# Measuring zSeries System Performance

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# Outline

- Computer System Performance
- Performance Factors and Measurements
- zSeries Performance
  - Measuring Application Performance
  - Measuring System Performance
- Additional Tools used
- Discussion

# Computer System Performance

- Amount of time used to complete a task
- Amount of work completed in unit of time
- Resource required and resource usage
- Others
  - Storage
  - Channel
  - Scalability
  - Availability (MTBF and MTTF)

# Factors of System Performance

- Hardware
- Processor
- Bus
- Clock
- Memory
- Secondary Storage
- I/O Devices
- Network
- Software
- Resource Allocation
- Resource Sharing
- Process Distribution
- Operating Systems
- Algorithms
- Context Switches
- Compilation

# Performance Measurement

- Metrics include:  availability, response time, channel capacity, latency, completion time, service time, bandwidth, throughput, scalability, performance per watt, compression ratio, speed up, …, and more.
- Two are used:
  - Response Time
  - Throughput

# Measuring zSystem Performance

- Application – DB2

  Compare the performance of accessing data stored in DB2 table against reading the same data accessed directly in VSAM running on z/OS hosted by IBM zSystem.

- System – CP, the Hypervisor

  Compare and analysis the performance of resource management by Hypervisor against the performance of resource management by z/VM and Linux (guest) of z/VM hosted by IBM zSystem

# Application – DB2

A Normalized Comparison of DB2 and Direct Access Performance under z/OS Environment

(By Christopher Corso)

Compares the performance of accessing data stored in DB2 tables against reading the same data values accessed directly in VSAM files. Validation testing is performed on MVS mainframes running DB2 version 9 under zOS. The comparison of the performance will be of a

# Testing and System Configuration

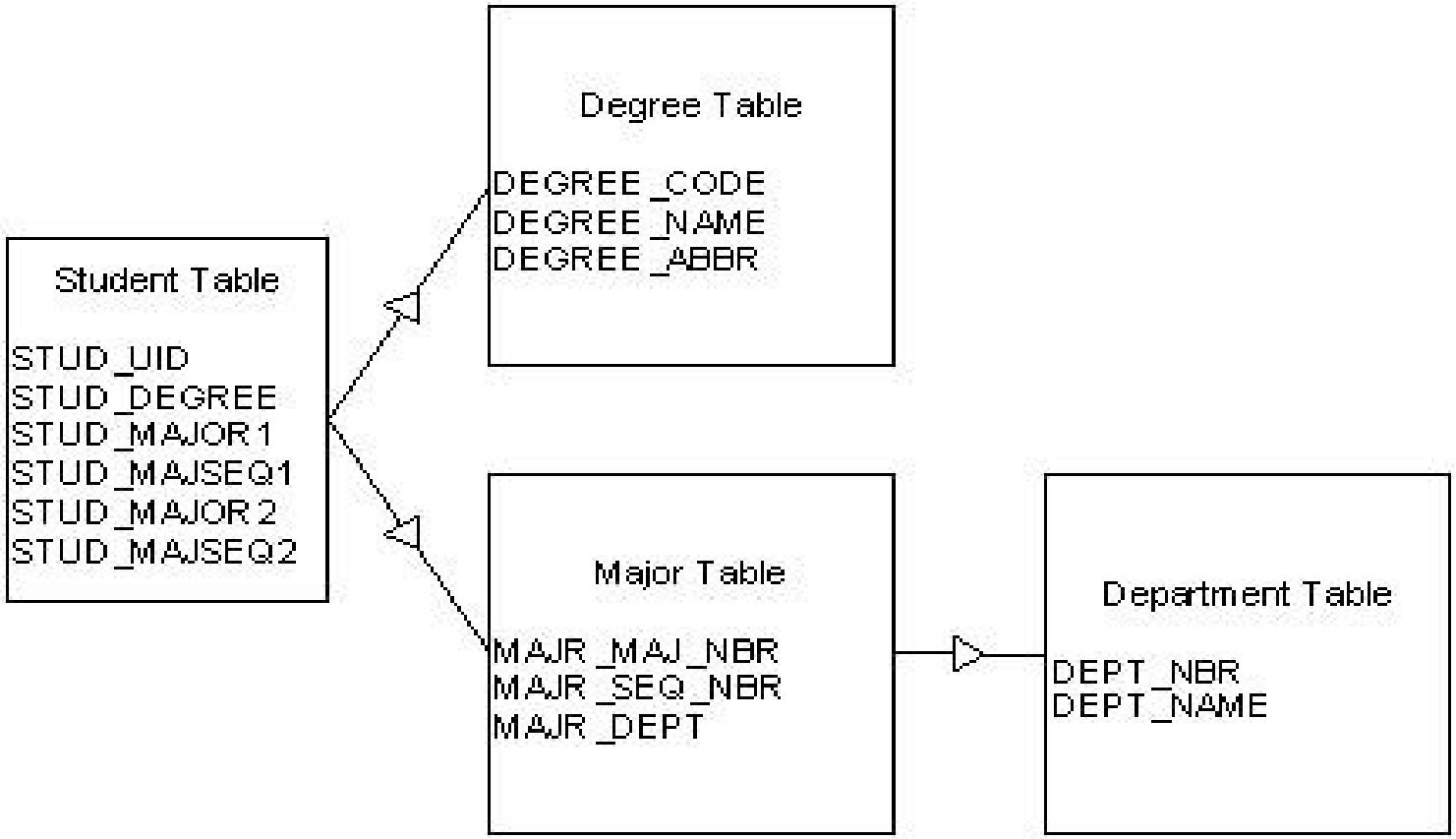
Time differentials of:

- Task Control Blocks (TCB)
- Service Request Blocks (SRB)
- Computer clock speeds (CPU)

Systems Used

- ISU Mainframe (z890) – zOS, DB2 version 9
- IIC Mainframe (IBM Innovation Center-Dallas) VM

# Table Relationships

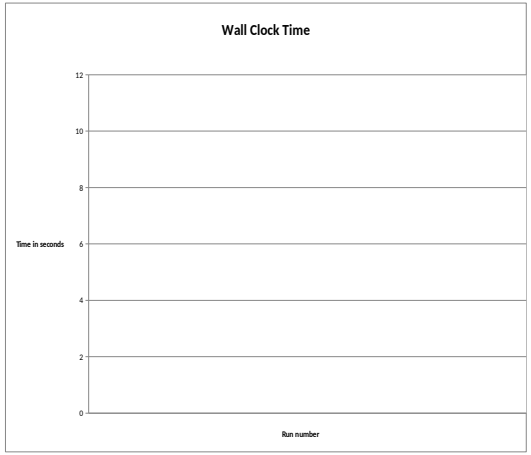


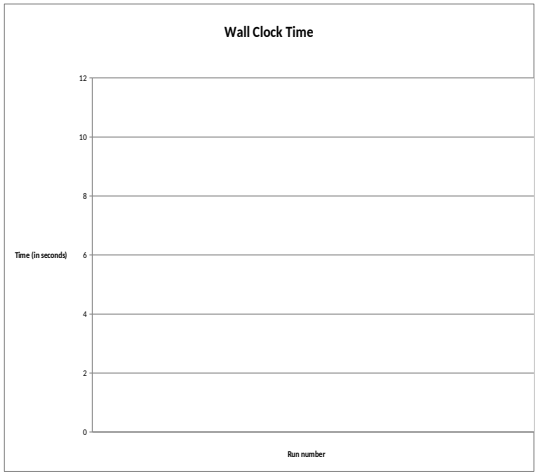
# Testing Programs and Names

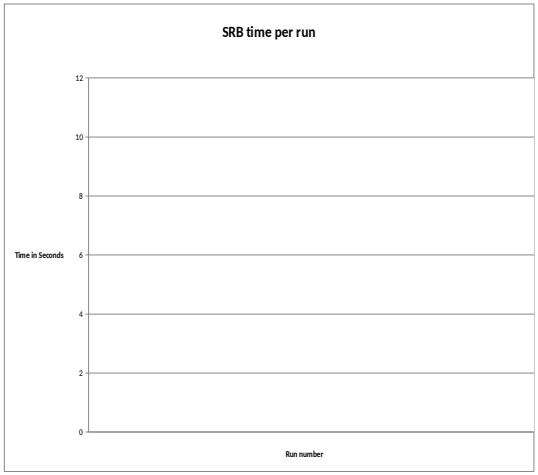
- DB2 only
- VSAM only
- DB2 with internal files
- VSAM with internal files
- SPEED1 – DB2 processing only
- SPEED2 - direct access VSAM processing only
- SPEED3 - direct access VSAM with internal files

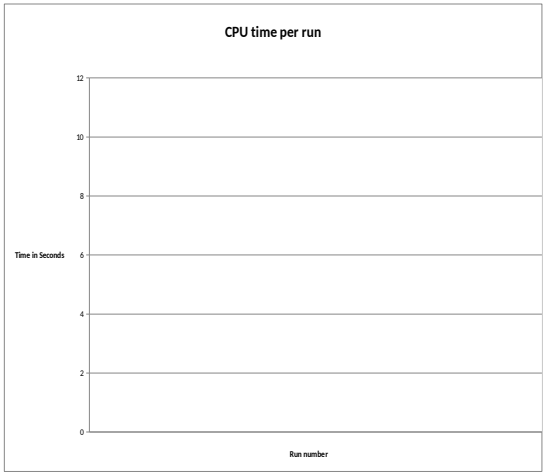
# Testing Results

- Wall Clock Time
- Task Control Block (TCB) Time
- Service Request Block (SRB) Time
- CPU Time


Wall Clock Time
12
10
8
6
4
2
0
Time in seconds
Run number


Wall Clock Time
12
10
8
6
4
2
0
Time (in seconds)
Run number


SRB time per run
12
10
8
6
4
2
0
Time in Seconds
Run number


CPU time per run
12
10
8
6
4
2
0
Time in Seconds
Run number

# Observation

- DB2 proved faster than direct VSAM access
- One method is not significantly faster to process than the other
- The least practical method of storing the data is to put it in variables within the source code itself
- Converting direct access VSAM is not always the best option
- It is much easier for users of the data to

# System – CP Hypervisor

compare and analysis the performance of resource management by Hypervisor against the performance of resource management by z/VM and Linux (guest) of z/VM hosted by IBM zSystem. The purpose is to analyze and correlate the relationship between the resource management of Guest Virtual Machine (Linux on z/VM) and the hypervisor of hosting Virtual Machine (z/VM). We will run benchmark on combinations of different of processes and guest VMs to collect their performance data for

# Performance of CP and z/VM

- Resource Allocation
  - By CP, By z/VM, By guest O/S – Linux
- Memory Management
  - By CP, By z/VM, By guest O/S – Linux
- CPU Cycle Distribution
  - By CP, By z/VM, by guest O/S – Linux
- Mainframe Resource Utilization and Scalability
  - Do they fit in the distributed system?

