Oracle Maximum Availability Architecture

An Oracle White Paper
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Oracle Commerce MAA
With a Case Study on
Exadata and Exalogic
1 Executive Overview

Oracle Maximum Availability Architecture (MAA) is Oracle's best practices blueprint based on proven Oracle high availability technologies and recommendations. The goal of MAA is to achieve the optimal high availability architecture at the lowest cost and complexity. Papers are published on the Oracle Technology Network (OTN) - http://www.oracle.com/goto/maa.

In this paper we describe the architecture along with installation, configuration, and operational best practices for deploying Oracle Commerce with MAA best practices. For the purpose of this paper Oracle Commerce is comprised of Oracle Commerce Platform, Oracle Commerce Experience Manager, and Oracle Commerce Merchandising.

Oracle Commerce MAA was implemented in three different MAA configurations: fully Active/Passive, Active/Active application with Active/Passive databases (also known as Active/Active/Passive), and fully Active/Active. Each was tested to validate MAA best practices and to measure and observe application impact in various outage scenarios, and the results are presented in this paper. Due to the way that certain applications have been coded, in the Active/Active/Passive configuration some applications needed to remain Active/Passive. These will be outlined in that section of the paper.
2 Introduction

Commerce Platform – formerly known as ATG Web Commerce, Commerce Platform is a framework that clients can build and develop large-scale B2C or B2B websites. Commerce Platform offers a complete commerce software platform that enables you to deliver a personalized customer buying experience across all customer touch points including the web, contact center, mobile devices, social media, physical stores, and more.

Commerce Experience Manager – formerly known as Endeca Commerce, Experience Manager gives clients the flexibility to set up the selling experience as they see fit. The application suite adds search capabilities when used with Oracle Commerce.

Commerce Merchandising – part of the Oracle Commerce Business Control Center, Merchandising allows a client to create and deploy content directly to its commerce web site in a manner that suits its business rules. Merchandising uses Oracle Commerce Content Administration to deploy both data-based content to the commerce database instance(s) and file-based content to the file systems, which the commerce applications are configured.

Commerce Service Center – the commerce customer service application. This is a fully-integrated system which allows CSRs to view and edit orders and profile information. Commerce Service Center is not in the scope of this paper; however, its implementation is similar to that of the base commerce web site.

This paper is organized into the following sections:

- **Oracle Commerce MAA** – a high level description of the architecture and key technology components.
- **Site State Model and State Transitions** – a description of how to establish the architecture on a target system and link to a set of documented steps in the appendix about how to move from one state to the next.
- **Oracle Commerce MAA Case Study on Exalogic and Exadata** – a detailed example of deploying Platform/Merchandising 10.2 and Experience Manager 3.1.2 on an Exadata and Exalogic environment, including:
  - Exadata and Exalogic configuration best practices
  - Procedures for how to operate the system in the event of planned and unplanned outages
- **Configuration Types** – detailed explanations of different ways in which MAA is accomplished with 2 environments or data centers.
- **Outage Testing and Results** – a description of how the test system behaved during various outages and the impact on Commerce Platform users.

For the purpose of this paper the terms Oracle Commerce Platform and Oracle ATG Web Commerce, as well as Oracle Endeca Commerce and Oracle Commerce Experience Manager may be used interchangeably. This is due to the familiarity of the former product branding.
2.1 Introduction to Engineered Systems

Oracle’s Engineered Systems combine best-of-breed hardware and software components with game-changing technical innovations. Designed, engineered, and tested to work best together, Oracle’s Engineered Systems can power the cloud or streamline data center operations to make traditional deployments even more efficient. The components of Oracle’s Engineered Systems are preassembled for targeted functionality and then, as a complete system, optimized for extreme performance. By taking the guesswork out of these highly available, purpose-built solutions, Oracle delivers a solution that is integrated across every layer of the technology stack—a simplicity that translates into less risk and lower costs for your business. Only Oracle can innovate and optimize at every layer of the stack to simplify data center operations, drive down costs, and accelerate business innovation.

2.1.1 Oracle Exalogic

Oracle Exalogic is an engineered system on which enterprises deploy Oracle business applications, Oracle Fusion Middleware, or third-party software products. Exalogic comes pre-built with compute nodes, memory, flash storage, and centralized storage, all connected using InfiniBand in a highly available architecture with fault tolerance and zero-down-time maintenance. Exalogic is optimized for Oracle Commerce, and Oracle Commerce is optimized for Exalogic through enhancements such as full InfiniBand between ATG and Endeca.

2.1.2 Oracle Exadata Database Machine

Oracle’s Exadata Database Machine is Oracle’s database platform delivering extreme performance for database applications including Online Transaction Processing, Data Warehousing, Reporting, Batch Processing, or Consolidation of mixed database workloads. Exadata is a pre-configured, pre-tuned, and pre-tested integrated system of servers, networking, and storage all optimized around the Oracle Database. Exadata is an excellent platform for Oracle Commerce because of the many enhancements contained within it, such as write-back flash cache.
3 Oracle Commerce MAA

Oracle Commerce MAA is a high availability architecture – providing local HA – layered on top of the MAA best practices for Oracle Database and Oracle Fusion Middleware. Operating out of multiple data centers is increasingly important to maintain some form of high availability. The full MAA architecture provided includes two sites to provide business continuity in the event of a single site failure. Section 5 will cover the different configurations.

Figure 1. Commerce Platform MAA
3.1 Oracle Database MAA

See also: *Oracle Database High Availability Overview* for a thorough introduction to Oracle Database high availability products, features, and best practices.

To achieve maximum Commerce Platform application availability, Oracle recommends deploying it on an Oracle Database MAA foundation as depicted in *Figure 2. Oracle Database MAA* which includes the database technologies described here. MAA includes high availability within a data center and across data centers.

- Oracle Real Application Clusters
- Oracle Clusterware
- Oracle Data Guard and Online Upgrade
- Oracle Flashback Database
- Oracle Automatic Storage Management
- Oracle Recovery Manager and Oracle Secure Backup
- Oracle GoldenGate
3.1.1 Oracle Real Application Clusters

Oracle Real Application Clusters (RAC) allows Oracle Database to run any packaged or custom application unchanged across a set of clustered nodes. This capability provides the highest levels of availability and the most flexible scalability. If a clustered node fails the Oracle database will continue running on the surviving nodes. When more processing power is needed another node can be added without interrupting user access to data.

The Oracle Commerce JDBC client integrates with the Oracle RAC Fast Application Notification (FAN) and Fast Connection Failover (FCF) features to provide a more aware connection pool. See also: Oracle Real Application Clusters Administration and Deployment Guide.

3.1.2 Oracle Clusterware

Oracle Clusterware is a general purpose clustering solution originally designed for the Oracle Real Application Clusters Active/Active multi-instance database and which has been extended to support clustering of all applications. Oracle Clusterware provides traditional HA failover support in addition to online management of protected resources, such as online relocation of applications for planned maintenance. Oracle Clusterware is a policy engine providing a rich dependency model for start and stop dependencies, ordered startup and shutdown of applications, and defined placement of resources for affinity, dispersion, or exclusion. Oracle Clusterware provides a suite of integrated stand-alone or bundled agents for Oracle Application high availability and application resource management.

