Right Fit Platform Selection

The future runs on System z

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Topics for today's discussion

- **Selecting a Platform and Total Cost of Ownership**
- **Deployment Options**
- **System z Concepts and Proximity Advantages**
- **Why System z as a Deployment Option**

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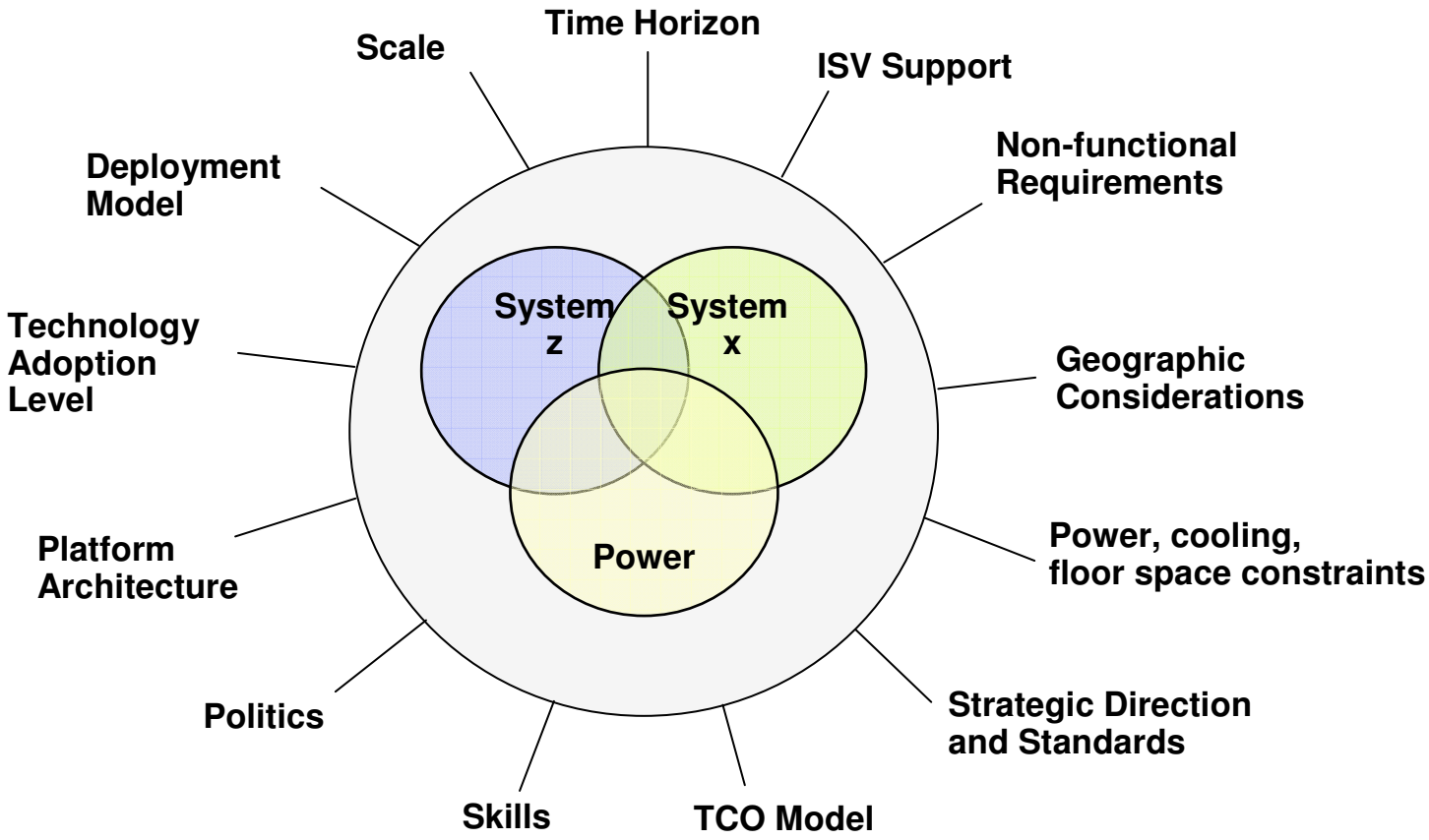
Selecting a Platform



There are many factors that influence platform selection making it difficult to develop a simple platform selection matrix

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How do companies select a platform for their applications?

- **First question is**
  - "Will it run there?"
- **Second question is**
  - "How much does the hardware cost?"
- **Done!**
- **But this is just a TCA view……Is that all we should be thinking about?**

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What did we miss? Non-Functional requirements

- **Shouldn't they have asked some questions about:**
  - Scalability? Availability? Backup? Site Disaster Recovery?
  - Security? Reliability? Data Integrity? Maintainability?
  - Volumes and Service Levels?
  - Space? Power? Cooling?
  - Operations? Scheduling? Monitoring? Server Management?
  - Integration? Performance and Value of Data Proximity?

- **That leads us to a more complete TCO view?**

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A full range of TCO factors considerations – *often ignored*

- ***Availability***
  - High availability
  - Hours of operation
- ***Backup / Restore / Site Recovery***
  - Backup
  - Disaster Scenario
  - Restore
  - Effort for Complete Site Recovery
  - SAN effort
- ***Infrastructure Cost***
  - Space
  - Power
  - Network Infrastructure
  - Storage Infrastructure
- ***Additional development and implementation***
  - Investment for one platform – reproduction for others
- ***Controlling and Accounting***
  - Analyzing the systems
  - Cost
- ***Operations Effort***
  - Monitoring, Operating
  - Problem Determination
  - Server Management Tools
  - Integrated Server Management – Enterprise Wide
- ***Security***
  - Authentication / Authorization
  - User Administration
  - Data Security
  - Server and OS Security
  - RACF vs. other solutions
- ***Deployment and Support***
  - System Programming
    - Keeping consistent OS and SW Level
    - Database Effort
  - Middleware
    - SW Maintenance
    - SW Distribution (across firewall)
  - Application
    - Technology Upgrade
    - System Release change without interrupts
- ***Operating Concept***
  - Development of an operating procedure
  - Feasibility of the developed procedure
  - Automation
- ***Resource Utilization and Performance***
  - Mixed Workload / Batch
  - Resource Sharing
    - shared nothing vs. shared everything
  - Parallel Sysplex vs. Other Concepts
  - Response Time
  - Performance Management
  - Peak handling / scalability
- ***Integration***
  - Integrated Functionality vs. Functionality to be implemented (possibly with 3rd party tools)
  - Balanced System
  - Integration of / into Standards
- ***Further Availability Aspects***
  - Planned outages
  - Unplanned outages
  - Automated Take Over
  - Uninterrupted Take Over (especially for DB)
  - Workload Management across physical borders
  - Business continuity
  - Availability effects for other applications / projects
  - End User Service
  - End User Productivity
  - Virtualization
- ***Skills and Resources***
  - Personnel Education
  - Availability of Resources

