Extending Your Mainframe For More Business Value

Add A Workload – Communications Backbone

Business Challenge

Our payments business is a key source of revenue, but it is too costly to maintain the connections

A Communications Backbone can solve this problem

Service Oriented Finance CIO

IBM

Providing Application-To-Application Connectivity In A Diverse Environment

- **System Platforms**

- **Programming Models**

  Asynchronous Messaging   Synchronous RPC   Publish/Subscribe

- **Programming Languages**

  RPG   COBOL   C++   Microsoft .net   Java

- **Transport Protocols**

  Web Services   WebSphere MQ   JMS   FTP   TCP/IP Multicast   HTTP   SMTP

- **Standards & Message Formats**

  ACORD   HIPAA   ebXML   COBOL Copybook   SWIFT   EDI-X.12

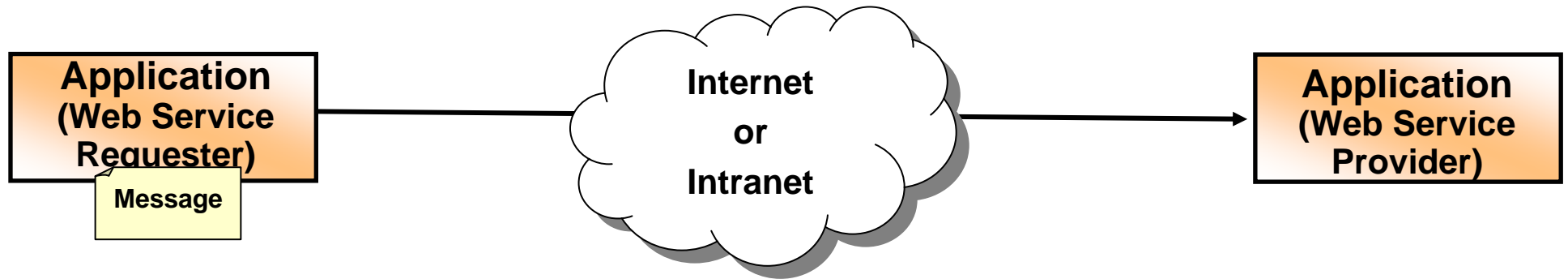 Custom Formats   XML   IFX   AL3   EDI-FACT   HL77   Word/Excel/PDF

Quiz

- What is An Enterprise Service Bus?

Answer:
An ESB connects anything
to everything

How To Provide Application-To-Application Connectivity

- Installed environments are very diverse
  - ▶ No single technology can provide all of the required power and flexibility

- Use a combination of middleware technologies as needed
  1. **Web Services**
     Standards-based, heterogeneous, Internet-based exchanges

  2. **Asynchronous Messaging**
     Adds reliability, assured delivery, application de-coupling

  3. **Mediation Broker**
     Adds services to transform and enrich information as it flows from one application to another

- Implementations of these technologies is known as an
  Enterprise Service Bus

Web Services Provide Simple Point-To-Point Connectivity

```
┌─────────────────────┐                    ╭────────────╮                    ┌─────────────────────┐
│    Application       │                   │  Internet   │                   │    Application       │
│  (Web Service        │──────────────────▶│     or      │──────────────────▶│  (Web Service        │
│   Requester)         │                   │  Intranet   │                   │   Provider)          │
└─────────────────────┘                    ╰────────────╯                    └─────────────────────┘
     │ Message │
```
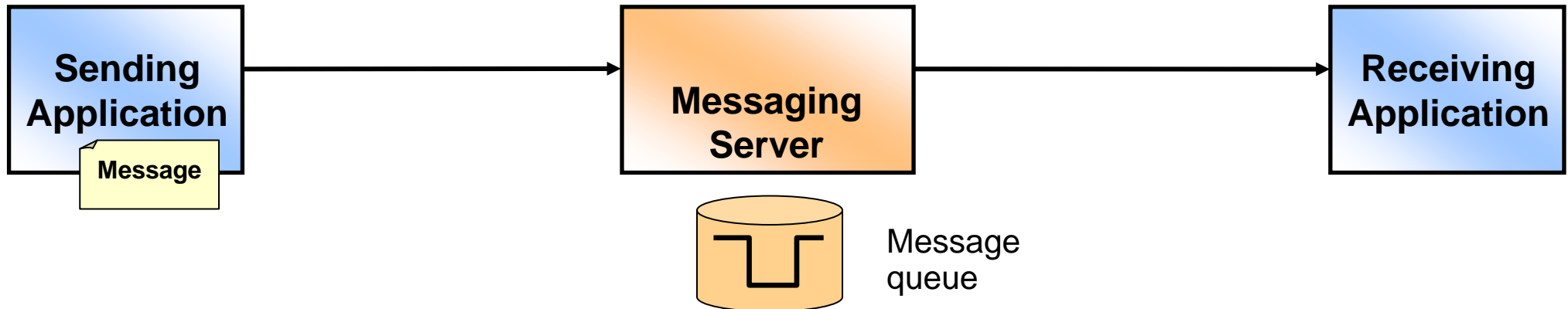
- Advantages
  - ► Almost every platform supported
  - ► Standards-based, works across the internet

- But there are considerations…
  - ► The requester and provider must be running at the same time
  - ► No infrastructure for managing overall web services

- Mainframe supports web services via WebSphere Application Server, CICS, and IMS SOAP Gateway

Message Queues Provide Greater Flexibility With Asynchronous Messaging

```
Sending          →        Messaging          →        Receiving
Application               Server                       Application
  [Message]              [Message queue]
```

- Sender and receiver do not need to run at same time
    - ▶ Put and get messages from queues

- Reliable, assured delivery

- Sender and receiver can process messages at different rates

- Message servers can be networked together
    - ▶ Messages automatically arrive at named destination queue

- Mainframe supports messaging via WebSphere MQ and WebSphere Application Server (JMS)

