Maximum Availability Architecture with Oracle Database 12*c* and GoldenGate12cR2/R3: A Real-World Case Study

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Agenda

- Introduction
- Technology Drivers, Context
- Original Architecture
- MAA & CO-OP Target Architecture
- GoldenGate 12cR2
- Goldengate 12cR3 Microservices Architecture
- Disaster Recovery
- Enterprise Manager
- Lessons Learnt and Next Steps
- Q&A

About Me

ORACLE ACE Associate

Nikitas Xenakis

Platform Specialist Architect, The Co-op

- 17+ years as Enterprise DBA (v7-12cR2/19c)
- Accountable for On-Prem/Cloud Platforms
- CAB/Beta Member: Oracle Database, Oracle RAC, Data Integration (Goldengate)
- Transaction Processing Global Leaders

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Leading UK Convenience Retailer

- **Annual Revenue: £9.5B**
- **2800+ Owned Outlets**
- **Retail, Wholesale, Franchise, Ecommerce**
- **14 Distribution Centres**
- **Logistics Network servicing 7500+ Stores**

Co-op HQ, Manchester UK - One of the most sustainable large buildings in the world

Business Drivers

- Technology as an **enabler** and **transformer** for business growth
- Acquisitions have **increased diversity** of technology landscape
- **Fit for the future**, continuously improve
- **Fuel for Growth**, efficiencies re-invested to the business
- **New Markets/Channels:** Wholesale, Franchising, Ecommerce

Technology Drivers

- **Simplification & Standardisation** of Database & Middleware platforms
- **Zero lost productive hours** from preventable issues, **protect service**
- Continuous Delivery, Continuous Integration **(CI/CD)**
- Increase **availability, scalability, agility, security** – downtime, poor performance is extremely costly
- **Data Centre Exit** Strategy

Business & IT Context

2200
CSG Stores

2800
Co-op Stores

2500
Independent Co-op Stores

1
Support Centre

4000 users

Co-op Data Centre A

Co-op Data Centre B

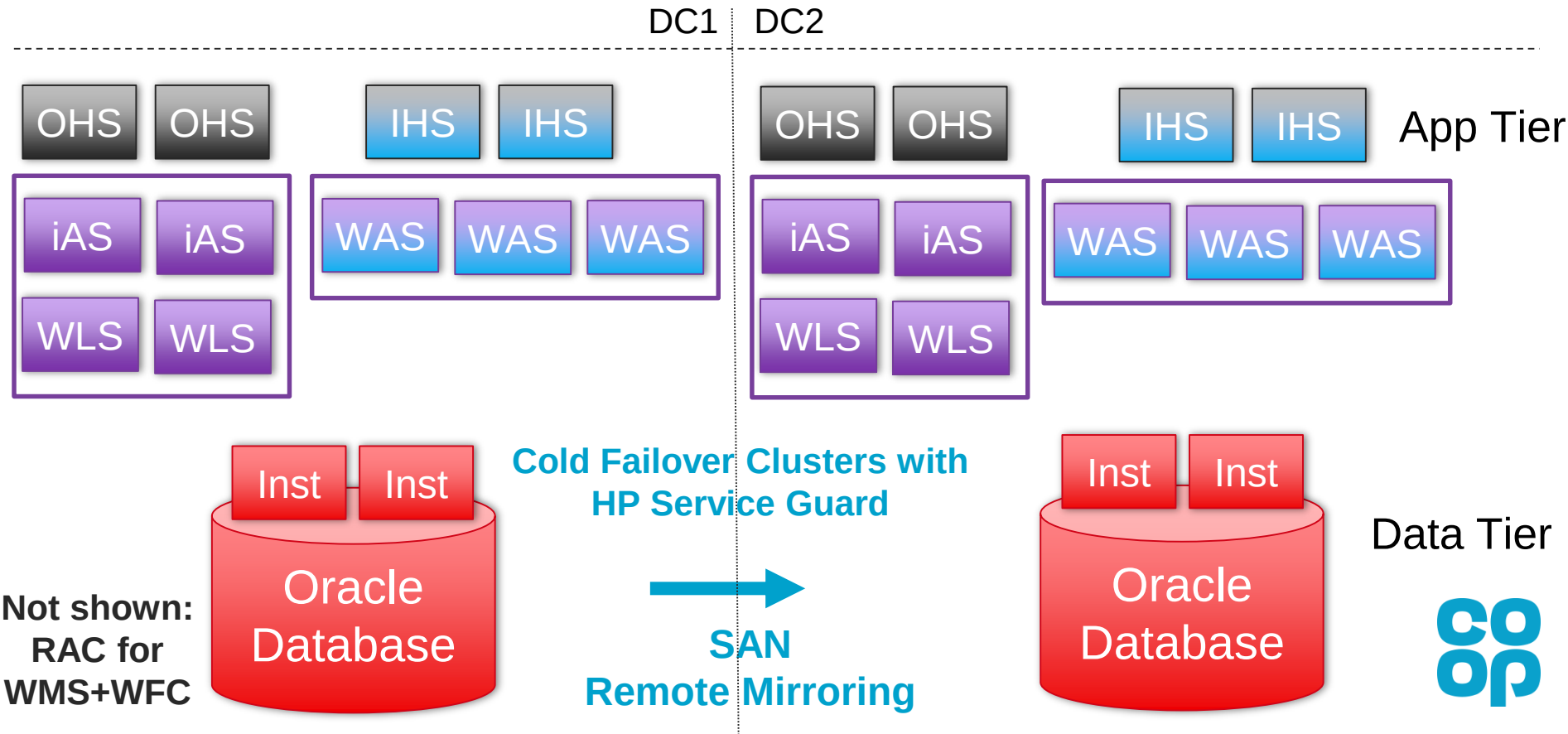
14
Distribution Centres

6,100,000 members

Cloud

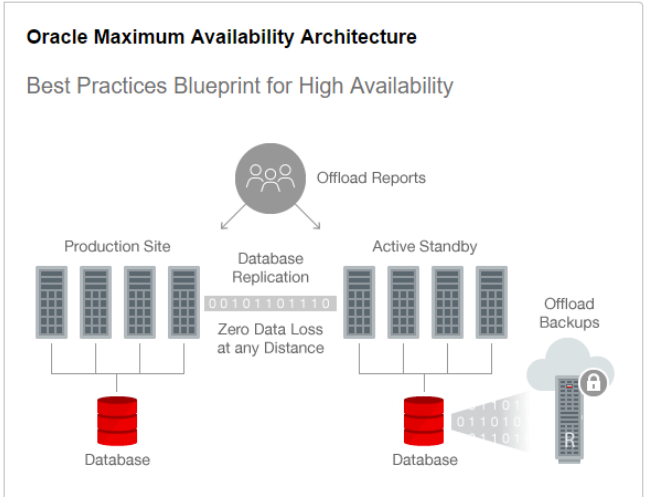
70,000 colleagues

Original Platform



Co-op Architecture (MAA Platinum)

What is Maximum Availability Architecture (MAA)?

