Building a connectivity solution for Smart SOA on System z

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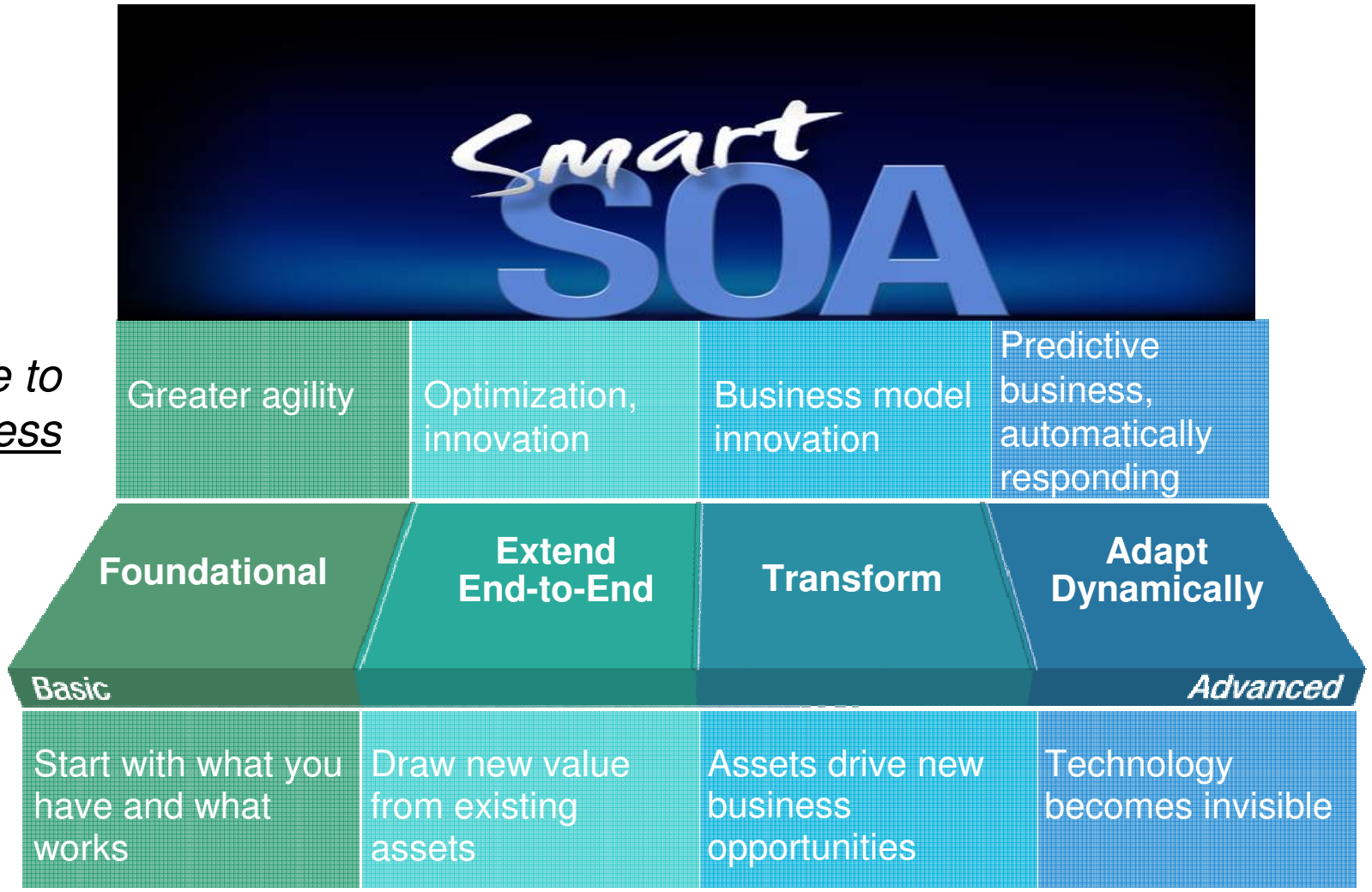
Smart SOA: Agility and Integrity for z Customers

Regardless of Where You Choose to Engage



Based on 6550 engagements using our SOA offerings

There is a Smarter Way!

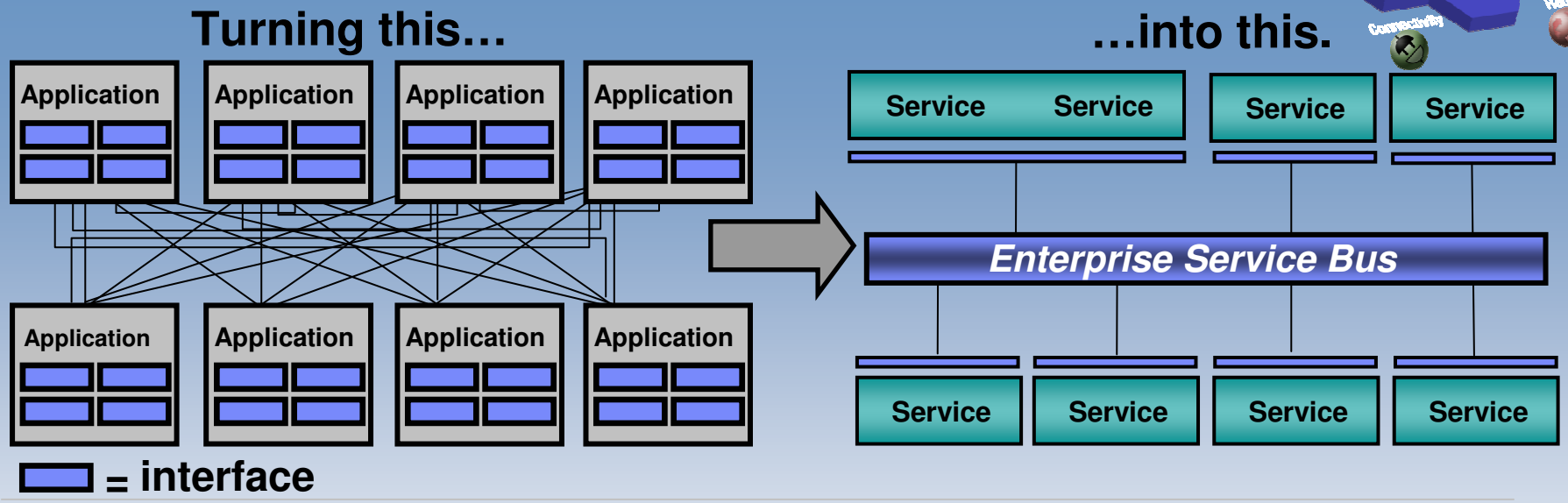
Continue creating value from your z assets

Smart SOA

Build an SOA around your core mainframe applications

- Highly virtualized and energy efficient – driving out cost and complexity
- Comprehensive security and resiliency – minimizing risk and downtime
- Centralized corporate data serving – a platform for business analytics
- A foundation for SOA – IT that responds to the business
- An ecosystem that is flourishing – ISVs and academic initiatives

SOA with an ESB – Simplifying Interfaces and Applications



SOA + ESB:

- ✓ Introduces rich business abstractions to describe the application interface.
- ✓ Decouples the interfaces from the business applications and reduces technical complexity
- ✓ Consolidate multi vendor platforms into a unified messaging backbone, enable reuse of both the business applications and their interfaces
- ✓ QoS to match business need, sending the right data to the right service, logs and correlates events

The ESB → Virtualizes access to services.

What is an Enterprise Service Bus?

- An ESB **enables integration between loosely-coupled applications and services within and across**
  - ***Services oriented architectures*** – where distributed applications are composed of granular re-usable services with well-defined, published and standards-compliant interfaces
  - ***Message driven architectures*** - where applications send messages through the ESB to receiving apps
  - ***Event driven architectures*** - where applications generate and consume messages anonymously
- Mediations **within an ESB enable intelligent processing of service request/responses, events, messages**
  - At application endpoints or distributed through the infrastructure of the Bus
  - Capabilities include:
    - Matching and routing of messages between services
    - Conversion of transport protocols between requestor and service
    - Transformations (e.g. XML to XML translations, DB lookups, aggregations),
    - Distribution of business events from/to disparate sources.
- **Enabling** simple application integration **across different platforms, programming models & messaging standards**
  - underpinning Business Process and managed Business Partner integration

Why loose coupling?

