

Application HA For Standalone Databases – Data Guard 11g, FSF and GI

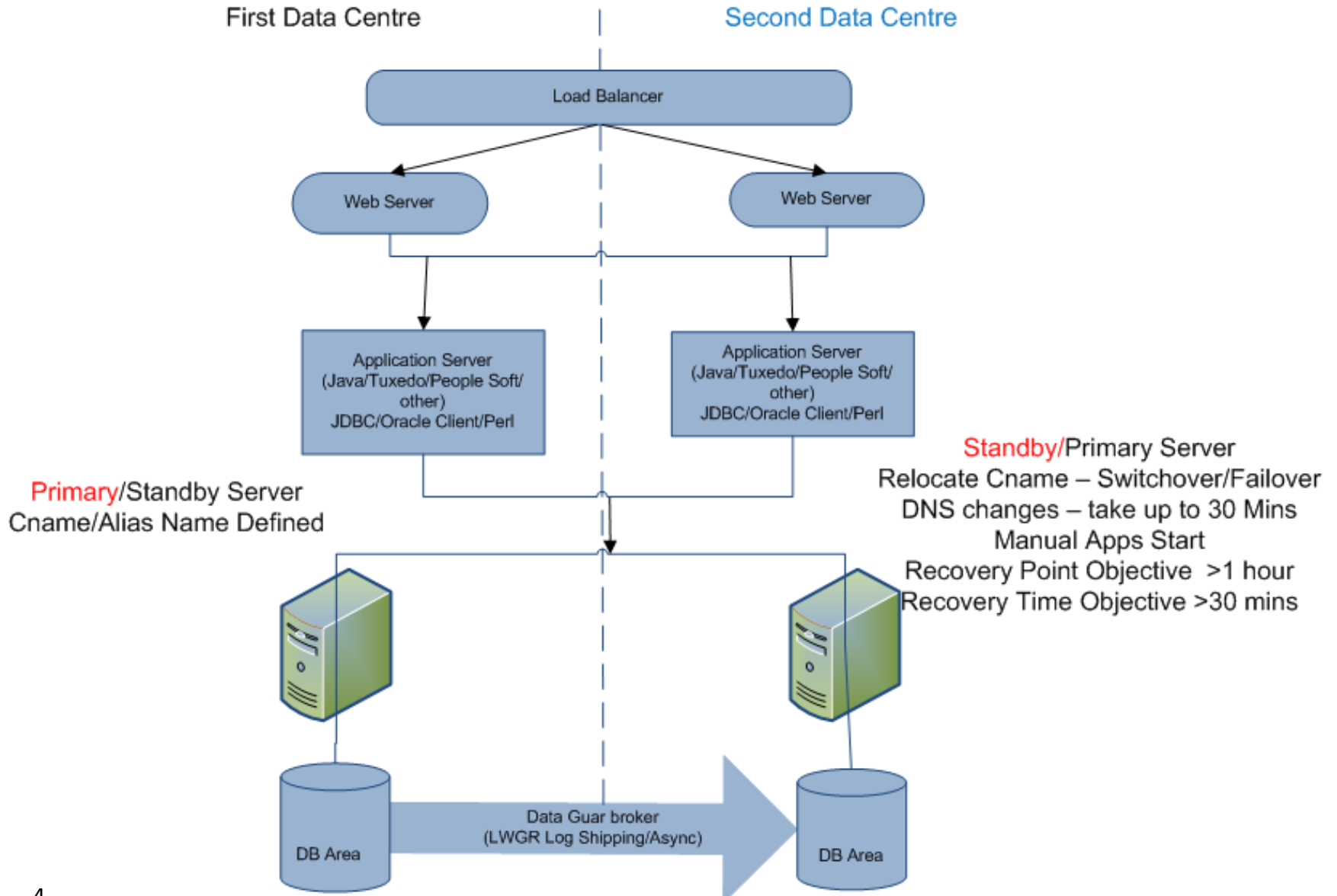
Agenda

- Overview existing database architecture and challenges faced
- Proposed new database architecture for Apps
- Oracle Data Guard broker- Observer and Flash Back
- Grid Infrastructure - Oracle Restart
- Service Registration for client Failover and Client connectivity set up
- Improvement achieved and Lessons learnt
- Oracle Enterprise Manager (OEM) monitoring
- Future plans

The Challenges

- Limited DR/HA capability
- Manual effort involved in role change/restoring database
- Manual start-up/shutdown the apps
- No proper RTO's and RPO's defined for core apps
- RTO measures in seconds
- Minimize data Loss
- Difficult to arrange planned downtime

