



IBM Software Group | WebSphere Software

# WebSphere Application Server 管理密技與性能調校

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# WebSphere Application Server V7

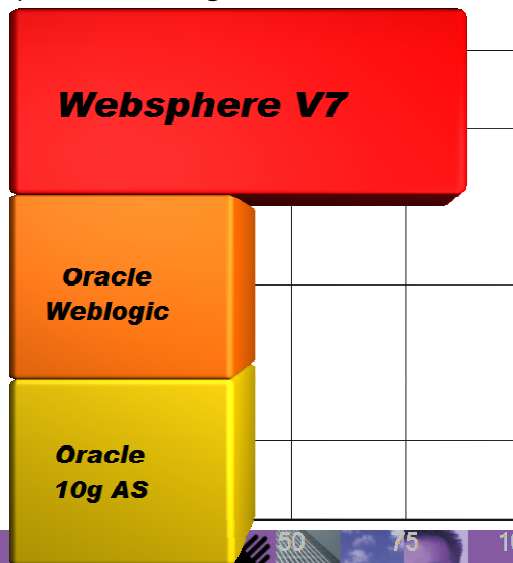
## *Performance Leader*

### SPECjAppServer2004

- ➔ Nearly 2x the performance per dollar than competition
- ➔ Strong leadership in head to head performance on identical hardware

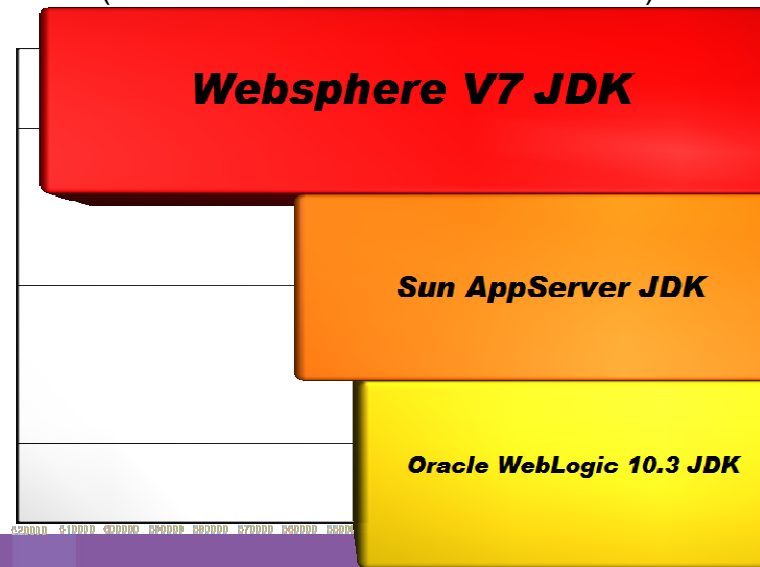
### SPECjAppServer2004 Performance

(Total Configuration Value Comparison)



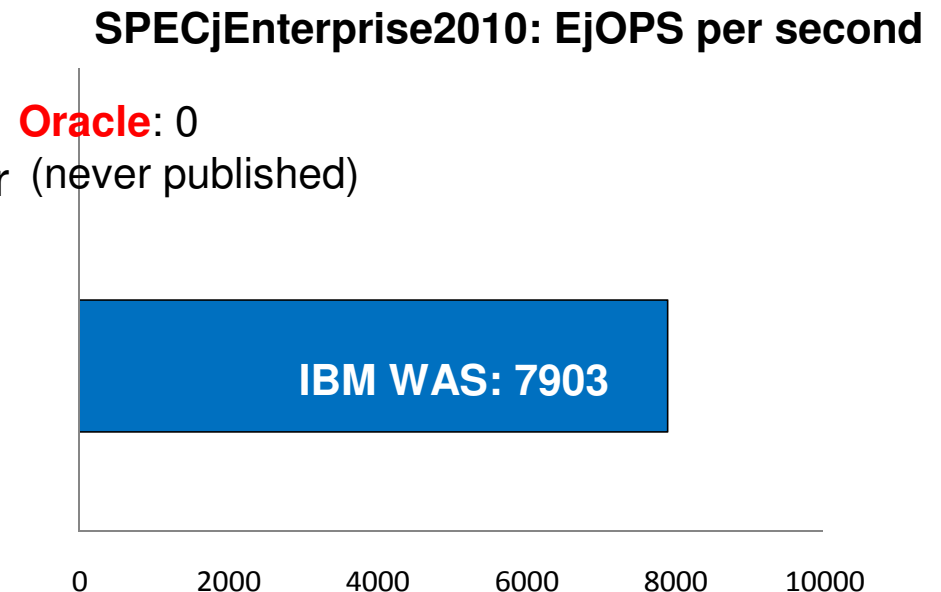
### SPECjBB2005 Performance

(Identical Hardware Performance)



# 10 Years of IBM WebSphere Performance Leadership

- **FIRST** to publish SPECj2001 & SPECj2002
- **FIRST** and **ONLY** company to publish SPECj2002 Distributed
- **FIRST** to publish SPECj2004
  - ▶ Was the only vendor to publish for over 13 months
  - ▶ **Held #1 spot for 60% of the time**
- **FIRST** to publish SPECjEnterprise2010 (JEE5)



Sources: <http://www.spec.org/jAppServer2004/results/jAppServer2004.html>

<http://www.spec.org/jEnterprise2010/results/jEnterprise2010.html>



# Power7 and WAS

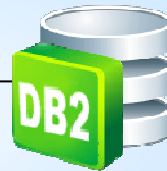
## Simplify Web Facing Application Deployment

### IBM WebSphere Application Server 7

1 JVM  
AIX TL4  
64 bit  
16 threads



IBM Power 750  
8 cores  
3.55GHz



**3920**

Transactions/sec

**73%** more work per JVM image

- ✓ Simpler configurations
- ✓ Better scale for software built on application server

