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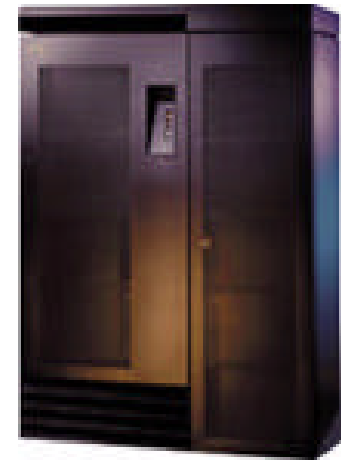
Z21



The world depends on

Ultra High Performance/Availability using IMS, Parallel Sysplex, and the Enterprise Storage Server

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Laboratory
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Agenda



- **IMS V7 highlights**
- **IMS V8 announcement**
- **IMS ESS/FICON evaluation**
- **IMS High Volume Transaction Processing**





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IMS Runs the World...



■ Most Corporate Data is Managed by IMS

- Over 90% of Fortune 1000 Companies use IMS
- IMS Manages over 15 Billion GBs of Production Data
- \$2 Trillion/day transferred thru IMS by one customer

■ Over 50 Billion Transactions a Day run through IMS

- IMS Serves Close to 200 Million Users a Day
- Over 79 Million IMS Trans/Day Handled by One Customer on a Single Production Sysplex, 30 Million Trans/Day on a single CEC
- 120M IMS Trans/day, 7M per hour handled by one customer
- 6000 Trans/sec across TCP/IP to a single IMS
- 11,700 Trans/sec (Over 1 Billion/day) with 4-way IMS Data/Queue sharing on a single CEC Parallel Sysplex
- 3000 days without an outage at one large customer

■ Ninth Largest Revenue Producing "Software Company"

"A still large and loyal IMS installed base due to the rock solid reputation of a transactional power horse for very large workloads. IMS is already successfully proven in large, web-based applications."

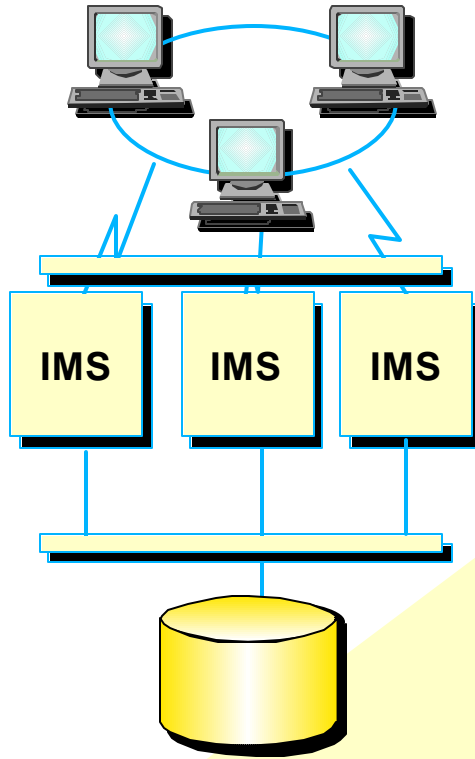
- Gartner Group report





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IMS - Version 7



Ideal for e-business

- ✓ Continuous Availability
- ✓ Systems Management
- ✓ Performance/Capacity
- ✓ Connectivity

the world depends on it

Enhancements

- Extended Large DB support
- Enhanced DB recovery
- Faster Restart with Multinode Persistent Sessions
- Enhanced Systems Mgmt Tools
- Enhanced Connectivity
- IMS Java

Benefits

- ✓ Enable Customer Growth
- ✓ Enhance Workload Balancing
- ✓ Increase Availability; Ease of Use
- ✓ Preserve Current Application Investment
- ✓ Enable New Applications

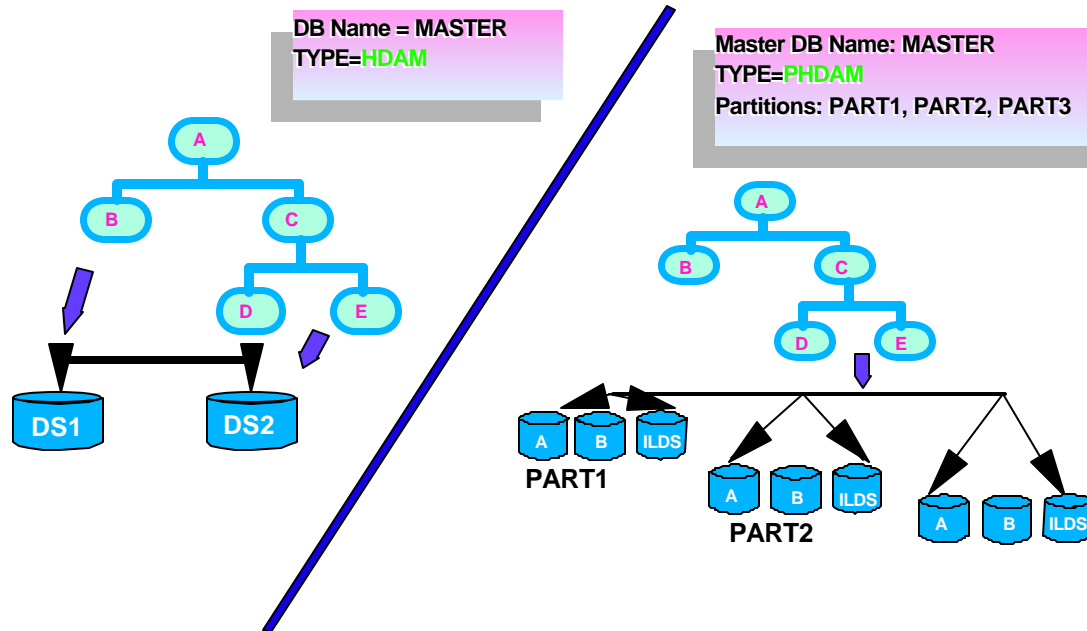
**Strategic Open Access
S/390 Enterprise Server**





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IMS v7 / High Availability Large DB Support for IMPROVED CAPACITY & DATA AVAILABILITY



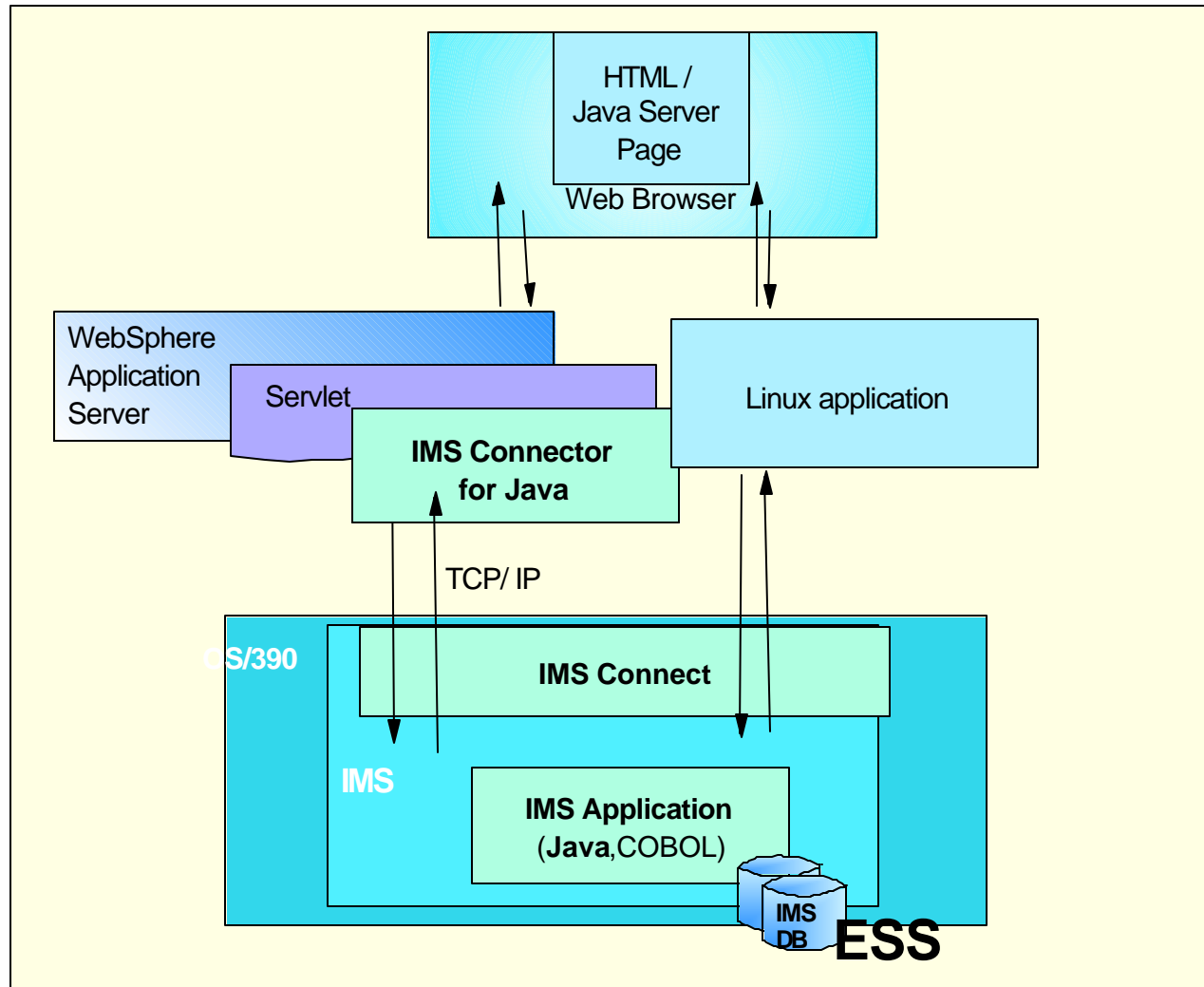
- ✓ Extends IMS Full Function database size
 - 1001 Partitions x 10 data set groups x 4G = 40 Terabytes
- ✓ Provides data availability through partition independence
- ✓ Provides easier manageability with smaller partitions of the database





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Accessing IMS from Java and Linux/390 Applications or Servlets through to ESS