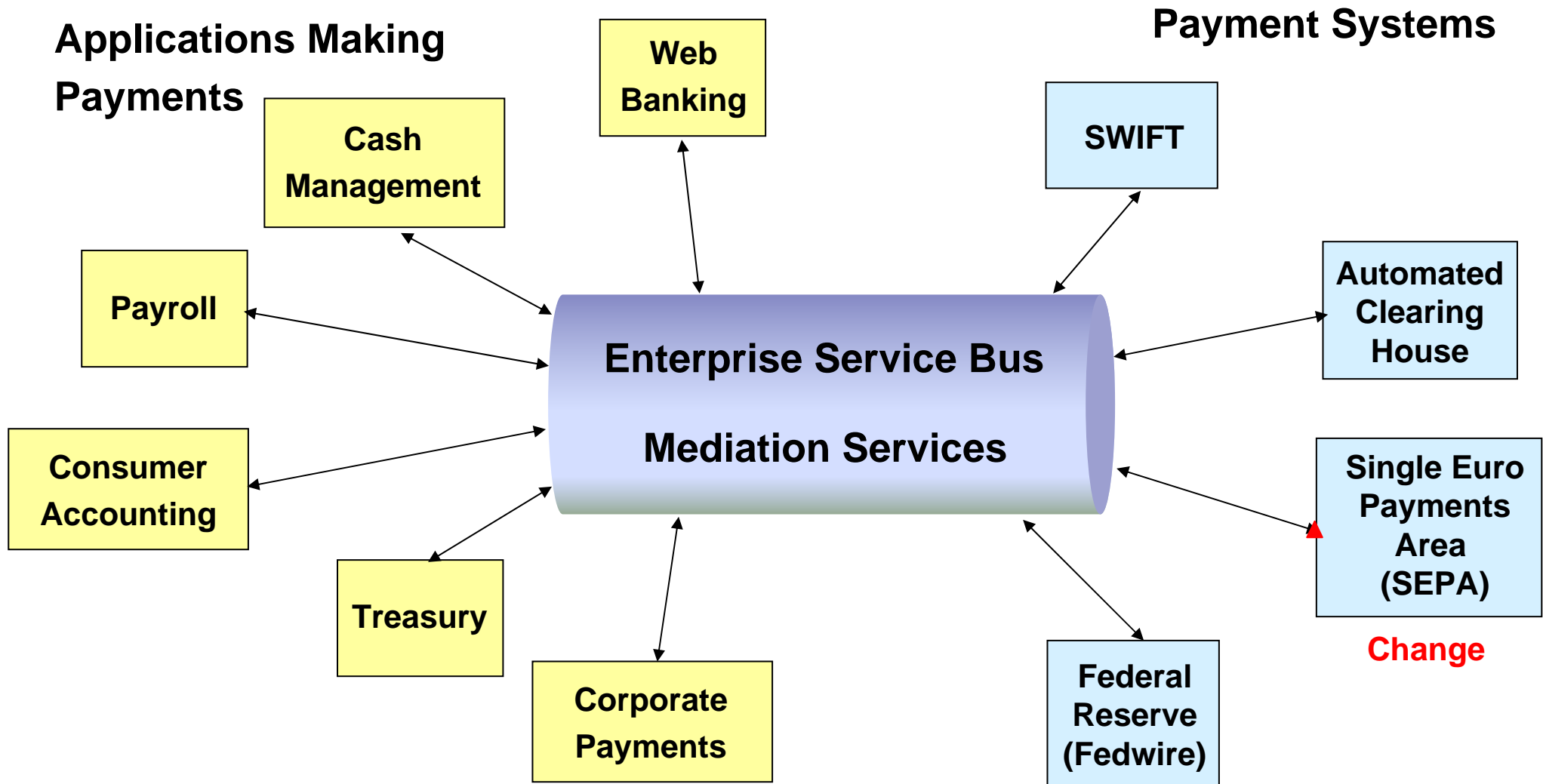# Connect Applications Point-To-Point With WebSphere MQ

- Connects to virtually everything
  - Over 80 platform configurations
  - Uses IBM Message Queuing Interface (MQI), Java Message Service (JMS), or SOAP/JMS
  - Bridges Web 2.0 AJAX client applications to the WebSphere MQ queues using RESTful interfaces

- Very simple API (put/get) for all main programming languages: C++, C#, Visual Basic, .NET, COBOL, Java

- The de facto standard for asynchronous messaging
  - 42% of z/OS customers have WebSphere MQ
  - 90% of the Fortune 100 businesses have WebSphere MQ
  - Banking clients move transactions worth $35 trillion/day
  - Government clients move 675+ million messages/day

However, Point-To-Point Connectivity Can Be Costly To Maintain

Applications Making Payments

Payment Systems
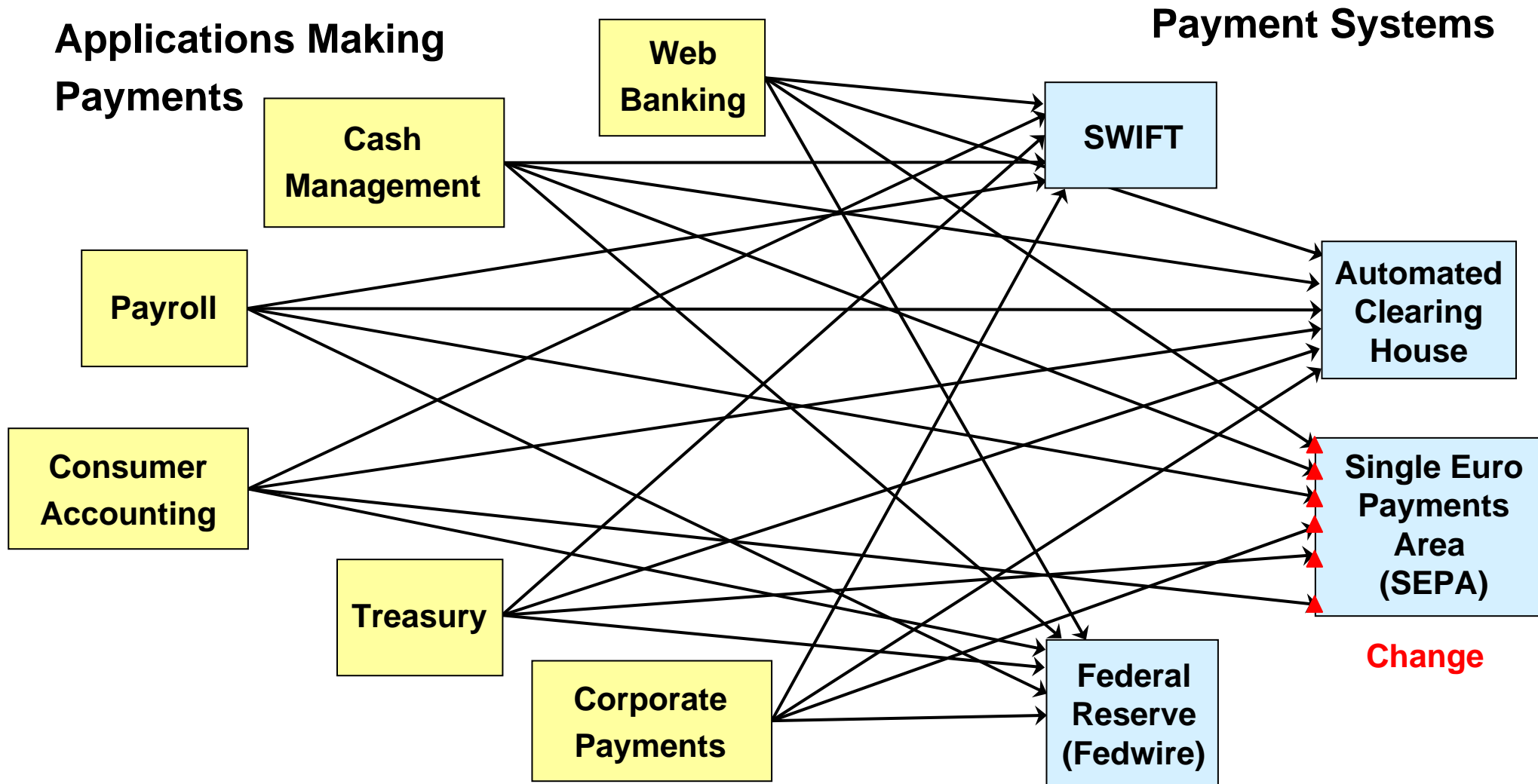
- Services are tightly coupled to one another
- One change requires many other changes

An Enterprise Service Bus Reduces Costs By Providing Centralized Mediation Services

Applications Making Payments

Payment Systems

Web Banking

Cash Management

Payroll

Consumer Accounting

Treasury

Corporate Payments

Enterprise Service Bus

Mediation Services

SWIFT

Automated Clearing House

Single Euro Payments Area (SEPA)

