Enabling Agile Processes on zEnterprise

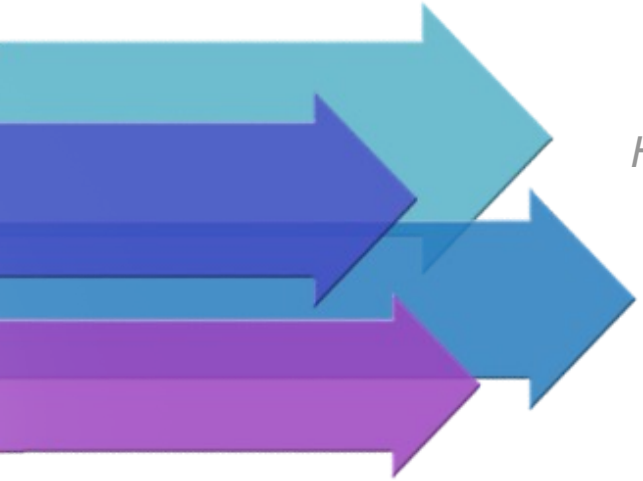
IBM BPM for z/OS

Date

Agenda

- ***Business processes and System z***
- A deeper look inside Business Process Management for z/OS
- Customer viewpoint

Business Process Management in 2011: Where Are We?



LOB and IT efforts are separate

How can we expand the scope of projects?

Improvements come one project at a time

How can we scale up from a project to a program?

Lacking leverage between projects

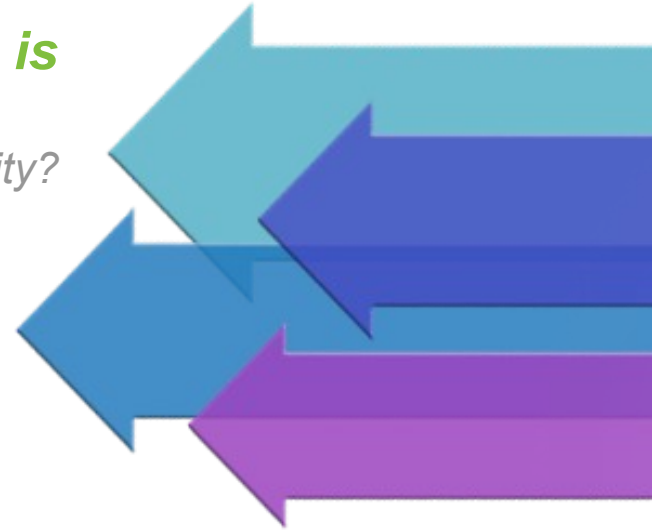
How can we maximize reuse?

Process Optimization is difficult

How can we get better visibility?

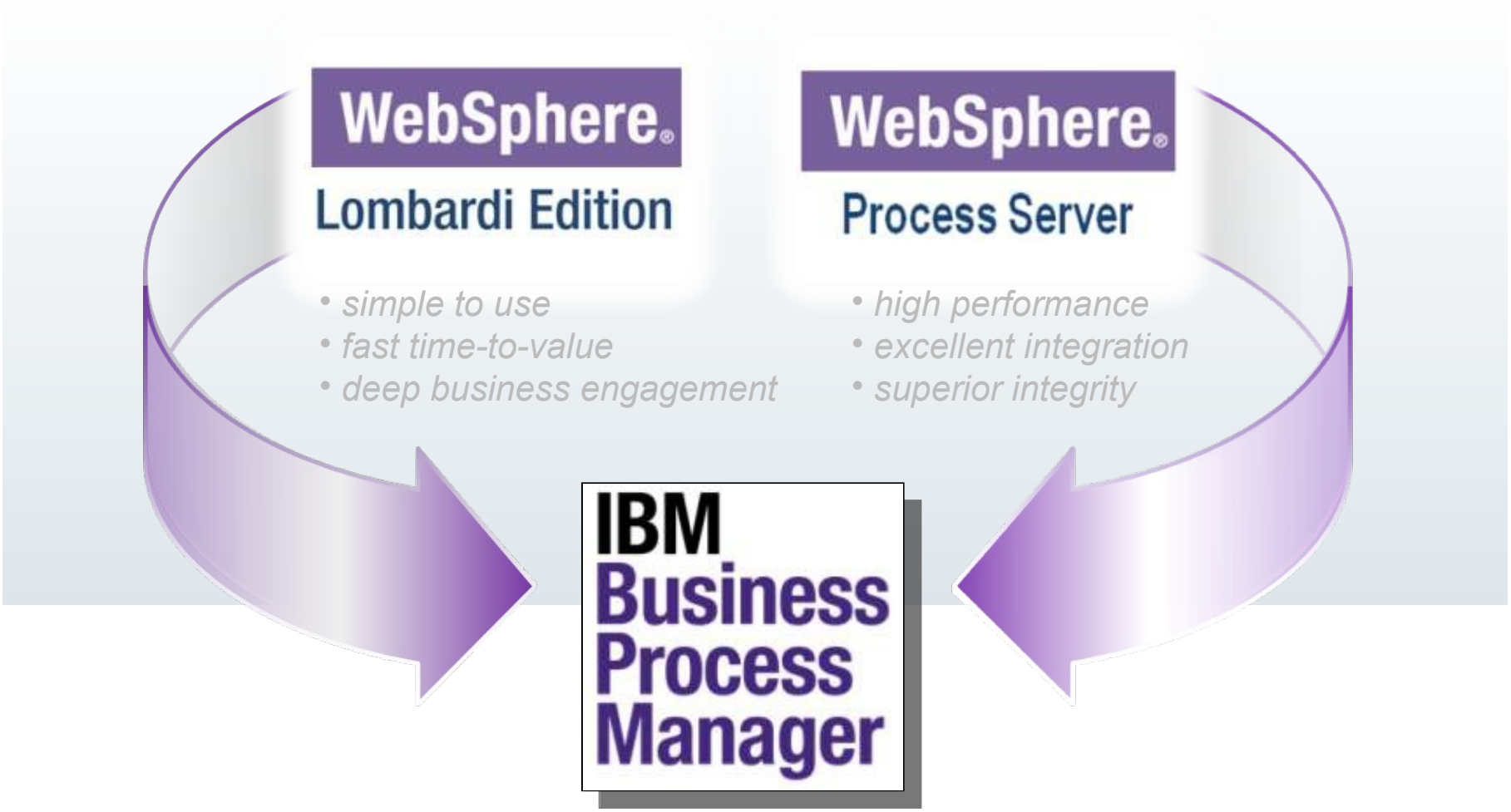
Rapid change is difficult to manage

How can we govern changes?



IBM Business Process Management in 2011:

Unifying two market-leading platforms



IBM Business Process Management for all platforms

Extend your core business processes powered by the strength of IBM zEnterprise

Extend your core business processes powered by the strength of IBM zEnterprise

Apply

***Apply** mainframe advantages when optimizing processes*

Simplify

***Simplify** operations by centralizing and visualizing process assets*

Unify

***Unify** process deployment & shared process services across z and non-z*

Enabling Agile Processes on zEnterprise

- ***Apply*** *mainframe advantages when optimizing processes*

Apply

- Resiliency through **workload management** & self-optimizing middleware platform
- **Co-location** with key applications & processes
- **Core runtime** environment provided by WAS
- **Core systems security** encompassing CICS, IMS, DB2, & MQ

Enabling Agile Processes on zEnterprise

- ***Simplify*** *operations by centralizing and visualizing process assets*

Simplify

- Process complexity through **high-performance** process automation, dynamic response & significant utilization rates
- **Control by streamlining** business applications for efficiency
- Operations through a single viewpoint that **centralizes process assets**

Enabling Agile Processes on zEnterprise

- ***Unify*** *process deployment and shared process services; extending and linking z and non-z processes*

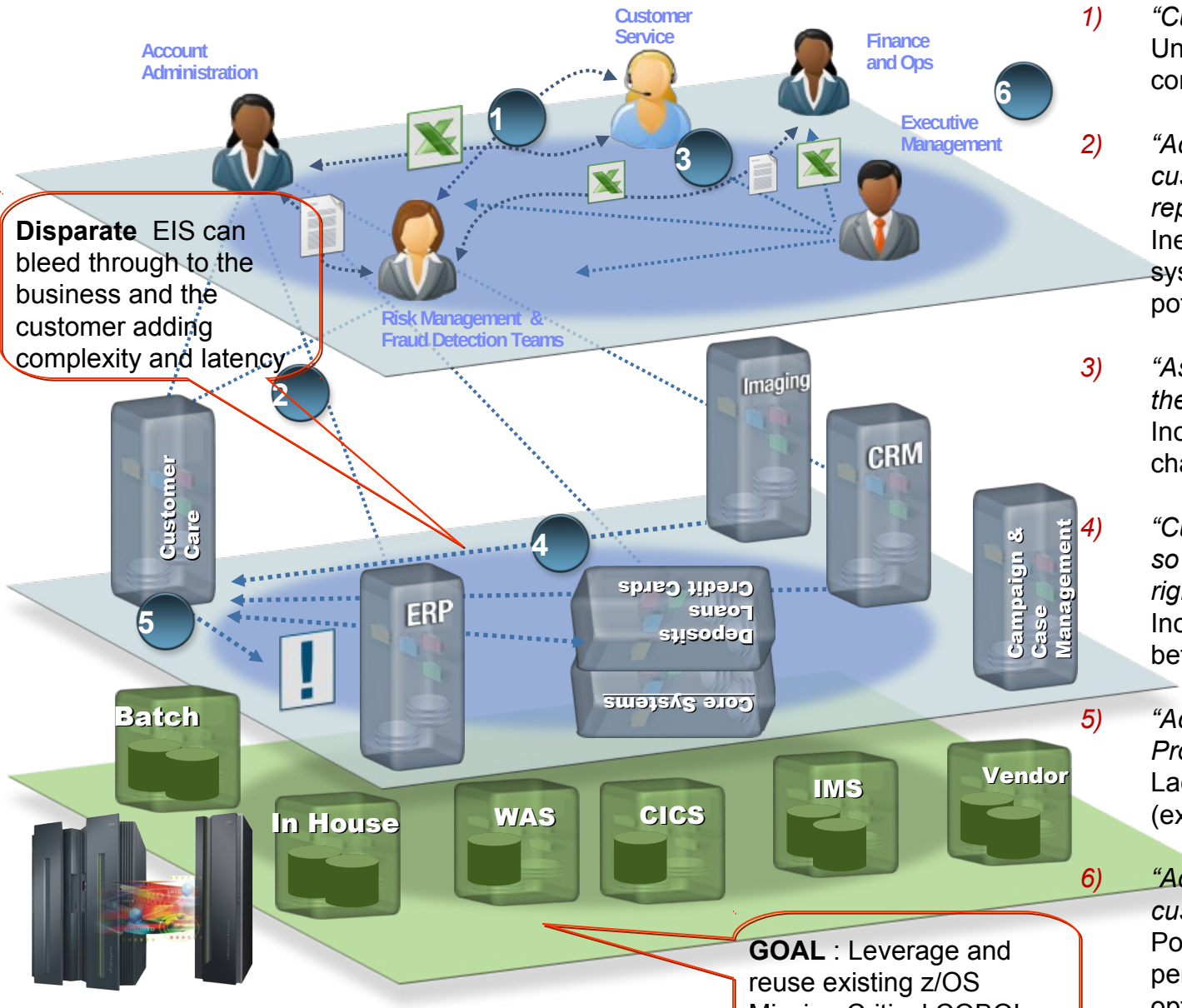
Unify

- **Shared and reusable** enterprise process services
- **Memory through WOLA**, providing high-speed cross-memory communications
- **IT/LOB alignment**, collaboration, governance and lifecycle management
- **Process deployment** across distributed and zEnterprise platforms

Extend your core business processes powered by the strength of IBM zEnterprise

- ***Apply*** *mainframe advantages when optimizing processes*
- ***Simplify*** *operations by centralizing and visualizing process assets*
- ***Unify*** *process deployment and shared process services*

Typical Process Problems in a System Z Environment



1) *"Customer initiates Account Opening"*
Unstructured tasks and communication slow the process

2) *"Account Opening Service retrieves customer/product data from repositories"*
Inefficient working environment spans systems, adversely affecting reuse potential

3) *"Assess financial risk associated with the customer for this account"*
Inconsistent prioritization, with rapid change being difficult to manage

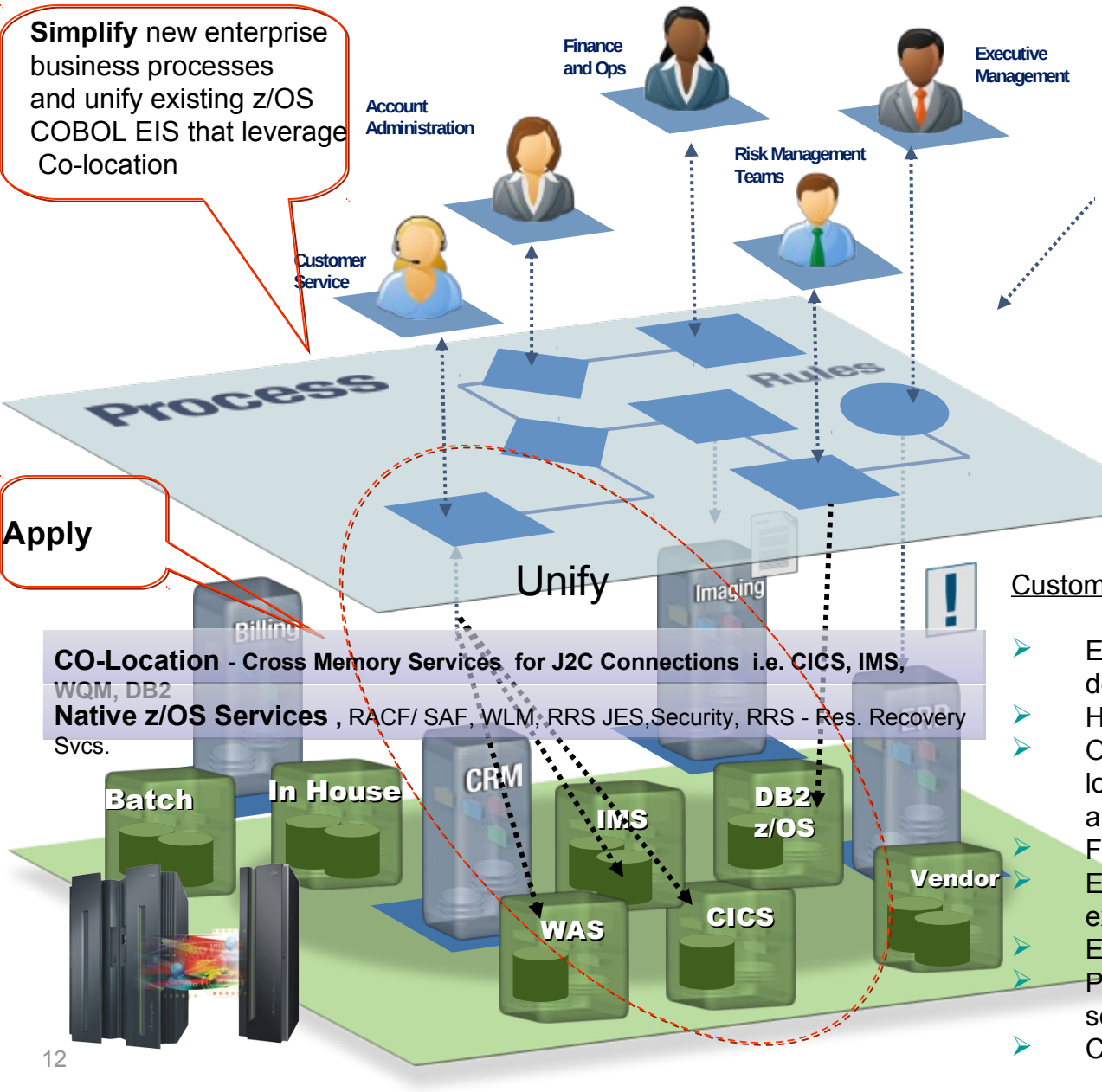
4) *"Customer Care process is triggered so that the bank staff can make the right decisions"*
Incomplete or inaccurate data flow between systems affects decisions

5) *"Account is created in the Product Processor"*
Lack of control over system & events (exception handling) slows processes

6) *"Account information returned to the customer"*
Poor visibility into process performance makes process optimization difficult

BPM on System Z Brings Order to the Chaos

Extract maximum business value from existing assets



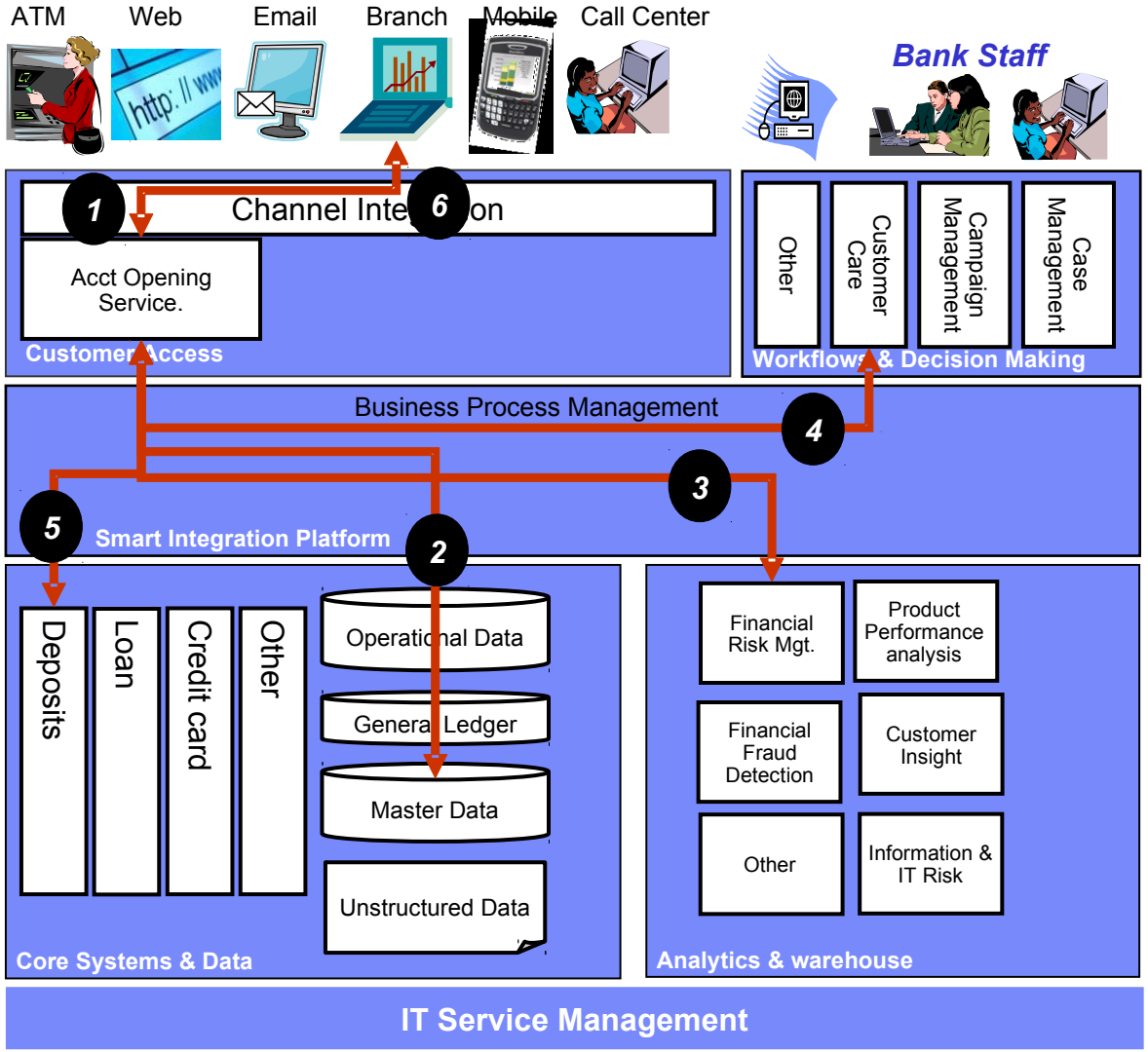
1) Automated workflow and decision making
2) Reduce errors and improve consistency
3) Standardize resolution across geographies
4) Leverage existing systems and data
5) Monitor for business events and initiate actions
6) Real-time visibility and process control

Customer Benefits:

- Ease of z/OS assets reuse with simplified design and specialized tooling
- Huge reduction in manual work & errors
- Optimization of z/OS resources through co-location of processes with z/OS data and applications
- Faster, more consistent issue resolution
- Enhanced usage of performance & process execution on z/OS platform
- Easier to manage the business
- Process integrity & stability with enhanced security
- Consistent case handling

Another View - Solution Scenario -

Industry Framework and BPM Enables Integration on Information and Processes Across The Bank: Account Opening Example



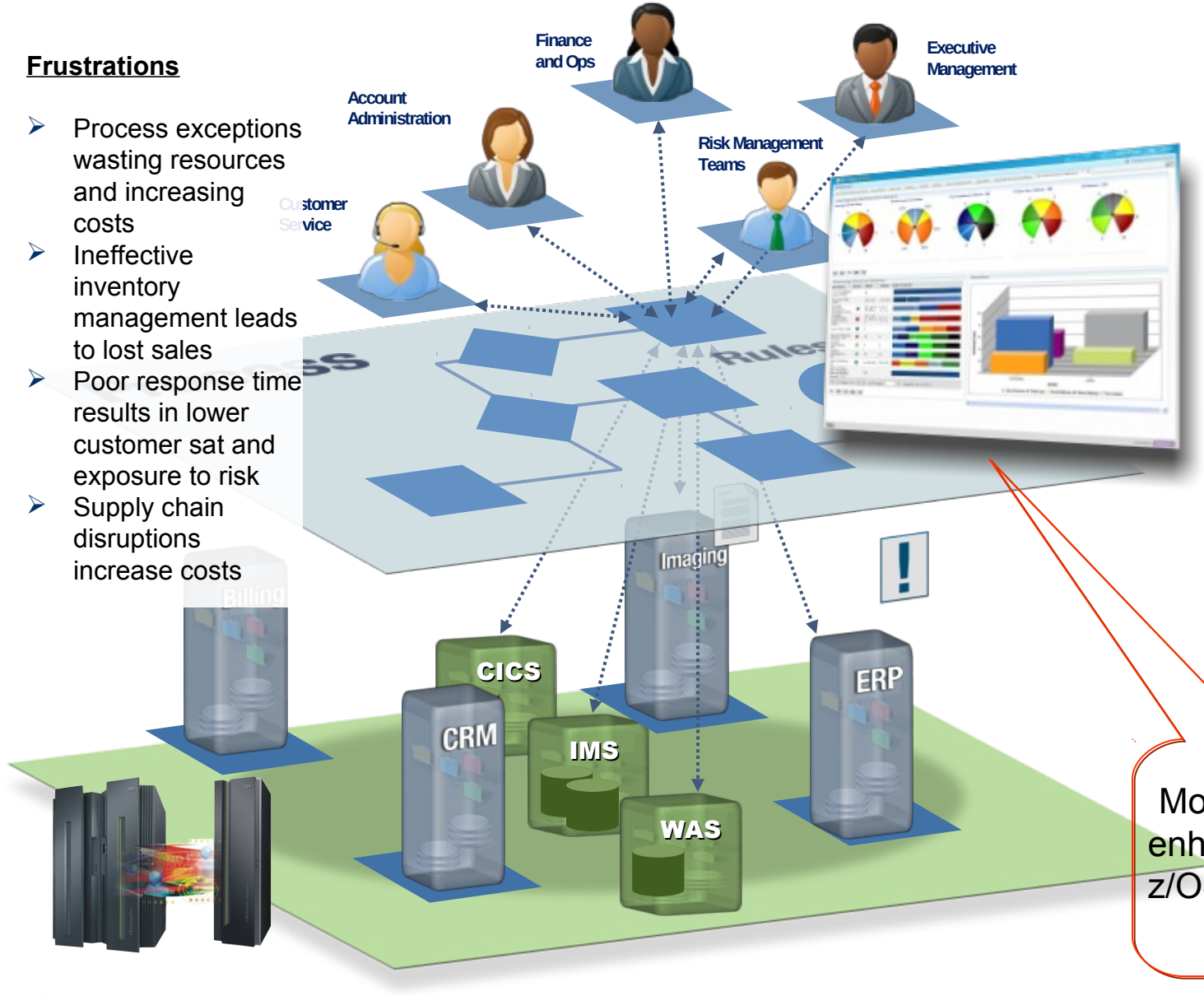
1. *Customer initiates Account Opening at a Branch*
2. *Account Opening Service retrieves customer & product data from the Master Data repository*
3. *Assess financial risk associated with the customer for this acct*
4. *Customer Care process is triggered so that the bank staff can make the right decisions*
5. *Account is created in the Product Processor*
6. *Account Information is returned to the customer*