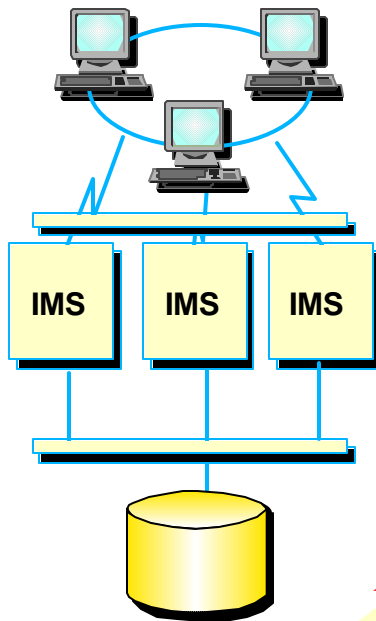
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Announcing IMS Version 8 General Availability October 25, 2002



Ideal for e-business

- ✓ Continuous Availability
- ✓ Systems Management
- ✓ Performance/Capacity
- ✓ Application Development/Connectivity



Enhancements

- Coordinated IMS/DB2 Recovery
- Coordinate Online Change
- Sysplex Terminal Management
- Sysplex-wide Resource Mgmt
- Sysplex-wide Operations with Single Point of Control
- Enhanced DB Recovery Ctrl
- Simplified Installation Process
- Enh Systems/Data Mgmt Tools
- Enhanced Java and XML

Benefits

- ✓ Enable Customer Growth
- ✓ Enhance Workload Balancing
- ✓ Increase Availability; Ease of Use
- ✓ Preserve Current Application Investment
- ✓ Enable New Applications

Strategic Open Access
S/390 and z/OS
Enterprise Server





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IMS V8 - QPP Began 03/01/2002



- Information **"Integration"** with New Application Development/Connectivity
 - ✓ Support of Persistent Reuseable JVM for improved tooling
 - ✓ Support for latest JAVA and SQL Standards
 - ✓ Integration with Websphere
 - ✓ Enhanced XML Support of Messages
- **Manageability**
 - ✓ Management View across Sysplex
 - Single Point Of Control (SPOC)
 - DB2 Control Center Integration
 - ✓ Enhanced Recovery
 - ✓ Sysplex Terminal Options
- **Scalability** in Performance/Capacity/Availability/Recovery
 - ✓ Increasing FastPath Area from 240 to 2048
 - ✓ Handling unpredictable volumes
 - ✓ Continuous up time for applications and user access





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XML and IMS for Transparent Application Integration



■ Processing XML Documents in New IMS Applications Today

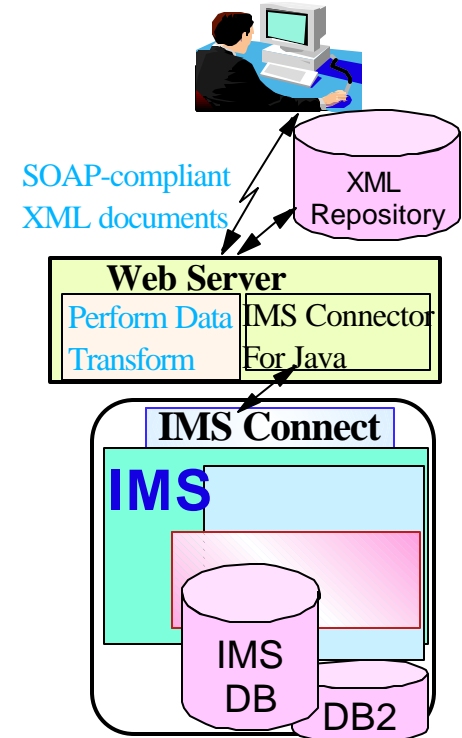
- Customers can write IMS C++ or IMS Java applications using the XML Toolkit for OS/390
- Customers can write IMS Cobol or PL/I application using XML support for COBOL and PL/I
 - Tran code still must be EBCDIC, rest of data can be XML
 - The IMS program can invoke XML parser to convert to non-tagged data

■ Bridging XML and Existing IMS Applications Today

- Using MQSeries Integrator
 - Dictionary support for messages
 - Routing and processing based on message content
 - US Utility built cost-effective e-business infrastructure to IMS
- Customers can enable existing IMS applications as Web Services via WAS

■ XML and IMS Requirements

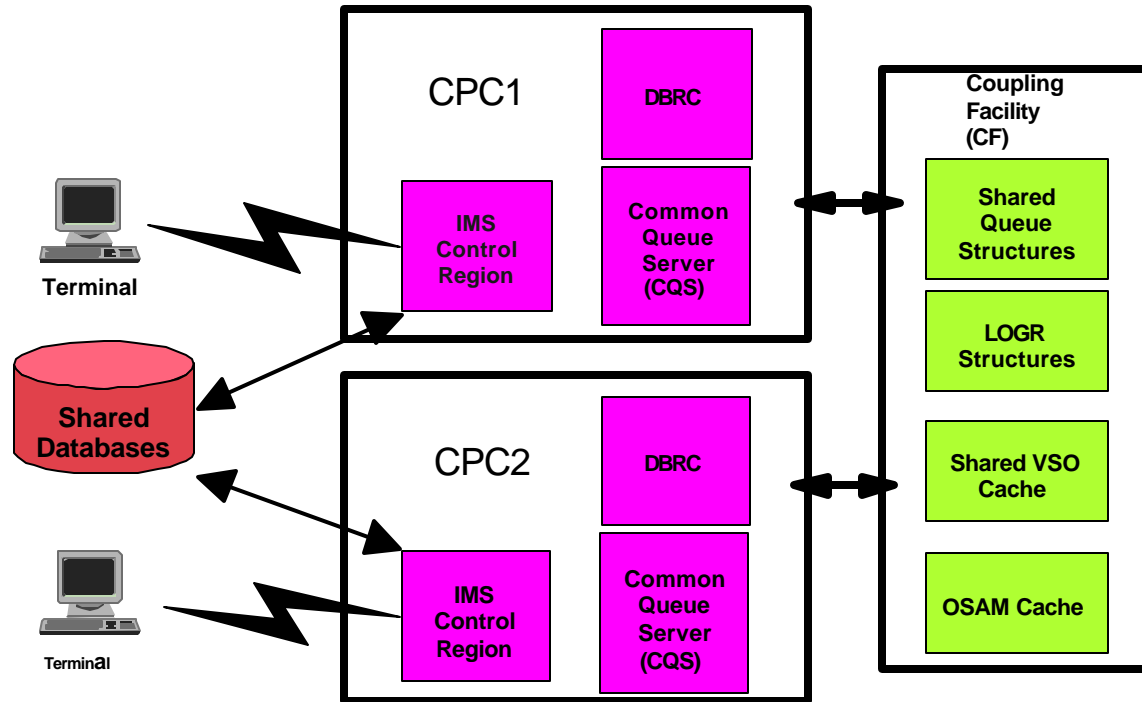
- Generate XML doc for outputs from new COBOL and PL/I applications
- Enable MFS-based IMS application programs as web services
- Transform XML for existing IMS applications using IMS Connect
- Using XML as an IMS Data Definition language





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IMS Sysplex Requirements



SYSTEMS MANAGEMENT REQUIREMENTS

- PRESENT A SINGLE SYSTEM IMAGE AND PROVIDE EASE OF USE THROUGH A SINGLE POINT OF CONTROL ACROSS THE SYSPLEX
- USERS NEED TO BE ABLE TO RESUME STATUS ON ANOTHER IMS IN IMSPLEX
- COORDINATE/MANAGE ONLINE CHANGE ACROSS THE IMSPLEX





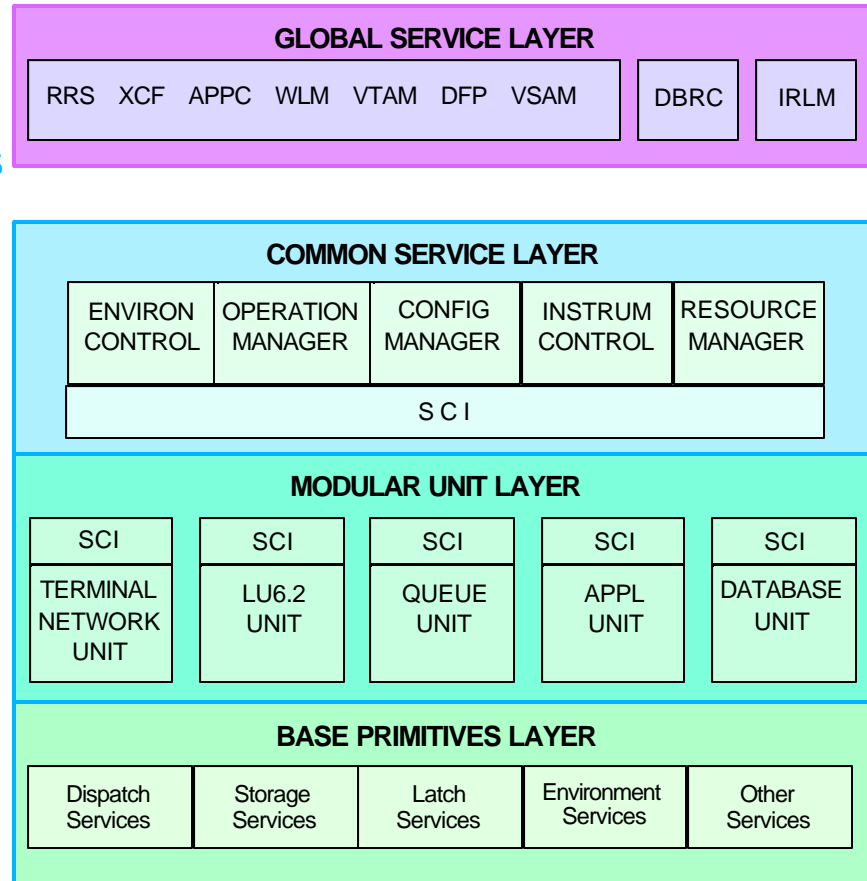
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Strategic IMS Architecture



Goals:

- Restructure IMS components into independent units
- Provide scalability by allowing multiples of units (mix and match different multiples of DB/TM mgrs)
- Fully exploit parallel sysplex environment



(BPE in V5, CQS in V6, ... and SCI in V8 ties it all together)





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IMS Directions



Continuous Improvement

IBM delivers at web speed...