### Competitive application server

1 JVM  
Windows  
64 bit  
16 threads



Nehalem EP  
8 cores



**2260**

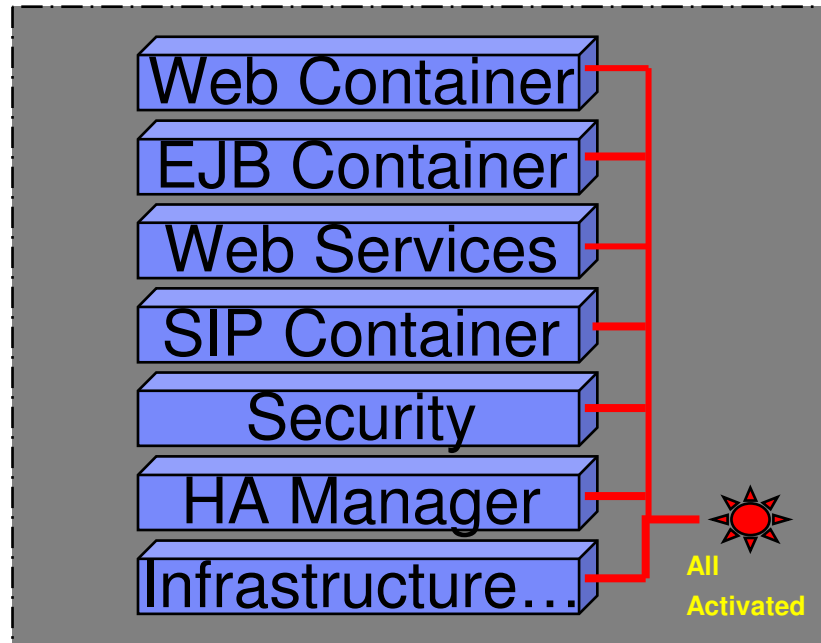
Transactions/sec



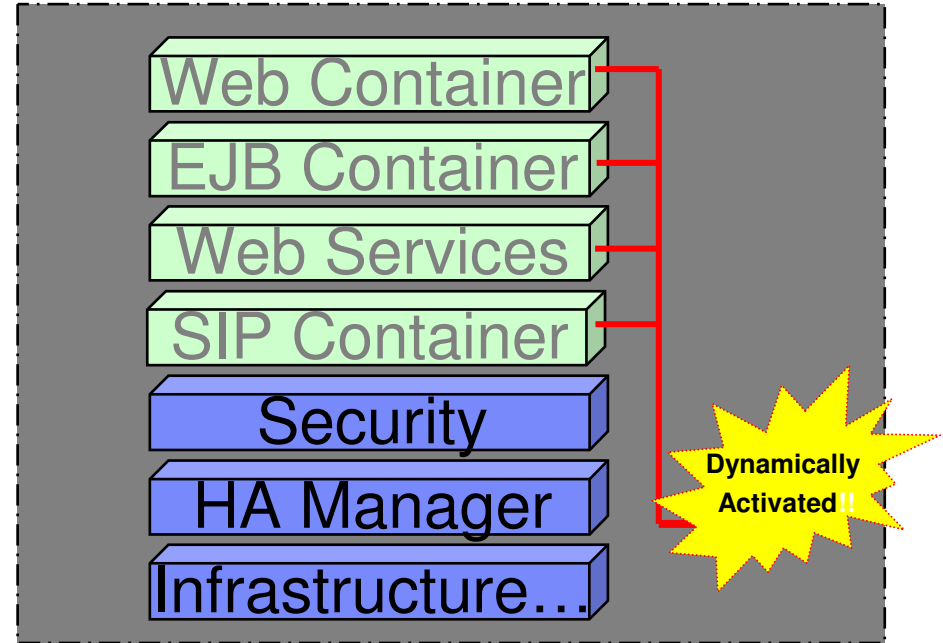
# Runtime Provisioning

Selects only the needed functions for memory and space efficiencies significantly reducing the application server footprint and start-up times

V6.1 Server

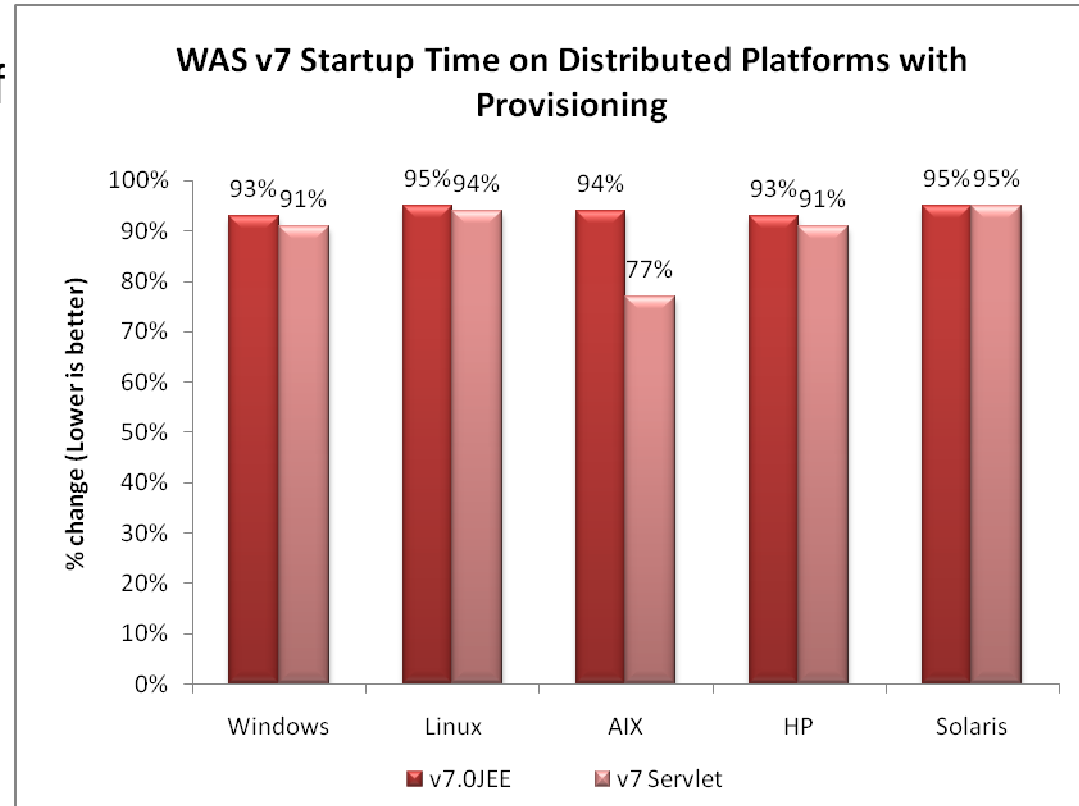


V7 Server



# WAS V7 Startup Times on Distributed Platforms with Provisioning On

- The chart shows comparison of provisioning on versus provisioning off in J2EE and Servlet scenario.
- Start-up time remained shows reduction across all the distributed platforms with provisioning enabled in the range of 5% to 23%.



