VPS

(Norwegian Central Securities Depository)

Latest Experiences

Large Systems Update November 2006

Agenda

- VPS organization
- Infrastructure and applications
- WebSphere Application Server v6.1 for z/OS
- zAAP
- Early support programs, CAP, zIIP, Data sharing
- Future plans

What is SOA?

- Service oriented architecture is a composition model
- Service
  - a business task / function that are invoked through well designed and standardized interfaces
  - Hides implementation details
  - For example: OS function, customer written business logic, an application, etc.
- Interface neutrality
  - Uniform, universal, platform independent, programming language independent

Why SOA?

- Integration
- Standards
  - The standards and technology are finally in place, with broad industry support
  - The necessary software to get started is available today
- Loosly coupled
  - Services are loosley bounded and dynamically linked
  - Platform independence, language independence
  - Change internal workings of a service does not effect its relations to other service components – not a new idea
- Reusability and flexibility
  - Integrate new functionality with existing assests in a cost effective manner
  - Extend lifetime of exsisting applications by making it easier to integrate with new functionality.
- Reduce the gap between the ”techies”/developers and users/requestors
  - Make application development more business oriented, align development process to business needs
- Thight link betweem business and technology
  - Not pure technology focus, but driven by business goals
  - SOA unites business and IT (as opposed to IT alone defining the design)

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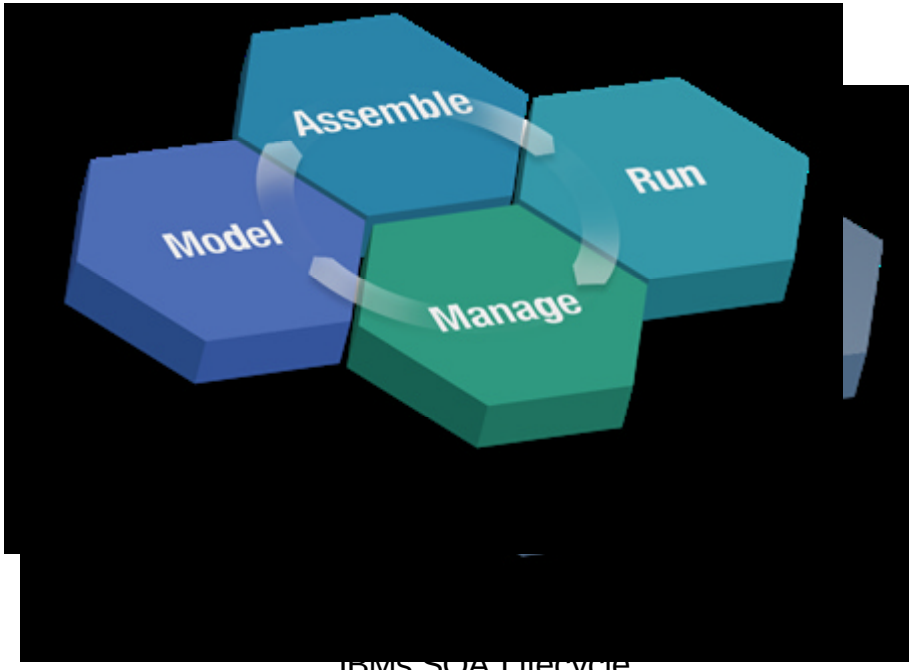
The SOA Lifecycle

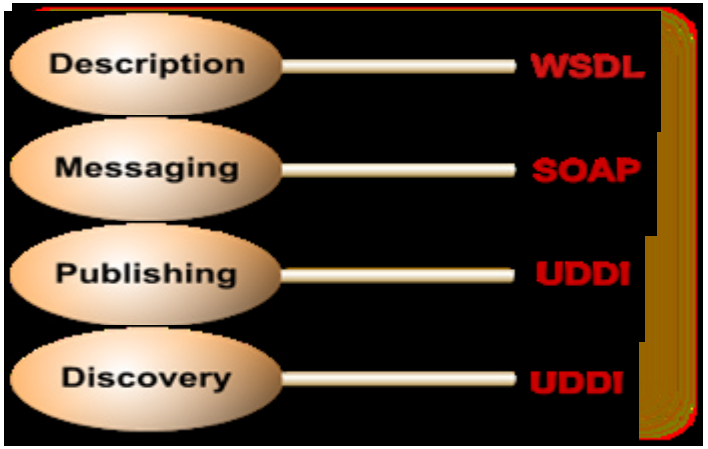
- Model
  - Understand the business needs and business environments
  - Identify the components that make up business services
  - Design, model and simulate
- Assemble
  - Discover and extend
  - Construct and test
  - Compose
- Deploy
  - Integrate people
  - Integrate processes
  - Manage and integrate information
- Manage
  - Manage services
  - Manage identity and compliance
  - Monitor business metrics

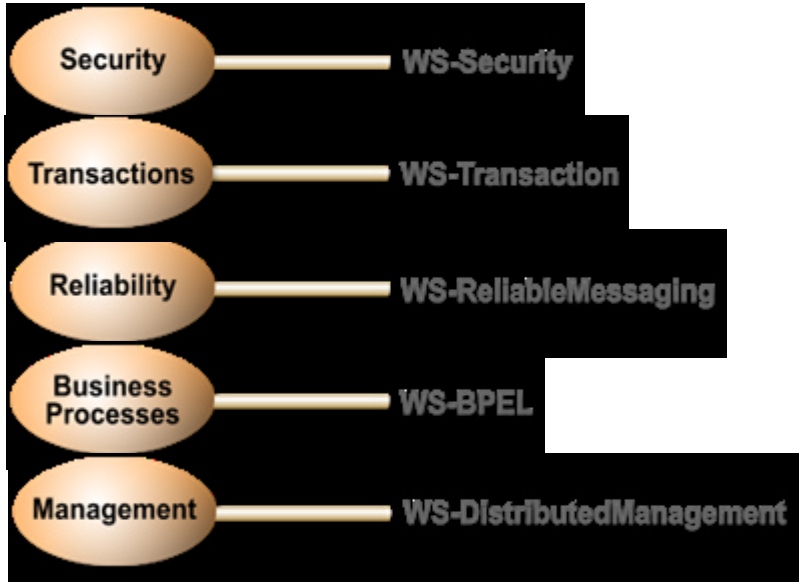


IBM's SOA Lifecycle

Web Services and SOA

- SOA: a concept and a set of design patterns
  - For componentization
  - Flexibility
- WebServices: a set of standards which an entire industy is agreeing on
  - Software components described via WSDL that are capable of being accessed via standard network protocols such as SOAP over HTTP
  - Message exchange is neutral - XML (SOAP)
  - Standards for defining service interfaces expressed in XML (WSDL) and exposed
  - Interoperability
- Web Service is an example of a Service
  - Standardization through neutral interfaces as regards to hardware, OS, and programming language
  - Advanced Web Services standards support security, transactional, reliability, business process execution, and management
- SOA does not require Web Services
  - But a collection of Web Services may form an instance of SOA