Business Monitor on System Z for End-to-End Visibility

Monitors in-process, correlates individual transactions, provides dashboards

Frustrations

- Process exceptions wasting resources and increasing costs
- Ineffective inventory management leads to lost sales
- Poor response time results in lower customer sat and exposure to risk
- Supply chain disruptions increase costs



Benefits

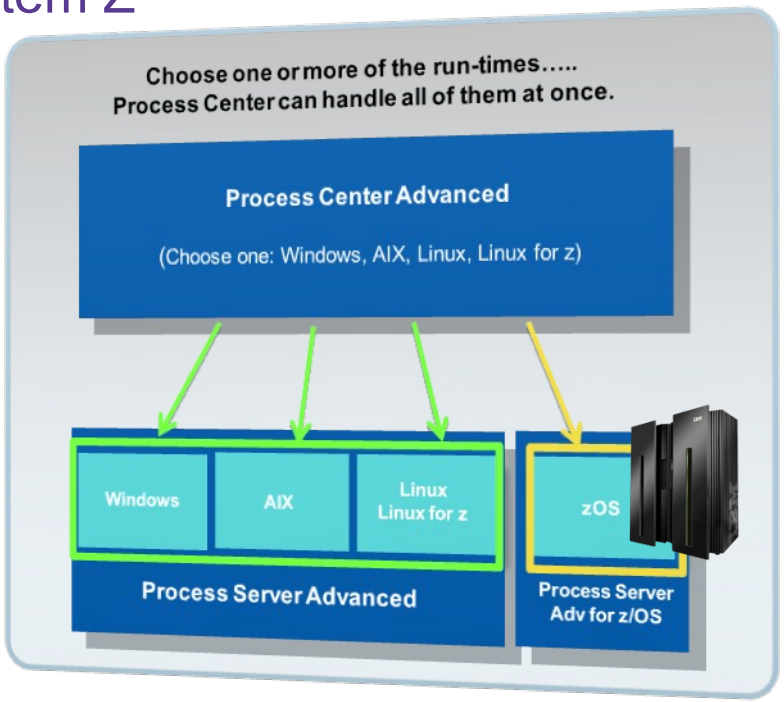
- Monitor metrics, business situations, and events in real-time
- User customizable dashboards to ensure targeted, relevant information
- Feed and correlate alerts with business event processing for enhanced pattern visibility
- Interact directly with processes in real-time
- Predict future values of KPIs based on historic and cyclic trends
- Trigger alerts when predicted values indicate a problem detection

Monitor 7.5 is enhanced for z/OS

Enabling Agile Business Processes on System Z

IBM Business Process Manager V7.5 for z/OS

- **Unified BPM platform** combines the **simplicity** of Lombardi Edition experience and the **power & scalability** of WebSphere Process Server – all integrated in a zEnterprise environment.
- **Leverages co-location** with IBM System Z programs for superior performance, scalability, and access to data
- **High volume process automation** with greater availability and qualities of service



IBM Business Process Manager V7.5 for z/OS highlights

New!

-

Built-in SOA

Agenda

- Business processes and System z
- ***A deeper look inside IBM Business Process Management for z/OS***

IBM BPM Process Server 7.5 for z/OS

Modernize and Extend Your IBM zEnterprise Business Processes

IBM Business Process Manager V7.5 for z/OS

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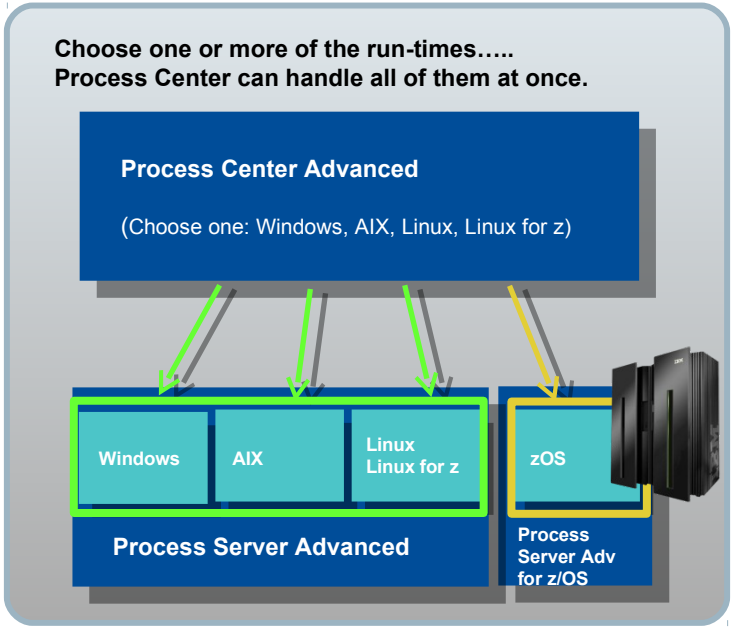

IBM Business Process Manager V7.5 for z/OS highlights

New!

- Built-in SOA components for extensive enterprise-wide service integration and orchestration
- Full compatibility with the latest version of IBM WebSphere Process Server for z/OS
- Flexible deployment of process applications originally created with IBM WebSphere Lombardi Edition for Linux on System Z or other platforms
- In-process rules authoring based-on WebSphere ILOG JRules technology
- Streamlined installation and configuration of BPM within IBM WebSphere Application Server on z/OS

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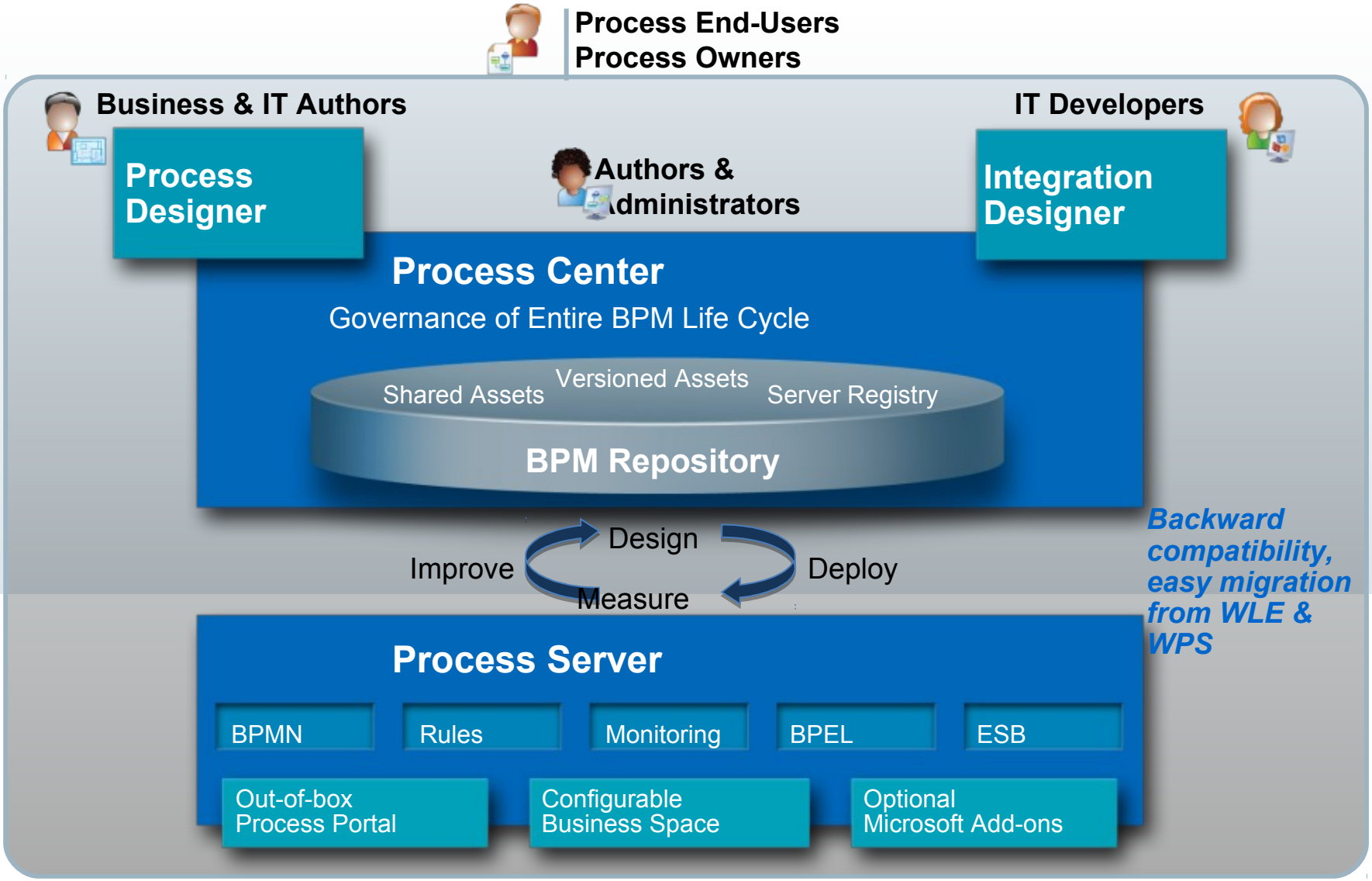
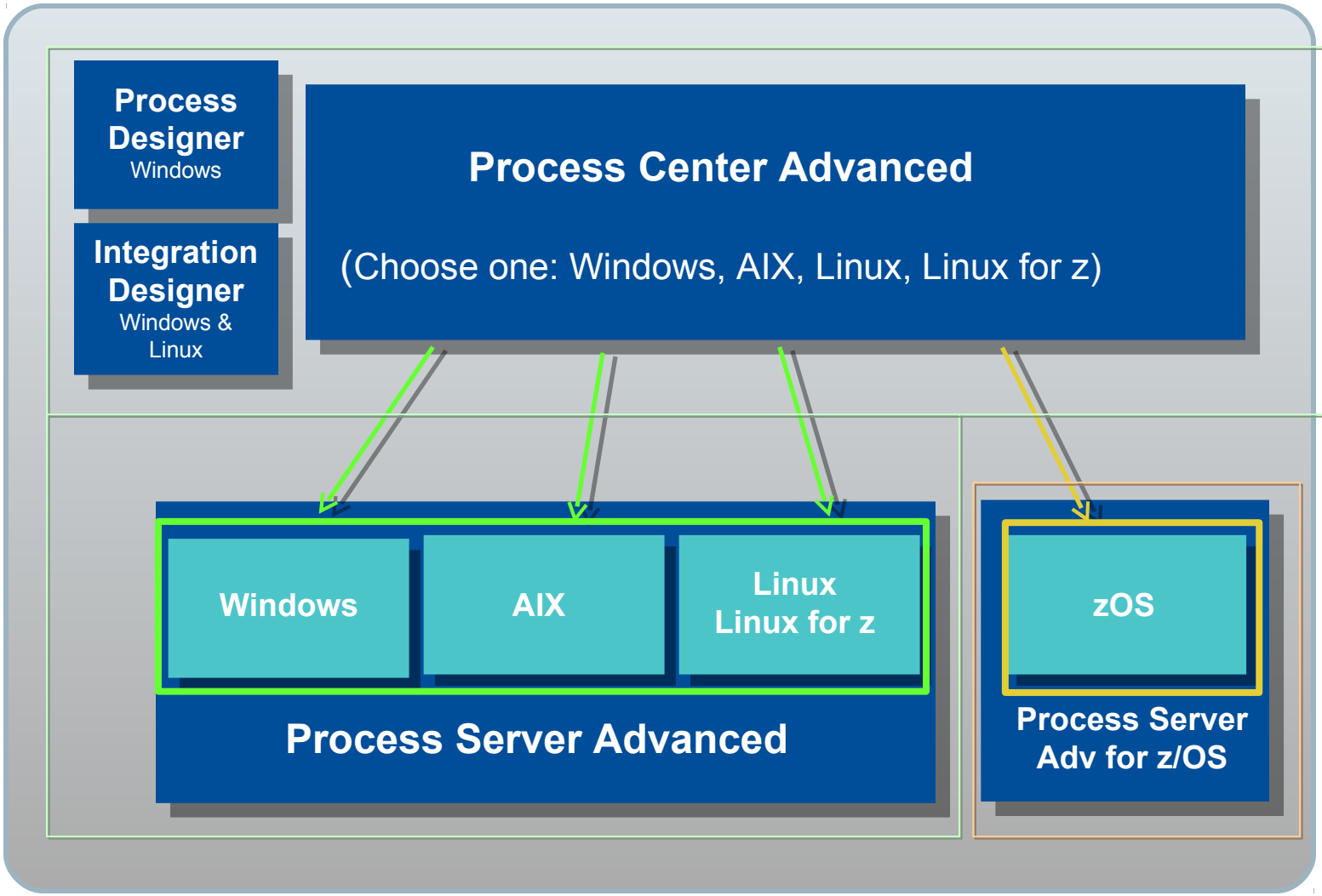
IBM Business Process Manager V7.5 - Architecture



IBM BPM V7.5 for z/OS is optimized for zEnterprise



These components are the same components you would use for any other platform

Modernize and streamline business processes for efficiency

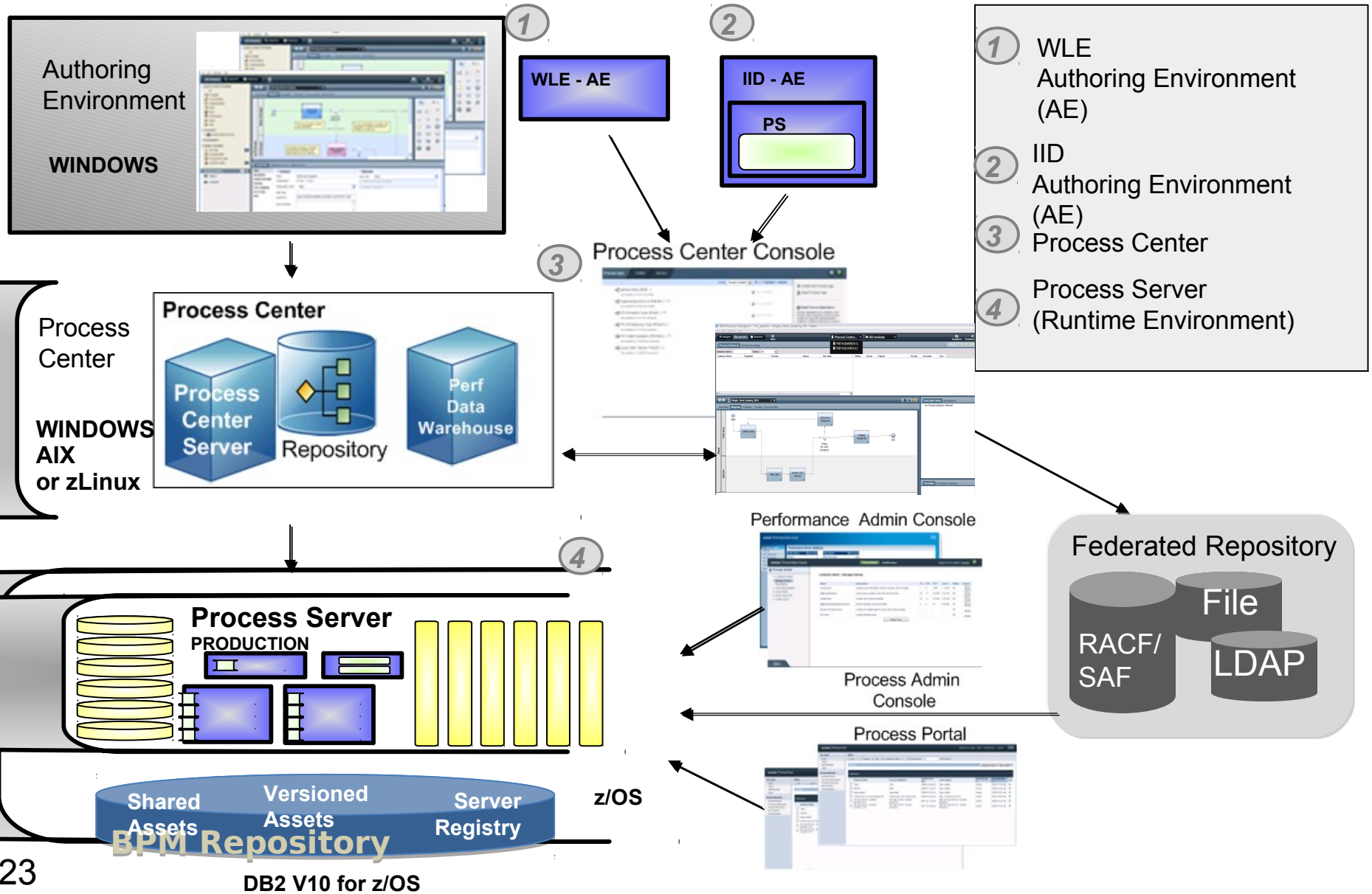
- ***Monitor metrics, business situations, and events*** in real-time
- ***User customizable dashboards*** to ensure targeted, relevant information
- ***Interact directly with processes*** in real-time
- ***Predict future values*** of KPIs based on historic and cyclic trends
- ***Trigger alerts*** when predicted values indicate a problem detection

IBM Business Monitor for z/OS

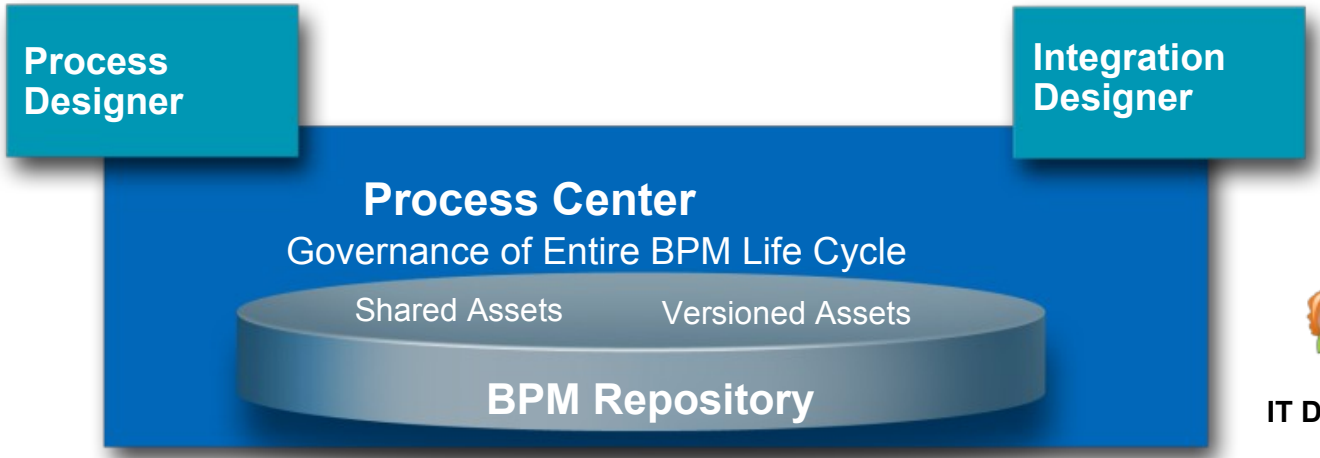
The Essential BPM Capabilities

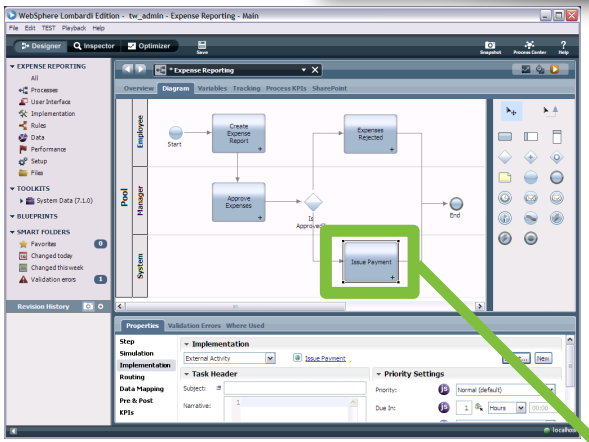
- Modeling
- Monitoring
- Automation
- Governance
- Optimization
- Rules
- Information
- Cases
- Events
- Integration
- Collaboration
- Analytics

IBM Business Process Manager V7.5 for z/OS

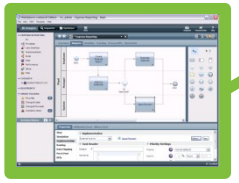


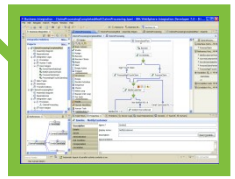
IBM BPM V7.5 ~ Authoring Scenarios

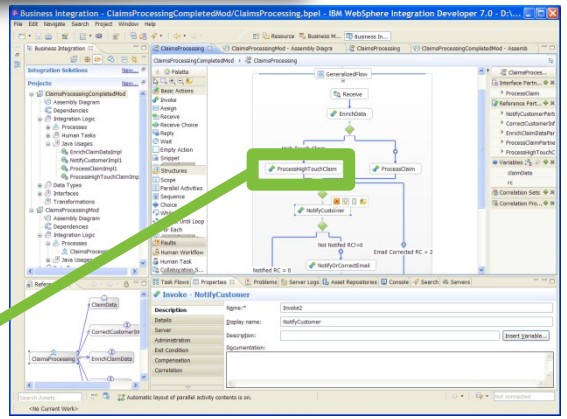




Business Author requires a back-end integration for an Expense Reporting process that he is building







Integration Developer is building a straight-through Credit Check process that has a business exception path requiring human interaction

Seamless Collaboration Across Roles

Business Process Owner

- Authors a Process Application
- Defines Service Interfaces for Implementation by Integration Developer

Integration Developer

- Imports the Process Application
- Generates Service Implementations
- Unit Tests Services
- Delivers Services to Repository

