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VSE/ESA 2.6

Performance Considerations

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VSE/ESA Development

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Documentation

- VSE Homepage:
  http://www.ibm.com/servers/eserver/zseries/os/vse/
- VSE Performance Documents:
  http://www.ibm.com/servers/eserver/zseries/os/vse/library/vseperf.htm
  - 2 new Documents
    - VSE/ESA 2.6 Performance Considerations
    - TCP/IP for VSE/ESA 1.4 Performacne Considerations
  - Also availabe on the VSE CD-ROM

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Agenda

- VSE/ESA 2.6
  - Performance Items (Overview)
  - Virtual Tape Support
  - Hardware Support
  - e-business Enhancements
  - Limitations for VSE/ESA Growth
- VSE/ESA 2.7 Preview

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VSE/ESA 2.6 Performance Items

- VSE/ESA 2.6 Base enhancements
  - Delete Label Function
  - LTA Offload for some AR commands
  - SVA-24 Phases moved above the line
  - Increased max number of SDL entries
  - SDL update from non-BG partitions
  - VSAM Buffer Hashing (VSE/ESA 2.5)
  - POWER Data file extension without reformat

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VSE/ESA 2.6 Performance Items - continued

- VSE/ESA 2.6 Hardware Support
  - FICON Support (VSE/ESA 2.3 or higher)
  - New 2074 System Management Console
  - OSA Express Adapter (e.g. Gigabit Ethernet)
  - VSAM Support for large 3390-9 Disks
  - Fastcopy Exploitation of ESS FlashCopy and RVA SnapShot

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VSE/ESA 2.6 Performance Items - continued

- VSE/ESA 2.6 e-Business Enhancements
  - Updated Java-based connectors
  - VSAM SHROPT(4) avoidance for connectors
  - CICS TS ECI over TCP/IP
  - SSL for VSE/ESA exploitation
  - SSL enabled CICS Web Support
  - New VSAM Redirector
  - New JDBC Driver Layer for VSAM
  - More samples (JConVSE, VSEPrint, etc.)

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Delete Label Function

- New function DELLBL in LABEL macro
- Must be explicitly exploited
  - Important for vendors with disk/tape management products
- Benefits
  - Saves recursive reads (GETNXGL) and write backs (ADDLBL/ADDNXL)
  - Saves >90% of the SVCs for this activity
- More Info
  - VSE Label Area -Layout and Capacity Consideration, VSE/ESA Software Newsletter, 12/2000
  - http://www-1.ibm.com/servers/eserver/zseries/os/vse/pdf/vsenew21/vseflab.pdf

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LTA Offload and SVA-24

- LTA Offload for some AR commands
  - Phases $$BATTNC and $$BATTNG are merged into $$BATTNA
  - Code of $$BATTNB is merged into IJBAR
  - Benefits
    - Less I/O by less FETCHes for LTA load
      - IGNORE, PAUSE, LOG, NOLOG, NEWVOL, START, BATCH
    - No LTA usage for MSG commands
- SVA-24 Phases moved above the line
  - $IJBPRTY (6K)

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SDL Entries

- Increased max. number of SDL entries
  - New IPL SVA parameter: SDL=n
    - Maximum value now 32765
    - About 56 SDL entries per 4K page in shared space below
    - Theoretically would cost 2.28 MB
- SDL updates from non-BG partitions
  - SET SDL command can now be issued from any partition
  - Internal locking is done to assure correctness

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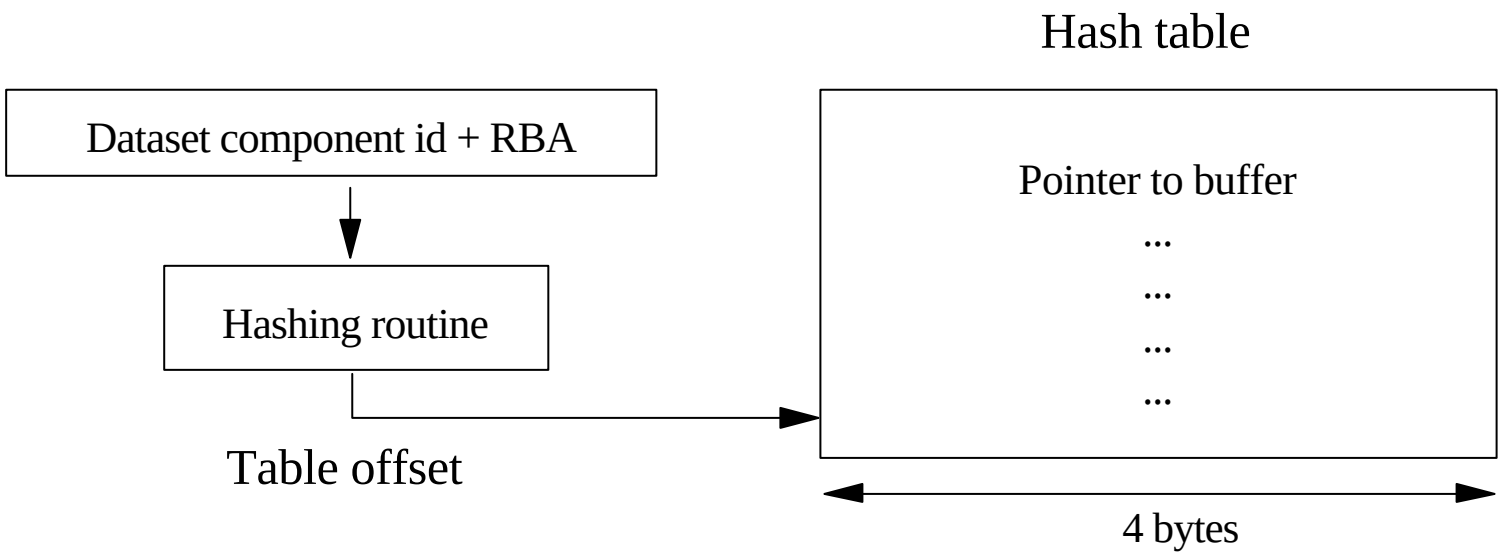
VSAM LSR Hashing (VSE/ESA 2.5)