See also: Oracle Clusterware Administration and Deployment Guide.

3.1.3 Oracle Data Guard and Online Upgrade

Oracle Data Guard provides a comprehensive set of services that create, maintain, manage, and monitor one or more standby databases to enable production Oracle databases to survive failures, disasters, user errors, and data corruption. Data Guard maintains these standby databases as transactionally consistent copies of the production database. If the production database becomes unavailable due to a planned or an unplanned outage, Data Guard can switch any standby database to the production role, thus greatly reducing the application downtime caused by the outage. Data Guard can be used with traditional backup, restore, and clustering solutions to provide a high level of data protection and data availability. See also: Oracle Data Guard Concepts and Administration.

Data Guard allows different data transport methods, depending on the type of data integrity and transport speed required:

- Synchronous – allows for zero data loss. This transport method sacrifices speed for better data integrity.
- Asynchronous – allows for near-zero data loss. This transport method may sacrifice some data integrity for transport speed.
Oracle Commerce supports both physical and logical standby databases. A physical standby database provides a physically identical copy of the primary database, with on disk database structures that are identical to the primary database on a block-for-block basis. A physical standby database is kept synchronized with the primary database using Redo Apply, which recovers the redo data received from the primary database and applies the redo to the physical standby database.

With Oracle Active Data Guard a physical standby database can receive and apply redo while it is open for read-only access and so may be used for other purposes as well as disaster recovery.

A logical standby database contains the same logical information as the production database, although the physical organization and structure of the data can be different. The logical standby database is kept synchronized with the primary database using SQL Apply, which transforms the data in the redo received from the primary database into SQL statements and then executes the SQL statements on the standby database. A logical standby database can be used for disaster recovery and reporting requirements, and can also be used to upgrade (see the MAA paper "Database Rolling Upgrades Made Easy") the database software and apply patch sets while the application is online and with almost no downtime.

With a single command a physical standby database can be converted into a Snapshot Standby and become an independent database open read-write, which is ideal for QA and other testing scenarios. The Snapshot Standby continues to receive and archive redo data from the primary database while it is open read-write, thus protecting primary data at all times. When testing is complete, a single command will convert the snapshot back into a standby database and automatically resynchronize it with the primary. See the Site Test section for an example use case.

A physical standby database can be used for rolling database upgrades using the SQL Apply (logical standby) process, and return to its function as a physical standby database once the upgrade is complete. See the MAA paper "Database Rolling Upgrades Made Easy" for more detail.

It is possible to deploy a local standby database at the primary site as well as a remote standby at a secondary site. A local standby offers the advantage that a failover can be performed while the Oracle Commerce Servers continue running, and it can be done almost transparently to the end users. The local standby also offers the ability to perform an online database upgrade without the need to switch to another site. We recommend that both a local and remote standby be deployed for maximum availability.

3.1.4 Oracle Flashback Database

Oracle Flashback Database provides a more efficient alternative to database point-in-time recovery. With Oracle Flashback Database current data files can be reverted to their contents at a past time. The result is much like restoring data from data file backups and executing point-in-time database recovery. However, Flashback Database skips the data file restoration and most of the application of redo data. Typically Flashback is used when a speedy recovery to a point in
time is required. Also, Flashback is limited to the amount of time that the undo_data is retained, so RMAN restore may be able to recover further into the past than Flashback may be able to.

Enabling Oracle Flashback Database provides the following benefits:

- Eliminates the time to restore a backup when fixing human error that has a database-wide impact.
- Because human errors can be quickly undone, it allows standby databases to use real-time apply to synchronize with the primary database.
- Allows quick standby database reinstatement after a database failover.

See My Oracle Support note, “Flashback Database Best Practices & Performance (Doc ID 565535.1),” which includes the use of preallocated flashback logs (see `_DB_FLASHBACK_LOG_MIN_TOTAL_SPACE`) to improve performance. See also: "Oracle Flashback Technology".

3.1.5 **Oracle Automatic Storage Management**

Automatic Storage Management (ASM) provides a vertically integrated file system and volume manager directly in the Exadata kernel, resulting in:

- Significantly less work to provision database storage
- Higher levels of availability
- Elimination of the expense, installation, and maintenance of specialized storage products
- Unique capabilities for database applications

For optimal performance ASM spreads files across all available storage. To protect against data loss ASM extends the concept of stripe and mirror everything (SAME) and adds more flexibility in that it can mirror at the database file level rather than the entire disk level.

3.1.6 **Oracle Recovery Manager and Oracle Secure Backup**

Recovery Manager (RMAN) is an Oracle Database tool that can back up, restore, and recover database files. It is a feature of Oracle Database and does not require separate installation. RMAN integrates with sessions running on an Oracle database to perform a range of backup and recovery activities, including maintaining a repository of historical data about backups. See also: *Oracle Database Backup and Recovery User's Guide*.

Oracle Secure Backup (OSB) is a centralized tape backup management solution providing performant, heterogeneous data protection in distributed UNIX, Linux, Windows, and Network Attached Storage (NAS) environments. By protecting file system and Oracle Database data, OSB provides a complete tape backup solution for your IT environment. OSB is tightly integrated with RMAN to provide the media management layer for RMAN. See also: "Oracle Secure Backup".
3.1.7 **Oracle GoldenGate**

Oracle GoldenGate provides bidirectional replication of data between sites to allow for each site to act independently. It is normally used in compulsory systems, where the highest availability is required. Oracle GoldenGate is normally used in fully Active/Active implementations and can provide more flexibility in site planning. Key features of Oracle GoldenGate include:

- Log-based replication, which does not have a distance limitation. This allows for greater distance between sites.
- Two or more sites have full read-write capabilities and act independently of each other.
- Maintains data integrity and allows for conflict detection and resolution.

3.1.7.1 **Create Role-Based Database Services**

A database service provides a simple named access point to the database. A service can physically span multiple instances in an Oracle RAC cluster and can be simply moved from one instance to another. By requiring ATG to connect only through a service we are able to relocate or reconfigure the service without reconfiguring ATG. Oracle Commerce on Oracle WebLogic Server uses JDBC and more specifically, WebLogic Server-GridLink connections to configure its connections. GridLink data sources provide connectivity directly to the database services. Together with the Oracle Notification Service (ONS), the data source can respond to state changes of the Oracle RAC instances, which are contained in the database service. See [WebLogic Server GridLink Data Sources](#) for more detail.

Role-based database services should be created for each database role and purpose as summarized in Table 1. **Role-based Services**.

