Session #: E2122

IBM

Analyzing Java Performance on iSeries

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Technology Consultant

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Abstract

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- This presentation will cover the tools for analyzing Java and WebSphere application performance on iSeries. It will cover in detail the IBM Performance Trace Data Visualizer for iSeries (PTDV). PTDV is a graphical Java application that can be used for performance analysis of Java and web applications running on an iSeries system. It will overview other tools including WebSphere Resource Analyzer, System Management tools, iDoctor, etc.

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Agenda

- Performance and Capacity Planning process
- System Level Optimization
- WebSphere Application Server Tuning
- Application Analysis tools
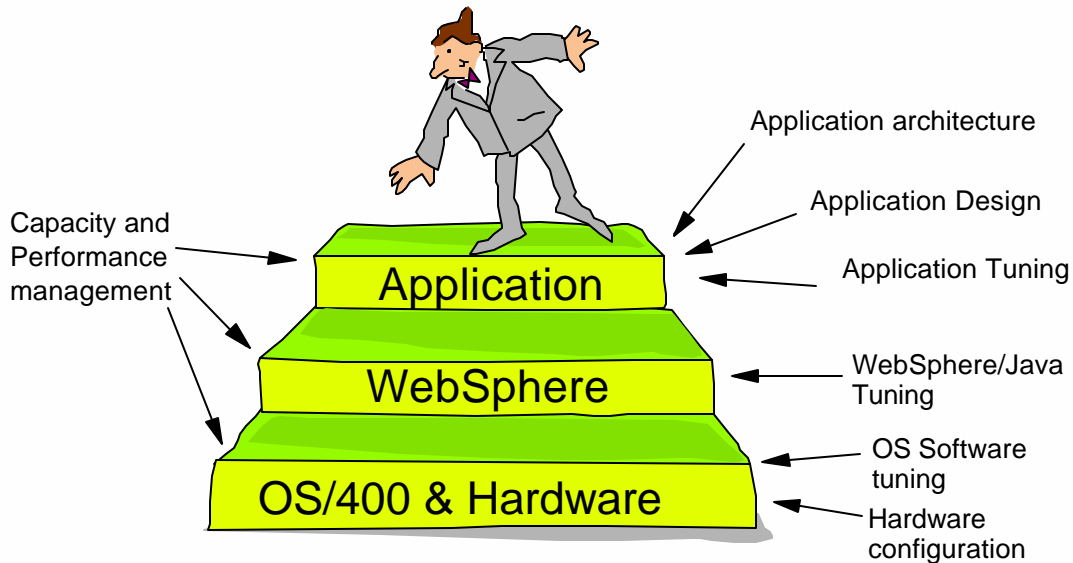- Performance Results
- Websites/References

Optimization Steps

- Prerequisite: Ensure adequate system resources:
  - ▶ Sufficient processor power
    - ▪ MHz and L2 cache are more important than Commercial Processing Workload(CPW)
  - ▶ Sufficient memory
  - ▶ No I/O bottlenecks
- To achieve optimal performance, stability, and scalability:
  - ▶ Step 1 - System Level Optimization for WebSphere
  - ▶ Step 2 - Optimize Java Environment
  - ▶ Step 3 - Tune WebSphere
  - ▶ Step 4 - Analyze and tune application code
  - ▶ Step 5 - Load and/or stress testing to prove the expected benefit

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3-4

System Level Optimization for WebSphere

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Application architecture

Application Design

Application Tuning

Capacity and Performance management

Application

WebSphere

WebSphere/Java Tuning

OS Software tuning

OS/400 & Hardware

Hardware configuration

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Pick the Right Server and Environment

IBM

- Run the latest release of OS/400
  - ► Keep current (load Java PTFs, run latest release you can)
- Run WebSphere on a server that meets CPU requirements
  - ► Plan for more CPU, main storage for Java
  - ► Don't expect great performance on an undersized server
  - ► Prefer newer (V4R5 or later) models; avoid 150s, 250s;
    - ▪ Newer model at same CPW should beat older model
    - ▪ Utilize servers which have L2 cache (bigger is better)
    - ▪ Utilize servers which have higher CPU MHz (versus just CPW)
- Use the Workload Estimator to determine the right system
  - ► http://as400service.ibm.com/estimator

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Tools for Ensuring adequate system resources

IBM

- Workload Estimator:
  - ► Provides an estimate of the size of hardware required to support a defined load
  - ► Can accept monitor data from current systems via PM/400
  - ► Does not handle LPAR, journalling, response times, locked resources, etc.
  - ► Easy to use, numerous defaults
  - ► Good if you have no idea
- BEST/1
  - ► Uses mathematical techniques to model a defined load executing on specific hardware and estimate the response/throughput
  - ► Can use performance monitor data as input
  - ► Models disk, IOP, memory; Does not model threads
- The only sure sizing method is based on load testing

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IBM eBusiness Workload Estimator: Selection

