SK Hynix Recovery Appliance Use Case

2015-10-26

Company & Customer Profile

SK hynix is the global leader in producing semiconductor, such as DRAM and NAND flash and System IC including CMOS Image Sensors.
Since pilot production of Korea's first 16Kb SRAM in 1984, SK hynix consistently led the industry with smaller, faster and lower power semiconductor.
As the second largest manufacturer of memory semiconductor, SK hynix is at the forefront of the IT industry.

Customer Profile

- Name : JeongRyun Park
- Company : SK hynix
- Role in Organization : IT Planning Team Leader / Information Technology Office

About Oracle in Our Organization

- Total 40 Unit of EXADATA across 4 business area in 5 FABs
- Hi-Tech Manufacturing Main System
- MES and Manufacturing Related System(Automation)
- HR,ERP, DW and Non MES System(Information)

BCP(Business Continuity Plan) Introduction on Entire IT System.

- Sep 2013, SK hynix China Wuxi Factory Fire
  - Problems in production for 3 months

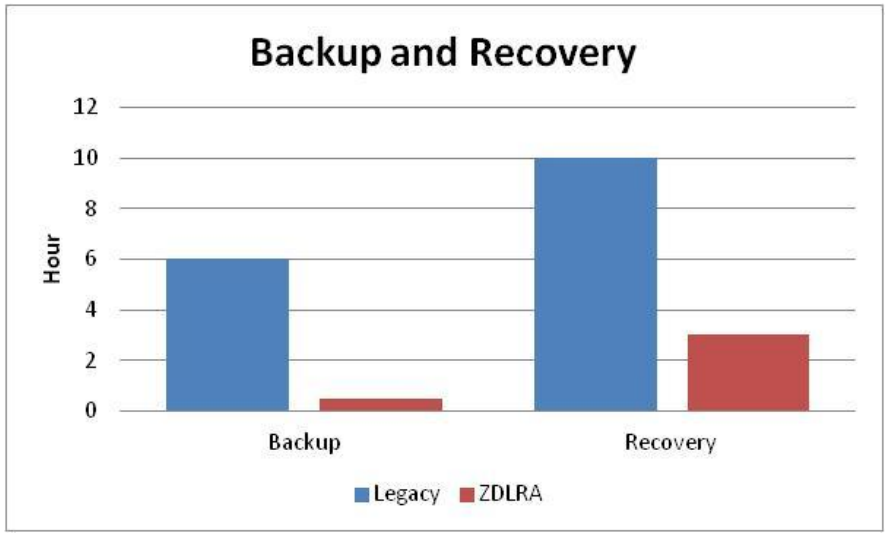
- Necessity of DR Systems
  - Manufacturing Automation Systems Campus DR
  - Information Systems Remote DR

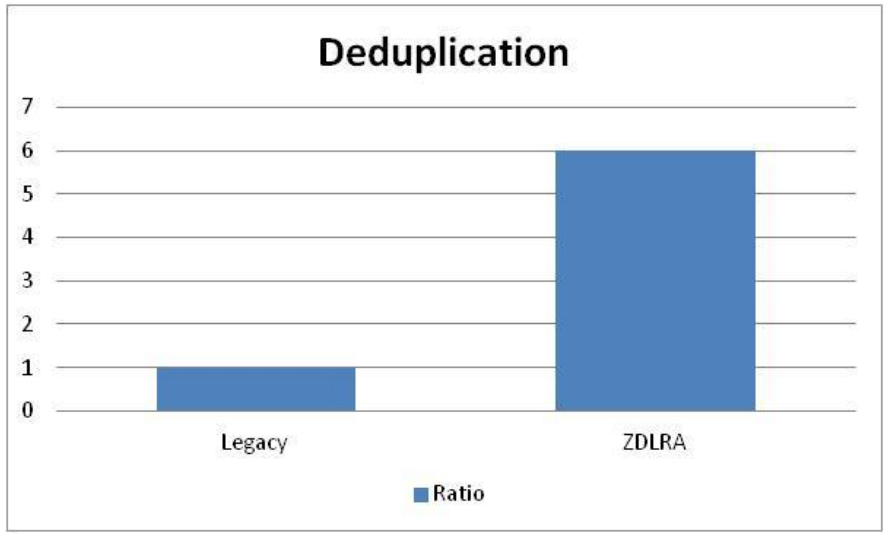
SK Hynix Inc. Reports Fiscal Year 2013 and Fourth Quarter Results

Consolidated fourth quarter revenue was 3.4 trillion won **decreased 18%** from 4.1 trillion won of the previous quarter, **due to decrease in production on account of Wuxi fab affected by a fire** and the appreciation of Korean Won.

