VM for VSE Guest Performance

VM & VSE Tech Conference

May 2000 - Orlando

Session G41

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Overview

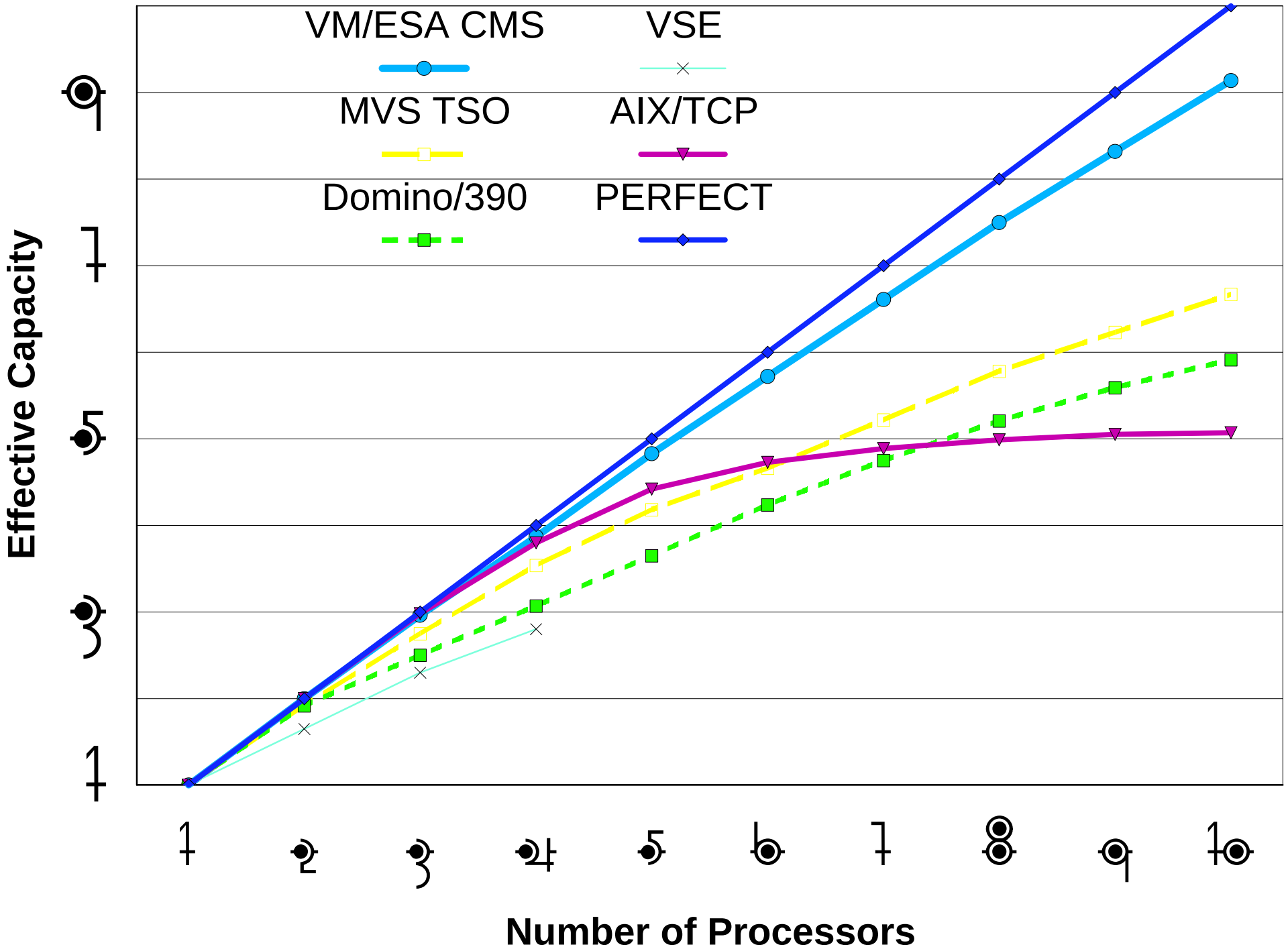
- Is VM Good for VSE Performance?
  - It depends.
- What does it depend on?
  - On what you mean by "performance"
  - Using V=R/F
  - Running VM on Native or LPAR
  - Virtual disk in storage
  - Enhanced minidisk cache
  - Hardware

The Short Answer is Yes

- Performance Value-Add of VM
  - Extend capacity of single VSE, by running multiple VSEs
  - VM/ESA extensions to scheduling such as limit shares
  - Resource sharing
    - Real storage is shared for V=V guests
    - Channels are shared without EMIF
    - DASD devices can be split up into minidisks

The Short Answer is Yes...