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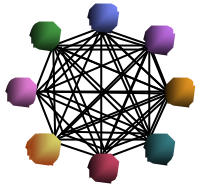
SOA: the next step on the evolution of enterprise integration

Direct Connectivity

All connectivity, mediation & additional logic buried in the application

Point-to-Point connection between applications

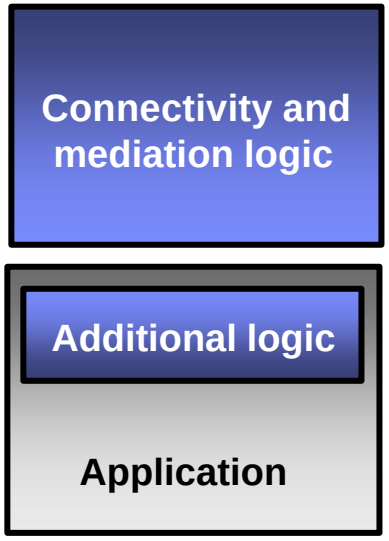


Message Queuing

Abstracts the connectivity logic from the application

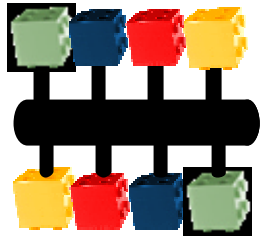
Applications via a centralized hub

Message Brokering



Abstracts the connectivity & mediation logic from the application

Integration and choreography of services through an Enterprise Service Bus



Service Orientation

Reduces application to its core business functions

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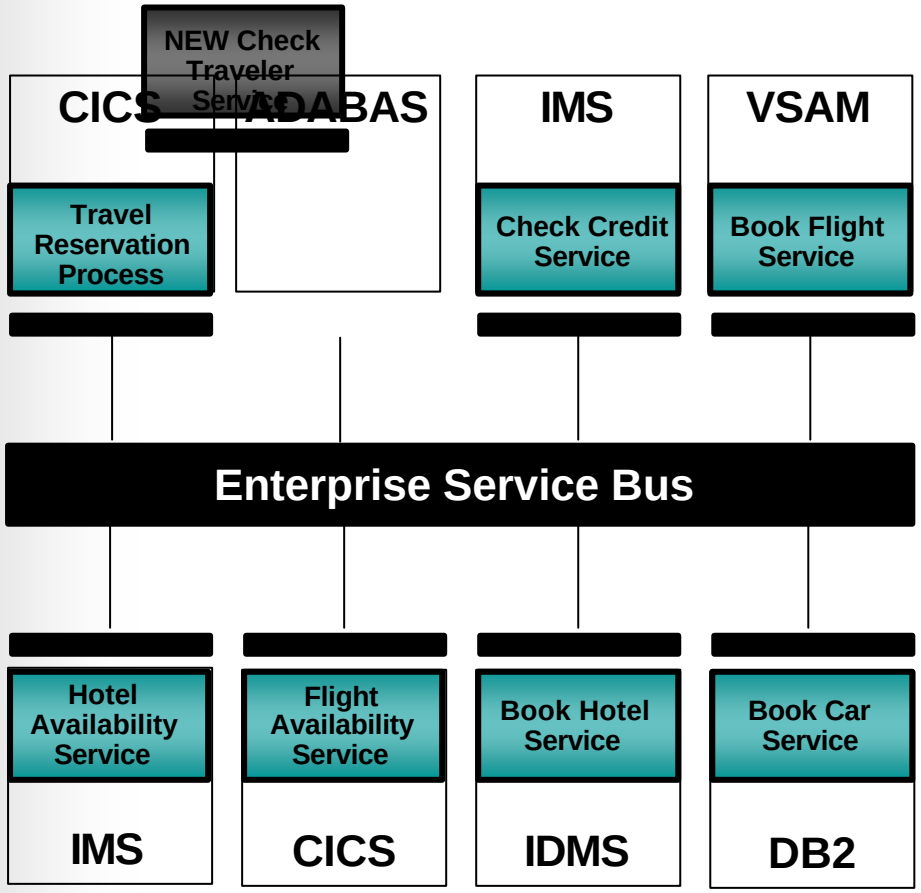
SOA lets you focus on core business, not IT



Add new services faster

Change services with minimal impact to existing services

REUSE core z/OS resources in composite SOA service implementations!

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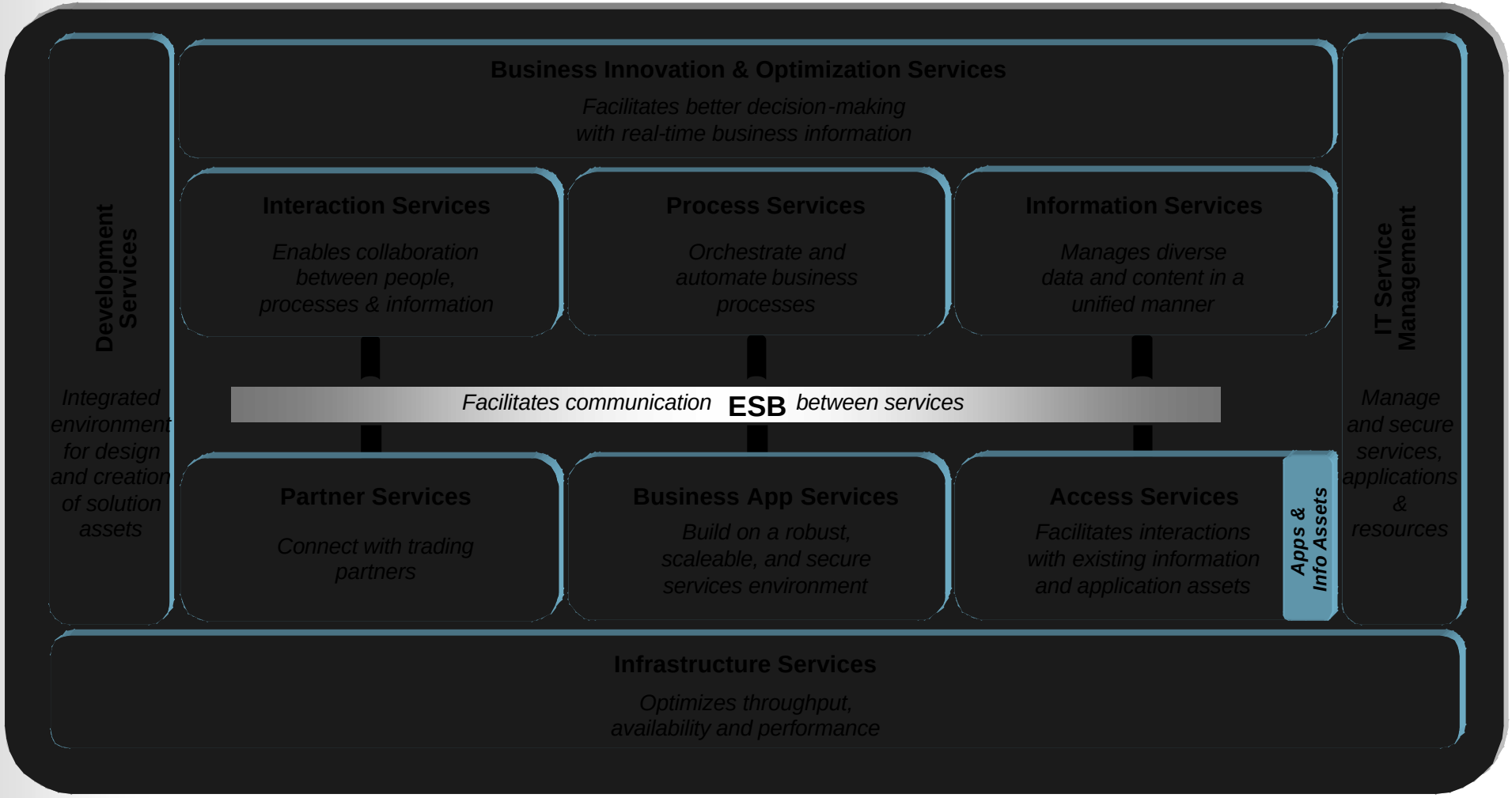
The SOA Reference Architecture