Pre- FSFO - DB Architecture



The Solution – Two Key Architecture

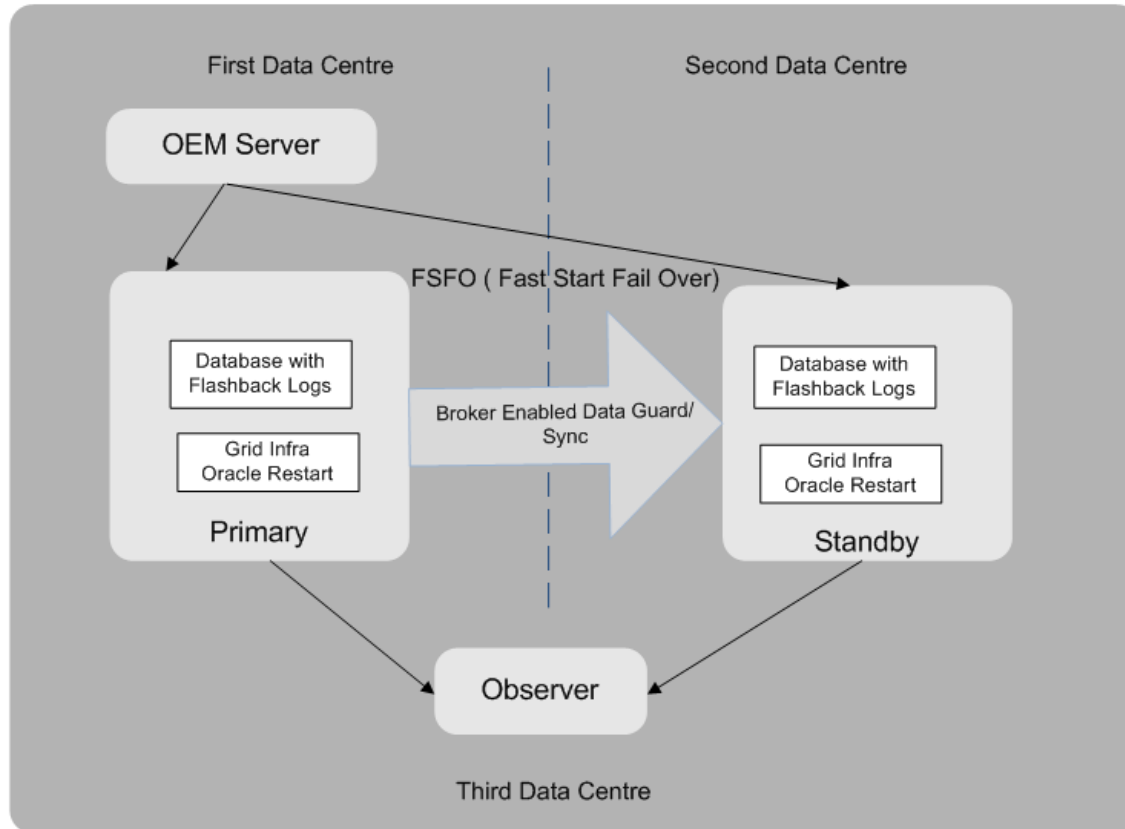
1) Fast Start Failover - Critical Applications

- Oracle Data Guard , Data Guard Broker and observer
- 11R2 , Physical Standby, Sync (Maximum Availability)
- Database Flash back and Fast recovery Area
- Oracle Grid Infrastructure
- OEM Monitoring

2) Active Standby – Other Business Applications

- Apps Availability < 24 X7
- Oracle Active Data Guard and Data Guard Broker
- 11R2 , Physical Standby, Sync/Async
- Database Flash back and Fast recovery Area
- OEM Monitoring

Database Architecture Overview



Oracle Database with Grid Infra, Data Guard and Flash back

- Fast Automatic Failover for Databases/Apps
- Reduced RTO for instance/node failure in seconds from mins
- Less expensive, Maximum ROI and better optimised for data protection and data recovery
- Reduced downtime with rolling upgrade – standby first patching
- Transparent to applications during failure and planned downtime
- Offload read only activities to active standby database
- Database Flash back used to reinitiate a failed primary database to become a standby

Mode	Risk of Data Loss	Transport	Acknowledgment Required
Maximum Availability	Zero Data Loss	Sync	Stall Primary until AKL received or Net_Timeout threshold expires. Then resume processing
Maximum Performance	Potential for minimum Data Loss	Async	Primary never wait for standby AKL

Oracle Grid Infrastructure

- What is Grid Infrastructure ?
- Why need GI on non-RAC systems ?
- What can we archive using GI ?
- How difficult to configure ?
- Can we achieve application High Availability on Standalone database ?
- What application (or drivers) are support on HA ?