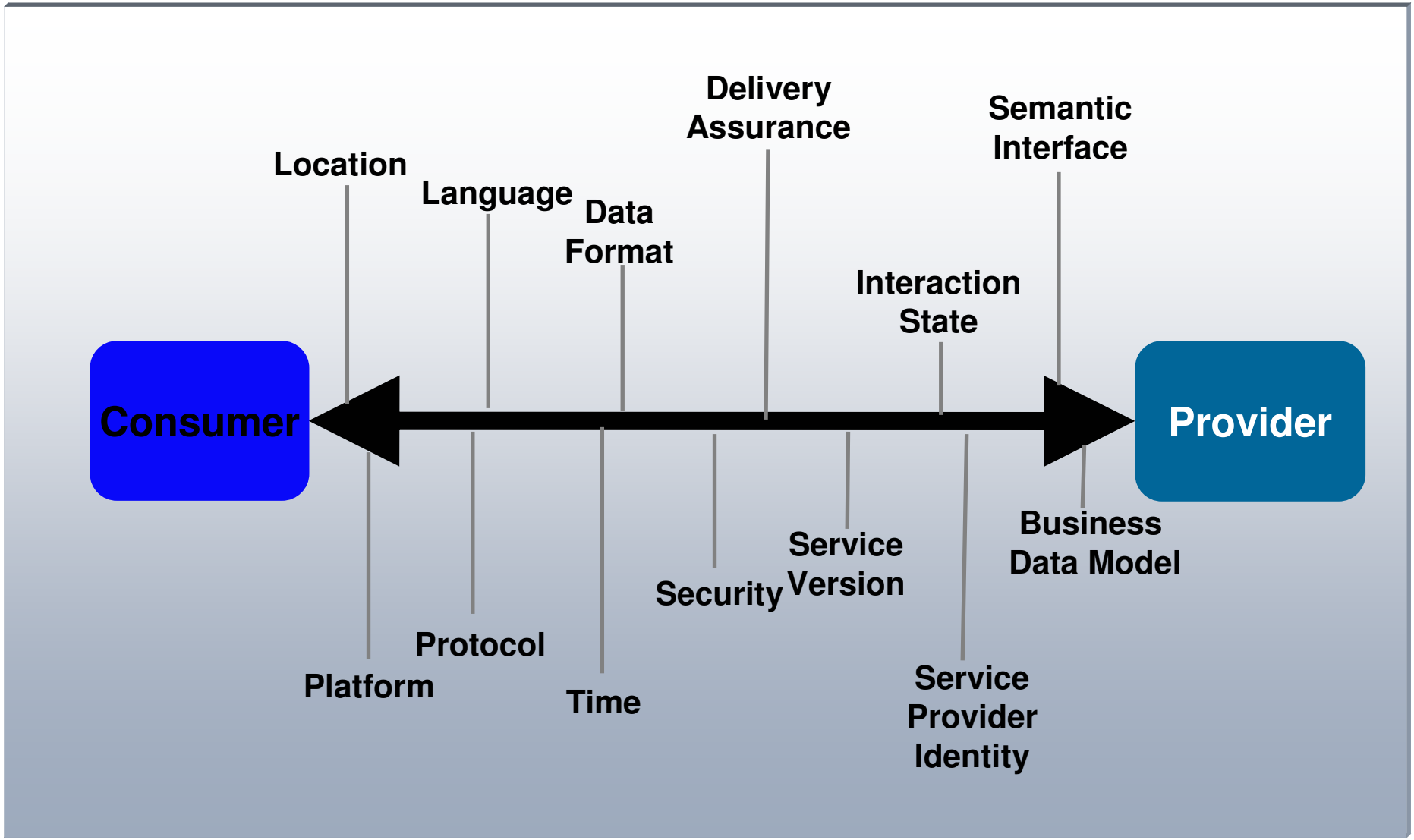
- **Tighter coupling tends to cost more over time:**
  - Synchronizing multiple organizations on change
  - Adapting, redeploying updated components without affecting others
  - Making changes is hard and expensive, or impossible:
    - Knowledge is distributed throughout the code
    - Same people are solving business and infrastructure problems
  - Different parts of the solution are difficult to manage separately
  - Hard to move, hard to scale, hard to distribute, hard to replace
  - More coupling implies more expensive testing

- **Loose coupling requires greater investment up front:**
  - More design work
  - More implementation work

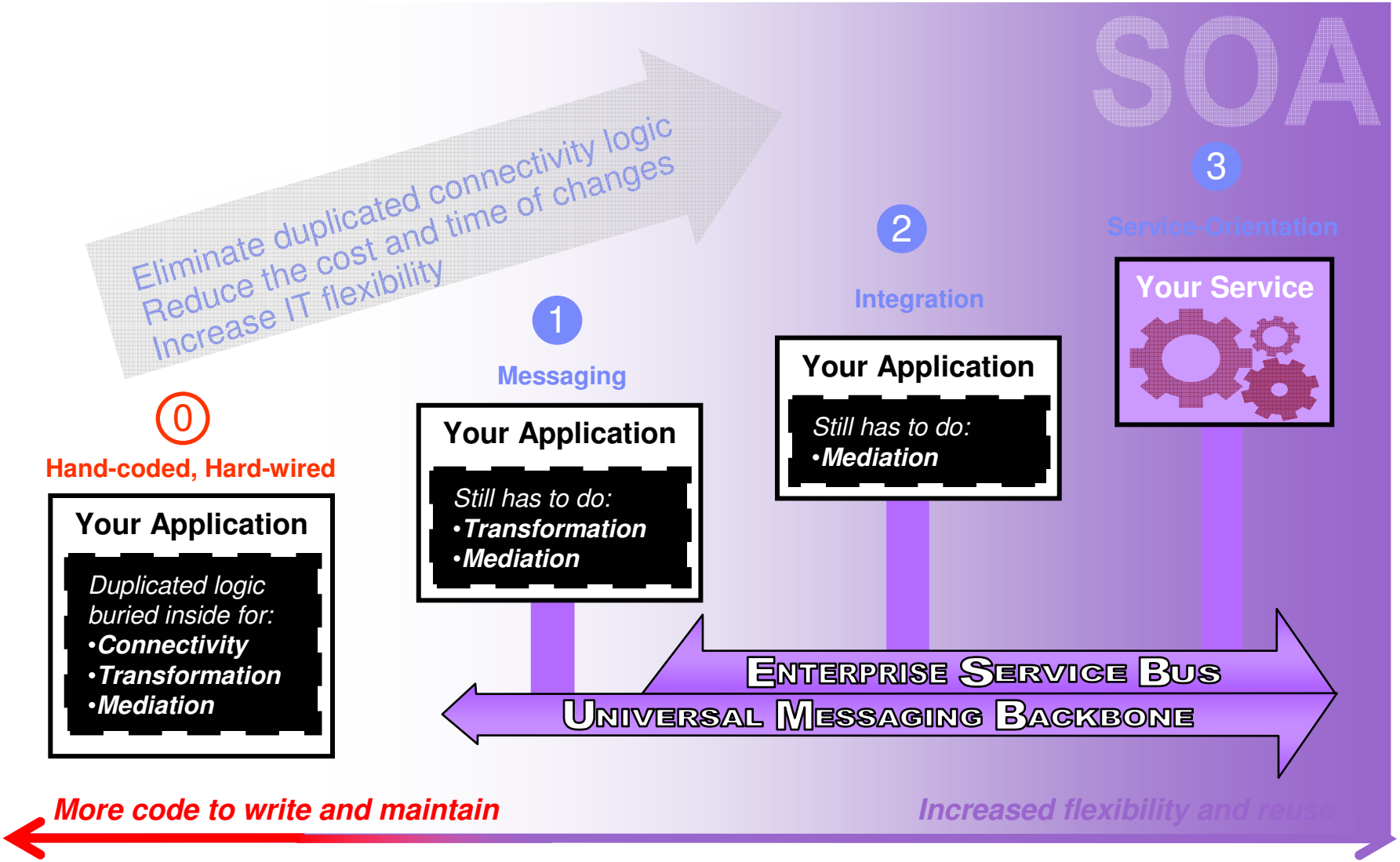
Several service elements must be considered when thinking about coupling:

- **Service**
- **Message**
- **Interface**
- **Contract**
- **Policy**
- **Conversation**
- **State**
- **Transactions**
- **Process**

Loose coupling aspects of service interactions



Simplifying Connectivity – A First Step To SOA

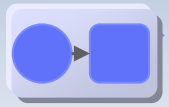


The Enterprise Service Bus

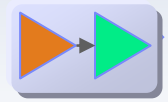
An Enterprise Service Bus (ESB) is a flexible connectivity infrastructure for integrating applications and services.