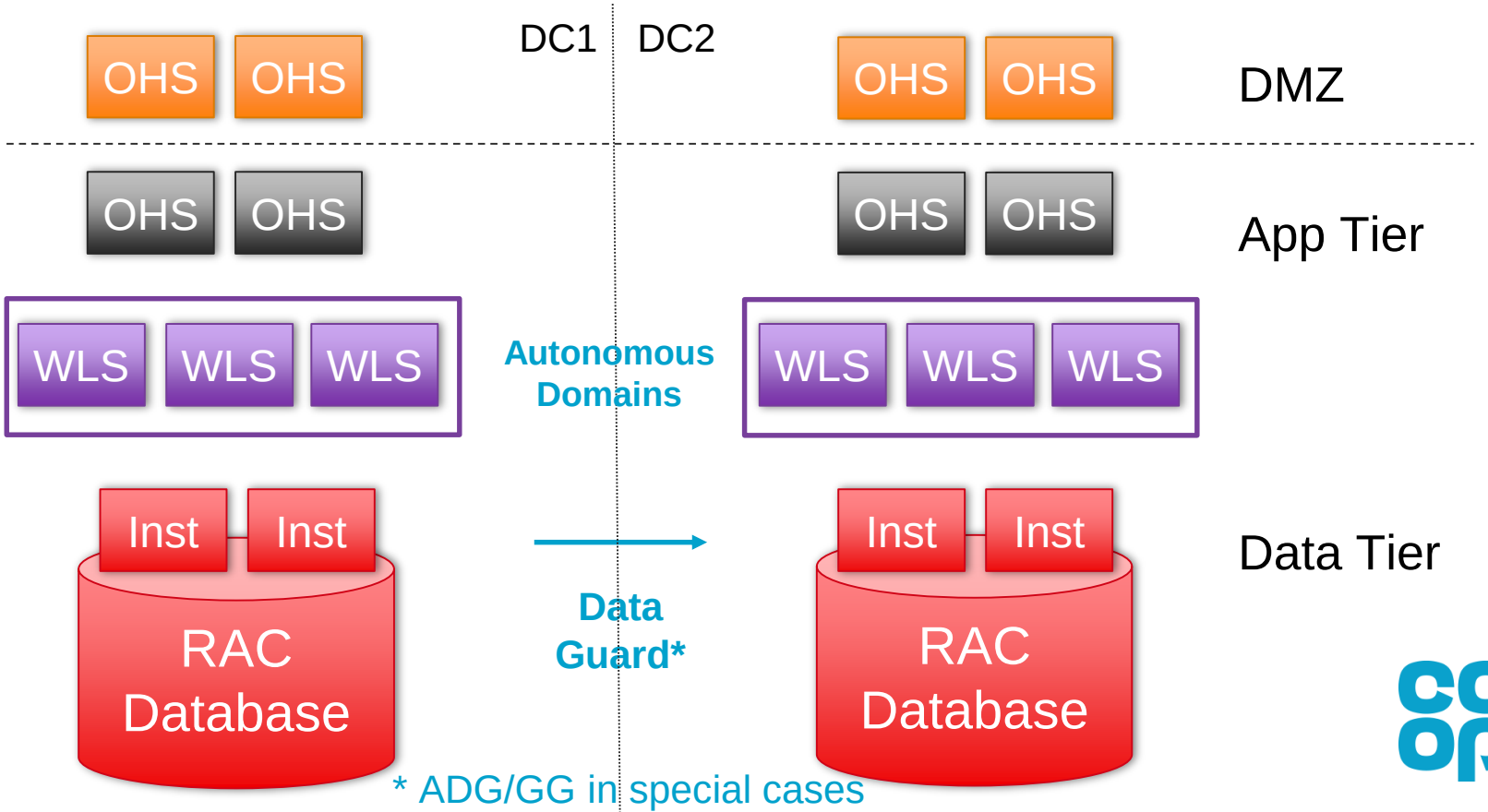


- A dedicated team within Oracle
- Blueprints & tested configurations
  - You may be “following MAA guidelines”
- Typically Active + Standby
- Started as Database team but
  - also covers FMW & Engineered Systems, Oracle Cloud
  - focused around HA, Scalability, DR

HA Architecture Considerations

- **RPO –** How much data can you afford to loose ?
- **RTO –** Downtime? How quickly should you be back up ?
- **Performance –** Performance after the event ?
- **Perceived Application Outage –** What does this mean to the end-user and operation (**Transparent ? or Not ?**)

Target Architecture – General Approach



Co-op Strategic MAA Design Patterns

	Database		Middleware
1a	Single instance (1PDB in CDB)	Data Guard {&FSFO}	WLS 1 or 3 nodes 1 domains/site
1b **Preferred**	RAC (1 PDB in CDB)	Data Guard	WLS 3 node {& ACFS/HA-NFS}
2	RAC (1 PDB in CDB)	Active Data Guard	WLS 3 node
3 **Preferred**	RAC (1 PDB in CDB)	Active Data Guard {& GoldenGate}	(non-Oracle)/(T)AC {& ACFS/HA-NFS}

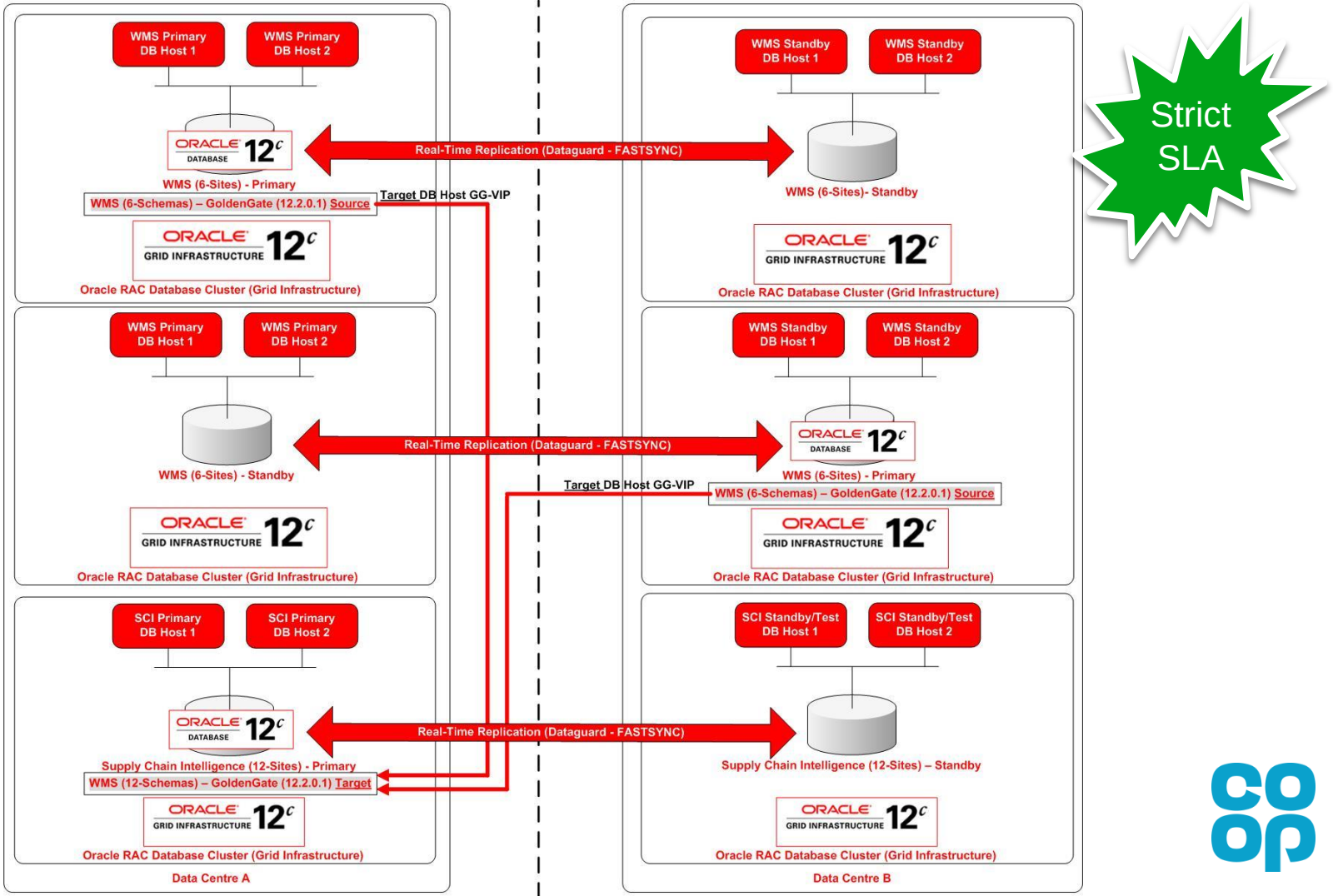
The Journey and Investment to MAA

- Cost of 20 mins downtime per DC = ££,£££
- Cost of 20 mins downtime per DB (6 DCs) = £££,£££
- Cost of > 20 mins per Cluster (6 DCs) = £,£££,£££
- Cost of >1 hr downtime per Cluster = Incalculable