<table>
<thead>
<tr>
<th>DATABASE ROLE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Production access to primary</td>
</tr>
<tr>
<td>Standby</td>
<td>Production offload of queries on standby</td>
</tr>
<tr>
<td>Snapshot Standby</td>
<td>Standby site testing</td>
</tr>
</tbody>
</table>

A database service can be created and configured using Oracle Enterprise Manager or by using the `srvctl` command line tool. ATG uses JDBC and therefore does not use transparent application failover (TAF). Here is an example of how a service can be created with the `srvctl` command:

```
srvctl add service -d atgmaa -s atgsvc -r atgmaa1,atgmaa2 -l PRIMARY -q FALSE -e NONE -m NONE -w 0 -z 0
```

Role-based services are also an important part of client failover best practices as detailed in the MAA white paper "[Client Failover Best Practices for Data Guard 11g Release 2](#)", a recommended read.
Configure Hugepages (Linux Database and Application Servers Only)

ATG typically runs with many database connections and a large System Global Area (SGA), or a group of shared memory areas, supporting an Oracle RAC instance. So configuring HugePages for the ATG database instances is essential. HugePages are not configured by default within an Exadata system, so it is necessary to manually configure sufficient HugePages for the ASM instance and all database instances on each Linux database server node. This will result in more efficient page table memory usage, which is critically important with a large SGA or when there are high numbers of concurrent database connections. HugePages can only be used for SGA memory space and should not be configured for more than is required.

MOS ID 361468.1, “HugePages on Oracle Linux 64-bit” describes how to configure HugePages. Automatic Shared Memory Management (ASMM) can be used with HugePages, so use the SGA_MAX_SIZE parameter to set the SGA size for each instance.

Automatic Memory Manage (AMM) cannot be used in conjunction with HugePages, so the MEMORY_TARGET and MEMORY_MAX_TARGET parameters should be unset for each database instance. See MOS ID 749851.1 “HugePages and Oracle Database 11g Automatic Memory Management (AMM) on Linux” for details.

Set the parameter USE_LARGE_PAGES='only' for each instance so that the instance will only start if sufficient HugePages are available. See MOS ID 1392497.1 “USE_LARGE_PAGES To Enable HugePages” for details.

It may be necessary to restart the database server to bring the new HugePages system configuration into effect. Check to make sure that you have sufficient HugePages by starting all the database instances at the same time.

Starting with Oracle Database 11g Release 2 (11.2.0.2), a message is logged to the database alert log when HugePages are being used, for example:

```
****************** Huge Pages Information ******************
Huge Pages memory pool detected (total: 18482 free: 17994)
DFLT Huge Pages allocation successful (allocated: 4609)
********************************************************************************
In this case, 4609 hugepages were used.
```

HugePages have also been proven to be a more performant method of running applications on Oracle WebLogic Server. It is a best practice to set up the operating system of a server running WebLogic Server to use HugePages to support the memory usage of WebLogic Server managed servers.

**Note:** When configuring HugePages for database or WebLogic Server managed server use it is important to calculate the amount of memory required either application and allocate slightly more than required to HugePages in the operating system. Once memory is allocated to HugePage, it is reserved ONLY for HugePages. If the database or WebLogic Server is not configured to use HugePages, and the operating system has been configured to allocate memory for HugePages, the database or application server may run out of memory or possibly not start at all.
3.1.7.3 Handle Database Password Expiration

The default behavior of Oracle Database has changed in release 11g such that database user passwords will expire after 180 days. Processes should be put in place to refresh passwords regularly, or expiration should be extended or disabled. ATG application availability will be impacted if passwords are allowed to expire. Password expiration for the default user profile can be disabled with the following command:

```sql
alter profile default limit password_life_time unlimited;
```

3.1.7.4 Configure Dead Connection Detection

When an ATG Server node fails suddenly there may not be time for the operating system to reset the TCP connections, and as a result the connections on the database server will remain open. To clean up the “dead” connections it is recommended that Dead Connection Detection is configured. See MOS ID 151972.1 “(Dead Connection Detection (DCD) Explained” for details.

Making these configuration changes may have an adverse effect on network utilization; therefore all changes should be tested and monitored carefully.

3.1.7.5 Reduce Timeout on Oracle RAC Node Failure (Exadata Only)

On Exadata it is possible to failover more quickly in the event of an Oracle RAC node failure by reducing the `misscount` parameter. The parameter defines how long to wait after a node becomes unresponsive before evicting the node from the cluster. The parameter should not be set to less than 30 (30 seconds). To update the CSS `misscount` setting, log in as the root user on one of the database servers and run the command:

```bash
$GRID_HOME/bin/crsctl set css misscount 30
```

3.2 Oracle Fusion Middleware MAA

To achieve maximum ATG application availability, deploy ATG on an Oracle Fusion Middleware WebLogic Server MAA foundation that uses the following WebLogic Server high availability features:

- WebLogic Server Cluster
- GridLink Data Sources
- Shared storage and Storage Replication

3.2.1 WebLogic Server Cluster

A WebLogic Server cluster consists of multiple WebLogic Server instances running simultaneously and working together to provide increased scalability and availability. A cluster appears to clients to be a single WebLogic Server instance. The server instances that constitute a cluster can run on the same system, or be located on different systems. You can increase a cluster's capacity by adding additional server instances to the cluster on an existing system, or you can deploy additional systems for the cluster to host incremental server instances on. In a
WebLogic Server cluster, application processing can continue when a server instance fails. You cluster application components by deploying them on multiple server instances in the cluster, then if a server instance on which a component is running fails, another server instance on which that component is deployed can continue application processing. Clusters are created for ease of configuration and application deployment, as a single configuration or deployment can be performed on the cluster. This single configuration or deployment is propagated to all of the cluster members.

Configuring ATG session backup (see "Enabling ATG Session Backup" for details) will enable ATG to utilize the application failover and server migration aspects of WebLogic Server clustering. Depending on which methods are used for replication, it may be possible to replicate session states and data caching across sites.

### 3.2.2 WebLogic Server GridLink Data Sources

A single GridLink data source provides connectivity between WebLogic Server and an Oracle RAC database. It uses ONS to respond adaptively to state changes in an Oracle RAC. It responds to FAN events to provide Fast Connection Failover (FCF), Runtime Connection Load-Balancing (RCLB), and Oracle RAC instance graceful shutdown. It also provides capabilities of Affinities.

See "Using GridLink Data Sources" in the Oracle Fusion Middleware Configuring and Managing JDBC Data Sources for Oracle WebLogic Server guide for more information about GridLink data sources.

### 3.2.3 Storage Replication

Storage replication technology is used to replicate the middle tier file systems and other data from the production site’s shared storage to the standby site’s shared storage. After storage replication is enabled, application deployment, configuration, metadata, data, and product binary information is replicated from the production site to the standby site. It is not necessary to perform any Oracle software installations at the standby site hosts. This method is best used with an Active/Passive configuration, as Active/Active middle tier application will require independent configurations.