Business Process Owner

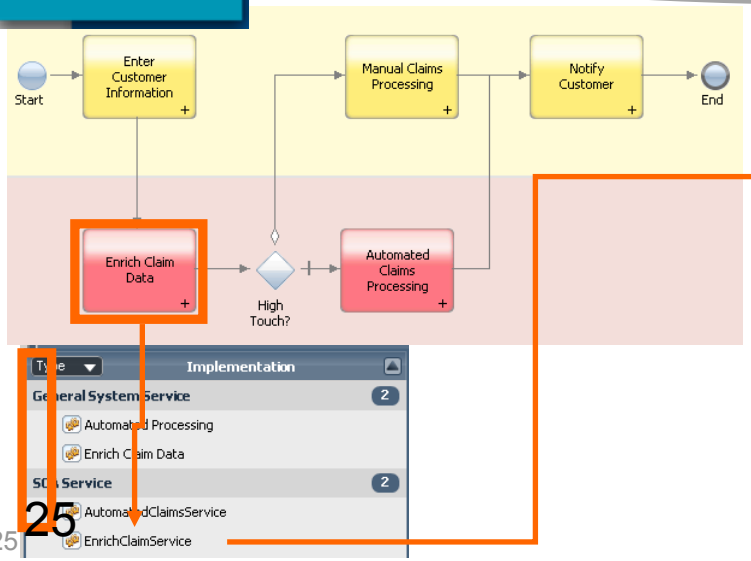
- Wires the Implemented Services to the Process
- Unit Test the Process

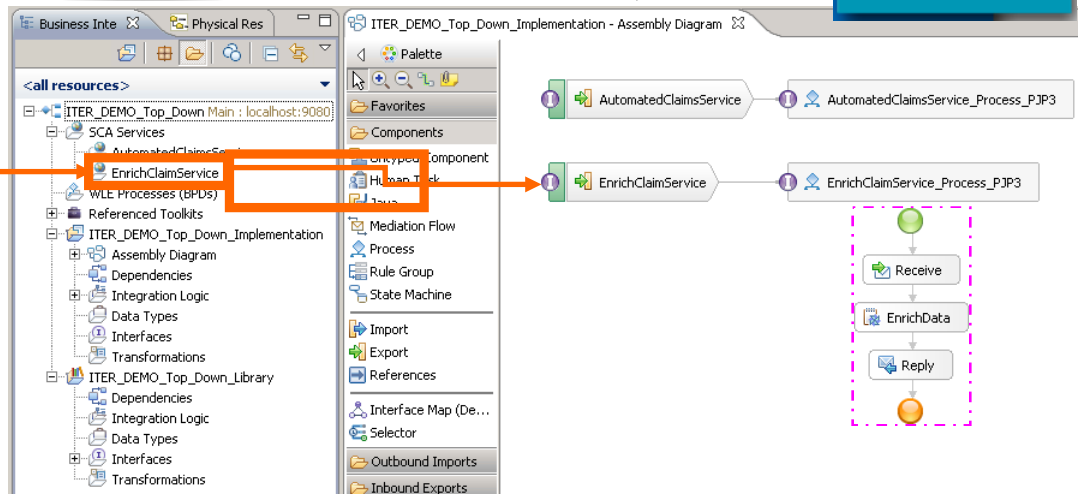
Shared Assets Versioned Assets Server Registry

BPM Repository

Process Designer

Integration Designer





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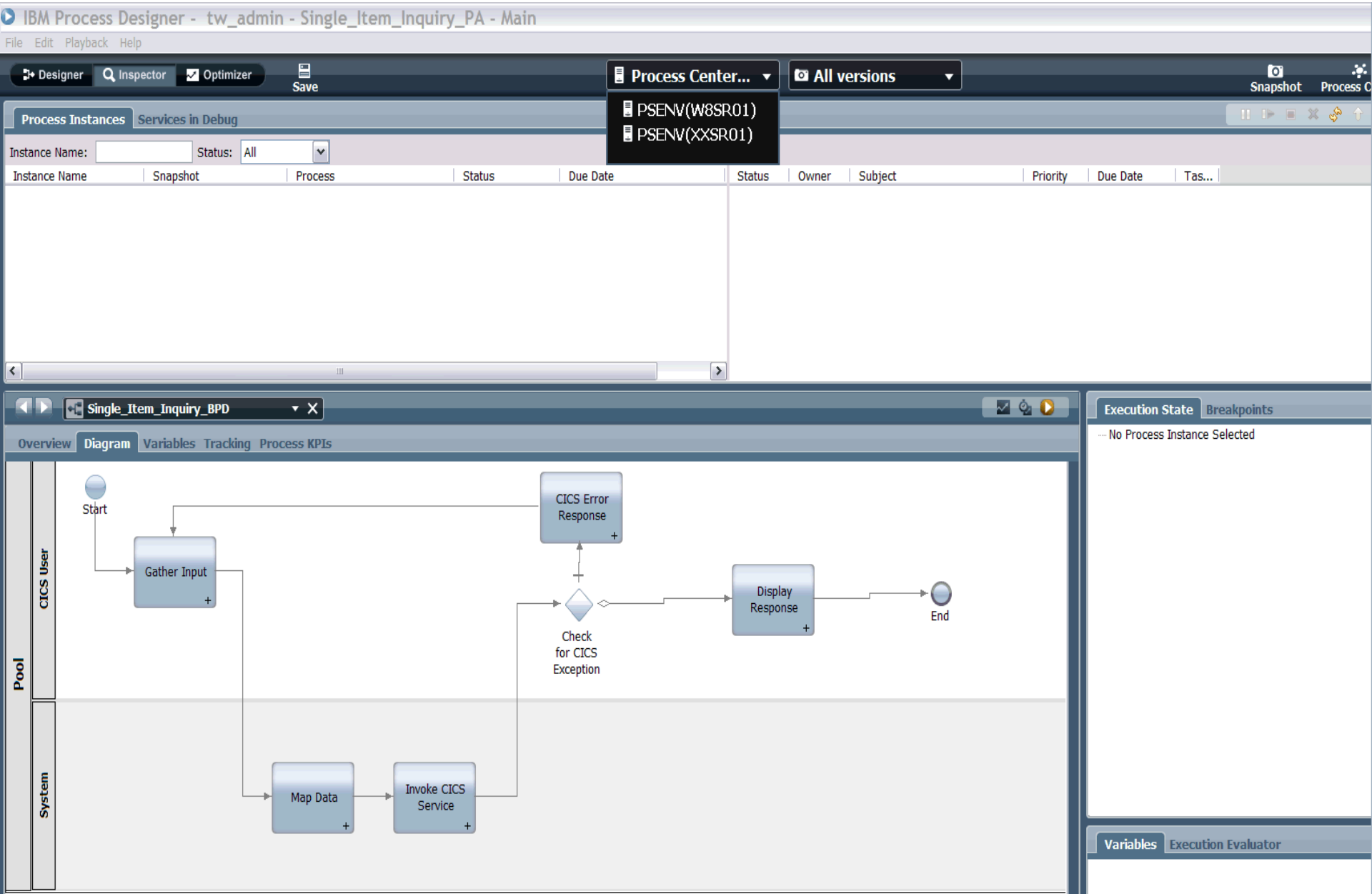
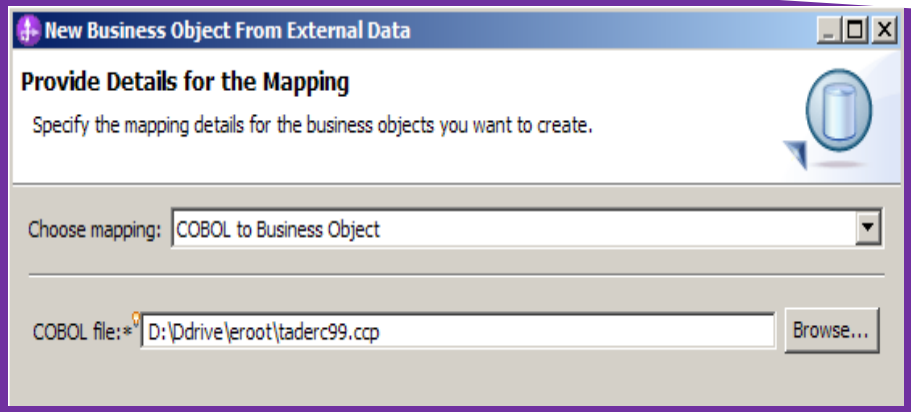
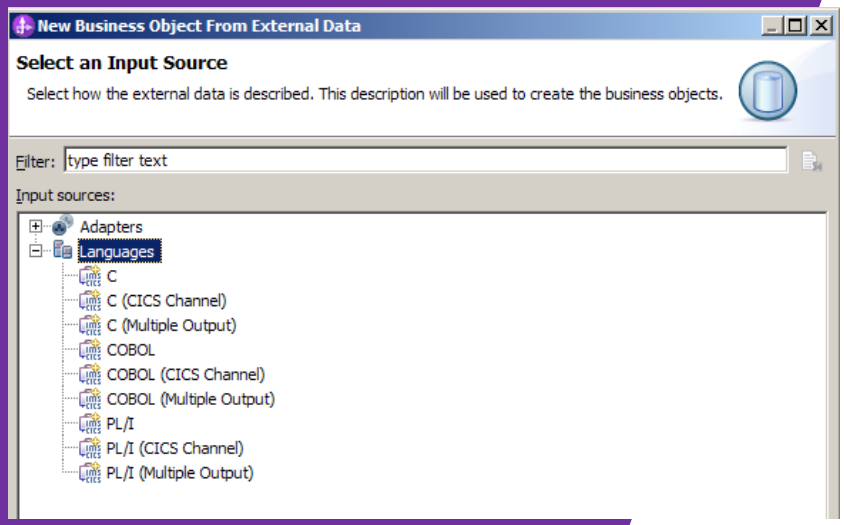
Process Designer and CICS COBOL Integration
Basic Process Flow



IBM BPM V7.5 for z/OS leverages native z/OS data structures



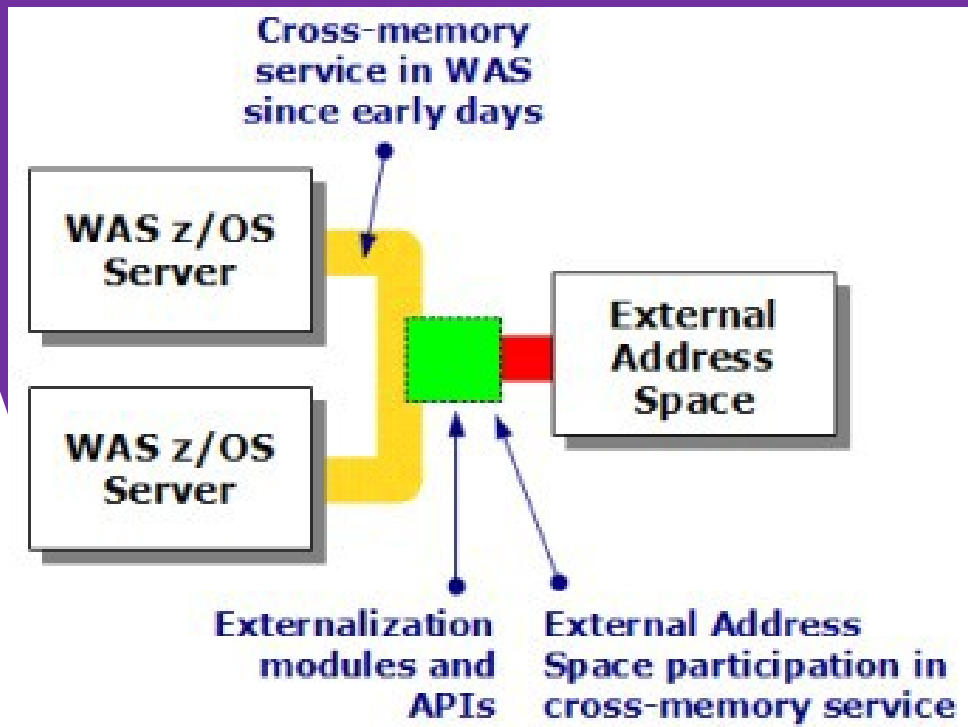


- Reference data from COBOL copybook
- Support for language such as C, COBOL, PL/1, Channel Records, multiple output
- SOA service abstractions create reusable services for processes and other clients

IBM BPM V7.5 facilitates fast communication with z apps

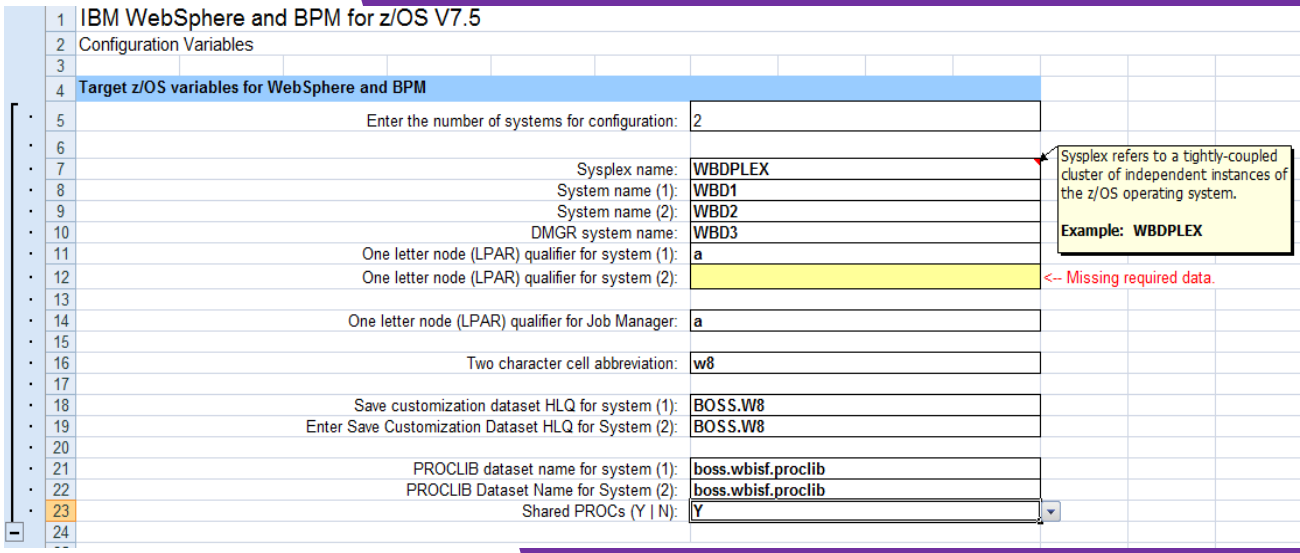
- The WebSphere z/OS "Optimized Local Adapters" is a function provided with WebSphere Application Server for z/OS

- Cross-memory local communications between BPM processes and external address spaces
  - CICS
  - IMS
  - batch programs
  - Unix Systems Services (USS) programs
  - Airlines Line Control (ALCS) programs



IBM BPM V7.5 for z/OS is easy to install and run

- Guided Configuration--Spreadsheet based tool to simplify configuration



1	IBM WebSphere and BPM for z/OS V7.5	
2	Configuration Variables	
3		
4	**Target z/OS variables for WebSphere and BPM**	
5	Enter the number of systems for configuration:	2
6		
7	Sysplex name:	WBDPLEX
8	System name (1):	WBD1
9	System name (2):	WBD2
10	DMGR system name:	WBD3
11	One letter node (LPAR) qualifier for system (1):	a
12	One letter node (LPAR) qualifier for system (2):	
13		
14	One letter node (LPAR) qualifier for Job Manager:	a
15		
16	Two character cell abbreviation:	w8
17		
18	Save customization dataset HLQ for system (1):	BOSS.W8
19	Enter Save Customization Dataset HLQ for System (2):	BOSS.W8
20		
21	PROCLIB dataset name for system (1):	boss.wbisf.proclib
22	PROCLIB Dataset Name for System (2):	boss.wbisf.proclib
23	Shared PROCs (Y | N):	Y
24		

Sysplex refers to a tightly-coupled cluster of independent instances of the z/OS operating system.

Example: WBDPLEX

<-- Missing required data.

75	**Installation paths by platform**		
76	Platform	Web Server Install Directory Path	Web Server Plugin Path
77	linux	/opt/IBM/HTTPServer	/opt/IBM/WebSphere/Plugins
78	windows	C:\Program Files\IBM\HTTPServer	C:\Program Files\IBM\WebSphere\Plugins
79	aix	/usr/IBM/HTTPServer	/usr/IBM/WebSphere/Plugins
80	hpux	/opt/IBM/HTTPServer	/opt/IBM/WebSphere/Plugins
81	solaris	/opt/IBM/HTTPServer	/opt/IBM/WebSphere/Plugins
82	os390	/usr/lpp/internet	/etc/webserver1/Plugins
83	os400	/QIBM/ProdData/WebSphere/Plugins/V61/webserver	/QIBM/ProdData/WebSphere/Plugins/V61/webserver
84			

Multiple environments – Advanced edition

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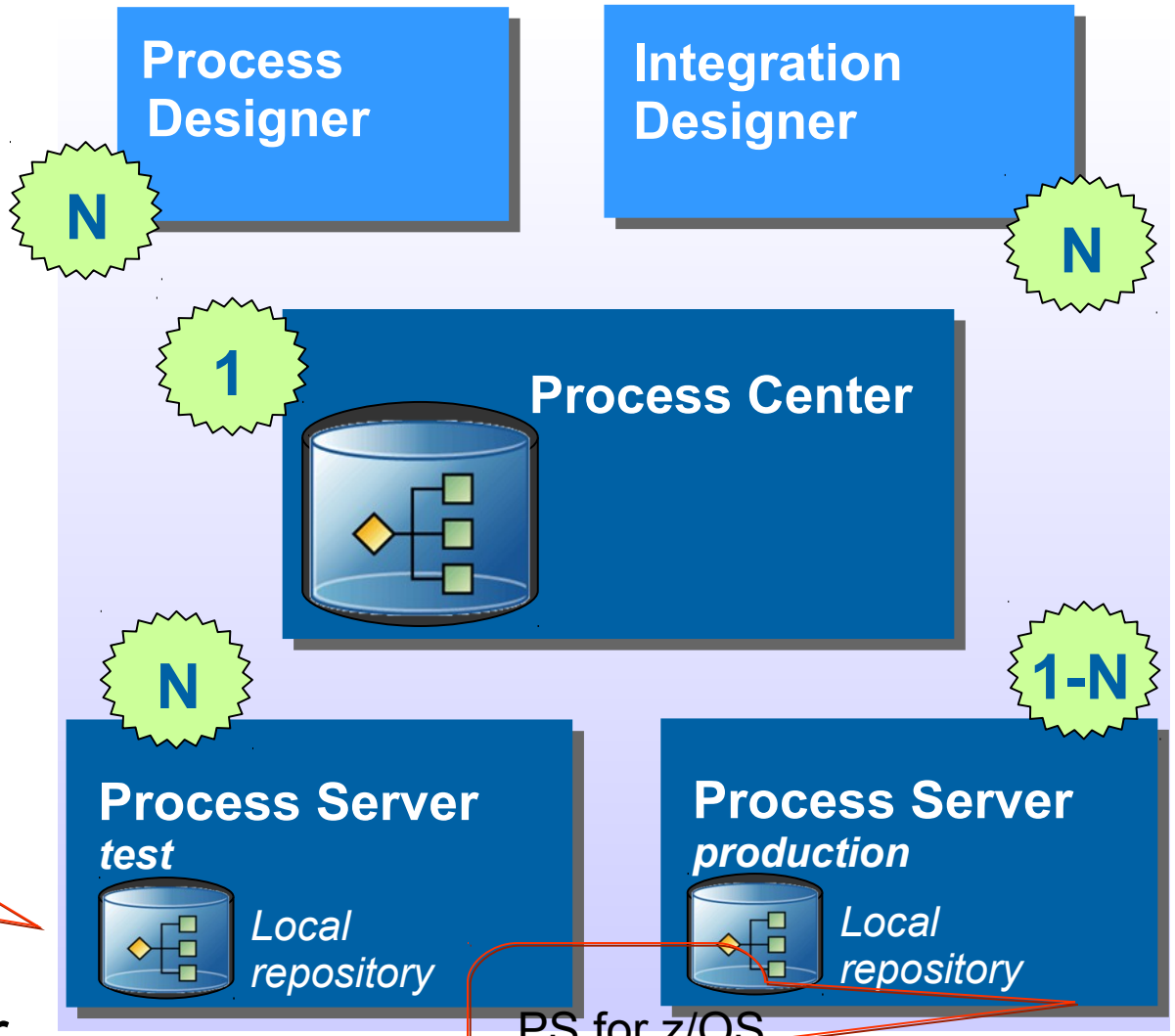
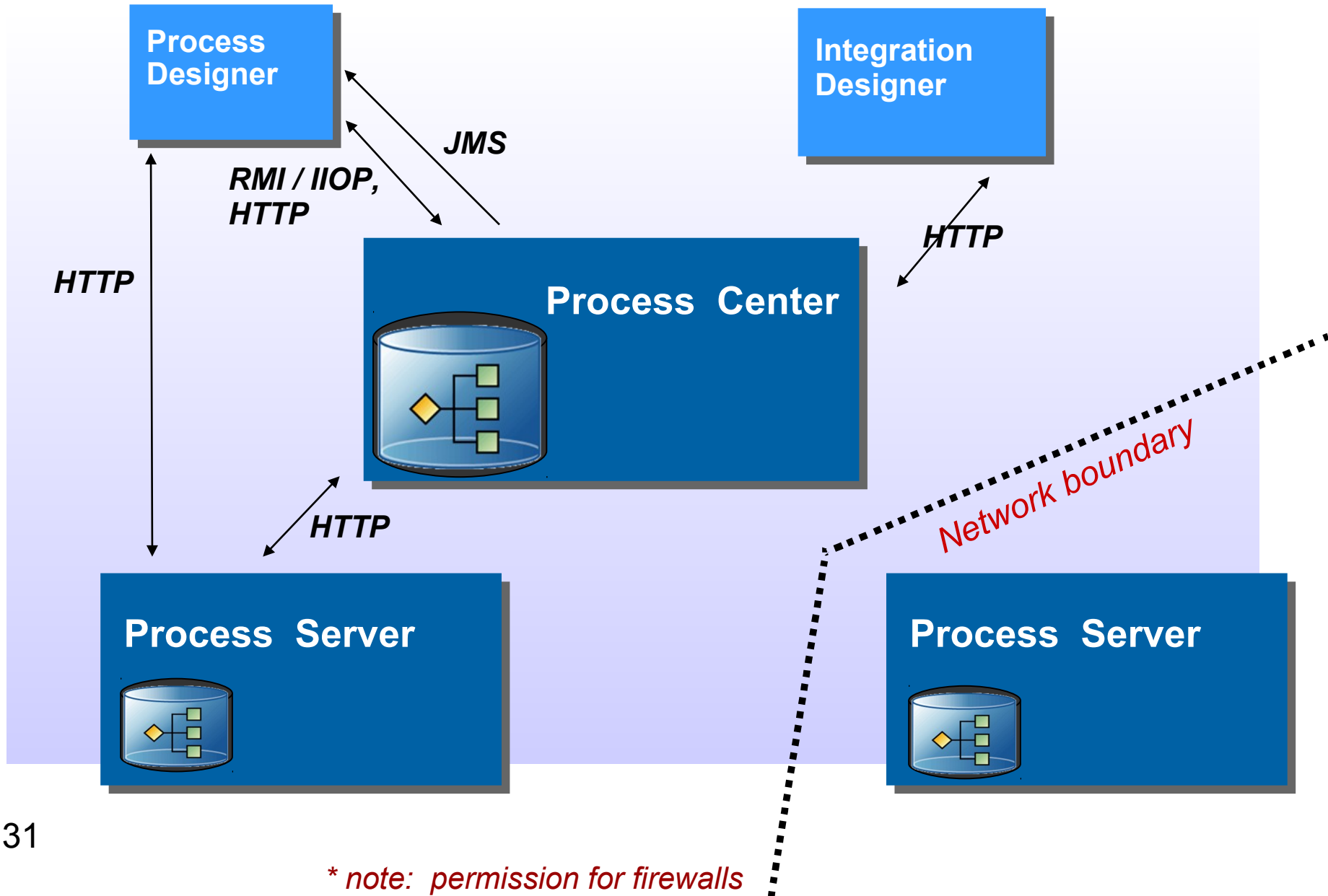