The Challenge & Use Case

SLA - **95-98%** of Picking **transactions to complete in no more than 1 sec** for our mission-critical Warehouse Management System while at the same time …

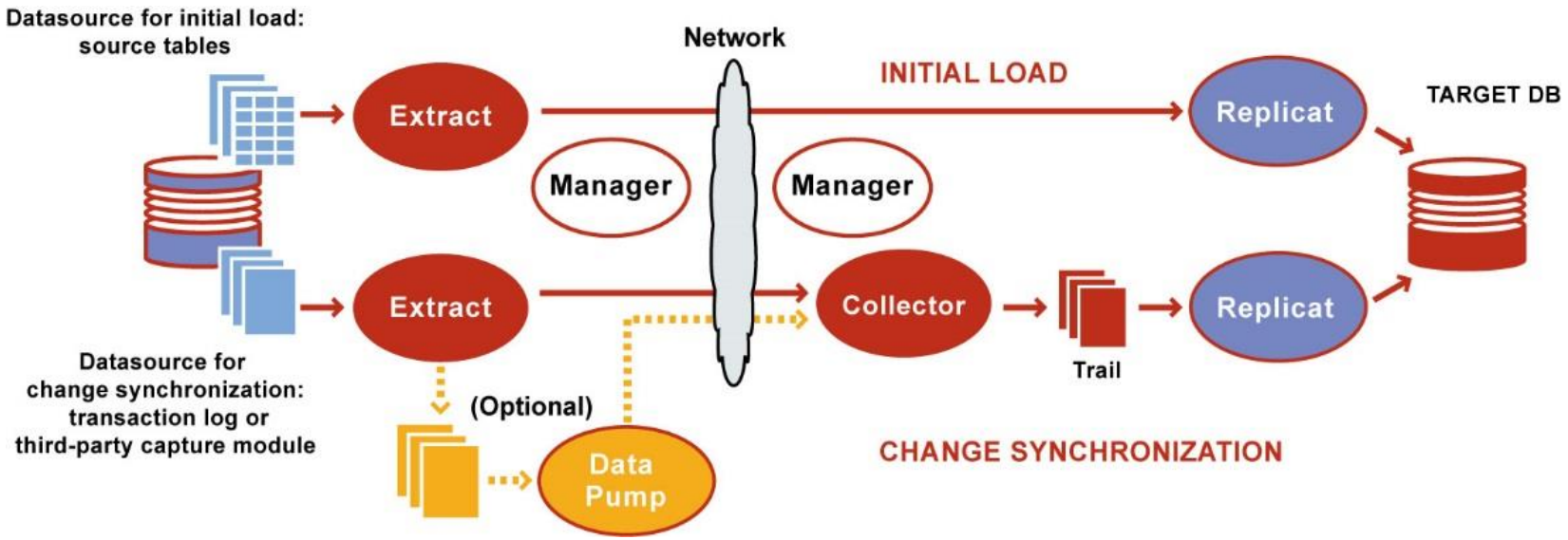
- Provide **Real-time Operational Reporting** capability to the logistics operation (14 DCs) without affecting on-line operations
- Provide Supply Chain Intelligence, **Analytics** capability to the Support Centre
- Capability for **Online upgrades** to minimize, avoid downtime


WMS Primary DB Host 1
WMS Primary DB Host 2
ORACLE DATABASE 12c
WMS (6-Sites) - Primary
WMS (6-Schemas) – GoldenGate (12.2.0.1) Source
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
Real-Time Replication (Dataguard - FASTSYNC)
Target DB Host GG-VIP
WMS Standby DB Host 1
WMS Standby DB Host 2
WMS (6-Sites)- Standby
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
Strict SLA
WMS Primary DB Host 1
WMS Primary DB Host 2
WMS (6-Sites) - Standby
Real-Time Replication (Dataguard - FASTSYNC)
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
WMS Standby DB Host 1
WMS Standby DB Host 2
ORACLE DATABASE 12c
WMS (6-Sites) - Primary
Target DB Host GG-VIP
WMS (6-Schemas) – GoldenGate (12.2.0.1) Source
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
SCI Primary DB Host 1
SCI Primary DB Host 2
ORACLE DATABASE 12c
Supply Chain Intelligence (12-Sites) - Primary
WMS (12-Schemas) – GoldenGate (12.2.0.1) Target
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
Data Centre A
Real-Time Replication (Dataguard - FASTSYNC)
SCI Standby/Test DB Host 1
SCI Standby/Test DB Host 2
Supply Chain Intelligence (12-Sites) – Standby
ORACLE GRID INFRASTRUCTURE 12c
Oracle RAC Database Cluster (Grid Infrastructure)
Data Centre B

What is GoldenGate (12c)?

- Real-time database replication, data integration product
- Part of Fusion Middleware 12c Portfolio
  - Also part of Data Integration Solutions (DIS)
- Part of **MAA** blueprint **& HA suite** of technologies
  - **Integrated with Oracle Database 12c**
  - **Heterogeneous** sources and targets (Oracle, Non-Oracle)
- **Log-based change data capture**, distribution, transformation and delivery
- Declarative with transactional integrity

GoldenGate Concepts - Architecture



https://docs.oracle.com/goldengate/1212/gg-winux/GWUAD/wu_about_gg.htm#GWUAD115

Why use GoldenGate 12c ?

Common Design Patterns and Use Cases

- **Uni-Directional**
  - Reporting Instance(s), On-line upgrade
- **Consolidation**
  - Data Mart, Data Warehouse, BI-Analytics
- Bi-Directional
  - High-Availability, Active-Active configuration
- Peer-2-Peer, Cascading
  - Load balancing, HA, scalability, distributed data-tiering

How did we decide on GoldenGate 12c ?

