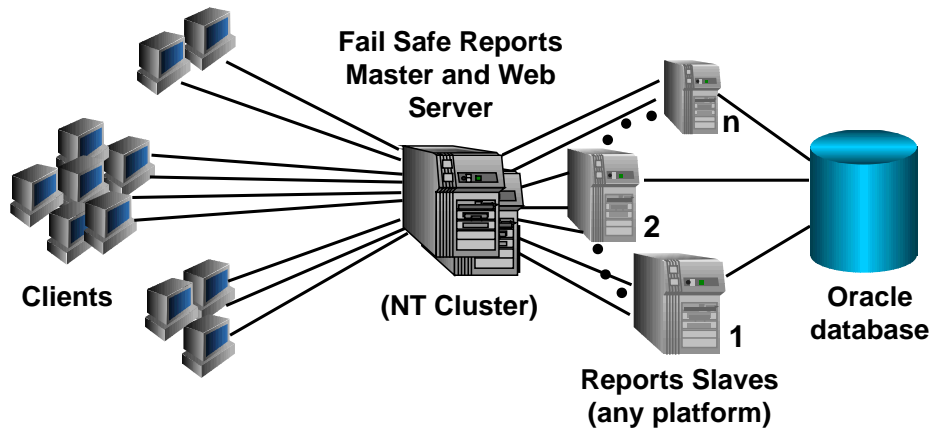Shared Disks

Web Pages & Forms Files

Database Files

Figure 5: Partitioned Workload Configuration

Multitiered Configuration

In a multitiered configuration, Forms and Reports servers reside on separate systems from the database. This is a common way to scale a Forms or Reports business solution, with a single back-end database driving a number of Forms or Reports servers running on multiple machines. In the case of multiple Forms servers, a load-balancing Web server is used to connect to the Forms servers (this Web server represents a single point of failure in traditional multitiered configurations). The entire solution can be made highly available by configuring just the Web server for failover with Oracle Fail Safe, and relying on the Web server to detect failures and redistribute incoming requests to surviving nodes. Availability can be improved further by also making one or more of the Forms servers fail-safe.

In the case of multiple Reports servers, one of the servers is designated the master, and is responsible for dividing the workload among the remaining servers. In this configuration, both the Reports master and the Web server represent single points of failure that would normally require user intervention to correct. By deploying the Reports master and Web server with Oracle Fail Safe, these single points of failure can be eliminated (see Figure 6).

The multitiered configuration also allows for very flexible architectures, with multiple clusters and platforms working together. As an example, Fail Safe Forms and Reports servers running on NT clusters in the middle tier could interface with a back-end Oracle Parallel Server database running on a UNIX system. Different servers within the application tier can even run on different platforms, so customers with existing Reports servers running on UNIX machines only need to add a single NT cluster running Oracle Fail Safe to make the Reports master (and thus the entire Reports tier) highly available. Mutitiered configurations also allow for incremental deployment of high availability into a customer's business solution, for example, by first adding high availability to less reliable middle-tier application servers before modifying legacy back-end database systems.

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Figure 6: Multitiered Reports Configuration

SUMMARY

Oracle Fail Safe 3.0 extends Oracle's leadership in delivering complete high availability business solutions by enabling rapid deployment of Fail Safe databases, forms applications, and reports applications on NT clusters. Oracle Fail Safe Solutions are ideal for Oracle Developer users who want a fast and easy way to make their forms and reports highly available. A variety of configurations are available to suit specific business requirements, from single-cluster configurations that offer an attractive low-cost entry point into the high availability space, to scaleable multitiered solutions that provide high availability with support for multiple platforms and technologies. Future improvements planned for Oracle Fail Safe include expanding support to additional Oracle applications.

For the latest online information on Oracle tools for Internet application development, refer to http://www.oracle.com/tools/InternetDevTools.html. For more information about Oracle Fail Safe Solutions, see http://www.oracle.com/nt/clusters/failsafe/index.html. For details on how Oracle Fail Safe 3.0 provides high availability for the Oracle8*i* database, including options for wide-area disaster tolerance, refer to the Oracle white paper *Oracle 8i with Oracle Fail Safe 3.0*. To be placed on the mailing list for product news and information, send e-mail to ofsinfo@us.oracle.com.

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