- Fast access to buffer in LSR subpool via hashing
- Saves CPU cycles by eliminating long searches
- Any type of VSAM file (not only KSDS)
- Any type of LSR request
- One hash table per LSR subpool



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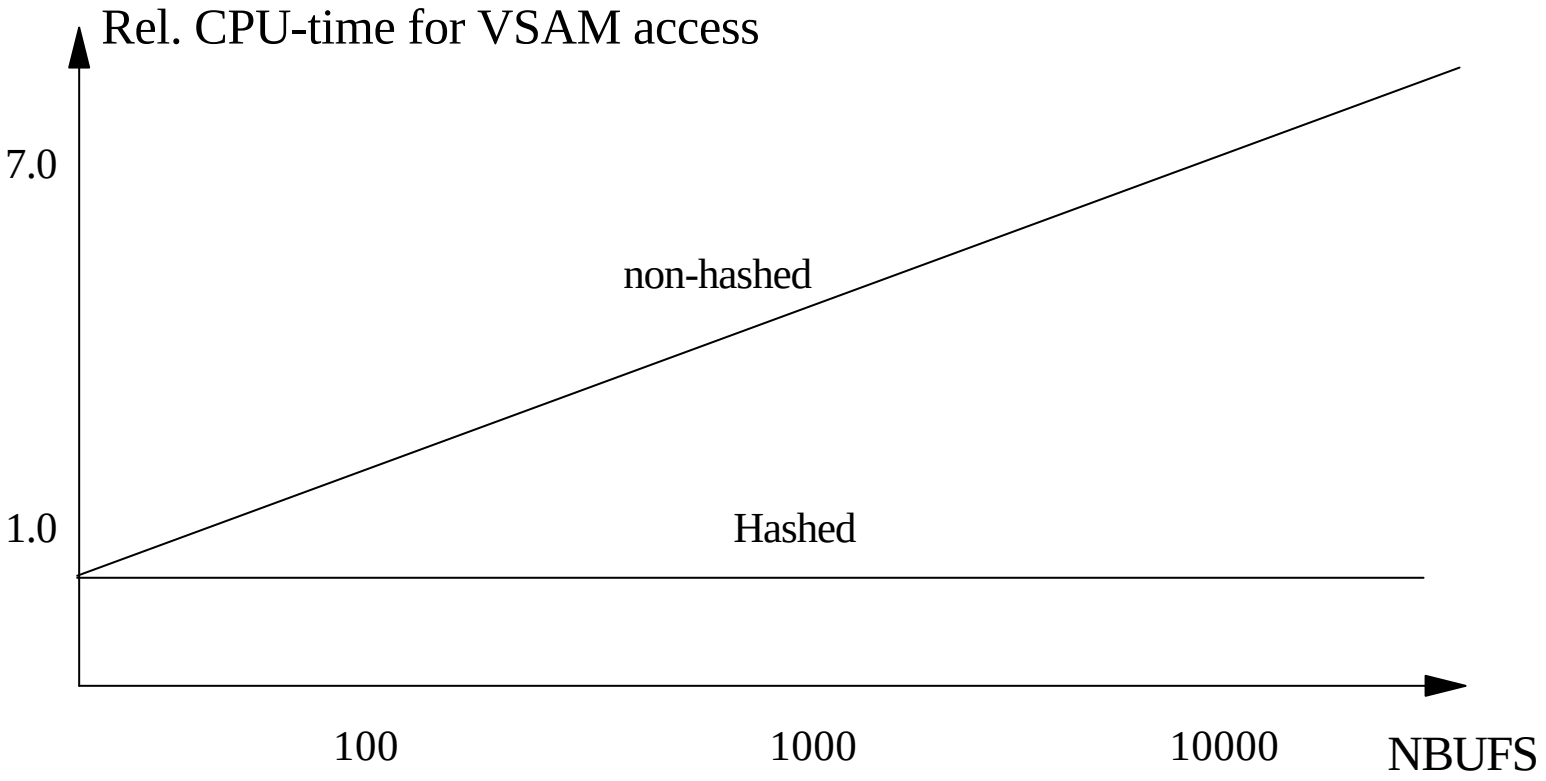
VSAM LSR Hashing - continued

- Performance test results (simplified)



VSAM CPU-time with hashing is independent of the number of buffers

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VSAM LSR Hashing - continued