IMS Goals

- Unlimited Growth
- 100% Accessible
- 100% Available
- GEN-Less System
- Dynamic Install
- Latest Technology

IMS V8 Enhancements

- Extend DB Connectivity
- Enhance Sysplex Operations
- Enhance Availability/Recovery
- Increase Capacity
- Simplify Install Process
- Enhance Management Tools

IMS Today

- High Availability Large DB
- Rapid Restart
- Enhanced DB Recovery
- Enhanced Connectivity
- IMS Java Applications

DB Transparent for Application Development

- Standardized Database calls
- Programming language flexibility

Easy management across the Sysplex

- coordinated change and expanded control





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IMS 64-bit Real Support



- ▶ OS/390 V2R10 or z/OS support 64-bit real addresses on z900
 - ▶ Addresses above the 31-bit address limit of 2 gigabytes are "above the bar"
 - ▶ IMS V8,V7, V6, and V5 are enabled for 64-bit
- ▶ OSAM supports real addresses above the 2GB bar
 - ▶ I/Os may be done with buffers above the bar
 - ▶ Database buffers may reside in real storage above the bar
 - ▶ Log buffers may reside in real storage above the bar
 - ▶ In previous releases of IMS, data in buffers which are above the bar must be moved below the bar before I/O is done
- ▶ Fast Path storage moved above the 2GB bar





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TotalStorage Enterprise Storage Server Model 800 (Silvertip) IMS Performance Evaluation

Leading Edge Technology to Maximize Business Value





IMS ESS DASD Evaluation



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- **OLDS Logging bandwidth**
 - ▶ high volume I/O

- **BMP**
 - ▶ sequential I/O

- **Database Utility runs**
 - ▶ random I/O

- **MSC WADS observations**
 - ▶ high volume WADS I/O

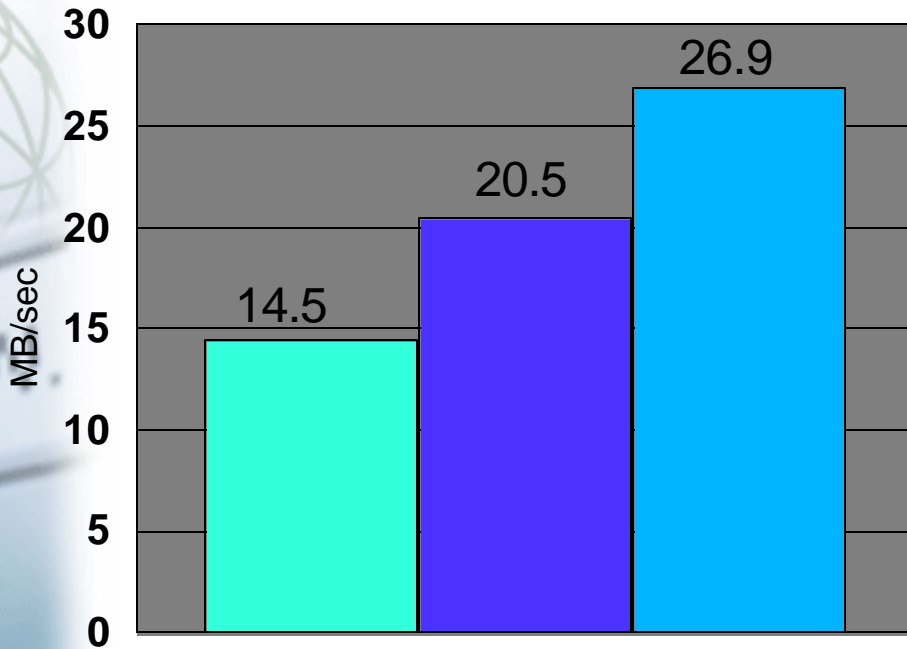




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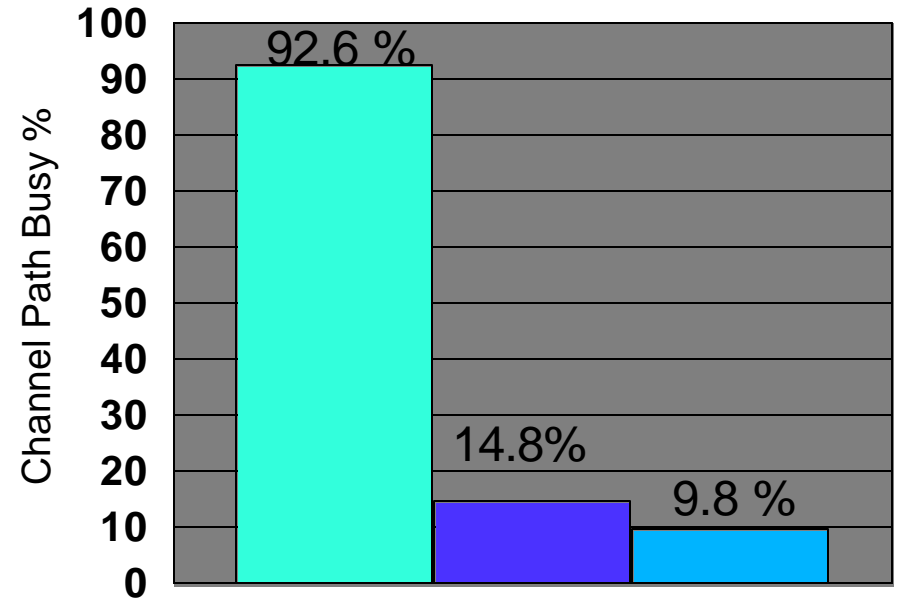
IMS OLDS Logging Bandwidth:

M800 FICON vs. F20 FICON vs. F20 ESCON



F20 ESCON vs F20 FICON vs M800 FICON

■ F20 ESCON
 ■ F20 FICON
 ■ M800 FICON



F20 ESCON vs F20 FICON vs M800 FICON

■ F20 ESCON
 ■ F20 FICON
 ■ M800 FICON

All 1 Channel Path



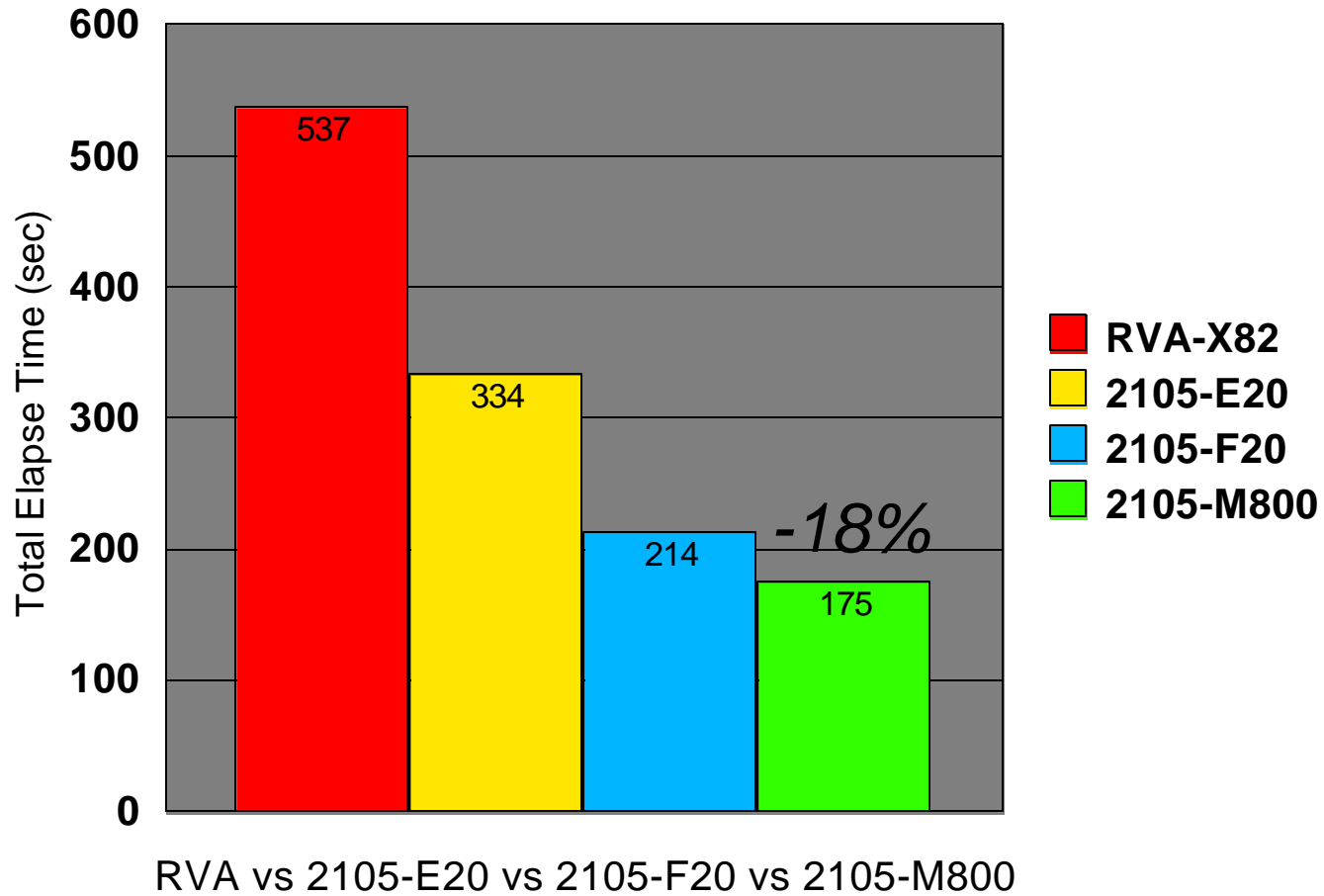


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IMS BMP Evaluation

BATCH WINDOW UTILITY BMP COMPARISON*

RVA-X82 vs 2105-E20 vs 2105-M800 vs 2105-F20



* End-of-day account reconciliation using account database with 362,405 roots

** RVA and E20 evals performed on 9672-ZZ7,
F20 and M800 evals performed on 2064-216





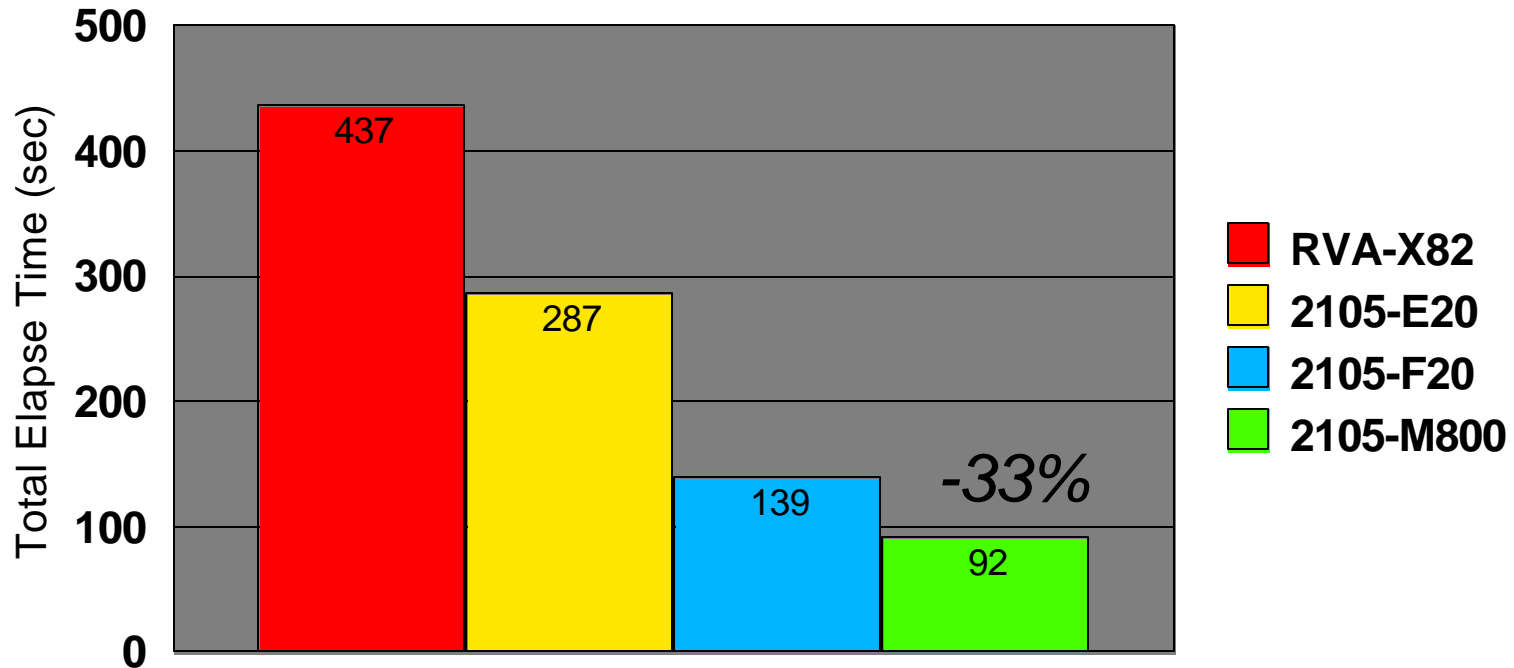
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IMS DBT DEDB Utility Evaluation

DEDB UNLOAD (FABCUR1+SORT) & DEDB RELOAD (FABCUR3) UTILITIES



RVA-X82 vs 2105-E20 vs 2105-M800 vs 2105-F20



RVA-X82 vs 2105-E20 vs 2105-F20 vs 2105-M800

E20 FABCUR1+SORT=102sec FABCUR3=185sec (287 sec)

F20 FABCUR1+SORT=33sec FABCUR3=106sec (139 sec)

M800 FABCUR1+SORT=22sec FABCUR3=70sec (92 sec)

* RVA and E20 evals performed on 9672-ZZ7,
F20 and M800 evals performed on 2064-216



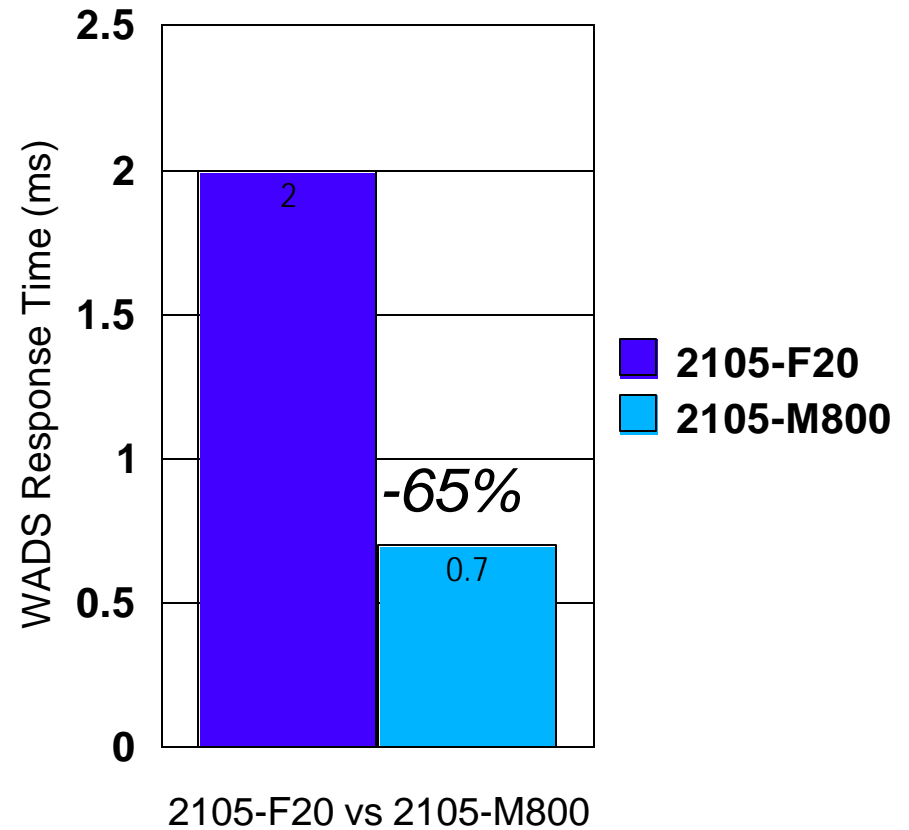
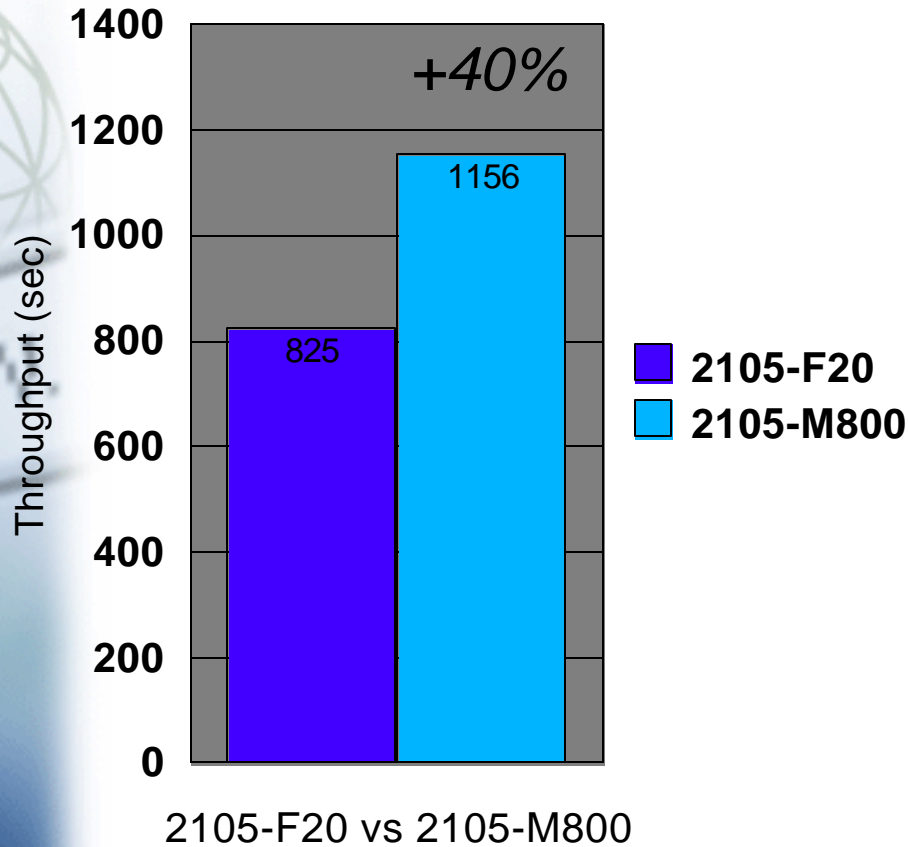


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IMS MSC via VTAM CTC Throughput Comparison

2105-M800 vs 2105-F20

100% Routing with 16 Logical Links



WADS on 1 Channel Path





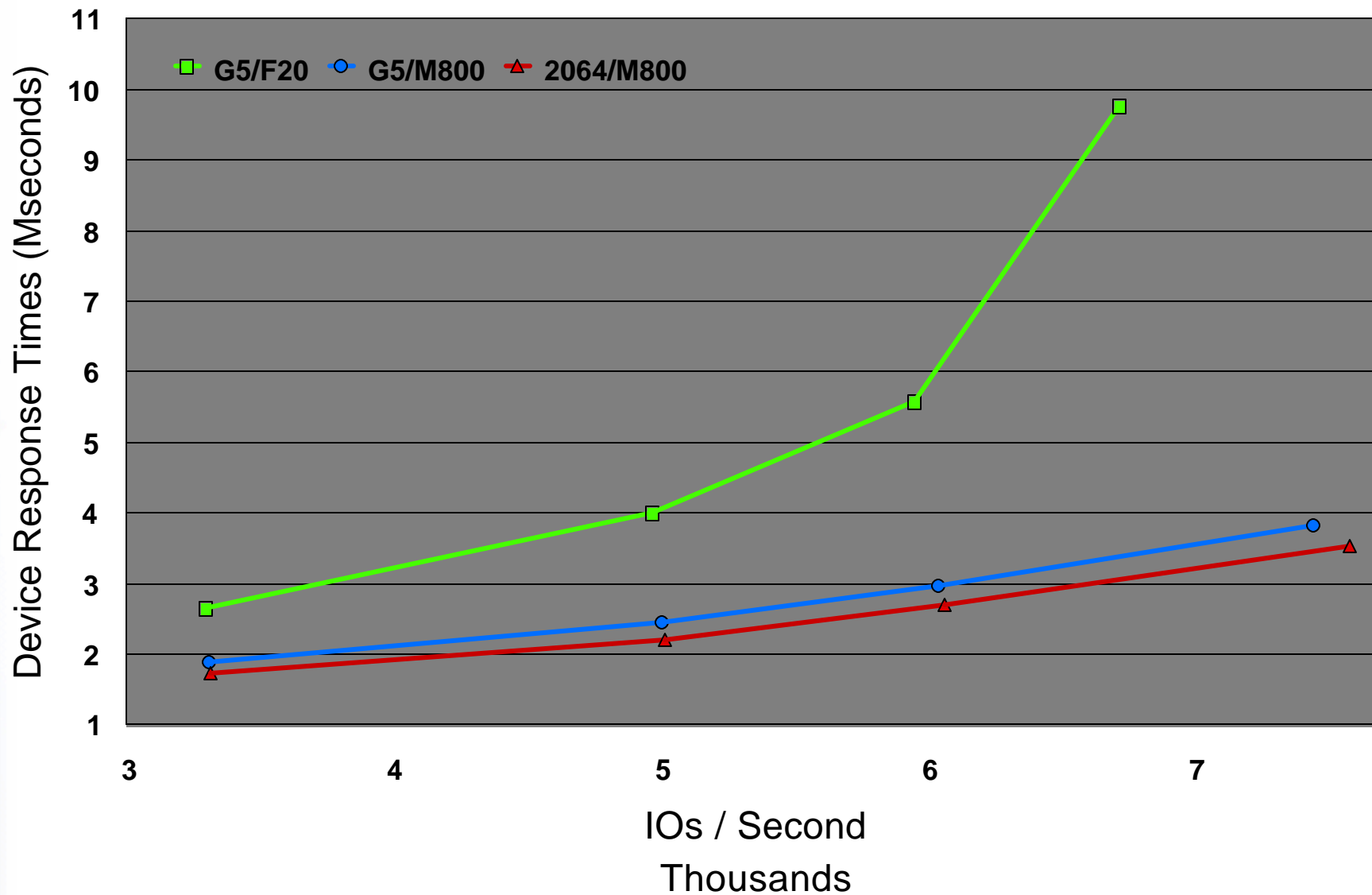
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Device Response Times Comparison