When the production site storage is replicated to the standby site storage, the equivalent Oracle home directories and data are written to the standby site storage. The recommended interval for scheduling incremental replications is once a day for the production deployment, where the middle tier configuration does not change very often. Additionally, you should force a manual synchronization whenever you make a change to the middle tier configuration at the production site (for example, if you deploy ATG application updates at the production site).
3.2.4 Further References

See these Oracle documentation references for more background on WebLogic Server MAA:

- Oracle Fusion Middleware 12c *High Availability Guide*
- *Oracle Fusion Middleware Using Clusters for Oracle WebLogic Server*
- Oracle Fusion Middleware 11g *Oracle Fusion Middleware High Availability Guide*
- *Oracle Fusion Middleware Disaster Recovery Guide*

Refer to these MAA papers:

- "Oracle WebLogic Server and Oracle Database: Oracle Integrated MAA Solutions" (Oracle WebLogic Server and Highly Available Oracle Databases: Oracle Integrated Maximum Availability Solutions"
- "Oracle WebLogic on Shared Storage: Best Practices"
- Oracle Fusion Middleware 11g Backup and Recovery
- *Oracle Fusion Middleware Disaster Recovery Guide*

3.3 Oracle Commerce Platform and Merchandising MAA

To achieve Oracle Commerce Platform and Merchandising application MAA, Oracle recommends deploying Oracle Commerce on a foundation that includes the architecture depicted in Figure 3 *Oracle ATG High Availability* on both the primary site and secondary site of Figure 1 *Oracle Commerce MAA*.

![Figure 3. Oracle Commerce High Availability](image-url)
Oracle Commerce Platform high availability is built on the foundation of Oracle Database MAA and Oracle Fusion Middleware MAA as described previously.

In Figure 3 Oracle Commerce High Availability, the only customer facing cluster created (enlarged in Figure 4 Oracle Commerce Customer Facing Cluster) is the ATG web store application. The components of the Oracle Commerce Platform cluster are as follows:

- **Page Servers (PS)**: At least 2 are required for HA. Ideally, at least one on each application server for MAA. These serve the actual page content to the end users. The best practice is not to combine a PS with any other server type. This is the only Commerce component, which is load balanced and therefore can be configured as part of a WebLogic Server cluster.

  For this particular environment the PES/GSS have been combined into two of the 4 PS applications, as there will not be a need for global scenarios or editing of scenario.

- **Process Editor Server (PES)**: Required for the editing of Oracle Commerce Platform Scenarios. Only one PES can be running in a Platform environment at a given time. This component does not require High Availability, as the main store application does not require PES in order to run.

- **Global Scenario Server (GSS)**: Are required for applications, which use long running or Commerce Platform scenarios that are globally-scoped. This type of scenario is uncommon. There can be many GSSs in a given environment and the PES is configured as a GSS by default.

- **Server Lock Manager (SLM)**: One primary and one backup, specified only by run order. Either JVM can become the primary, simply by being the first JVM to start. These are used by any repository whose item-descriptor is set with locked cache mode and by any custom code that uses the SLM API. This mode is used when more than one JVM could possibly write data to the same object, in the same repository, at the same time, across multiple threads. The best example of this is user profile data. There are also several OOTB and possibly custom code calls to this component.

- **Commerce Merchandising**: Is the management tier. The management tier is not usually set up as HA, as it only needs to be available for internal users for the management of the content for the customer facing site. The base component of the management tier is the Commerce Business Control Center (BCC). Sub-components of the BCC are:
  - **Content Administration (CA)**: CA is the means by which business users create new content for the customer facing site and deploy it either to the database or the file systems.
  - **Merchandising**: is a more granular method of creating content for the customer facing site, If configured, it includes a preview functionality to preview content as it will look, based on certain criteria.
  - **Site Management**: The BCC has the ability to maintain multiple site data in a single configuration set. This is also known as Commerce Platform Multisite. The default
installation of the Commerce Platform Commerce Reference Store includes the ATG Store and the ATG Home sites.

While the management tier is not required to be set up with high availability, redundancy is required in order to allow component access in the event of an outage. Therefore, the management tier is set up to run in an Active/Passive capacity with the use of shared storage.

3.3.1 Data Tier

This has already been described in the Oracle Database MAA section.

3.3.2 WebLogic Server/Commerce Platform Clustering

Commerce Platform uses WebLogic Server clustering described above. As ATG Web Commerce applications run within a WebLogic Server application server, clustering is essential to maintain session state for certain aspects of a user’s HTTP session. For this, ATG uses the combination of WebLogic Server clustering and ATG session component backup to the WebLogic Server cluster. ATG places session states into the HTTP session object as configured in the /atg/dynamo/Configuration/sessionBackupPropertyList component. Session data is replicated to all other members of the cluster via this component. That way, if an ATG managed server should become unavailable while a user has an active session, the user’s full session is failed over to another active cluster member.

See: "Understanding Cluster Configuration" (11g Release 1 (10.3.6)) or "WebLogic Server Clustering" (12c (12.1.2)) for more information on the setup of a WebLogic Server cluster.

See: Enabling Component Backup for information on ATG session backup configuration.

Note: as mentioned earlier, clustering of WebLogic Server applications is optional. ATG Page Servers are often clustered for ease of configuration and application deployment.

Figure 4. Oracle Commerce Customer Facing Cluster
3.3.3 Oracle Experience Manager MAA

The Platform/Experience Manager integration enables customers of Oracle Commerce Platform and Oracle Experience Manager to index the product catalog data in MDEX engines, the query engine that is the core of Oracle Endeca Guided Search, where it can then be queried and the results can be displayed on commerce sites. The MDEX Engine consists of the Indexer (Dgidx), the Dgraph, and the Agraph. The MDEX Engine loads the indices generated by the indexing component of the Endeca Information Transformation Layer.

The components of the Endeca architecture are documented in the Platform Services Documentation.

- **Experience Manager Application Controller (EAC):** This application is used to control any Endeca-based application. There is a central EAC which handles the overall control of Experience Manager subcomponents including distributing content to the MDEX engines. There are also EAC agents that are required to be running on each host that runs a standalone MDEX. See: Oracle Endeca Common Documentation.

- **Content Acquisition System (CAS):** CAS is the component where data is stored after ATG exports it from its repositories. See: Oracle Endeca CAS Documentation.

- **Tools & Frameworks w/ Experience Manager:** Tools and Frameworks is the install for Workbench, Experience Manager, and a number of reference applications. Within the Tools and Frameworks install is Workbench and Experience Manager, where merchandisers can configure custom landing pages, make modifications to search results, control dimensions, establish thesaurus entries, etc. See: Oracle Endeca Tools and Frameworks Documentation.

- **MDEX:** The MDEX Engine (sometimes known as the dgraph which is the actual process name that runs) is the workhorse application that processes the search and navigation queries. See: Oracle Endeca MDEX Engine Documentation.

To achieve maximum availability for the Platform-Experience Manager integration, Oracle recommends load balancing MDEX engines in order to ensure consistent display of Endeca-driven content for the Commerce Platform applications. While Experience Manager is made up of several components, the dgraph engines are the components which Platform and Merchandising accesses in order to view this content. The other components are used either by business users, or only required during startup of Platform page servers, so HA is not a concern. However, redundancy for these components is required.