- Potential Real-life benefits for applications
  - Applicability
    - All applications with VSAM LSR would benefit (mostly online transactions, but also batch)
  - Expected possible improvements
    - Online sample:
      - 80 % of your CICS transactions use LSR
      - Average of NBUFS is 200
      - About 25 % or your LSR transaction CPU time is VSAM
      - About 0.8x0.25 = 20 % of your CICS load is VSAM LSR
      - This VSAM LSR time can be reduced roughly by factor of 3
      - Roughly 10 % lower CICS CPU time per transaction

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Hardware Support

- New 2074 System Management Console
  - ESCON channel attached
  - Eliminates requirement for a non-SNA 3174 controller
- OSA Express Adapter Support (QDIO)
  - Available for G5 and above

	Gigabit Ethernet	Fast Ethernet 100 Mbps	ATM-LE 155 Mbps	Tokenring 4/16/100 Mbps
CHIPID TYPE=OSE (non-QDIO)	no	yes	yes	yes
CHPID TYPE=OSD (QDIO)	yes	yes	yes	yes

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Hardware Support

- Queued Direct I/O
  - Designed for very efficient exchange of data
  - Uses the QDIO Hardware Facility, without traditional S/390 I/O instructions
  - Without interrupts (in general)
  - Use of internal queues
  - With pre-defined buffers in memory for asynchronous use
- Exploitation by TCP/IP for VSE/ESA
- Measurements see TCP/IP presentation

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Virtual Tape Support

- Allows access to tape images residing in
  - A VSAM file (ESDS)
  - A remote file on a workstation or server
- Tape image is AWSTAPE format
  - Known from P/390, R/390 or FLEX/ES
- New VTAPE command
- Virtual Tape Simulator
  - Simulates channel program execution
- Virtual Tape Data Handler
  - Runs in a partition

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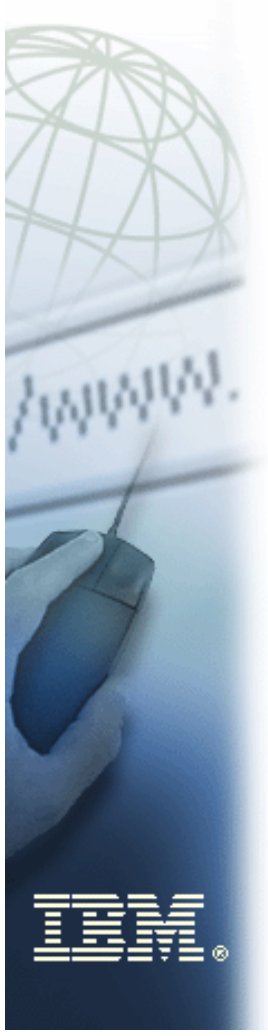

Virtual Tape Support - continued

- Virtual Tape Server
  - Runs on a workstation or server (Java)
  - Allows to access a tape image remotely
  - Communicates via TCP/IP with Virtual Tape Data Handler
- Designed to allow e-Delivery and e-Service (future)
  - Download a tape image containing a product
  - Obtain a CD/DVD containing the tape image
  - Install the product via Virtual Tape directly from the workstation
- Also possible
  - Backup to a Virtual Tape + copy to CD
  - Restore directly from CD via Virtual Tape

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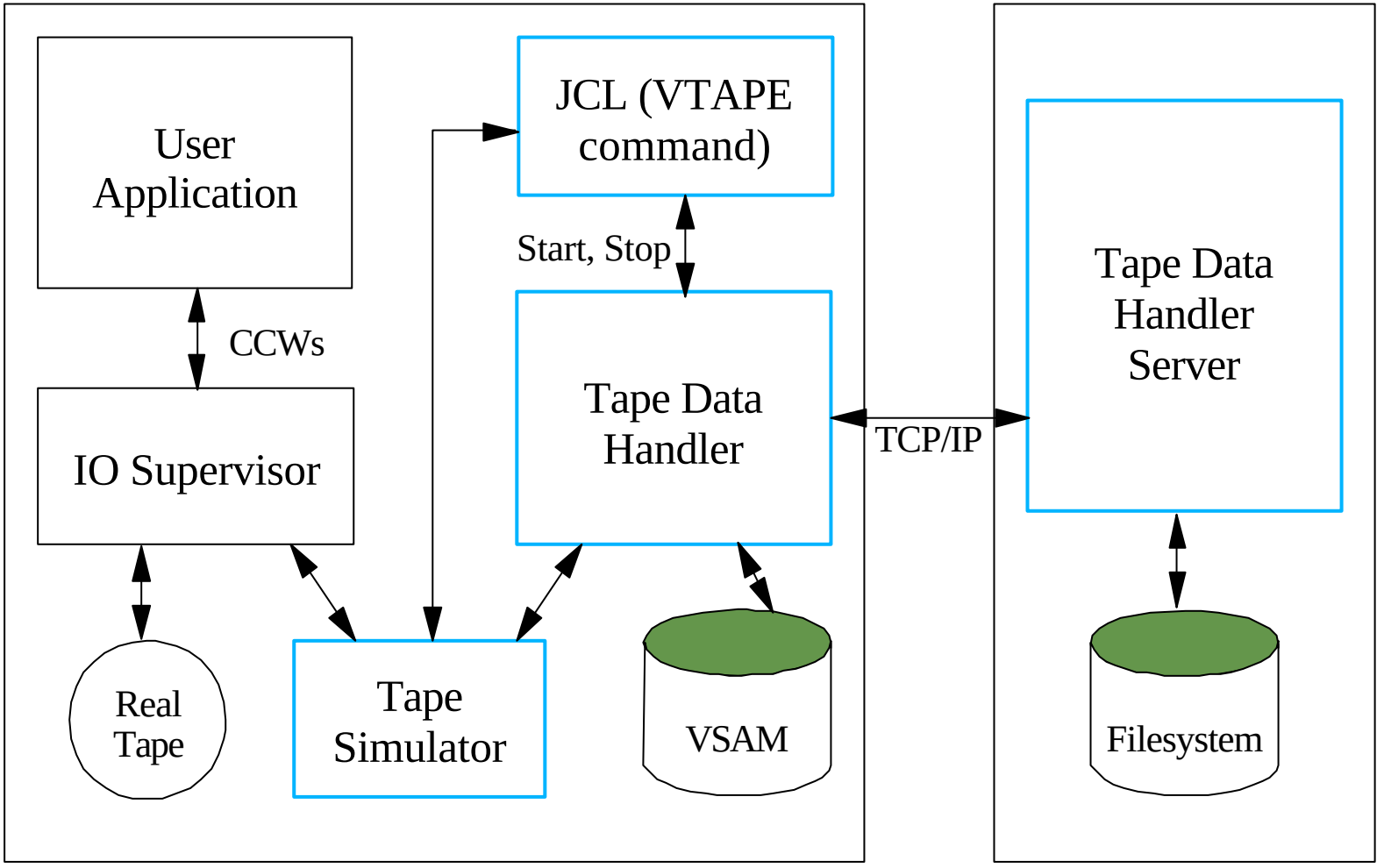
Virtual Tape Support - continued