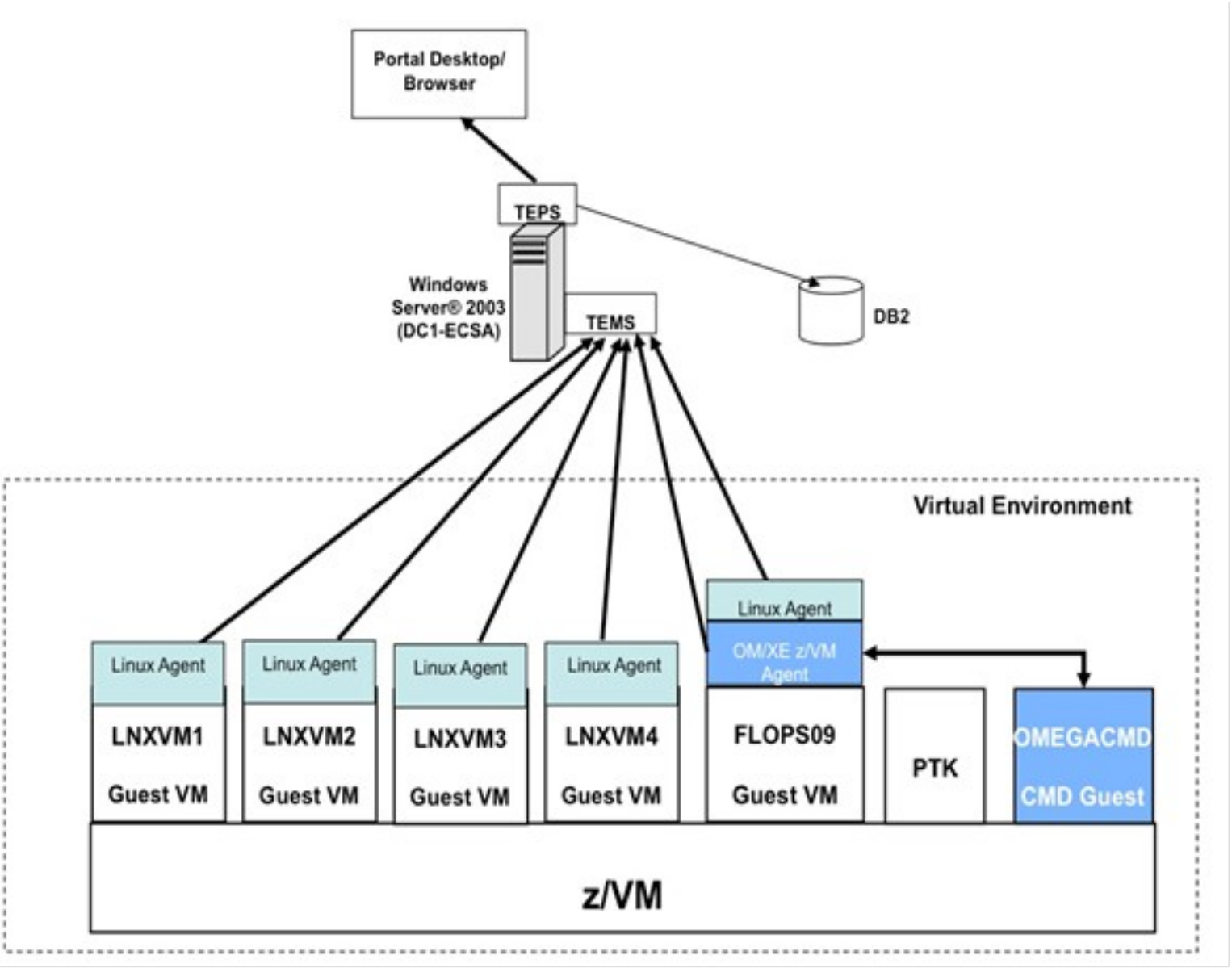
# Performance Concerns

- LPAR Optimization
  - How many LPARs becomes too many
  - What are the overheads of managing LPARs
- Guest Optimization
  - How many guest O/S's becomes too many
  - What are the overheads of managing guest O/S's
- Process Optimization
  - How many processes a guest O/S may handle to maintain scalability

# Benchmark Testing

- CPU Intensive Application Response Time and Throughput
  - Scaling from 1 to 2n processes per guest O/S
  - Scaling from 1 to 2m guests per LPAR
  - Scaling from 1 to 2k LPAR per system
- Memory Intensive Application Response Time and Throughput
  - Scaling from 1 to 2n processes per guest O/S
  - Scaling from 1 to 2m guests per LPAR

# Tivoli Performance Monitoring



# Discussions

- Under what circumstance CP allocate its resource adequately
- Under what circumstance VM manage its resource effectively
- Scalability of CPU intensive applications
- Scalability of memory intensive applications
- Mainframes v.s. Distributed Systems – A Collaboration Approach

# Question?