Endeca MDEX engine load balancing is covered in Chapter 2 of the Oracle Endeca Commerce MDEX Engine Performance Tuning Guide.
3.3.4 Load Balancing

Commerce Platform components (where noted below) are installed and deployed on multiple servers and run in an Active/Active configuration for high availability and scalability purposes. Client initiated workload is distributed across multiple component instances running on multiple servers through load balancing. Web server load is distributed by an HTTP load balancer directly to WebLogic Server or to the Oracle HTTP Server (OHS). OHS is optional and not utilized or depicted in Figure 3 Oracle Commerce High Availability. Refer to the F5 Oracle ATG Deployment Guide for a detailed example.

The Endeca MDEX engine load balancing is covered in Chapter 2 of the Oracle Endeca Commerce MDEX Engine Performance Tuning Guide.

3.4 Oracle Commerce Site State Model and State Transitions

In Figure 6 MAA Site State Model and State Transitions we illustrate the states that a deployment goes through as it progresses from the initial single site implementation through the setup, testing, and eventual dual site MAA deployment. The systems will have a specific configuration in each state and there will be a set of documented steps to move from one state to the next.
Table 2 State Transition Descriptions contains the steps taken for different portions of switchover or failover operations mentioned in ATG MAA Case Study on Exalogic and Exadata.

Table 2. State Transition Descriptions

<table>
<thead>
<tr>
<th>TRANSITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Site Setup</td>
<td>Install and configure the primary site.</td>
</tr>
<tr>
<td>Secondary Site Setup</td>
<td>Establish the secondary site.</td>
</tr>
<tr>
<td>Site Test</td>
<td>Prepare the standby site for a site test.</td>
</tr>
<tr>
<td>Site Test to Standby</td>
<td>Convert the site performing a site test back to standby mode.</td>
</tr>
<tr>
<td>Switchover</td>
<td>Switch the roles so that the current standby becomes the primary and the current primary becomes the standby.</td>
</tr>
<tr>
<td>Failover</td>
<td>Switch the current standby to primary mode. The current primary is assumed to be down or unavailable.</td>
</tr>
<tr>
<td>Reinstate Standby</td>
<td>Reinstate the old primary as a standby after failover.</td>
</tr>
</tbody>
</table>
Table 3 State Summary for Database and File System summarizes how the database and ATG file system are configured in each state:

Table 3. State Summary for Database and File System

<table>
<thead>
<tr>
<th>SITE STATE</th>
<th>ATG DATABASE - DATA GUARD</th>
<th>ATG FILE SYSTEM - REPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1 Primary and No</td>
<td>Not configured</td>
<td>Not configured</td>
</tr>
<tr>
<td>Site 2 2</td>
<td>Site 1 primary and site 2 physical standby.</td>
<td>Site 1 primary with continuous replication to site 2.</td>
</tr>
<tr>
<td>Site 2 Set Up</td>
<td>Snapshot standby during setup.</td>
<td>Site 2 snapshot during setup.</td>
</tr>
<tr>
<td>Site 1 Primary and</td>
<td>Site 1 primary and site 2 snapshot standby.</td>
<td>Site 1 primary with continuous replication to site 2.</td>
</tr>
<tr>
<td>Site 2 Test</td>
<td>Site 1 primary and site 2 physical standby.</td>
<td>Site 2 snapshot created for test.</td>
</tr>
<tr>
<td>Site 1 Primary and</td>
<td>Site 1 primary and site 2 physical standby.</td>
<td>Site 1 primary with continuous replication to site 2.</td>
</tr>
<tr>
<td>Site 2 Standby</td>
<td>Site 1 primary and site 2 physical standby.</td>
<td>Site 2 snapshot created for test.</td>
</tr>
<tr>
<td>Site 2 Primary and</td>
<td>Site 2 primary through failover, and site 1 down.</td>
<td>Site 2 primary established from replica, and site 1 down.</td>
</tr>
<tr>
<td>Site 1 Down</td>
<td>Site 2 primary and site 1 physical standby.</td>
<td>Site 2 primary and continuous replication to site 1.</td>
</tr>
<tr>
<td>Site 2 Primary and Site</td>
<td>Site 1 primary through failover and site 2 down.</td>
<td>Site 1 primary established from replica, and site 2 down.</td>
</tr>
<tr>
<td>1 Standby</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 2 Primary and Site</td>
<td>Site 2 primary and site 1 snapshot standby.</td>
<td>Site 2 primary with continuous replication to site 1.</td>
</tr>
<tr>
<td>1 Test</td>
<td>Site 2 primary and site 1 snapshot standby.</td>
<td>Site 1 snapshot created for test.</td>
</tr>
</tbody>
</table>
4 Oracle Commerce MAA on Exalogic and Exadata

ATG 10.2 was deployed into an Oracle Commerce Reference Store application and Merchandising MAA configuration on Exalogic and Exadata machines. It was deployed in an Active/Passive configuration.

Exadata MAA is a very mature pre-optimized, pre-configured, integrated system of software, servers, storage, and MAA configuration best practices that comes ready-built to implement the highest database and application availability and performance. Additionally, the MAA Best Practices white paper "Deploying Oracle Maximum Availability Architecture with Exadata Database Machine" includes an Exadata MAA Outage and Solution Matrix which includes Exadata specific components in addition to the aforementioned reference to Oracle Database High Availability Best Practices 11g Release 2 (11.2) guide in table 13-1. Most outages should incur zero database downtime and a minimal application impact for any affected connections. For real world examples of how Exadata achieves end-to-end application availability and near zero brownout for various hardware and software outages, refer to the Exadata MAA video at http://vimeo.com/esgmedia/exadata-maa-tests.

Figure 7 Oracle Commerce Exadata and Exalogic Disaster Recovery Topology is a high level overview of the configured system.
4.1 Server Deployment

The production data center is comprised of an Oracle Exadata Database Machine quarter rack X3 with the database services listed in Table 4 Database Services. Additionally, a virtualized X3 Exalogic machine, also called an Exalogic Virtualized Data Center (vDC), deployment with 6 virtual servers (VM) was created for the Commerce Platform and Merchandising application tier components as detailed in Table 5 Primary Site VMs, and their function details are described earlier in “Oracle Commerce High Availability” and pictured in Figure 3 Oracle Commerce High Availability, Figure 4 Oracle Commerce Customer Facing Cluster, and Figure 5 Commerce Experience Manager Deployment. The steps to configure the application tier are detailed in the Oracle Commerce MAA Best Practices document.