IBM

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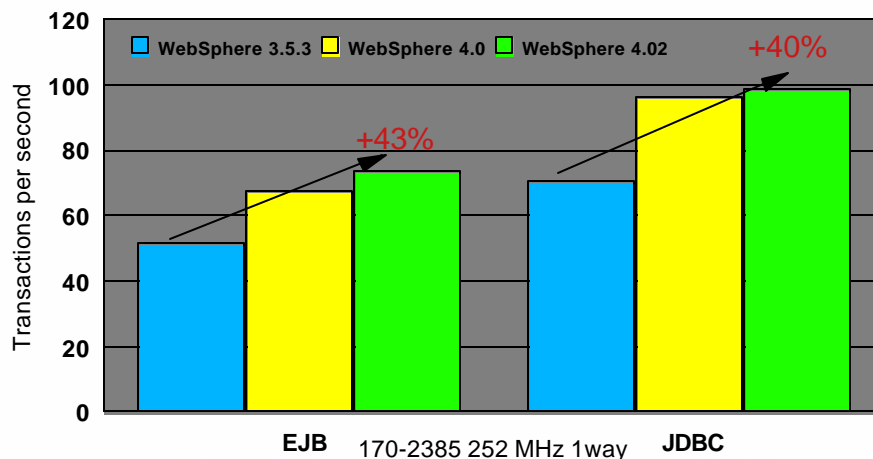The technical developer conference with more

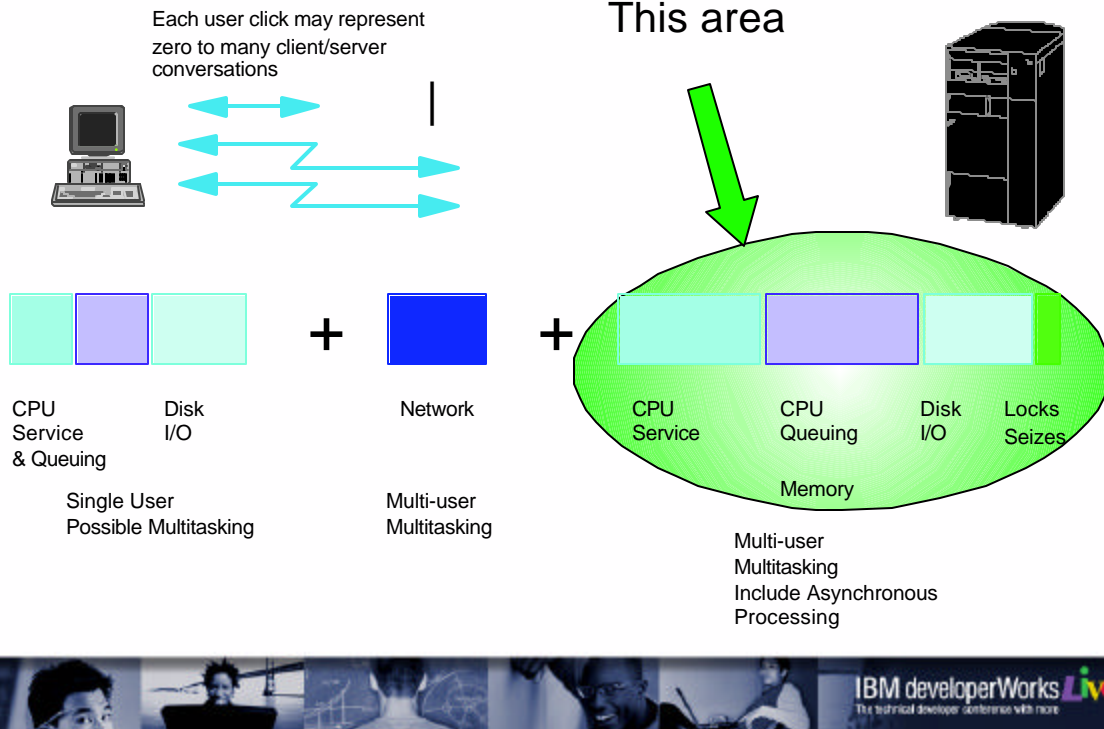## IBM eBusiness Workload Estimator: Results
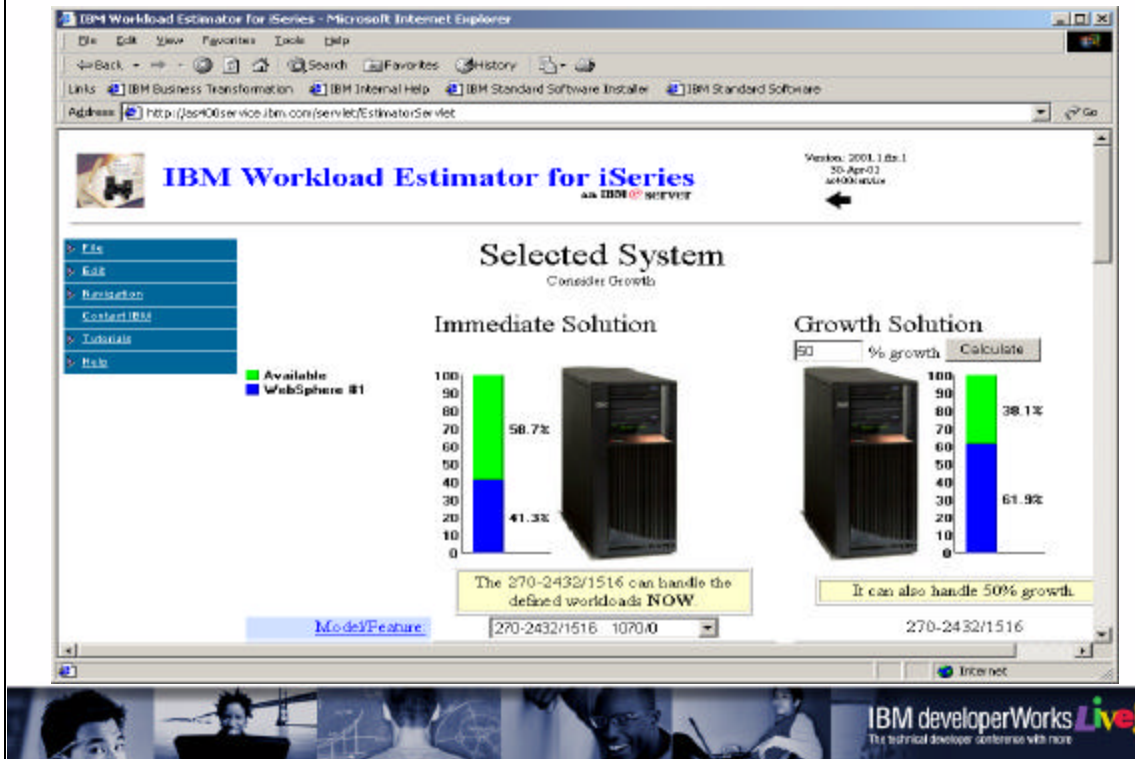
Pick the Right Server and Environment II