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Updated Java-based Connector

- The Java-based connector has been updated to support the Java 2 platform (JDK 1.3)
- Introduced JDBC layer for VSAM access
  - Allows to issue SQL statements
- Adaptations for WebSphere 4.0
  - Enhanced connection pooling by support of JCA (Java Connector Architecture)
  - Connectors can be deployed as Resource Adapter and as (JDBC-) Data Source
- SSL enabled connections possible
  - Transparent use of secured connections

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VSAM Share Options with Connectors

- SHROPT(4) Backgrounds
  - Using connectors to UPDATE a VSAM file already opened for output (e.g. by CICS) needs SHROPT(4)
  - SHROPT(4) has big overhead
- Performance implications
  - Bigger pathlength for processing of UPDATE requests due to VSAM internal locking
  - Each READ must be done from disk
  - Each WRITE must go to disk
  - Additional catalog I/Os for statistics
  - Influence on any application, not only connectors

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VSAM SHROPT(4) Avoidance

- Connectors in VSE/ESA 2.5 require SHROPT(4) when updating VSAM files owned by CICS
- New VSAM-via-CICS Service avoids SHROPT(4) by routing the VSAM requests to CICS
- Communication between batch and CICS is XPCC
- New transactions related to VSAM-via-CICS:

Transaction	Program	Description
ICVA	IESCVSTA	starts the service
ICVP	IESCVSTP	stops the service
ICVS	IESCVSRV	internal server task
ICVM	IESCVMIR	internal mirror task
none	IESCVSTI	internal start program