Performed evaluation between Active Data Guard and GoldenGate

Criteria

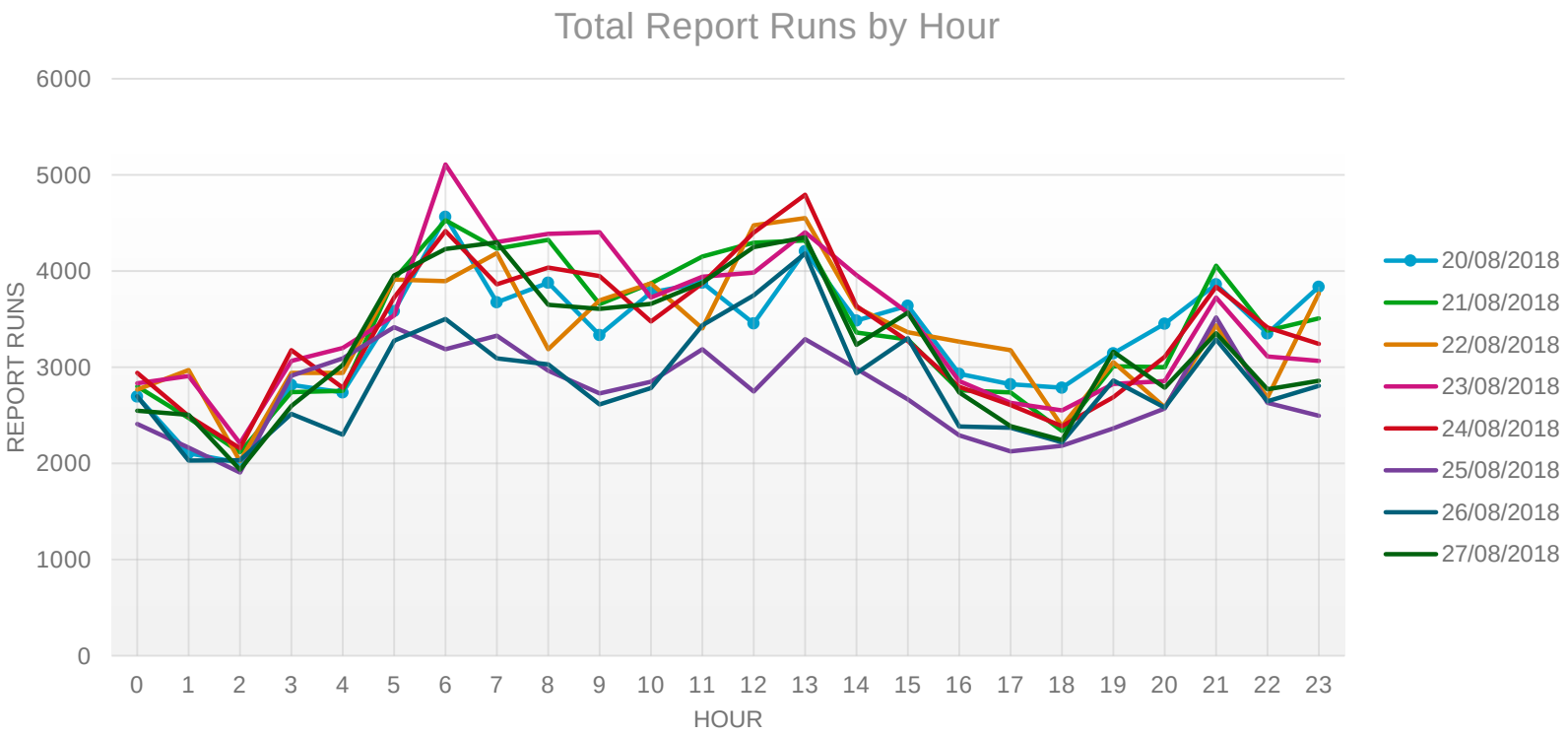
- **Cost** (List price : ADG:£8,415/CPU, GG : £12,805), GG license includes ADG
- **Continuous Availability** (perform on-line upgrades, enable less disruption)
- **Data Integration and Consolidation**
- **Replication approach** (Heterogenous, **different versions** of **Oracle** Database)
- **Replication granularity** (schema, sub-schema, table etc.)

What did we use GoldenGate 12c for ?

A combination of **Uni-directional** & **Consolidation** design patterns, **combined** with Oracle **RAC**, **Dataguard** and **GoldenGate** for **MAA**

- Providing **Real-time Operational Reporting** capability to the operation (12 Sites)
  - **Selective (sub-schema) replication** between source and target
- Providing Supply Chain BI, Analytics capability to the Support Centre
  - Analytical (OLAP) capability using real-time data at the individual depot
  - Further capability to create aggregate MI/BI analytics for the whole operation

What did we use GoldenGate 12c for ?



How did we implement GoldenGate 12c ?

Oracle Products in Use

Database Tier (RHEL 6.5)

- RAC (12.1.0.2) including NON-CDB (certification req.)
- Grid Infrastructure (12.1.0.2)
- **Dataguard** in Maximum Availability (**FASTSYNC** - 12.1.0.2)
- **GoldenGate12cR2 (12.2.0.1**) with RAC12c (NON-CDB)
- **Database Filesystem (DBFS)** – Available on **Linux** and **Solaris** only
- **Grid Infrastructure Agent (XAG) (7.1)** for managing GG resources

Middleware Tier

- Non-Oracle Middleware – Third-party certification requirement for accessing GG target

Enterprise Manager

- 13.2 inc DB Diagnostics & Tuning packs, GG pack

DOCS - http://www.oracle.com/technetwork/database/availability/oracle-database-maa-best-practices-155386.html

GoldenGate 12c Operations

GoldenGate Source A Resources

Resource Name	Resource Type	Target	State	Node	FC	RC	State Details
dbfs_mount_wmsscp1		**C ONLINE**	**ONLINE**	**dc1pwmdb101**	**0**	**0**	
dbfs_mount_wmsscp2		**C ONLINE**	**ONLINE**	**dc1pwmdb201**	**0**	**0**	
ora.dc1pwmdb101.vip	Cluster VIP	C ONLINE	ONLINE	dc1pwmdb101	0	0	
ora.dc1pwmdb201.vip	Cluster VIP	C ONLINE	ONLINE	dc1pwmdb201	0	0	
ora.sawmsscp.db	database	C ONLINE	ONLINE	dc1pwmdb101	0	0	Open
ora.sawmsscp.db	database	C ONLINE	ONLINE	dc1pwmdb201	0	0	Open
ora.sawmsscp.ggwmsscp1.svc	**service**	**C ONLINE**	**ONLINE**	**dc1pwmdb101**	**0**	**0**	
ora.sawmsscp.ggwmsscp2.svc	**service**	**C ONLINE**	**ONLINE**	**dc1pwmdb201**	**0**	**0**	
ora.sawmsscp.msfph.svc	service	C ONLINE	ONLINE	dc1pwmdb201	0	0	
ora.sawmsscp.wmsph.svc	service	C ONLINE	ONLINE	dc1pwmdb101	0	0	
ora.scan1.vip	SCAN VIP	C ONLINE	ONLINE	dc1pwmdb101	0	0	
ora.scan2.vip	SCAN VIP	C ONLINE	ONLINE	dc1pwmdb201	0	0	
ora.scan3.vip	SCAN VIP	C ONLINE	ONLINE	dc1pwmdb201	0	0	
xag.ggwmsscp1-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc1pwmdb101**	**0**	**0**	
xag.ggwmsscp1.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc1pwmdb101**	**0**	**0**	
xag.ggwmsscp2-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc1pwmdb201**	**0**	**0**	
xag.ggwmsscp2.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc1pwmdb201**	**0**	**0**	

GoldenGate Source B Resources

Resource Name	Resource Type	Target	State	Node	FC	RC	State Details
dbfs_mount_wmsrcp1		**C ONLINE**	**ONLINE**	**dc2pwmdb101**	**0**	**0**	
dbfs_mount_wmsrcp2		**C ONLINE**	**ONLINE**	**dc2pwmdb201**	**0**	**0**	
ora.dc2pwmdb101.vip	Cluster VIP	C ONLINE	ONLINE	dc2pwmdb101	1	0	
ora.dc2pwmdb201.vip	Cluster VIP	C ONLINE	ONLINE	dc2pwmdb201	1	0	
ora.rowmsrcp.db	database	C ONLINE	ONLINE	dc2pwmdb101	1	0	Open
ora.rowmsrcp.db	database	C ONLINE	ONLINE	dc2pwmdb201	0	0	Open
ora.rowmsrcp.ggwmsrcp1.svc	**service**	**C ONLINE**	**ONLINE**	**dc2pwmdb101**	**1**	**0**	
ora.rowmsrcp.ggwmsrcp2.svc	**service**	**C ONLINE**	**ONLINE**	**dc2pwmdb201**	**1**	**0**	
ora.rowmsrcp.msflg.svc	service	C ONLINE	ONLINE	dc2pwmdb201	1	0	
ora.rowmsrcp.wmslg.svc	service	C ONLINE	ONLINE	dc2pwmdb101	1	0	
ora.scan1.vip	SCAN VIP	C ONLINE	ONLINE	dc2pwmdb101	1	0	
ora.scan2.vip	SCAN VIP	C ONLINE	ONLINE	dc2pwmdb101	1	0	
ora.scan3.vip	SCAN VIP	C ONLINE	ONLINE	dc2pwmdb101	1	0	
xag.ggwmsrcp1-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc2pwmdb101**	**1**	**0**	
xag.ggwmsrcp1.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc2pwmdb101**	**0**	**0**	
xag.ggwmsrcp2-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc2pwmdb201**	**1**	**0**	
xag.ggwmsrcp2.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc2pwmdb201**	**0**	**0**	