- Process Designer
- Integration Designer
- Process Center
  - *Master Repository*

“Online and Offline” Process Server environments



* note: permission for firewalls

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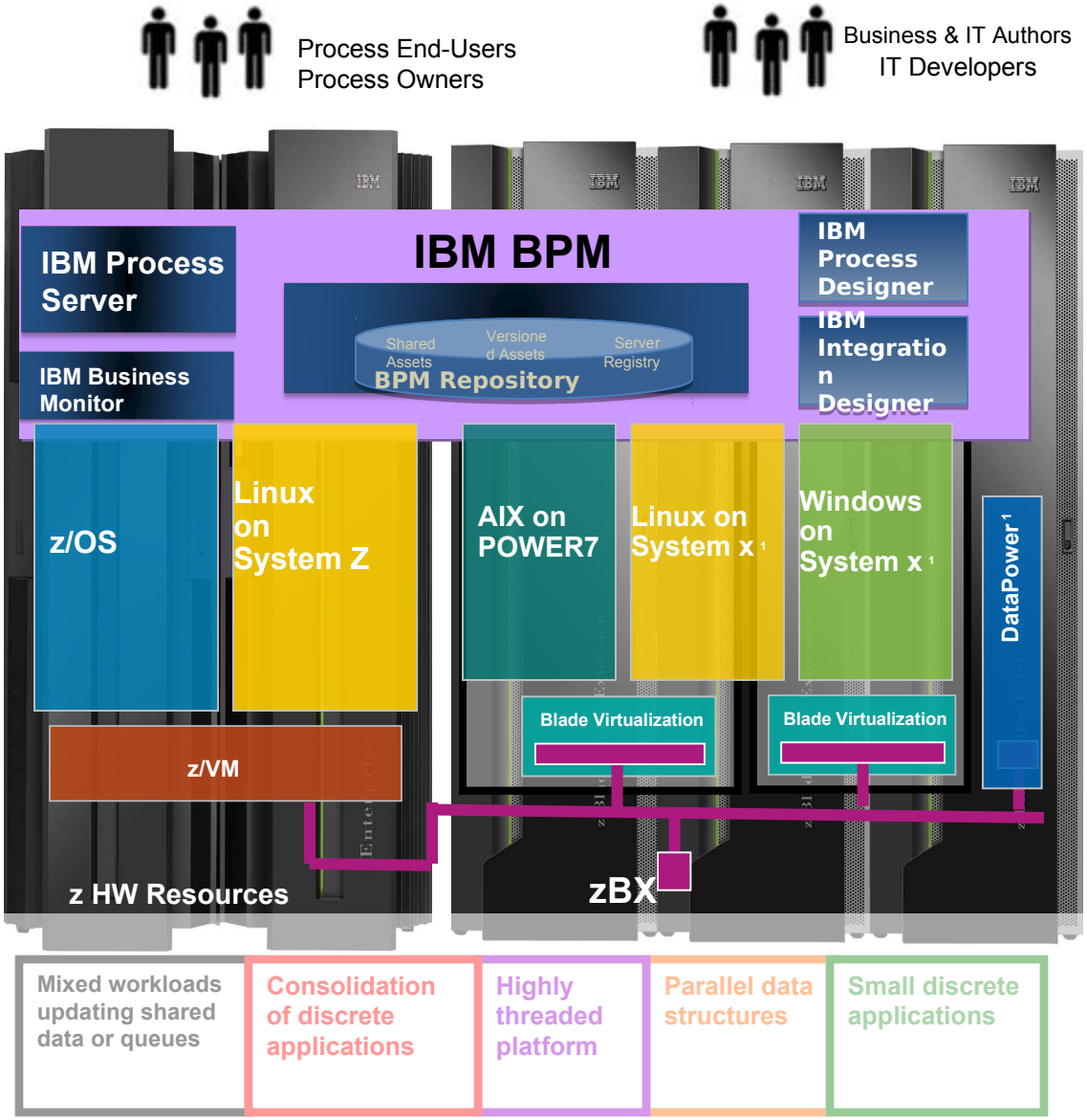
The z/OS Platform
z196 and zEnterprise Environment

IBM BPM on the zEnterprise

- Modernize enterprise applications with BPM simplicity, visibility, power and governance
- Configure zEnterprise with zBX to meet business process workload on z, zLinux, or zBX-based AIX, Linux, Windows
  - –Process Server execution workloads on z/OS
  - – Process Center development environment/Repository on zLinux or zBX AIX
  - –Authoring (Process Designer and Integration Designer) on Windows based zBX blades



[1] All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

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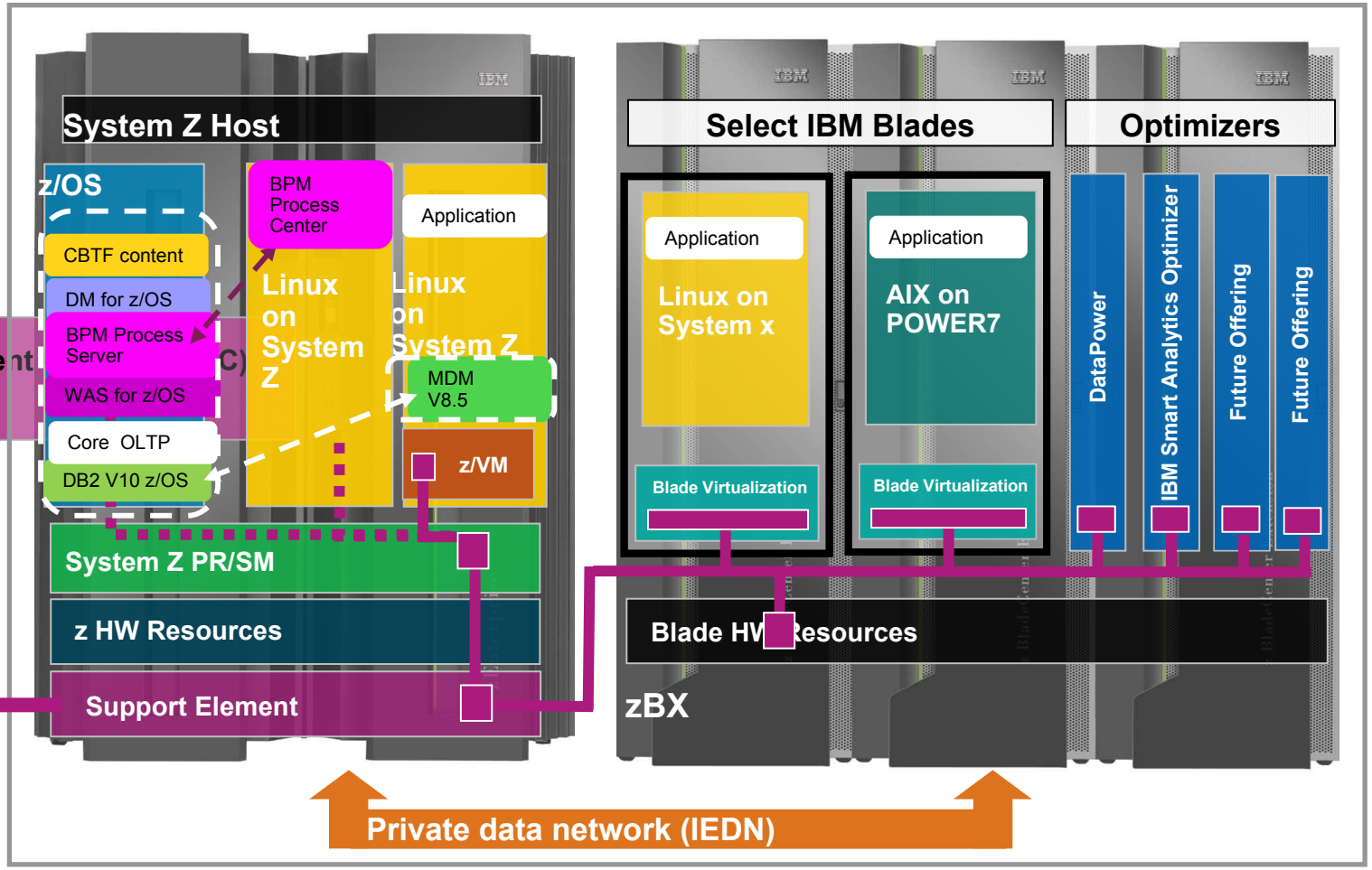
The zEnterprise Environment - A Solution Scenario



IBM zEnterprise System – Best in Class Systems and Software Technologies

A system of systems that unifies IT for predictable service delivery

Unified management for a smarter system:
zEnterprise Unified Resource Manager

- Unifies management of resources, extending IBM System z® qualities of service end-to-end across workloads
- Provides platform, hardware and workload management

The world's fastest and most scalable system:
IBM zEnterprise™ 196 (z196)

- Ideal for large scale data and transaction serving and mission critical applications
- Most efficient platform for Large-scale Linux® consolidation
- Leveraging a large portfolio of z/OS® and Linux on System z applications
- Capable of massive scale up, over 50 Billion Instructions per Second (BIPS)

Scale out to a trillion instructions per second:
IBM zEnterprise BladeCenter® Extension (zBX)

- Selected IBM POWER7® blades and IBM System x® Blades[1] for tens of thousands of AIX® and Linux applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network

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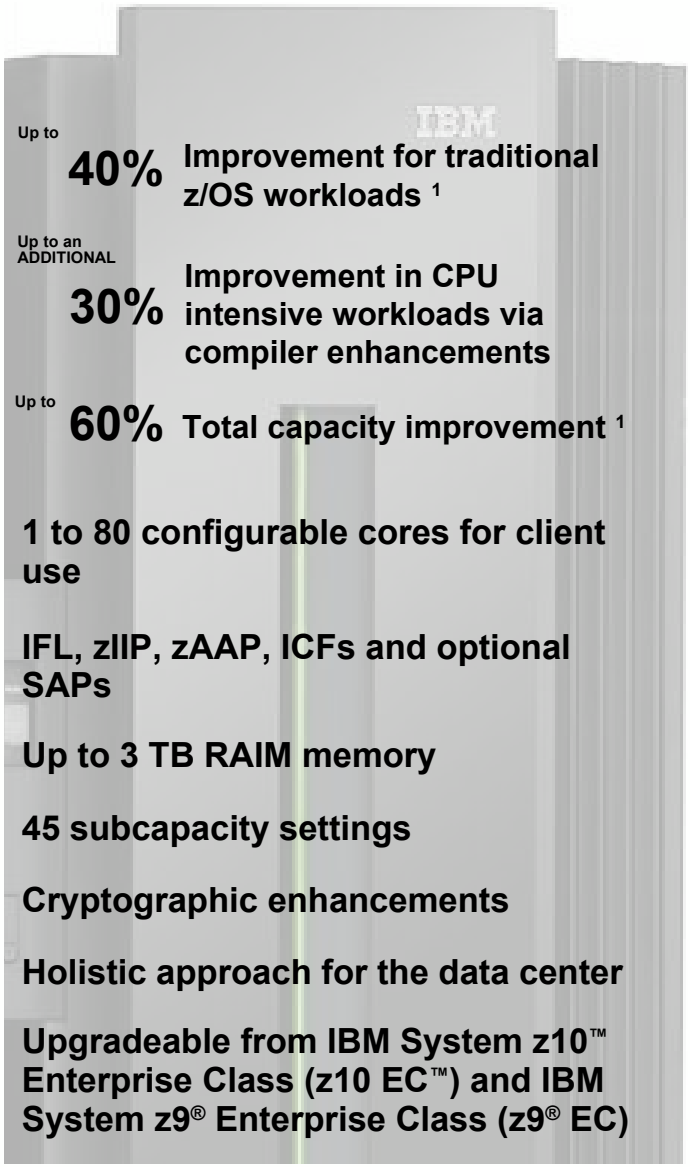
The Value Begins At the Heart of z196 …



Up to **40%** Improvement for traditional z/OS workloads [1]

Up to an ADDITIONAL **30%** Improvement in CPU intensive workloads via compiler enhancements

Up to **60%** Total capacity improvement [1]

1 to 80 configurable cores for client use

IFL, zIIP, zAAP, ICFs and optional SAPs

Up to 3 TB RAIM memory

45 subcapacity settings

Cryptographic enhancements

Holistic approach for the data center

Upgradeable from IBM System z10™ Enterprise Class (z10 EC™) and IBM System z9® Enterprise Class (z9® EC)

zEnterprise 196 (z196)
Machine Type: 2817
Models: M15, M32, M49, M66, M80

- **Improved connectivity**
  - One to four books
  - Hot pluggable I/O drawer
  - InfiniBand Coupling links
- **Focus on the environment**
  - Options to help eliminate hotspots and save on energy
  - Static power savings
  - Query maximum potential power
  - Leadership technology for cooling and power distribution
- **Operating System Flexibility**
  - z/OS, z/VM®, z/VSE™, z/TPF and Linux on System z
- **Security and reliability**
  - Elliptic curve cryptography
  - Concurrent patch update enhancements

[1] For average LSPR workloads running z/OS 1.11.

Service Levels to Match Your Business Needs

Increased flexibility for your multi-architecture strategy when data is on z/OS

zEnterprise System

TCO Focus

TCA Focus

Distributed Systems

- ✓ Silo managed islands of computing
- ✓ Less dynamic than z virtualization
- ✓ Minimal resource sharing with z resources

Select IBM Blades in zBX

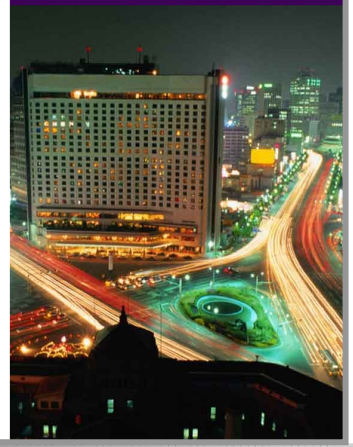
- ✓ Expanded ISV support for enterprise applications
- ✓ Targeted for applications that interact with mainframe data and transactions
- ✓ Provisioned and managed by System z

Linux on z/VM

- ✓ Extreme consolidation of servers and networking
- ✓ Superior levels of virtual server provisioning, monitoring and workload management
- ✓ Industry-best virtual I/O bandwidth and reliability
- ✓ Fewer components and reduced complexity
- ✓ System z qualities of dynamic resource management and capacity-on-demand
- ✓ Seamless integration with z/OS backup and disaster recovery solutions

z/OS

- ✓ Extreme scalability and performance for transaction processing and data serving
- ✓ High availability and cross-system scalability with Parallel Sysplex® and GDPS
- ✓ Leading policy-based capacity provisioning and workload management
- ✓ Pervasive, high-performance security support



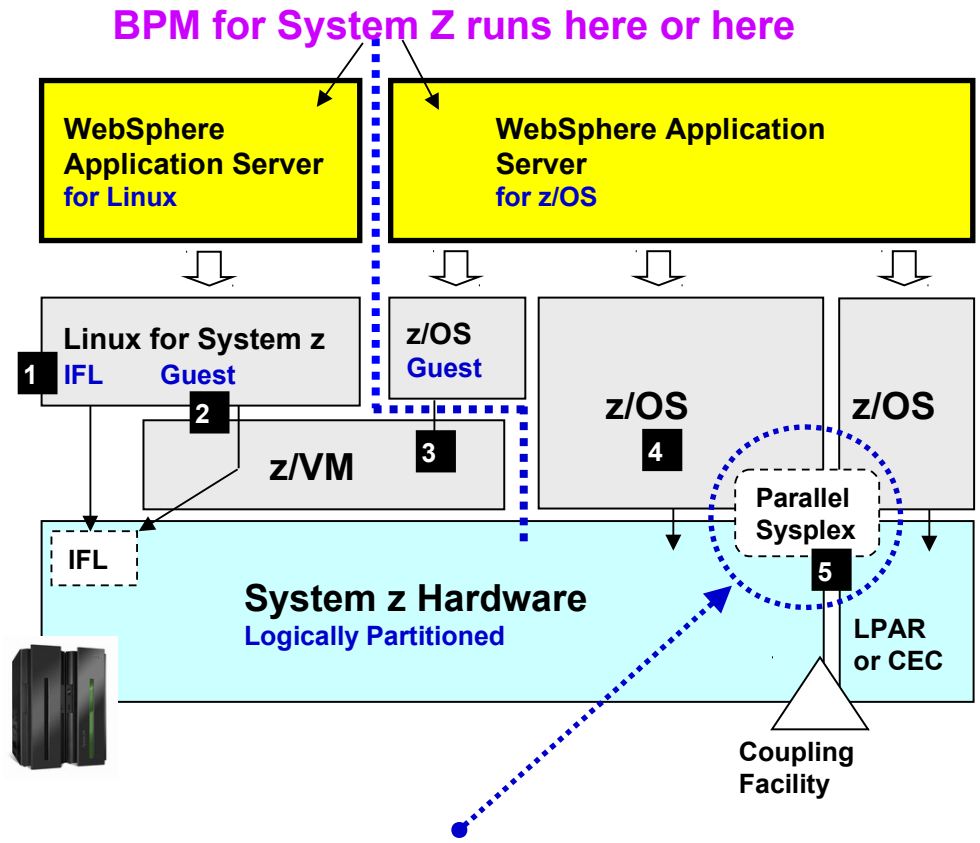
LOWER

SCALABILITY, SECURITY, DYNAMIC WORKLOAD MANAGEMENT

HIGHER

BPM V7 for System z, z/OS, Linux, and WebSphere Application Server

Here's a mapping of how the two flavors of WebSphere Application Server can be hosted on System z hardware:



1. **Linux for System z directly on IFL**
   Possible, but not very common. Solution where no zVM skills exist
2. **Linux for System z as guest on zVM**
   Very common. This provides excellent virtualization with z/VM with Linux running as a guest. Runs on the IFL.
3. **z/OS as guest on z/VM**
   Another example of zVM's virtualization capabilities. WAS z/OS as guest typically in a development or test environment.
4. **z/OS in a non-Sysplex environment**
   WAS runs directly on z/OS with no z/VM virtualization. No Sysplex more common in test environments or small production.
5. **z/OS in a Parallel Sysplex environment**
   This is the flagship environment. This is where high availability, scalability and maximum platform exploitation takes place.

WebSphere z/OS design and implementation capitalizes on the Sysplex environment

BPM for z/OS exploits these QOS functions

What is the “Right” System Z Topology for BPM?

Running the Process Server component of BPM on z/OS provides the following differentiating benefits & business drivers:

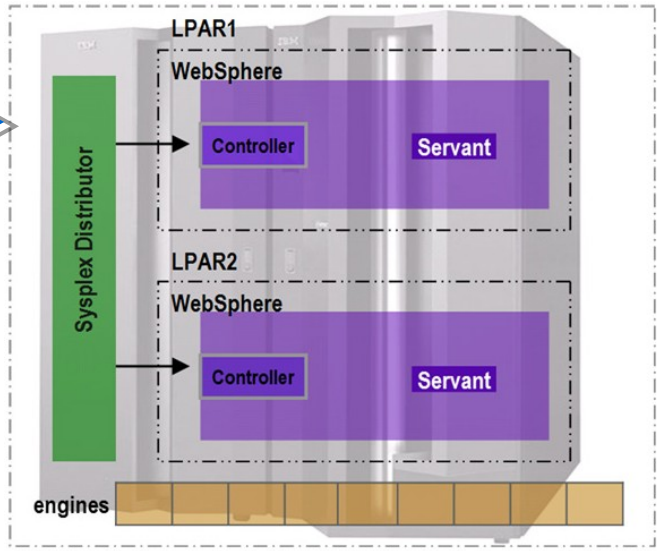
Resiliency of BPM on z/OS:
•Middleware on z/OS plugs into the underlying OS core capabilities; by installing BPM on WAS, the z/OS Workload Manager provides prioritized queuing between the controller and servant to handle critical work according to service level agreements by which it is governed
•Middleware on z/OS is self-optimizing, with additional servants dynamically started with greater workloads
•Middleware on z/OS is self-healing, with servants being recoverable entities

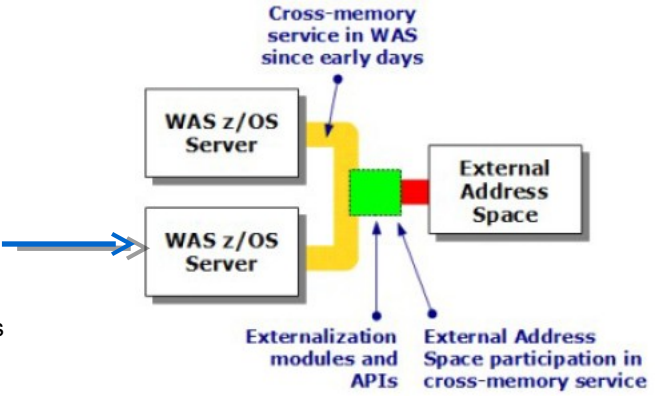
Reducing enterprise & process complexity with BPM on z/OS:
•Utilization is a significant complexity factor; while distributed servers are often cheaper than other options, you are really only able to leverage a portion of them
•z/OS provides significant utilization rates, often near 100%; therefore running the BPM process server on z/OS provides high-performance process automation and dynamic response
•z/OS is designed to run mixed workloads effectively and efficiently

Securing the enterprise & process assets on z/OS:
•Centralized process assets, data, and enterprise services on z/OS provides a clear security advantage
•The application environment layer delivers security in a variety of ways; On one hand, you have a core systems security aspect that encompasses BPM, CICS, IMS, DB2, and MQ.
•On the other hand, you have the open environments supported by WebSphere products, with WebSphere Application Server acting as the core runtime for the entire WebSphere software stack

Controlling the proliferation of assets:
•SOA, BPM, and z/OS are a natural fit and provide a sophisticated computing environment across the business with shared and reusable enterprise services
•Recentralizing core middleware assets onto z/OS provides simplified operations with a single viewpoint into large system clustering, with advanced workload balancing across all systems
•WOLA (WebSphere Optimized Local Adapters) for z/OS is a high speed cross memory exchange mechanism between WAS z/OS and external address spaces on the same LPAR. It allows programs in address spaces outside the WAS z/OS server (i.e., BPM process server) to access the cross memory service and communicate *directly* with Java applications. WOLA bypasses the overhead of network stacks and protocol handlers. It's a very fast *bi-directional* cross-memory byte array "pipe." Its objective is to strip as much of the *transport* overhead away so you can realize as much *processing throughput* as your programs and your system will allow.