Oracle Grid Infrastructure Installation

- Install Oracle Grid Infrastructure **Software Only** for a Stand-Alone database server
- (or)
- Install GI for a Standalone Server if ASM is present at database server
- The post script need to be select carefully as per environment

```
To configure Grid Infrastructure for a Stand-Alone Server run the following command as the root user:  
/oracle/product/grid/perl/bin/perl -I/oracle/product/grid/perl/lib -I/oracle/product/grid/crs/install /oracle/pro  
duct/grid/crs/install/roothas.pl
```

```
To configure Grid Infrastructure for a Cluster execute the following command:  
/oracle/product/grid/crs/config/config.sh
```

Grid Infrastructure Installation Post Checks

Make sure HA services are running at host level

- crsctl <check/config/enable/disable> has
- crsctl stat res -t

```
afaoratst01:AUAFAST:/oracle/product/grid4/bin:./crsctl check has
CRS-4638: Oracle High Availability Services is online
afaoratst01:AUAFAST:/oracle/product/grid4/bin:./crsctl config has
CRS-4622: Oracle High Availability Services autostart is enabled.
afaoratst01:AUAFAST:/oracle/product/grid4/bin:./crsctl stat res -t
-----
NAME                TARGET  STATE        SERVER          STATE_DETAILS
-----
Local Resources
-----
ora.LISTENER.lsnr   ONLINE ONLINE        afaoratst01
ora.ons              OFFLINE OFFLINE       afaoratst01
-----
Cluster Resources
-----
ora.auafatst_ogg.auafatst_ha.svc
1                   ONLINE ONLINE        afaoratst01
ora.auafatst_ogg.db
1                   ONLINE ONLINE        afaoratst01    Open
ora.cssd             1           OFFLINE OFFLINE
ora.diskmon          1           OFFLINE OFFLINE
ora.evmd             1           ONLINE  ONLINE        afaoratst01
```

```
afaoradev01:AUAFADEV:/oracle/product/grid4/bin:./crsctl check has
CRS-4638: Oracle High Availability Services is online
afaoradev01:AUAFADEV:/oracle/product/grid4/bin:./crsctl config has
CRS-4622: Oracle High Availability Services autostart is enabled.
afaoradev01:AUAFADEV:/oracle/product/grid4/bin:./crsctl stat res -t
-----
NAME                TARGET  STATE        SERVER          STATE_DETAILS
-----
Local Resources
-----
ora.LISTENER.lsnr   ONLINE ONLINE        afaoradev01
ora.ons              OFFLINE OFFLINE       afaoradev01
-----
Cluster Resources
-----
ora.auafatst_cdc.auafatst_ha.svc
1                   OFFLINE OFFLINE
ora.auafatst_cdc.db
1                   ONLINE INTERMEDIATE afaoradev01    Mounted (Closed)
ora.cssd             1           OFFLINE OFFLINE
ora.diskmon          1           OFFLINE OFFLINE
ora.evmd             1           ONLINE  ONLINE        afaoradev01
```

What is Oracle Restart (part of GI)

- The Oracle Restart improves the availability of your database. It will start the listener, database and other Oracle components after the hardware or software failure or whenever the database host restarts.

- **Register database listener**

- `$ srvctl add listener -o /oracle/product/11.2.0.3`
- `$ srvctl start/stop/status/config listener`

- **Register database**

- `$ srvctl add database -d <DB_UNIQUE_NAME> -o /oracle/product/11.2.0.3 -r PRIMARY -n <DB_NAME> -i <INSTANCE_NAME> -p /oracle/product/11.2.0.3/dbs`
- `$ srvctl add database -d <DB_UNIQUE_NAME> -o /oracle/product/11.2.0.3 -r PHYSICAL_STANDBY -n <DB_NAME> -i <INSTANCE_NAME> -p /oracle/product/11.2.0.3/dbs`
- `$ srvctl start/stop/status/config database -d <DB_UNIQUE_NAME>`
- `$ crsctl stat res -t`

GI Database Services

- Database service is not just restricted to scheduled jobs
- Database service can be influence to which node the application can communicate to
- Database service can be static or dynamic
- GI HA will start the service dynamically as per the database role