- VM paging benefits - demand and block paging, use of expanded storage.
- HW exploitation - greater N-way, expanded storage
- VM/ESA features
  - Virtual disk in storage for lockfile
  - Enhanced minidisk cache
  - DB2 for VM Guest Sharing


VM/ESA CMS
VSE
MVS TSO
AIX/TCP
Domino/390
PERFECT
Effective Capacity
Number of Processors

Nonperformance Reasons

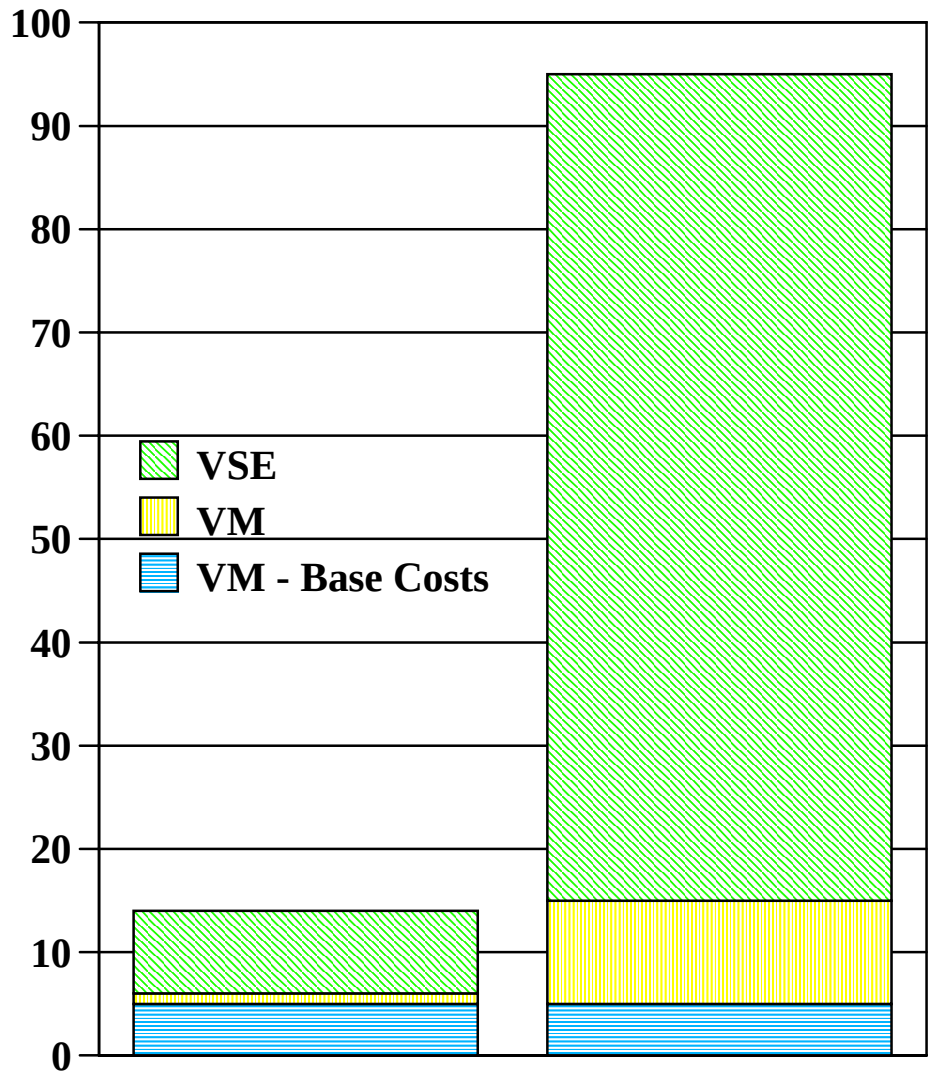
- CMS features
- Isolate production and test
- Migration vehicle
- Resource Management
- Other PPs (e.g. OV/VM)

What do you mean by "Performance"?