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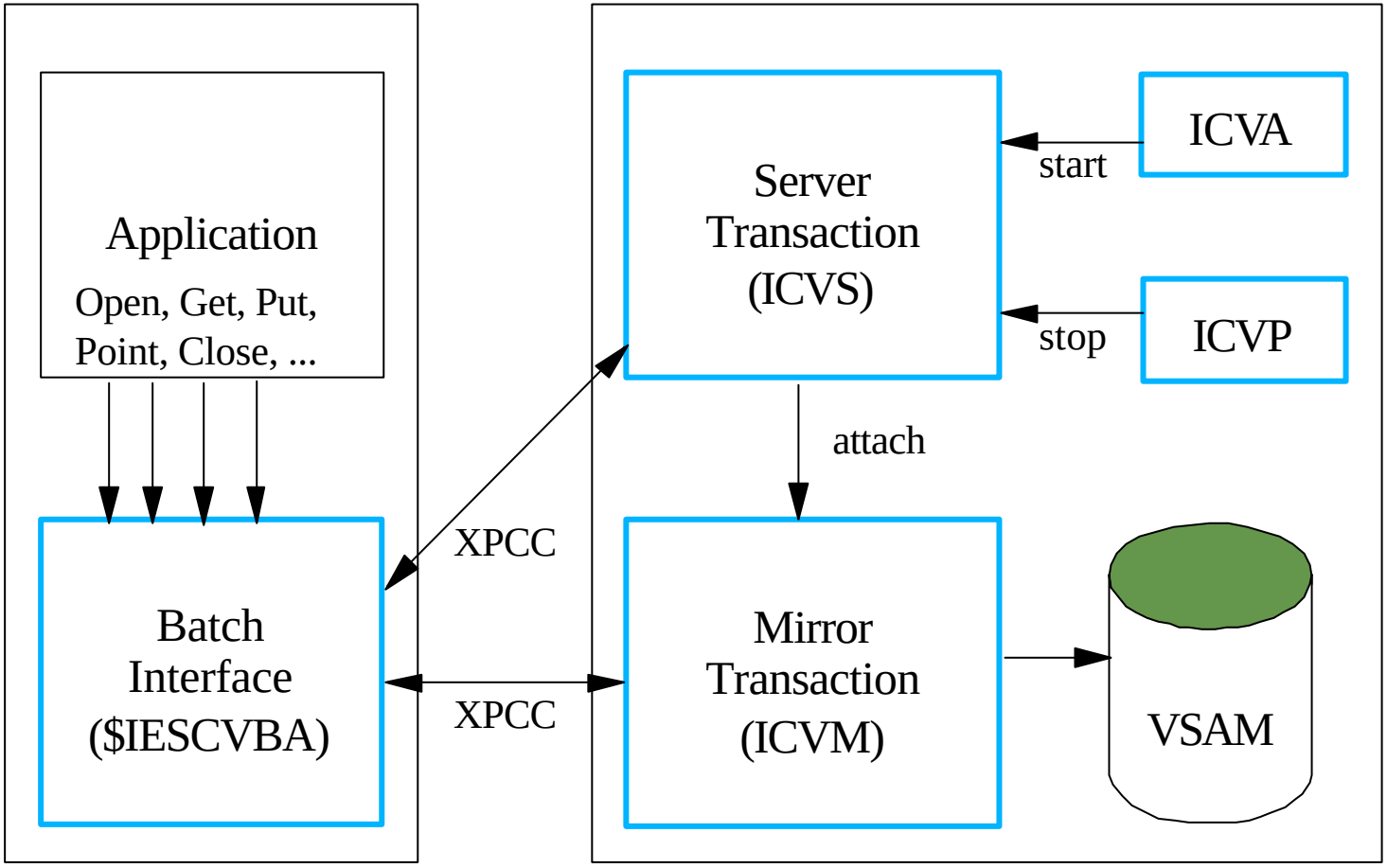
VSAM-via-CICS Service



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VSAM-via-CICS Service - continued

- How VSAM-via-CICS works
  - Long running server transaction ICVS
  - Attaches a mirror transaction ICVM on request
  - Mirror transaction is attached for
    - "Open" from batch
    - Browse files from batch
  - Mirror transaction ends at "close" from batch
  - Service can run in multiple CICSes at the same time
  - Batch counterpart is implemented in phase $IESCVBA

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VSAM-via-CICS Service - continued

- Naming convention for "VSAM-via-CICS files"
  - Each CICS is treated as "virtual" catalog
  - Files defined in CICS (via CEDA DEFINE FILE) are visible within this catalog
  - "Virtual" catalog file id

#VSAM.#CICS.<applid>

indicates "virtual" CICS catalog

APPLID of CICS region owning the files within this catalog

  - "Virtual" cluster file id is the 7 character name known in CICS

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VSAM-via-CICS Service - continued

- Example
  - Assume there is a CICS region DBDCCICS
  - CICS knows a file named MYFILE
  - Real VSAM files MY.VSAM.TEST.FILE resides in catalog MY.USER.CATALOG
  - "Batch only" name would be
    - Catalog: MY.USER.CATALOG
    - Cluster: MY.VSAM.TEST.FILE
  - "VSAM-via-CICS" name would be
    - Catalog: #VSAM.#CICS.DBDCCICS
    - Cluster: MYFILE

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VSAM-via-CICS Service - continued

- VSAM-via-CICS files can only be accessed from the following applications
  - Java-based connector via VSE Java Beans
  - DB2-based connector via VSAM CLI (SQL)
  - REXX new VSAMIO function
- IDCAMS does NOT show these files
- "virtual" names can NOT be specified in DLBLs
- no changes made in VSAM for this support
- no influence on "normal" VSAM processing
- But: Maps can be defined for a "virtual" file
  - via Java-Based connectors
  - via IDCAMS RECMAP function

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VSAM Redirector

- New connector
  - VSE is client
  - PC / workstation is server
- Exploits VSAM exit IKQVEX01
- Allows to redirect one of more VSAM files to a PC or workstation
- All VSAM requests of a particular file are redirected
  - Open / close
  - Get / put / point / delete / insert
- Transparent for applications
  - Usable from batch and CICS

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VSAM Redirector - continued

- Owner of data can be
  - VSAM
    - Requests are forwarded to workstation
    - VSAM still owns the data
    - VSAM executes the requests
    - Used for data replication/syncronisation
  - PC / workstations
    - VSAM does not execute the requests
    - Handler on workstation 'simulates' VSAM logic
    - A VSAM file with at least one dummy record is required (for open processing)