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Total Cost of Ownership (TCO) Help Available from IBM

Total Cost of Ownership (TCO) Analysis Offering

- **Offered by Worldwide Software Group - zProject Office**
- **One week study focusing on TCO:**
  - Mainframe to distributed offloads
  - Distributed to mainframe consolidation
- **Study will produce a presentation showing:**
  - Alternative configurations
  - TCO analysis of configurations
- **Local SWITA and account team participation required**
- **Contact: csbender@us.ibm.com**

Scorpion Study

- **More detailed study of entire server environment**
- **Tim Eddy or Mark Stern**
- **IT Financial and Management Consultants**
- **Contact: timeddy@us.ibm.com or mestern@us.ibm.com**

Race

- **A TCO tool available to you to do platform TCO analysis and comparisons**
- **What IBM used to analyze our own ECM consolidation project and select applications/server to consolidate**
- **Terry Weinberg**
- **Contact: tlweinbe@us.ibm.com**

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WinterGreen Research ROI/TCO

Features and Benefits Analysis -- Calculate Value In the Context of Improved Return on Investment

Business Models Provide ROI Cost Analysis : SLA, EAI, Security, Scalalability, Hardware, Software, Labor, Networking, Infrastructure, Power, Floor Space, Training, Stack Integration

On Line Models Specific to Benefits
Comprehensive, personalized analysis
Analysis of one to many applications
Report to Management

WGR
WINTERGREEN RESEARCH

knowledge is power
Wintergreen Research

Contact: Susan Eustis 781-763-5078
info@wintergreenresearch.com

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Topics for today's discussion

- Selecting a Platform and Total Cost of Ownership
- **Deployment Options**
- System z Concepts and Proximity Advantages
- Why System z as a Deployment Option

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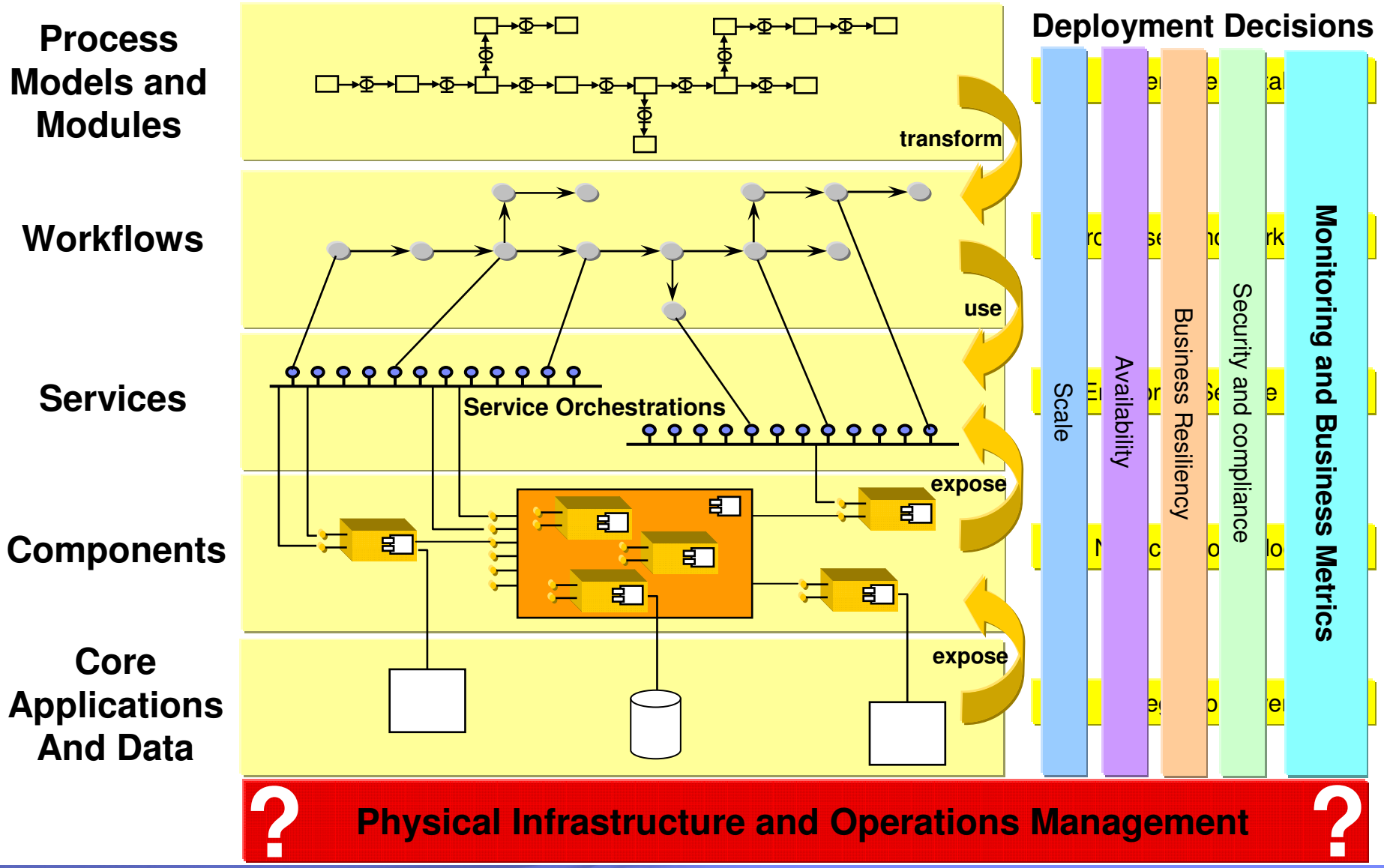
Building and deploying SOA applications



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Don’t all platforms allow you to take these issues into consideration?

Good question……Let’s see if we can find a good answer!

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The right ‘tool’…All of these tools can move a person from one place to another…real fast….