WebSphere Application Server runtime configurations on z/OS





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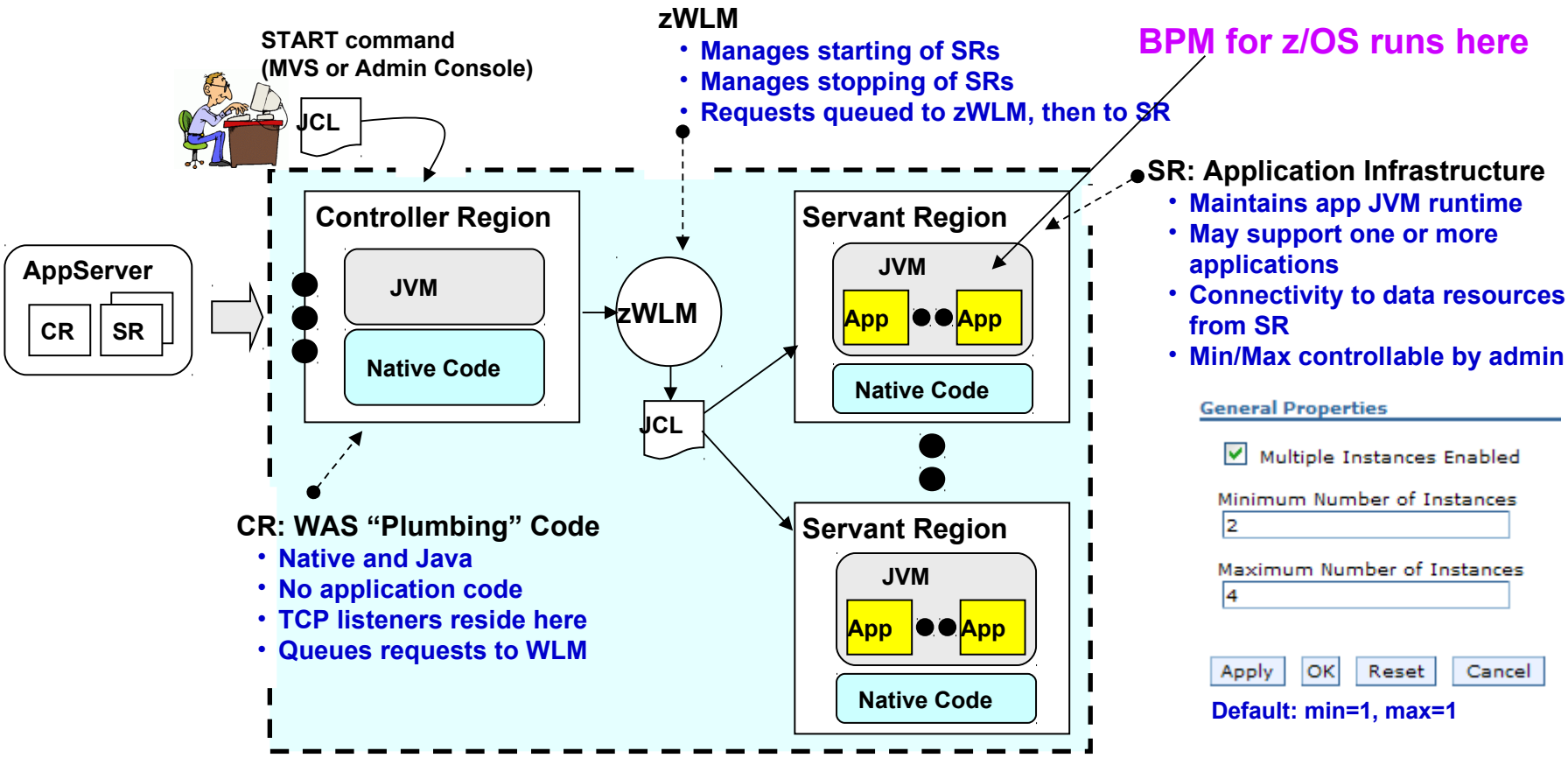
BPM 7.5 for z/OS - Applying the Rule of Four

- Four basic rules, applied here in the form of questions, can help to determine whether to deploy on System z:
  - Is the hardware current (z10, z196), that is - is the customer positioned to take advantage of the latest hardware capabilities and the best software pricing?
  - Does the business application require frequent access to z/OS data (DB2 z/OS or IMS-DB) or transactions (CICS, IMS, WebSphere MQ)?.
  - Are the related workloads highly dynamic, unpredictable, or of high business value?
  - Can the workloads take advantage of specialty processors (IFLs, zIIPs, or zAAPs)?

The Controller / Servant Architecture

This is a unique architectural element to the WAS z/OS design. No other platform has this design because no other platform has WLM:**

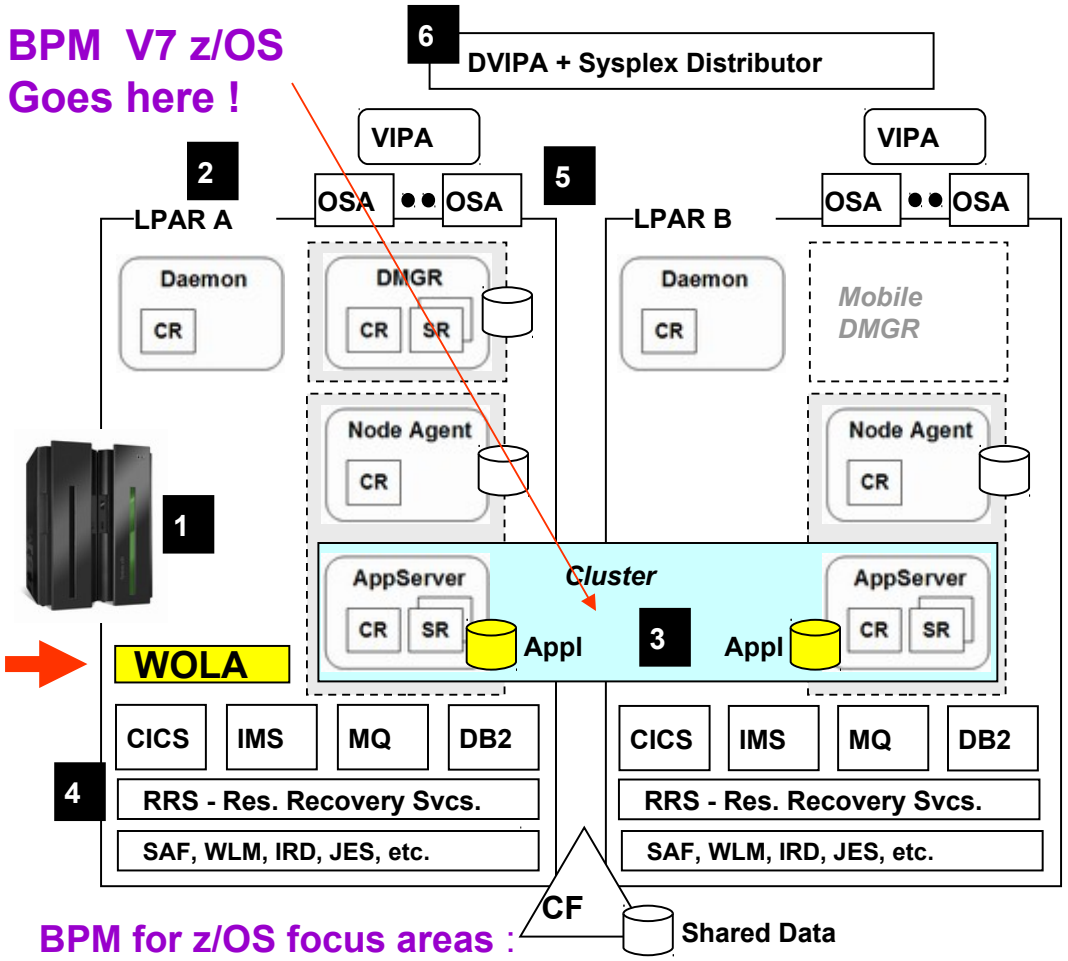


Let's now explore how this is accomplished …

** WebSphere on distributed uses the phrase "Workload Management" but it's not the same as zWLM

The Big Picture of WAS and BPM z/OS in Parallel Sysplex

It's all about redundancy *and* integration with platform HA / DR function



BPM for z/OS focus areas :
H/A-DR, Local Connections, DS, Q Sharing and DB2 z/OS strengths

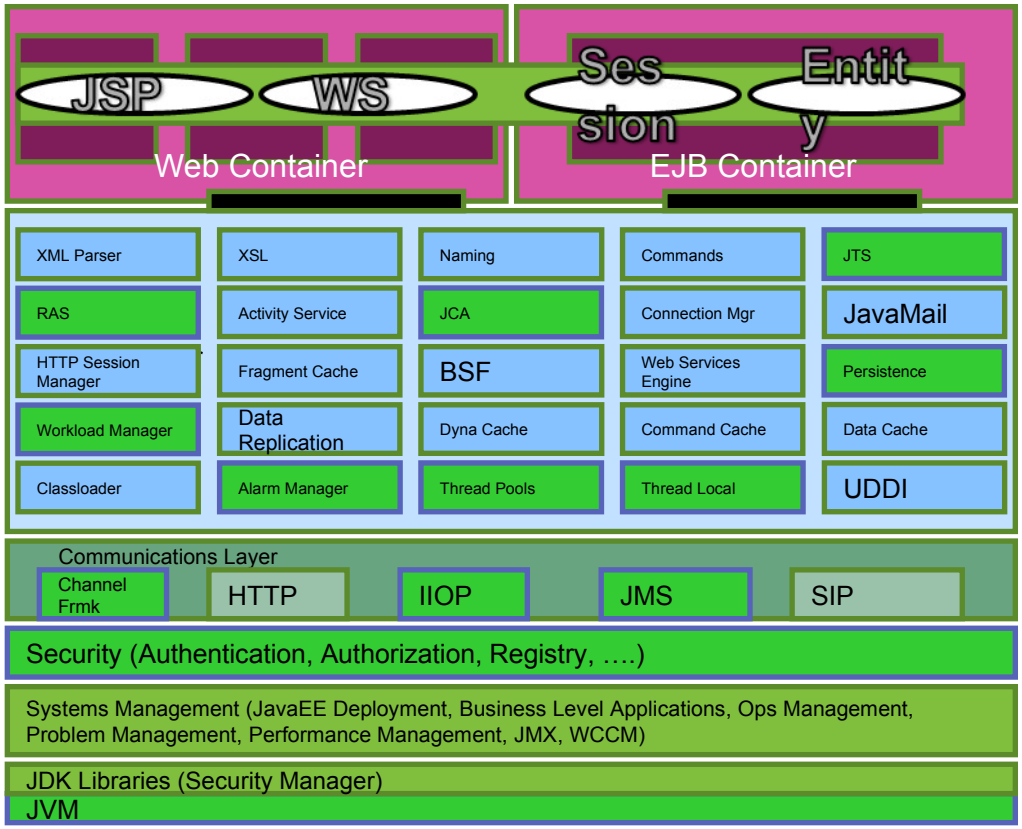
We show two operating system instances. That can be higher for greater availability and more manageable failover

1. **Redundant and fault-tolerant hardware**
   System z hardware design has many layers of fault tolerance and redundancy.
2. **Redundant z/OS instances**
   Either through logical partitioning (LPAR) or separate physical machines.
3. **Clustered WebSphere z/OS servers**
   Multiple application servers grouped into a logical unit for application deployment and management
   z/OS exclusive: dynamic SR expansion (more coming up)
4. **Redundant data resource managers with Sysplex shared data**
   Multiple resource managers instances with shared data in CF and a global syncpoint manager (RRS)
5. **Redundant network adapters hidden behind Virtual IP address**
   On the front end, multiple network interfaces with a moveable virtual IP address protecting against outage
6. **Workload distribution hidden behind distributed virtual IP and Sysplex Distributor**
   Further abstraction of real IP addresses behind a virtual IP that can be swapped across images in a Sysplex, with Sysplex Distributor providing TCP connection distribution based on WLM

WAS for z/OS: Active benefits

Integration with z/OS that maintains application transparency

- Server Architecture
  - Control/Servant Region Split
- Workload Management
  - Leverages Workload Manager
- Security
  - Use of the Security Authorization Facility (with RACF, ACF2…)
- Transaction Management
  - Leverages Resource Recovery Services
- Connectors
  - Leverages available local (Type 2) connectors
- Thread Management
  - OS level threads for monitoring and control
- Scalability
  - Multiple Servant Region
- Communications layer
  - True Asynchio model
- Recovery
  - Leverages Automatic Restart Manager
- Reporting
  - System Management Facility



Common across platforms

Optimized for z/OS

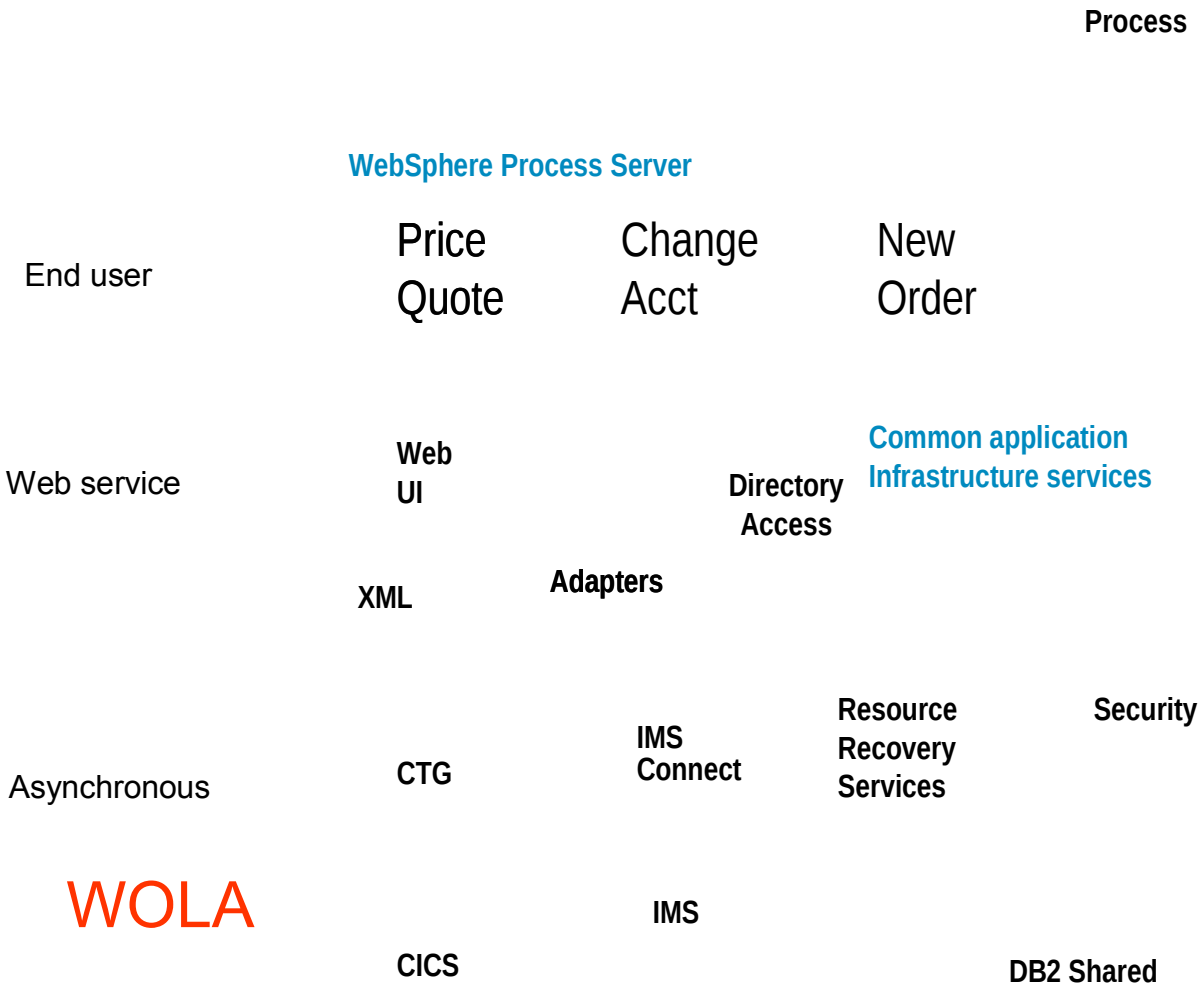
A full range of TCO factors considerations – *often ignored*

- *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

The z/OS Platform Environment
BPM and Co-Location

Processes that frequently interact with CICS, IMS, DB2 z/OS

... benefit most from co-location on z/OS



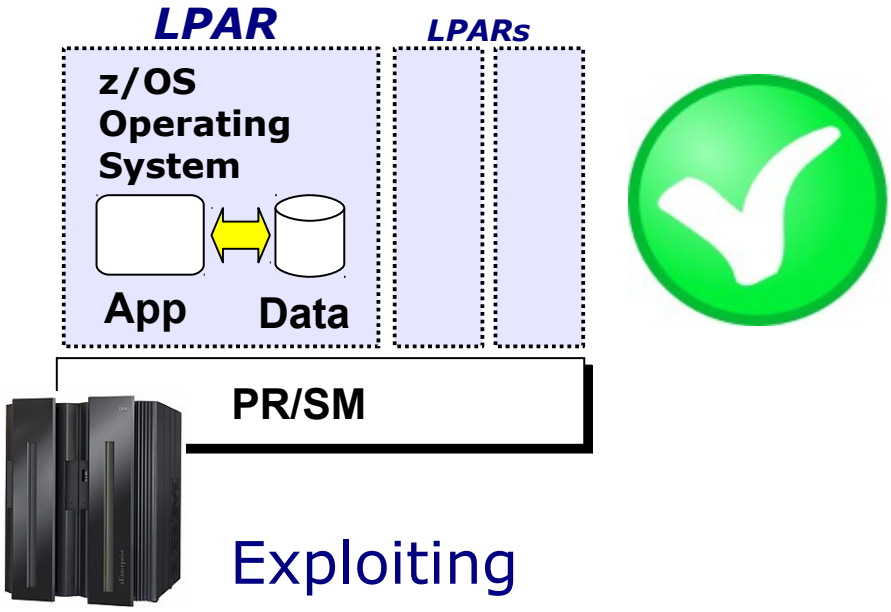
WAS for z/OS Global Transaction scope / RRS

Process management enables automated & efficient service oriented implementations. Running it on System z delivers:

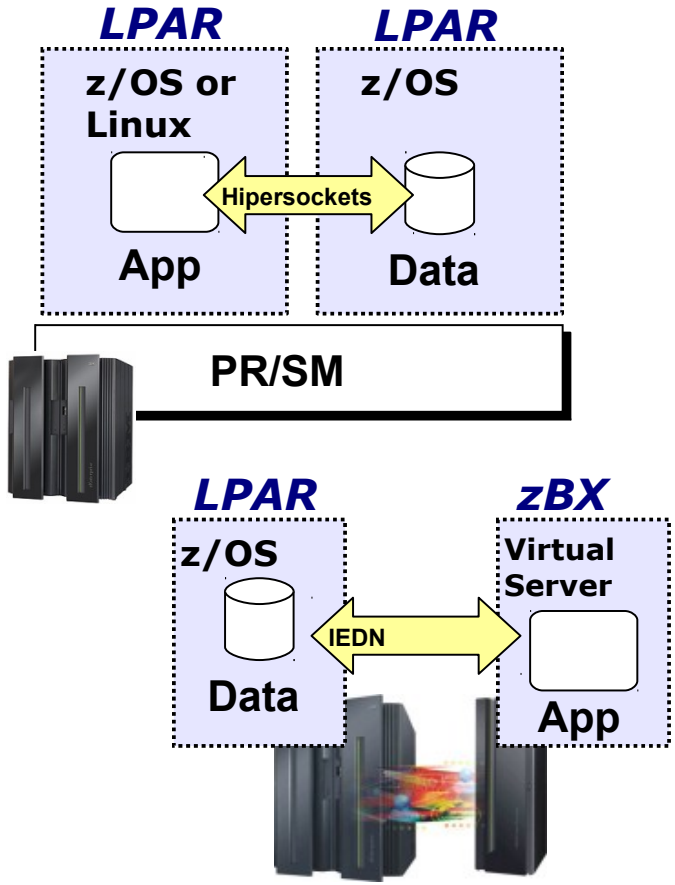
- Enterprise-class operation
- Performance improvements
- Virtual network between assets on z
- Enhanced security
- Consistent backup and recovery, process integrity
- Continuous Availability

"Co-Location"

We use the term "co-location" to mean the application and the data source resident on the *same instance of z/OS:*

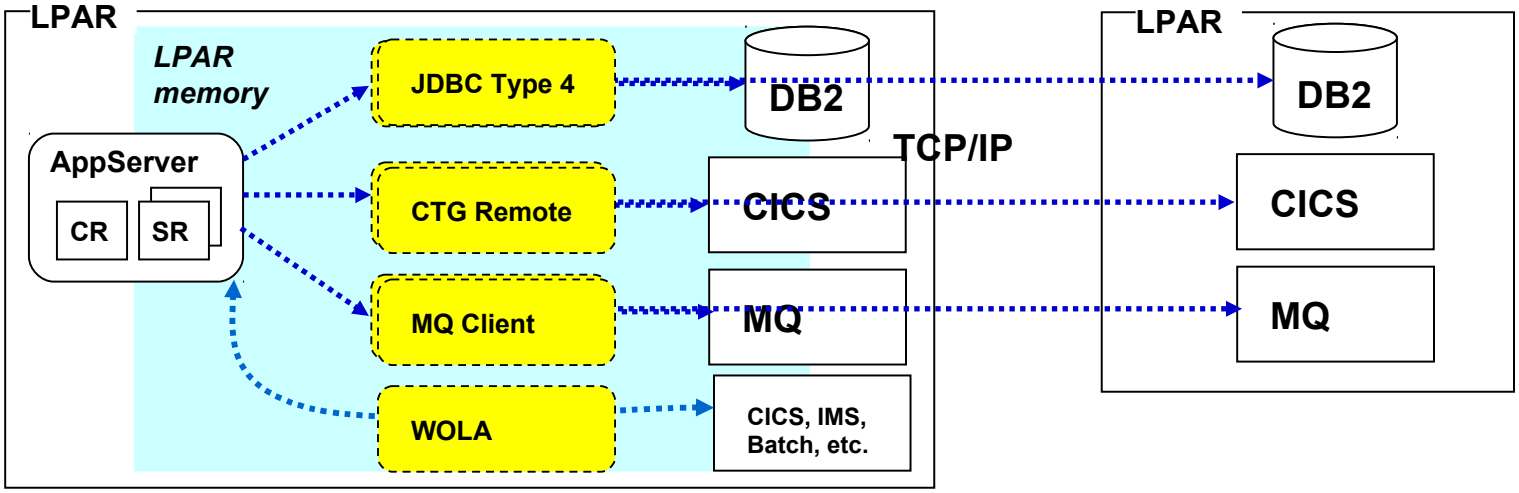


Exploiting *cross-memory co-location* services of z/OS



May be applicable to business needs, but this is not what we mean by "co-location"

Co-Location - Cross-Memory Communications



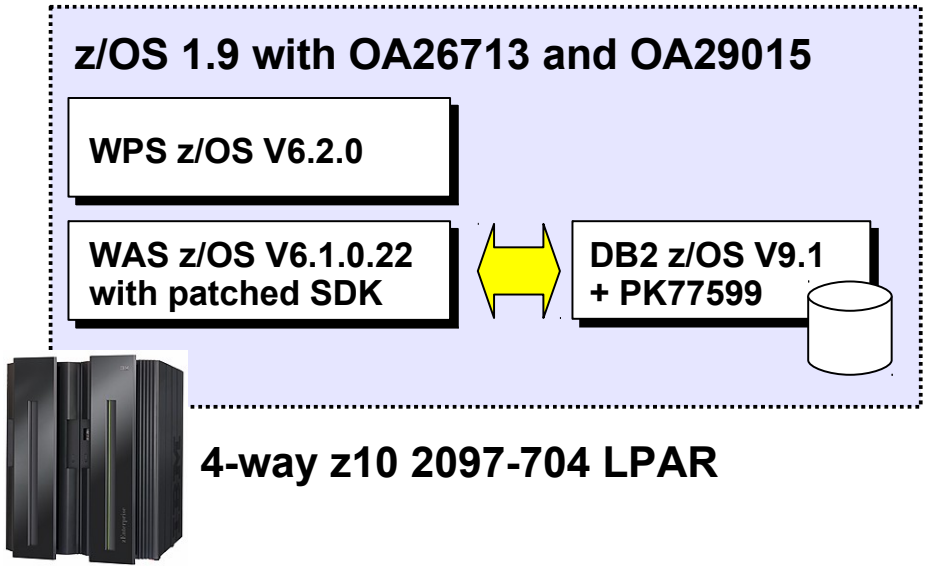
- ✓Cross memory speed
- ✓Avoids encryption overhead
- ✓Security ID propagation
- ✓Exploitation of z/OS transaction management (RRS)
- ✓Avoid serialization of parameters
- ✓Single thread of execution