- Critical to answering the original question.
- Typically one of the following:
  - ITR = Internal Throughput Rate = a measure of work per CPU second.
  - ETR = External Throughput Rate = a measure of work per wallclock second.
  - CPU Utilization = how busy processor is; tied to ITR.
  - Response Time (Elapsed Time) = how long jobs take; tied to ETR
  - Interactive Users vs. Batch Work
  - How many phone calls you get

CPU Usage by VM/ESA

- Base costs and background work
  - Scheduling and dispatching
  - Accounting
  - Monitor
- Costs proportional to VSE requests or requirments of VM/ESA



CPU Usage - SIE

- Used by VM/ESA to run VSE guest
- Exits from SIE indicate work for VM
- Hardware assists can help avoid SIE exits
- Most common reasons for exiting SIE
  - I/O processing
  - Page fault resolution
  - Instruction simulation
  - Minor time slice expires

Exits from SIE

- Data in memory techniques avoid I/O.
- I/O Assist avoids SIE exit to handle:
  - I/O interrupt processing
  - CCW translation from virtual to real addresses
- CCW translation bypass for V=R guest.
- Minor time slice: SET SRM DSPSLICE
- Avoid Paging
  - V=R/F
  - Reserved pages for V=V
  - Sufficient storage

VM I/O Processing

- I/O Assist
  - V=R/F Guests
  - Dedication Devices
- CCW Translation Bypass
  - Dedicated and full pack minidisks
  - Only some V=R I/O
  - SET NOTRANS ON (SET CCWTRAN OFF)
- Fast CCW translation
  - Applies only to select DASD I/O