2105-M800 vs. 2105-F20 - IMS/DSW Measurements



ALL Volumes - 32 3390-3 DB + IMS System Volumes, R/W = 3.0
Total H/R = 0.92, Read H/R = 0.90 on 16GB cache





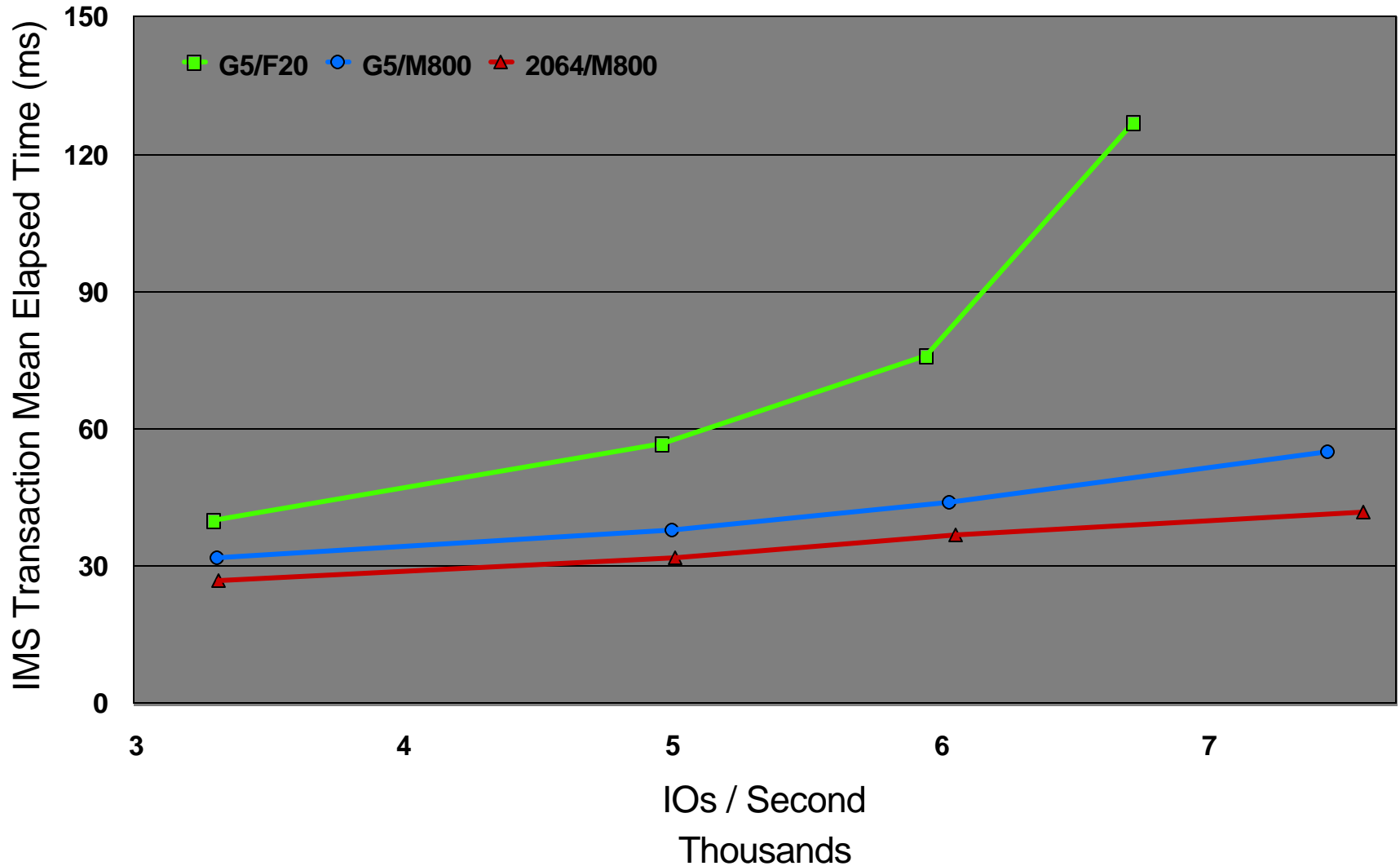
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IMS Transaction Mean Elapsed Time Comparison

2105-M800 vs. 2105-F20 - IMS/DSW Measurements



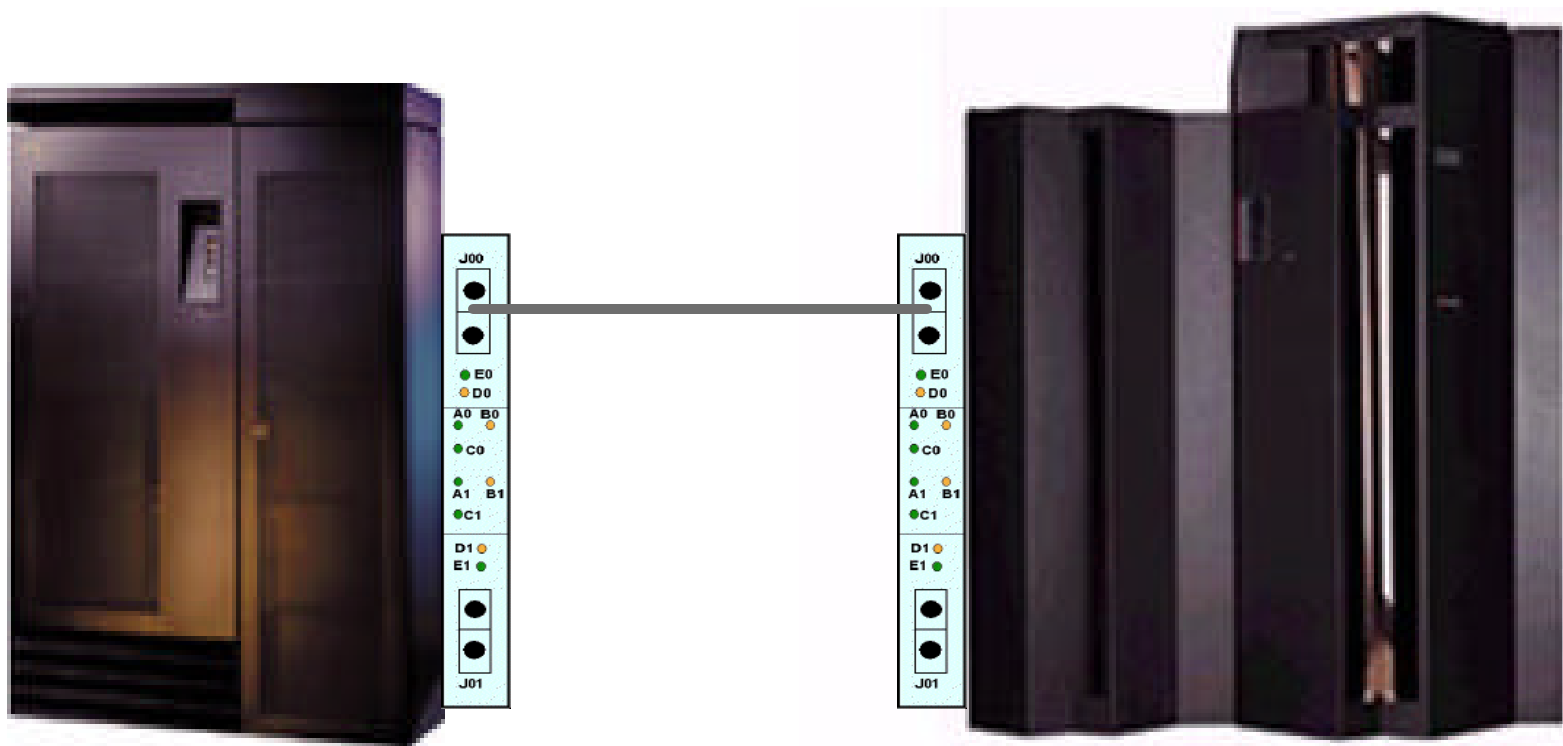
ALL Volumes - 32 3390-3 DB + IMS System Volumes, R/W = 3.0
Total H/R = 0.92, Read H/R = 0.90 on 16GB Cache





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ESS F20 with FICON- IMS studies