- Use the latest version of WebSphere
  - ► WebSphere Advanced 4.02 provides better performance than 3.5
  - ► Load the latest WebSphere fix pack

Where are we tuning the application?

Each user click may represent zero to many client/server conversations

This area

| CPU Service & Queuing | Disk I/O | | Network | | CPU Service | CPU Queuing | Disk I/O | Locks Seizes |

Single User
Possible Multitasking

Multi-user
Multitasking

Memory

Multi-user
Multitasking
Include Asynchronous
Processing

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iSeries Performance Behavior...

- Traditional applications
  - ► Low percentage high level language instructions
  - ► **Large percentage systems services (Data Base Get Records)**
  - ► 2 ways to improve performance:
    - IBM improves OS/400
    - Customer improves how application uses system resources

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...iSeries Performance Behavior

IBM.

- Java applications
  - ► **Higher percentage of high level language instructions**
  - ► Lower percentage use of operating system services
  - ► Computational performance of Java becomes more important
  - ► Java Virtual Machine (JVM) and translation facilities
  - ► Potentially inefficient coding practices have greater impact
- Portability has its price
  - ► Less able to take account of environment-specific performance capabilities
  - ► Performance penalties disappearing with time
  - ► Still slower than traditional

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Java Advantages with iSeries

IBM.

- Fully Integrated JVM
  - ► Below MI
  - ► Other platforms use software JVM above OS
- Designed for scaleable SERVER work (many threads & objects)
  - ► Beware of single thread comparisons
- Transformer
  - ► Persistent 64-bit instructions
  - ► Retains Java bytecode portability
- Superior Garbage Collection
  - ► Concurrent, not stop-and-copy
- Emphasis on Optimization and Currency

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Java Execution Modes

IBM.

- Java Transformer
  - ► Creates hidden, compiled programs called Direct Execution programs
- Just in time compilation (JIT)
  - ► Default option in V4R5 and V5R1 (JIT 3.6)

Characteristic	Direct execution	Just-in-Time (JIT) Compiler
Execution speed	Faster for large programs	Faster for small programs and dynamic environments
Loading speed	Faster if the code is pre-compiled; slower if is not pre-compiled	Faster if methods are called more than once; slower if most methods are used a small number of times
Memory use	Less if many processes are using the same program	Equal to static compilation if one or only a few processes are using the same program
Disk use	Uses four to five times the space of JIT	Uses four to five times less space than static compilation
Ease of use	More user management	Invisible to user
Binding	Tight binding within a JAR, loose binding between classes or between different JAR files (WPO in V5R1)	Tight binding for all classes and JAR files

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Keep OS/400 current

IBM.

- Load latest CUM package and PTFs
  - ► OS/400
    - ▪ http://www.ibm.com/servers/support/
  - ► Java
    - ▪ http://techsupport.services.ibm.com/server/support
  - ► WebSphere
    - ▪ http://www.ibm.com/servers/eserver/iseries/software /websphere/wsappserver/
  - ► Toolbox
    - ▪ http://www.ibm.com/servers/eserver/iseries/toolbox/
  - ► DB2/400
    - ▪ http://www.ibm.com/servers/support/

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Set OS/400 System Values...

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- Change System Values
  - ▶ MAXACT for the *BASE pool
    - Increasing this value will reduce or eliminate thread transitions into the ineligible state.
    - Initial choice of value should be (arbitrarily) high, then as implementation proceeds, monitor, and decrease the value if thought necessary.
    - Consider a separate pool if non-java work in *BASE
  - ▶ QACTJOB (Initial number of active jobs)
    - Increase to 400 (from default of 20)
  - ▶ QADLACTJ (Additional number of active jobs)
    - Increase to 50 (from default of 10)

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...Set OS/400 System Values

IBM.

- Change System Values
  - ▶ QADLTOTJ (Additional number of total jobs)
    - Increase to 50 (from default of 10)
  - ▶ QTOTJOB (Total number of jobs)
    - Increase to 1000 (from default of 35)
  - ▶ QMAXACTLVL (Maximum activity level of the system)
    - Ensure is at *NOMAX
  - ▶ QPRCMLTTSK (Processor multi-tasking)
    - Make sure is set to 1 (On)

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OS/400 Subsystem Settings - Database Jobs

IBM.