Table 4 Database Services

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Database Role</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATGSVC</td>
<td>Primary</td>
<td>Production</td>
</tr>
<tr>
<td>ATGSVC_TST</td>
<td>Snapshot Standby</td>
<td>Site Test</td>
</tr>
<tr>
<td>ATGSVC_STBY</td>
<td>Standby</td>
<td>Production offload of read-only workloads</td>
</tr>
</tbody>
</table>

Table 5 Primary Site VMs

<table>
<thead>
<tr>
<th>Host Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>scan01vm0059-eoib1</td>
<td>WebLogic Server admin server</td>
</tr>
<tr>
<td></td>
<td>Commerce Platform server 1, hereon referred to as ATG1</td>
</tr>
<tr>
<td>scan03vm0060-eoib1</td>
<td>Commerce Platform server 2, hereon referred to as ATG2</td>
</tr>
<tr>
<td>scan03vm0061-eoib1</td>
<td>Commerce Platform / Merchandising server 1, hereon referred to as ATG3</td>
</tr>
<tr>
<td>scan03vm0062-eoib1</td>
<td>Commerce Platform / Merchandising server 2, hereon referred to as ATG4</td>
</tr>
<tr>
<td>scan03vm0063-eoib1</td>
<td>Experience Manager Mgmt/Dgraph Server, hereon referred to as Endeca1</td>
</tr>
<tr>
<td>scan03vm0064-eoib1</td>
<td>Experience Manager Dgraph Server, hereon referred to as Endeca2</td>
</tr>
</tbody>
</table>

Table 6 Standby Site Host Names

<table>
<thead>
<tr>
<th>Host Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>scan04cn21</td>
<td>WebLogic Server admin server</td>
</tr>
<tr>
<td></td>
<td>Commerce Platform server 1, hereon referred to as ATG1</td>
</tr>
<tr>
<td></td>
<td>Experience Manager Mgmt/Dgraph Server</td>
</tr>
<tr>
<td>scan04cn22</td>
<td>Commerce Platform server 2, hereon referred to as ATG2</td>
</tr>
<tr>
<td></td>
<td>Experience Manager Dgraph Server</td>
</tr>
<tr>
<td>scan04cn23</td>
<td>Commerce Platform / Merchandising server 1, hereon referred to as ATG3</td>
</tr>
<tr>
<td>scan04cn24</td>
<td>Commerce Platform / Merchandising server 2, hereon referred to as ATG4</td>
</tr>
</tbody>
</table>
The standby data center is comprised of an Oracle Exadata Database Machine quarter rack X3 and a virtualized X3 Exalogic machine, also an Exalogic Virtualized Data Center (vDC) deployment. Like the production data center, 6 virtual servers (VMs) were created for the ATG application tier components as detailed in Table 6 Standby Site Host Names, and their functional details are described in “Oracle Commerce Platform High Availability” and pictured in Figure 3 Oracle ATG High Availability, Figure 4 Oracle Commerce Customer Facing Cluster, and Figure 5 Experience Manager Deployment.

F5 4200v Local Traffic Managers load balancers were used for Oracle Commerce Platform Server load balancing.

The Commerce Platform and Experience Manager File Systems and all other shared file systems were hosted on the ZFS Storage Appliances located on the Exalogic machines.

4.2 Workload

The Oracle Application Testing Suite (OATS) was used to capture and create a repeatable workload against the ATG Commerce Reference Store. The behavior of this workload was monitored during outage testing and any anomalies were noted.

The workload was comprised of 3 scenarios with 500 virtual users executing each scenario in a loop. The 3 scenarios were:

- Site browsing (70%) (Catalog and products, 40%; Comparison, 15%; and Breadcrumbs, 15%)
- Adding to and abandoning a shopping cart (25%)
- Going through a checkout (5%)

The primary metric used was hits/second, and it averaged 156 in our baseline test as illustrated in Figure 8 Baseline Workload Chart.
5 Configurations Types

The following section gives a brief explanation of the different ways, in which 2 sites or data centers can be configured to provide MAA for Oracle Commerce applications. Each configuration lists its benefits and drawbacks.

5.1 Fully Active/Passive Configuration

When a 2-site configuration is set up where one site’s applications are live and the other’s are on standby, it is known as an Active/Passive configuration. This is a common configuration for most clients. As time and technology progresses, this configuration is losing popularity. Figure 9 Fully Active/Passive Configuration shows the typical Commerce Active/Passive configuration.

![Figure 9 Fully Active/Passive Configuration](image)

5.1.1 Benefits of Active/Passive Configuration

- Easiest to configure.
- Supported by Oracle support agreements in all configurations.
- Configurations are limited to individual data centers and each is independent.
• Only one data center functions at a time.
• Supports OOTB Commerce Platform configuration types.
• ZFS Replication can be used in Exalogic implementations, as the standby site can be configured in an identical manner.
• Easier application deployments between sites, as replication handles the standby site deployment.

5.1.2 Drawbacks to Active/Passive Configuration
• Less traffic can be run through the environments as only half the servers are in use at a given time.
• Time is needed to reconfigure business facing application in alternative data center (store-front can be hot passive).
• Peak load may cause strain on applications.
• Does not support zero-downtime if entire primary site goes down.
5.2 Active/Active/Passive Configuration

The Active/Active/Passive site configuration has become increasingly popular among Commerce clients. In this configuration certain customer-facing applications are set up as Active/Active, and other internal-facing applications may not be due to how they were written and can be deployed. The database is set up as it was in the Active/Passive configuration, with a one-way replication from the primary to the standby sites. Because of the combination of Active/Passive and Active/Active, this type of configuration is also known as Active/Active/Passive (A/A/P).

Figure 10. Active/Active/Passive Configuration
5.2.1 Benefits of Active/Active/Passive Configuration

- Supports more traffic, as both sites serve traffic for customer-facing applications.
- Minimal downtime if there is an application failure on a single site location.

5.2.2 Drawbacks to Active/Active/Passive Configuration

- More complicated to set up, because separate configurations are required for each site. Also, several different failover configurations options can be considered.
- Data centers cannot be very far apart because latency plays a large factor when the site with the passive database has its applications connecting to the site with the active database. Maximum distance should only be within 100 or so miles.
- Data center applications do not act independently of each other because they both connect to the same database nodes.
- May not support OOTB ATG configuration types and custom configuration may be required depending on the BCC deployment type selected.
- Oracle support agreements may not support custom code or configurations if a client develops a new component which doesn’t comply to support guidelines.
- Downtime to swap to passive database if there is a database failure.
- Only the Server Lock Managers from the data center, where the active database nodes reside, should be used for all Production JVMs in both data centers. This is to prevent additional latency of having to jump back and forth unnecessarily between sites.
- Only certain applications can be set up Active/Active due to how they were designed.
  - Only the Platform Page Servers and Experience Manager MDEX processes can be Active/Active and load balanced.
  - Commerce Merchandising and the Experience Manager Workbench cannot be Active/Active, so plans need to be put in place to fail these applications over if the primary site fails.
5.3 Fully Active/Active Configuration

This configuration allows for the highest availability. However, it is the most complex to set up and some of the configuration is not be available OOTB. It also incorporated the use of Oracle GoldenGate to perform asynchronous replication between both data centers. Items replicated include the new or changed catalog data for the Commerce sites, as well as order and profile data.

Figure 11. Fully Active/Active Configuration
5.3.1 Benefits of Active/Active Configuration

- Supports more traffic than an Active/Passive database configuration because more traffic can be routed to each database.
- Zero downtime if there is an application or database failure in either site.
- Each data center acts completely independent of the other, meaning all applications can be Active/Active.
- Data centers can be long distances apart, such as several thousand miles.
- Latency for GoldenGate replication is not such a large factor, even over great distances.