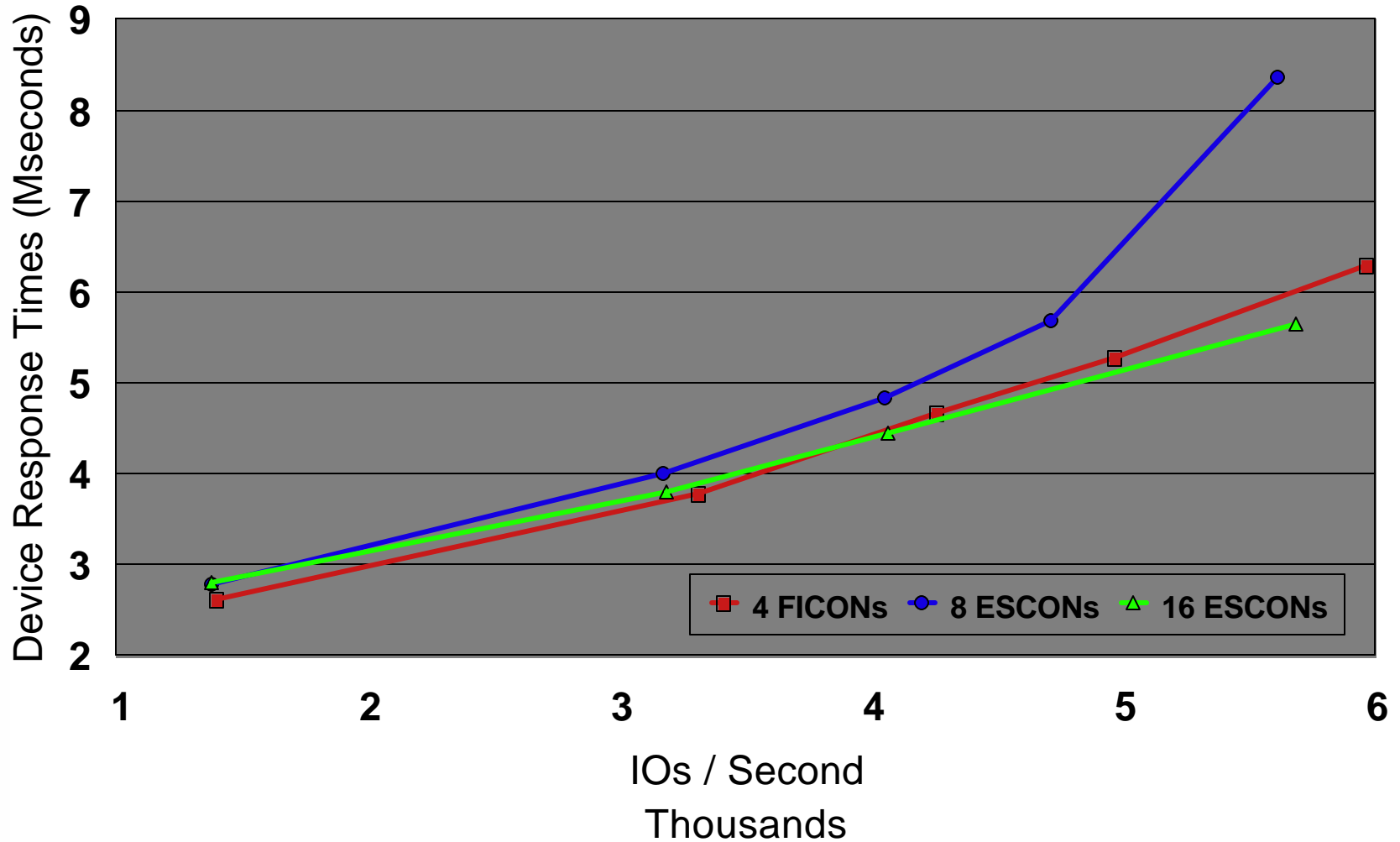
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ESS Native FICON Measurement

4 FICONs vs. 8 ESCONs vs. 16 ESCONs



IMS/DSW 32 DB + 4 IMS system volumes on 7 LCU's
R/W = 3:1, Tot/H = 91%, Read/H = 88%





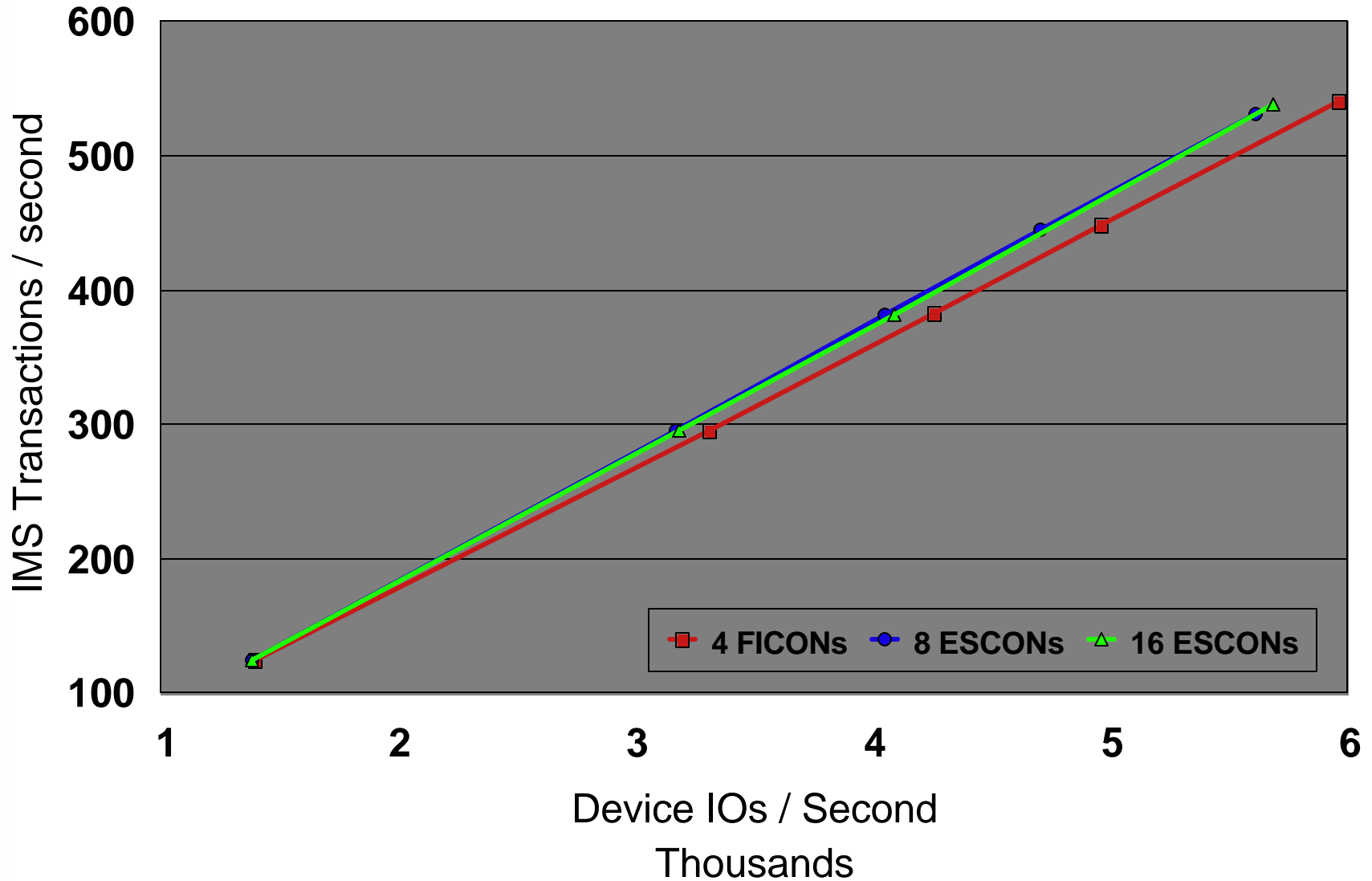
ESS Native FICON Measurement

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ESS Native FICON Measurement

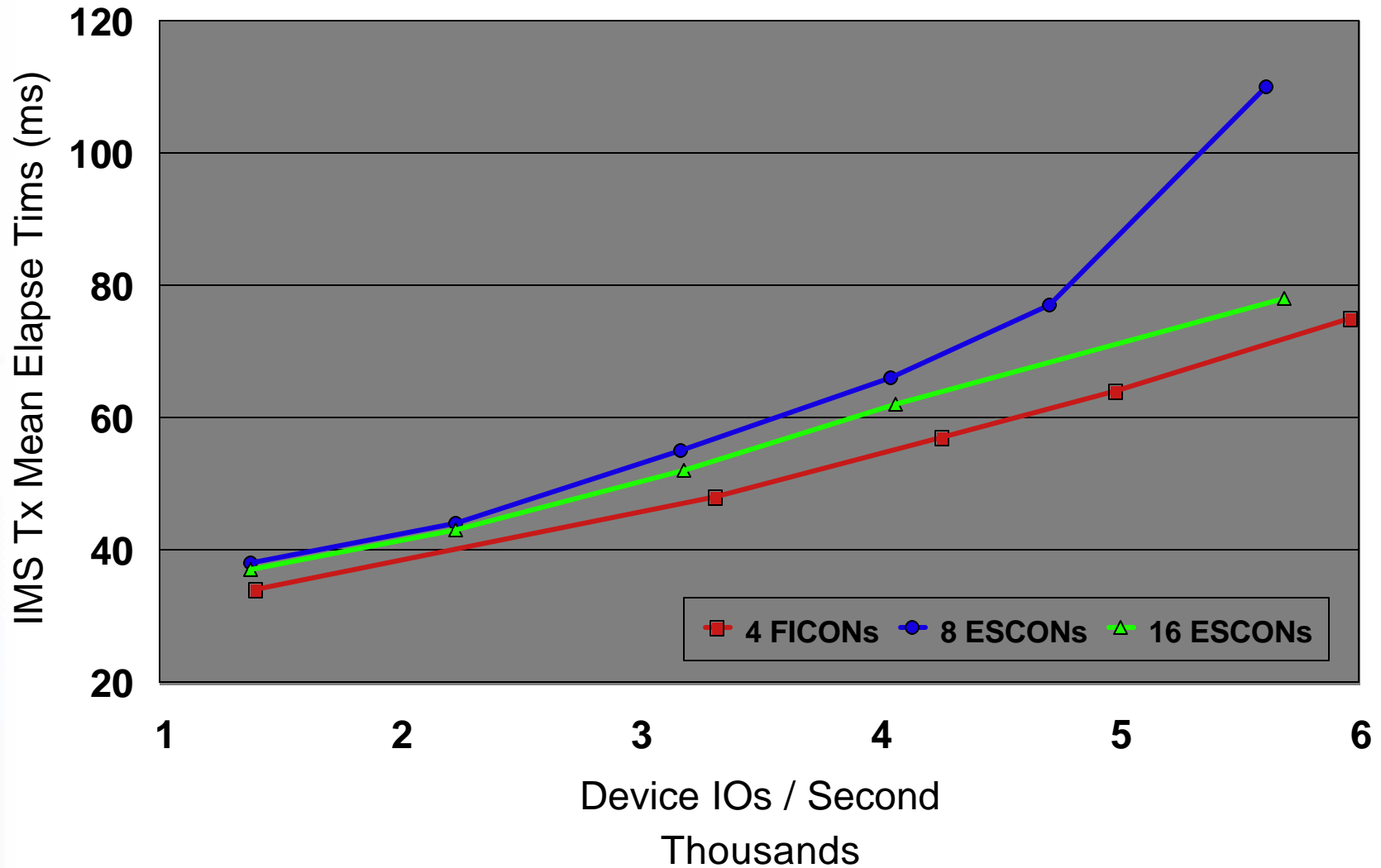
4 FICONs vs. 8 ESCONs vs. 16 ESCONs



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IMS/DSW 32 DB + 4 IMS system volumes on 7 LCU's