**System Configuration**  
 Intel Xeon x365 (Prestonia), 4 x 3.00 GHz , Memory: 3.5 GB, L2: 512 KB per processor (WIN 2003 (32-bit))  
 Linux on PowerPC\_POWER6 15gb RAM - 4 proc - 9117-MMA ( SLES 10 sp2)  
 PowerPC\_POWER6 15gb RAM - 4 proc - 9117-MMA - AIX 5.3  
 8 x 1.6 ghz Intel Itanium 2 - 16gb ram - (HP-UX 11.31)  
 Solaris(t5220) SPARC-Enterprise-T5220 - 64 x 1.2ghz - 32gb ram - Solaris 10 8/07 s10s\_u4wos\_12b  
 SPARC 64 bit kernel

## WAS v7 Flexible Management

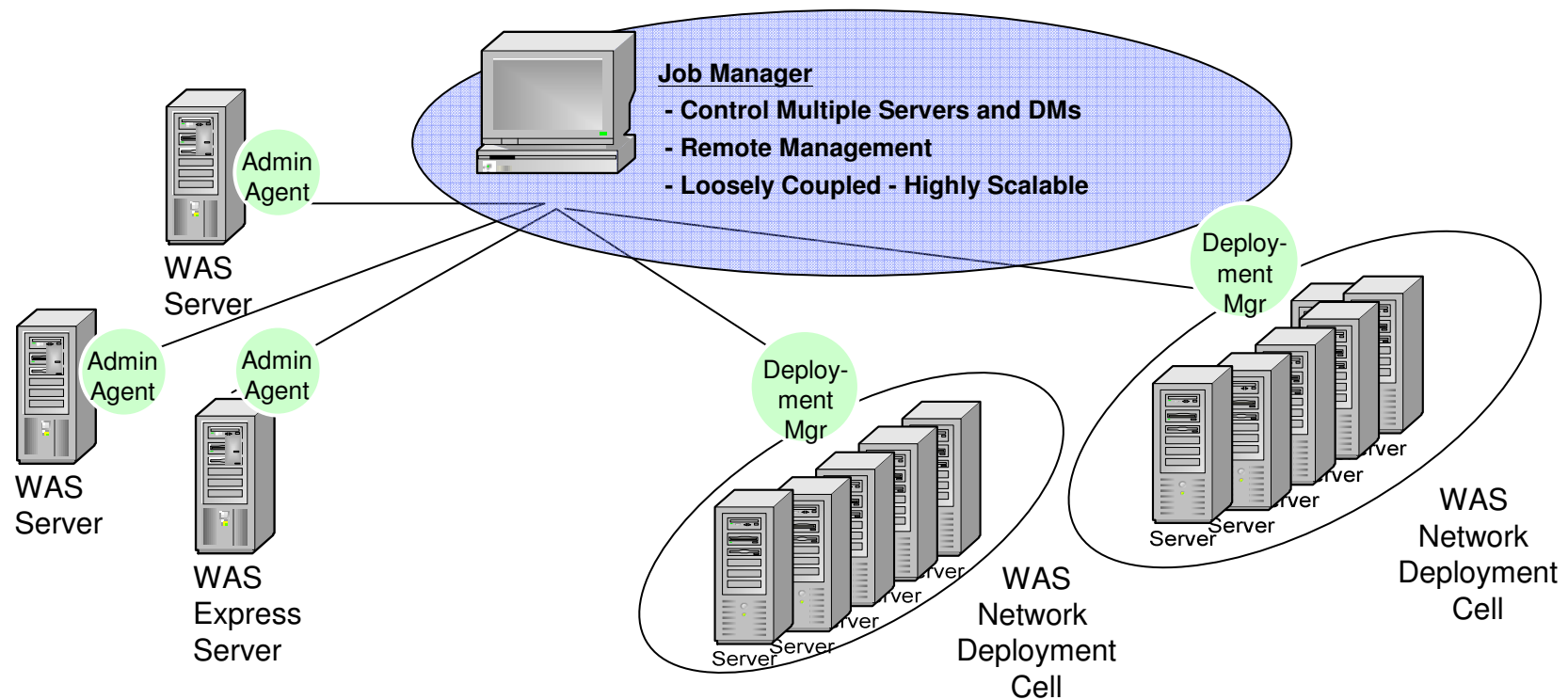
- Supports high latency remote branch servers
- Supports geographically separated data centers



# Flexible Management

For cost effective worldwide growth

- Job Manager for expanded central administration
- Central administration agent for WAS Express and Base



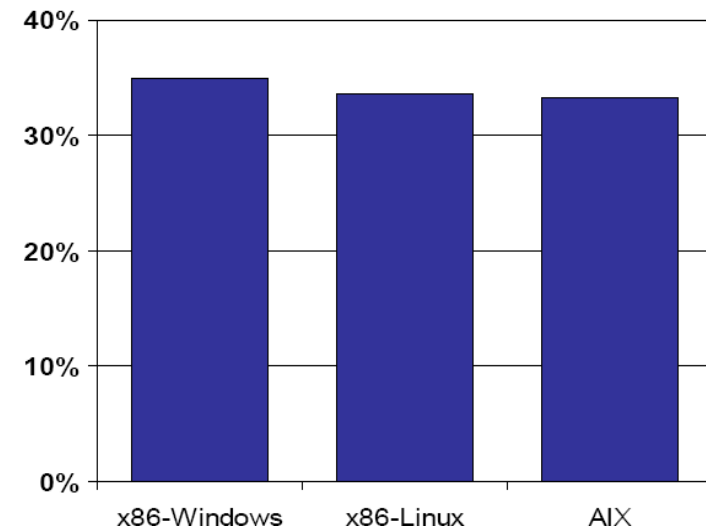


## Benefits of compressed references

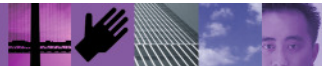
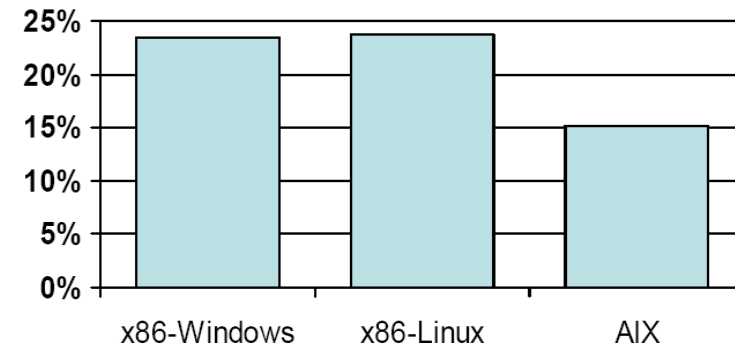
- Access to larger heap space than 32-bit environments
- Smaller heaps than 64-bit environments
- Overall throughput improvements
- More efficient heap utilization

Get **SMALLER**,  
Get **FASTER**

64 bit Footprint Reduction



64 bit Throughput Improvements



# What is the Cause of the Performance Problem?

Network?