GoldenGate Target Resources

Resource Name	Resource Type	Target	State	Node	FC	RC	State Details
dbfs_mount_sciscp1		**C ONLINE**	**ONLINE**	**dc1pscdb201**	**0**	**0**	
dbfs_mount_sciscp2		**C ONLINE**	**ONLINE**	**dc1pscdb201**	**0**	**0**	
ora.dc1pscdb101.vip	Cluster VIP	C ONLINE	ONLINE	dc1pscdb101	1	0	
ora.dc1pscdb201.vip	Cluster VIP	C ONLINE	ONLINE	dc1pscdb201	0	0	
ora.sasciscp.db	database	C ONLINE	ONLINE	dc1pscdb101	0	0	Open
ora.sasciscp.db	database	C ONLINE	ONLINE	dc1pscdb201	0	0	Open
ora.sasciscp.ggsciscp1.svc	**service**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**1**	**0**	
ora.sasciscp.ggsciscp2.svc	**service**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**1**	**0**	
ora.sasciscp.scilg.svc	service	C ONLINE	ONLINE	dc1pscdb101	0	0	
ora.sasciscp.scilg.svc	service	C ONLINE	ONLINE	dc1pscdb201	1	0	
ora.sasciscp.sciph.svc	service	C ONLINE	ONLINE	dc1pscdb101	0	0	
ora.sasciscp.sciph.svc	service	C ONLINE	ONLINE	dc1pscdb201	1	0	
ora.scan1.vip	SCAN VIP	C ONLINE	ONLINE	dc1pscdb101	0	0	
ora.scan2.vip	SCAN VIP	C ONLINE	ONLINE	dc1pscdb201	1	0	
ora.scan3.vip	SCAN VIP	C ONLINE	ONLINE	dc1pscdb201	1	0	
xag.ggsciscp1-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**1**	**0**	
xag.ggsciscp1.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**0**	**0**	
xag.ggsciscp2-vip.vip	**appvipx**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**0**	**0**	
xag.ggsciscp2.goldengate	**goldengate**	**C ONLINE**	**ONLINE**	**dc1pscdb201**	**0**	**0**	

GoldenGate Services Mgmt

Dependency Order of Stopping GG dependent services

```
echo Stopping goldengate resources
/u01/app/xag/7.1/bin/agctl stop goldengate ggwmsscp1
/u01/app/xag/7.1/bin/agctl stop goldengate ggwmsscp2

echo Stopping dbfs_mounts
/u01/app/12.1.0/grid/bin/crsctl stop res dbfs_mount_wmsscp1
/u01/app/12.1.0/grid/bin/crsctl stop res dbfs_mount_wmsscp2

echo Stopping GG VIPs
/u01/app/12.1.0/grid/bin/crsctl stop res xag.ggwmsscp1-vip.vip
/u01/app/12.1.0/grid/bin/crsctl stop res xag.ggwmsscp2-vip.vip

echo Stopping database
srvctl stop database -db <db_name>
```

GoldenGate Services Mgmt

Dependency Order of Starting GG dependent services

```
echo Starting database
srvctl start service -d sawmsscp – CRS/XAG will automatically bring all dependent
resources

echo Moving services to the preferred instance
srvctl relocate service -d sawmsscp -s GGWMSSCP1 -oldinst WMSSCP2 -newinst WMSSCP1
srvctl relocate service -d sawmsscp -s GGWMSSCP2 -oldinst WMSSCP1 -newinst WMSSCP2
```

GoldenGate Source A - DB Host 1 Status

```
GGSCI (dc1pwmdb101) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                                MANAGED/xag.ggwmsscp1.goldengate
EXTRACT     RUNNING     EAM1        00:00:05      00:00:09
EXTRACT     RUNNING     EPH1        00:00:04      00:00:05
EXTRACT     RUNNING     EWT1        00:00:03      00:00:08
EXTRACT     RUNNING     PAM1        00:00:00      00:00:03
EXTRACT     RUNNING     PPH1        00:00:00      00:00:00
EXTRACT     RUNNING     PWT1        00:00:00      00:00:08
```

GoldenGate Source A - DB Host 2 Status

```
GGSCI (dc1pwmdb101) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                                MANAGED/xag.ggwmsscp2.goldengate
EXTRACT     RUNNING     ECW1        00:00:05      00:00:01
EXTRACT     RUNNING     EHG1        00:00:03      00:00:07
EXTRACT     RUNNING     ENE1        00:00:04      00:00:05
EXTRACT     RUNNING     PCW1        00:00:00      00:00:03
EXTRACT     RUNNING     PHG1        00:00:00      00:00:03
EXTRACT     RUNNING     PNE1        00:00:00      00:00:01
```

GoldenGate Source B - DB Host 1 Status

```
GGSCI (dc2pwmdb101) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                                MANAGED/xag.ggwmsrcp2.goldengate
EXTRACT     RUNNING     ELE1        00:00:03      00:00:00
EXTRACT     RUNNING     ELG1        00:00:04      00:00:08 - LIVE
EXTRACT     RUNNING     ENH1        00:00:05      00:00:04 - LIVE
EXTRACT     RUNNING     PLE1        00:00:00      00:00:03
EXTRACT     RUNNING     PLG1        00:00:00      00:00:02 - LIVE
EXTRACT     RUNNING     PNH1        00:00:00      00:00:05 - LIVE
```

GoldenGate Source B - DB Host 2 Status

```
GGSCI (dc2pwmdb201) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                                MANAGED/xag.ggwmsrcp2.goldengate
EXTRACT     RUNNING     EAR1        00:00:04      00:00:01 - LIVE
EXTRACT     RUNNING     ECY1        00:00:04      00:00:05 - LIVE
EXTRACT     RUNNING     EPM1        00:00:03      00:00:06
EXTRACT     RUNNING     PAR1        00:00:06      00:00:02 - LIVE
EXTRACT     RUNNING     PCY1        00:00:03      00:00:03 - LIVE
EXTRACT     RUNNING     PPM1        00:00:00      00:00:06
```

GoldenGate Target - DB Host 1 Status

```
GGSCI (dc1pscdb201) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                 MANAGED/xag.ggsciscp1.goldengate
REPLICAT    RUNNING     RAM1        00:00:06      00:00:02
REPLICAT    RUNNING     RLE1        00:00:09      00:00:07
REPLICAT    RUNNING     RLG1        00:00:05      00:00:08
REPLICAT    RUNNING     RNH1        00:00:06      00:00:06
REPLICAT    RUNNING     RPH1        00:00:11      00:00:05
REPLICAT    RUNNING     RWT1        00:00:09      00:00:07
```

GoldenGate Target - DB Host 2 Status

```
GGSCI (dc1pscdb201) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt    XAG

MANAGER     RUNNING                     MANAGED/xag.ggsciscp2.goldengate
REPLICAT    RUNNING     RAR1        00:00:06      00:00:09
REPLICAT    RUNNING     RCW1        00:00:11      00:00:05
REPLICAT    RUNNING     RCY1        00:00:07      00:00:00
REPLICAT    RUNNING     RHG1        00:00:12      00:00:10
REPLICAT    RUNNING     RNE1        00:00:08      00:00:01
REPLICAT    RUNNING     RPM1        00:00:17      00:00:16
```

Monitor Errors

Error Log

```
/u01/app/oracle/product/12.2.0/ogg_pr1 – OGG_HOME on TARGET
-rw-r-----. 1 oracle oinstall 151593 Dec  6 11:24 ggserr.log
```

Start by looking at records processed by the extract and pump on the source, and replicat on the target. e.g.:

Extract:
grep -i 'records processed' $**GG_HOME/dirrpt/EPH1.rpt**
Pump:
grep -i 'records processed' $**GG_HOME/dirrpt/PPH1.rpt**
Replicat:
grep -i 'records processed' $**GG_HOME/dirrpt/RPH1.rpt**

Also review AWR between time of issues and cpu and network usage at source and target in EM. Was anything happening on source or target schemas at that time ?