- Increase the number of QSQSRVR initial jobs (Native JDBC)
  - ▶ Use a value equal to the approximate number of expected concurrent transactions, plus something for the Application Server.
  - ▶ Used for Native JDBC, default 5
  - ▶ CHGPJE SBSD(QSYS/QSYSWRK) PGM(QSYS/QSQSRVR)
  - ▶ Increased number slightly increases overhead
  - ▶ Ensure maximum number of uses is at default (200)
- Increase the number of QZDASOINIT initial jobs (Toolbox)
  - ▶ Used for Toolbox JDBC, default 1
  - ▶ CHGPJE SBSD(QSYS/QSERVER) PGM(QIWS/QZDASOINIT)
  - ▶ Same rules as above

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Measuring System Resource Usage

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- PM/400
  - ▶ Trends
- Management Central/Collection Services
  - ▶ Real Time Analysis

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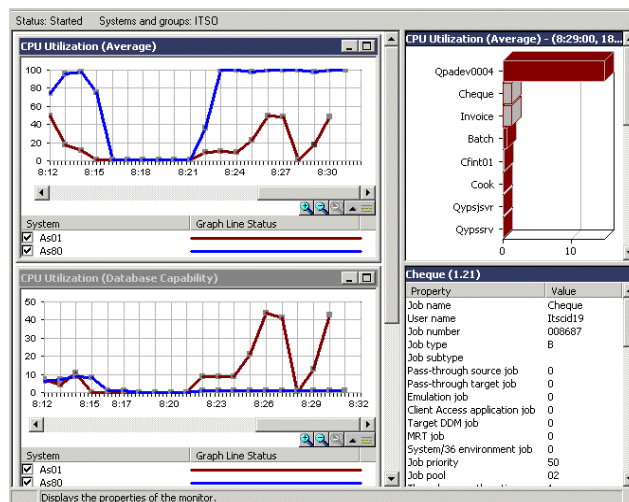
Optimizing Java at system level

IBM.

- Java Optimizations
  - ► Package Java application as a .jar or .zip file
    - Improves class loading time and Improves code optimization
  - ► Use CRTJVAPGM/CHGJVAPGM to optimize to level 40
    - In V5R1 store all JAR files in same directory
    - Allows tight binding across JAR files
  - ► Place frequently used JAR files first in CLASSPATH
  - ► Adjust value GCHINL as necessary
    - Specifies the memory threshold before garbage collector runs
    - Large number allocates more memory to GC, GC runs less frequently
  - ► Leave GCHMAX as default (*NOMAX)
    - When MAX is reached, all threads are stopped, garbage collection is done synchronously
  - ► Monitor GC faulting
    - JVM runs in the storage pool of the subsystem in which it is started
    - Rule of thumb: Page Faults 20 - 30 (NDB events)
    - If storage available, < 20 -30 may bring benefits

WebSphere Application Server Tuning

IBM.

- WebSphere Queues
  - ► Bigger doesn't necessarily mean better performance
  - ► Testing is the premier way to tune the queues
  - ► Tune from Back To Front
    - DataSource
    - Servlet Engine
    - HTTP Server
- Guidelines
  - ► Set HTTP threads somehow higher than the maximum application concurrency
  - ► Set the Servlet queue size to a lower value
  - ► Set the Datasource queue size to an even lower value
- Excellent Whitepaper
  - ► http://www.ibm.com/software/webservers/appserv/3steps_perf_tuning.pdf

WebSphere Queue Overview

Clients → **Web Server** → **Servlet Engine** → **Data Source** → **Database**

HTTP Server Administration to change **Max Active Threads**

Use the Admin Console to change **Web Container Max Threads** *(formerly known as Max Connections)*

Use the Admin Console to change **Maximum Connections Pool Size**
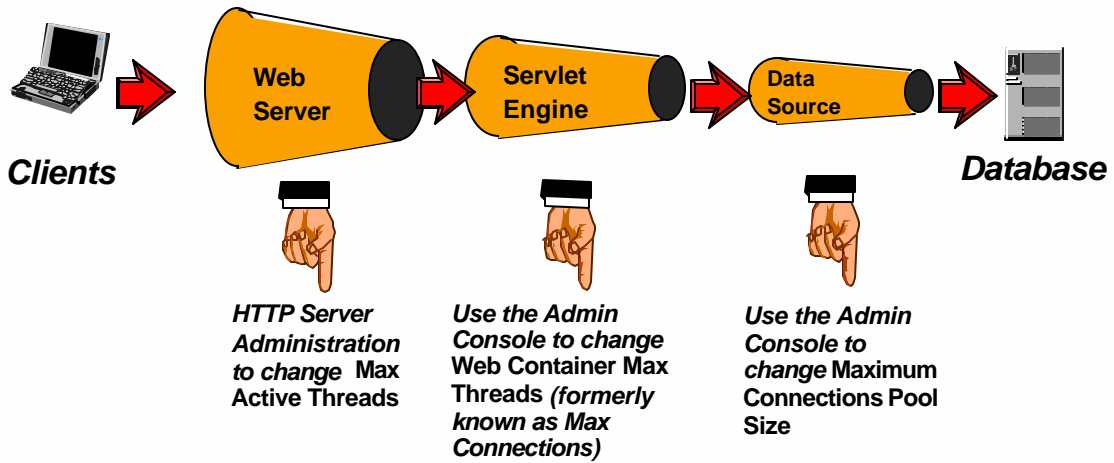
Tuning the HTTP Server Queues

Tuning the Servlet Queues - WAS 3.5

Tuning the Servlet Queues - WAS 4.0

Tuning the Data Source - WAS 3.5

Tuning the Data Source - WAS 4.0

WebSphere Tuning Knobs...