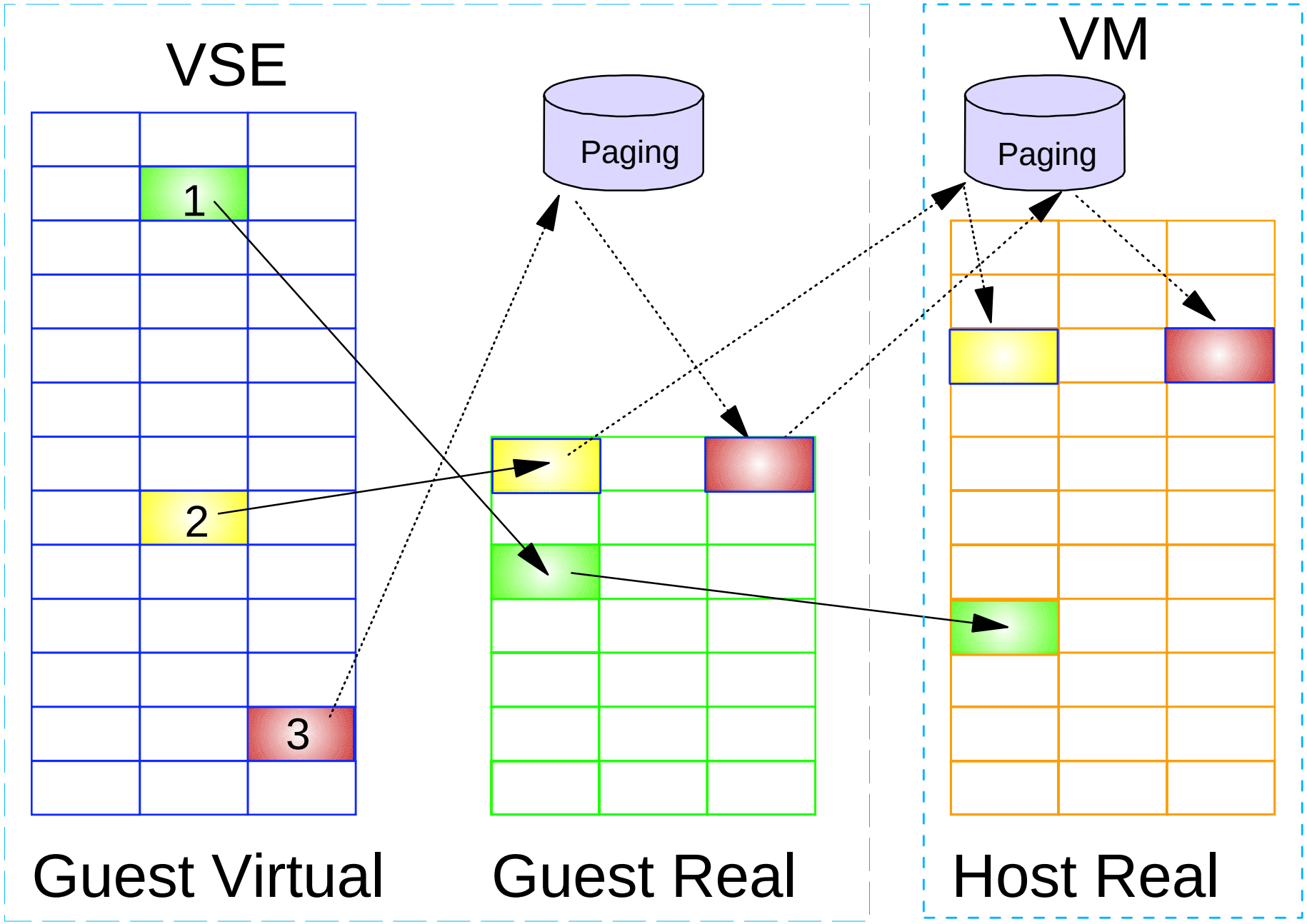
I/O Considerations

- I/O Assist gives best CPU performance
- Dedicated I/O is not eligible for MDC
- For V=R CCWTRANS OFF makes guest I/O ineligible for fast CCW translation
- For VSE Guests, VSE vdisks are more efficient than VM vdisks.
- Both VM vdisks and MDC require sufficient storage
- MDC read performance is as good as VM vdisk performance

DASD Considerations

- Dedicated Devices
  - Required for full I/O Assist
  - Not eligible for MDC
- Full pack minidisks
  - Can be shared between guests
  - Some I/O assist
  - Define via VOLSER or DEVNO
  - DEVNO not eligible for MDC
- Partial pack minidisks can be shared
- FBA Volumes - should start/end on 64 512-byte block boundaries.

Paging Considerations



Paging Considerations

- For V=V guests the potential exists for "Double Paging"
- No VM paging for V=R/F
- The closer the VSE VSIZE is to the defined storage for the virtual machines, the lower the VSE paging.
- PAGEX ON use.
- VM/ESA can use expanded storage for high speed paging device.

V=R/F/V Considerations

- V=R/F potential I/O assist benefit (saves CPU)
- V=F avoids overhead of recovering V=R
- 1 V=R + 5 V=F or 6 V=F
- V=V avoids dedicating storage
- V=R defaults to dedicating processors
- Running VM/ESA in an LPAR -
  - No V=F, only V=R, but without I/O Assist
  - Often better to use V=V and reserve pages

Virtual MP Support

- Define additional processors dynamically
  - Directory include MACHINE ESA 2
  - CP DEFINE CPU vcpu_addr
- Or put everything in the directory
  - CPU 00 NODEDICATE
  - CPU 01 NODEDICATE
- Detaching vCPU resets virtual machine
- For testing: more virtual than real processors

Virtual MP Support

- CP commands of interest
  - QUERY VIRTUAL CPUS
  - CPU vcpu_addr cmd_line
  - DEDICATE and UNDEDICATE