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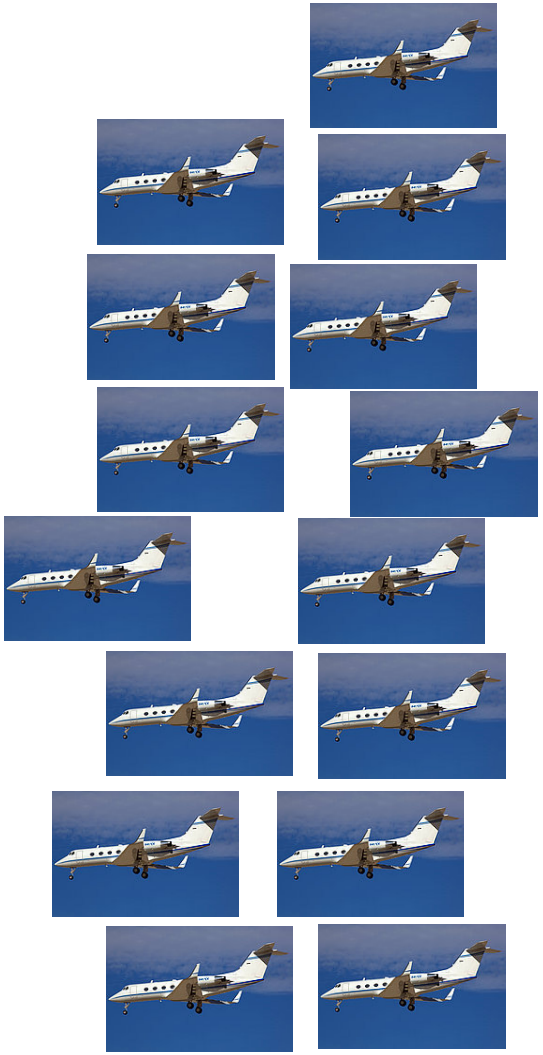
But…which is the right tool… to move 1 person? 100 people? 400 people?



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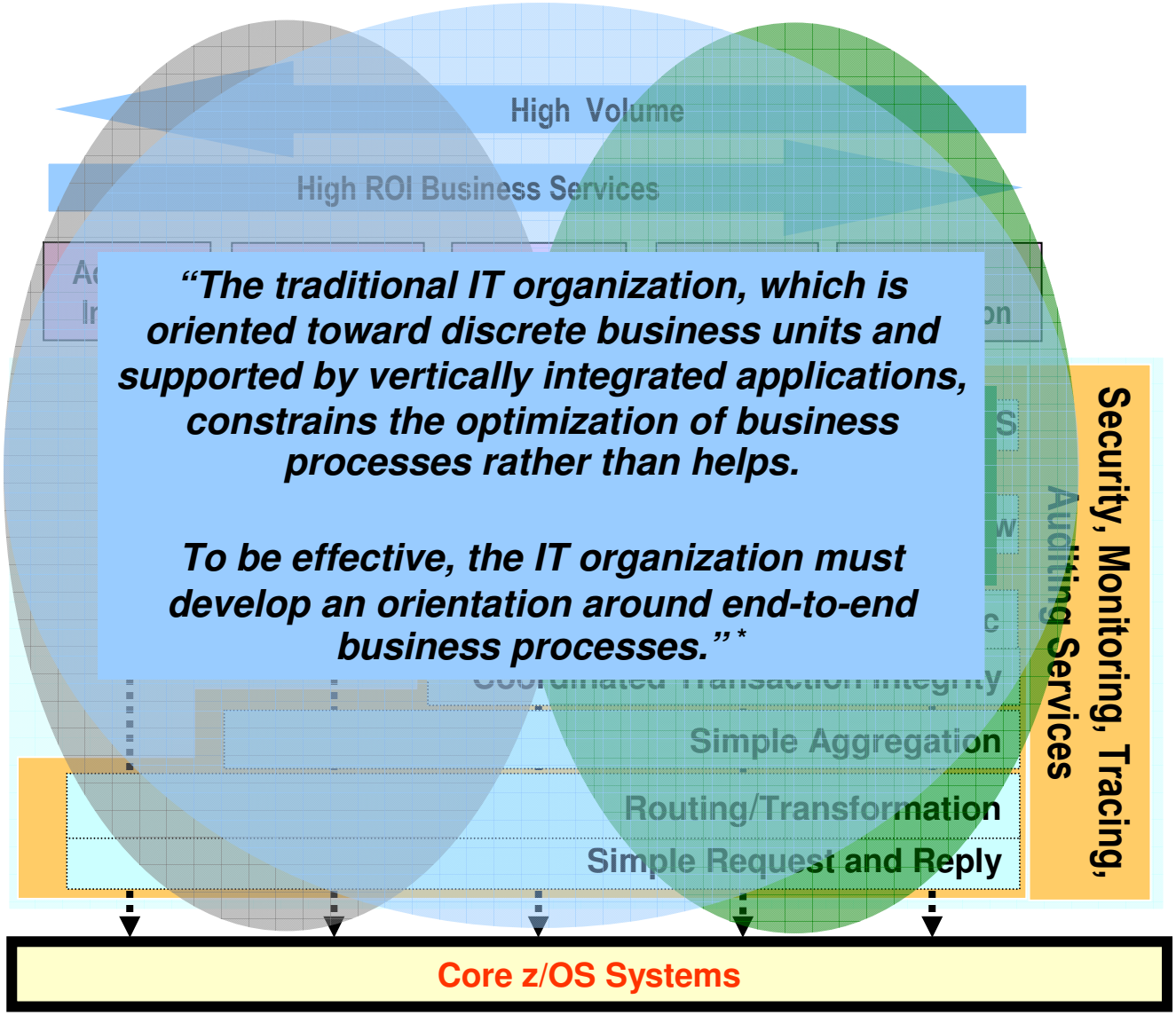
Deployment is dictated by business requirements



"The traditional IT organization, which is oriented toward discrete business units and supported by vertically integrated applications, constrains the optimization of business processes rather than helps.

To be effective, the IT organization must develop an orientation around end-to-end business processes."*

As the complexity of the business transaction increases (rightward movement) the workload becomes more targeted to a mainframe deployment:

- Need to handle complex transactions
- Ability to effectively monitor end-to-end transaction
- Rollback/compensate support
- Stringent security/isolation requirements
- Elimination of 3 tier latency (value of proximity to data)

* *Forrester Research, Inc, SOA Will Change How IT Works: IT Will Shift Its Focus From Discrete Business Units And Applications, May 31 2005*

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WAS Deployment Options

- **There are many application characteristics that lend themselves to different deployment options for optimal performance, cost and qualities of service.**
- **Most organizations have diverse application portfolios with multiple different characteristics and requirement mixes.**
- **Deploying the WAS runtime infrastructure on multiple diverse platforms provides the ultimate flexibility for proper application deployment for the best business benefit often referred to as “right fit”.**
- **The two page matrix that follows can be used to help map the application characteristics/requirements to the best platform for delivering those advantages.**
- **The beauty of WAS is that from a development, administration and application perspective WAS is the same across platforms providing ease of portability and reuse of skills.**
- **The differences are delivered by the platform on which WAS is deployed.**

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WAS Deployment Options Matrix Usage

- **On the following two charts "good" is good, "better" is a higher level than good and "best" is a higher level than better. "Better" is never better than "best". One could argue some of these assessments, as nothing is absolute, and a customer may want to make some changes in these assessments as is appropriate to their environment and the types of distributed servers they have (e.g. System p has significant advantages that other distributed servers may not possess.) In fact each application may require a slightly different assessment for some of the features/characteristics. In some cases you may also want to expand a feature/characteristic into multiple sub features/characteristics to increase the granularity for a certain application thus adding more rows to the matrix. For example you may want to break out the "Total Cost of Ownership (TCO)" characteristic into multiple items because your organization currently has a real focus on a particular cost item. Maybe you feel a feature/characteristic is not on the list and needs to be added to the matrix.**