IBM

- Set the *initial* GC size to:
  - ► 64MB for 1-2 way systems
  - ► 256MB for 4-8 way systems
  - ► 1GB for 12-24 way systems
  - ► Expand WebSphere Administrative Domain > Nodes > Your Node > Application Servers. Choose your server. Click on the JVM Settings Tab on the right side pane. Tune the Initial Java Heap Size and select Apply when finished to apply your changes.

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...WebSphere Tuning Knobs...

IBM

- Disable Auto Reload or Increase the class re-load interval
  - ► From the Application Assembly Tool, expand Web Modules and Select the IBM Extensions Tab. To disable auto reloading uncheck the Reloading Enabled Box. To set a longer reload interval, change the reload interval to a large number of seconds. In a production environment, setting the reload to once every half hour (1800 seconds) is reasonable. Apply the changes, and redeploy the ear file.
  - ► This can be changed in the web.xml file too if avaliable. However there is no way to do this through the console in WAS 4.0.

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...WebSphere Tuning Knobs...

IBM.

- Session Manager
  - ► Do not enable persistent sessions unless required by the application
    - AE: Expand WebSphere Administrative Domain > Nodes > Your Node > Application Servers > Your Server > Services Tab > Session Manager Service. Select Edit Properties. Choose the Persistence Tab. Make sure the Enable persistent sessions box is unchecked.
  - ► If persistent sessions are required, enable multi-row sessions and caching
    - AE: Expand WebSphere Administrative Domain > Nodes > Your Node > Application Servers > Your Server > Services Tab > Session Manager Service. Select Edit Properties. Choose the Database Tab and check the multi-row sessions box.

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...WebSphere Tuning Knobs

IBM.

- Session Manager
  - ► Set the base memory value to a number close to the maximum number of active sessions. Ensure that Allow Overflow is enabled (default)
    - AE: Expand WebSphere Administrative Domain > Nodes > Your Node >Application Servers > Your Server > Services Tab > Session Manager Service. Select Edit Properties. Choose the Advanced Tab. Set the Maximum in-memory session count and Allow overflow.

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Performance Tuner...

- WebSphere 4.0 Performance Tuner
  - ► Wizard run from the Administration Console
  - ► Stepping through the Performance Tuner:
    - Select the application server you would like to tune, and click next
    - Set the maximum number of Web Container Threads, click next
    - Select Pass By Reference, and set the ORB Pool Size, click next.
    - Select your Data Source from the list, click next
    - Set DataSource Max Connections, click next
    - Set the Prepared Statement Cache Size, click next
    - Leave the box on "Tune Database" unchecked, Click next
      - This tuning option performs database tuning operations which are unnecessary on iSeries.
    - Set JVM Starting Heap Size, click next
    - Click finish
  - ► Some settings may trigger messages saying value out of normal range
    - This is not necessarily a problem

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...Performance Tuner

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WebSphere Resource Analyzer - Overview

IBM.

- Stand-alone performance monitor for WebSphere Application Server
  - ► Visualization of performance indicators for WebSphere and JVM resources
    - Runtime, Database connection pools, Servlet Engines, etc.
- Statistical and load data
  - ► Memory usage, response time, servlet instance counts
- Supports Advanced Edition only
  - ► http://www-4.ibm.com/software/webservers/download.html

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WebSphere Resource Analyzer - Advantages

IBM.

- Monitor real-time performance of servlets.
- Detect trends by analyzing snapshots of data over time
- Determine efficiency of allocated resources.
  - ► Memory, size of connection pools,...
- Analyze the load on application servers
- WebSphere Application Server is enabled for data collection
  - ► User must enable for data reporting from the Administrator's Console
    - Multiple reporting levels are available - each provides more data for analysis
    - Increasing levels of reporting adds performance overhead to environment
  - ► Use the Resource Analyzer to begin collecting data for the enabled resource

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WebSphere Resource Analyzer
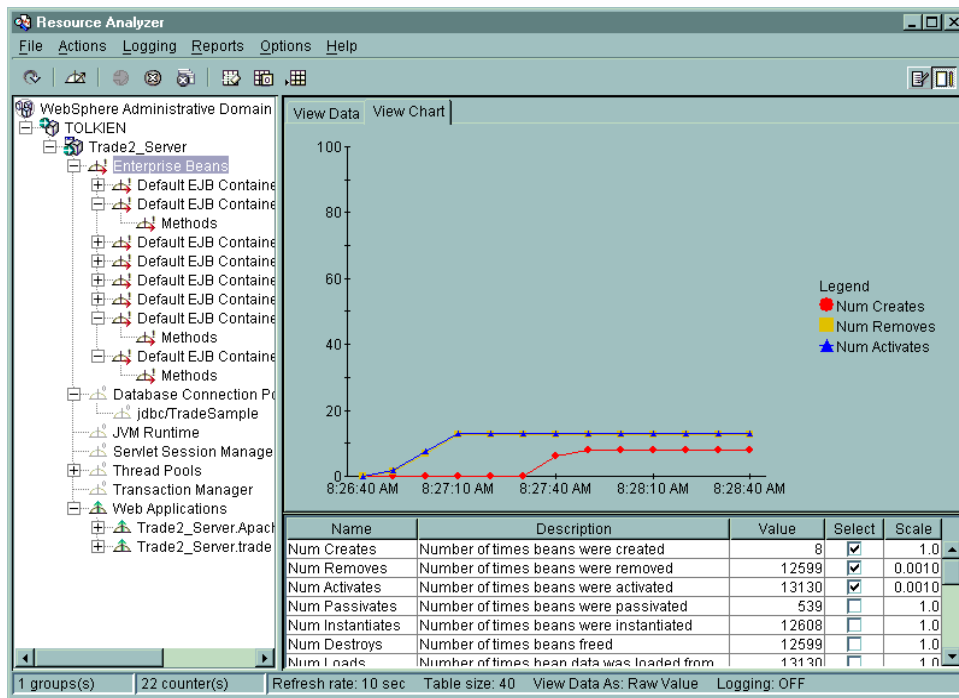
Performance Explorer (PEX)

