Extending Your Mainframe for More Business Value

Extend Connectivity With a Mainframe 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

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Providing Application-to-Application Connectivity Can Be Complicated

- System Platforms

- Programming Models

  Asynchronous Messaging   Synchronous RPC   Publish/Subscribe

- Programming Languages

  RPG   COBOL   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   FIX   AL3   EDI-FACT   HL77   Word/Excel/PDF

- Error Recovery

How to Provide Application-to-Application Connectivity

- Installed environments are very diverse
  - ▶ No single technology can provide the 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

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

Web Services Provide Simple Point-to-Point Connectivity

Application (Web Service Requester)	Internet or Intranet	Application (Web Service Provider)

Message
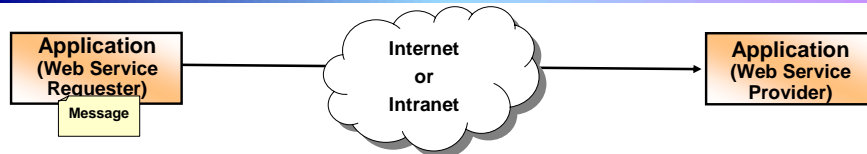
- Advantages
  - ▶ Almost every platform supported
  - ▶ Standards-based, works across the internet

- 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

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Message Queues Provide Greater Flexibility with Asynchronous Messaging

| Sending Application	Messaging Server	Receiving Application

Message
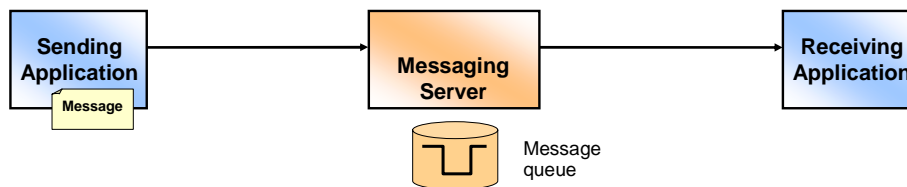
Message queue

- 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)

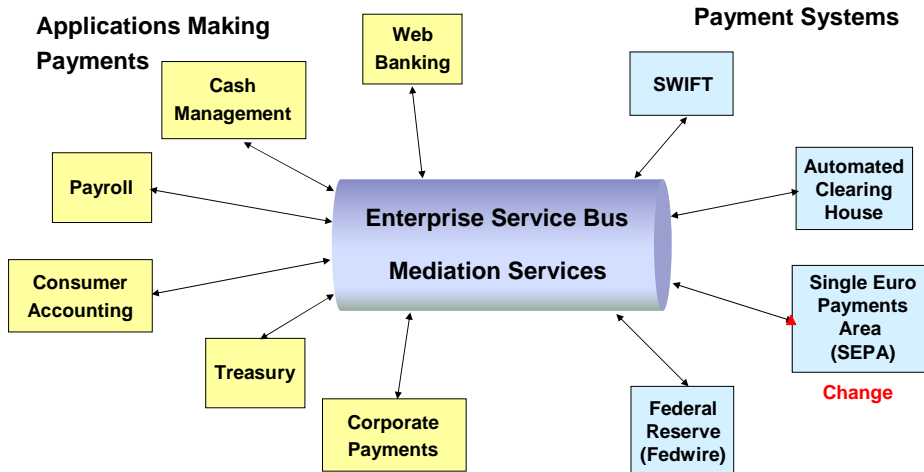## Connect Applications Point-to-Point with WebSphere MQ

- Connects to virtually everything
  - ▶ Over 80 platform configurations
  - ▶ Uses IBM Message Queuing Interface (MQI), Java Message Service (JMS), or SOAP/JMS

