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Exadata MAA Best Practices Migrating Oracle Databases

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Exadata and MAA Best Practices

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Key Points



Migrating to Exadata

1. Migration Preparation is Essential
2. Pick the Right Migration Method
3. Fast Network Reduces Migration Time



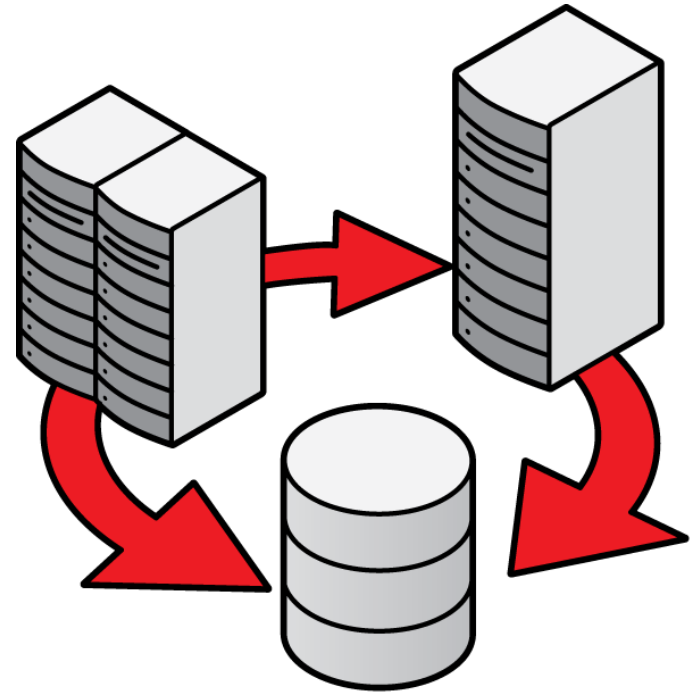
Key Point #1

Migration Preparation is Essential

Simplify and Optimize during migration leads to the best performance and highest availability on Exadata.

Migration Goal

- Move your data
- Simplify and Optimize
 - Get rid of baggage
 - Better performance
 - Better resource utilization
 - Better stability



Learn Exadata Database Machine

Target Environment

Oracle Database 11g Release 2

- Upgrade Guide
- Upgrade Companion (MOS 785351.1)

Automatic Storage Management (ASM)

Oracle Real Application Clusters (RAC)

Linux 64bit or Solaris x86

Exadata software maintenance (MOS 888828.1)

Database Migration to Exadata

Simplify and Optimize

Simplify and Optimize

For Exadata

Smart storage

Hybrid Columnar
Compression (HCC)

For Best Practice (MOS 757552.1)

Default init.ora

Undecorated SQL (w/ good stats)

Improved schema object layout

Fewer tablespaces and data files

Large database extent size

Character set (MOS 123670.1)

Database Migration to Exadata

Prepare Source and Exadata Target

Migration Preparation

Prepare source system

Database upgrade to 11.2

Hardware upgrade

Drop unnecessary schema objects

Prepare Exadata system

ASM Configuration

- Redundancy
- compatible.rdbms

Install latest versions (MOS 888828.1)

Review Exadata Critical Issues (MOS 1270094.1)

Migration Strategy

Test

- Use Real Production Workload
 - Real Application Testing (RAT)
 - Database Workload Replay
 - SQL Performance Analyzer (SPA)
- 1. Test migration to non-Exadata Linux x86-64 + ASM
 - Oracle 11g Release 2
 - Latest Exadata database patch (MOS 888828.1)
- 2. Test on your Exadata system
- 3. Test again for good measure





Key Point #2

Pick the Right Migration Method

There are many ways to migrate to Exadata
- the “best” way depends on your
environment and goals.