SK hynix ZDLRA Effect-> Quantitative Measurement

- Recovery Appliance reduce backup window to 12X
- Recovery Appliance reduce recovery window to 3X
- Recovery Appliance save space to 6X





Characteristics of Hi-Tech MES & Related Systems

BigData & VLDB

- Avg. DB Size : 30~50TB
- Daily Data Increment : 3~5TB
- Structure/Un-Structure
- Business Data / Sensor Data

Extreme Transaction Processing

- 4,000 ~ 6,500 Sessions
- 2,000 ~ 3,500 tx/sec
- Redo Gen. 80~100MB/Sec
- DW / Analysis Query
- Powered by Exadata

Real-Time

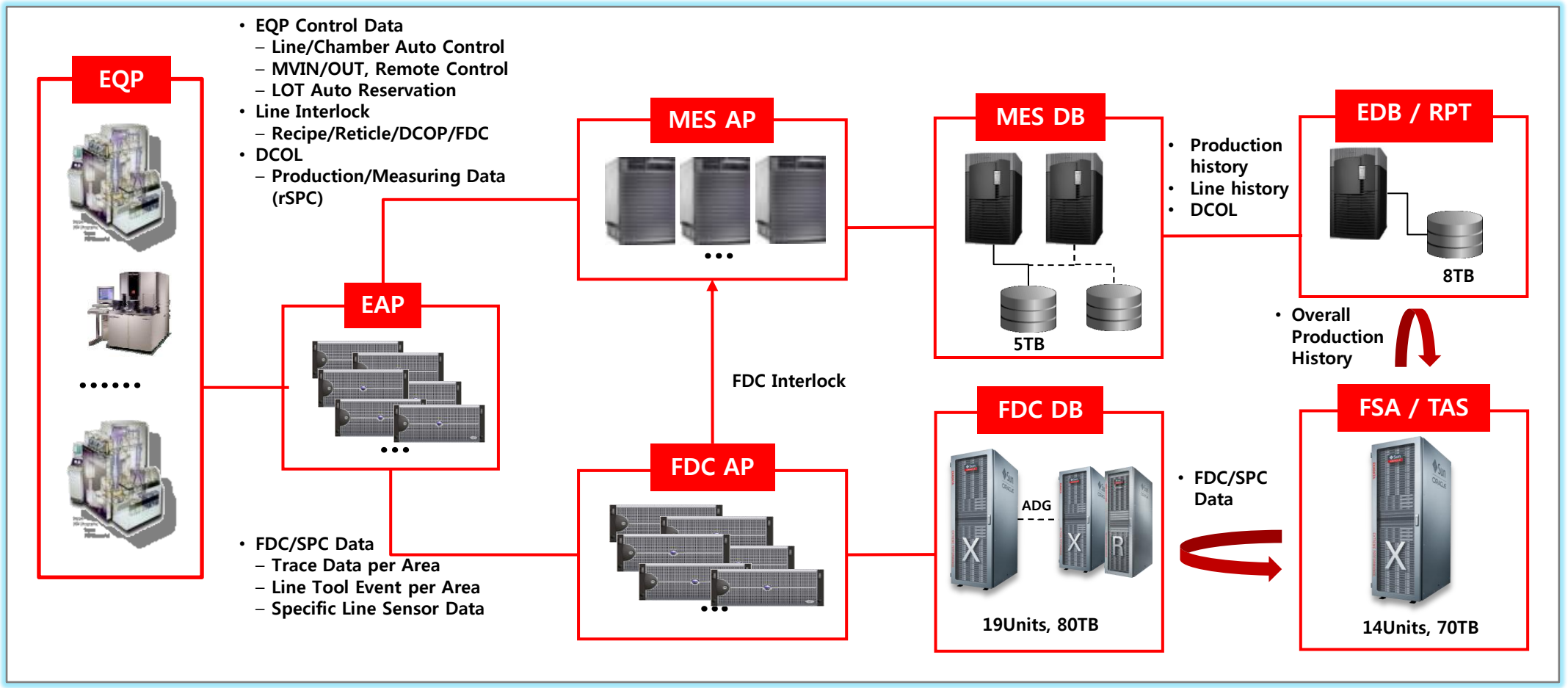
- Manufacturing Control
- Process Control
- Sensor Data Collection, Real-Time Analysis, Monitoring and Order Process
- No deferred processing