Benefits: Save mips, increased robustness, improved security

For details, see:

WAS z/OS – the value of Co-Location, http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101476

The Original 2009 Study - Background



Notes:

- This testing took place just as we were getting zAAP offload in the SDK and the JDBC drivers were updated
- This was *before* the days of zAAP-on-zIIP
- z/OS APAR fix OA26713 provided offload of *some* Type 2 processing to the zAAP
- z/OS APAR fix OA29015 provided *even more* offload of Type 2 processing to the zAAP
- Patched SDK in WAS 6.1.0.22 provided the SDK awareness of zAAP; function provided starting WAS z/OS 6.1.0.23 and later
- DB2 APAR PK77599 is what delivered enhanced performance JDBC drivers

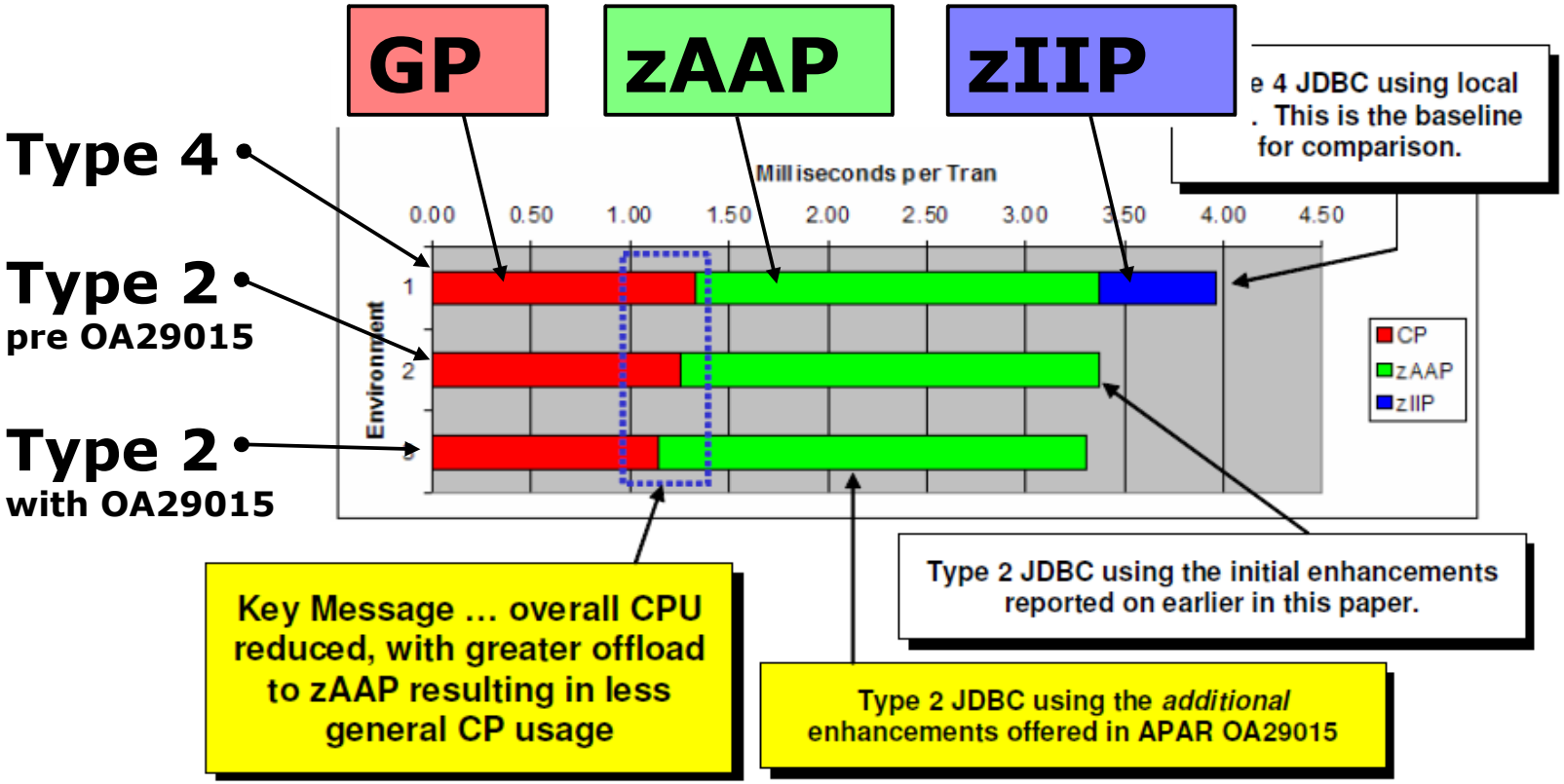
WPS workload because it represented a more robust, real-world environment than some simple echo program. WPS workload detailed in WP101476 document.

Driver tool used to bring system to steady state and held at consistent transaction rate for measured time. Measured CP/transaction the goal. Not stress/scalability.

Control Variable = JDBC Type 2 vs. JDBC Type 4

CP measured included everything on the system, not just WAS or WPS or JDBC. *Everything.*

Original Study Key Results Picture



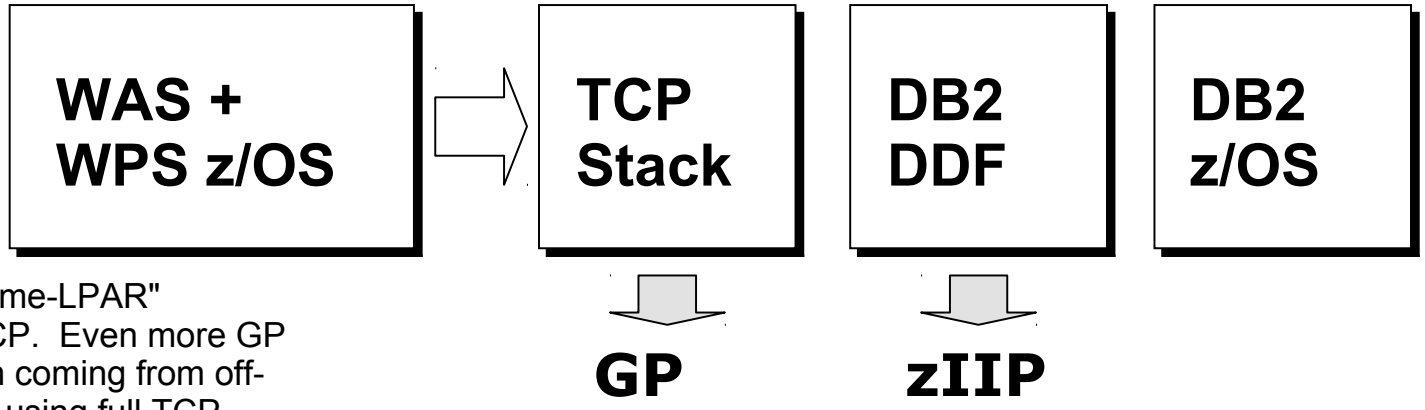
Type 2 uses less overall CPU than Type 4

Type 2 uses less total GP than Type 4

OA29105 reduced total GP for Type 2 even further

Step Back -- Answer the "Why?" Question

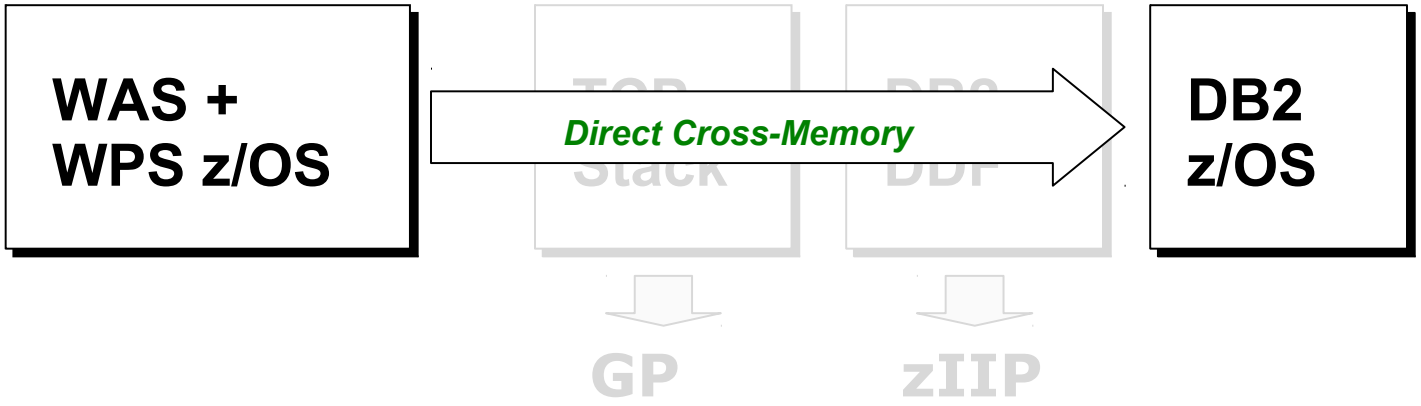
Type 4



This was "same-LPAR" optimized TCP. Even more GP is used when coming from off-platform and using full TCP stack

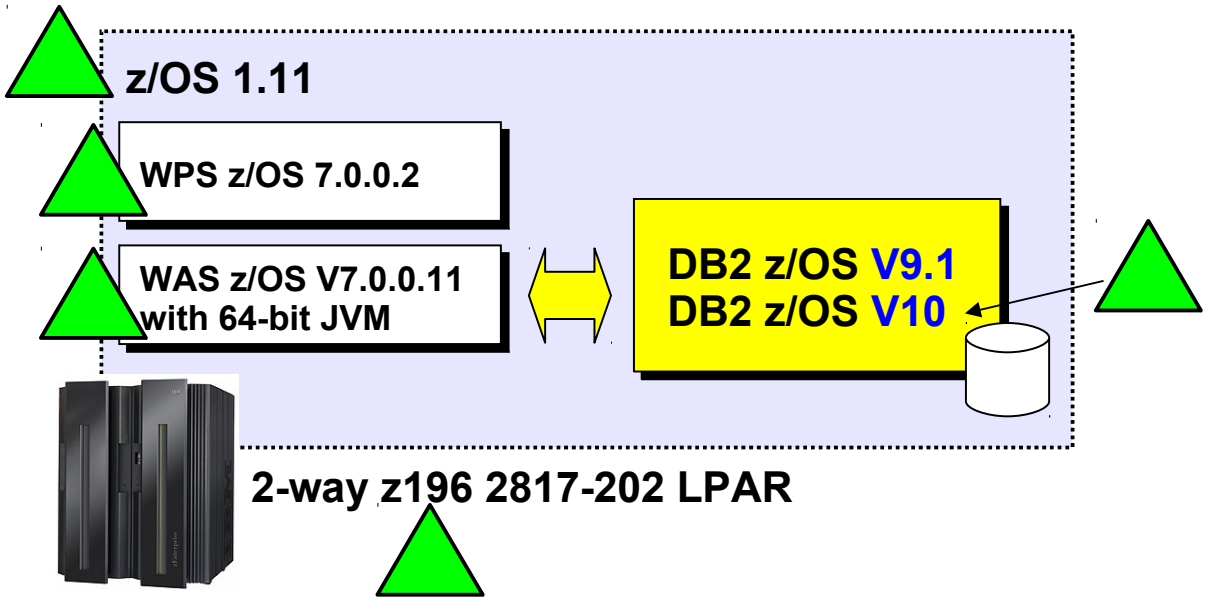
Plus the effects of serialization of query parameters, switching thread of execution and the use of XA partner logs rather than RRS

Type 2



Avoid serialization of query parameters, enjoy single thread of execution, use RRS rather than XA partner logs

The 2011 Update Test



A lot of things different from the original testing:

- Updated machine type
- Fewer engines in LPAR
- Updated z/OS level
- Updated WPS level
- Updated WAS level
- Updated DB2 level

Direct apples-to-apples comparison between original test and this test is difficult.

For the update test ...

Two Control Variables:

1. **JDBC Driver Type**
2. **DB2 Version Type**

	JDBC Type 2	JDBC Type 4
DB2 V9.1	**A**	**C**
DB2 V10	**B**	**D**

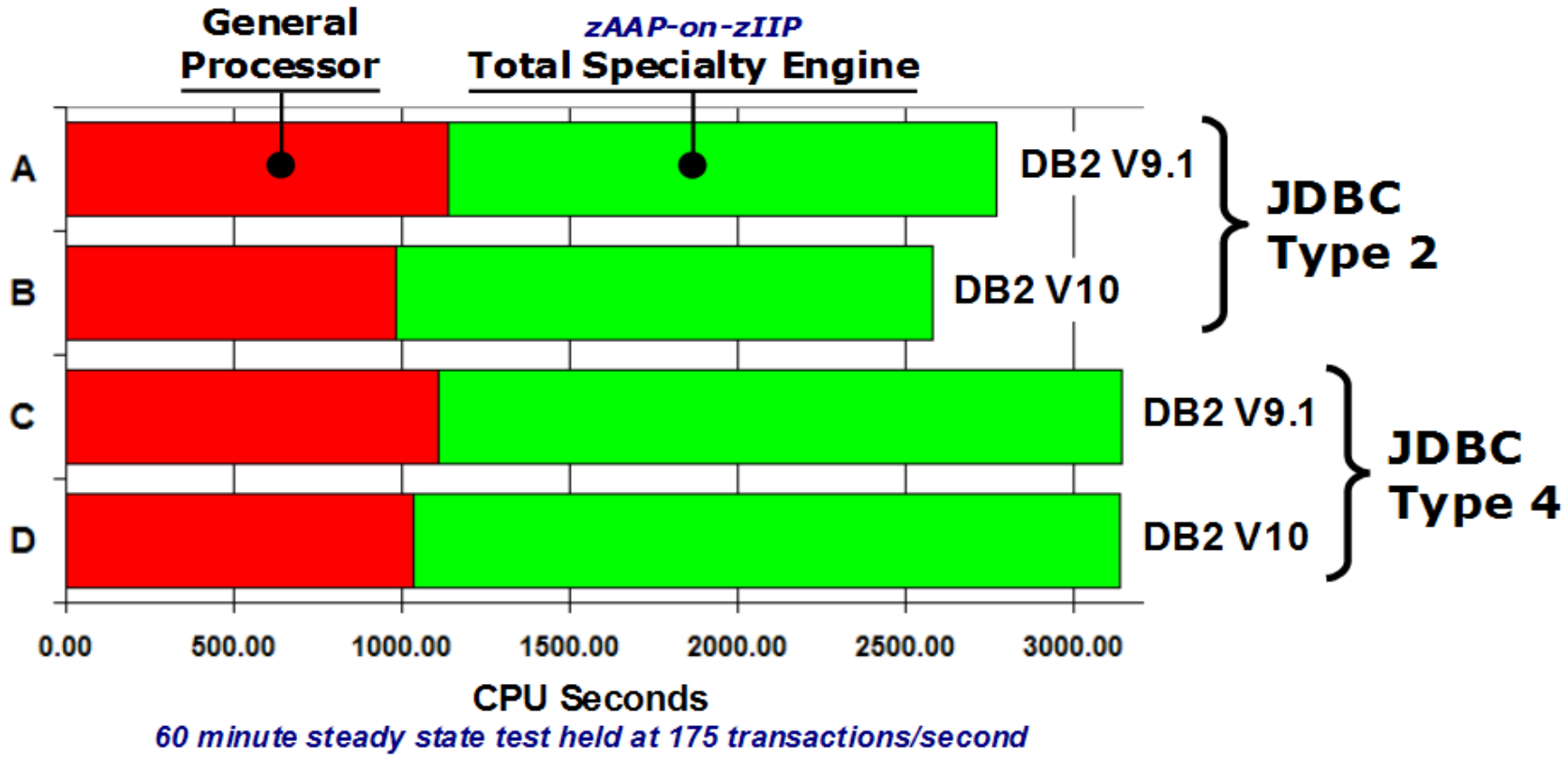
The update document and this presentation will focus on the comparisons within this two control variable set of results

What's Different with DB2 z/OS V10?

- Substantial changes to the JDBC Type 2 driver -- now uses the same lower-level code as JDBC Type 4 ... better handling of internal housekeeping requests
- The underlying dispatching of JDBC Type 4 DDF to zIIP has changed ... more to zIIP than before

In the results that follow we isolate the effects of these changes so we can measure and see the value

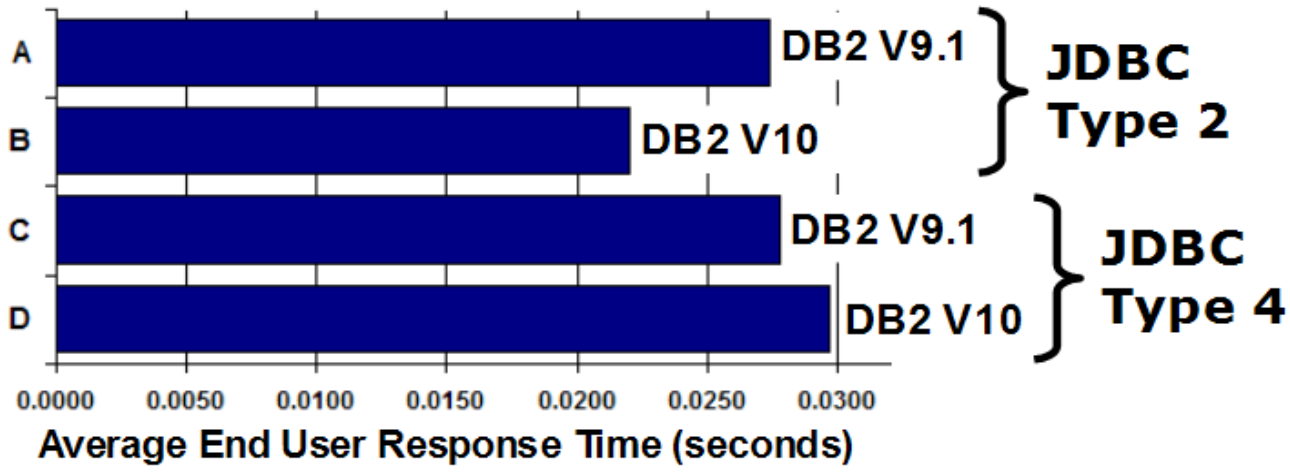
Broad Context Results Picture



Notes:

- Total CPU seconds for entire test run, not milliseconds/transaction as measured in original test. Be careful with direct comparisons between original and this update test.
- zIIP and zAAP now combined since we have zAAP-on-zIIP
- JDBC Type 2 generally better than Type 4
- DB2 V10 GP better than V9.1

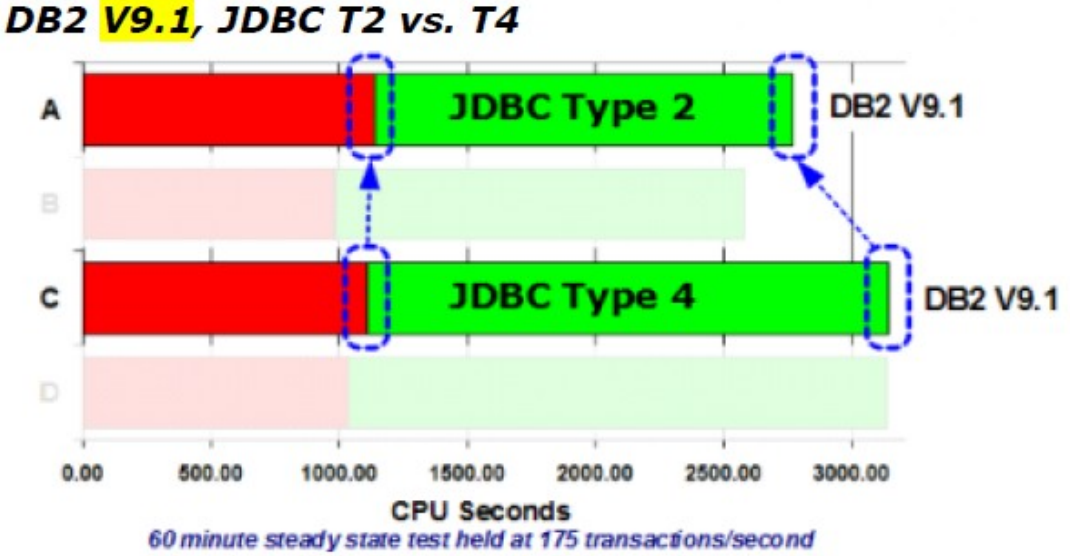
Average End User Response Time



Note the X-Axis scale ... we're not talking about large differences here

JDBC Type 2 with DB2 V10 does enjoy a nice reduction vs. DB2 V9.1

Hold DB2 at V9.1, compare T2 vs. T4



Less is better (CPU seconds for the 60 minute test duration)

The following table summarizes the comparison of CPU seconds consumed during the testing run duration:

	Type 2	Type 4	T2 Benefit	% T2 Benefit
General	1139.76	1111.68	-28.08	-2.53%
Specialty	1637.64	2038.68	401.04	19.67%
Total	2777.40	3150.36	372.96	11.84%

Using DB2 V9.1, JDBC Type 2 used a small percentage *more* GP, nearly 20% *less* total specialty engine, and nearly 12% *less* total CPU.

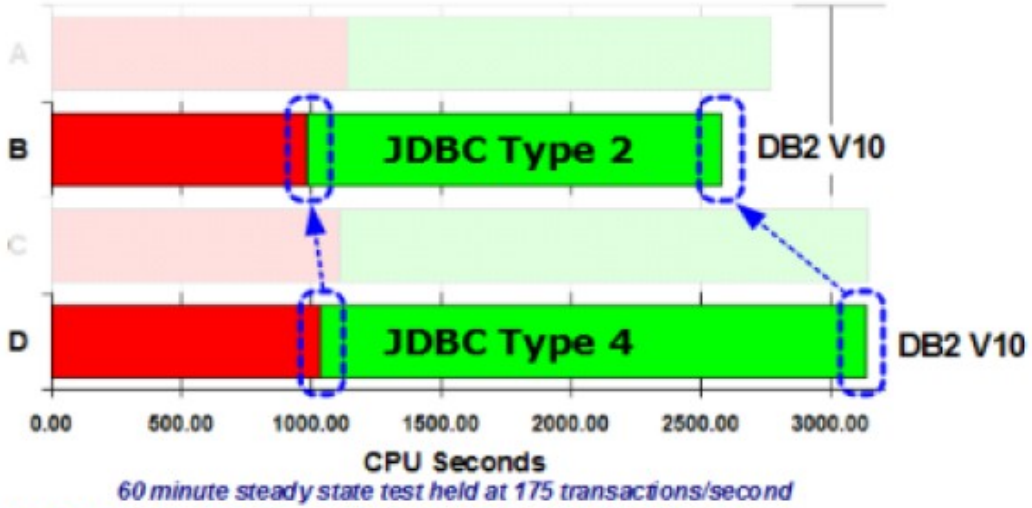
Given all the other changes to the environment we noted before ...

Slight increase in GP usage with Type 2 vs. Type 4

A decent reduction in specialty engine usage as well as total usage

Hold DB2 at V10, compare T2 vs. T4

DB2 V10, JDBC T2 vs. T4



60 minute steady state test held at 175 transactions/second

Less is better *(CPU seconds for the 60 minute test duration)*

The following table summarizes the comparison of CPU seconds consumed during the testing run duration:

	Type 2	Type 4	T2 Benefit	% T2 Benefit
General	979.92	1031.76	51.84	5.02%
Specialty	1605.60	2110.68	505.08	23.93%
Total	2585.52	3142.44	556.92	17.72%

Using DB2 V10, JDBC Type 2 used 5% *less* GP, nearly 24% *less* total specialty engine, and nearly 18% *less* total CPU.