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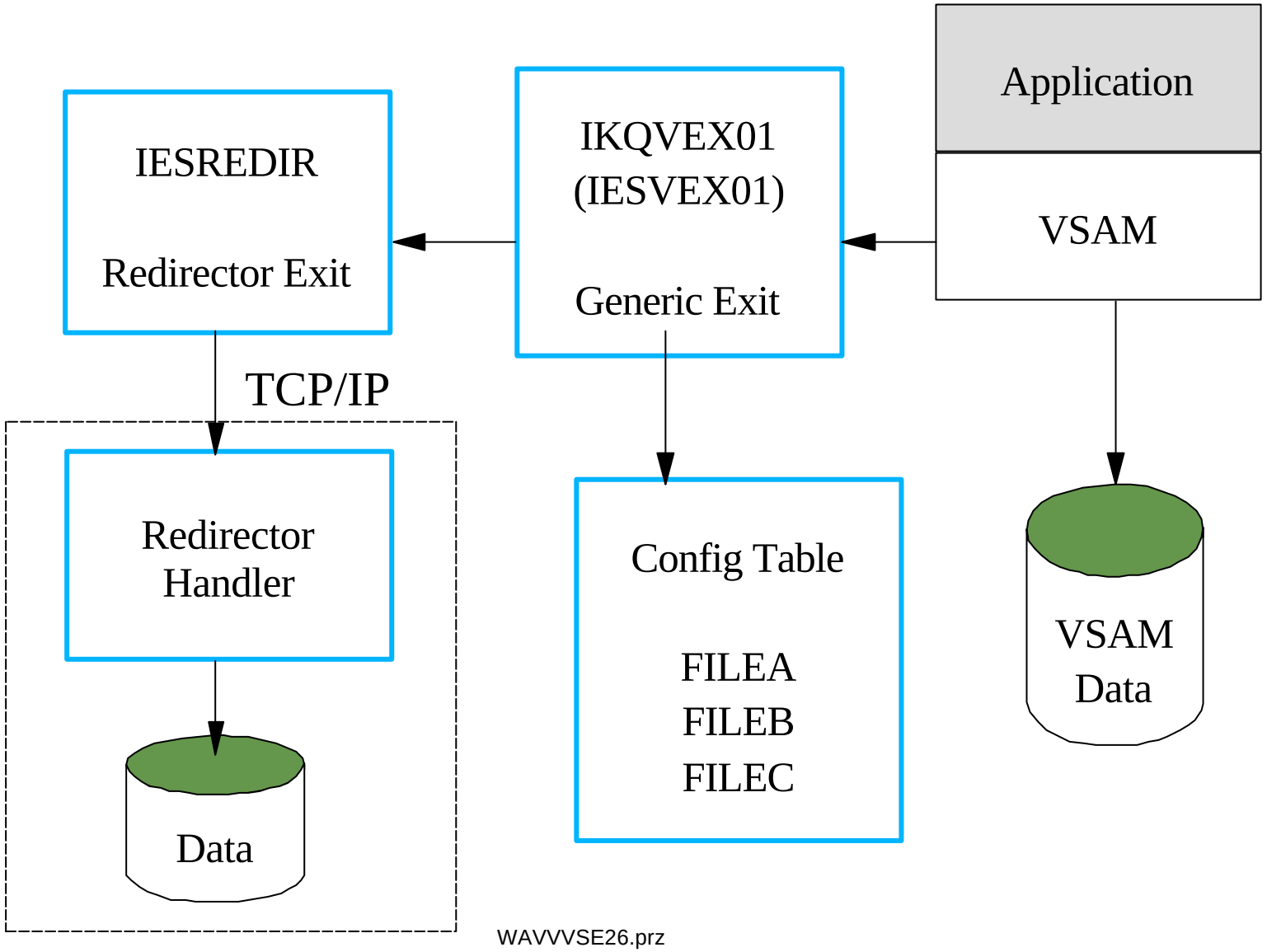
VSAM Redirector - continued



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VSAM Redirector - continued

- Decision if a file is redirected or not is
  - Done at open time
  - Based on the config table (PHASE)
    - Catalog id and file id
  - Only a very small (open-)overhead for non-redirected files
  - No overhead for get/put/... if not redirected
- Generic Exit can also call a 'Vendor' exit instead of Redirector exit
  - Defined in the config table
  - Based on catalog id and file id

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VSAM Redirector - Performance Implications

- Is the file redirected ?
  - No: only at OPEN time (very small overhead)
  - Yes: at each request
- Network overhead ?
  - Yes, if file is redirected
  - Depends on
    - Number of VSAM requests
    - Size of records
- Data ownership
  - OWNER=REDIR
    - no VSAM I/O

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CICS TS Enhancements

- CICS Web Support
  - new: SSL enabled (https)
- External Call Interface (ECI) over TCP/IP
  - Call a CICS program from a workstation
  - Prerequisits
    - CICS Client
    - CICS Transaction Gateway