Change

Federal Reserve (Fedwire)

- A change requires only one change in the ESB mediation services
- Services can be created and maintained independently

Health Insurance Company – Analysis Showed Benefit Of Using WebSphere Message Broker For Enterprise Integration

- The ESB on z/OS solution offered these benefits over the custom point-to-point connection option over the 5-year period:
  - ▶ 62% reduction in solution build cost
  - ▶ 73% reduction in on-going code maintenance of the integration solution
  - ▶ 42% reduction in infrastructure administration

- For an investment of $2.5M in WebSphere software, the company would realize a benefit of **$165M** over a 5-year period
  - ▶ Resulting in an ROI of **6,715%**

Source: High-level analysis for a large U.S. Health Insurance Company using IBM's Business Value Assessment (BVA) model, 2006
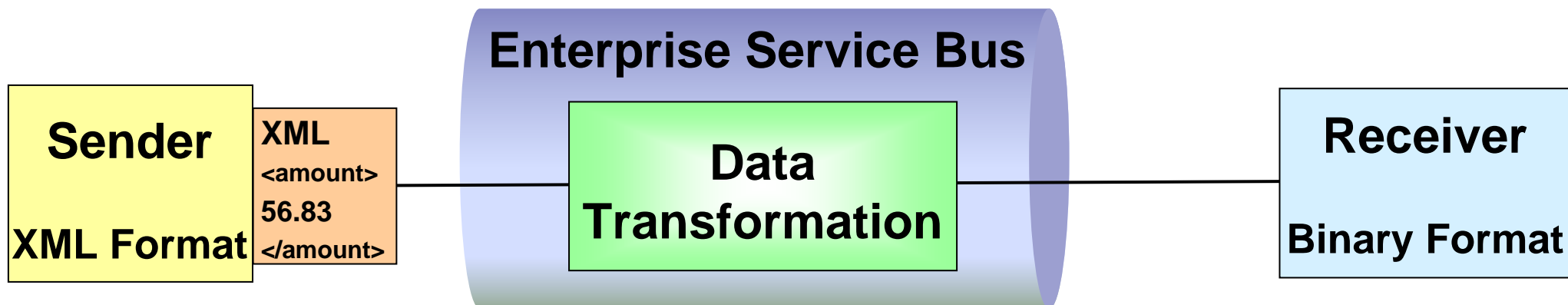
Mediation Service: Content-Based Routing

Example: Route payment based on payment amount
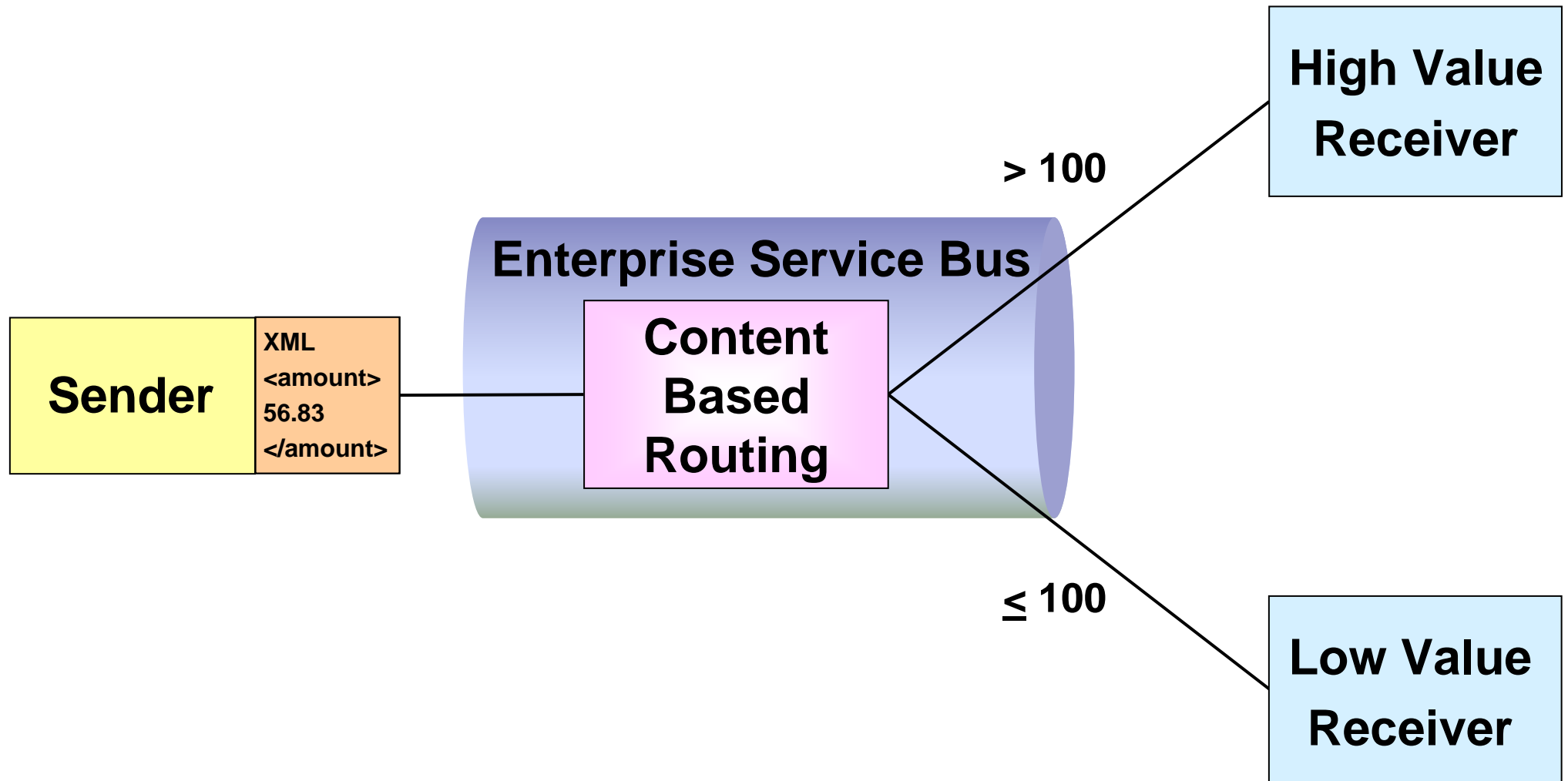
Mediation Service: Data Transformation
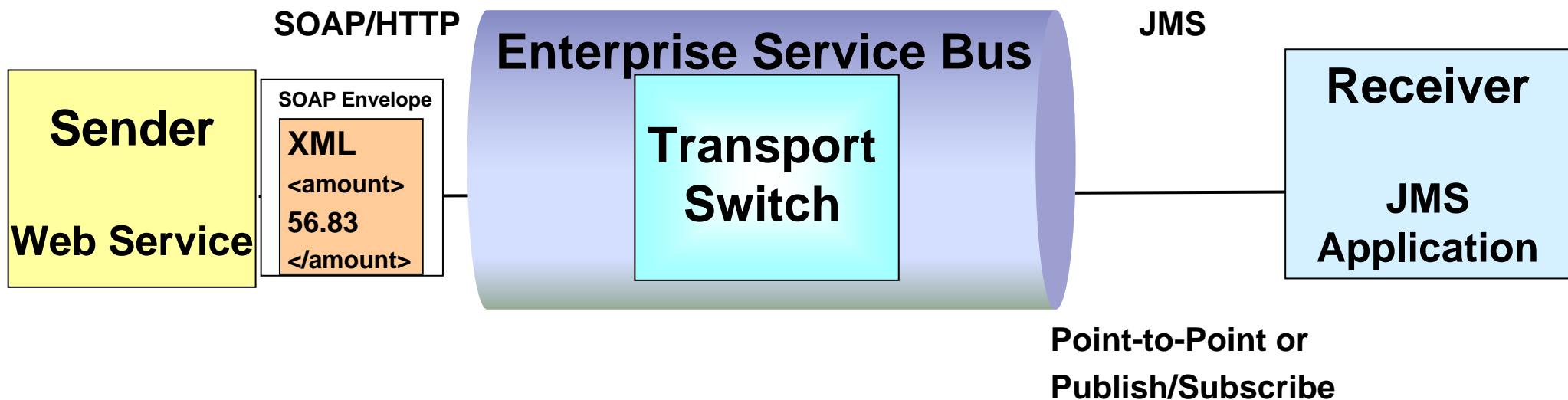
Example: Transform XML to binary format

```
                    Enterprise Service Bus

Sender          XML                  Data                    Receiver
             <amount>            Transformation
XML Format    56.83                                         Binary Format
             </amount>
```