Leverage z/Middleware for maximum business flexibility.

SOA on z/OS – a complete solution from existing systems to the full SOA Lifecycle

Increased capabilities / automation

WebSphere Process Server

For customers who want a higher level solution to design, automate and manage composite applications and operational business processes. Built on WebSphere ESB.

WebSphere ESB

A new product that delivers an Enterprise Service Bus. Provides Web Services connectivity and data transformation. Built on WebSphere Application Server.

WebSphere Message Broker

A new version of our proven product that delivers an advanced Enterprise Service Bus. Provides universal connectivity and data transformation. Built on WebSphere MQ.

Application/Transaction Servers

WebSphere Application Server

A world-class J2EE foundation providing industry-leading levels of availability, scalability, and performance.

CICS

IMS

WebSphere MQ

Provides reliable integration messaging to connect applications and Web services across more than 80 supported platform configurations.

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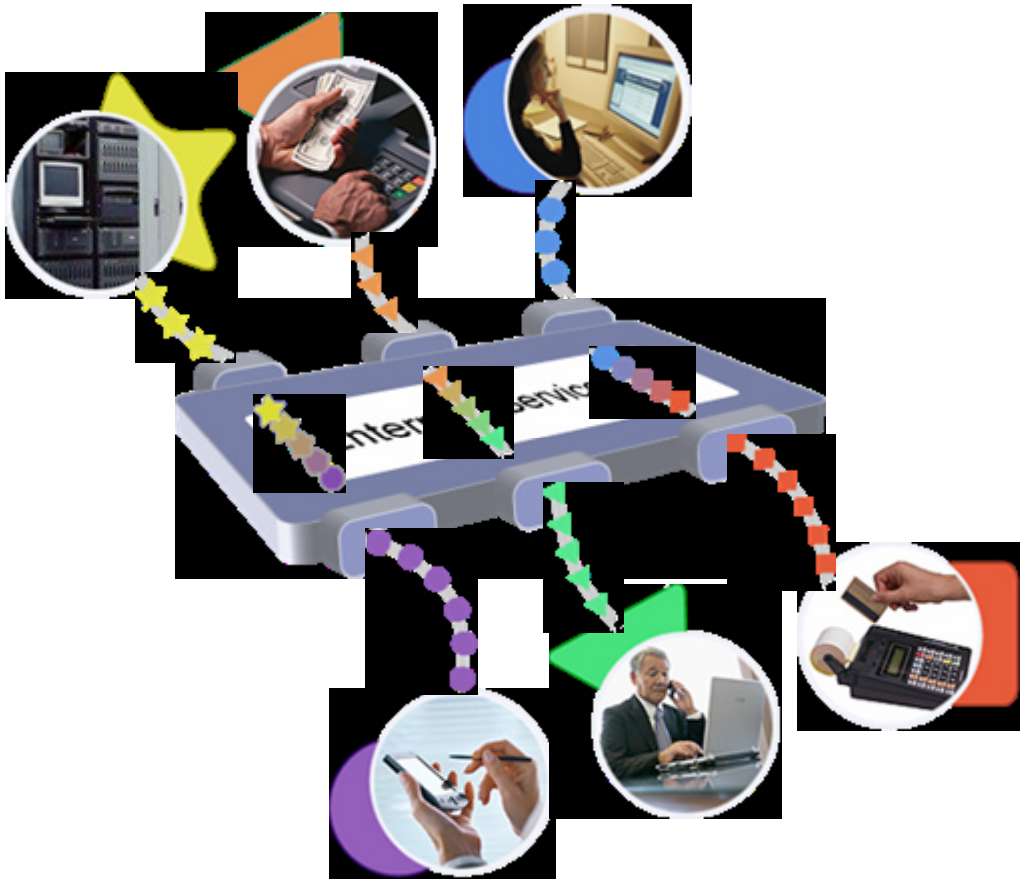
The ESB is a core component of a Service Oriented Architecture

- that connects and integrates an organization's IT infrastructure, across many locations, using different transport services, and…
- that can route messages to the appropriate systems and transform messages formats, and…
- is standards based, and…
- does all this securely, reliably, at very high volumes in a manageable manner