- **Totaling the "bests" in the columns only shows the number of exclusives/advantages a platform exhibits it does not show application deployment leadership.**

- **To determine deployment one must map a specific application or business process against the application feature/characteristics column and determine if the feature/characteristic is or is not required in this case.**

- **Only consider the rows that are important or that matter for this application/business process and rank them in groupings of high, medium or low priority.**

- **You may want to substitute numerical values for the "good, better, best". For one feature/characteristic best may be 10, better may be 8 and good may be 7. For another best may be 10, better may be 4 and good may be 1, and so on. You might also want to put numerical weighting values on or within your rankings of the high, medium and low priority groupings of the features/characteristics by maybe assigning values from 10 to 7 for the highs, values from 6 to 4 for the mediums and values from 3 to 1 for the lows. Now you can apply the numerical weightings of high, medium, low to the numerical values of best, better, good for only those features/characteristics that matter for this application/business process and total them for each platform column.**

- **The results should not always be the final answer but should only be used as a general guide.**

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WAS Deployment Options

Feature/Characteristic	z/OS	Linux for System z	Distributed
Proximity/Integration with CICS,IMS,DB2	Best	Better	Good
Proximity with Distributed Data	Good	Best	Best
Homogeneous/Skewless/Predictable OLTP	Good	Good	Best
Heterogeneous/Skewed/Unpredictable OLTP	Best	Better	Good
Cloning Binaries for Upgrades/Maintenance	Good	Best	Good
Small Working Set	Good	Good	Best
Large Working Set	Best	Better	Good
Single Standalone Workloads	Good	Best	Best
Multiple Mixed Workloads	Best	Better	Good
Compute/Computational Intensive	Good	Good	Best
I/O Intensive	Best	Better	Good
Low I/O but Higher Ratio of Reads to Writes	Better	Better	Best
Low I/O but Higher Ratio of Writes to Reads	Best	Better	Good
Spikey or Chatty workloads	Best	Better	Good
Few Context Switches	Good	Good	Best
Lots of Context Switches	Best	Better	Good
Total Cost of Acquisition (TCA)	Good	Best	Better
Total Cost of Ownership (TCO)	Best	Better	Good
Disaster Recovery	Best	Better	Good

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WAS Deployment Options (continued)

Feature/Characteristic	z/OS	Linux for System z	Distributed
Multiple Workload Management	Best	Good	Good
Green Advantages of Power, Cooling, Floor Space	Best	Best	Good
Consolidation of Multiple Applications from Under Utilized Servers	Good	Best	Good
Speedy Deployment	Good	Best	Good
Test/Migration/Prototyping	Good	Best	Good
zAAP Offload	Best	N/A	N/A
FRCA Cache Performance	Best	N/A	N/A
Network Latency	Best	Better	Good
SLA Enforcement/Prioritization of Workload	Best	Better	Better with WVE
Dynamic Load Balancing	Best	Better	Better with WVE
Scalability of Users or Transaction Volumes	Best	Good	Good
High Availability	Best	Best	Better through clustering
Single Application Performance	Good	Good	Best
Higher Overall Throughput of Multiple Workloads	Best	Better	Good
Security and Cryptographic Capability	Best	Best	Good
2-Phase Commit	Best	Good	Good
Thread Management/Failover/Recovery	Best	Good	Good
Chargeback/Usage Reporting	Best	Better	Good

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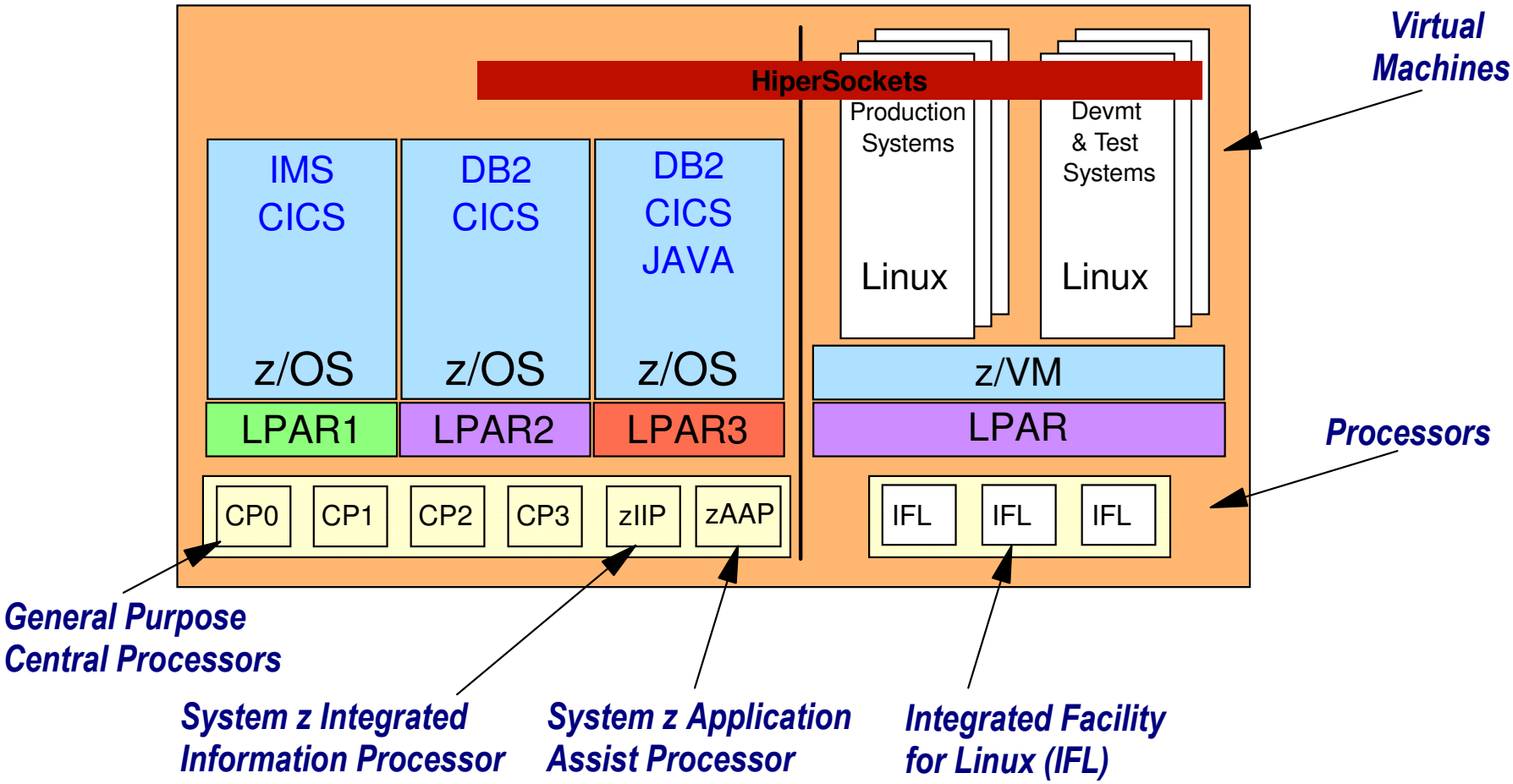
System z Concepts and Terms