Other Common Transformations

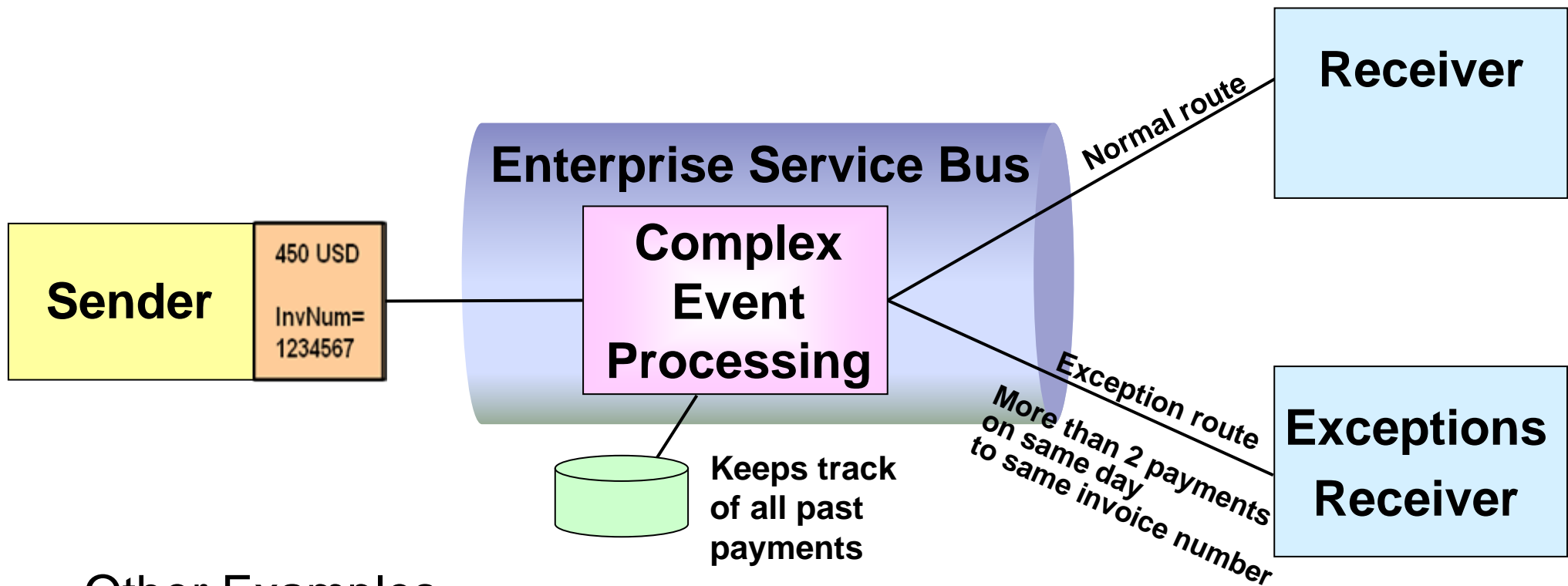- One XML schema to another XML schema
- Industry specific transformations, e.g., IFX to SWIFT