Migration Methods

	Migration Method	Downtime factor
<u>Physical</u> <ul style="list-style-type: none"> •Block for block copy •Whole tablespace or database •Typically best for OLTP 	Data Guard Physical Standby	Switchover (11.2) Change rate + upgrade (11.1)
	Transportable Tablespaces	Data size
	Transportable Database	Data size
<u>Logical</u> <ul style="list-style-type: none"> •Unload, reload with SQL •Easy to subset •Typically best for DW 	Data Pump	Data size
	Insert as Select	Data size
HA Options <ul style="list-style-type: none"> •Use in conjunction with other method to reduce downtime 	GoldenGate	Client reconnect
	Cross Platform Incremental Backups (w/ TTS)	Change rate + metadata size
	Data Guard Transient Logical Standby	Client reconnect

High Availability Options

- Cross Platform Incremental Backups
 - Reduce downtime for Transportable Tablespaces
- Oracle GoldenGate
 - Reduce downtime for any method
 - Zero data loss fallback
 - Phased migration
- Data Guard Transient Logical Standby
 - Reduce upgrade downtime coming from 11.1 for Physical Standby

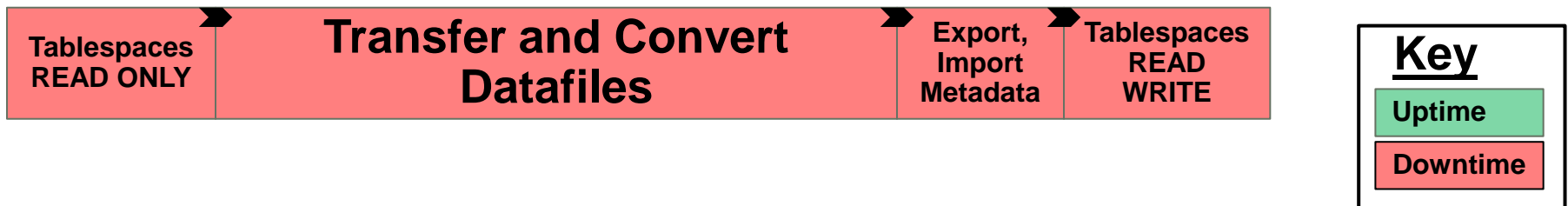


Reduce Migration Downtime

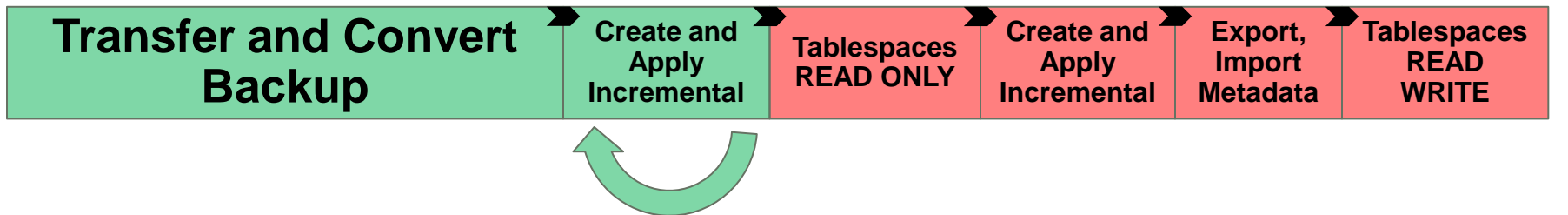
XTTS + Cross Platform Incremental Backups (MOS 1389592.1)

- Standard XTTS but most data moved while source online
- Reduce Downtime $f(\text{change rate} + \text{metadata size})$

Traditional XTTS



XTTS w/ Incrementals



Reduce Migration Downtime

Oracle GoldenGate

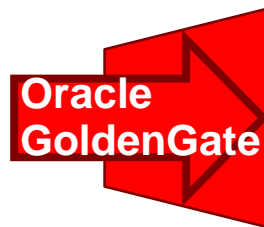
- Log-based data replication cross platform and version
- Downtime $f(\text{client reconnect})$

1. Instantiate target using any physical or logical method
2. Keep target in sync using GoldenGate
3. Redirect clients to target for switchover