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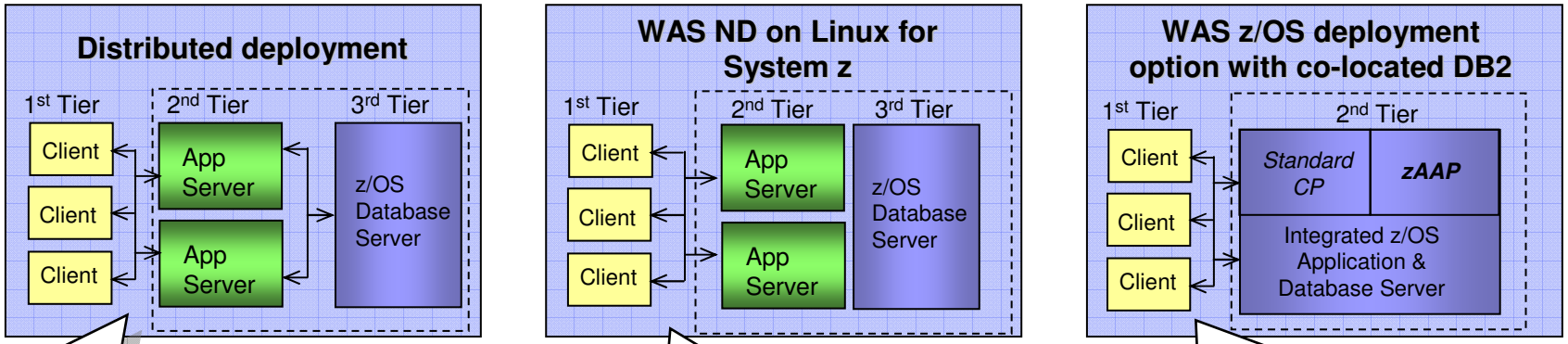
Platform Matters

WebSphere Deployment options



Typical distributed deployment with:

- Network layer between each tier
- Normal access to z/OS DB limited by the network overhead and processor speed

Typical distributed deployment on the mainframe with:

- Ability to use hipersockets for faster DB transactions
- Normal DB access

Unique configuration only for WAS z/OS with:

- Memory to memory transfer rates with DB (Type 2 connections) for high volume transfer rates
- Remove network layer and overhead

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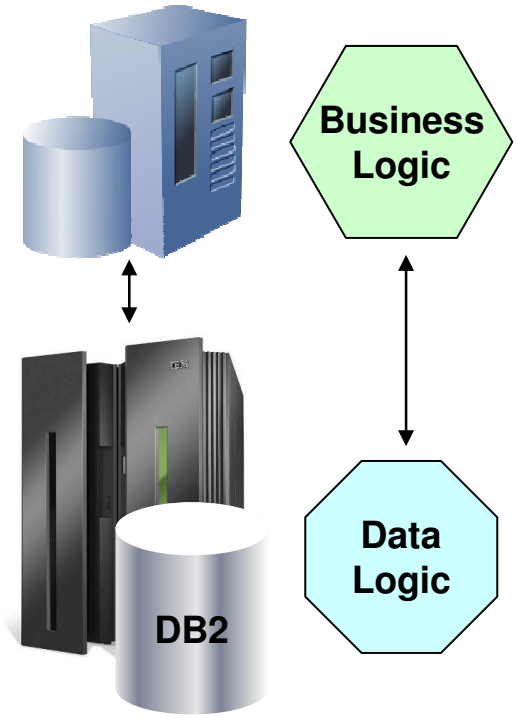
What happens when logic and data are separated?



- Objects are converted into byte array at the requester (CPU, time)
- **Network latency is incurred (time)**
- More latency is incurred as service is dispatched (CPU, time)
- Objects are reconstructed at the server (CPU, time)
- Requested data is retrieved
- Objects are converted into byte array at the server (CPU, time)
- **Network latency is incurred (time)**
- Objects are reconstructed at the requester (CPU, time)

Some other considerations:

  - Number of interactions between the tiers, volume of data passed
  - No local optimizations of the access protocol
  - Effect on server memory requirements due to locking

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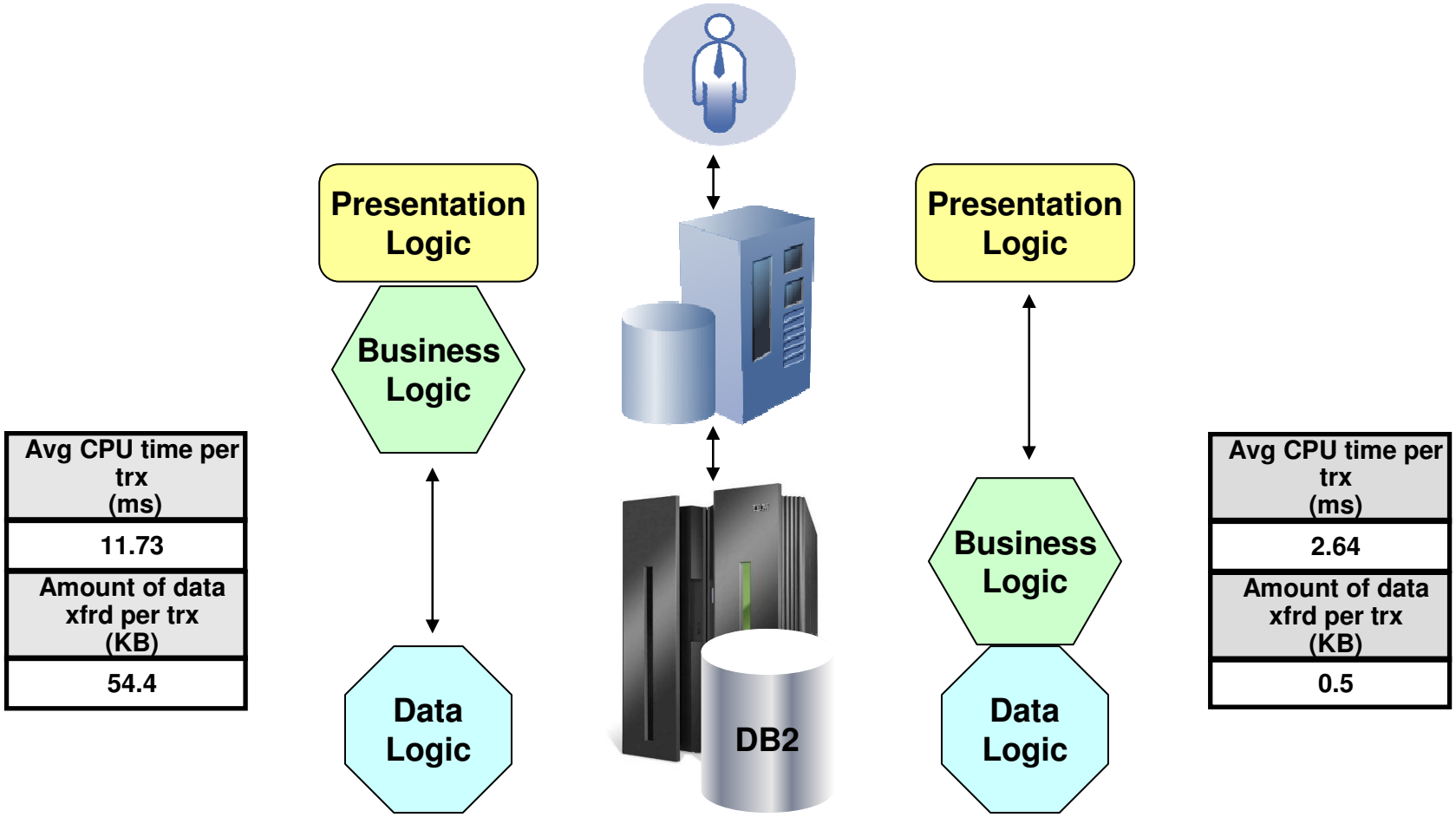
The value of proximity: transportation industry POC