Monitor Lag

Checking LAG

```
11:14:56 SQL*Plus(SCISCP1)>
select local_database,
       heartbeat_received_ts,
       remote_database,
       incoming_path,
       incoming_lag
from ggadmin1.gg_lag_history - on TARGET database
where incoming_path like '%LG%'
order by heartbeat_received_ts
```

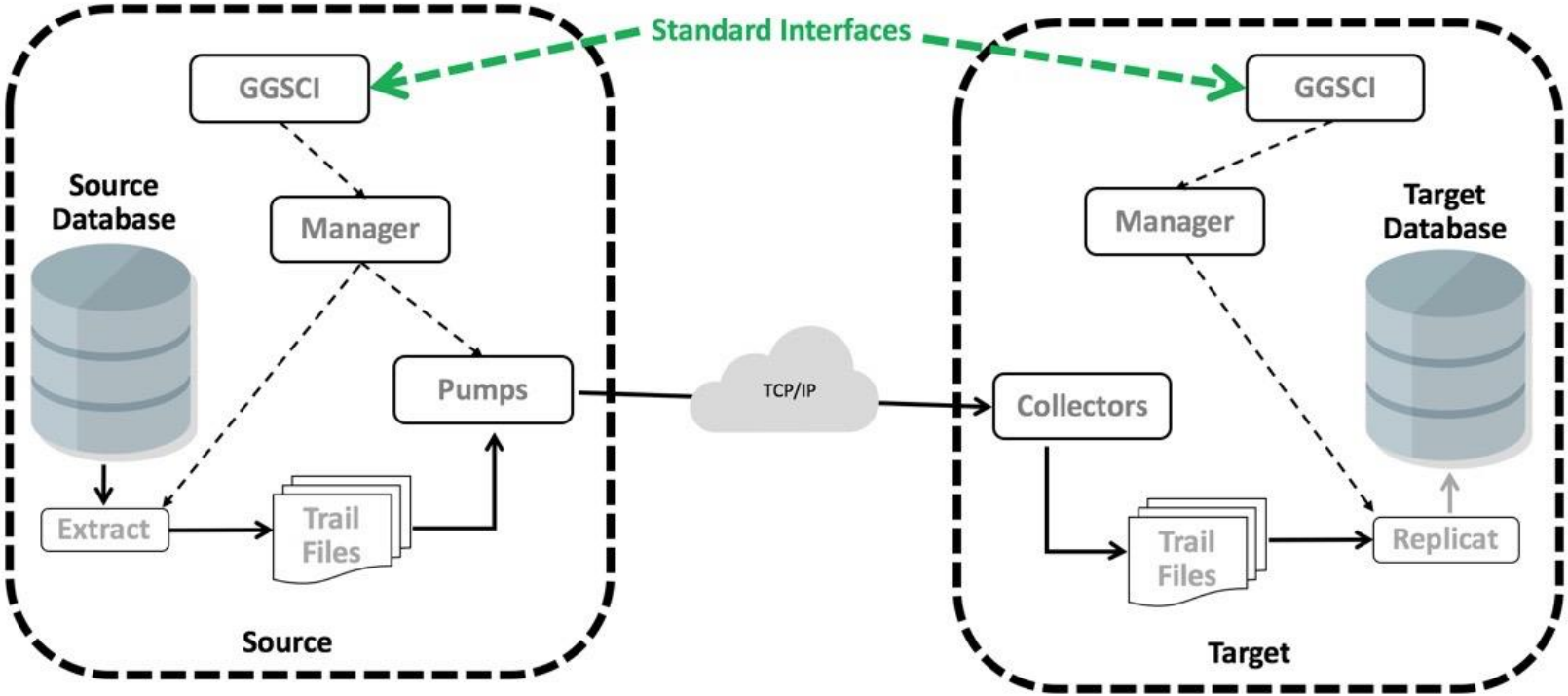
Monitor Lag

LOCAL_DATA	HEARTBEAT_RECEIVED_TS	REMOTE_DAT	INCOMING_PATH	INCOMING_LAG
SCISCP	14-MAY-18 05.04.07.916919 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	2.903311
SCISCP	14-MAY-18 05.05.07.854275 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.368682
SCISCP	14-MAY-18 05.06.06.929015 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	3.762453
SCISCP	14-MAY-18 05.07.07.966960 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.163101
SCISCP	14-MAY-18 05.08.10.125794 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	5.587652
SCISCP	14-MAY-18 05.09.09.104919 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.942674
SCISCP	14-MAY-18 05.10.07.961121 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	3.483457
SCISCP	14-MAY-18 05.11.10.695457 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	5.833455
SCISCP	14-MAY-18 05.12.06.925823 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.214994
SCISCP	14-MAY-18 05.13.09.056914 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.585623
SCISCP	14-MAY-18 05.14.10.204768 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	5.975953
SCISCP	14-MAY-18 05.15.08.217370 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	4.411166
SCISCP	14-MAY-18 05.16.10.203503 PM	WMSRCP	ELG1 ==> PLG1 ==> RLG1	5.752485