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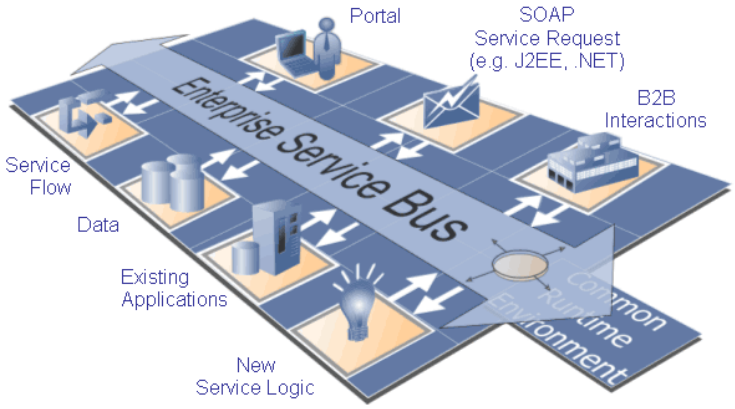
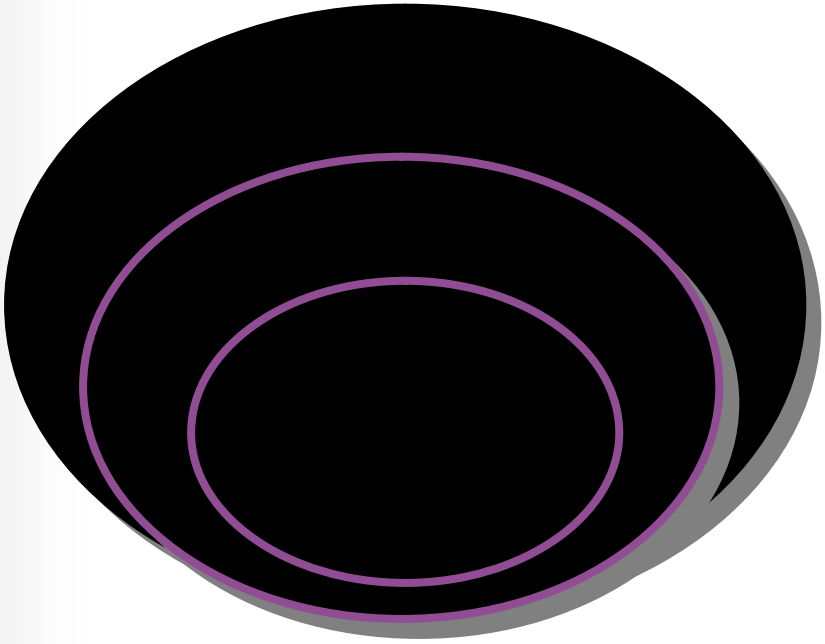
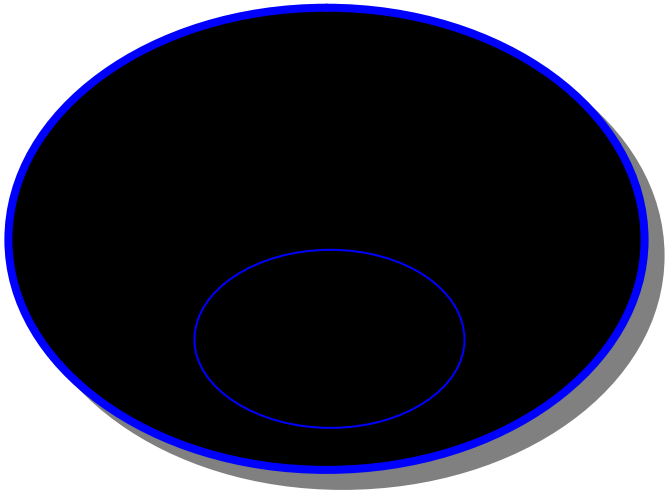
Enterprise Service Bus products



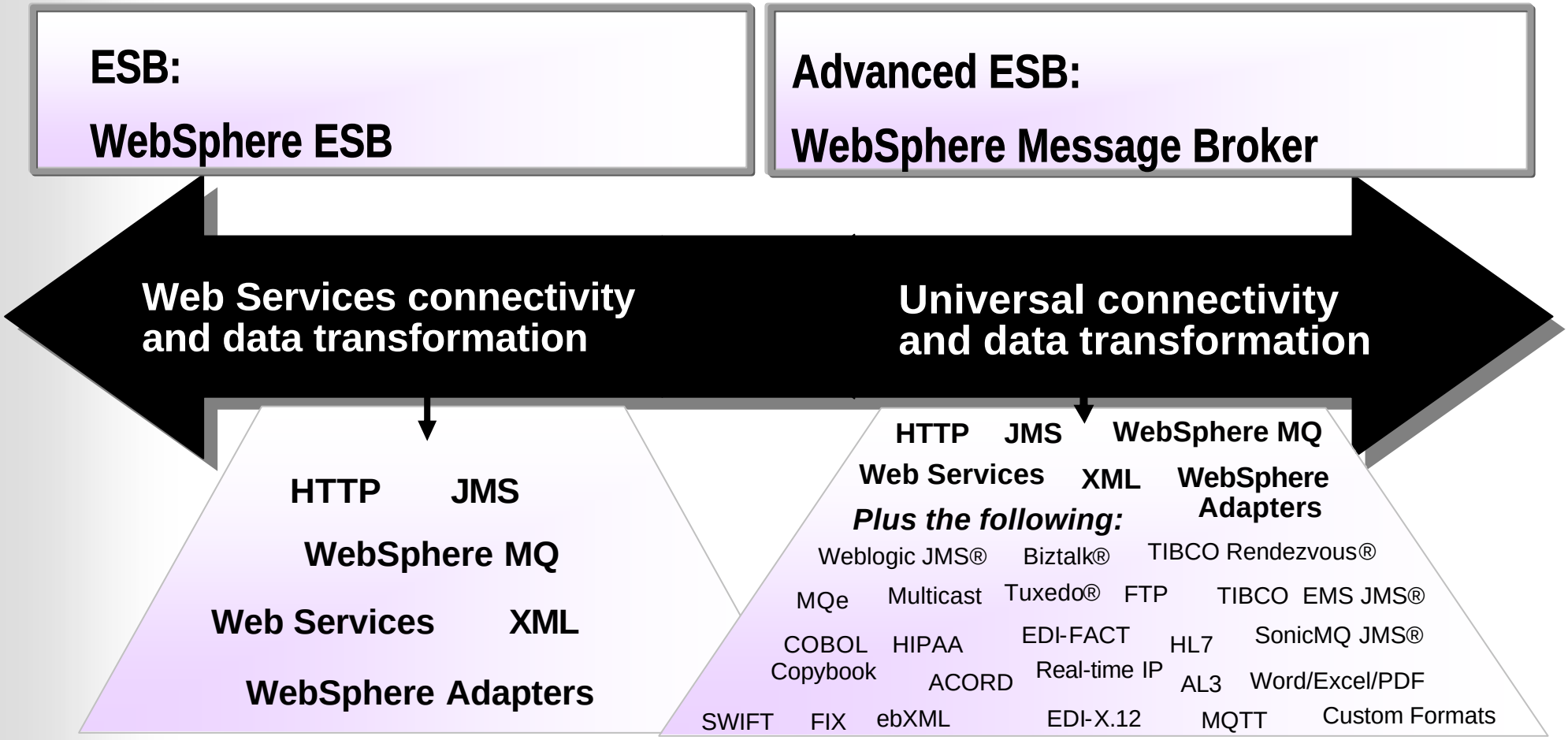
- WebSphere Application Server V6.1 for z/OS
- WebSphere ESB for z/OS
- WebSphere Process Server V6 for z/OS



- Websphere MQ V6 for z/OS
- WebSphere Message Broker V6 for z/OS



WebSphere ESB and WebSphere Message Broker



Customers face a range of ESB requirements. As a result, any given project might require an ESB or an Advanced ESB… OR BOTH.