- Oracle 9.2 or later
- Data type constraints
- ARCHIVELOG and LOGGING



Source

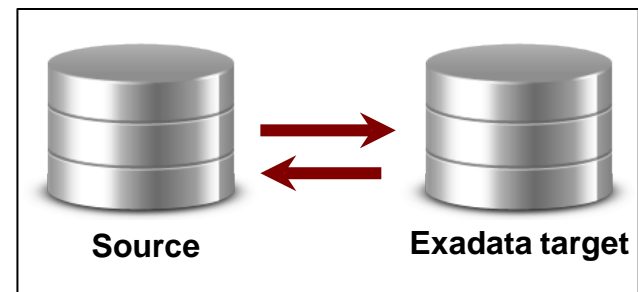
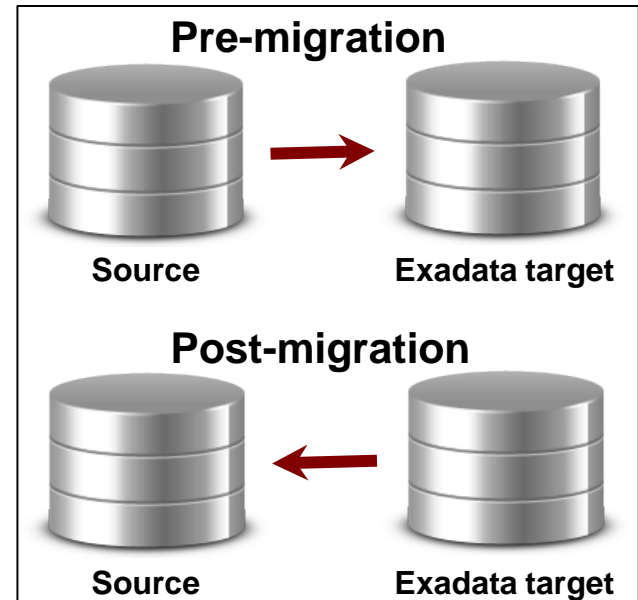


Exadata target

Zero Data Loss Fallback and Phased Migration

Oracle GoldenGate

- Zero data loss fallback
 - After migration, switch replication direction
 - Redirect clients to source for fallback
- Phased migration
 - Bi-directional replication



Which One?

- Your best approach
 - Application-specific requirements?
 - Oracle E-Business Suite (MOS 1133355.1)
 - Are you **Simplified and Optimized**?
 - Will you Simplify and Optimize?
 - HCC? During migration or after?
 - Source platform and source version?
 - Database size?
 - How much downtime?
 - Experience level?
 - Other business requirements?



Best may not be fastest

Scenario 1

From Existing Exadata Database Machine (V1 or X2)

- Simplified and Optimized already (?)
 - HCC released in 11gR2

Option		When to Use
1	Data Guard Physical Standby	•First choice
2	Data Guard Transient Logical Standby	•Reduce upgrade downtime from 11.1

Scenario 2

From Little Endian (Non-Exadata)

- Example: Windows -> Exadata

Option		When to Use
1	Data Guard Physical Standby	<ul style="list-style-type: none">•No need to Simplify and Optimize
2	Data Guard Transient Logical Standby	<ul style="list-style-type: none">•Reduce upgrade downtime from 11.1
3	Data Pump	<ul style="list-style-type: none">•Simplify and Optimize•Full data type support•Cross platform support
4	GoldenGate	<ul style="list-style-type: none">•Reduce downtime•Zero data loss fallback•Phased migration

Scenario 3

From Big Endian

- Example: AIX / HP-UX / SPARC -> Exadata

Option		When to Use
1	Transportable Tablespaces	<ul style="list-style-type: none">•No need to Simplify and Optimize
2	Transportable Tablespaces + Cross Platform Incremental Backups	<ul style="list-style-type: none">•No need to Simplify and Optimize•Reduce downtime
3	Data Pump	<ul style="list-style-type: none">•Simplify and Optimize
4	GoldenGate	<ul style="list-style-type: none">•Reduce downtime•Zero data loss fallback•Phased migration



Key Point #3

Fast Network Reduces Migration Time

Having a fast network is important for quick migration, but watch out for bottlenecks in other areas.