Firewall?

Dispatcher?

HTTP sever?

Application server?

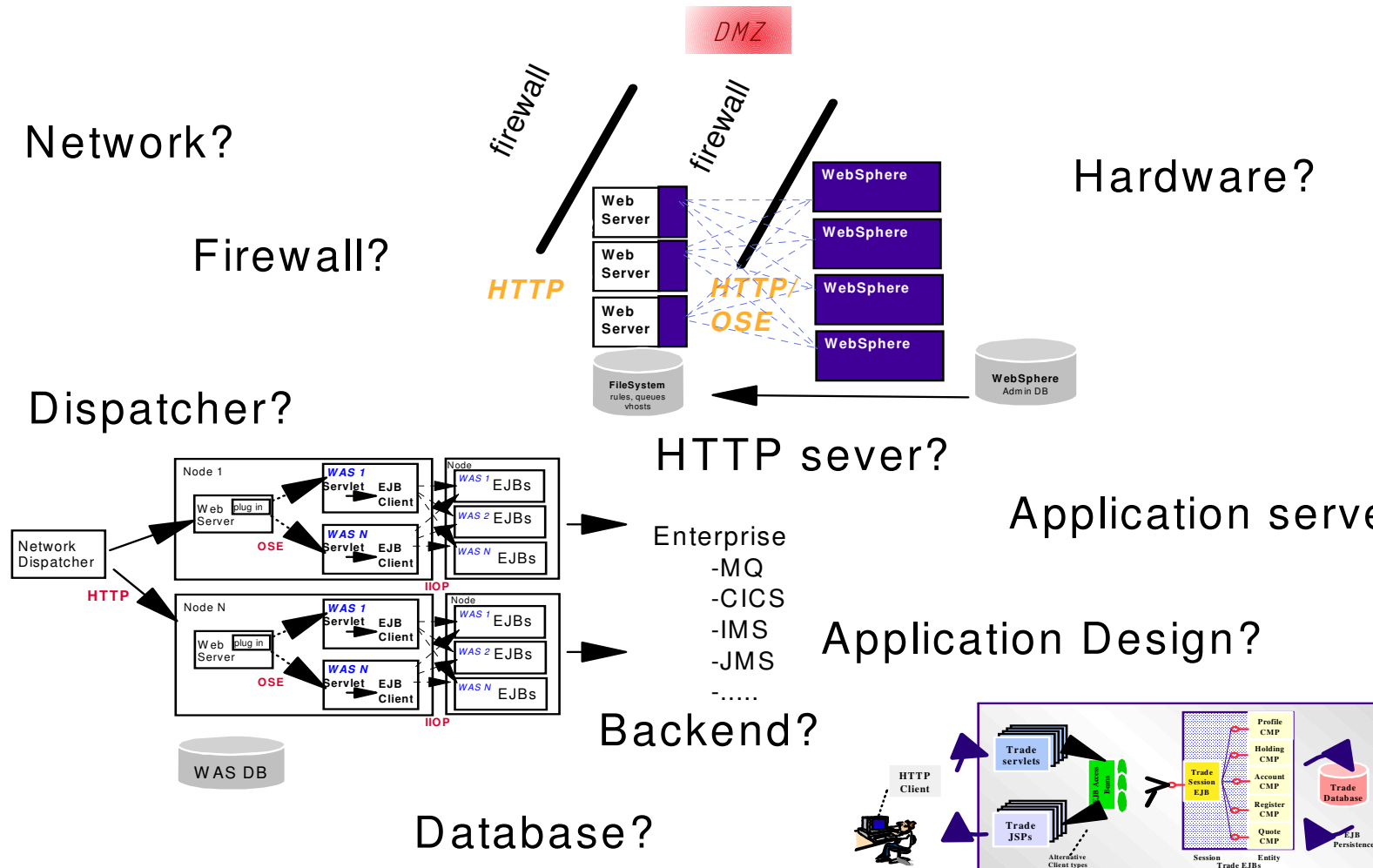
Application Design?

Backend?

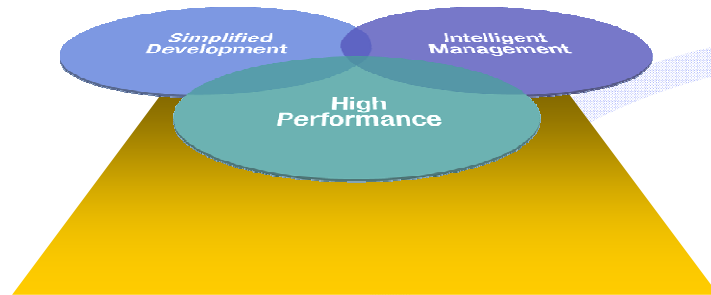
Database?

Scaling?

EJBs?



# Intelligent Solutions Tailored to Client Needs



**Tivoli Performance Viewer and Runtime Performance Advisor**



**WebSphere Virtual Enterprise**



**WebSphere Extreme Scale**



## Performance Monitoring Infrastructure (PMI)

- Server-side function that collects performance data from a running application server
- Performance data collected on
  - ▶ Customer's application resources
    - Example: Custom PMI, EJBs, Servlets/JSPs, Web Services, etc.
  - ▶ WebSphere run-time resources
    - Example: JVM memory, thread pools, database connection pools, etc.
  - ▶ System resources
    - Example: CPU usage, total free memory, etc.
  - ▶ Detailed list of all metrics listed in Information Center



# PMI Data Collection Metrics

- Organizes PMI metrics into categories
  - ▶ Basic – J2EE components, CPU usage, HTTP session info
  - ▶ Extended – Basic + additional WebSphere resources (WLM, Dynamic Cache, etc.)
  - ▶ Fine-grained control to enable/disable individual metrics
- Sequential update
  - ▶ Causes all PMI counters to be updated sequentially
  - ▶ Enabling adds additional overhead
  - ▶ If PMI is enabled after the server is started, the server needs to be restarted to start the PMI.