An ESB performs the following between requestor and service

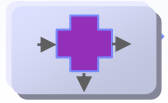
MATCHES & ROUTES communications between services



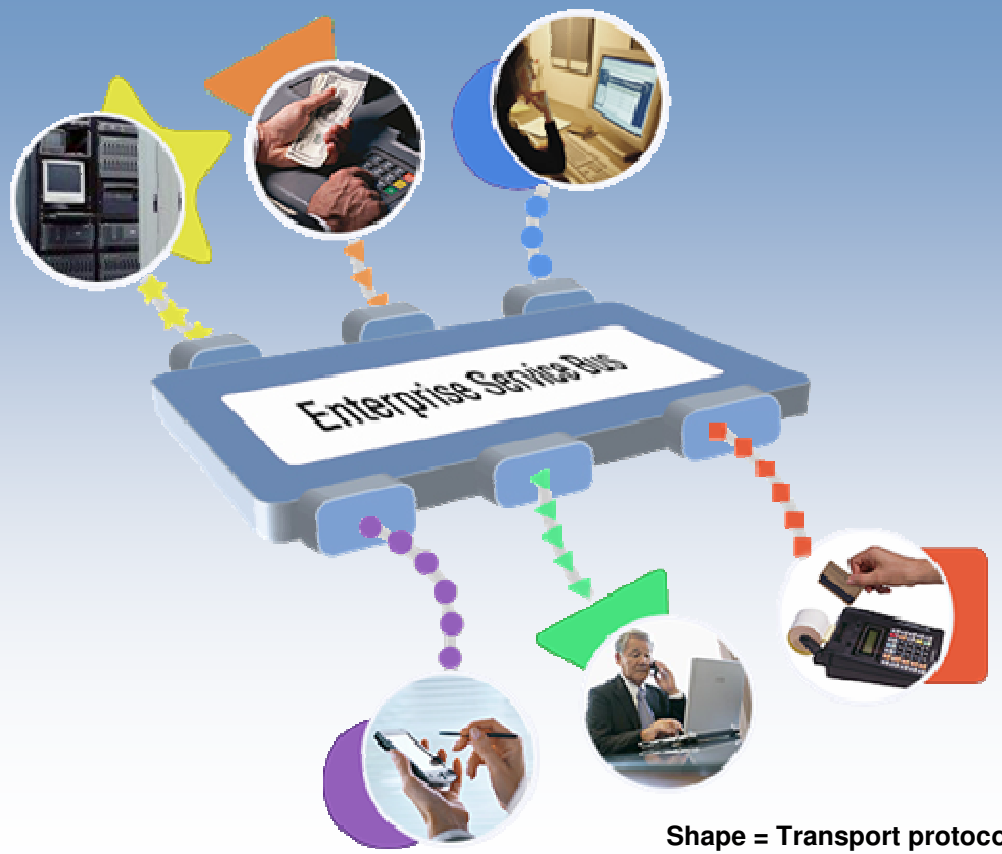
CONVERTS between different transport protocols



TRANSFORMS between different data formats

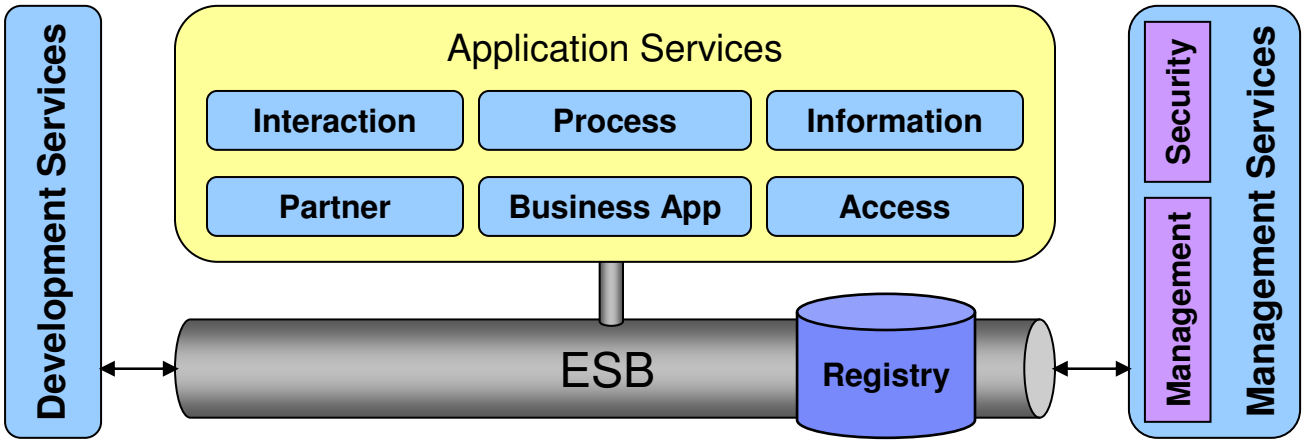


IDENTIFIES & DISTRIBUTES business events



Shape = Transport protocol
Color = Data format

An ESB-centric view of the Logical Model

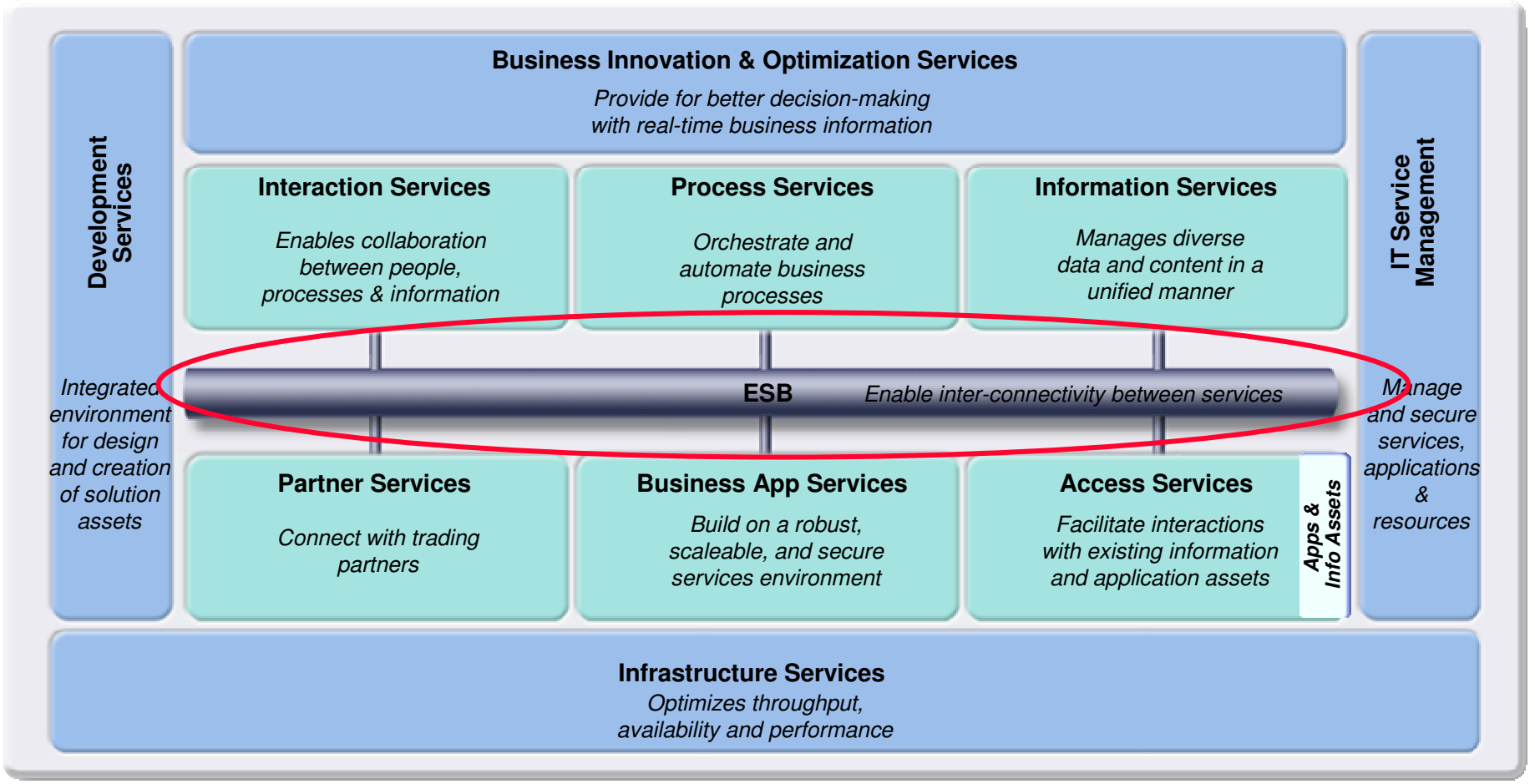


- **Outside ESB**
  - Business Logic (Application Services)
    - ESB ***does*** contain integration logic or connectivity logic
    - Criteria: semantics versus syntax; aspects
- **Loosely coupled to ESB**
  - Security and Management
    - Policy Decision Point outside the ESB
    - ESB can be Policy Enforcement Point
- **Tightly coupled to ESB**
  - Service Registry
    - Registry a Policy Decision Point for ESB
    - ESB a Policy Enforcement Point for Registry
    - But, Registry has a broader scope in SOA
- **Tooling required for ESB**
  - Development
  - Administration
  - Configures ESB via Service Registry

Described in a developerWorks article by Greg Flurry
http://www-128.ibm.com/developerworks/architecture/library/ar-esbpat1/