- **Effect of refactoring business logic to be co-resident with z/OS data:**
  - Average CPU time per EJB transaction was reduced by over 77%
  - Number of bytes of data transferred per EJB transaction was reduced by 99%

http://www.ibm.com/support/techdocs, Optimizing WebSphere Performance on DB2, WP100558

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Application Characteristics that are optimal for System z

- Mixed workloads that require integration with other transactions or data (RRS, large L1 and L2 cache, Type 2 driver local calls)
- High volume, high transaction rates, large number of users, unpredictable web workload (WLM, IRD, On/Off CoD, HiperDispatch)
- Heavy I/O content, large amounts of data (High I/O bandwidth, large L1 and L2 cache, HW compression and sort assist)
- High availability requirement (What "z" stands for, redundancy, Parallel Sysplex, enhanced book availability, redundant I/O interconnect, online reorg)
- Bullet proof, rock solid security (SAF)
- High business resiliency and disaster recovery requirement (GDPS, ARM, CBU)
- Ability to scale near linearly (Parallel Sysplex, On/Off CoD, CUoD, CIU, HiperDispatch)
- Manage multiple heterogeneous applications and run them at higher server utilization (WLM, PR/SM virtualization, HiperDisPatch)
- Mission critical web application (most robust QoS)
- Application modernization exposing current applications to the web and exploiting SOA (HATS, connectors, WAS, Rational Developer for System z, WPS, WBSF)
- New J2EE applications with new expanded functionality and flexibility or which require integration with z/OS transactional or database subsystems (WAS, Hipersockets, RRS, Large 1MB Page Frame exploitation for managing Java Heap)
- SLA requirements (WLM)
- Server "sprawl" - Too many servers (Linux for System z, IFL, z/VM)
- Consolidation of "lots of low utilized servers" (Linux for System z, IFL, z/VM)
- Multi-tiered applications that require better performance or security (Linux for System z, IFL, z/VM, z/OS, Hipersockets)
- Cost reduction requirements (TCO, lower incremental costs, IFLs, zAAPs, zIIPs)
- Requirement for large encryption or SSL volume (CPACF, Crypto Express2, 18,000 SSL transactions per second, ICSF)
- Master workflow for horizontal integration (WPS)
- Sophisticated SOA applications that could benefit from collapsing multiple tiers and providing centralized administration, monitoring and logging (WAS, WPS, WBSF, WebSphere Portal Server, WMB, WSRR, DB2)
- System z is an excellent platform for deploying an Enterprise Service Bus infrastructure in support of applications and services across the enterprise (WESB, WMB)

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WebSphere on System z Options

A self managing server environment with the versatility and power to help integrate your business

Linux deployment: Distributed Consolidation

- ✓ Applications from multiple under utilized distributed servers
- ✓ Higher utilization than distributed servers
- ✓ Green advantages of power, cooling and floor space
- ✓ Implement multi-tier applications in a single System z for better data proximity exploiting hipersockets
- ✓ Lower TCO with IFLs
- ✓ Speedy deployment – cloning/server provisioning
- ✓ Higher QoS than distributed
- ✓ Less stringent requirements than z/OS deployment
- ✓ Alignment with distributed WebSphere family
- ✓ Unrivaled virtualization with centralized management
- ✓ No z/OS Skills
- ✓ Web Serving infrastructure consolidation
- ✓ Presentation Services
- ✓ Flexible, virtualized Test/Migration/Prototyping Platform
- ✓ ISV products not available on z/OS

Perfect for the System z customer requiring speedy deployment with less stringent QoS/integration requirements

z/OS deployment: Integration Option

- ✓ Highest QoS production environment
- ✓ Lower TCO with zAAPs
- ✓ Full exploitation of System z and z/OS
- ✓ Tight integration with DB2, CICS, IMS for chatty applications to eliminate network latency for best data and transactional proximity
- ✓ "Spikey", unpredictable workloads
- ✓ Service level agreement management
- ✓ Dynamic load balancing, prioritization
- ✓ Strict security requirements
- ✓ Highest availability, reliability, scalability
- ✓ Disaster recovery and autonomic function
- ✓ Dynamic I/O configuration
- ✓ Storage management
- ✓ Capability/tools to modernize and integrate existing System z applications
- ✓ Migrate applications from another platform that require additional scalability and integration

Perfect for the System z customer requiring high QoS and significant integration with CICS, IMS or DB2