Mediation Service: Transport Switching

Example: Switch from SOAP/HTTP to a JMS message

SOAP/HTTP

JMS

Enterprise Service Bus

Sender

Web Service

SOAP Envelope

XML
<amount>
56.83
</amount>

**Transport
Switch**

Receiver

**JMS
Application**

Point-to-Point or
Publish/Subscribe

Complex Event Processing

Example: Fraud detection and alerting

Sender

450 USD

InvNum=
1234567

Enterprise Service Bus

Complex Event Processing

Keeps track of all past payments

Normal route

Exception route
More than 2 payments on same day to same invoice number

Receiver

Exceptions Receiver

Other Examples

■ Enforcement of regulatory constraints

■ Periodically report aggregate payments

■ Service level agreement monitoring and notification

Combine Mediation Services Together To Meet Connectivity Requirements
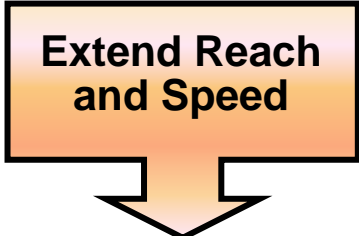
Enterprise Service Bus
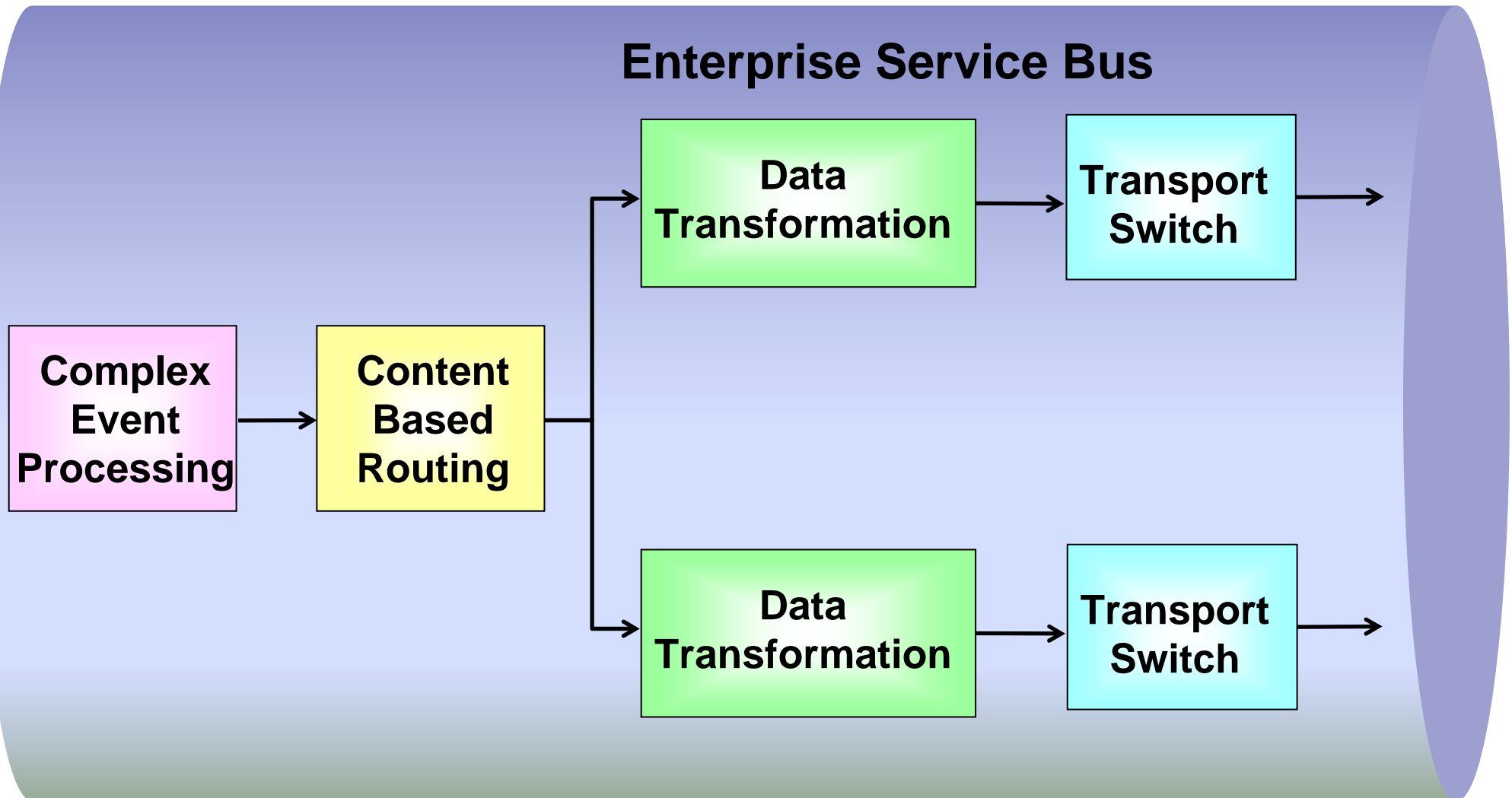
- Combine mediation services in any order
- Construct mediation flow to connect services

IBM Enterprise Service Bus Connects Almost Anything To Anything

Devices

Telemetry

Mobile

Data Formats

ACORD

COBOL Copybook   XML

SWIFT   EDIFACT   MIME

HIPAA   IDoc   HL7

C Header   X12   TLOG

Custom Binary

Messaging Systems

Sonic MQ

WebSphere MQ

Any JMS   TIBCO EMS

TIBCO Rendezvous

WebSphere platform messaging

File System

IBM Enterprise Service Bus

Platforms

z/OS   AIX   Linux

Solaris   HP/UX   Windows

Databases

DB2   SQL Server
Oracle   Sybase

Protocols

SOAP   FTP

TCP/IP Sockets

LDAP   HTTP

SMTP

WebSphere Adapters

Enterprise Applications

Ariba

JD Edwards   SAP

Oracle   PeopleSoft

i2   SunGard

Siebel

Single copy of message delivered simultaneously to many subscribers

Multicast

Implementing Your Enterprise Service Bus Depends Upon Your Requirements

	Web Services and Mediation	**Extend Reach and Speed**
	WebSphere ESB (Runs on z/OS)	**WebSphere Message Broker (Runs on z/OS)**
Built on WebSphere Application Server	✔	
Wide Range of Platforms	✔	✔
Web Services (SOAP/HTTP)	✔	✔
Content-Based Routing & Transformation	✔	✔
Transport Switching & Database Support	✔	✔
Adapters for Enterprise Applications	✔	✔
XML Data Format	✔	✔
Non-XML Data Formats		✔
Complex Event Processing		✔
Content-Based Publish/Subscribe		✔
Mobile and Telemetry Devices		✔
Multicast		✔
Third Party Messaging Systems		✔

04 - Extend Connectivity With A Mainframe Communications Backbone v7.2.ppt

DEMO: Using WebSphere Message Broker For Payments
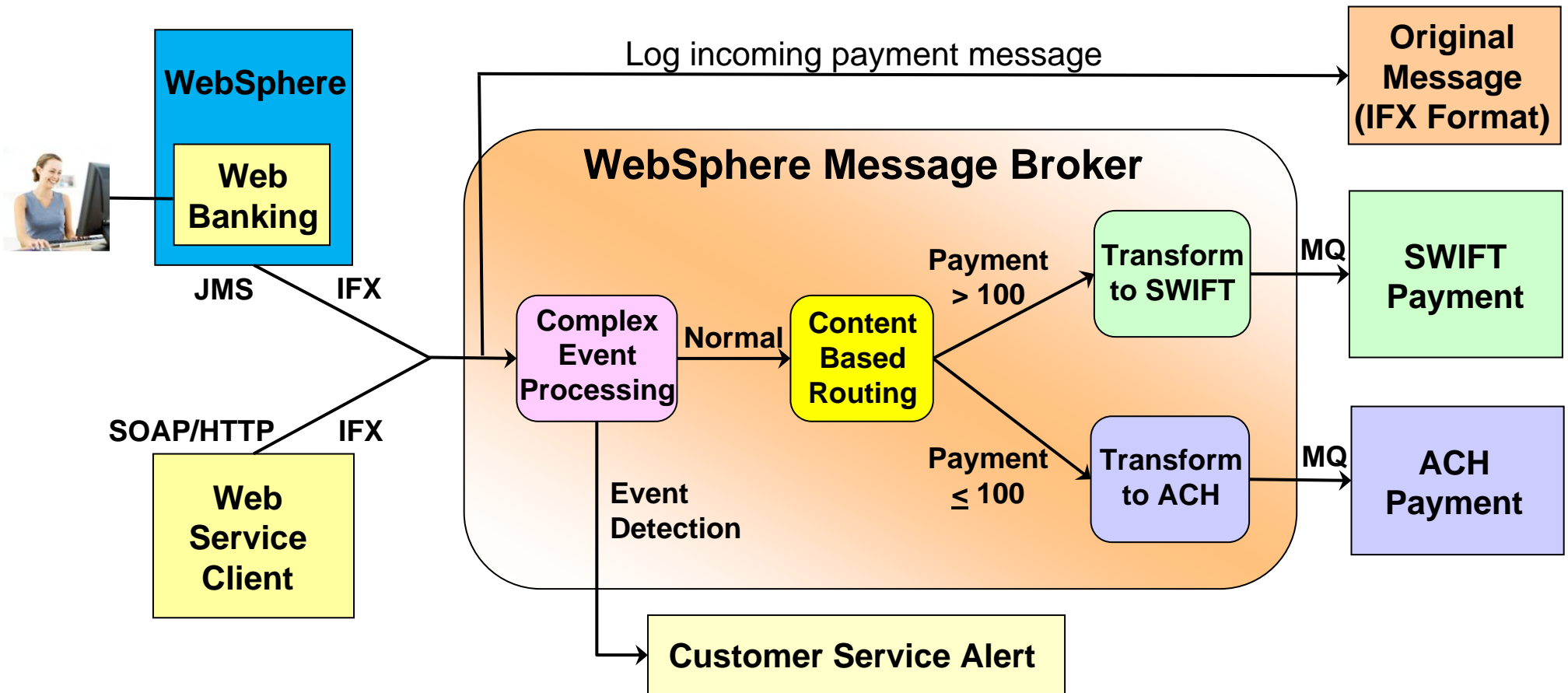
- Web banking payments routed to payment system based on amount
- Transformation from IFX to SWIFT and ACH formats
- 3rd payment on same invoice number on same day creates customer service alert
- Payments are processed exactly the same for a web service client