SOA Reference Architecture

Model of the Logical Architecture

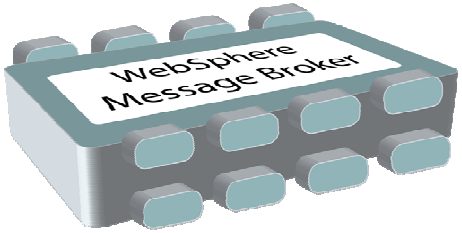


ESB offerings from IBM WebSphere

WebSphere delivers the most complete ESB solution

WebSphere ESB

Built on WebSphere Application Server for an integrated SOA platform



WebSphere Message Broker

Built for universal connectivity and transformation in heterogeneous IT environments

ESB offerings from IBM WebSphere

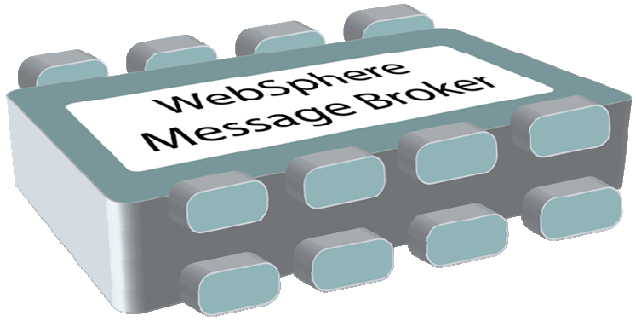
WebSphere DataPower Integration Appliance

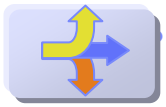
Purpose-built hardware ESB for simplified deployment and hardened security

WebSphere Message Broker on System z

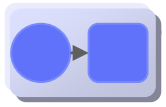
Built for universal connectivity and transformation in heterogeneous IT environments

- Connect FROM anything TO anything: the broadest range of transport, protocol, data format and transformation capabilities
- Flexible and function rich ESB: address a wide range of requirements encompassing both existing & new, applications and services.
- Tightly integrated and optimized for the z/OS platform, including specific features for MQ, DB2, CICS, IMS and RRS subsystems.
- Advanced features such as Complex Event Processing and file based integration including VSAM.

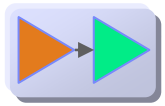




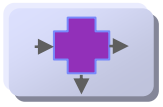
Exploits the unparalleled reach and reliability of the WebSphere MQ enterprise messaging backbone



Integrates everything through standard protocols, WebSphere Adapters for enterprise applications, and specialized connectivity options



Enables transformation between a wide range of data formats, including XML, legacy, and industry standards, and custom formats

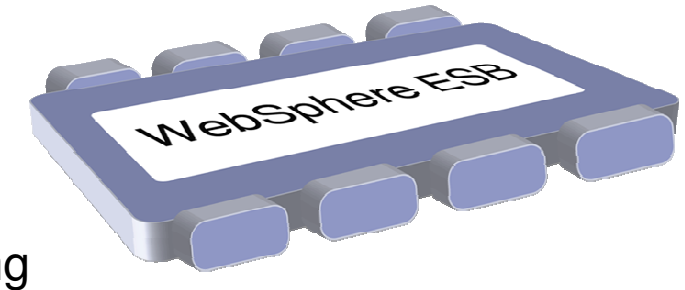


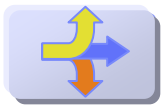
Optimized for high-volume processing and rapid time to value for complex mediation requirements with a robust set of pre-built mediation function

WebSphere ESB on System z

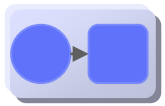
Built on WebSphere Application Server for an integrated SOA platform

- Integrates seamlessly with WebSphere platform
- Delivers business-critical qualities of service
- Easily extended to WebSphere Process Server
- Integrated solution for service mediation and hosting

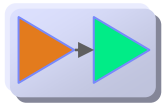




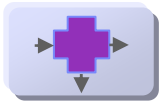
Delivers leadership in SOA standards for service composition, and leverages the embedded messaging and web services engines from WebSphere



Integrates everything with WebSphere Adapters for enterprise applications, the breadth of the WebSphere ecosystem, and support for standard protocols



Optimized for standard XML and web services formats, with basic support for other common formats

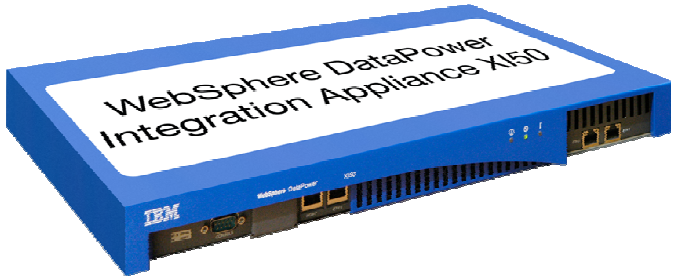


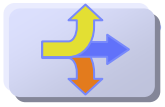
Provides business visibility with embedded event engine for Business Activity Monitoring solutions

WebSphere DataPower Integration Appliance XI50

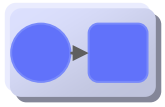
Purpose-built hardware ESB for simplified deployment and hardened security

- Redefines the boundaries of middleware with specialized hardware
- Many functions integrated into a single device
- Simplified deployment and ongoing management

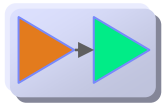




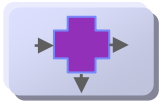
Secures services on the network with sophisticated web services access control, policy enforcement, message filtering, and field-level encryption



Optimized to bridge between leading standard protocols at wirespeed, including web services, messaging, files, and database access



Enables transformation between a wide range of data formats, including XML, legacy, and industry standards, and custom formats



Captures and emits events to facilitate web services management and enable business visibility in Business Activity Monitoring solutions

IBM's ESBs at the heart of your IT & your business

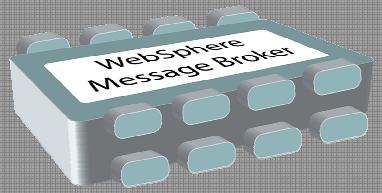
Business Process, Logic and Presentation

- WebSphere Portal
- WebSphere Process Server
- WebSphere Application Server

Management, Security, and Services

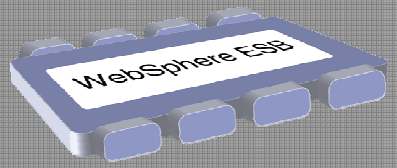
- WebSphere Service Registry and Repository
- Tivoli Federated Identity Manager
- Tivoli Composite Application Manager for SOA

IBM ESB Portfolio



WebSphere Message Broker

WebSphere DataPower Integration XI50



WebSphere ESB

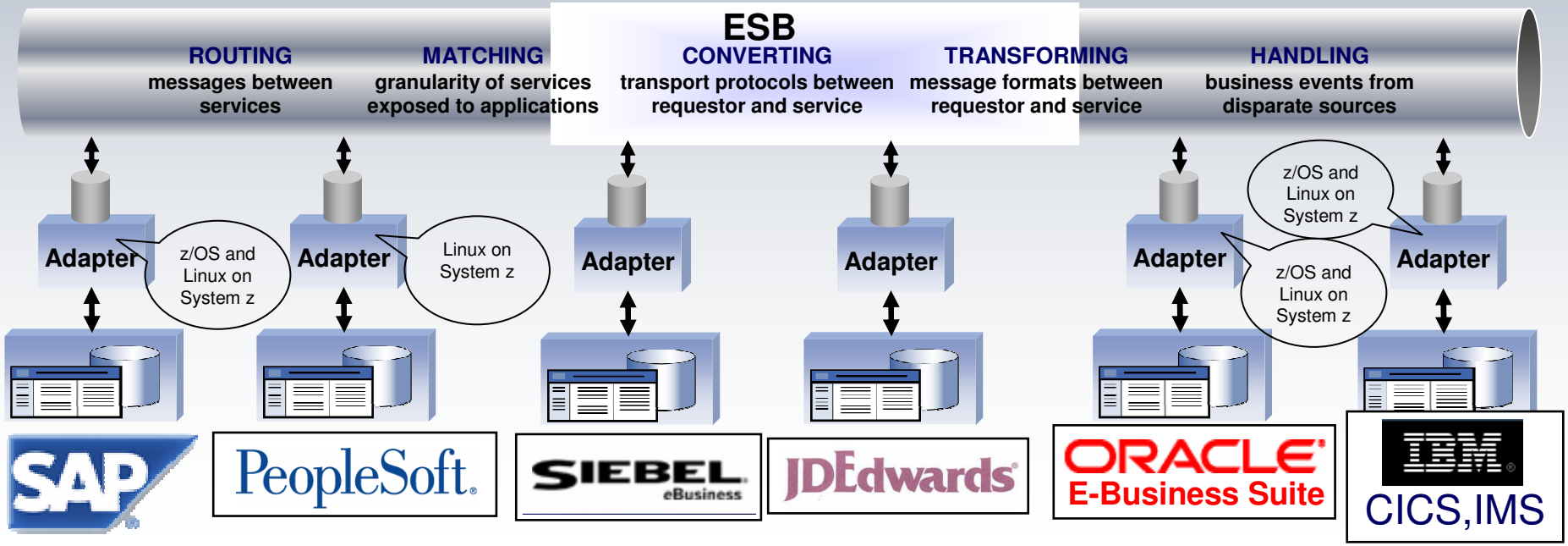
- WebSphere MQ
- WebSphere TX
- WebSphere Adapters
- WebSphere Partner Gateway