- PEX provides three types of performance data collection capabilities:
  - ► STATS - program oriented (mentioned for consistency only).
  - ► PROFILE - to identify programs that should be investigated further as potential performance bottlenecks (mentioned for consistency only).
  - ► TRACE collects detailed program, Licensed Internal Code (LIC) task, OS/400 job and object reference information.
- PEX is part of OS/400
- Performance Tools/400 (PT1) provides a capability to print reports for review and manual interpretation
- IBM makes a no-charge tool available at Alphaworks named PTDV (**P**erformance **T**race **D**ata **V**isualizer)

What is PEX Trace Data?

- PEX will create a record for particular events
  - ► Method entry/exit
  - ► Java Object Creates and Deletes
  - ► Java Locks
  - ► WebSphere Events
  - ► etc.
- Some events (method entry/exit) require special "hooks" in code
- Can generate large amounts of data

Collecting data with PEX

- Create a session definition
  - ► Informs system about collection type and job to collect against (ADDPEXDFN)
- Start collecting data
  - ► Creates data files containing performance data using session definition (STRPEX)
- Stop collecting data
  - ► Terminates data collection (ENDPEX)
- Analyze the data
  - ► Display collected data with optionally installed tool

What is PTDV?

- PTDV Features
  - ► Allows you to view all running jobs and threads and see which are doing the most work
  - ► Shows call trace for each thread, and shows amount of time, instructions, cycles, and objects used by each method call
  - ► Summarizes information at trace, job, thread, and method level
  - ► Detailed information on objects -- e.g. number of creates, locking behavior, lifetime
- Designed primarily for working with Java programs, but will also work with other ILE languages
- Runs in client-server mode -> data stays on AS/400, visualize it on your PC
- Available externally with limited support
  - ► http://www.alphaworks.ibm.com/tech/ptdv

PTDV

Adding Method Entry/Exit Hooks

IBM.

- There are two ways of adding hooks to a Java program:
  - ► Run CRTJVAPGM on the jar/zip/class files with ENBPFRCOL(*ENTRYEXIT)
    - Don't do this for system files such as classes.zip, rt.jar, etc.
  - ► Use the JIT and enable hooks by specifying properties:
    - java.compiler=jitc
    - os400.enbpfrcol=1

Specifying Java Properties

IBM.

- There are many ways to specify Java properties:
  - ► When using the JAVA or RUNJVA CL programs:
    - JAVA PROP((java.compiler jitc) (os400.enbpfrcol 1))
  - ► When using the java command from QSH:
    - java -Djava.compiler=jitc -Dos400.enbpfrcol=1
  - ► For WebSphere 3.0+, in the command-line parameters for the application server:
    - -Djava.compiler=jitc -Dos400.enbpfrcol=1
  - ► In a file called /QIBM/UserData/Java400/SystemDefault.properties:
    - java.compiler=jitc
    - os400.enbpfrcol=1

Data Base Monitor Overview

IBM

- Database Monitor
  - ▶ Database Monitor for iSeries (DB Monitor) is a tool that can be used to analyze database performance problems after SQL requests have completed running.
  - ▶ The DB monitor tool has been part of OS/400 since V3R6.
    - ▪ The iSeries performance analyst will use DB monitor to gather database and performance data generated when SQL queries are executed.
    - ▪ Then using customized SQL programs, the analyst will be able to view, analyze and conclude the most appropriate actions to take in order to generate the most efficient SQL queries possible for their application.
  - ▶ Excellent Redpaper available
    - ▪ Using AS/400 Database Monitor and Visual Explain To Identify and Tune SQL Queries (REDP0502)
    - ▪ http://www.redbooks.ibm.com

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Operations Navigator - Visual Explain

IBM

- Visual Explain is a new tool introduced in V4R5
- Provides a graphical interface to:
  - ▶ identify and analyzing SQL performance
  - ▶ the access plan the optimizer generates for a given SQL query
  - ▶ identify the tables involved and indexes considered for the query execution as well as join order, type of sort (if required), type of grouping (if required),
  - ▶ and other valuable information

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Operations Navigator - Visual Explain