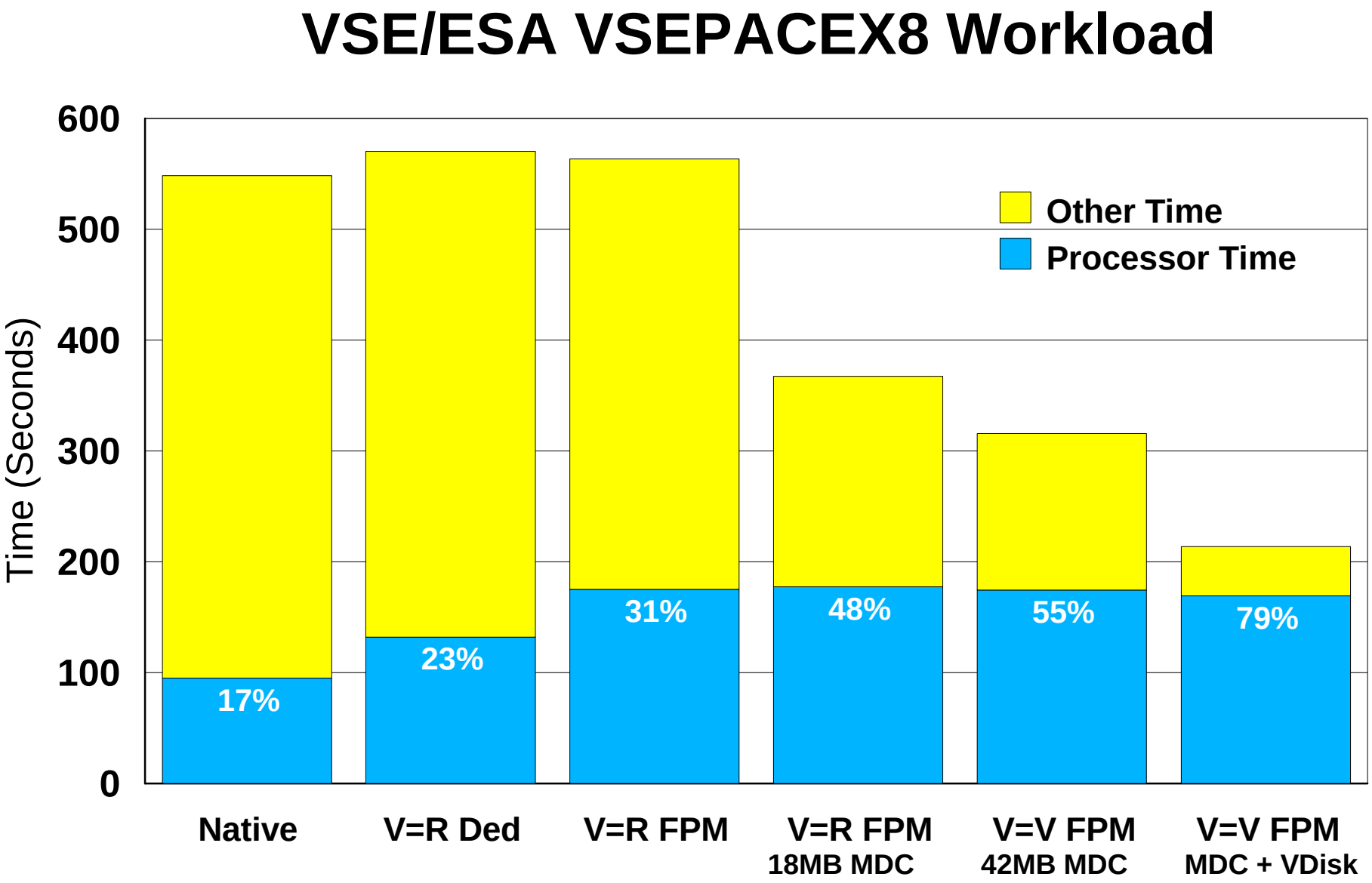
Virtual MP Tuning

- Share setting is for virtual machine, divided amongst all virtual processors
- Processors can be dedicated
- Mixing dedicated and shared processors is not recommended
- Defined but inactive vCPU (stopped state) makes guest ineligible for I/O assist
- Monitor, INDICATE, RTM for all vCPUs
- Potential for >100% (N*100%)
- Dedicated processor looks 100% busy