Run Your Communications Backbone On The Mainframe

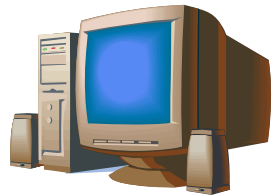**What platform should I use to run my communications backbone?**

Extend your mainframe to provide a communications backbone with WebSphere MQ and WebSphere Message Broker on System z

Service Oriented Finance CIO

IBM

Communications Backbone

WebSphere Message Broker Includes three components installed in one LPAR with z/OS

**WebSphere Message Broker Developer Toolkit Windows or Linux**

WebSphere Message Broker

WebSphere MQ
(Extended Security Edition optional)

DB2
(Configuration Data)

z/OS LPAR (includes Communication Server)

Crypto express2
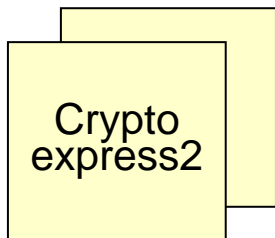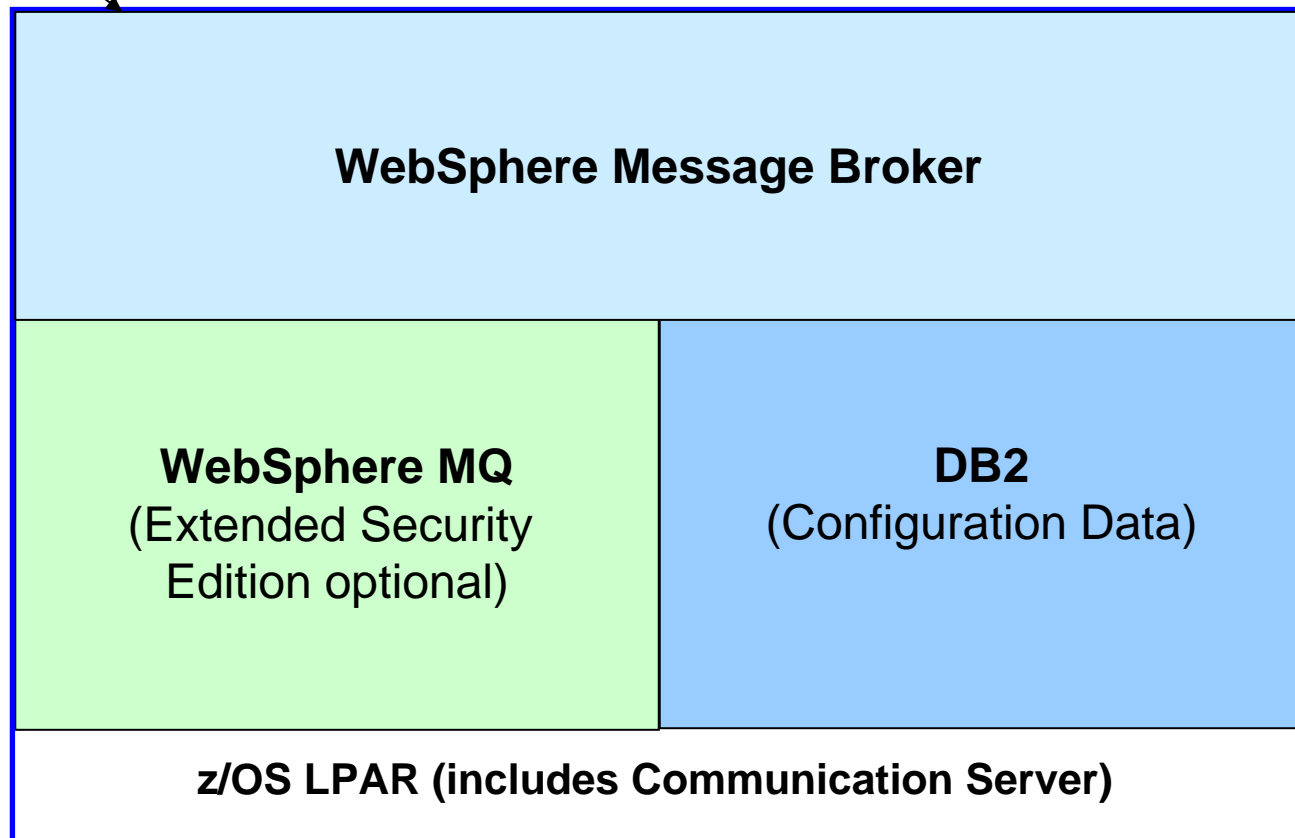
Optional hardware cryptography assist

Communications Backbone Exploits z/OS Capabilities

- **Exploits sysplex clustering to provide true 24X7 operations**
  - ▶ WebSphere MQ takes advantage of Parallel Sysplex to enable MQ shared queues

- **Leverage System z hardware advantages**
  - ▶ Huge I/O bandwidth (z10 InfiniBand - 6 GBps)
  - ▶ Hipersocket in-memory networking eliminates latency
  - ▶ Unmatched hardware reliability
  - ▶ Crypto Cards accelerate encryption