5.3.2 Drawbacks to Active/Active Configuration

- Most complicated to set up because it incorporates Oracle GoldenGate.
- Not an OOTB ATG configuration type.
- Oracle support agreements may not support custom code or configurations if a client develops a new component which doesn’t comply with support guidelines.
- Time is needed to reconfigure business facing applications in the alternative data center.
- Significant design time and effort may need to be spent to account for the various profile transition use-cases that can arise to eliminate data conflicts across the two databases.
6 Outage Testing and Results

6.1 Unplanned Outage Procedures

6.1.1 Database Server Outages

With Commerce deployed and layered on the MAA database architecture as shown in Figure 2 Database MAA earlier, many database related outages have no impact. A summary of outage times with Recovery Time Objectives (RTO) and their detailed recovery steps are described in the Oracle Database High Availability Best Practices 11g Release 2 (11.2) guide in table 13-1.

Additionally, as mentioned in “ATG MAA Case Study on Exalogic and Exadata”, there is a discussion of the integration of MAA operational and configuration best practices with Oracle Exadata Database Machine (Exadata MAA) and how it provides the most comprehensive high availability solution available for Oracle Database. The MAA Best Practices white paper "Deploying Oracle Maximum Availability Architecture with Exadata Database Machine" includes an Exadata MAA Outage and Solution Matrix which includes Exadata specific components that will not be repeated here.

The workload was ramped up and the following outages were simulated:

- Database Instance Outage – A database instance was stopped abruptly using the command `shutdown abort` using SQLPlus.
- Database Node Outage – A database server node was stopped abruptly using a power reset from the Exadata Integrated Lights Out Manager (ILOM).

6.1.2 Commerce Platform Application Server (CRS) Outages

The workload was ramped up and the following outage was simulated:

- Instance – A Commerce Platform JVM was stopped abruptly using the command `kill -9` on the server process.
- Node - This environment only contained the virtualized case, so a VM was stopped abruptly using the command `xm destroy` issued from the VM Server (DOM0).

6.1.3 Commerce Platform Application Server Lock Manager (SLM) Outage

- Instance – A Commerce Platform SLM JVM was stopped abruptly using the command `kill -9` on the server process.
- Node - This environment only contained the virtualized case, so a vm was stopped abruptly using the command `xm destroy` issued from the VM Server (DOM0).
6.1.4 Commerce Experience Manager Server Outages

- The workload was ramped up and the following outage was simulated:
- Instance - An MDEX engine process (dgraph) was stopped abruptly using the command `kill -9` on the server process.
- Node - This environment only contained the virtualized case, so a VM was stopped abruptly using the command `xm destroy` issued from the VM Server (DOM0).

6.1.5 WebLogic Server Admin Server Outage

- Instance - The WebLogic Server Admin process was stopped abruptly using the command `kill -9` on it.
- Node - This environment only contained the virtualized case, so the WebLogic Server Admin VM was stopped abruptly using the command `xm destroy` issued from the VM Server (DOM0).

6.1.6 Site Outage

The workload was ramped up and the following outages were simulated:

- Site – All servers on the primary site were stopped abruptly and site failover was performed.

6.2 Unplanned Outage Test Results

The test results for the various outages are summarized in Table 7 Summary of Unplanned Outage Results.

### Table 7 Summary of Unplanned Outage Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Outage</th>
<th>Outage (seconds)</th>
<th>User Errors</th>
<th>Performance Degradation</th>
<th>Time to Failover (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce Platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRS Server</td>
<td>Instance</td>
<td>0</td>
<td>49%</td>
<td>30%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Node</td>
<td>0</td>
<td>37%</td>
<td>54%</td>
<td>0</td>
</tr>
<tr>
<td>WebLogic Server</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admin Server</td>
<td>Instance</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Node</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>30</td>
</tr>
<tr>
<td>Experience Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Server</td>
<td>Instance</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Node</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100</td>
</tr>
<tr>
<td>Database Server</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instance</td>
<td>10 (partial)</td>
<td>1.9%</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Node</td>
<td>45 (complete)</td>
<td>2.1%</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site-wide</td>
<td>86 (complete)</td>
<td>100.0%</td>
<td>100.0%</td>
<td>86</td>
</tr>
<tr>
<td>Commerce Platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLM Server</td>
<td>Instance</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

**Key:**

CRS=Commerce Reference Store | JVM=Java Virtual machine | SLM=Server lock manager
6.2.1 Observations on Database Server Outages

6.2.1.1 Database Instance Failure

When a database instance failed, connections on that instance failed over to the surviving node and Commerce Platform was able to continue processing. The graph in Figure 12 Database Instance Failure Graph shows that there was only a very slight and short reduction in performance after the outage.

![Figure 12. Database Instance Failure Graph](image)

6.2.1.2 Database Node Failure

Similar to the Database Instance Outage, when the database node failed, connections to that instance failed over to the surviving node and Commerce Platform was able to continue processing. The graph Figure 13 Database Node Failure Chart shows that there was only a very slight and short reduction in performance after the outage.

![Figure 13. Database Node Failure Chart](image)
6.2.2 Observations on Unplanned Commerce Platform Server (CRS) Outages

Failures were minimal because Commerce Platform employs WebLogic Server clustering to handle session failures. The bulk of failures were due to a quick increase in volume. **Figure 14 Commerce Platform CRS Instance Outage Graph** shows the impact of killing half of their JVM instances in the cluster. **Figure 15 Commerce Platform CRS Node Outage Graph** shows the impact of running an `xm destroy` on one of two VMs in the Commerce Platform cluster. **Figure 16 Commerce Platform SLM Instance Outage Graph** shows the impact of killing one, then both of the Commerce Platform SLM instances.

![Figure 14. Commerce Platform CRS Instance Outage Graph](image1)

![Figure 15. Commerce Platform CRS Node Outage Graph](image2)
6.2.3 Observations for Commerce Platform Server Lock Manager (SLM) Outages

Figure 16. Commerce Platform SLM Instance Outage Graph

6.2.4 Observations on Experience Manager Outages

The performance remained steady when the Experience Manager instance (dgraph) was killed and when an MDEX node failed. Figure 17 Commerce Experience Manager Outage Graph shows that there was no impact.

Figure 17. Commerce Experience Manager Outage Graph
6.2.5 WebLogic Server Administration Server Outage

The failure of the Administration Server did not have any impact. When the Administration Server becomes unavailable the server instances remain up and running. The clustered server instances, load balancing, and failover capabilities supported by the domain configuration remain available even if the Administration Server fails.

Because a virtual IP was used for the WebLogic Server Administration Server install listen address, the WebLogic Server Administration Server can be started on any of the WebLogic Servers which has been configured to use the virtual IP address.

6.2.6 Observations on Site Outage

All users were lost on site outage, and the site failover procedure was followed to restore service on the standby site. The failover procedure was performed manually and the timings for each step are shown in Table 8 Recovery Times for Site Outage.