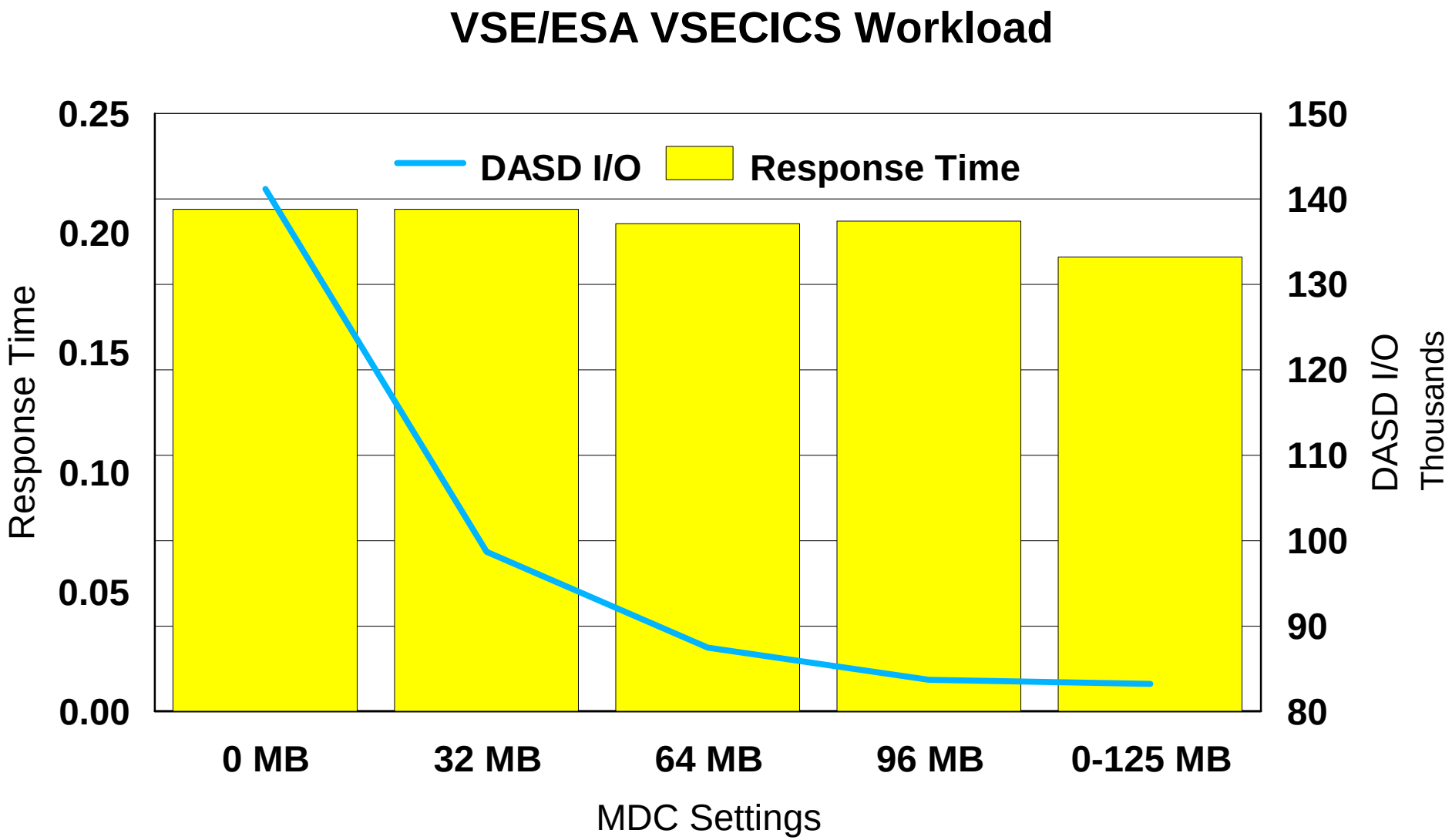
VM/ESA Data in Memory Techniques

- VM Data Spaces
  - Exploited by DB2 Server for VSE and VM (SQL/DS)
- VM Virtual disk in storage
  - volatile FBA minidisk
  - private or shareable
  - perfect for lock file
- Minidisk cache
  - Undedicated 3380, 3390, 9345, and RAMAC
  - SSCH, SIO, SIOF and Diagnose I/O
  - Read-once data generally does not benefit
  - New (2.3.0) Record level MDC does not apply to VSE
  - Do not use MDC for VSE lockfile

Minidisk Cache Benefits Example 1



Minidisk Cache Benefits Example 2



Summary

- Many features to be exploited
- Optimum configuration will depend on
  - What you mean by the term **performance**
  - What resources you have available
- http://www.ibm.com/s390/vm/perf/tips/
  - Common problems/solutions
  - CCW translation matrix
  - VSE Guest Performance
  - Performance related APARs
  - MDC guidelines
  - N-way and CMOS thoughts
- VM is still a friend and helper to VSE