- **RACF security**

- **Disaster recovery via GDPS**

- **Capacity upgrade on-demand for unexpected peaks**

WebSphere MQ Shared Queues On z/OS

- Any processor can access the same queue
  - ▶ Queue sharing groups

- Exploits Parallel Sysplex

- Automatic load balancing

- Scalable throughput

Parallel Sysplex

2 **3** **4**

Queue Sharing Group

MQGET

Shared
Queue

Coupling Facility
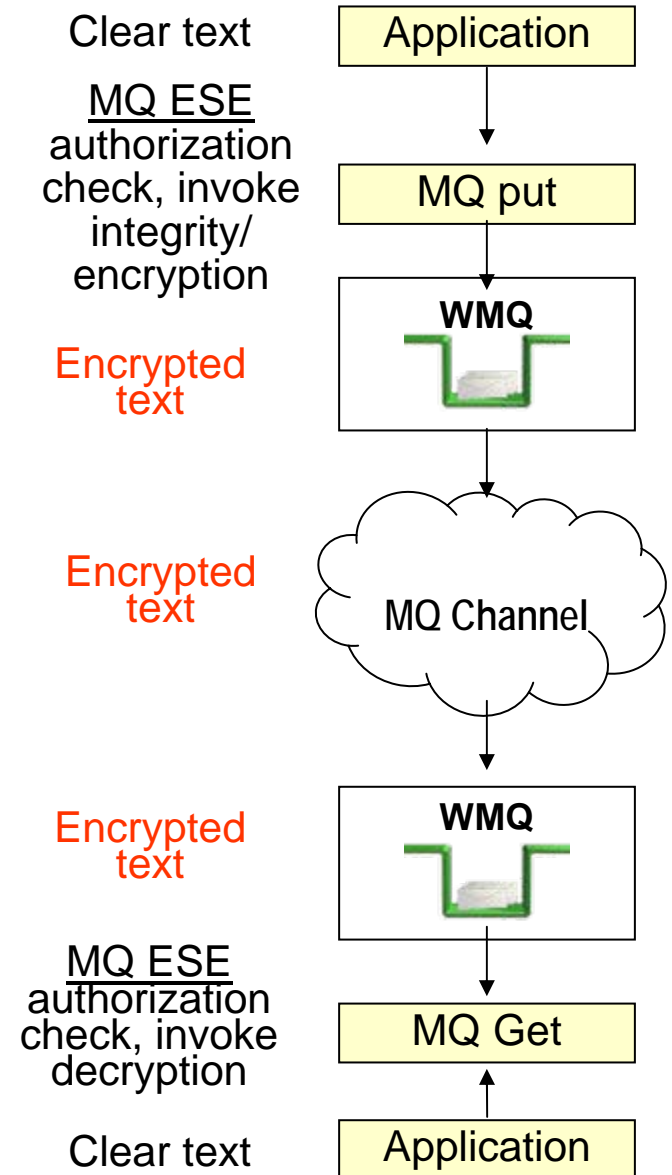
1

MQPUT
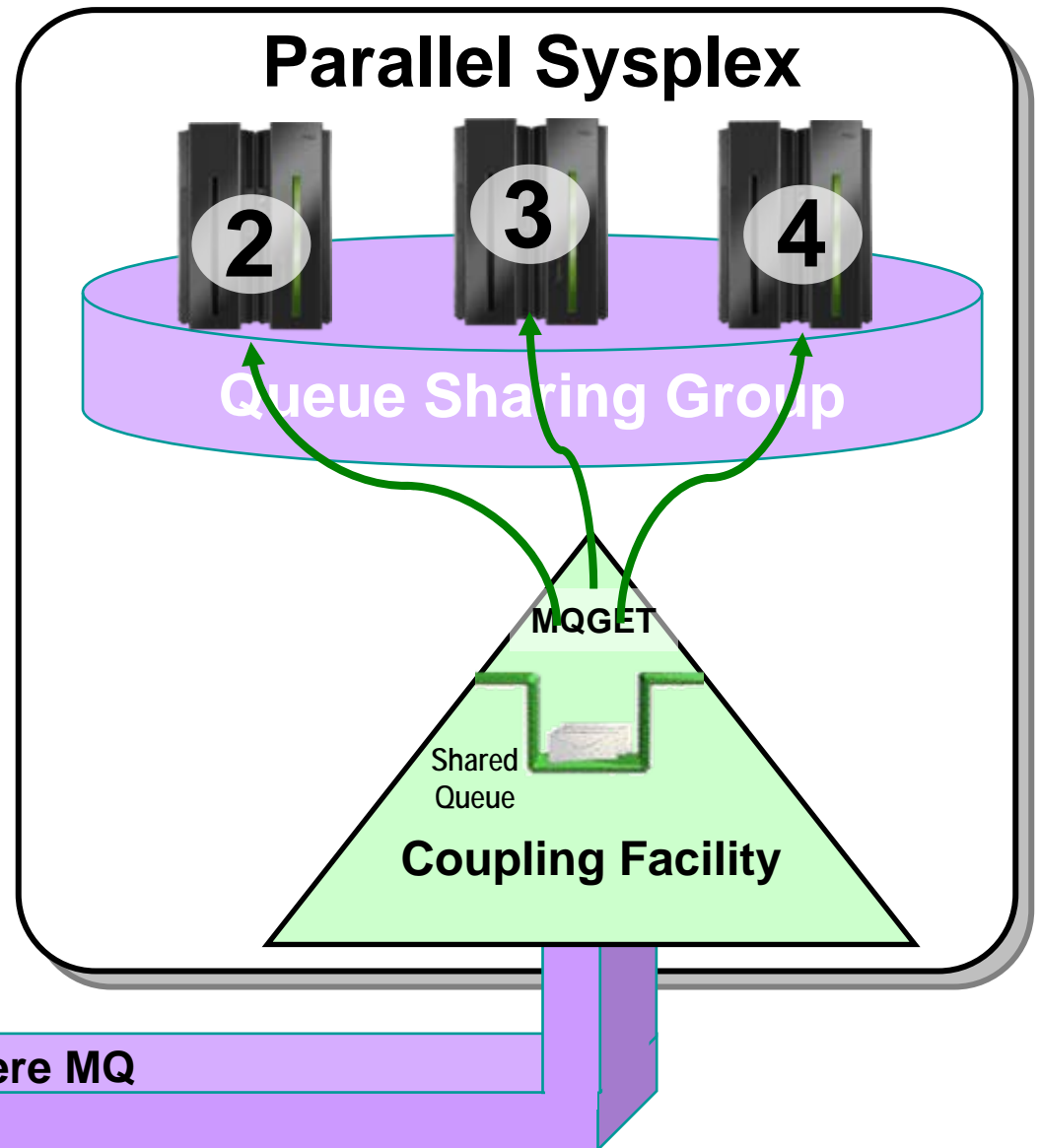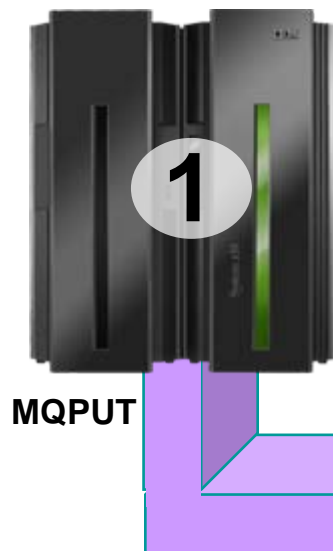
WebSphere MQ