Networks for Moving Data

- 3 network choices
 - No fibre channel

Network	Ports (Full Rack)
10 Gb/s Ethernet★	16
40 Gb/s InfiniBand	8
1 Gb/s Ethernet	24 (14 in X2-8)

- Best Practice
 - Large MTU
 - IPoIB connected mode
 - Use all database servers
 - Active/active bonding on Ethernet
 - Requires customer switch support
 - Do not change InfiniBand to active/active

Bottleneck Not Always the Network

- Non-network bottlenecks
 - Slow source system I/O
 - CPU to send and receive

```
# scp 1GB_file 192.168.20.139:/tmp
1GB_file 100% 1060MB 66.3MB/s 00:16
```

IB network

Slow

PID	USER	PR	NI	UIRT	RES	S	%CPU	TIME+	COMMAND
93704	root	25	0	56496	3324	25	R 99.5	0:04.38	/usr/bin/ssh -x -oForwardAgent no -oPermitLocalC
93705	root	17	0	91884	5132	26	S 98.5	0:04.33	sshd: root@notty

CPU max

- Small I/O
 - scp(1) 4KB I/O

Moving Data Direct to ASM

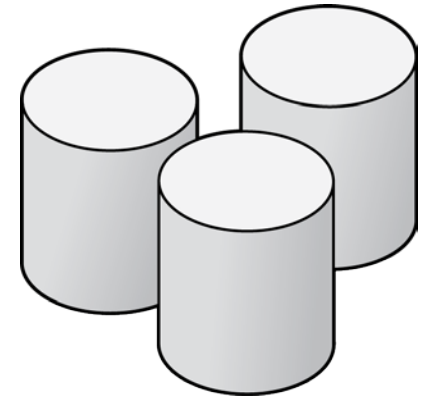
- Databases on Exadata use ASM
 - Direct to ASM network transfer
 - RMAN `BACKUP AS COPY AUXILIARY`
 - `DBMS_FILE_TRANSFER`
 - Convert during XFR 11.2.0.3 backport
 - `ASMCMD CP`
 - Use latest versions if different endian
 - Bytes transferred != bytes written

Tool	1 stream	4 stream
DFT	217 MB/s	771 MB/s
RMAN	585 MB/s	1542 MB/s

Active/active 10Gb/s Ethernet

Staging Data

- Staging space
 - DBFS
 - Recommended for best performance
 - MOS 1054431.1
 - NFS
 - NOT local disk

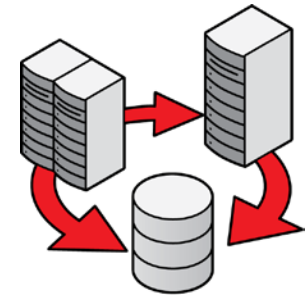


Key Points and Business Takeaways



Migrating to Exadata

Key Points and Takeaways



1. Migration Preparation is Essential

Simplify and Optimize during migration leads to the best performance and highest availability on Exadata.

2. Pick the Right Migration Method

There are many ways to migrate to Exadata - the “best” way depends on your environment and goals.

3. Fast Network Reduces Migration Time

Having a fast network is important for quick migration, but watch out for bottlenecks in other areas.

Migrating to Exadata

Resources and References

- Planning
 - Latest Exadata Software (MOS 888828.1)
 - Upgrade Companion (MOS 785351.1)
- Methods
 - Physical
 - MAA on OTN
 - MOS 1055938.1, 413484.1, 1133355.1
 - Logical
 - MAA on OTN
 - MOS 737460.1, 1055938.1, 1085687.1
 - High Availability Options
 - MOS 1389592.1
 - Oracle GoldenGate on OTN
- Network and Staging
 - DBFS (MOS 1054431.1)

Hardware and Software Engineered to Work Together

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