Zero-Downtime

- 24 * 7 * 365 No Down Time
- No Delay on Extreme Transaction
- MAA

Flexible Management on Big Data Not Impacting Real-Time Transaction

EXADATA has been services more than 40 systems in FDC and QA since 2012



- FDC Main Function and Practice : Real Time Data Collection, Fault Detection & Response Automation, Classification Function
- FSA / TAS Main Function and Practice: FDC and SPC Data Collection, QA , Reporting and Mining

EXADATA Legacy backup and Issues

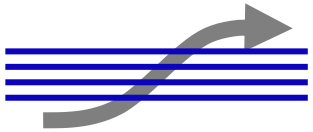
Needs Fast Backup on Big Data Not Impacting Real-Time Transaction

AS-WAS Backup Configuration

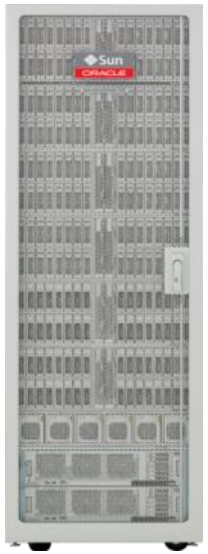
Each Exadata had been backed up to Legacy System

FDC System

RMAN Backup
- Image Copy
- Incremental Update



Network



EXADATA (45TB)