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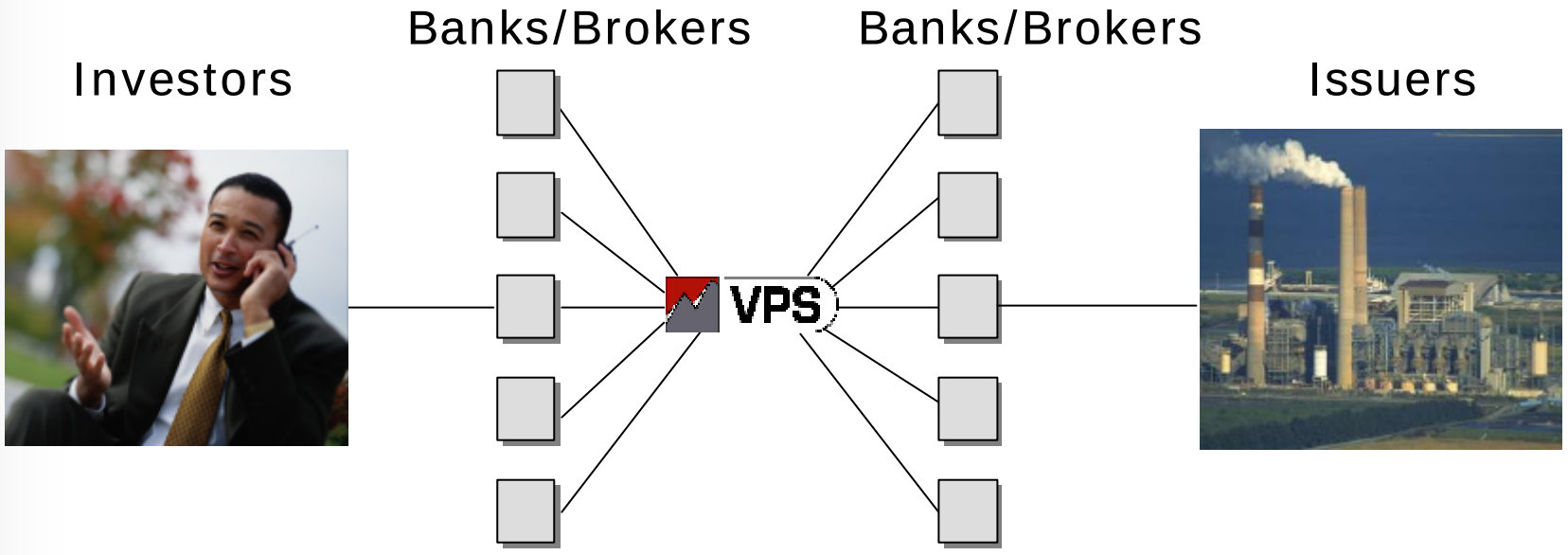
VPS Vision : *We simplify….*



Business idea:

VPS shall, through brokers, banks and fund managers, offer effective and secure custody, registrar and settlement services to issuers and investors

Customers and partners

200 financial institutions, stockbrokers and mutual funds management companies use the VPS system in order to be able to provide services for some 800 000 security holders with securities accounts in VPS.

VPS' Customers
Banks
Brokerage Houses
Mutual Fund Management Companies
Clearing & Settlement Members

Other joint venture partners
The Central Bank of Norway
The Oslo Stock Exchange
The Norwegian Options and Clearing House - NOS
The Banks' Central Clearing House

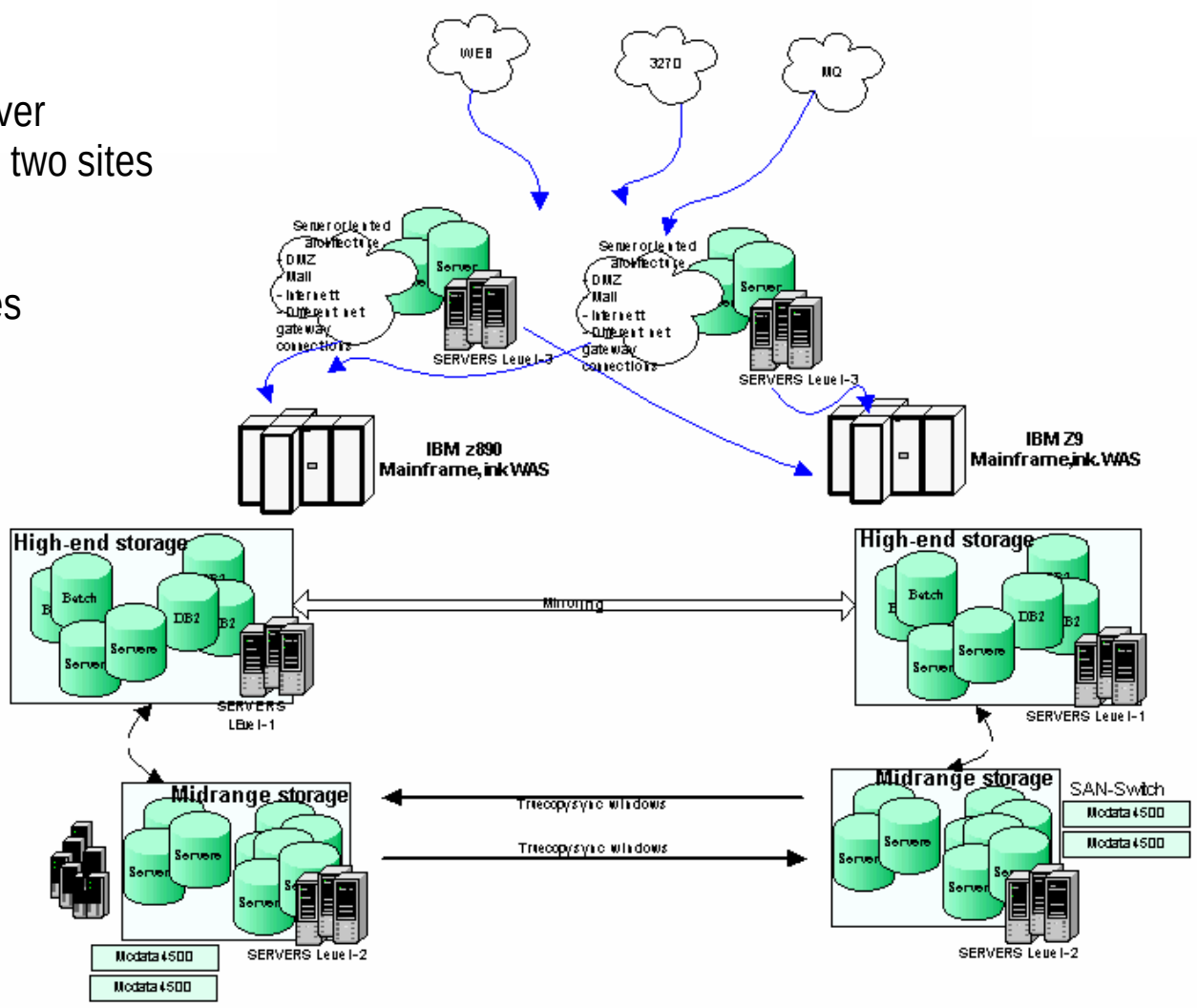
VPS Account on Internett

VPS, in collaboration with customers, has developed VPS Account Online that provides the investor with:

- Access to information related to holdings and transaction 24/365
- Electronic archive of notifications of changes in registrations, annual statements etc.
- View rights and powers of attorney
- Tax services around the realization of shares and primary capital certificates (simplifies the preparation of tax returns)
- Buy and sell mutual fund shares
- Overview of personal retirement savings
- Participation in IPOs and secondary offerings
- Reservations to partake in shareholder meetings and information related thereto

Current mainframe infrastructure

- Two sites connected by DWDM's – dedicated fiber and PPRC Mirroring of data
- Parallel Sysplex and Server Time Protocol across the two sites
  - Soon Data Sharing
- Two processor complexes
  - **z890 – 260**
  - **z9 BC S07 U02**



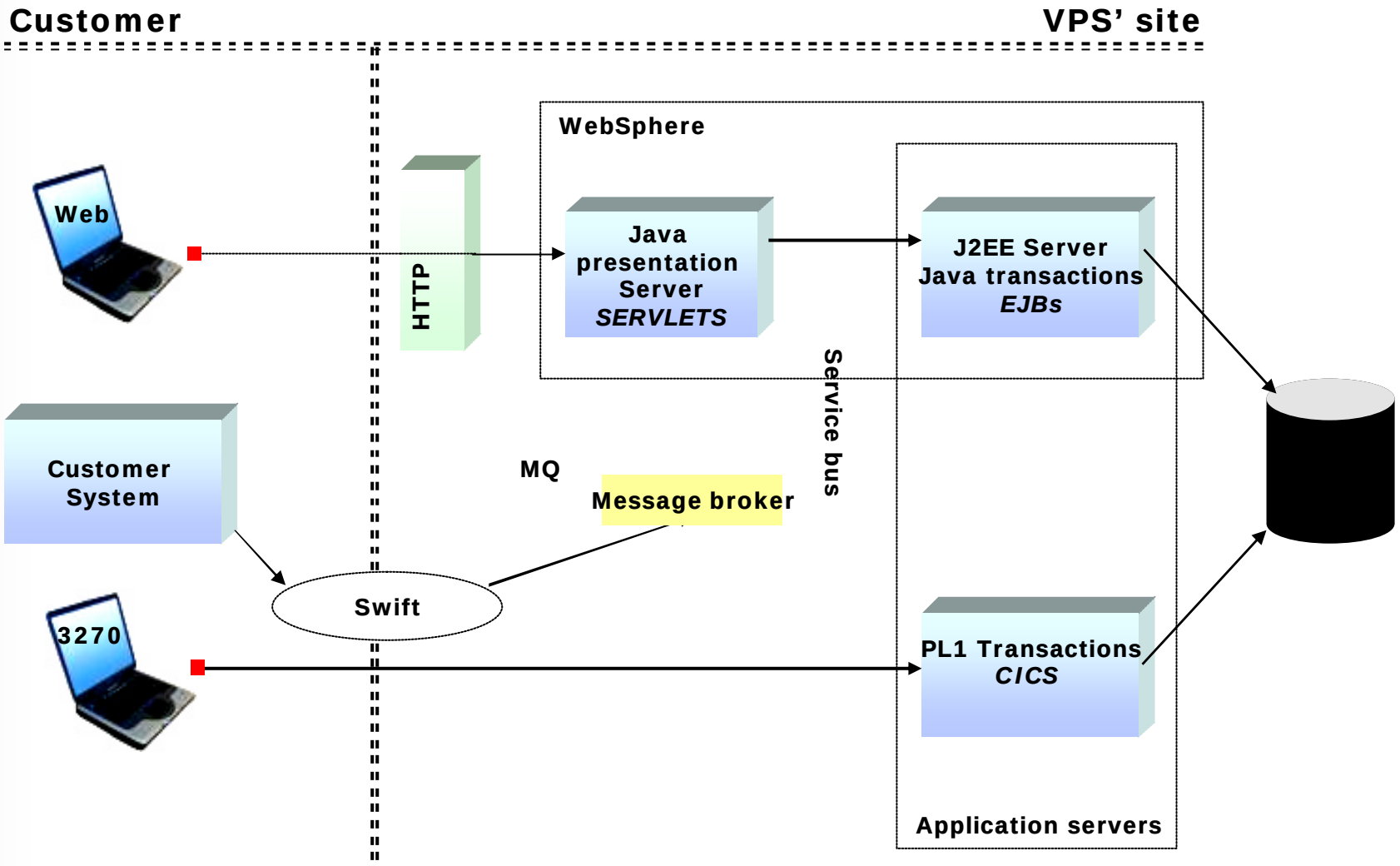
Applications

- Inhouse development
- Legacy applications developed in PL1 / CICS.
- New applications in JAVA and WebSphere
  - Servlets/JSPs & portlets, Web Services
  - EJB's, SOA
  - Developing batch programs in Java
- DB2
- MQ
- VPS Policy: All new development in Java