Register database

- **On PRIMARY Database**

```
./srvctl add service -d <DB_UNIQUE_NAME> -s <DYNAMIC_Service> -I PRIMARY -q TRUE -e  
SELECT -m BASIC -z 150 -w 10
```

- **On STANDBY Database**

```
./srvctl add service -d <DB_UNIQUE_NAME> -s <DYNAMIC_Service> -I PRIMARY -q TRUE -e  
SELECT -m BASIC -z 150 -w 10
```

```
./srvctl config/start/stop/remove service -d <DB_UNIQUE_NAME> -s <DYNAMIC_Service>
```

Configuring Client Failover using OCI / JDBC / Perl & SQL *Net config

- Oracle Grid Infrastructure HA and other Oracle 11g APIs/drivers/adapters are supported inbuilt mechanism for FAN
- No hassle to configure ONS or open any special ports
- FAN – Fast Application Notification
- TAF - Transparent Application Failover (connection recovery capabilities)
- FCF – Fast Connection Failover

```
• <connect string>=  
• (DESCRIPTION_LIST=  
• (LOAD_BALANCE=off)  
• (FAILOVER=on)  
• (DESCRIPTION=  
• (CONNECT_TIMEOUT=10)(RETRY_COUNT=3)  
• (ADDRESS_LIST=  
• (ADDRESS=(PROTOCOL=tcp)(HOST=xxxxxPRD.db.auckland.ac.nz)(PORT=1521)))  
• (CONNECT_DATA=(SERVICE_NAME = DYNAMI C_Service ))  
• )  
• (DESCRIPTION=  
• (CONNECT_TIMEOUT=10)(RETRY_COUNT=3)  
• (ADDRESS_LIST=  
• (ADDRESS=(PROTOCOL=tcp)(HOST=xxxxxPRD-dr.db.auckland.ac.nz)(PORT=1521)))  
• (CONNECT_DATA=(SERVICE_NAME = DYNAMI C_Service))  
• )  
• )  
• )
```

Observer

- What is observer??
 - Low footprint OCI client built into the DGMGRL CLI
- Observer configuration Requirements
 - Special Entry in Data guard broker
 - Flash back and Maximum Availability mode
 - FSFO observer version must match the database version
 - Only one of the standby can be the failover target at any give point of time if more than one standby defined
- What observer do and benefits??
 - Observer Initiates the failover
 - Seconds job to re-initiate a failed primary
 - Can be easily re-located to other server
 - Configured observer in third site to avoid split brain problem due accidental start-up of former primary
- When Observer will think Failover happened??
 - when both observer and standby lose connection will primary
 - Failover threshold timeout elapsed
 - No Failover If observer lost contact with primary but standby does not
- Location
 - Along with primary or standby or third site

Test cases

Test Case	Result
Site Failure	Dynamic HA Service Failure as expected
Crash primary/Standby	Dynamic HA Service Failure as expected
Network Failure	Dynamic HA Service Failure as expected (Failover – Threshold -90 sec)
Data Guard Switchover (Active)	All service remain available
Load Balancing	Apps - Not Supported
Lag Tolerance	No auto Failover. Primary will run in maximum performance mode
Observer down	No auto Failover

Lessons Learned / Tuned the configuration

- DG parameters
- FastStartFailoverThreshold=90 <increase from 30 to 90>
- FastStartFailoverPmyShutdown='FALSE'

Properties:

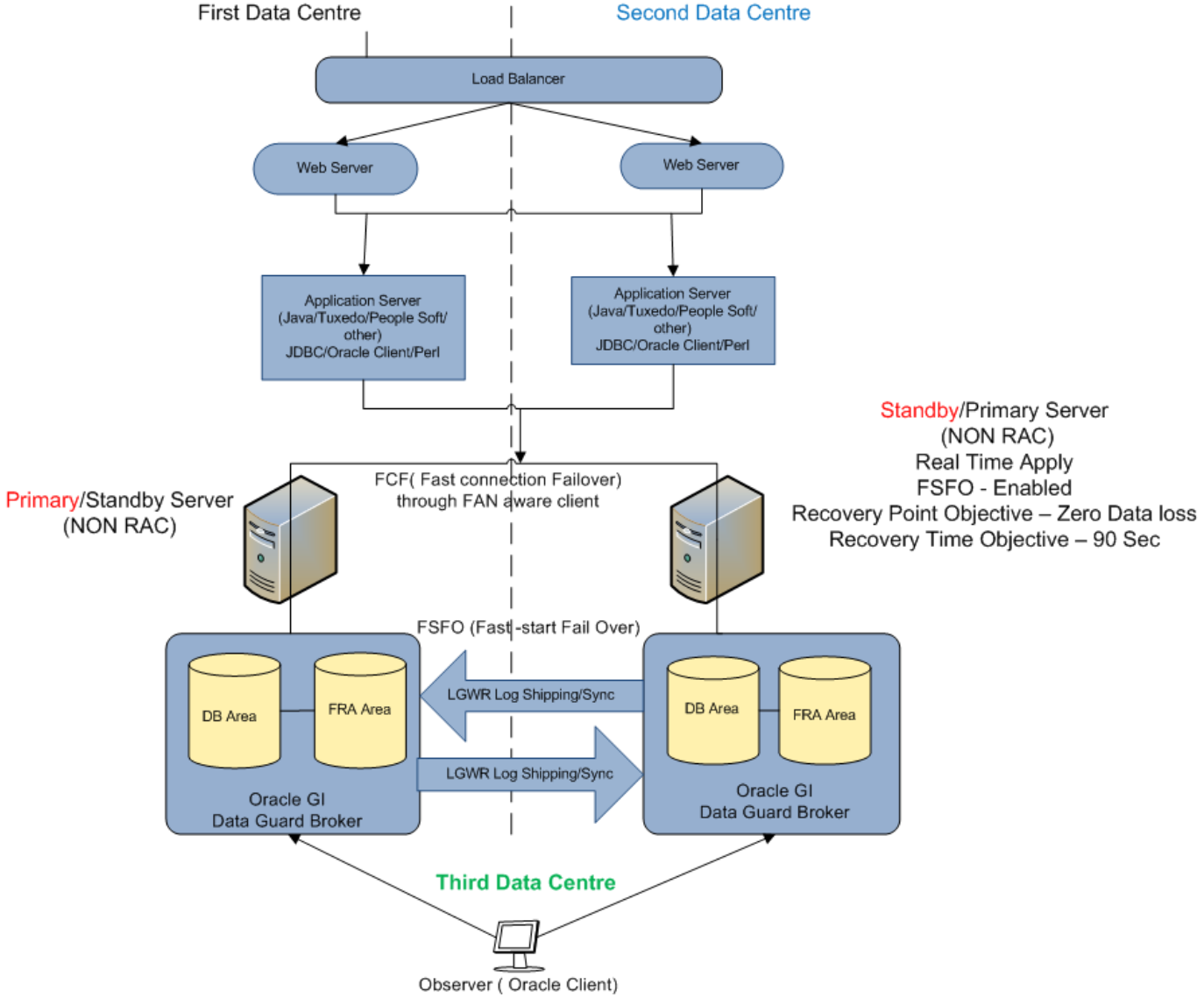
FastStartFailoverThreshold	= '30'
OperationTimeout	= '30'
FastStartFailoverLagLimit	= '30'
CommunicationTimeout	= '180'
FastStartFailoverAutoReinstate	= 'TRUE'
FastStartFailoverPmyShutdown	= 'TRUE'
BystandersFollowRoleChange	= 'ALL'

Fast-Start Failover: ENABLED

Threshold:	90 seconds
Target:	Standby_DB_Name
Observer:	observer Server
Lag Limit:	30 seconds (not in use)
Shutdown Primary:	FALSE
Auto-reinstate:	TRUE

- Data guard broker should be disabled to refresh the PRIMARY database using RMAN duplicate – test environments

After Upgrade – DB/Apps Architecture



Improvements Achieved

- Standard and automated DR Solution
- Application HA achieved
- Application failover Time \approx Database failover Time
- Standard oracle set up and Fast- Start Fail over deployment across all Tier 1 applications
- Reduce time for manual Switchover
- No application changes required
- Reliable
 - Always have a good primary after a fail over
 - No split brain conditions
 - Data integrity maintained

Standard == Simplicity

Monitoring and Alerts via OEM

- OEM used to monitor the FSFO set up along with observer
- Can use OEM console to see the configuration in one screen and can do the configuration verification
- Alerts generated if FSFO readiness is compromised
- Alerts generated when failover occurred or role changed
- FSFO configured DB's needs to be monitor through sys password not with dbsnmp
- Integration between OEM and central monitoring system (Nagios)

Future Plans

- Database upgrade plans – 12c
- DR/HR for 12c Database – GDS and Data Guard (FSFO)
- Testing underway – with Applications

Question And Answers ??