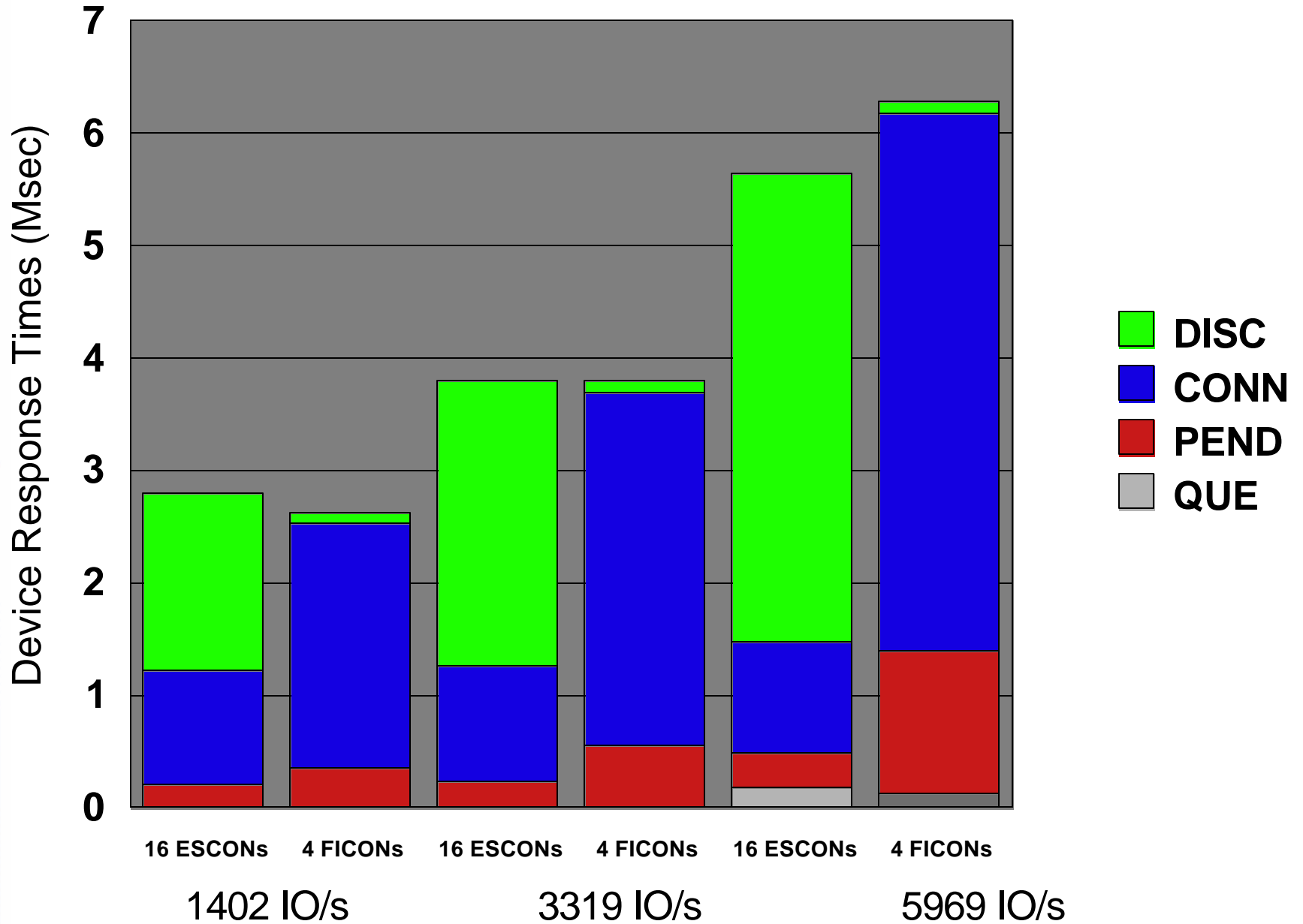
R/W = 3:1, Tot/H = 91%, Read/H = 88%





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ESS F20 with Native FICON, 4 FICONs vs. 16 ESCONs
IMS/DSW 32 DB + 4 IMS System Volumes on 7 LCUs
R/W = 3:1, Tot/H = 90%, Read/H = 88%

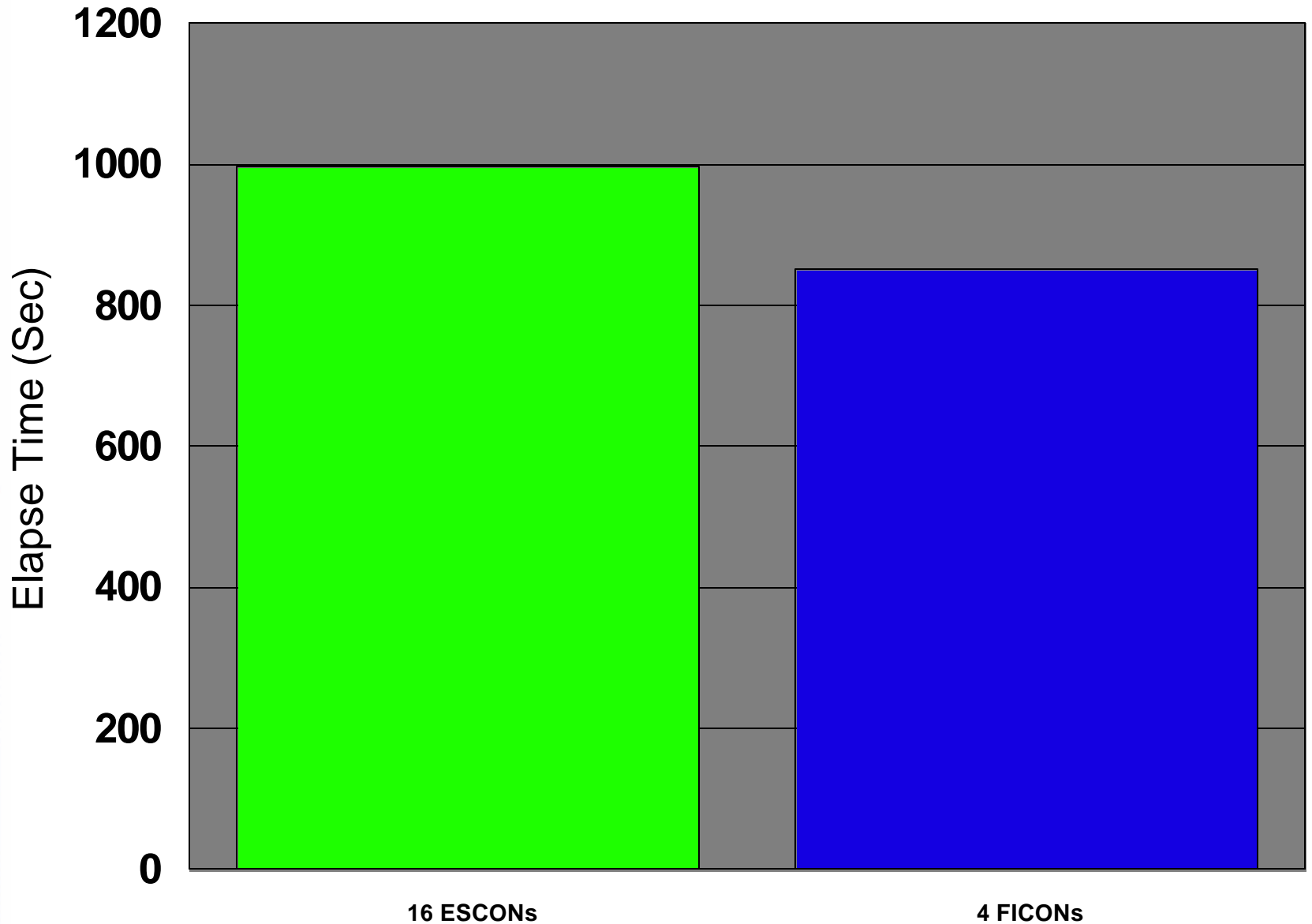




ESS F20 with Native FICON (4 FICONs) vs. 16 ESCONs IMS/DSW DB Restore Jobs (IDCAM import)



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IMS DB Restore (IDCAM Import) Jobs from 12 vols (1 LCU) to 32 DB volumes (4 LCUs)





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IMS High Volume Transaction Benchmark - Fast Path



**Ultra High Performance/Availability using
IMS Fast Path, Data Sharing, Shared Queues
and the Enterprise Storage Server in a
Parallel Sysplex**