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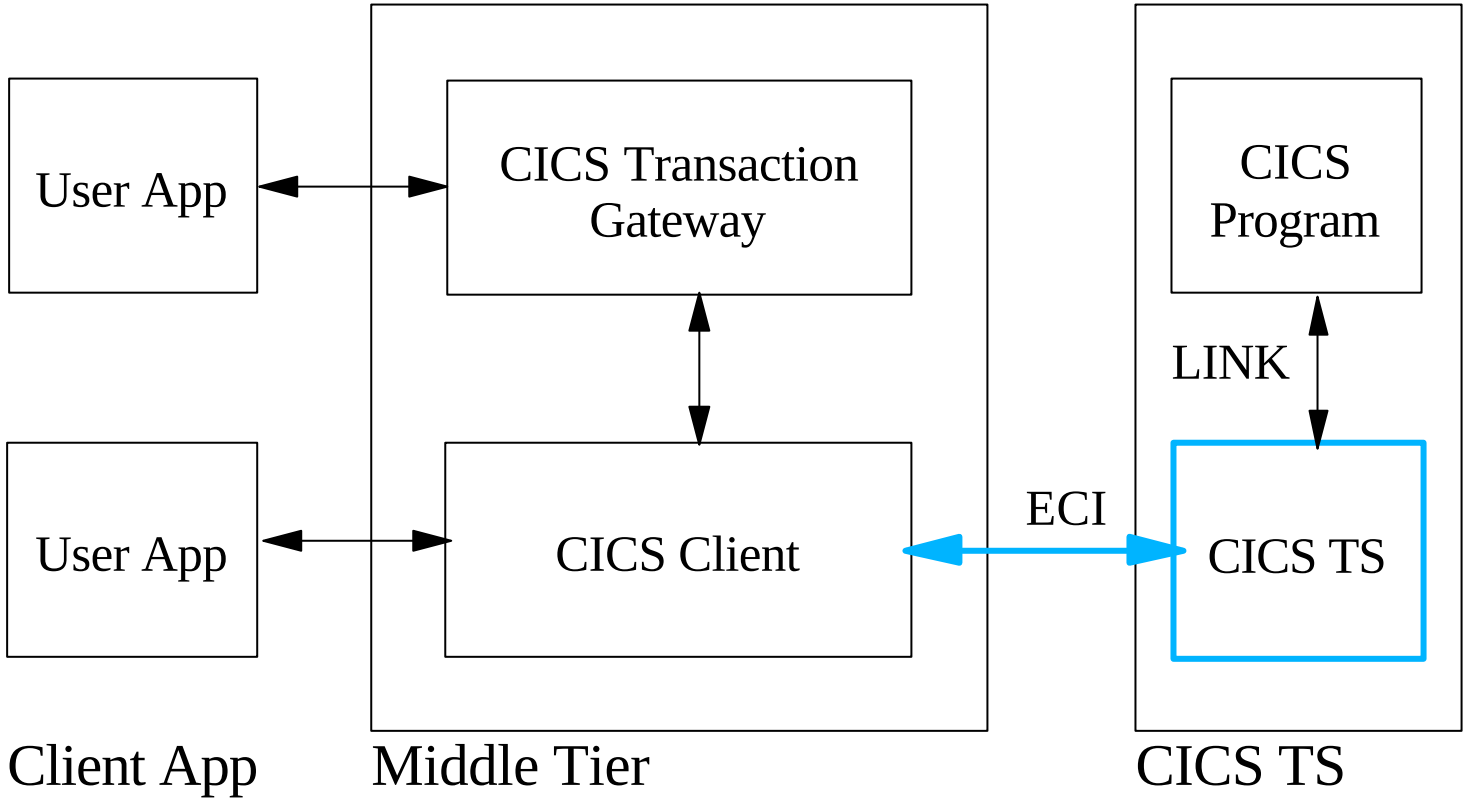
External Call Interface (ECI)



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General Performance Hints for Connectors

- Reduce amount of data transferred
  - Transfer only data that is needed
  - Issue only requests that are needed
- Use connection pooling
  - Reduce overhead of connection establishment
- Performance of connectors depends on
  - Network performance
  - Performance of "server"
  - Performance of "client" or middle tier

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Dependencies for VSE/ESA Growth

- System dependecies
  - Many control-blocks etc.. still below the line
  - VTAM IOBUF areas in System GETVIS-24
  - Non-Parallel-Share limits n-way support
  - Number of tasks
    - Up to 255, 32 per partition, 208 subtasks in total
- Application dependencies
  - Integrated system concepts/functions
  - Functions/Applications dependencies
  - Number of users per TCP/IP partition

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Dependencies for VSE/ESA Growth - continued

- Not being considered to be a limit
  - Number of partitions
    - 12 static + 150-200 dyn. partitions
  - Real storage (max. 2 GB)
  - Total virtual storage (max. 90 GB,3390-9:108 GB)
    - depends on the max number of log. devices (15)
  - Total number of devices (3 digit CUU)
    - Max. 1024 devices (and 16 channels)
  - Total number of logical units
    - 255 per partition and 12x255=3060 in total
  - Label area
    - Max. about 9000 in total, and 712 in sub areas