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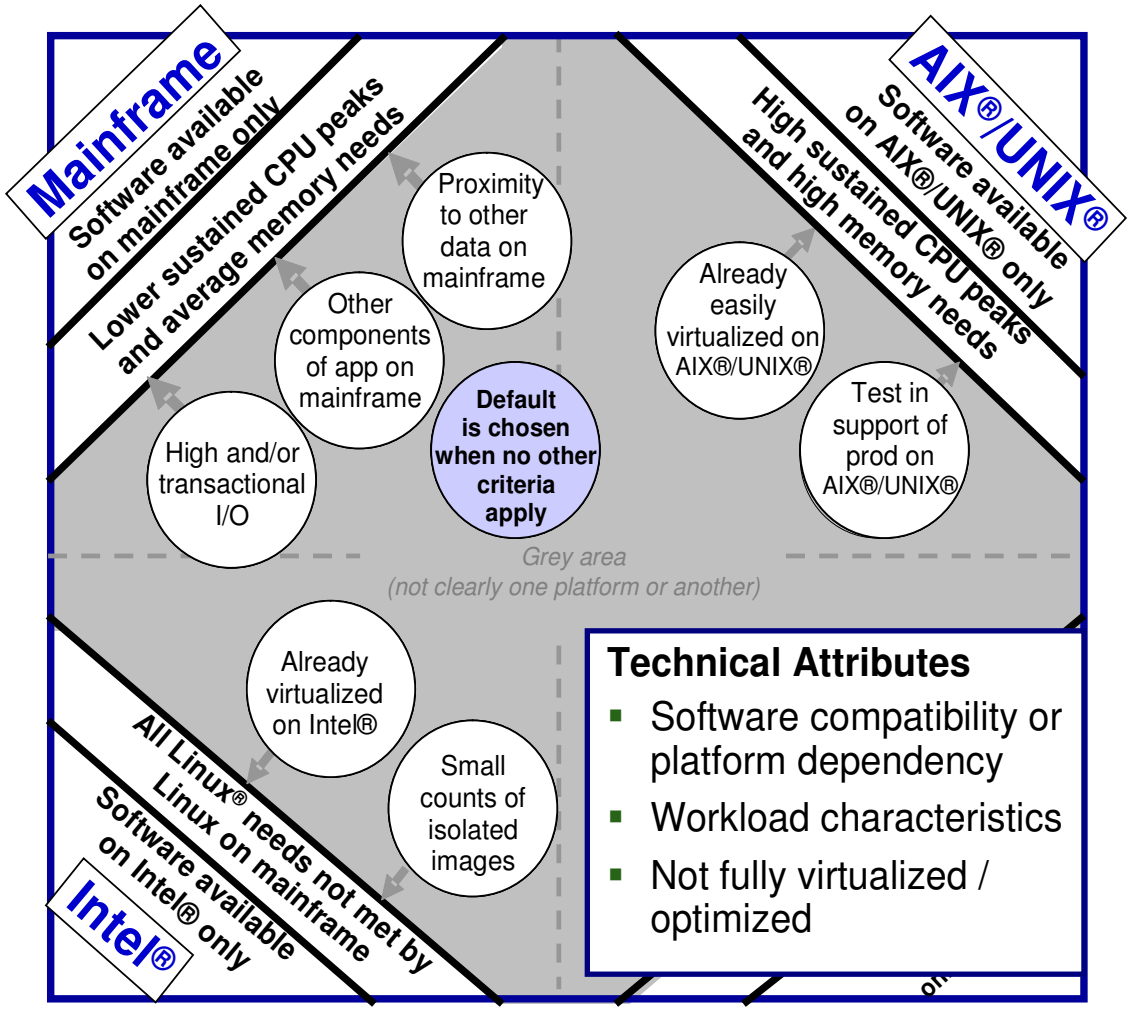
IBM's Consolidation Effort Evaluates Each Workload for Suitability Based on Technical Attributes

Priority Workloads for Consolidation:

- WebSphere® applications
- Domino® Applications
- Selected tools: Tivoli®, WebSphere® and internally developed
- WebSphere MQ
- DB2® Universal Database™



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SOA plays right into the strengths of System z

Reuse

Bulk of enterprise transactions and data reside on System z today as candidates for reuse (5X more expensive to rewrite)

Integration

True value of System z per its design point is the consolidation of multiple diverse applications that must interact with one another against a common data source (Only platform designed specifically for integration)

Flexibility

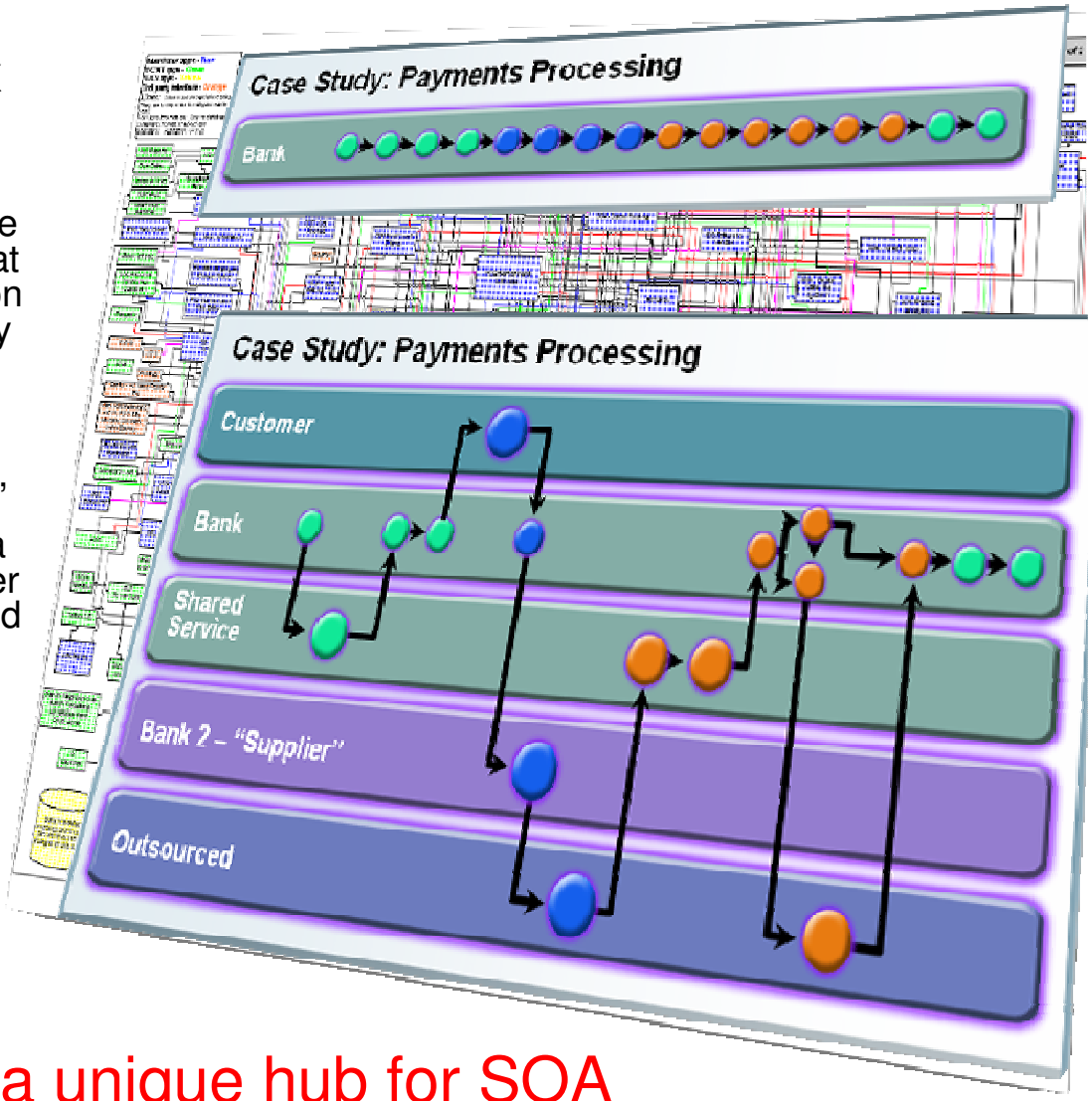
SOA is designed for change through standards, levels of abstraction and loosely bound, dynamically linked services choreographed in a workflow (System z is a great platform for master process flow with robust queue management and high I/O bandwidth for data movement)