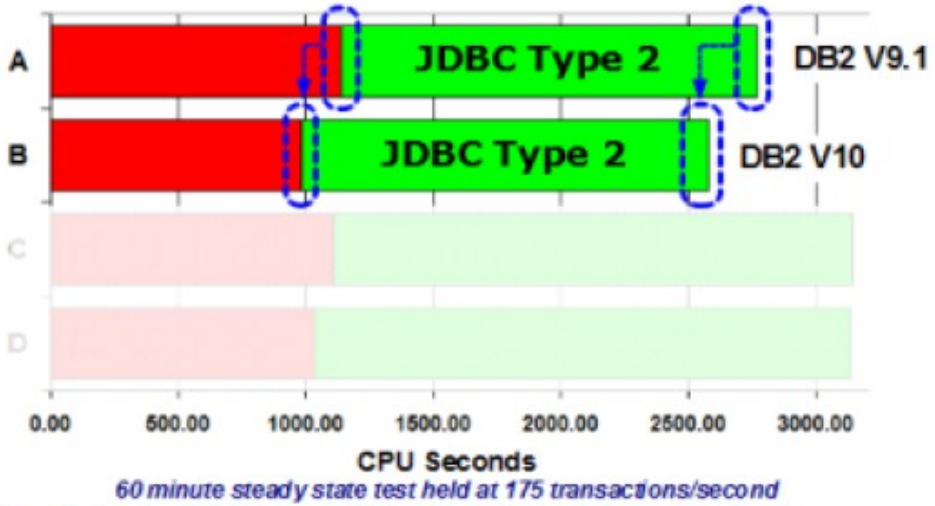
Given all the other changes to the environment we noted before ...

Now we see a 5% drop in GP

Nearly 18% drop in total CPU consumed

Hold JDBC at T2, compare DB2 V9.1 v 10

JDBC Type 2, DB2 V9.1 vs. DB2 V10



Less is better (CPU seconds for the 60 minute test duration)

The following table summarizes the comparison of CPU seconds consumed during the testing run duration:

	DB2 V10	DB2 V9.1	V10 Benefit	% V10 Benefit
General	979.92	1139.76	159.84	14.02%
Specialty	1605.60	1637.64	32.04	1.96%
Total	2585.52	2777.4	191.88	6.91%

Using JDBC Type 2, DB2 Version 10 used 14% *less* GP, about 2% *less* specialty and nearly 7% *less* overall CPU compared to DB2 V9.1.

Given all the other changes to the environment we noted before ...

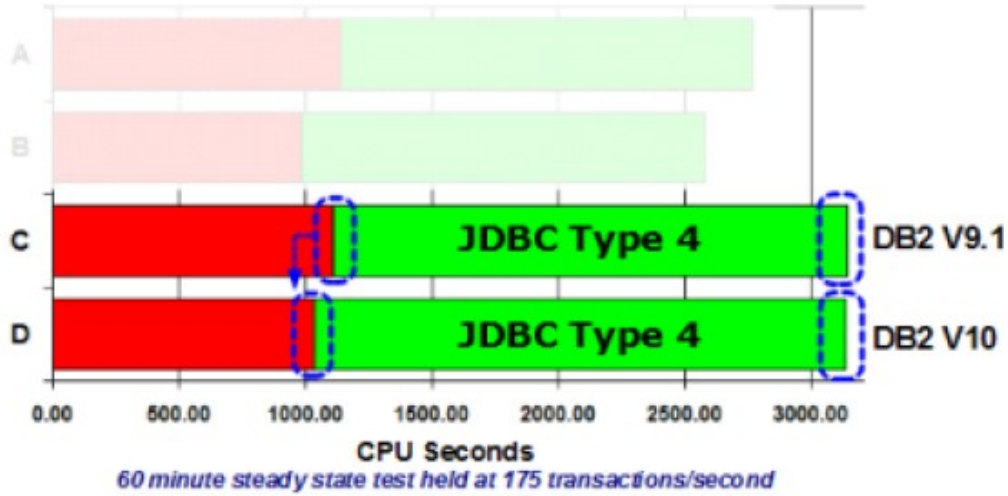
14% improvement in GP usage with JDBC Type 2 driver from V9.1 to V10

Only about 2% reduction in specialty engine usage

Overall, about a 7% improvement in Type 2 with DB2 V10

Hold JDBC at T4, compare DB2 V9.1 v 10

JDBC Type 4, DB2 V9.1 vs. DB2 V10



Less is better *(CPU seconds for the 60 minute test duration)*

The following table summarizes the comparison of CPU seconds consumed during the testing run duration:

	DB2 V10	DB2 V9.1	V10 Benefit	% V10 Benefit
General	1031.76	1111.68	79.92	7.19%
Specialty	2110.68	2038.68	-72.00	-3.53%
Total	3142.44	3150.36	7.92	0.25%

Using JDBC Type 4, DB2 Version 10 used 7% *less* GP, over 3% *more* specialty and just a bit *less* overall CPU compared to DB2 V9.1.

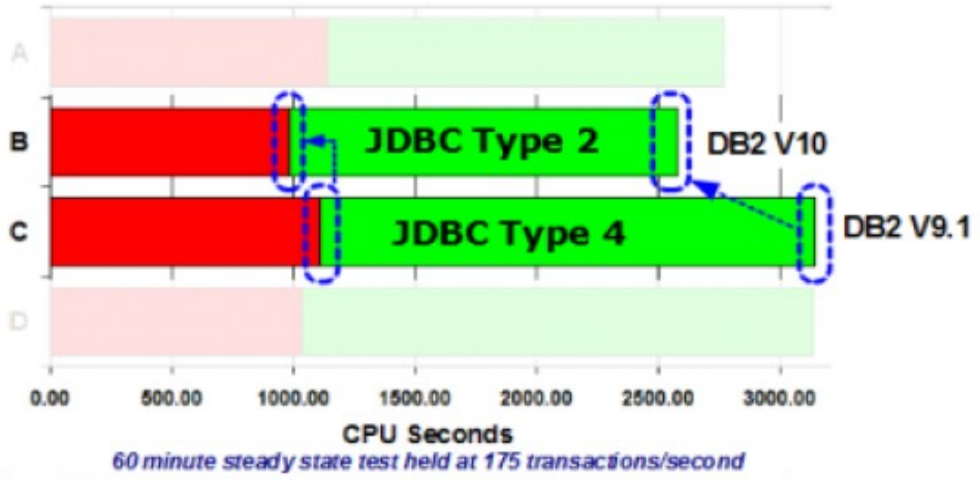
Given all the other changes to the environment we noted before ...

7% improvement in GP usage with JDBC Type 4 driver from V9.1 to V10

Specialty engine usage increased 3.5%.

Overall, a very small benefit in JDBC T4 going from V9.1 to V10

Change Both Variables - Type and Version



Less is better (CPU seconds for the 60 minute test duration)

The following table summarizes the comparison of CPU seconds consumed during the testing run duration:

	Type 2 DB2 V10	Type 4 DB2 V9.1	T2/V10 Benefit	% T2/V10 Benefit
General	979.92	1111.68	131.76	11.85%
Specialty	1605.60	2038.68	433.08	21.24%
Total	2585.52	3150.36	564.84	17.93%

Double-digit *less* GP, speciality and total CPU when the comparing T2 v T4 and DB2 V10 v DB2 V9.1

Given all the other changes to the environment we noted before ...

Nearly 12% reduction in GP usage with T2 and DB2 V10 compared to T4 and DB2 V9.1

21% reduction in speciality usage

Nearly 18% overall benefit from the change

Closing **Notes**

Overall Summary

This document has summarized the effect of two areas of benefit:

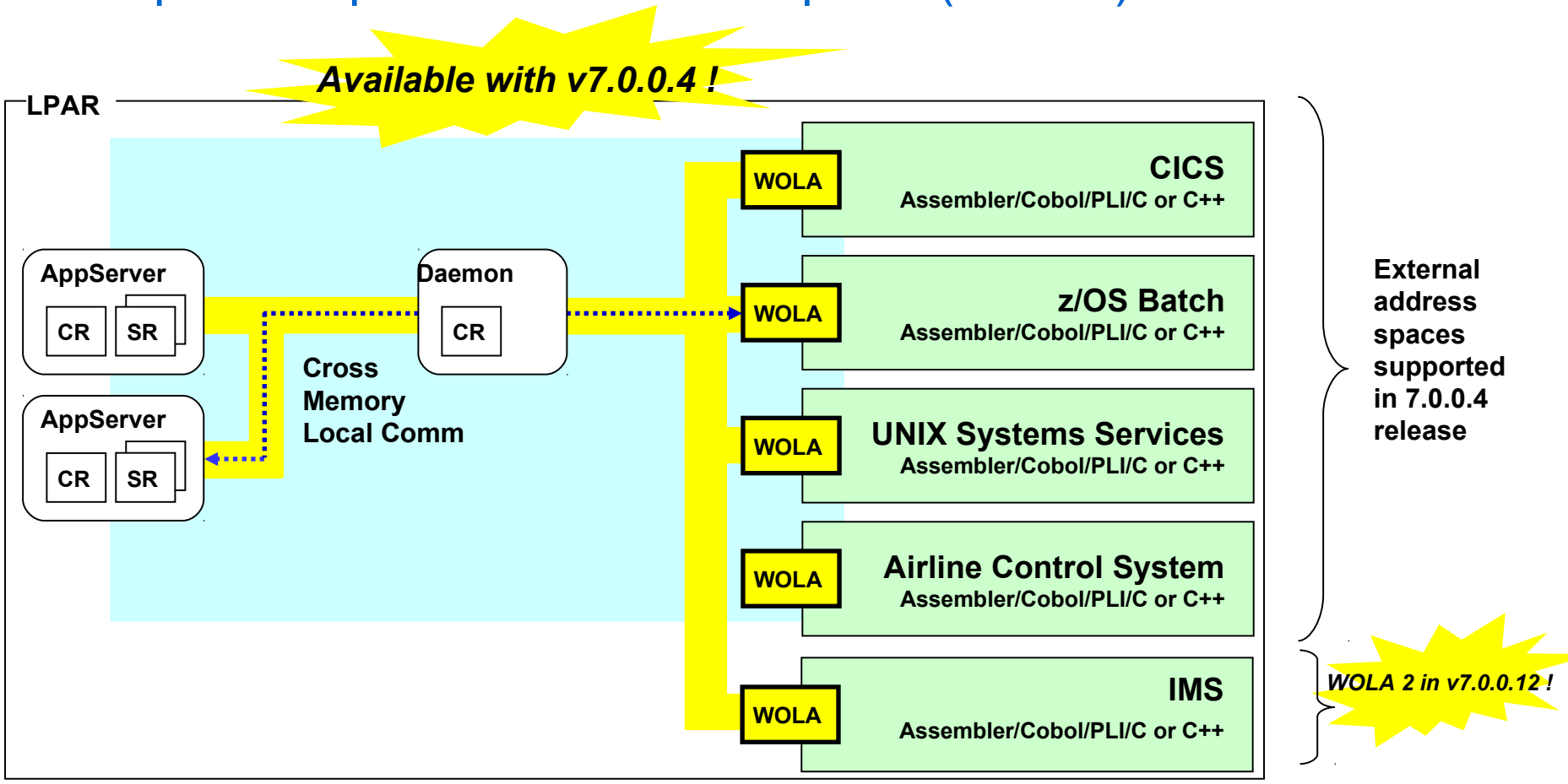
1. The CPU benefits associated with JDBC Type 2 which uses cross-memory technology. This eliminates the CPU associated with the TCP stack and DB2 DDF.
2. The benefits associated with DB2 z/OS V10 as compared to DB2 z/OS V9.1.

Co-location with Type 2 is the best use of your capacity. It also provides operational benefits and reduced complexity, which were outlined in the original WP101476 white paper.

Few notes of caution ...

- **Results vary, no guarantee of performance, etc.**
- **We can't tell from these numbers the specific effects of z196 versus the z10. It's there, we just can't isolate it based on the results data of this specific test.**
- **Nor can we tell from these numbers the specific effects of the newer levels of WAS and WPS. Again, it's there ... just can't isolate it from results of this specific test.**
- **Ditto z/10 V1.11 ... from results of this specific test.**
- **Effects of DB2 V10 and associated JDBC drivers we did isolate and compare with DB2 V9.1**

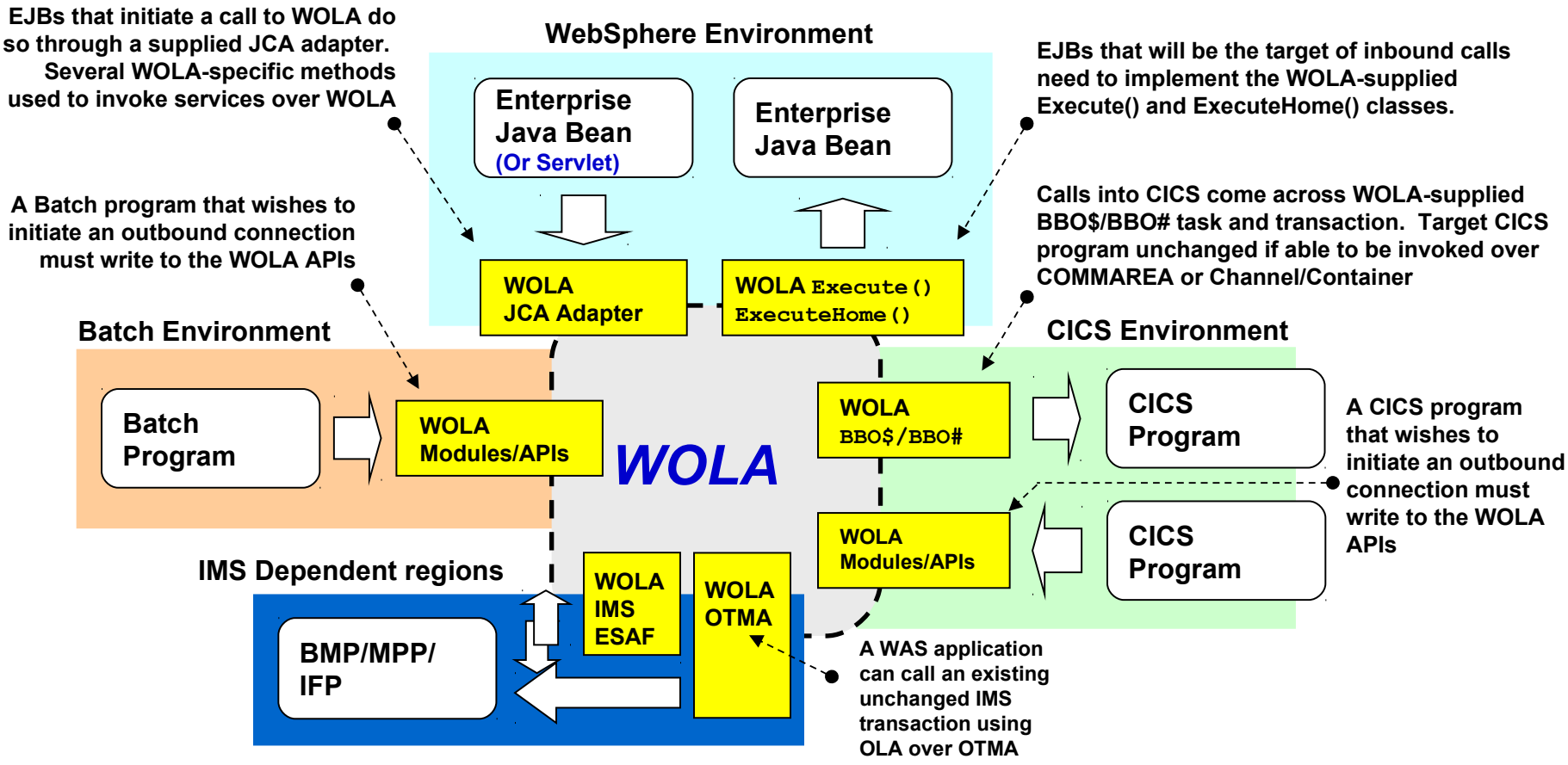
WebSphere Optimized Local Adapters (WOLA)



Benefits:

- Based on Local Comm cross-memory access (z/OS exclusive)
- Bi-directional … WAS outbound or inbound to WAS
- CICS Security and Transaction propagation
- Very fast. 1.5x – 6x faster than other local solutions
- Allows all the z/OS players to call one another like peers – leverage all of your assets

The WOLA Interface

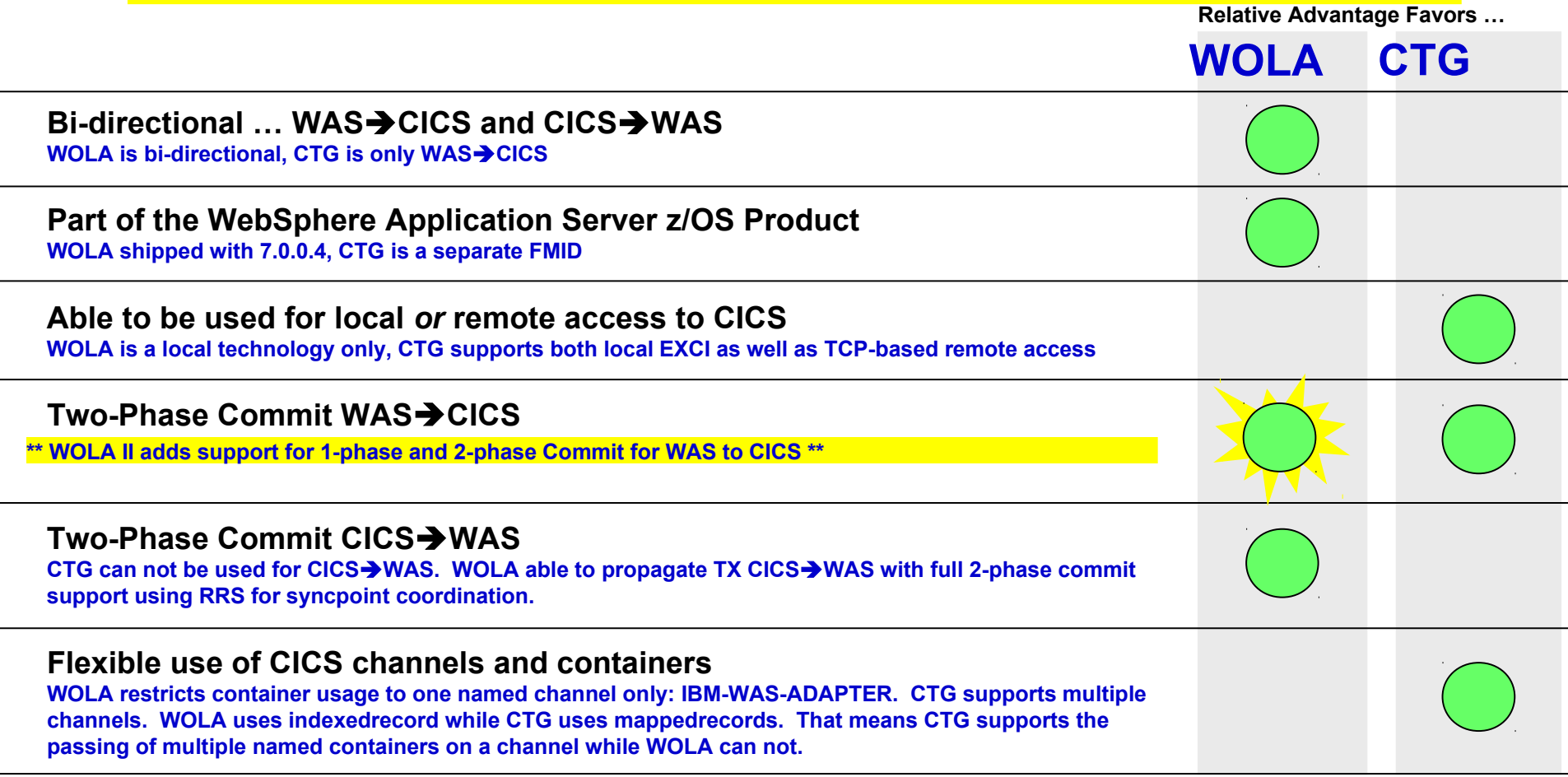


You make modules/classes available: `STEPLIB`, `DFHRPL`, `DFSESL`, `ola.rar` and `ola_apis.jar`

Batch CICS IMS WAS Development Tool

WOLA and CTG positioning

WOLA is a *complementary technology* with CTG. Both have their place within an enterprise architecture.