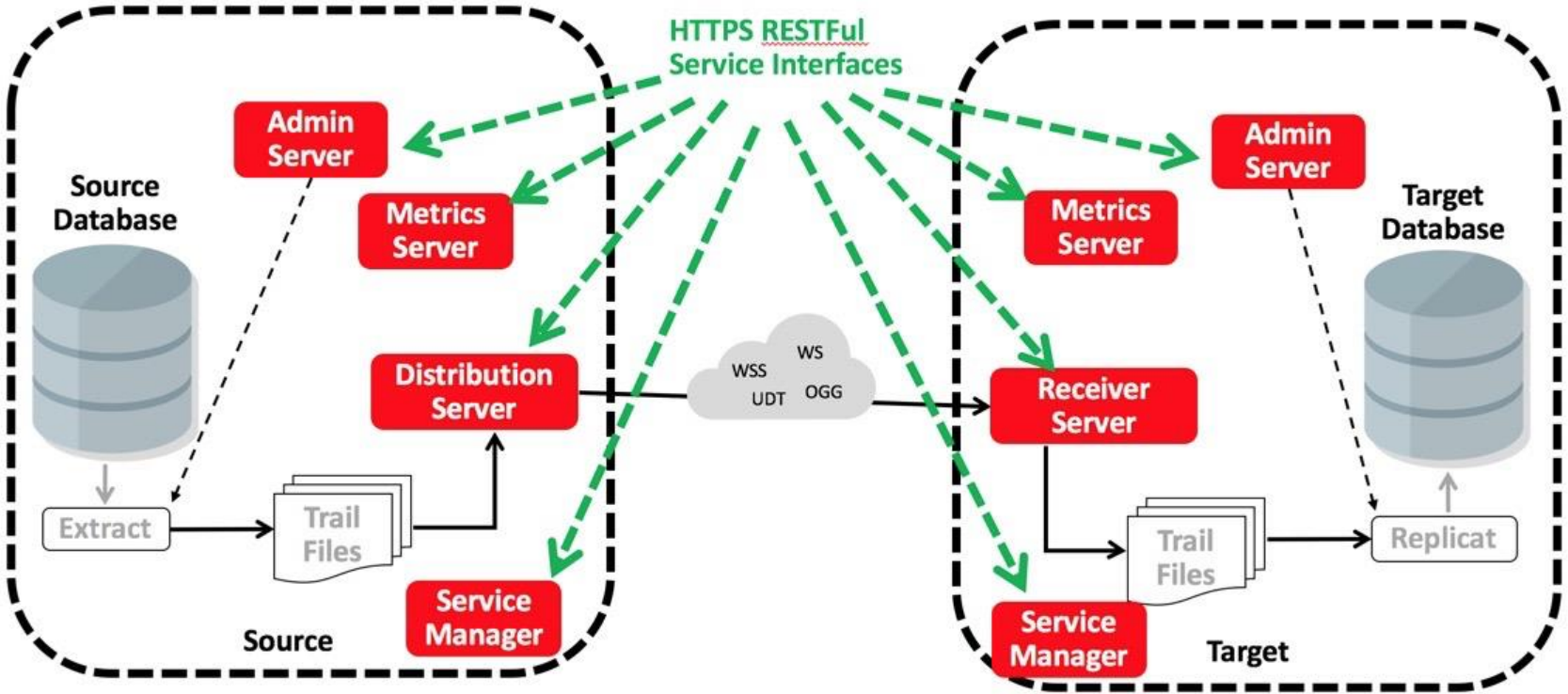
GoldenGate 12cR3

Microservices Architecture

GoldenGate 12c – Classic Architecture



GoldenGate 12cR3 Microservices Architecture



GoldenGate 12cR3 Microservices Architecture

Co-op Evaluation and Due Diligence

- **Single, Web interface available for all sources and targets**
- Simple to administer, configure, troubleshoot and monitor
- Built on **established Classic architecture**
- Simple **RAC integration through XAG**

Benefits for Co-op

- Ease of Admin and maintenance for all sources and targets
- Secure, Simple to setup, configure, troubleshoot and monitor all configurations
- **All learnings** (HA/MAA) & knowledge **from GoldenGate 12.2 Classic Architecture still valid**
- **Cloud-enabling our On-Prem MAA architecture for** future hosting and **Data Centre Exit**
- **Role based security** and **segregation of duty**

GoldenGate 12cR3 Microservices Architecture

Database Tier (RHEL 6.5)

- **RAC (12.1.0.2)** including **NON-CDB** (certification req.)
- Grid Infrastructure (**Source - 12.1.0.2**, **Target – 12.2.0.1**)
- **Active Data Guard in Maximum Availability** (FASTSYNC)
- **GoldenGate12cR3 (12.3.0.1.4**) with RAC12c (NON-CDB)
- **Database Filesystem (DBFS)**
- **Grid Infrastructure Agent (XAG) (9.1)** for managing GG resources

Middleware Tier

- Non-Oracle Middleware – Third-party certification requirement for accessing GG target

Enterprise Manager

- 13.2 inc DB Diagnostics & Tuning packs, **GG pack** (**Allows** use of **Performance Manager**)

What has been tested successfully so far ?

- **Source/Target (GG/Classic & GG/MA) : 12.1.0.2**
- **Source : 12.1.0.2, Target : 12.2.0.1 (On-line Upgrade)**
- **Design** to **Deployment** in aprox. 3 weeks of effort
- **Planned** and **Un-planned** scenarios proven successfully

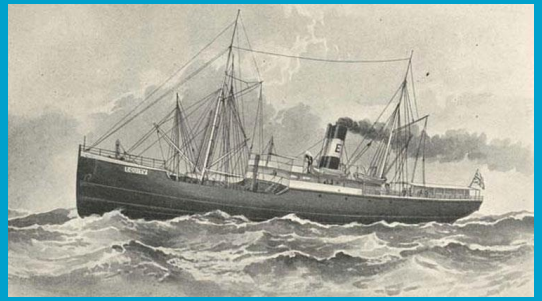
MAA & Oracle Multitenant

Why Oracle Multitenant ?

Multitenant benefits to Co-op – Considerations

- Maximum Consolidation & Maximum Tenant Protection
- Ability to test DG switchover at PDB level (Audit/Risk)
- Schema to Tenant mapping
  - Specific Resource Allocation per PDB
  - Ability to flashback at PDB level (impact single app/site only)
  - Optimal utilisation of Server Resources
  - **Goldengate** : Extract configured at CDB level, Replicat at PDB

Disaster Recovery



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Disaster Recovery Approach

Twin sites, ~symmetric, equal capacity

- Both sites run Live, DR & Test (fully licensed)
- Services spread: Active/Passive + Passive/Active
  - No stretch Clusters
  - Consciously no auto failover (FSFO)
  - Exec level authorisation needed for whole DC
  - Switchover tested at least once a year (Risk, Audit)

DR Notes

Data centres are as autonomous as possible

- No use of stretched VLANs
- No state in the middle tier (wherever possible)
- Dual domains – 2 copies of application
- (Active) Standby databases – 2 copies of data

DR Testing

DR switchover tests

- For Platinum/Gold & Silver tiers: regular switchover to alternate DC 1 or 2 times per year
- Symmetrical: DR is sized as per production so no reduction in performance, resilience when running on alternate site
- Typically tested on a “groups of applications” basis
- Data Guard switchover and DNS update for application
- Runs in alternate DC for a minimum of 7-21 days

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DR Considerations - GoldenGate

- Source switchover/failover is straightforward
  - Make sure Manager, Extract, Pump restart correctly
- Target switchover/failover is not trivial …
  - DB Role (Primary/Standby) triggers a DB job on sources which executes a script to switch the GoldenGate target vip addressed by the Pump source; followed by stop/start of manager, extract and pump and replicat (target)