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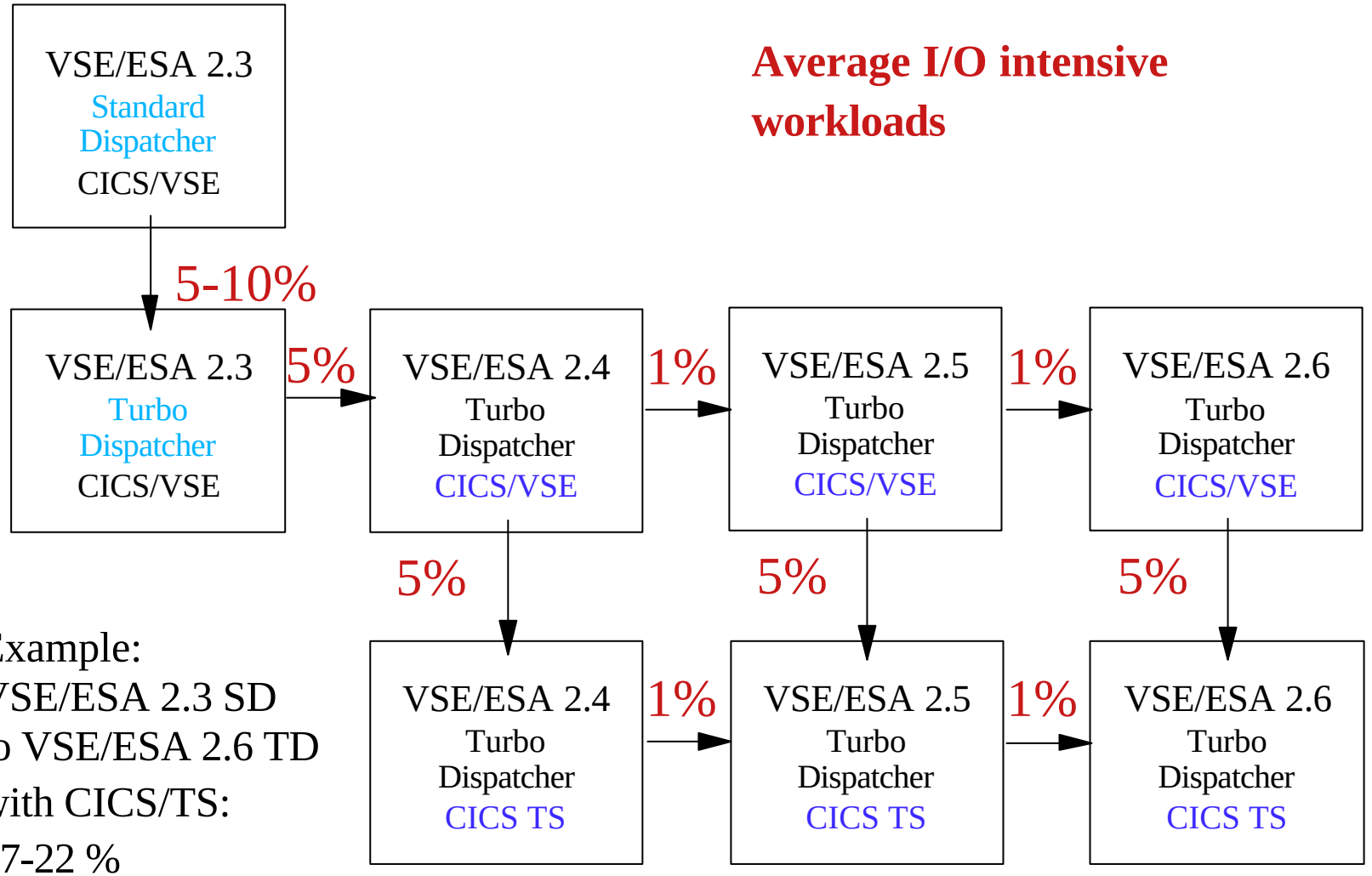
Overhead Deltas for VSE Releases

Average I/O intensive workloads



Example:
VSE/ESA 2.3 SD
to VSE/ESA 2.6 TD
with CICS/TS:
17-22 %

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VSE/ESA 2.7 Preview

- Hardware Crypto
  - LeedsLite (PCICA)
    - RSA, DES, 3DES, MAC, SHA-1 and random number generation
  - Available for G5, G6, z800, z900
  - Hydra Interace between Adjunct Processor and the crypto card
    - Common Crypto interface
    - Currently only RSA supported
  - Of benefit for Session initiation (SSL-Handshake)

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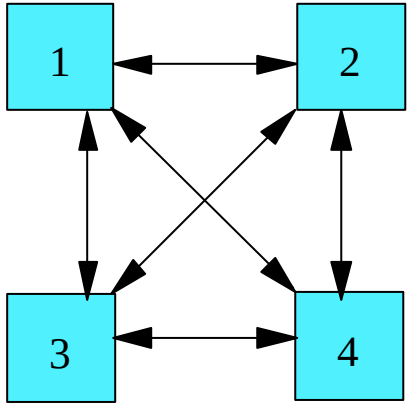
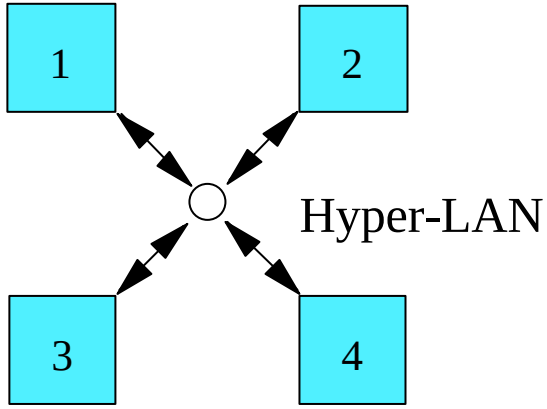
VSE/ESA 2.7 Preview - continued

- HyperSockets support
  - Fast data transfer between LPARs
  - Uses QDIO Architecture
  - Available with zSeries
  - Also possible:
    - "Virtual HyperSockets" (VM guest LAN)
      - with z/VM V4.2, G5, G6, MP3000

CTCAs



HyperSockets



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Questions