 Still confused about WOLA? See http://www.youtube.com/user/WASOLA1

WAS on z/OS Exclusives/Differentiators versus Distributed

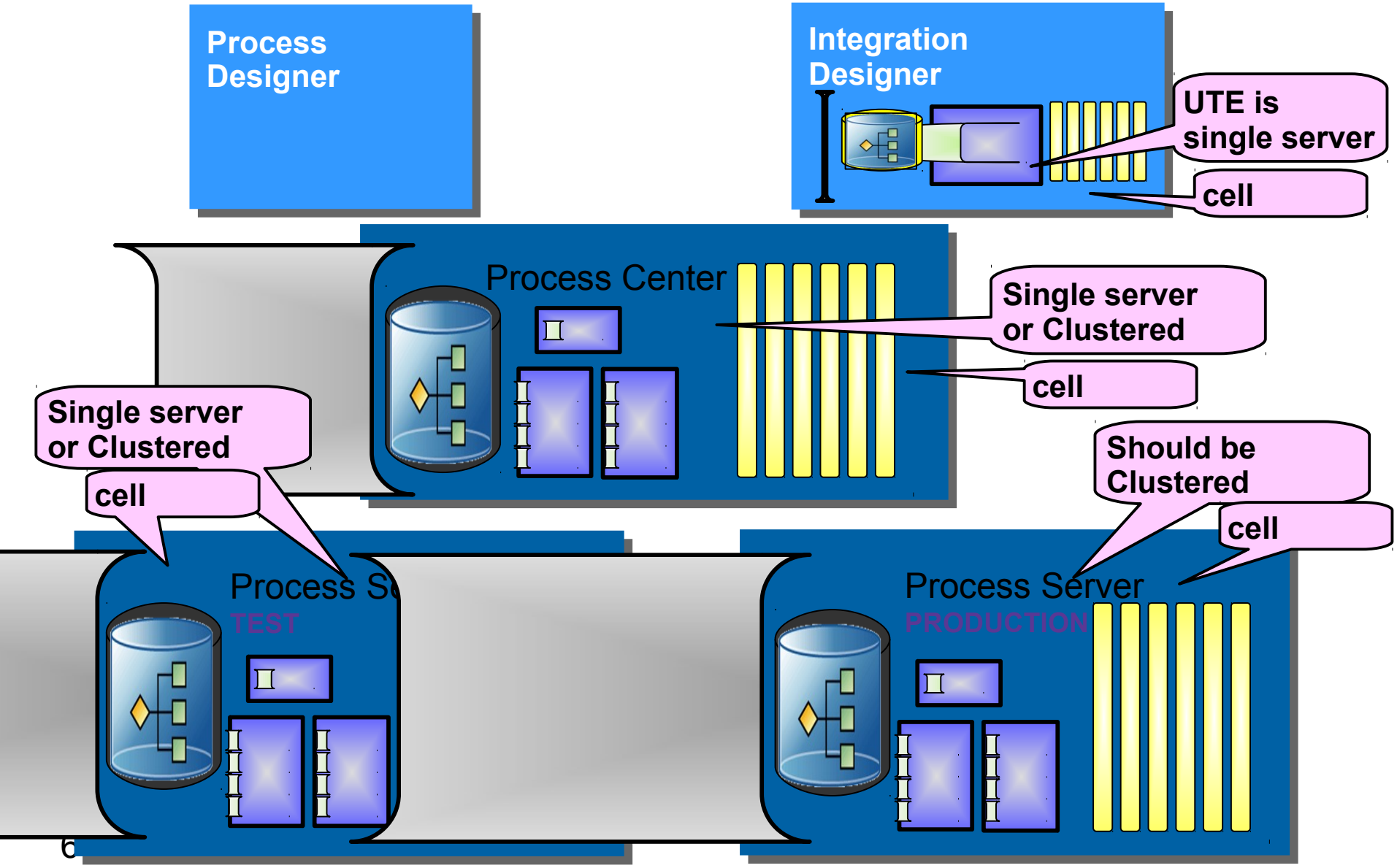
WAS on z/OS Exclusives/Differentiators	Perf/ Scal	Rel/ Avail	Sec	Mgmt	TCO	Dist Alt
Server Architecture – CR/SR, multiple JVMs, Appl. Isolation	✓	✓		✓		WVE
WLM spawning servant regions/JVMs/Address Spaces	✓	✓		✓	✓	WVE
WLM queuing	✓	✓				WVE
Pull versus Push architecture for routing/balancing	✓	✓		✓		None
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

WAS on z/OS Exclusives/Differentiators v. Distributed (cont'd)

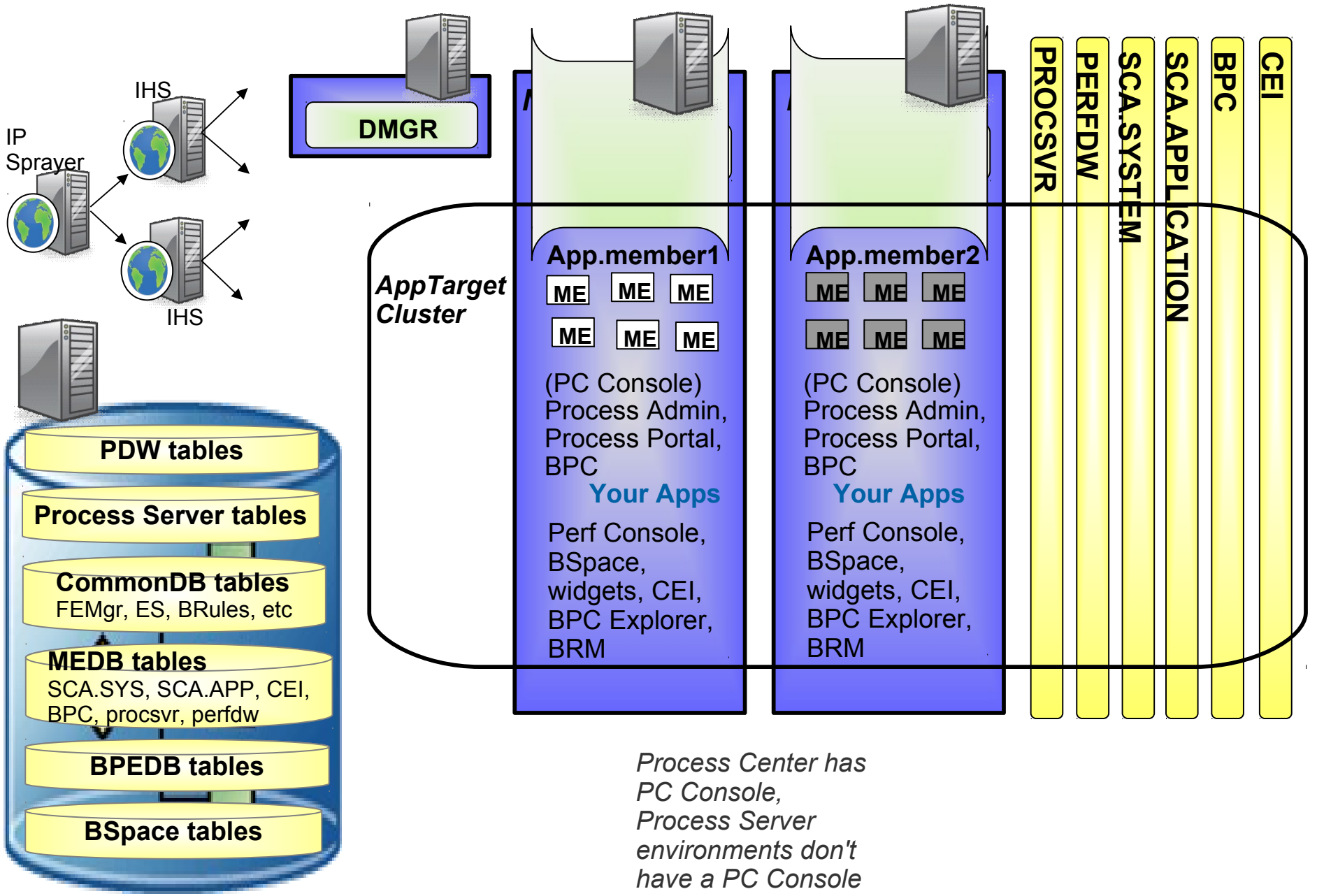
WAS on z/OS Exclusives/Differentiators	Perf/ Scal	Rel/ Avail	Sec	Mgmt	TCO	Dist Alt
Hipersockets between LPARs						None
Sysplex Distributor for TCP/IP routing	✓		✓	✓	✓	None
Parallel Sysplex exploitation	✓	✓		✓		None
GDPS disaster recovery	✓	✓		✓		None
		✓		✓		
Capacity Backup (CBU)		✓		✓	✓	None
On/Off 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

Installing IBM BPM 7.5 for z/OS

Multiple cells - Advanced

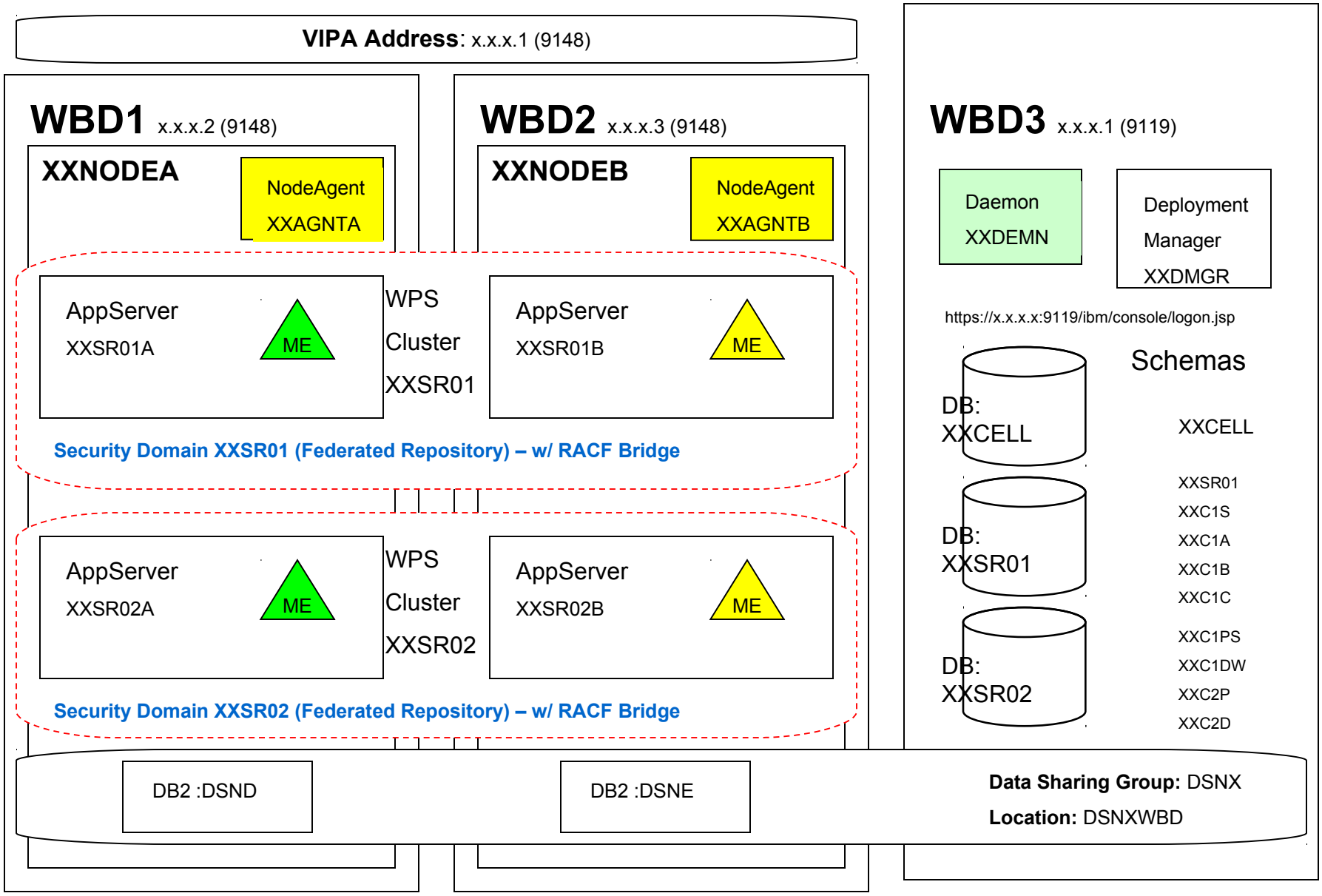


Single cluster (Advanced) - General view

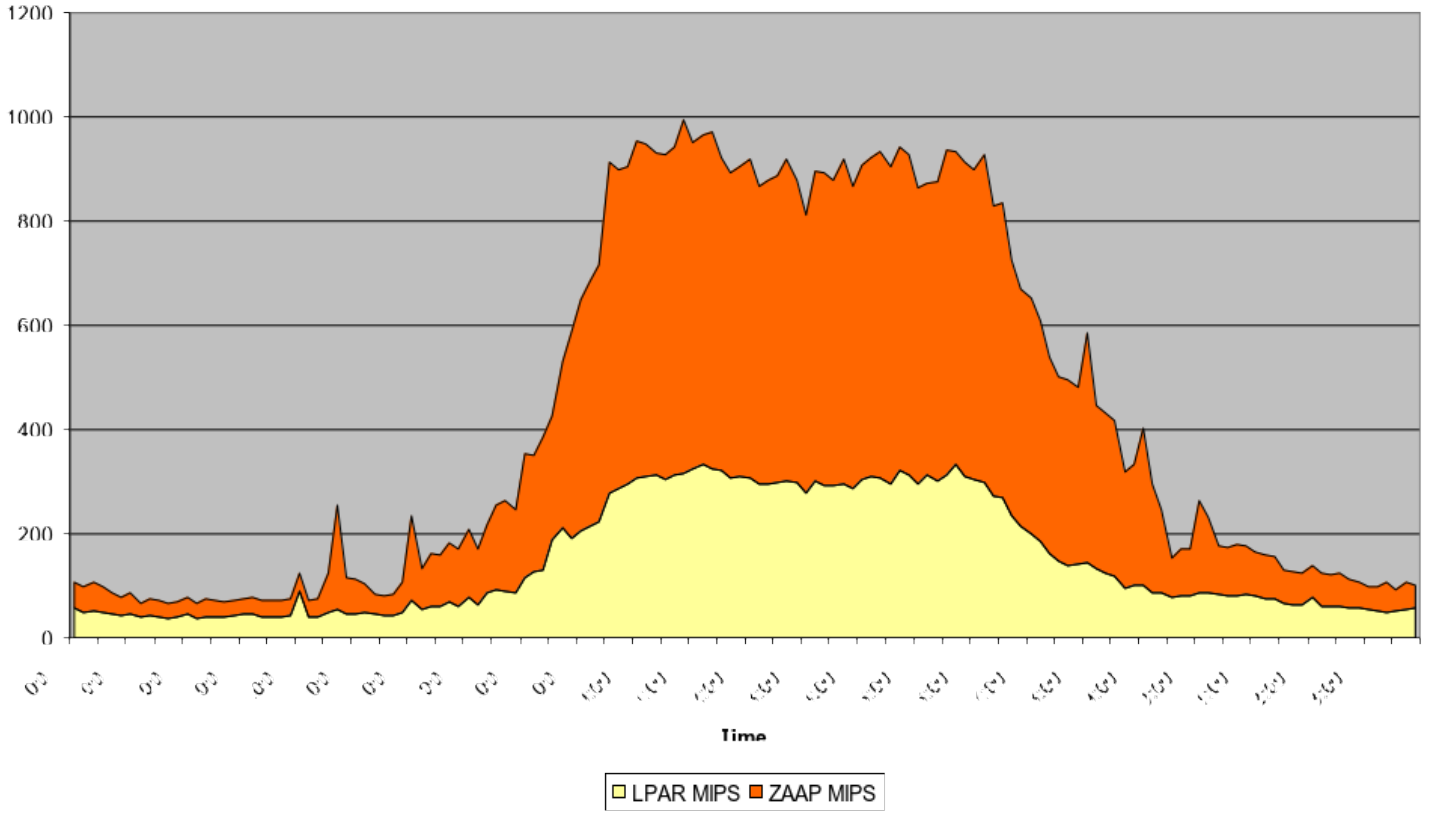


Process Center has PC Console, Process Server environments don't have a PC Console

IBM PS 7.5 z/OS Cluster Topology



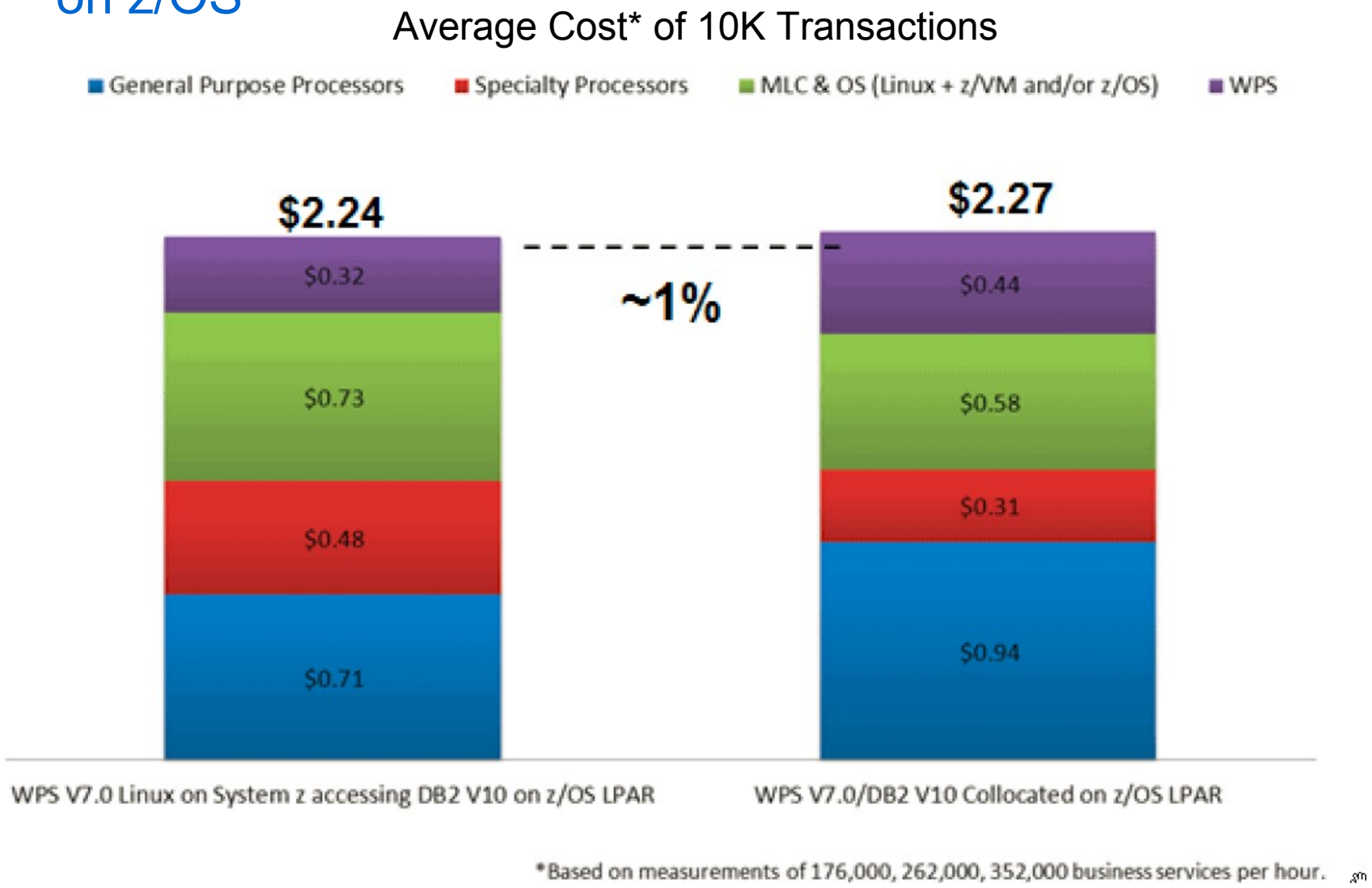
Specialty Processors Reduce Costs



"Costs reduced both by usage of zAAPs (66% offload achieved) and running Java on z10 (approx 8% reduction in CPU workload)"

Source: Large AP Bank

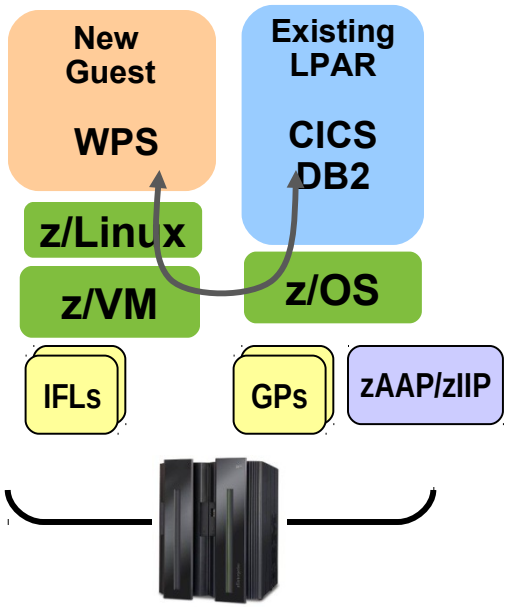
Continuous Price Performance Improvements of BPM on z/OS



Source: WebSphere for z/OS Prescriptive User Cases White Paper (OPct. 26, 2011 Addendum)

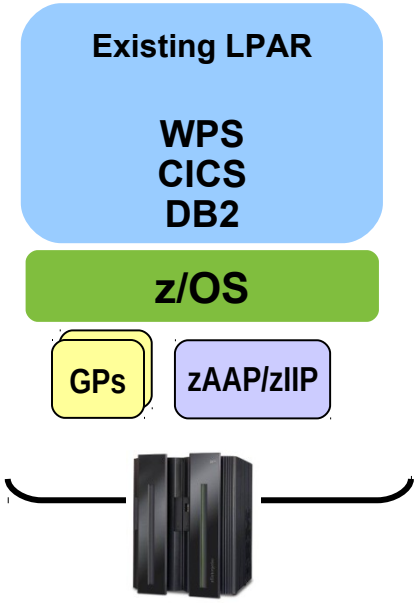
PUC v3 Configurations for Linux/z vs z/OS

zLinux and z/VM
(CTG remote and JDBC Type-4)



- WPS runs in a new zLinux Guest on z/VM
- CICS and DB2 run in a separate z/OS LPAR.
- CTG was used to access remote CICS transactions.
- JDBC Type 4 driver for DB2 access.

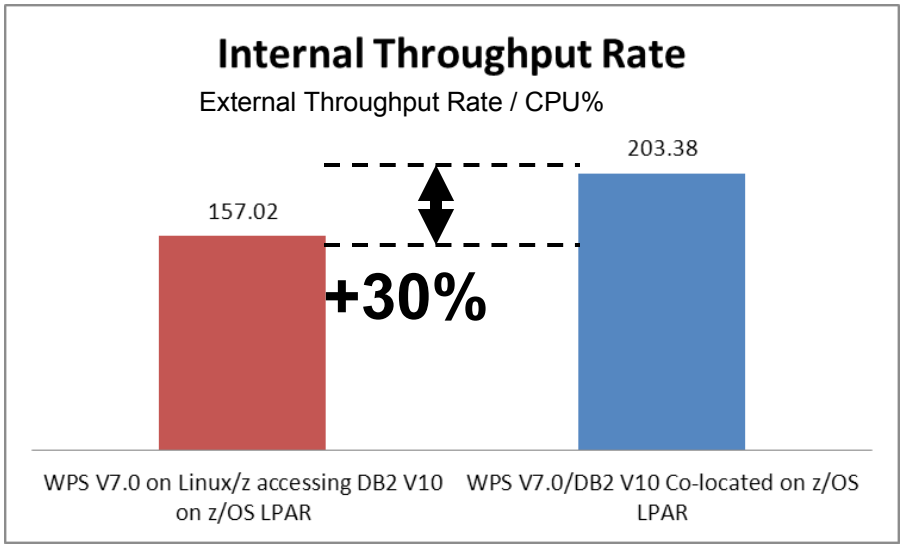
Same LPAR Co-located (Type 2)

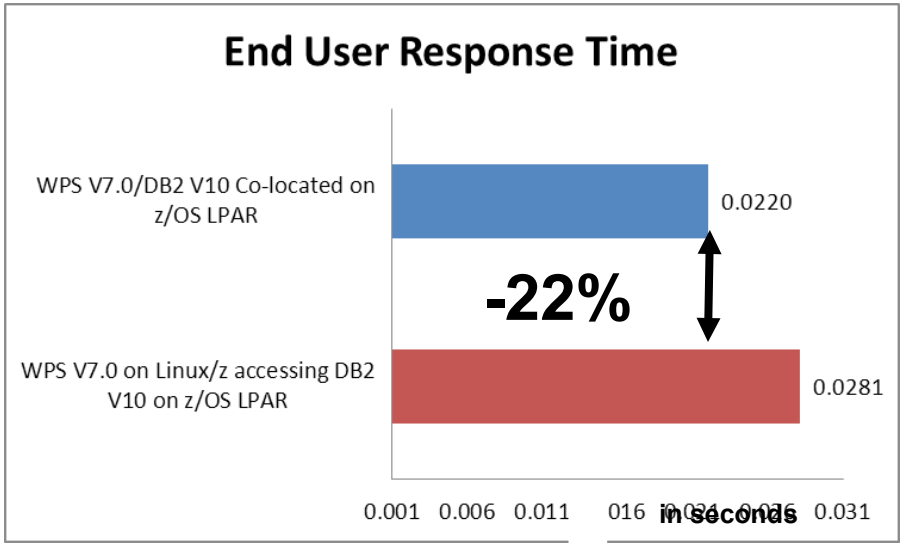


- WPS runs collocated with CICS and DB2.
- CTG was used to access CICS transactions.
- JDBC Local Type 2 adapter is used for DB2 access.

Source: WebSphere for z/OS Prescriptive User Cases White Paper (OPct. 26, 2011 Addendum)

PUC v3 Performance Comparisons





PUC v3 Results:

- Co-Located z/OS handled 30% more transactions than Linux/z
- Co-Located z/OS End user Response time was 22% lower than Linux/z

Source: WebSphere for z/OS Prescriptive User Cases White Paper (OPct. 26, 2011 Addendum)