Cross-ESB Capabilities

WebSphere Adapters helping to Reuse, Connect, Compose

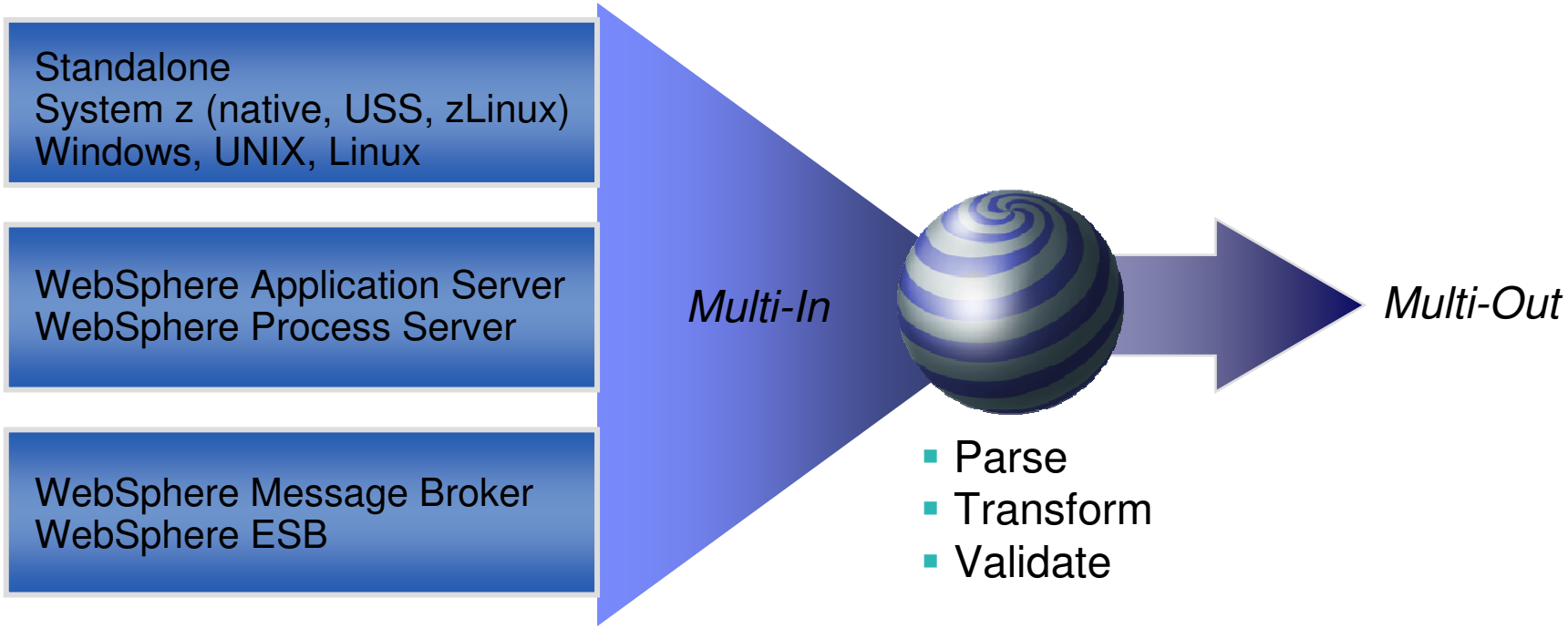
Service-enable existing applications to an ESB

- **Move beyond just accessing data to reuse both data and logic in composite applications**
- **End-to-end interaction with application driven business events**
- **A portfolio of pre-built SAP, Oracle and other application adapters as well as a toolkit to generate your own**
- **Use adapters, MQ Service Definitions or ESB mediations to service enable assets**



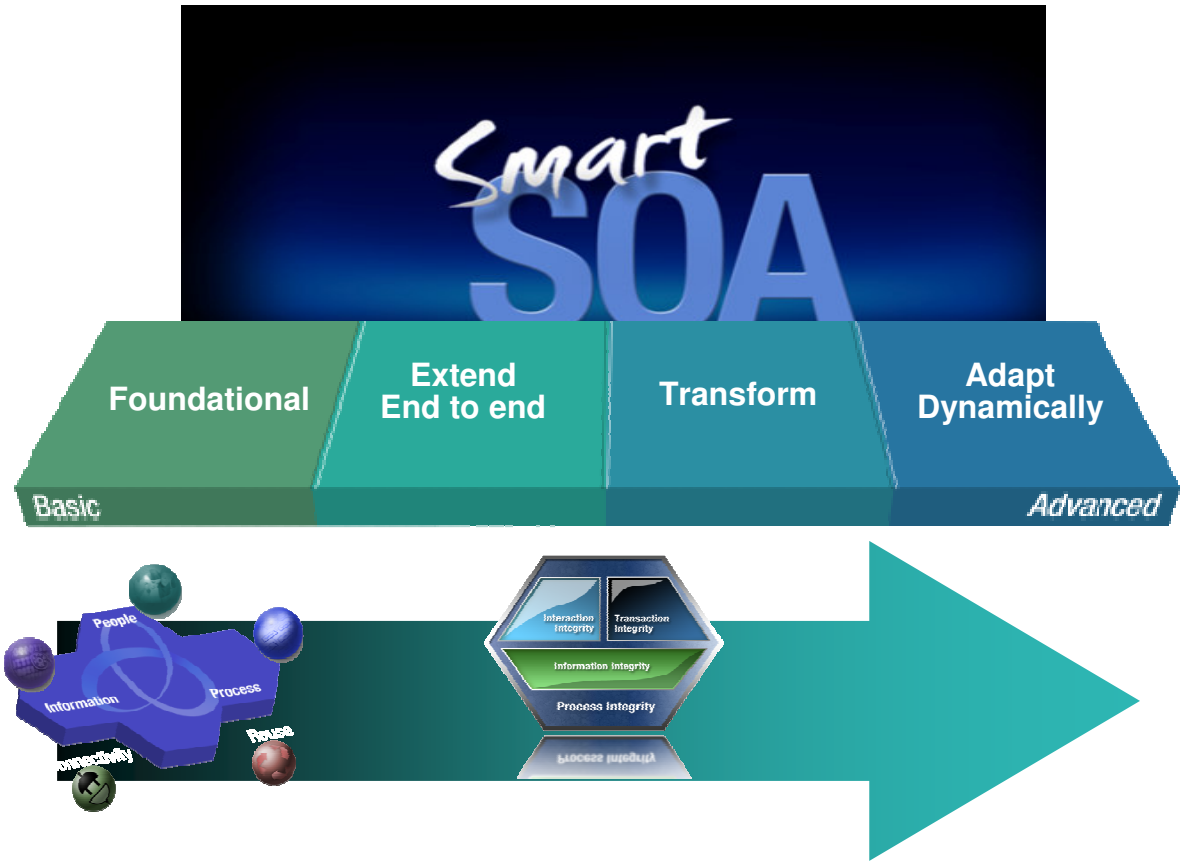
IBM WebSphere Transformation Extender

- ***Transform, validate, and enrich document files and, messages, containing complex and variable data structures***
- ***Deliver trustworthy information for critical business initiatives***
- ***Help Meet regulatory compliance requirements***