Shared Queues Enable High Availability

- Queue Manager failure
  - ▶ No messages marooned due to queue manager failure

- Leverages ARM (Automatic Restart Manager) for Queue Manager restart

Parallel Sysplex

3

Queue Sharing Group

MQGET

Shared
Queue

Coupling Facility

1

MQPUT
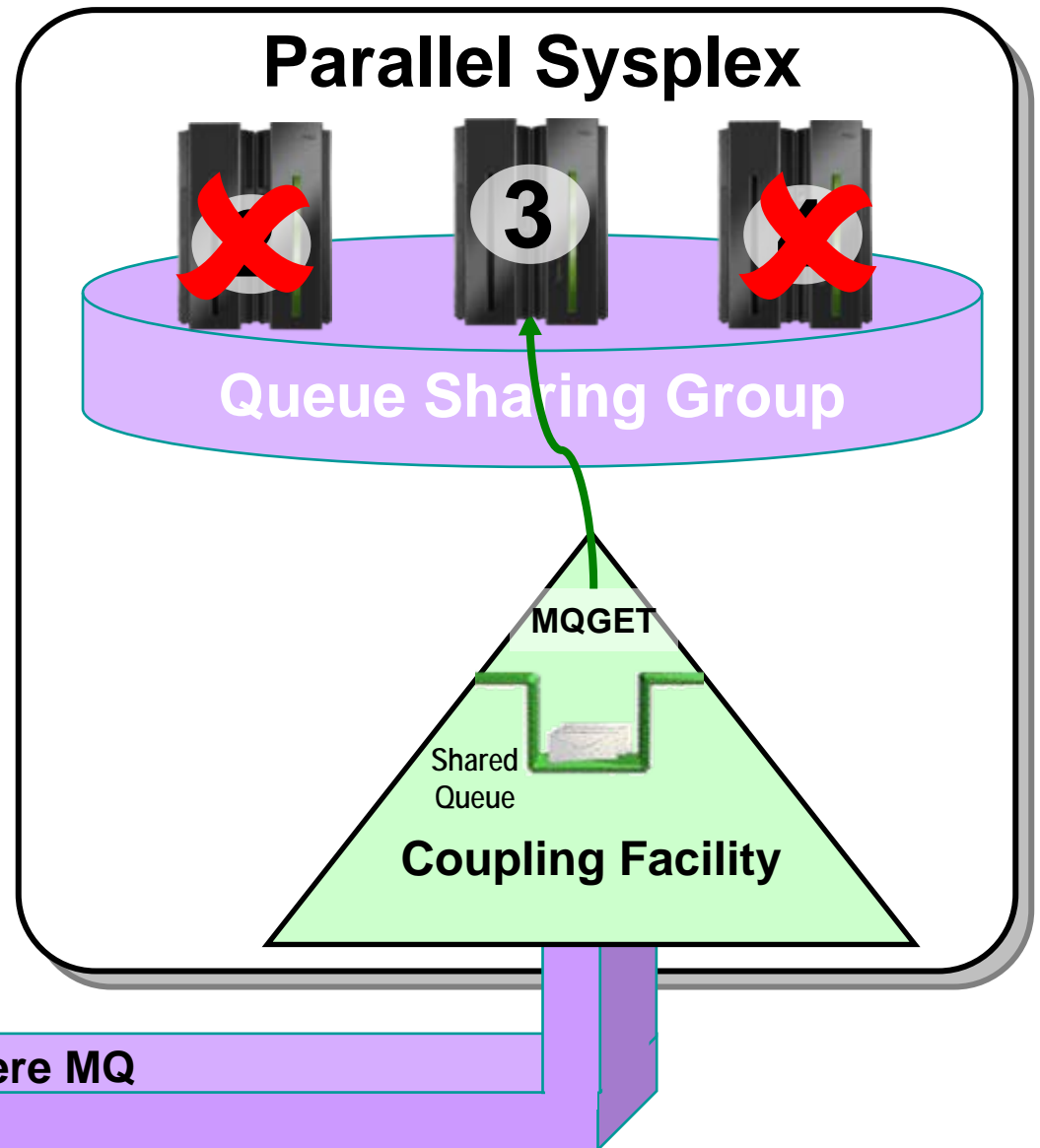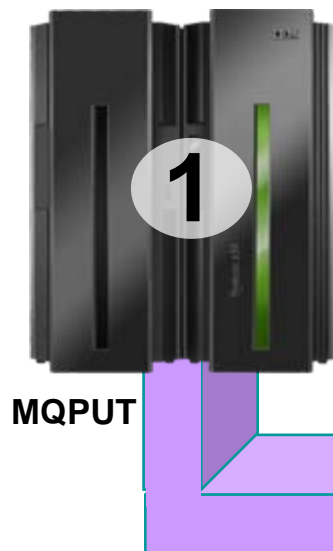
WebSphere MQ

WebSphere MQ Extended Security Edition For z/OS V6 Enhances Security And Compliance

- Protects message data end-to-end-including when it resides in queues. 3 security levels:
  - ▶ None-authorization only
  - ▶ Integrity-attaches digital signatures to messages
  - ▶ Privacy-encrypt/decrypt

- Exploits System z cryptographic processor

- Simple upgrade on top of WebSphere MQ
  - ▶ Intercepts application message before it enters/leaves queues

- Provides key element of solution for Payment Card Industry (PCI) Data Security Standard (DSS)

Clear text → Application

MQ ESE authorization check, invoke integrity/ encryption → MQ put

Encrypted text → WMQ

Encrypted text → MQ Channel

Encrypted text → WMQ

MQ ESE authorization check, invoke decryption → MQ Get

Clear text → Application

WebSphere MQ File Transfer Edition Delivers A Reliable Managed File Transfer Backbone For SOA

"… **custom-built, in-house, hard-coded integration solutions (the majority using free FTP software) are much the most widely-used approach.**

"**…often take 2 to 4 times the time and effort to build**

"**…require a similar multiple of ongoing maintenance and support effort…**

"**… IBM application integration costs 2-4 times less**"

Source: "Enterprise Integration Challenge," Software Strategies, 2007

- Bulk transfer of files, regardless of size
- Messaging and file transfer use single backbone
- Eliminates need for File Transfer Protocol (FTP)
- Log of transfer activity for audit purposes
- Automation/control of file movement
- Graphical interface for configuring and monitoring
- Files can be transferred to/from from ESBs
- WebSphere Message Broker complements with mediation services specifically designed for file data
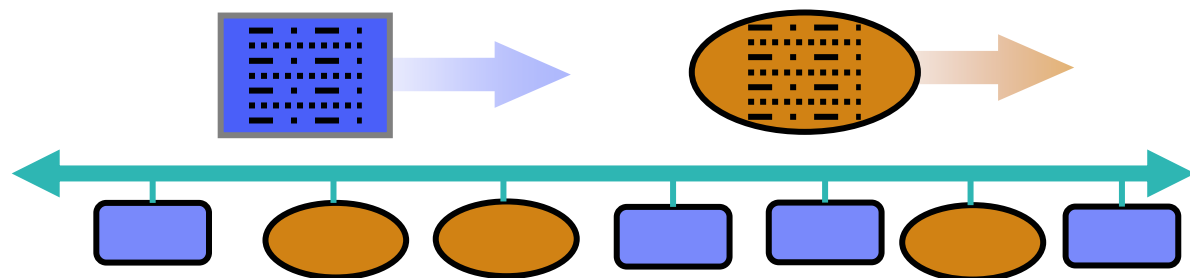
Consolidated Transport for messages & files

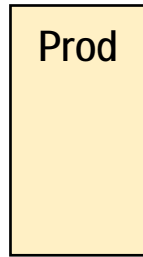# Case Study: Mainframe Extension Solution – Communications Backbone

Existing Mainframe

Existing z10:
2 GP 1,720 MIPS DB2 workload

Existing Disaster Recovery Site

Existing:
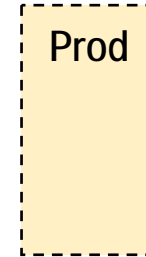1 GP for hot disaster switch-over
1 "dark" DR processors

Add 1 LPAR for New WMB workload

Prod | 1,132 MIPS additional workload

Incremental:
2 GP   1132 MIPS WMB, MQ, DB2
1 GB Memory

And Add Disaster Recovery

Prod

Capacity Backup:
2 GP

3 year cost of acquisition $4.29M

Or add 2 HP 9000 rp7440 Servers With TIBCO BusinessWorks and Enterprise Message Service
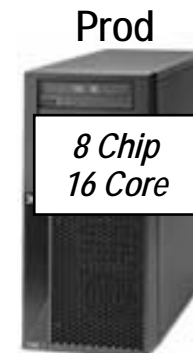
And Add Disaster Recovery

Prod | Prod | Prod | Prod

8 Chip 16 Core | 8 Chip 16 Core | 8 Chip 16 Core | 8 Chip 16 Core

30,911* Performance Units | 30,911* Performance Units | 30,911* Performance Units | 30,911* Performance Units

3 year cost of acquisition $8.21M

Production Performance Units required = 1,132 x 54.6= 61,822