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Workload



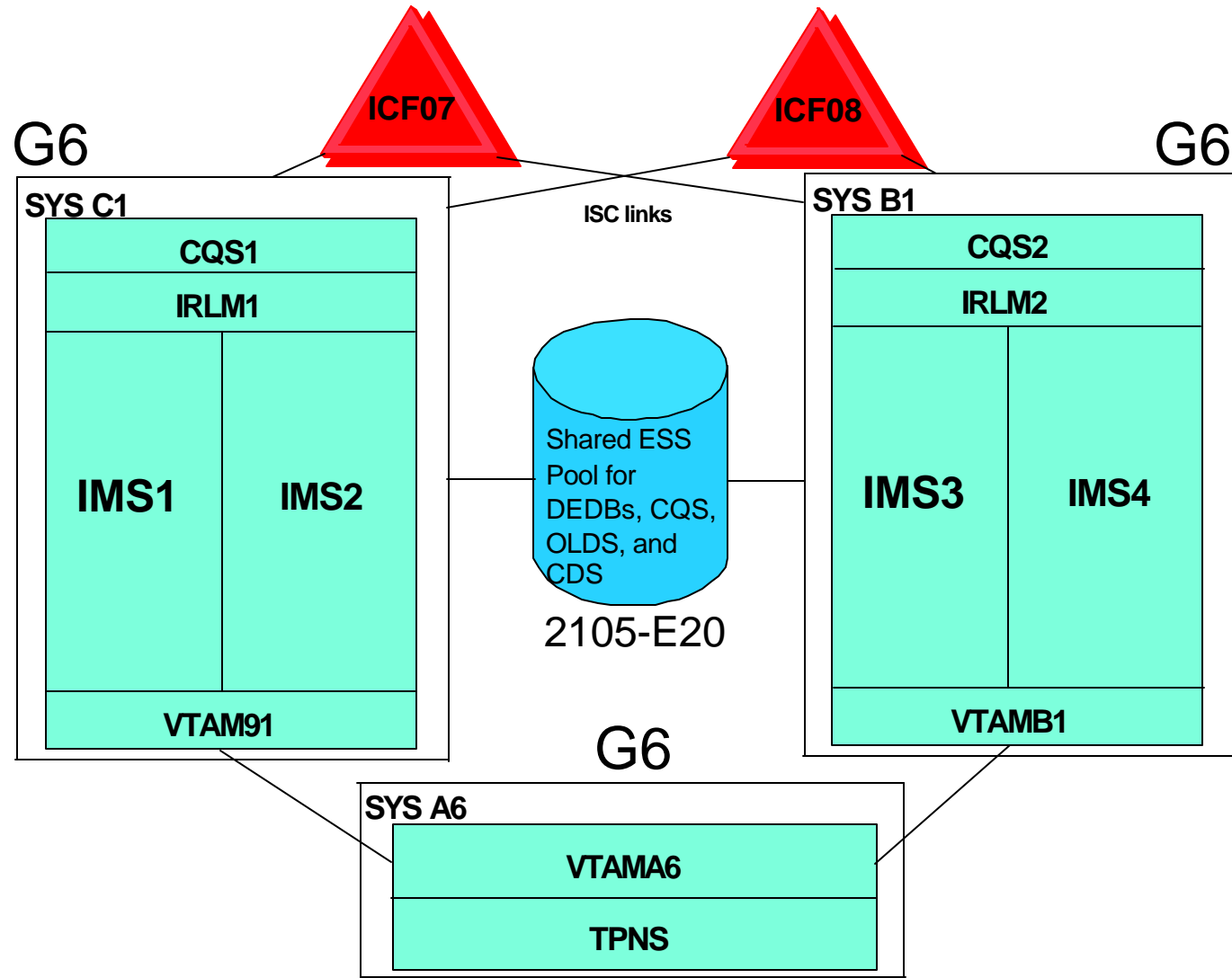
- **Fast Path Credit Card Debit/Credit service**
- **4 DEDB databases**
 - ▶ 2 Shared VSO areas
 - ▶ Account database - 86 Areas
- **Average/Minumum transaction database call profile:**
 - ▶ 1 GHU
 - ▶ 1 Update
 - FLD
 - ISRT
 - REPL
- **Maximum transaction database call profile:**
 - ▶ 2 GHU
 - ▶ 2 REPL
 - ▶ 1 ISRT
- **Average transaction TP call profile:**
 - ▶ 1 GU
 - ▶ 1 ISRT





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IMS V7 Parallel Sysplex Environment





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IMS 7.1 with ESS in the Parallel Sysplex



■ Hardware -

- ▶ 2 9672-ZZ7 processors
- ▶ ESS 2105-E20
 - ESCON channels
 - 7 PAVs per volume
 - 3300 cylinders per volume

■ Software -

- ▶ OS/390 2.8
- ▶ IMS 7.1
- ▶ IRLM 2.1
- ▶ TPNS 3.4

■ Result -

- ▶ **11,246 transactions per second !**



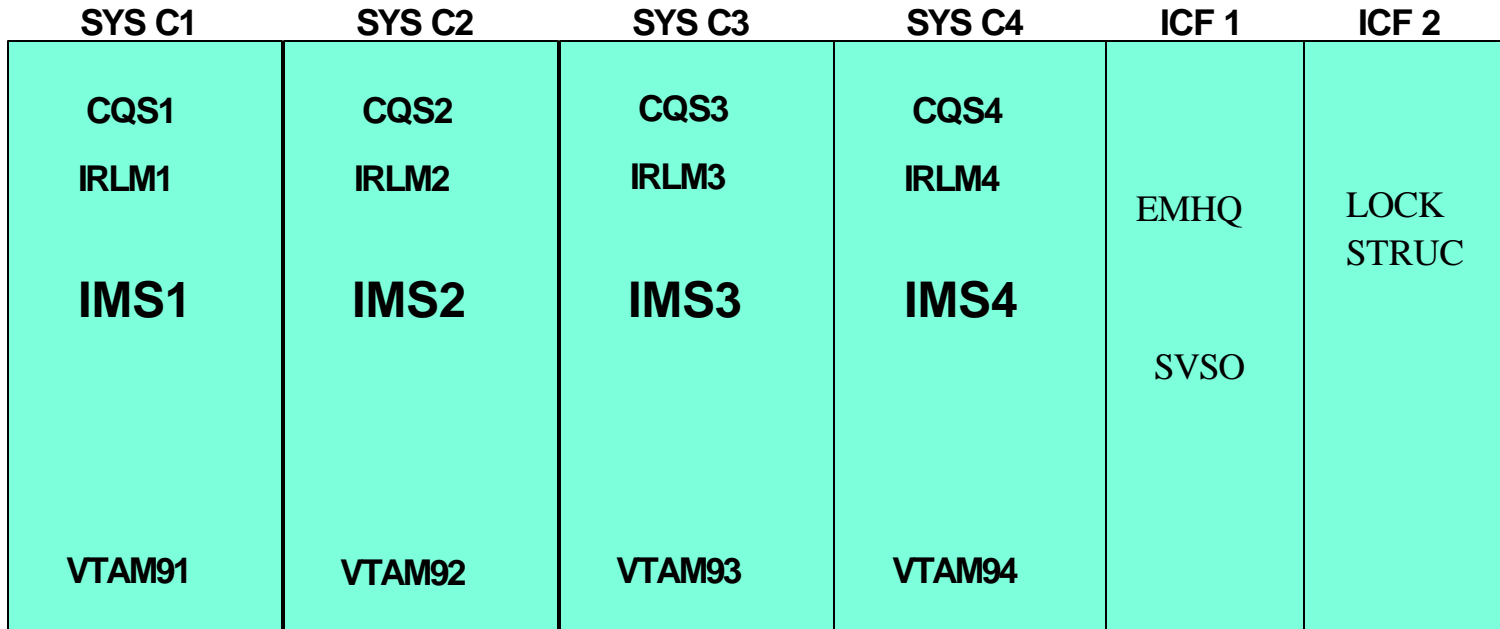


IMS V8 Parallel Sysplex Environment

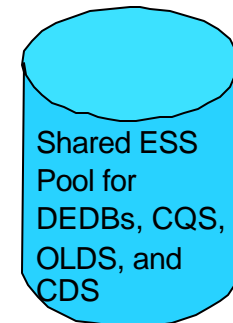
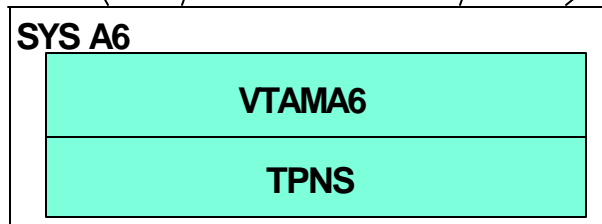


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2064-216



G6



2105-M800





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IMS 8.1 with ESS in the Parallel Sysplex



■ Hardware -

- ▶ 1 2064-216 processor
- ▶ ESS 2105-M800
 - native FICON
 - 7 PAVs per volume
 - 30,000 cyls per volume

■ Software -

- ▶ z/OS 1.2 (archlvl=2)
- ▶ IMS 8.1
- ▶ IRLM 2.1
- ▶ TPNS 3.4

■ Result -

- ▶ **11,784 transactions per second !**





Account DEDB results



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■ I/O response time

- ▶ V7 overall average response time: 2.5 millisecc
- ▶ V8 overall average response time: <1 millisecc

■ IOSQ time

- ▶ V7 - none
- ▶ V8 - none

■ DeviceBusy delay

- ▶ V7 - average less than .01 millisecc
 - (only 8 of 89 areas reported 0.1 millisecc db delay)
- ▶ V8 - none

*V7 using E20 & 9672-ZZ7, V8 using M800 & 2064-216





IMS OLDS results



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- **10 OLDS per IMS**
- **2500 cylinders per OLDS**
 - ▶ **I/O response time**
 - V7 - overall average response time: 3 millisec
 - V8 - overall average response time: 1.2 millisec
 - ▶ **IOSQ time**
 - V7 - none
 - V8 - none
 - ▶ **DeviceBusy delay**
 - V7 - none
 - V8 - none

*V7 using E20 & 9672-ZZ7, V8 using M800 & 2064-216





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Results Overall



- **Tran rate -**
 - ▶ V7 - 11,246 per second
 - ▶ V8 - 11,784 per second (1,018,137,600 per day)
- **Total DASD I/O rate -**
 - ▶ V7 - 13,733 I/Os per sec
 - ▶ V7 - average response time - 3 ms
 - ▶ V8 - 12,960 I/Os per sec
 - ▶ V8 - average response time - 1 ms
- **Total CF utilization -**
 - ▶ V7 - 61.3% of 4 cps
 - ▶ V8 - 52.3% of 4 cps
- **Total CPU utilization -**
 - ▶ V7 - 93.3% of 20 cps
 - ▶ V8 - 95.4% of 12 cps

*V7 using E20 & 9672-ZZ7, V8 using M800 & 2064-216





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Where does ESS fit with IMS?





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IMS in a non-sysplex environment



- RECON datasets - PAV candidate
- WADS datasets
- OLDS datasets - FICON candidates
- IMS database datasets - PAV candidates
- IMS Trace and Monitor datasets
- QBLKS dataset
- Message queue datasets
- RACF database - PAV candidate





IMS in a sysplex environment



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- RECON datasets - PAV candidate
- WADS datasets
- OLDS datasets - FICON candidates
- IMS database datasets - PAV candidates, especially for datasharing
- IMS Trace and Monitor datasets
- QBLKS dataset
- Message queue datasets (unless using shared queues)
- RACF database - PAV candidate
- Couple datasets
- System logger datasets - FICON candidate
- CQS checkpoint and SRDS (if using shared queues)





Summary



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- **IMS V8 is the ideal transaction server**
 - ▶ higher availability
 - ▶ improved performance
 - ▶ increased capacity
- **ESS is the ideal storage server**
 - ▶ availability of data
 - ▶ improved performance
 - ▶ increased capacity
- **FICON takes IMS and storage performance to the next level**
 - ▶ increased bandwidth
 - ▶ improved I/O performance
 - ▶ reduced channel requirements
- **IMS V8, ESS, and FICON combine to increase business capacity and performance**
 - ▶ improved transaction rates
 - ▶ reduced response times
 - ▶ increased capacity





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