The SOA Entry Points grow with you

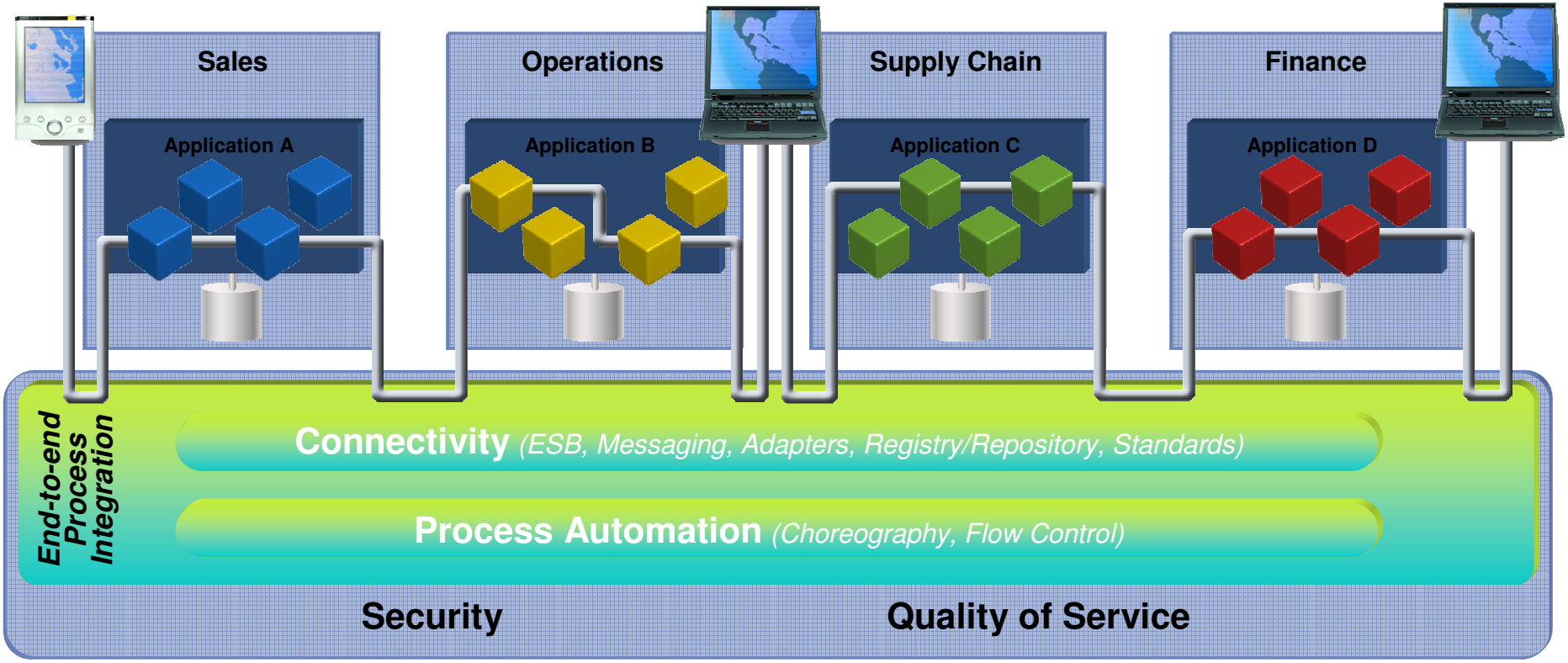
Enabling Agility and Reliability for your Business Needs



Process Integrity is Critical to Advanced SOA Projects

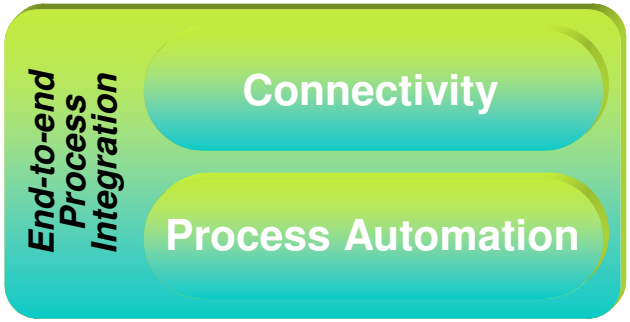
To Achieve Business Agility Without Sacrificing Integrity

Process Integrity is the degree to which loosely coupled "open" systems deliver the reliability, consistency, scalability and predictability of tightly coupled "closed" systems



Process Integrity Demands High Quality of Service System z is uniquely capable of ensuring QoS

- Up to 99.999% availability in a Parallel Sysplex to avoid planned and unplanned outages
- Change management and rolling maintenance reduces planned outages
- GDPS enables recovery of whole systems across vast distances in split second time
- Component level recovery for both hardware and software
- Automated recovery response to failures including restart and isolation, as appropriate
- Dynamic workload balancing across systems and logical partitions for 24x7 operations

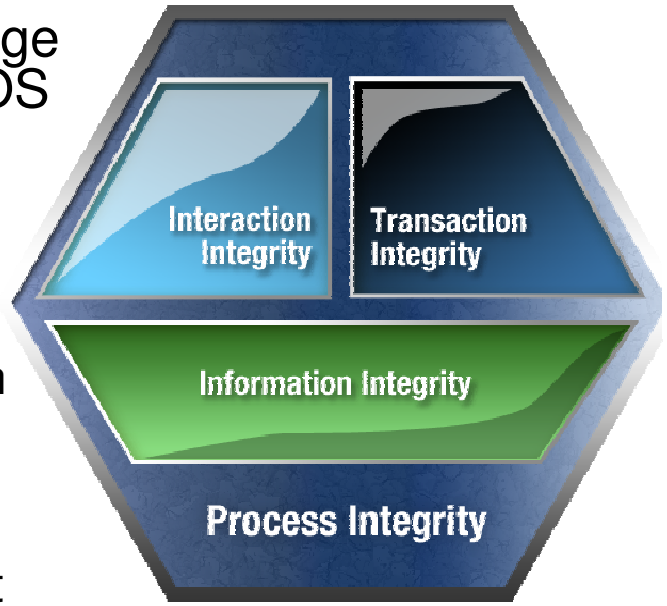


Quality of Service

A large bank running their ESB on System z has seen 99.99% availability since their initial deployment two years ago.

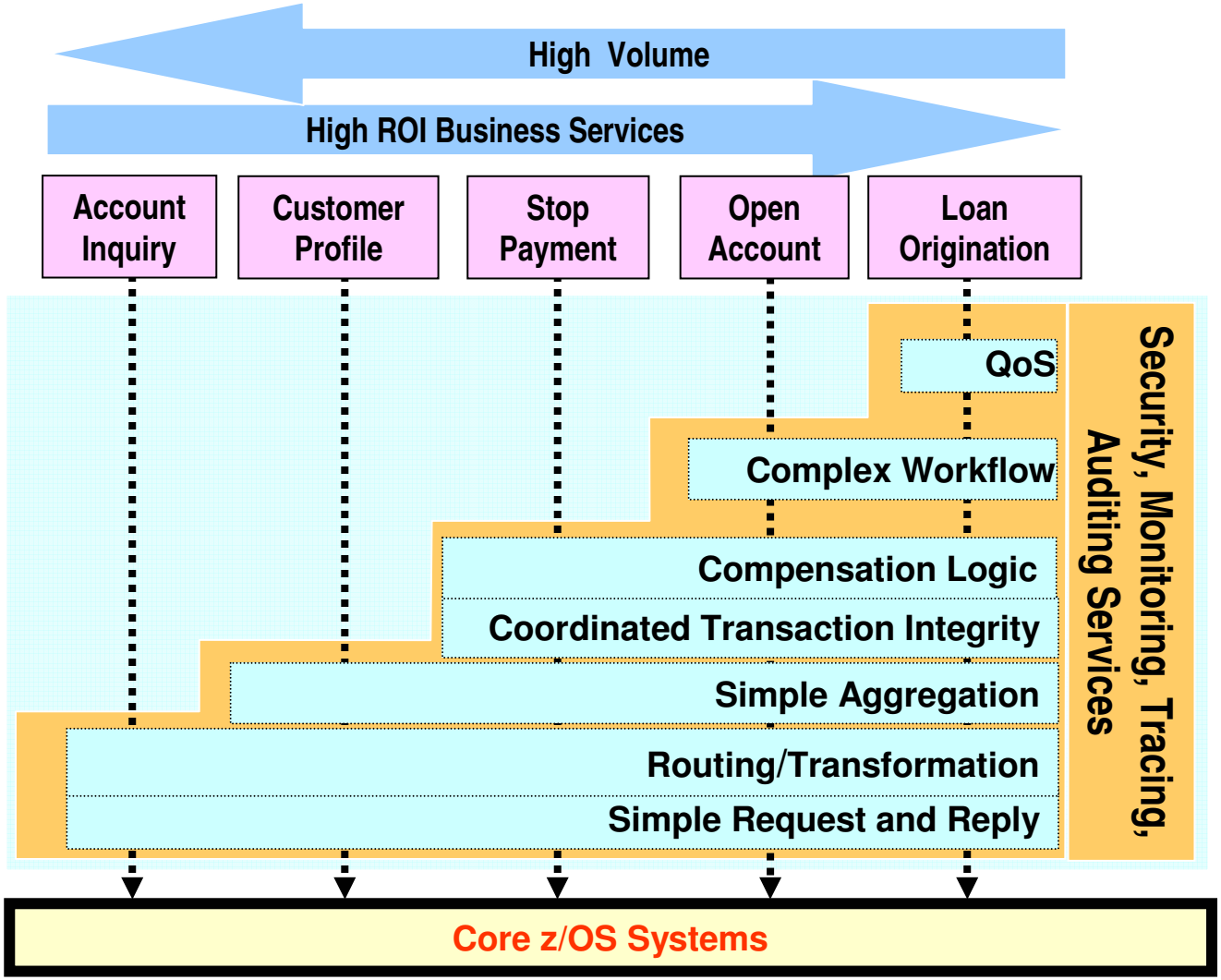
Process Integrity with Connectivity software for System z