Qualities of Service

System z has the highest levels of availability, reliability, security, scalability, WLM, systems management, disaster recovery

Proximity of Data

Local memory calls, integrated security, high performance, tighter integration, two phase commit, zAAP/zIIP engines for lower cost



System z: a unique hub for SOA

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WebSphere Application Server for z/OS®
Application Transparent z/OS Integration

Combining Industry Leading SOA Runtime and z/OS to Deliver Superior Customer Value

Integration with z/OS

- Workload Management - Leverages Workload Manager
- Security - Use of the Security Authorization Facility
- Transaction Management - uses Resource Recovery Services
- Thread Management - OS level threads for monitoring & control
- Scalability - Multiple Servant Regions
- Recovery - Leverages Automatic Restart Manager
- Reporting - System Management Facility
- zAAP Engines – Java Processing Offload

New with Version 7

- Reduced response time with support for FRCA
- Reduced overhead for High Availability Manager in a Sysplex
- Improved thread failover, recovery, reliability and performance
- Reduced overhead associated with collecting SMF records
- Improved resource usage reporting, esp. for zAAP utilization

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WAS on z/OS Exclusives/Differentiators

- **WebSphere Application Server on z/OS leverages z/OS, Parallel Sysplex and System z Hardware capabilities.**
- **Consequently WAS on z/OS has capabilities that are exclusive and not available when WAS is deployed in a distributed environment.**
- **These exclusives become differentiators that add to WAS functionality when deployed on z/OS.**
- **Exploiting these exclusives requires no changes to the application so from a development, administration and application perspective WAS is the same on z/OS as it is on other platforms providing ease of portability and reuse of skills.**
- **The differences are delivered by the platform on which WAS is deployed.**
- **The next two charts detail the WAS on z/OS exclusives/differentiators and list their advantages for performance/scalability, reliability/availability, security, manageability, total cost of ownership as well as distributed alternatives where they exist. Note that the distributed alternatives are not as functionally rich as the z/OS offerings.**

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WAS on z/OS Exclusives/Differentiators versus Distributed

WAS on z/OS Exclusives/Differentiators	Perf/ Scal	Rel/ Avail	Sec	Mgmt	TCO	Dist Alt
Server Architecture – CR/SR, multiple JVMs, Appl. Isolation	✓	✓		✓		WVE
WLM spawning servant regions/JVMs/Address Spaces	✓	✓		✓	✓	WVE
WLM queuing	✓	✓				WVE
Pull versus Push architecture for routing/balancing	✓	✓		✓		None
WLM routing/load balancing	✓	✓		✓		WVE
WLM classification/priorities – SLA enforcement guarantee	✓			✓		**WVE**
WLM stateful work placement	✓			✓		None
zAAP (Java) Offload					✓	None
zIIP Offload across LPARs					✓	Same
Resource Recovery Services (RRS) – 2-phase commit		✓		✓		XA
Automatic Restart Manager (ARM)		✓		✓		None
RACF/SAF interface security			✓			None
Type 2 local connector	✓	✓				None
WebSphere Optimized Local Connector (WOLA) to CICS/Batch	✓		✓	✓	✓	None
CTG adapter only – not need to run address space	✓	✓		✓		None
Fast Response Cache Accelerator (FRCA)	✓					None
Hung Thread Management/Failover/Recovery	✓	✓		✓		None
High Availability Manager – XCF instead of heartbeat	✓	✓		✓		Heart beat
SMF for Chargeback/Usage Reporting				✓		None
RMF for Monitoring				✓		None
SMP/E install				✓		None
zPMT/WCT				✓		None

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WAS on z/OS Exclusives/Differentiators versus Distributed (continued)

WAS on z/OS Exclusives/Differentiators	Perf/ Scal	Rel/ Avail	Sec	Mgmt	TCO	Dist Alt
Hipersockets between LPARs	✓		✓	✓	✓	None
Sysplex Distributor for TCP/IP routing	✓	✓		✓		None
Parallel Sysplex exploitation	✓	✓		✓		None
GDPS disaster recovery		✓		✓		None
Capacity Backup (CBU)		✓		✓	✓	None
On/Off Capacity on Demand (ooCoD)	✓					None
Cryptographic processors	✓		✓	✓	✓	None
System z10 hardware instructions for Java	✓					None
High I/O bandwidth	✓					None
Intelligent Resource Director (IRD)	✓	✓		✓		None
HiperDispatch	✓					None
GMT vs. local time for error log msgs/traces versus WTO				✓		None
Logging response failures and return exceptions		✓		✓		None
Dynamically changing trace routing – BUFFER, SYSPRINT, TRCFILE				✓		None
Message routing and output handling (convert WTO to DD)				✓		None
Spinning output stdout/stderr				✓		None
Display Command improvements				✓		None
Pause/Resume listeners		✓		✓		None
Servant Survivor – staying up during a timeout flurry	✓	✓		✓		None
Enclave propagation	✓	✓		✓		None
Handling large IIOP msgs in 64-bit mode	✓	✓		✓		None
Support for 120K+ HTTP clients	✓				✓	None

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DB2 Connect	Geographically Dispersed Parallel Sysplex	OMEGAMON*	System z9
DB2 Universal Database	HiperSockets	On demand business logo	SystemPac*
developerWorks*	Hiperspace	OS/390*	Tivoli*
DFSMSdfp	HyperSwap	Parallel Sysplex*	TotalStorage*
DFSMSdss	IBM*	PR/SM	Virtualization Engine
DFSMShsm	IBM eServer	Processor Resource/ Systems Manager	VTAM*
DFSMSrmm	IBM e(logo)server*	pSeries*	WebSphere*
DFSORT	IBM logo*	RACF*	z/Architecture
Domino*	IMS	RAMAC*	z/OS*
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