Statistic set	Description
None	All statistics are disabled.
Basic	Statistics specified in J2EE 1.4, as well as top statistics like CPU usage and live HTTP sessions are enabled. This set is enabled <i>out-of-the-box</i> and provides basic performance data about runtime and application components.
Extended	Basic set plus key statistics from various WebSphere Application Server components like WLM and Dynamic caching are enabled. This set provides detailed performance data about various runtime and application components.
All	All statistics are enabled.
Custom	Enable or disable statistics selectively.



# The Integrated Tivoli Performance Viewer

Tivoli Performance Viewer

**Tivoli Performance Viewer**

[Tivoli Performance Viewer](#) > **AppServer1**

The performance data for this server.

[More information about this page](#)

Refresh View Module(s)

- [-] AppServer1
  - [-] Advisor
  - [+] Settings
  - [+] Summary Reports
  - [-] Performance Modules
    - [+] DCS Statistics
    - [+] Dynamic Caching
    - [+]  JDBC Connection Pools
    - [+] HAManager
    - [+]  JCA Connection Pools
    - [+]  JVM Runtime
    - [+] Object Pool
    - [+] ORB
    - [+]  Servlet Session Manager
    - [+]  Thread Pools
    - [+]  Transaction Manager
    - [+]  Web Applications
    - [+] Workload Management

Start Logging

Statistics

- JVM Ru:Hea
- ◆ JVM Ru:Use

Time	JVM Ru:Hea (Value)	JVM Ru:Use (Value)
4:35:59 PM	50.0	45.0
4:37:08 PM	50.0	35.0
4:38:17 PM	50.0	40.0
4:39:26 PM	50.0	35.0
4:40:34 PM	50.0	35.0

Reset To Zero Clear Buffer View Table



# Runtime Performance Advisor (Performance and Diagnostic Advisor )

- SystemOut.log Example:

```
[4/2/04 15:50:26:406 EST] 6a83e321
TraceResponse W CWTUN0202W:
Increasing the Web Container thread
pool Maximum Size to 48
might improve performance.

Additional explanatory data follows.

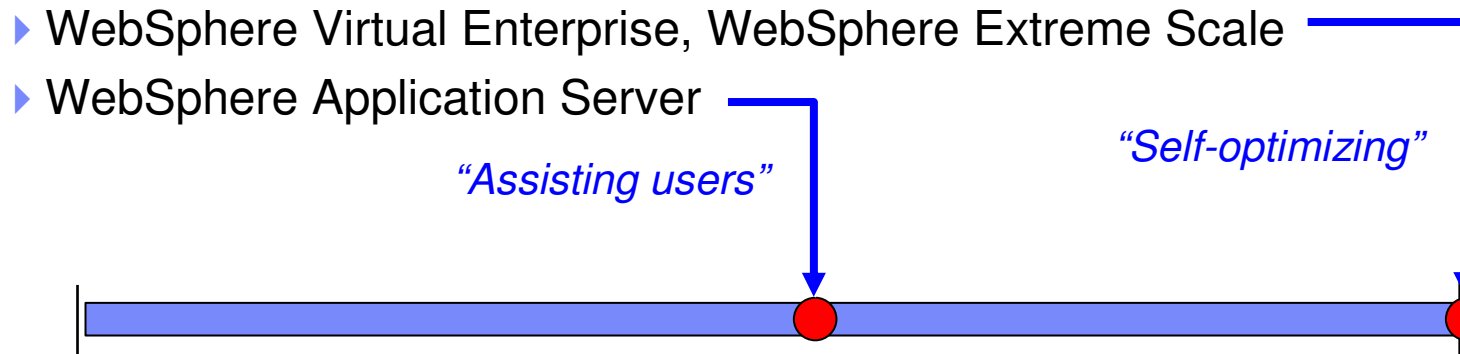
Average number of threads: 48.

Configured maximum pool size: 2.

This alert has been issued 1 time(s)
in a row.
The threshold will be updated to
reduce the
overhead of the analysis.
```



# Options for Self-Optimizing WebSphere



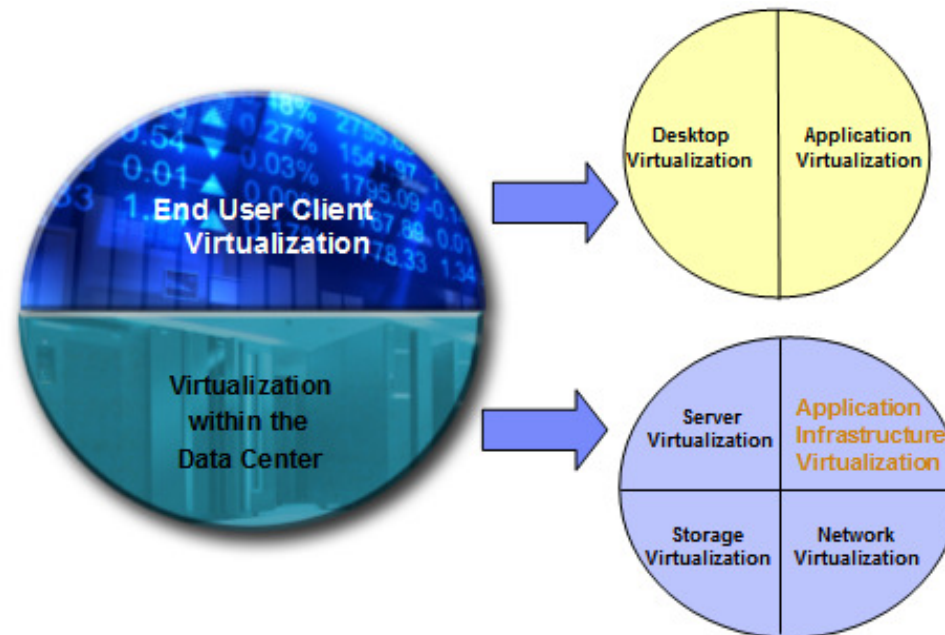
Level	1: Basic	2: Managed	3: Predictive	4: Adaptive	5: Autonomic
<b>Description</b>	Rely on reports, product and manual actions to manage IT components	Management software in place to provide facilitation and automation of IT tasks	Individual components and <b>systems management tools able to analyze and recommend actions</b>	IT components collectively able to monitor, analyze and take action with minimal human intervention	IT components collectively and <b>automatically managed by business rules and policies</b>
<b>Benefits</b>		Greater system awareness Improved productivity	Reduced dependency on deep skills <b>Faster/better decision making</b>	Balanced human/system interaction IT agility and resiliency	<b>Business policy drives IT management</b> Business agility and resiliency