- WebSphere MQ for z/OS, WebSphere Message Broker for z/OS, WAS for z/OS, WESB for z/OS
  - Fully ARM-enabled
  - Workload Management
    - Goal-oriented resource allocation
    - Workload scaling, workload isolation
  - Takes full advantage of Parallel Sysplex for with MQ Shared Queues
  - Sophisticated heterogeneous transaction coordination
  - Supports DB2 data sharing, CICS EXCI support and Resource Recovery System (RRS) global transaction coordination
  - RACF for integrated security
  - Reporting and Chargeback



- **Reduced points of failure**
- **Faster processing**
- **Fast End-to-end recovery**

Summary: ESB deployment is dictated by business requirements



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)

Additional considerations for placing workloads on z

Key Takeaways

1. Connectivity on System z – fundamental to Smart SOA
   - ✓ Connects virtually any commercial IT system
   - ✓ Provides availability, security and compliance to help you meet your business objectives
   - ✓ Integrates easily with your key System z business environments (e.g. CICS, IMS) to help reduce risk and cost of core application reuse
   - ✓ Provides connectivity for your business services that matches Service Levels of your System z applications
   - ✓ Ensures flexibility and scalability needed for growth and shared services workload balancing
   - ✓ Adoption of SOA on System z is growing
2. IBM is continuing to invest in the mainframe
   - ✓ SOA products and services
   - ✓ Significant investment for the next five years to drive simplification
   - ✓ Continued focus on the ecosystem

Improving Business Agility
…and the challenge of integrating existing applications

"Legacy modernization is morphing into a strategic function. IT can't afford to toss away reliable application transactions indiscriminately."

-- Phil Murphy, Forrester Research, April 2007

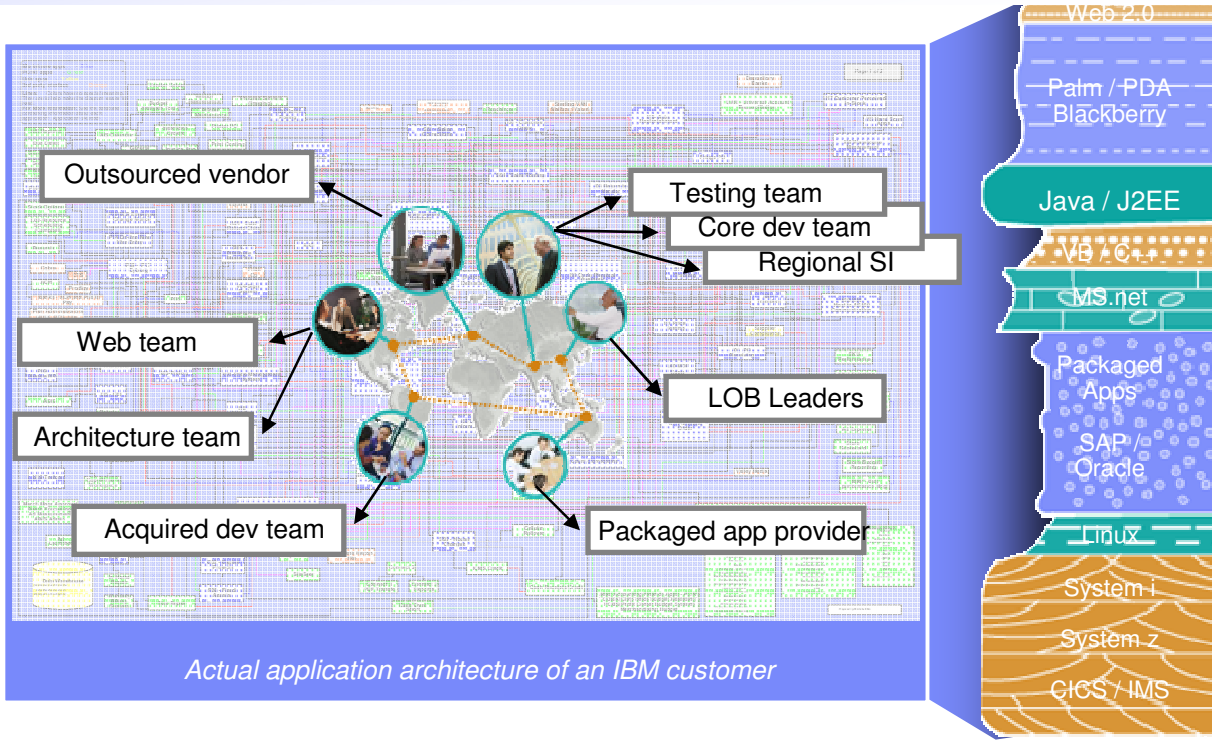
Assets
Layer of disjointed, poorly understood enterprise assets, preventing reuse

Architectures
Tightly-coupled architectures hindering IT flexibility

Skills
IT skills shortage and silos limiting staff productivity and mobility

Processes and tools
Duplicate processes, tools and infrastructures limiting collaboration

Investments
Increasing maintenance costs limiting flexibility for new investments

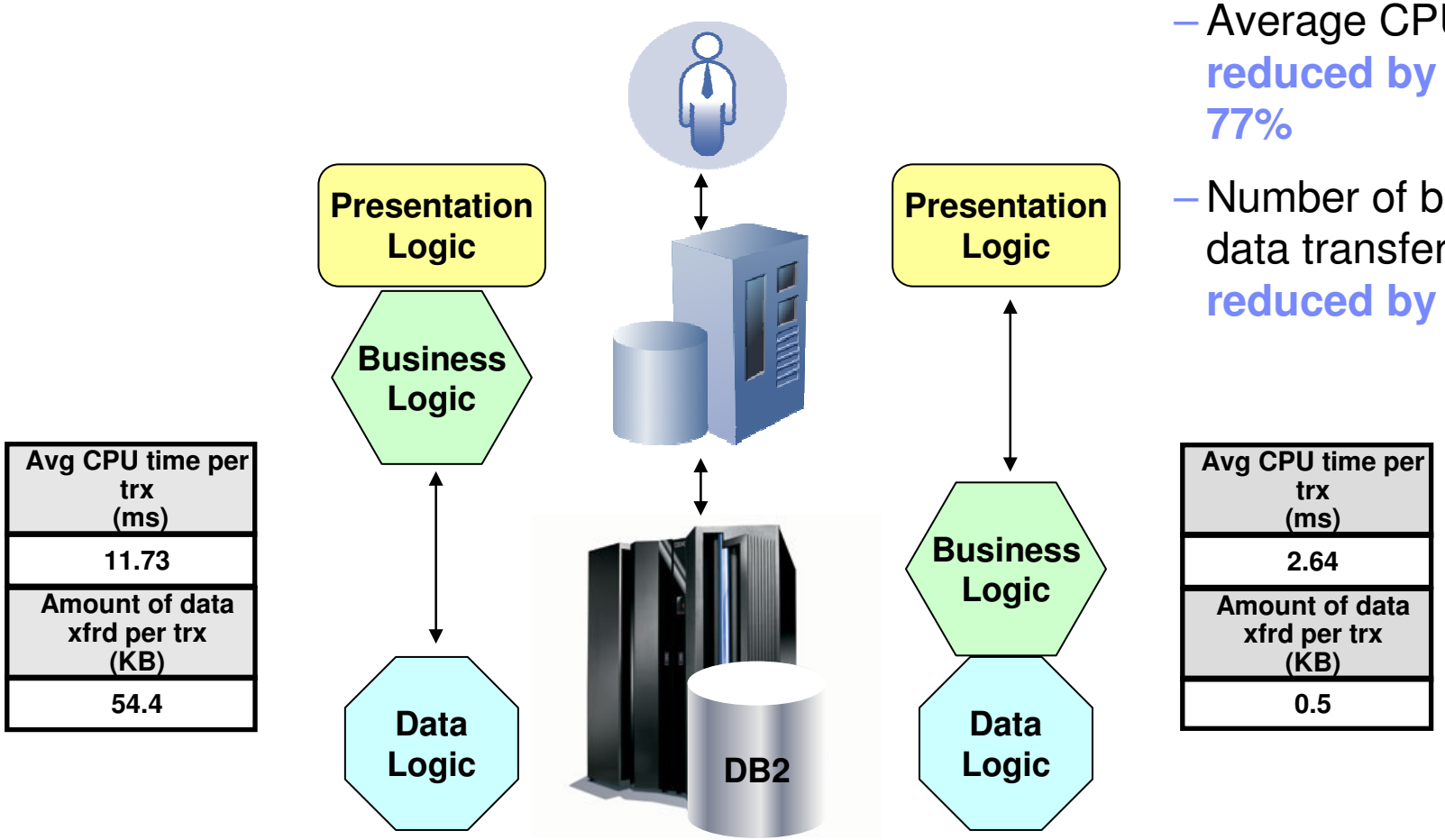


Actual application architecture of an IBM customer

Performance: The value of proximity

Per EJB transaction:

- Average CPU time **reduced by over 77%**
- Number of bytes of data transferred **reduced by 99%**

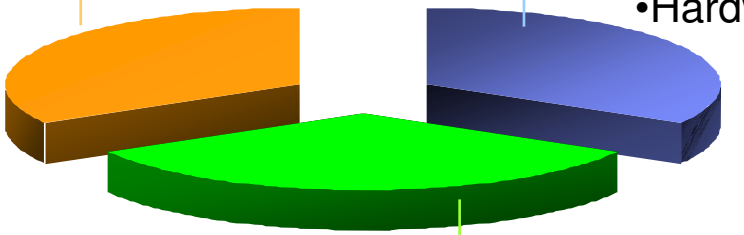


Transportation industry POC
http://www.ibm.com/support/techdocs, Optimizing WebSphere Performance on DB2, WP100558

Cost of Ownership

- **The cost of running incremental workload on the mainframe goes down as the total workload grows**
- **Consolidation opportunities accelerate the benefit**
- **When considering your ESB deployment, consider Total Cost of Ownership vs Total Cost of Acquisition**

Often overlooked:
•Maintenance
•Development and Test software, hardware and maintenance

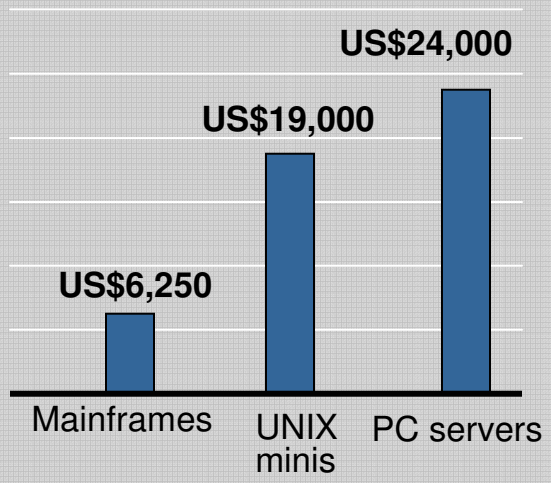


Always considered:
•Software
•Hardware

Rarely considered:
•People
•Power/Cooling
•Space
•Ease of growth
•Cost per application

Arcati

Predicted average cost
per end user in 2010



Five-year costs for hardware, software and maintenance

Arcati Research 2005.
"The Dinosaur Myth 2004 Update."

z/VM Virtualization Value: Environmental Cost

z/VM Virtualization?
IT Cost Implications of consolidating 760 x86 processor cores

z10 EC – 26 IFLs

30 Square Feet

Hourly Energy Usage: 16.3 KWatts

Annual Energy Usage: 0.2 M KWatts*

Cost: $24.6 K/year

z/VM Net Savings per year
2,570,000 KWatts
$307.9K
92% Less electricity

20 Racks of x86 Blades (760 CPUs)

108 Square Feet

Hourly Energy Usage: 219.5 KWatts*

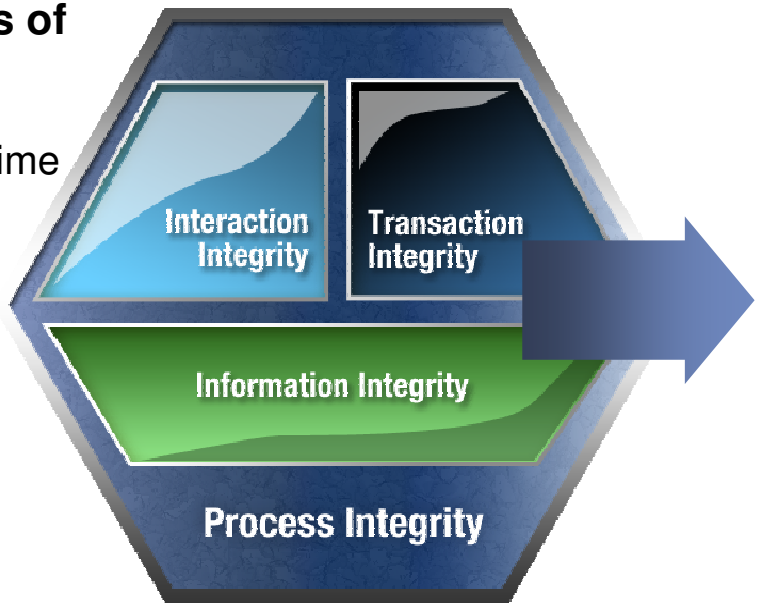
Annual Energy Usage: 2.77 M KWatts*

Cost: $332.5 K/year

Become Greener with z/VM Virtualization on z10 EC:
13X better than unvirtualized x86

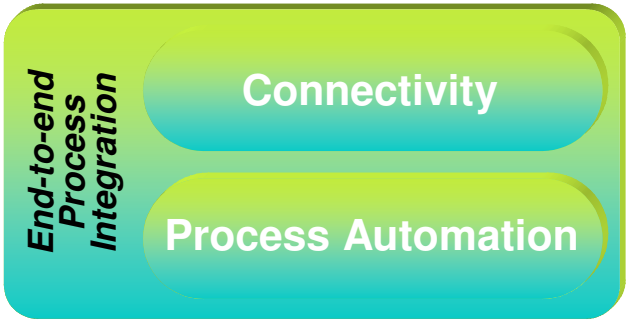
Transaction Integrity Assures Consistency of Execution Enabling Consistent Transaction Processing in an SOA Environment

- **Transaction Integrity ensures that individual updates of IT / business resources are linked together and processed as a single unit of work**
  - Atomic transactions are short-lived and operate in real-time in a single unit of work
  - Transactions can be long running, lasting seconds or months, and can include multiple atomic transactions
- **Key Transaction Integrity Products:**
  - WebSphere Process Server, WebSphere ESB, WebSphere Application Server
  - WebSphere Message Broker, WebSphere MQ
  - WebSphere DataPower Integration Appliance XI50
  - WebSphere Service Registry and Repository
  - WebSphere Adapters
  - CICS Transaction Server



Process Integrity Demands High Quality of Service Scalability, Availability and Performance are Fundamental

- **Maintaining High QoS in End-to-end Processes**
  - Workload management and high availability of transactions
  - SOA appliances to accelerate XML and security processing
  - Virtualization to enable flexible allocation of resources
- **Performance Testing and Monitoring**
  - Performance testing and problem analysis tools
  - Runtime monitoring to proactively identify performance problems in end-to-end processes
- **Key Quality of Service Products:**
  - Tivoli Composite Application Managers
  - WebSphere Application Server
  - WebSphere XD
  - WebSphere DataPower SOA Appliances
  - Rational Performance Tester Extension for SOA Quality
  - IBM Systems Servers



Quality of Service

WebSphere Adapters V6.1 on System Z

http://www.ibm.com/support/docview.wss?uid=swg27006249

An adapter is the preferred method of connectivity when

…an application has a large number of interfaces

- A single instance of an adapter provides one place to access multiple interfaces

…an application is not enabled for web services connectivity

- Even when applications are web-service enabled, this often covers only a subset of functionality

…customers are on multiple versions of the application which each have different interfaces

- Many applications have old versions that are still in use by customers and do not have the same degree of open connectivity as later versions
- Using an adapter to encapsulate the integration logic minimizes the impact of upgrading between application versions

…it is common for customers to customize the application's functionality

- A meta-data driven adapter helps customers to service-enable their custom functionality without having to also customize the adapter

Complex Data requires Powerful Capabilities

- *Code-Free Design and Deployment*
  - *There is no "language" to TX, the transforms and data process are all maintained within the spreadsheet-like GUI, and you never need to drop down to writing code to handle complex transforms. You create portable "transformation objects".*
- *Self-describing Data Model*
  - *WebSphere TX uses data in its native format, and has a unique mechanism for describing data in its native form. WebSphere TX is able to handle complex and mixed data types using one design environment*
- *Data Validation as part of the transformation process*
  - *data is validated to content rules and context usages as part of the transformation process. You do not need to write separate logic or have separate executions in order to provide extremely rich data validation*
- *High-Throughput of Complex Transforms and Enhancements*
  - *WebSphere TX has a unique many-to-many model of transforming and processing data, which allows it to execute all transforms, lookups and data enrichments with only one pass at the data, making it one of the most performing transformation engines on the market*
- *One Engine – Mature – with Multiple Deployment Options including Z*
  - *Using the same design environment, you can deploy transformation to a number of runtime environments including ,embedded, standalone batch and event driven scenarios across a number of OS platforms.*