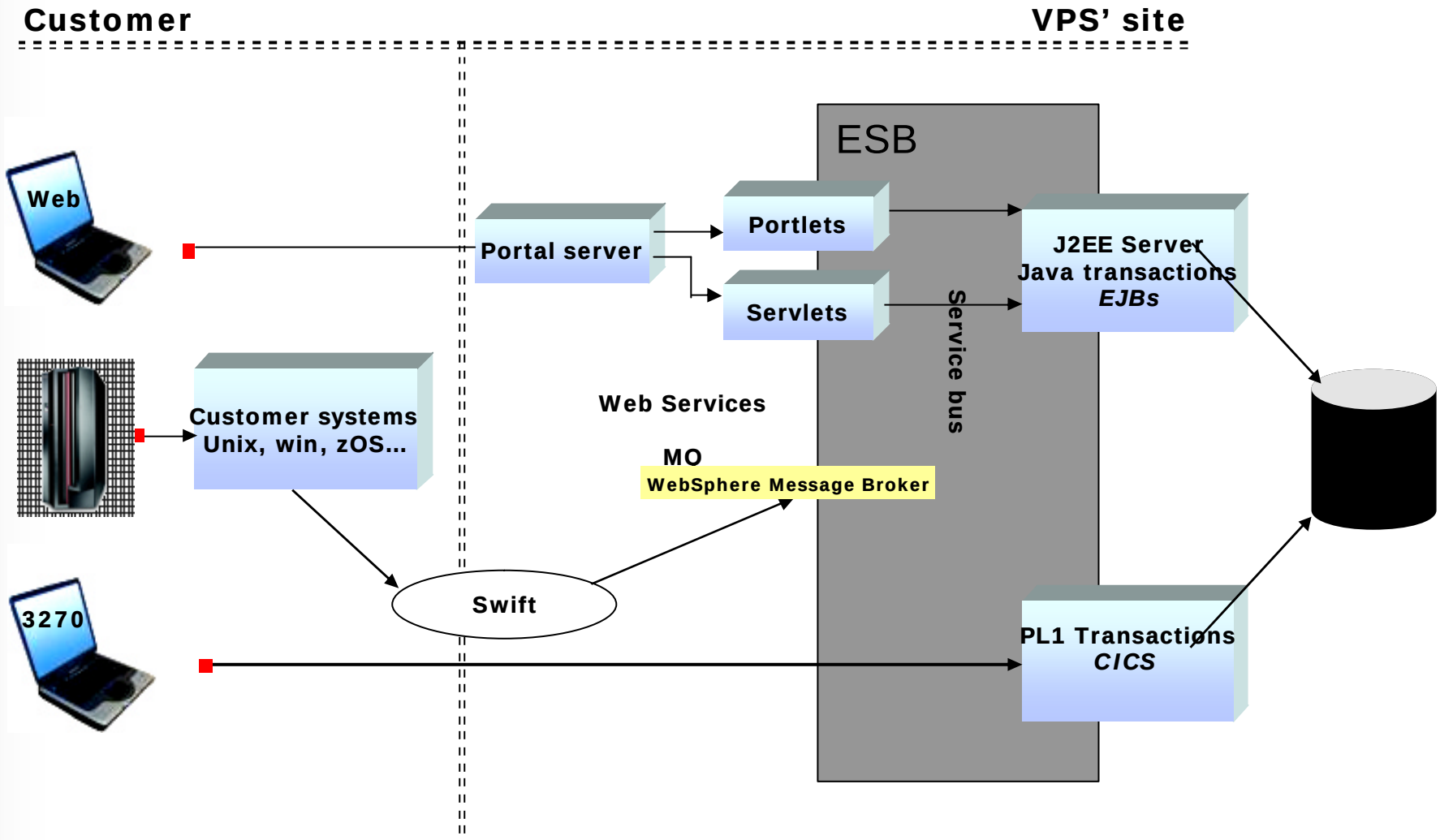
Transaction processing

- WEB applications
  - Servlets calls EJBs directly or use JMS/MQ to run CICS transactions
  - Applets use CTG to call CICS transactions (will be replaced by servlet/portlet based applications)
  - Message exchange based on open standards - XML
- Business to business (B2B)
  - MQ transport
  - SWIFT messages transformed to/from VPS properitary formats with WebSphere Message Broker
  - CICS read messages from MQ, processes the message, and replies with an MQ message
  - WebSphere MDB reads from MQ, processes the message and replies with an MQ message
- 3270 directly to CICS
  - 3270 screens transformed to VPS API and use the same programs as B2B initiated transactions

Sketch of current architectural layout

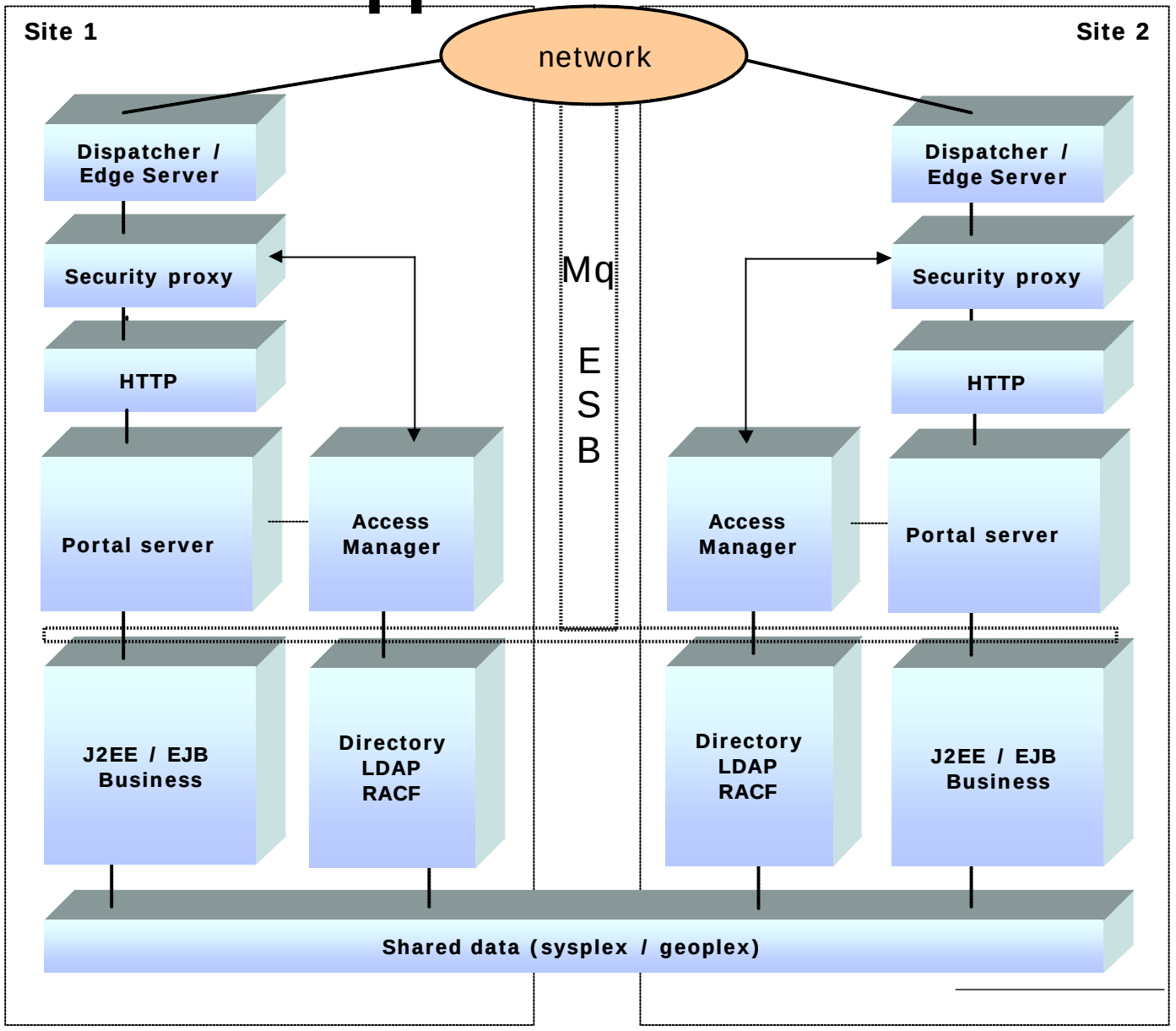


Sketch of future architectural layout



Software stack - web applications

- All components are redundant
- WAS for z/OS v6.1 cluster across 2 sites
- Data sharing (soon!)
- To be implemented: WAS and DB2 with workload balancing