## 什麼是應用程式架構虛擬化？

**WebSphere Virtual Enterprise (WVE)** – 應用程式架構可以根據使用者要求作優先排序，作智慧性的動態調整，並根據當時的使用狀況，彈性調度應用伺服器的資源，對於最重要的應用程式與使用者優先回應



# WVE功能



Title Search



Assess risk



Issue Title



Tax Records



Manage account

應用程式

## a. 伺服器整合(Server Consolidation)

- 動態工作量智慧調整

## b. 達到Service Level Management承諾

- 根據預先制定好的政策重要的交易服務優先被處理

## c. 應用程式多版本管理

- 不停機的程式版本部署
- 智慧型的應用程式版本管理政策制定

## d. 自我健康管理

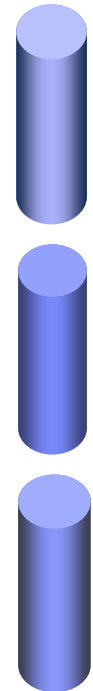
- 可自行監控應用程式效能並作調整
- 當應用伺服器發生問題可自行診斷並立即啟動恢復程序完全不用人為介入

## e. 中介軟體管理平台

- 可針對其他廠牌應用伺服器如 WebLogic, TomCat, JBoss 等提供工作量動態調整功能



伺服器資源



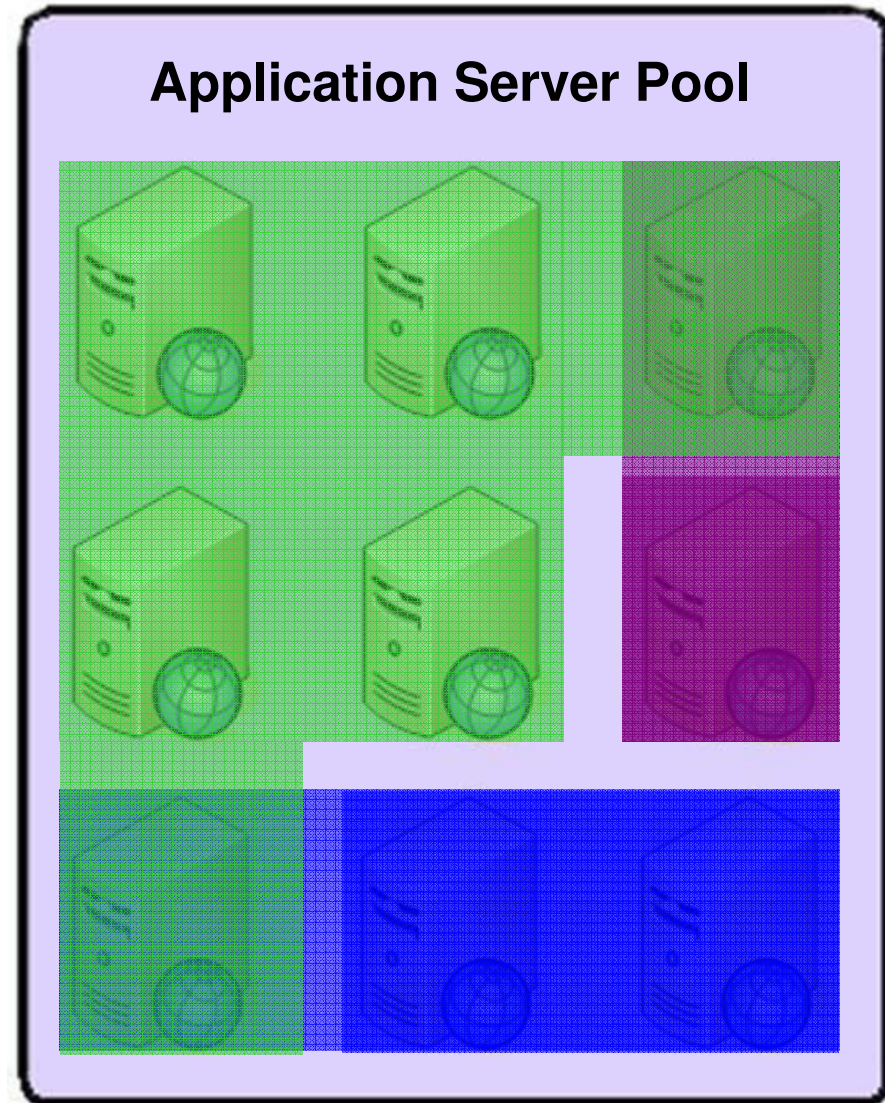
各式資料來源



## Ensures SLAs are met

Application Name	Priority	Avg. CPU Utilization
房貸系統	High	60%
信用卡系統	Medium	25%
存提系統	Low	36%

假設 #1:  
房貸利率宣佈調降



\* Hypothetical, for illustrative purposes

## WVE效益說明

### 幫助企業節省成本-35家以上企業訪談評估的結果

- 硬體成本節省約 25 ~ 40%<sup>1</sup>
- 能源成本節省約 25 ~ 40%<sup>2</sup>
- 管理操作維護成本節省約 35 ~ 55%<sup>3</sup>
- 達到五個九的執行率(99.999% uptime)，將非預期的停機時間從一年263分鐘降低至5分鐘

[1] 伺服器整合(預計總體利用率達到40-60%)使硬體成本降低

[2] 能源成本與硬體成本相關且節省金額受限於下列因素如1) 特定伺服器硬體能源耗用率 2) 不同地區kwh成本

[3] 管理成本與組織全職人力成本息息相關(如節省多少人力, 未來人力聘僱節省成本). 計算基準為 32 hrs/year/server. 若計算 75% 伺服器台數以及保守估計使用 WebSphere Virtual Enterprise 可節省 50% 成本.