Enterprise Manager

Cloud Control

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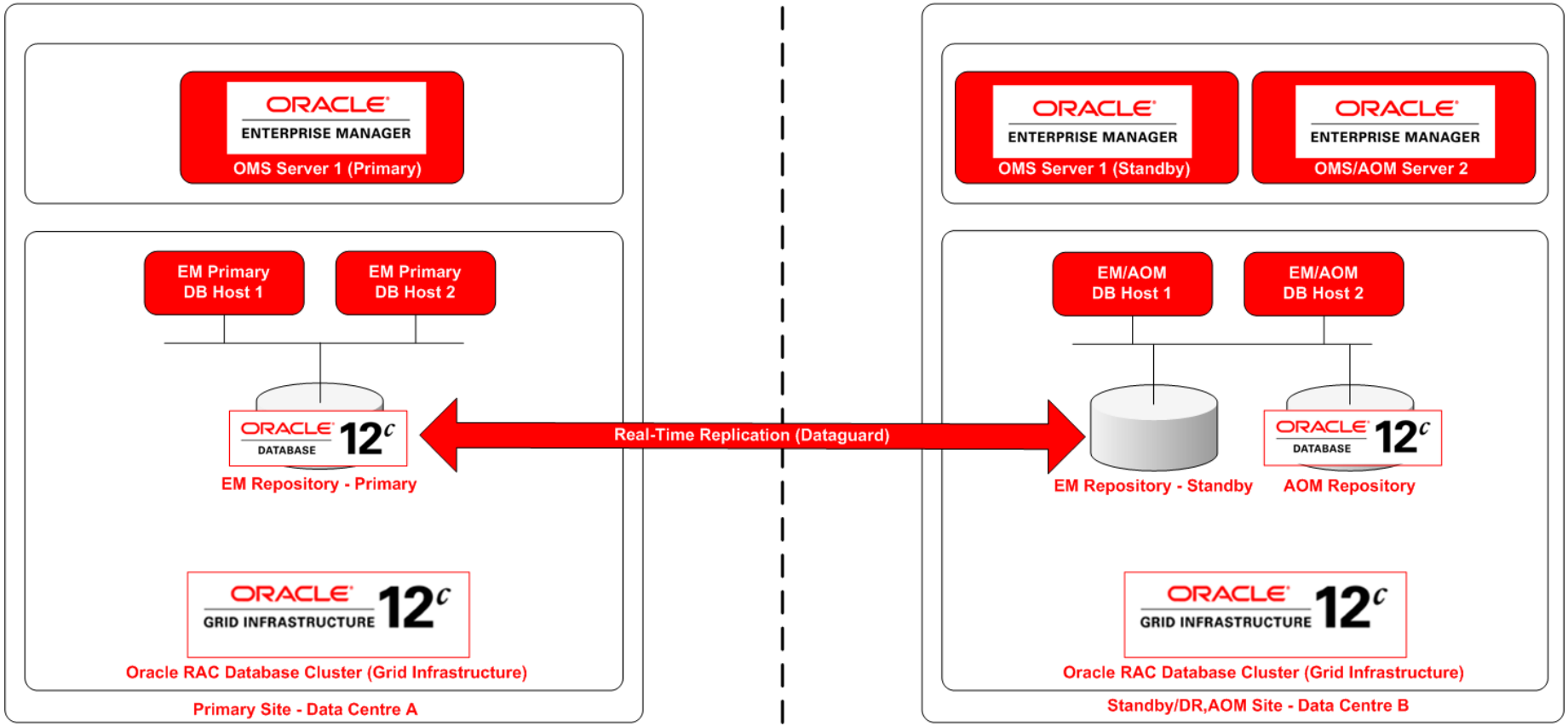
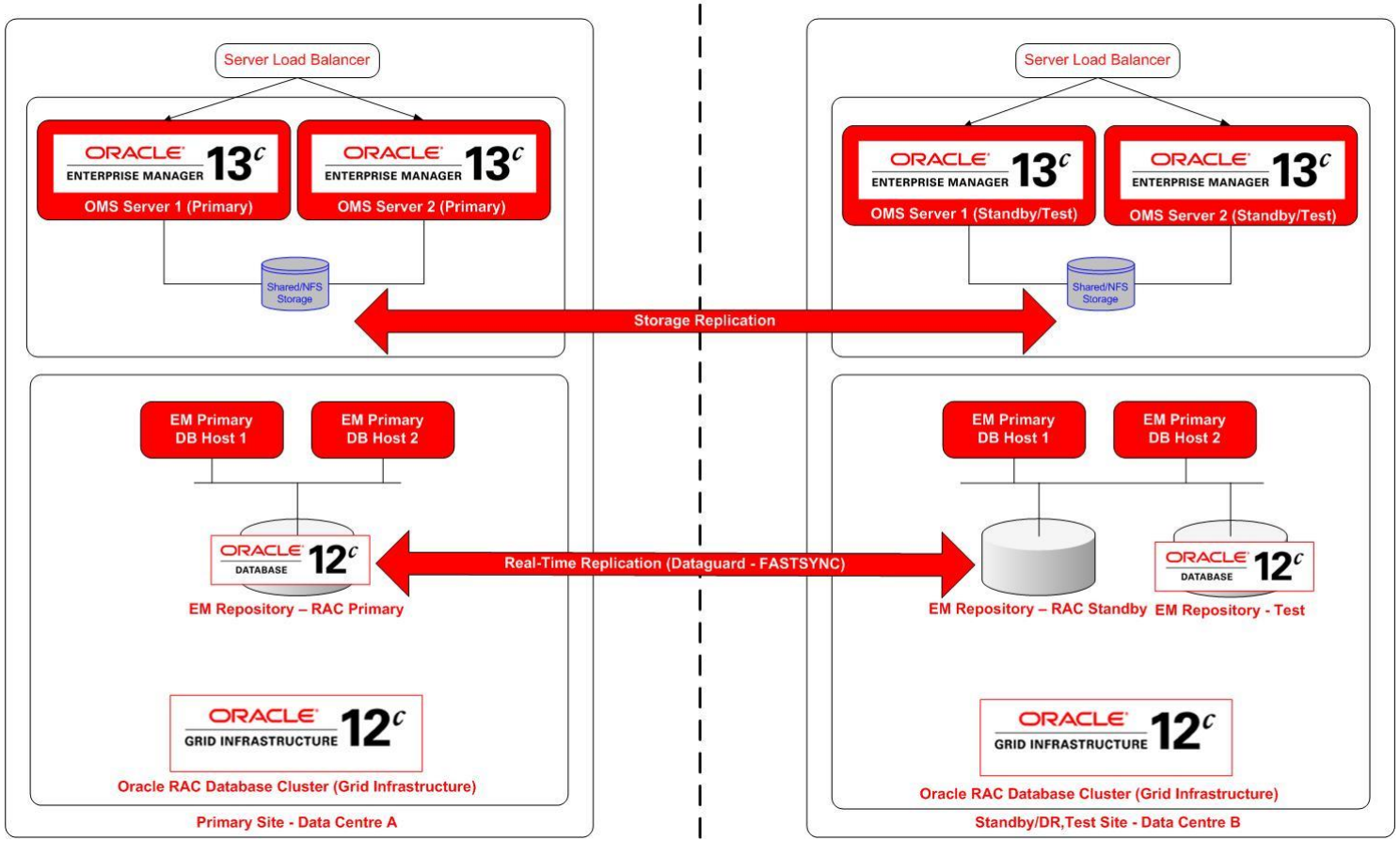
EM/AOM 13cR2 – Current Platform



EM with Always On Monitoring (AOM)

- Always On Monitoring 13cR2
  - https://docs.oracle.com/cd/E63000_01/EMADM/em_mon_svc.htm#EMADM15489
- Continuous monitoring of targets through a Lightweight Java application and a Database Repository
- Receive notifications when OEM has to be patched

EM/AOM - MAA Target Architecture



Lessons Learnt

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Next Steps

FAIRTRADE

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Conclusions & Lessons – GoldenGate (CA/MA)

- **Prove it works!** Clear test plan for all HA/DR scenarios
- Do not underestimate the amount of testing required
- Good understanding of the database schema
  - Support Document ID **1296168.1 for schema validation**

GoldenGate 12cR3 MA – Next Steps

GoldenGate MA Production Deployment (Q3/2019)

- GG/MA in MAA on current setup; GG/MA installation and configuration to co-exist with GG/Classic for seamless transition

Grid Infrastructure and Database Upgrade (19c)

- GI upgrade 12.1.0.2 to 18.3/19c with GG/MA in MAA setup
- Database upgrade 12.1.0.2 to 19c
- Migrate our schema consolidation to multitenant (PDBs)
- **Z**ero **D**owntime **U**pgrade/Patching capability (19c)

Future Plans

- **Rapid/Fleet Home Provisioning** (Patching, GoldImage)
- **Autonomous Health Framework** (Prediction, Prevention, Self-Healing)
- **RedHat to Oracle Linux migration** - Ksplice for Zero downtime patching (avoid reboot)
- **MAA/Autonomous**: Relocation of our GG/Target onto Autonomous TP/DW

The Co-op Journey to MAA

MAA Investment pays off

- **Planned Outages** for Server BIOS upgrades
- **Unplanned Outages** (4 Server failures/crashes)
- **Scale vertically and horizontally as logistics network grows**

Zero Business Impact on our logistics mission-critical Transaction Processing (TP) and **Real-Time Operational Reporting/Analytics (GoldenGate Target)**

Co-op HQ
One of the most sustainable large buildings in the world 2013

Thank You!

Q&A

https://en.wikipedia.org/wiki/One_Angel_Square