WAS for z/OS – key benefits

- Workload Management
  - WLM and Parallel Sysplex exploitation
- High-availability
  - Based on System z availability
  - Server clustering
- Security
  - Based on z/OS Security Server / RACF (SAF)
  - Security context passed between WAS applications and other z/OS applications
- Robust transactional support
  - Based on z/OS Resource Recovery Services (RRS)
- Performance improvement
  - Parallel Sysplex scalability
  - Data proximity with DB2 on z/OS
  - Use of JAVA specialized processors (zAAP) to improve TCO

WebSphere Application Server

- WAS 1.1
  - Started in 1998
  - Servletengine
- WAS 3
  - JDK 1.2, J2EE 1.0
  - Support for z/OS
- WAS 3.5 (2001)
  - Only servlet engine on zos
- WAS 5 (2003)
  - J2EE 1.3
  - Major rewrite
  - Deployment manager
  - MQ support
  - Embedded JMS server
  - WAS for z/OS, same as network deployment + z/Os adavtages like advanced workload balancing
- WAS 5.1
  - JDK 1.4.2
  - Jython support
- WAS 6.0 (dec. 2004)
  - JMs enhanchements
  - z/OS specific
    - Rescue Recovery services
    - RACF support
    - Sysplex support
    - eXended Deployment
- WAS 6.1 (May 2006)
- VPS now in production with WAS 6.1

WebSphere and JAVA on z/OS at VPS

- Reuse existing z-infrastructure and skills
  - Simplify the infrastructure –> less work –> fewer people needed –> less costs
  - Operation, monitoring, reports, SLA
  - Backup, distaster recovery, 2-site
  - Data on z plattform, shared with other applications
- Centralized user administration
  - Use same userid and password on web/java applications as on 3270
  - Can move a service from 3270 environment to web/java environment without changing user definitions
- Security, logging, auditing, accounting
- Availability, scalability

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WebSphere and JAVA on z/OS at VPS

- Cost effective - compared to distributed
- Software
  - Run several instances of WebSphere on the same computer on one licence
  - A distributed solution will require more licences on WebSphere and other products like:
    - DB2, MQ, OS , BACKUP and monitoring Software etc.
  - Can install and maintain one copy of the software
- Hardware
  - Effective use of CPU capacity
  - Variation in load during a 24 hour period
  - For a long period Web/Java application had no influence on the size of the mainframe (how many mips we needed was set by the batch production during the night)
- Today, VPS uses zAAP for 'cheap MIPS' for JAVA

Why zAAP at VPS?

- Load on WebSphere and Java will continue to increase
- Low cost
  - Hardware
  - ”Free” software
- Gives better performance for WebSphere, and avoids CPU contention between WebSphere/JAVA and other applications

Experienced benefits of zAAP

- Better Performance
  - *Quicker restart of WAS servers*
  - *Faster deployment of applications*
  - *Helps on garbage collection*
- Better isolation of JAVA load from other load in the same LPAR
- Big variation in load on the zAAP processor
  - Minimum 10% maximum 70-80%
- *WAS and zAAP → good combination!*

Early Support Programs

- Server Time Protocol (STP) in production
- z/OS 1.8 in production
- WebSphere Application Server v 6.1 in production

DB2 V8 exploitation of zIIP

1. ERP or CRM application serving*
   - **For applications running on z/OS, UNIX®, Linux, Intel®, or Linux on System z that access DB2 for z/OS V8 on a System z9 EC, via DRDA® over a TCP/IP connection. DB2 gives z/OS the necessary information to have portions of these SQL requests directed to the zIIP**

2. Data warehousing applications*
   - **Requests that utilize DB2 for z/OS V8 complex star schema parallel queries may have portions of these SQL requests directed to the zIIP when DB2 gives z/OS the necessary information**

3. Some DB2 for z/OS V8 utilities*
   - **A portion of DB2 utility functions used to maintain index maintenance structures (LOAD, REORG, and REBUILD INDEX) typically run during batch, can be redirected to zIIP.**

* The zIIP is designed so that a program can work with z/OS to have a portion of its Service Request Block (SRB) enclave work directed to the zIIP. The above types of DB2 V8 work are those executing in SRB enclaves, portions of which can be sent to the zIIP.

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JAVA in Batch on z/OS

- Quite a few have been doubtful…..
  - Does it make sense ?
  - Does it perform ?
  - BPXBATCH ?
    - Limitations, SYSOUT, return codes, etc
- Advantages
  - Use JAVA skills also for batch development
  - Leverage ’free’ zAAP capacity during night time
  - Eclipse development environment
    - Develop and Unit-test on Windows, Deploy to z/OS
  - JZOS Batch Toolkit solves the BPXBATCH problems

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JAVA in Batch

- JZOS now a part of JDK
  - JAVA programs running under JZOS can be incorporated/included in a batch stream
  - Standard JCL
  - You can exercise the return code
  - SYSOUT – same way as other programming languages

- JDK on z/OS support access to MVS type datasets
  - VSAM , SEQ, PDS, PDSE

- We try to avoid JAVA access directly to z/OS datasets
  - JAVA programs should be platform independant
  - We use DB2 and HFS/zFS files
  - Easy to test on Windows (SQL via DDF til z/OS)

JAVA in Batch current status

- Framework for JAVA batch development established
- Project currently running with 5 developers
- First application to be ready for production in January 2007
- So far, everything looks GOOD……

- http://www.alphaworks.ibm.com/tech/zosjavabatchtk

Future plans

- Infrastructure
  - Geoplex
  - Network deployment – cross sites
  - DB2 Data sharing
  - Standard Single Signon (SAML, Liberty, WS security).
  - ESB
- Applications
  - SOA
  - Portlets , Web services
  - Industry standard formats (swift 20022, etc.)
  - Replace CICS/PL1s and 3270 with WebSphere/Java and web gui