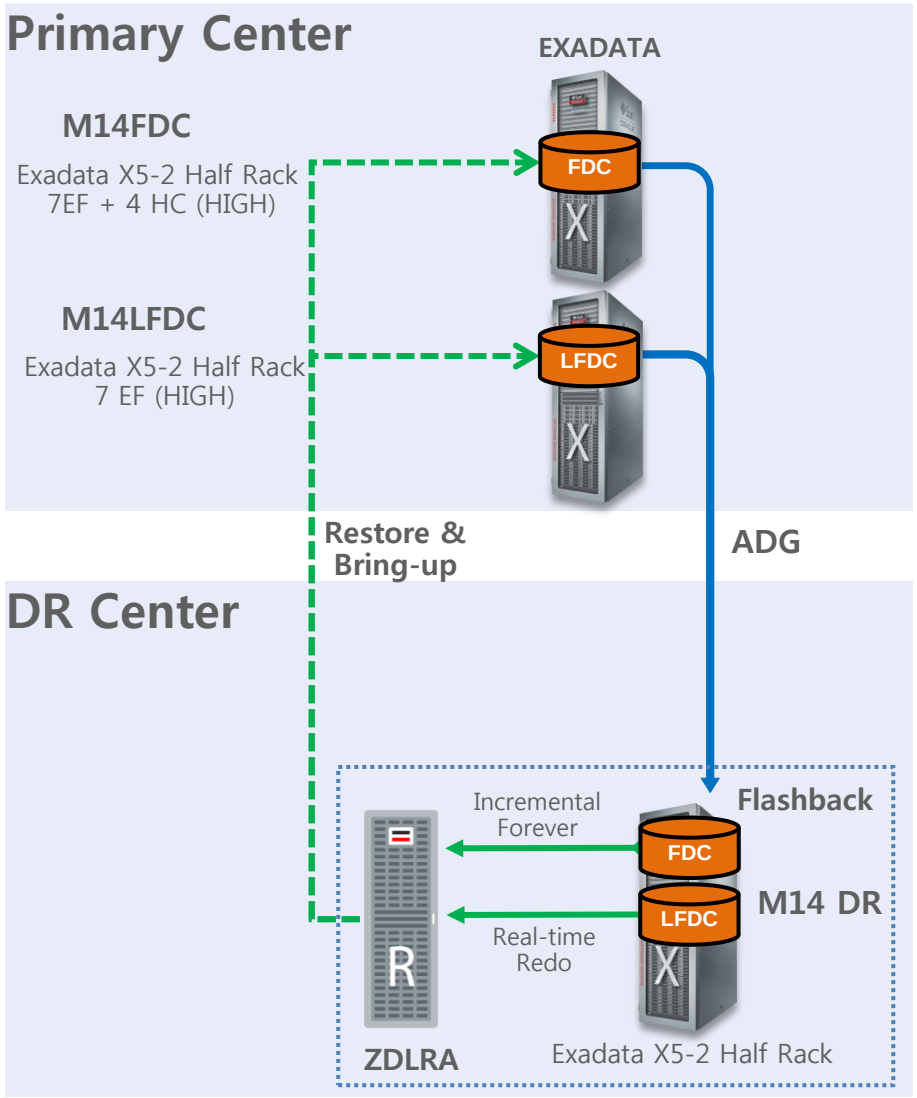
Legacy System

Main Issue

- Impacting on Real-Time Transaction
  - Consumes CPU on Database Server and I/Os on Storage Server
  - Exadata resource management (DBRM and IORM) limit the backup resource usages under 40%
- Backup Window and Performance Impact Increasing
  - Full backup time on initial Half Rack was 7 hours → After Expansion to Full Rack, backup took 13 hours
  - 3 Hours for Incremental Update Backup
- Incremental Backup Validation Issue
  - Needs periodic backup validation
  - Validate Backup using Snapshot Clone
- Backup Management and Monitoring Overhead
  - Manage RMAN Scripts for 40 systems
  - Manage Scheduling and Monitoring for 40 systems.

Benefits of Recovery Appliance

EXADATA DR System Architecture



- Eliminate Impact on Real-Time Transaction
  - Maximum Availability Architecture
  - Backup from Standby Database to minimize impact
  - Enable Flashback on Standby Database and Enable MAA parameters for comprehensive data protection
- Simple, Low Overhead and Consistent Performance
  - Only changed blocks are backed up → steady backup performance
  - Multiple Databases are covered by One ZDLRA
  - Guaranteed Restore Rate
- Incremental Forever Strategy and Validation
  - Backup window is very small consistently
  - Backup Validation is performed periodically
- Management Benefits
  - Easy backup environment configuration using Enterprise Manager
  - Archivelog Auto Backup
  - Do not need any backup configuration after Fail-Over
  - Intelligent Backup Space Estimation

Can Reduce RTO under 1 Hour!

Recovery Scenario (RTO < 1 Hour)

Target	Incident Type	Recovery Target					
		ZDLRA		DR Flashback		Failover	
		Recovery Time Actual	Priority	Recovery Time Actual	Priority	Recovery Time Actual	Priority
SPFILE	LOSS	< 10 min	1				2
CONTROLFILE	LOSS	< 10 min	1				2
BLOCK	Corruption	< 10 min	1				2
REDO LOG	Current Redo Loss						1
	Active/Inactive Redo Loss	< 10 min	1				2
TABLE/PARTITION	TABLE Loss	< 30 min	1	< 15 min	2		3
	PARTITON Loss	< 30 min	1	< 15 min	2	< 30 min	3
DATAFILE	Specific Datafile Loss	< 15 min	1				2
TABLESPACE	Specific Tablespace Loss	< 30 min	1				2
	System Tablespace Loss	< 30 min	1				2
	Undo Tablespace Loss	< 30 min	1				2
DATABASE	Fresh DB Creation + TPITR [1)]	< 60 min	1				2
SITE FAILURE	Site Failure						1

[1)] Among 40 TB, Recent 7 days of data should be recovered first for service open. Rest of data will be recovered after service open

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