# Global Financing Institution

## ■ Background

- ▶ Stock trading applications
- ▶ Tax and settlement applications
- ▶ Internal operations applications (e.g. trouble tickets)

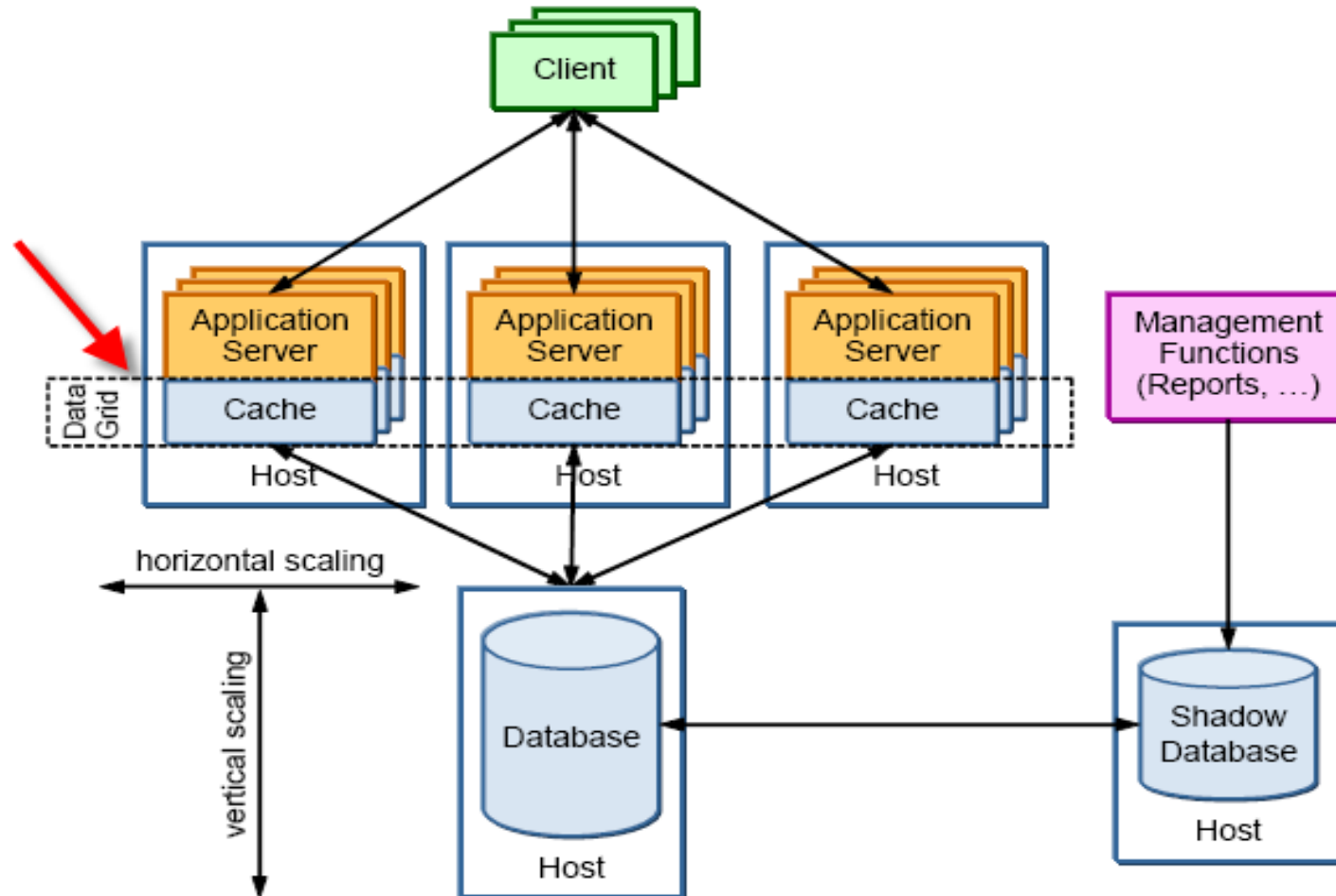
## ■ Challenges

- ▶ Consolidate servers and optimize hardware resources
- ▶ Ensure SLAs of applications are met
- ▶ Implement a chargeback system
- ▶ Increase availability of applications