Table 8 Recovery Times for Site Outage

<table>
<thead>
<tr>
<th>RECOVERY STEP</th>
<th>ELAPSED TIME (SECONDS)</th>
<th>CUMULATIVE TIME (SECONDS)</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Data Guard Failover</td>
<td>35</td>
<td>35</td>
<td>These two steps performed in parallel</td>
</tr>
<tr>
<td>Commerce Platform FS Replication</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role Reversal &amp; Mount</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WebLogic Server Admin Server Startup</td>
<td>6</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Commerce Platform CRS Server Startup</td>
<td>3</td>
<td>42</td>
<td>Performed in parallel across Servers</td>
</tr>
<tr>
<td>Experience Manager Server Startup</td>
<td>5</td>
<td>47</td>
<td>Performed in parallel across Servers</td>
</tr>
<tr>
<td>First Commerce Platform Login</td>
<td>35</td>
<td>86</td>
<td>Login and select Contacts View</td>
</tr>
</tbody>
</table>

Each step in the process could have been executed by script with no delay between steps, and in that case the total time to perform recovery, excluding the first user login, was estimated to be 47 seconds.
7 Summary of Best Practices

Here is a summary of the best practices that were presented in this paper, providing a checklist for a Commerce Platform and Merchandising MAA implementation.

7.1 Best Practices Commerce Platform Database HA

Here are the Commerce Platform database best practices that should be applied to the primary and secondary site to achieve highest availability:

- Deploy Oracle Commerce on an Oracle RAC database for the highest availability and scalability.
- Use Automatic Storage Management to simplify the provisioning and management of database storage.
- Enable Oracle Flashback Database to provide the ability to "rewind" the database in the event of user errors.
- Use Oracle Recovery Manager to regularly backup the Oracle Commerce database.
- Always use HugePages for Oracle Commerce databases on Linux. Monitor memory usage and adjust the workload and parameters accordingly.
- Configure database Dead Connection Detection to actively remove dead connections in the event of Oracle Commerce Platform Server node failure.
- For Exadata deployments, configure cluster misscount to 30 seconds to reduce downtime in the event of database node failure.
- Revalidate the configuration regularly and especially after changes are made. exachk can be used to assist in the validation process for when deployed on Exadata.

7.2 Best Practices for Oracle Commerce Application HA

Here are the Oracle Commerce Platform application best practices that should be applied to the primary and secondary site to achieve highest availability:

- Always use HugePages for Oracle Commerce servers on Linux. Monitor memory usage and adjust the workload and parameters accordingly.
- Deploy multiple Oracle Commerce servers and deploy all critical Oracle Commerce Platform, Merchandising, and Experience Manager components in a load balanced, distributed service, or clustered configuration, so that work can continue in the event of a server node failure.
- Deploy a load balancer in a redundant configuration and load balance server load using our recommended logic.
- Deploy the Oracle Commerce File System on a fault tolerant filer.
- Take regular backups of the Oracle Commerce Servers and Oracle Commerce File System.
• Connect to the database through the role based services using WebLogic Server GridLink data sources.

• Reduce TCP Keepalive Timeout on Oracle Commerce Servers.

7.3 Best Practices for Disaster Readiness and Recovery

Here are the best practices for deploying a secondary site and recovery procedures in readiness for a site outage:

• Deploy a second geographically separated site that can run the Oracle Commerce workload in the event the primary site is down. The environment configuration type will determine the distance between the two sites.

• Use Data Guard to replicate all database changes to a standby database located on the secondary site.

• Take advantage of Oracle Active Data Guard to offload read-only queries to the standby database.

• Enable Oracle Flashback Database so that the old primary database can be quickly reinstated as a standby in the event of a site failover.

• Replicate the Oracle Commerce File System to the secondary site if using an Active/Passive environment configuration. Develop procedures to reverse the direction of replication in the event of failover or switchover, and to clone the replica for site testing.

• Export the Oracle Commerce File System primary, standby replica, and clones, with different names to avoid mounting the incorrect one.

• Create different role-based database services for the Oracle Commerce database in primary, standby, and snapshot standby mode.

• Develop and document operational procedures in line with the Oracle Commerce MAA state model and state transitions.

• Use Oracle Data Guard Broker to simplify Data Guard administration.

• Use the snapshot standby to provide an updatable replica of the primary database for temporary site testing.

• Use Oracle Golden Gate when replicating between two active sites or data centers.
## Appendix

### A  Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session Backup</td>
<td>The Oracle Commerce Platform implements a session backup facility that allows you to specify a set of session-scoped Nucleus components and properties that should be backed up after every request. This session backup mechanism saves these session-scoped components and properties, and restores them when the application server migrates a session to another server.</td>
</tr>
<tr>
<td>Virtualized Data Center (vDC)</td>
<td>A collection of physical compute nodes and storage that sit on the Exalogic fabric. These physical resources are organized into a pool that can then be accessed by self-service users. It offers an access point through which to allocate and control the resources inside.</td>
</tr>
<tr>
<td>Virtual Server (VM)</td>
<td>An entity that provides the outward interface of a stand-alone operating system. This entity is a virtual machine with guest operating system, which consumes CPU and memory resources. A VM can be a member of one or more vNets.</td>
</tr>
</tbody>
</table>
B References

2. Exalogic & Exdata: The Optimal Platform for ATG
3. MAA Best Practices for Oracle Exadata Database Machine (technical white paper)
5. Oracle Fusion Middleware 11g High Availability Guide
6. Oracle Fusion Middleware Using Clusters for Oracle WebLogic Server, 11g Release 1 (10.3.6), Part Number E13709-06
7. Oracle WebLogic Server Clustering, 12c Release 12.1.2
10. Oracle ATG Commerce Reference Store Overview, Release 10.2
11. Oracle Endeca Common Documentation, Release 3.1.2
12. Oracle Endeca MDEX Engine, Release 6.4.1
13. Oracle Endeca Content Acquisition System (CAS), Release 3.1.2
14. Oracle Endeca Tools and Frameworks, Release 3.1.2
15. Oracle Endeca Platform Services, Release 6.1.3
16. MOS 1345041.1 - Oracle Art Technology Group (ATG) Commerce Supported Environments Matrix
17. MOS 1461463.1 - Oracle ATG Web Commerce Reference Architecture
18. Oracle WebLogic Server and Highly Available Oracle Databases: Oracle Integrated Maximum Availability Solutions
19. Oracle Fusion Middleware, Configuring and Managing JDBD Data Sources for Oracle WebLogic Server, 11g Release 1 (10.3.6), E13737-05
20. Oracle WebLogic Server: Configuring a JDBC Data Source, 12c Release 12.1.2
21. Oracle Fusion Middleware Disaster Recovery using Oracle's Sun ZFS Storage Appliance
22. Disaster Recovery for Oracle Exalogic Elastic Cloud with Oracle Exadata Database Machine
23. Automating Disaster Recovery using Oracle Site Guard
C Change Record

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<tr>
<th>Date</th>
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<tr>
<td>2013/10/10</td>
<td>Fixed some standby syntax mistakes</td>
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<td>Removed configuration appendixes into separate best practices</td>
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<td>Added environment configurations</td>
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