IBM

DMPJVM overview

IBM
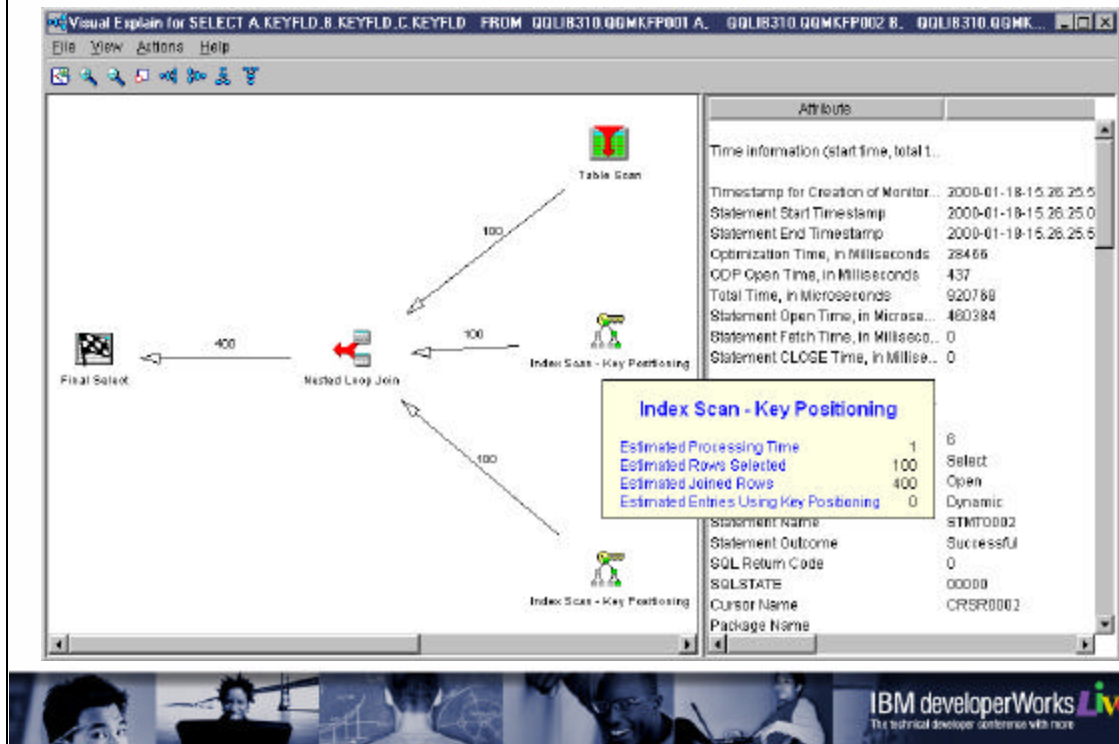
- DMPJVM (Dump Java Virtual Machine) is a standard OS/400 command
  - ► The command dumps information about the Java Virtual Machine (JVM) for a specified job. The information is dumped to a spooled printer file to be printed
  - ► The dump includes formatted information about:
    - The classpath
    - garbage collection
    - threads that are associated with the Java virtual machine.
  - ► May need to do **CHGJOB JOB(*) DFTWAIT(300)** before running DMPJVM on busy WebSphere jobs to avoid timeout

Performance Review Process

IBM.

Phase	Data Collected By:	Data Analyzed By:
System analysis	* Performance Monitor * PM/400 * Collection Services * Performance Explorer (PEX)	* Performance Tools (5769-PT1) * IBM * Management Central * Manually
WAS/Java analysis	* WebSphere Jobs * Performance Explorer (PEX) * DMPJVM	* WebSphere Resource Analyzer * Manually * Manually
Application analysis	* Performance Explorer (PEX) * DMPJVM * DBMonitor * SQL Visual Explain	* PTDV * Manually * Manually * Manually

Notes:

1. There is no tool which will match the application level Java with database interactions

2. Other tools are in existence, such as JPDC/Jinsight and iDoctor, but we make no
    recommendations related to their use

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Trade 2 Benchmark - Description

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- The Trade 2 benchmark simulates an online stock trading site using WebSphere Application Server Advanced Edition
  - ► Trade 2 uses a web browser to interact with simulated user
  - ► The benchmark uses JSPs and servlets to interact with EJBs for database access
  - ► It contains transactions for the following:
    - Registration to create a user profile, user ID, password, and initial account balance
    - Login validates an already registered user
    - Browse current stock price for a ticker symbol
    - Purchase shares
    - Sell shares from holdings
    - Browse portfolio
    - Logout terminates the users active interval
  - ► The results of this benchmark are reported as transactions per second

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Trade 2 Benchmark - Runtime Topology

IBM.