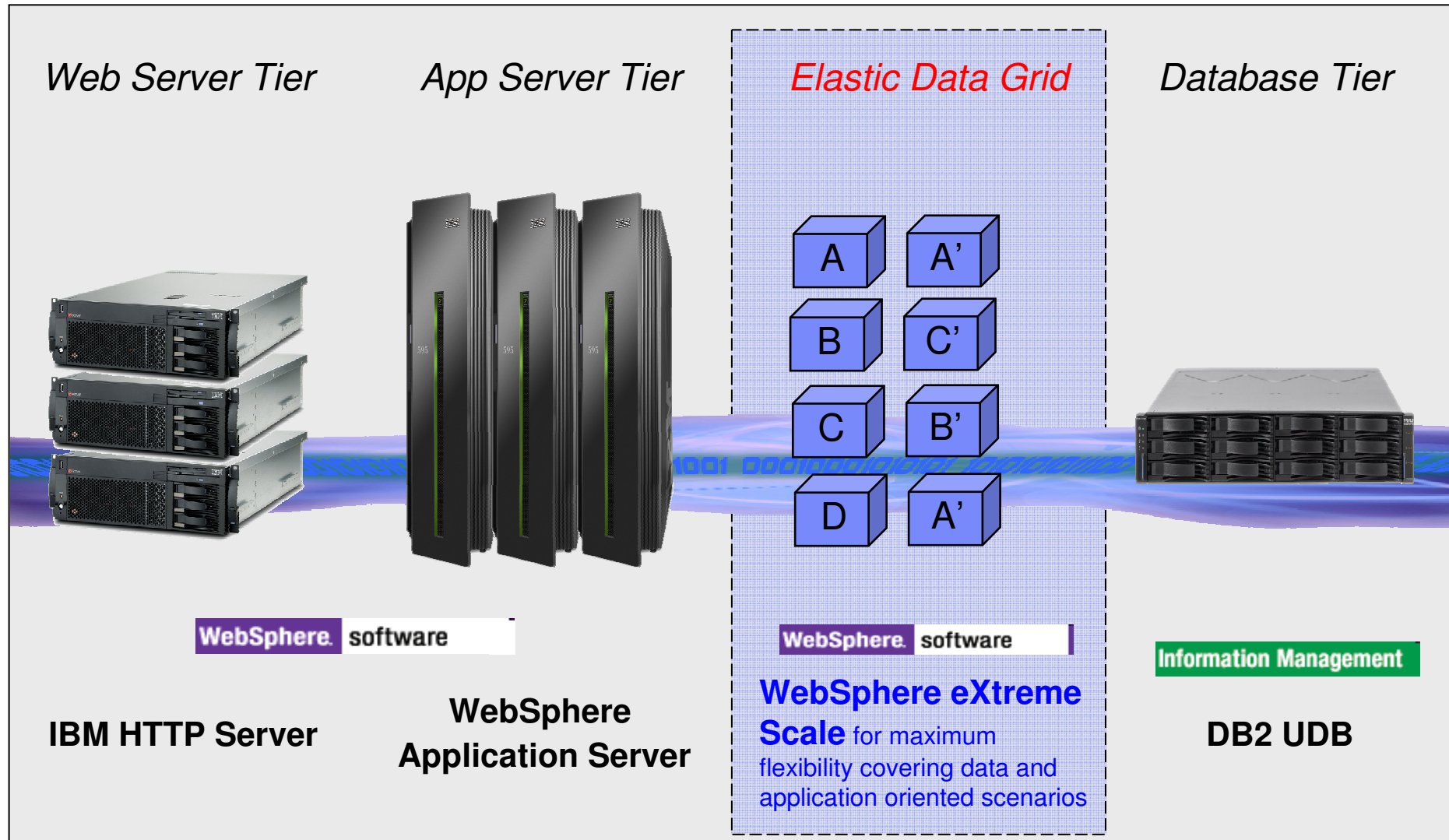
	Prior to Jan 2008	July 2008
Application Server	WAS ND 6.0	WAS ND 6.1
Virtualization, QoS & Management	N/A	Virtual Enterprise 6.1
# of Machines	32	14
Hardware	Mixed	Blades
Operating System	Windows	Linux
# of Applications	22	42+



# Caching and Scalability

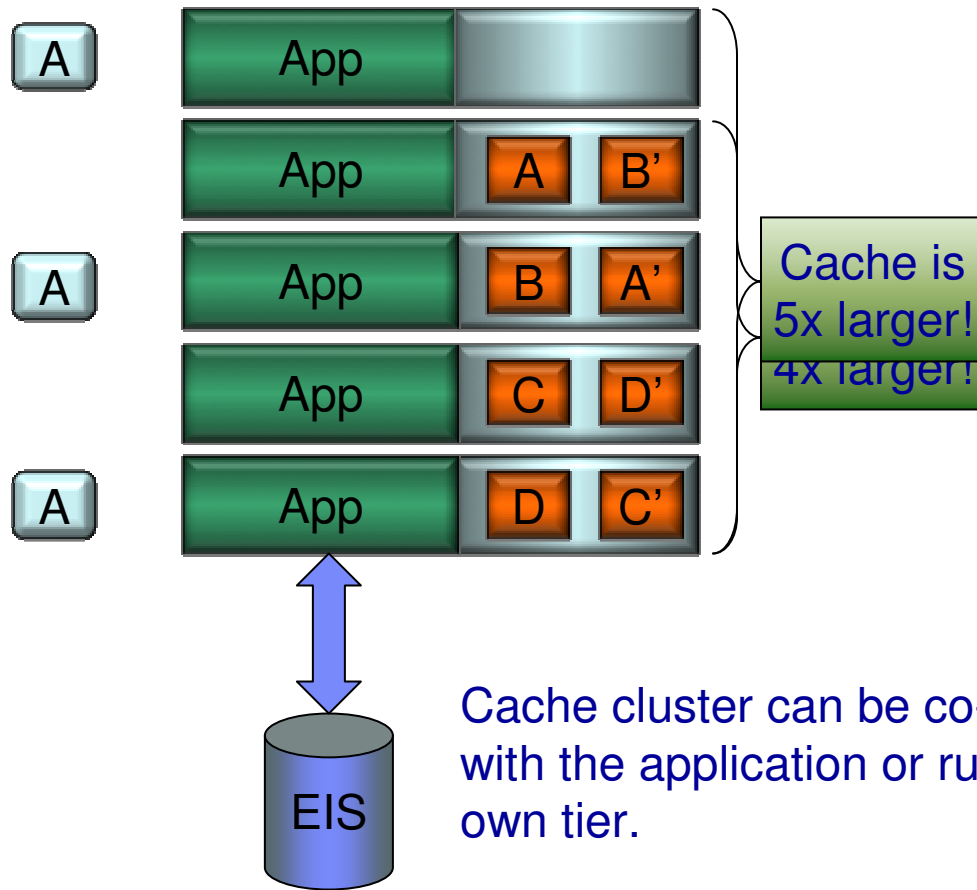


# Modern Application Infrastructure Topology



# WebSphere eXtreme Scale based Cache Operation

- Cluster Coherent cache
- Cache capacity determined by cluster size, not individual JVM Size
- No invalidation chatter
- Cache request handling handled by entire cluster and is linearly scalable
- Load on EIS is lower
- No cold start EIS spikes
- Predictable performance as load increases
- Cached data can be stored redundantly





# Extreme scalability is becoming extremely common

## Entertainment

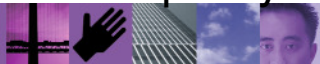
**5 Billion**  
requests per day

**10x**  
reduced  
response  
times

### Fantasy sports web infrastructure

- ▶ **Before:** 60ms response time against Database
- ▶ **After:** WXS improved to 6ms response time
- ▶ 450k concurrent users
- ▶ 80k requests per second up to 1M in 2011
- ▶ 6 weeks from concept to production

- Support transaction-intensive services
- Deliver consistent & predictable response times
- Take action on growing volumes of business events
- Scale with simplicity and lower cost



## Summary

- WebSphere provides many tools to assist in tracking down performance problems
- WAS embedded Tivoli Performance Viewer (TPV) and runtime performance advisor allows you to visualize and analyze performance data with advice.
- WebSphere Virtual Enterprise provides features like policy based workload management, application health management, application edition management, and so on.
- WebSphere Extreme Scale improve performance by getting data close to the transaction that needs it.