Trade2

WebSphere Application Server

http/htttps

HTTP Server

request → Servlets

response ← JSPs

Business Data Access

EJB

JDBC

Enterprise Data

Web Browser

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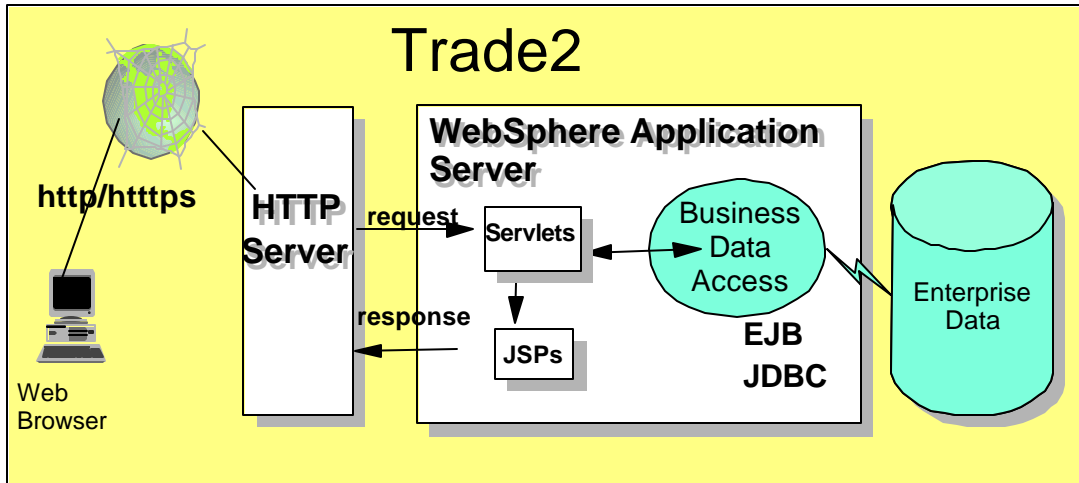
Trade 2 Benchmark - V5R1 vs V4R5
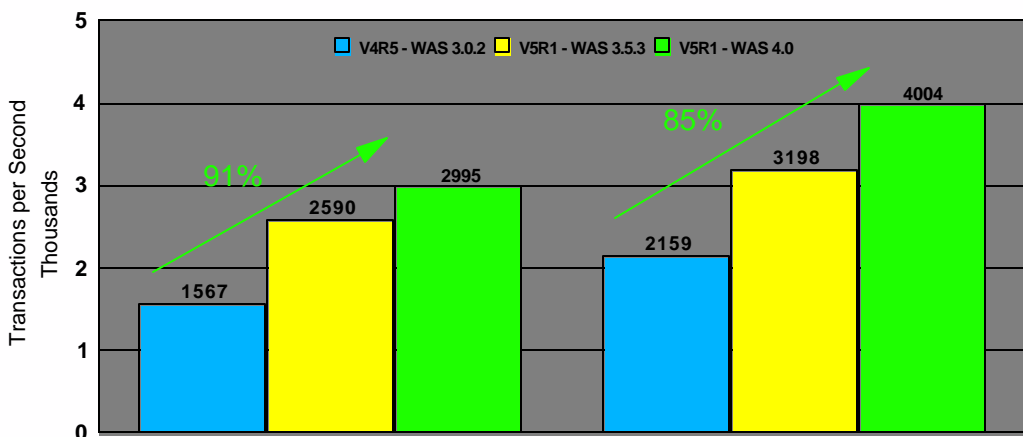
IBM.

Transactions per Second Thousands

Legend: ■ V4R5 - WAS 3.0.2 ■ V5R1 - WAS 3.5.3 ■ V5R1 - WAS 4.0

EJB: 1567, 2590, 2995 (91%)
JDBC: 2159, 3198, 4004 (85%)

EJB			JDBC		
V4R5 EJB	**V5R1 EJB**		**V4R5 JDBC**	**V5R1 JDBC**	
M840/2420 24-way	M840/2461 24-way		840/2420 24-way	840/2461 24-way	
500 MHz	600 MHz		500 MHz	600 MHz	
65% CPU	94% CPU	98% CPU	70% CPU	82% CPU	80% CPU
subsecond	subsecond	subsecond	subsecond	subsecond	subsecond
IBM Lab Measurements, April 2001, October 2001			IBM Lab Measurements, April 2001, October 2001		

iSeries improved scalability 85 - 91%

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Summary

- Ensure WebSphere <u>server</u> is appropriate for workload
  - ▸ Focus on capacity planning and system tuning
- Ensure WebSphere <u>application</u> is tuned for performance
  - ▸ Follow 5 steps:
    - Step 1 - System Level Optimization for WebSphere
    - Step 2 - Optimize Java Environment
    - Step 3 - Tune WebSphere
    - Step 4 - Analyze and tune application code
    - Step 5 - Load and/or stress testing to prove the expected benefit
  - ▸ Utilize the tools available on iSeries
- iSeries provides excellent WebSphere performance
  - ▸ Throughput
  - ▸ Scalability
  - ▸ Response Time

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References...

- Workload Estimator
  - ▸ http://as400service.ibm.com/estimator
- WebSphere
  - ▸ iSeries
    - http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/
  - ▸ iSeries WebSphere Performance White Paper
    - http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/product/PerformanceConsiderations.html
  - ▸ PartnerWorld for Developers
    - http://www.iseries.ibm.com/developer/websphere
  - ▸ IBM WebSphere
    - http://www.software.ibm.com/webservers/
    - http://www.software.ibm.com/webservers/appserv
  - ▸ WebSphere White Papers
    - http://www.ibm.com/software/webservers/appserv/whitepapers.html

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...References...

IBM.

- iSeries Performance Tools
  - ► http://www.ibm.com/servers/eserver/iseries/perfmgmt/
- Redbooks/Redpapers/Redpieces
  - ► http://www.redbooks.ibm.com/
- iSeries
  - ► http://www.ibm.com/as400/infocenter
- iSeries 400 Web Programming Technology
  - ► http://www.iseries.ibm.com/ebusiness/
- WebSphere
  - ► http://www.iseries.ibm.com/websphere
  - ► http://www.iseries.ibm.com/developer/websphere
  - ► http://www.software.ibm.com/webservers/
  - ► http://www.software.ibm.com/webservers/appserv

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...References

IBM.

- VisualAge for Java
  - ► http://www.software.ibm.com/ad/vajava
- Java
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