- 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
  - ▶ 60% of the Fortune 500 businesses have WebSphere MQ
  - ▶ 66% of North American and European banks
  - ▶ 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
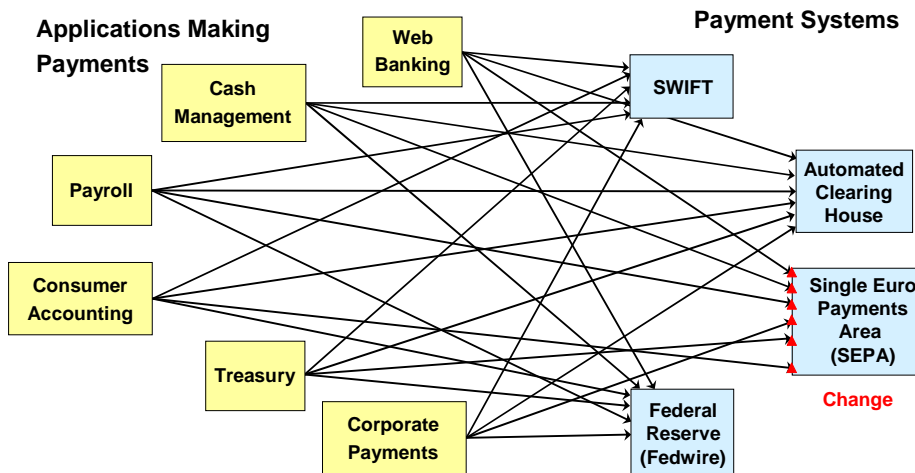
- Services are tightly coupled to one another
- One change requires many other changes

An Enterprise Service Bus Reduces Costs By Providing Centralized Mediation Services

Applications Making Payments

Payment Systems

Web Banking	
Cash Management	SWIFT
Payroll	Automated Clearing House
Consumer Accounting	**Enterprise Service Bus Mediation Services**
Treasury	Single Euro Payments Area (SEPA) — **Change**
Corporate Payments	Federal Reserve (Fedwire)

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

Case Study – Analysis Showed Benefit of Using WebSphere Message Broker for Enterprise Integration
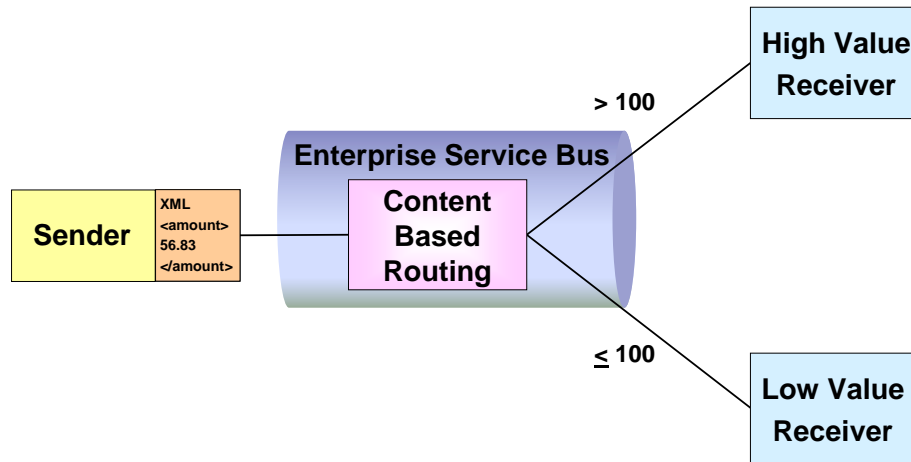
- The ESB on z/OS solution offered these benefits over the custom point-to-point connection option over the 5-year period:
  - ▶ 62% reduction in solution build cost
  - ▶ 73% reduction in on-going code maintenance of the integration solution
  - ▶ 42% reduction in infrastructure administration

- 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 **6715%**

Mediation Service: Content-Based Routing

Example: Route payment based on payment amount

High Value Receiver

> 100

Enterprise Service Bus

Sender

XML
<amount>
56.83
</amount>

Content Based Routing

≤ 100

Low Value Receiver

Mediation Service: Data Transformation

Example: Transform XML to binary format

Enterprise Service Bus

Sender

XML Format

XML
<amount>
56.83
</amount>

Data Transformation

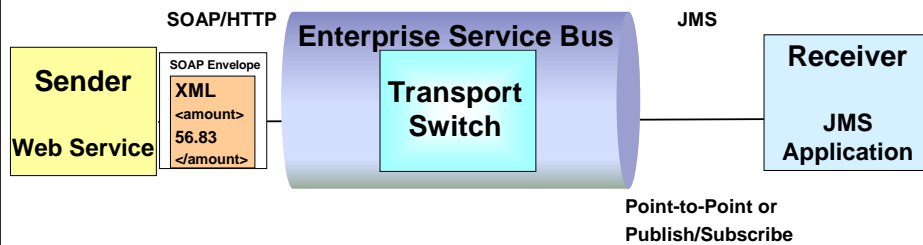**Receiver**

Binary Format

<u>Other Common Transformations</u>
- One XML schema to another XML schema
- Industry specific transformations, e.g., FIX to SWIFT

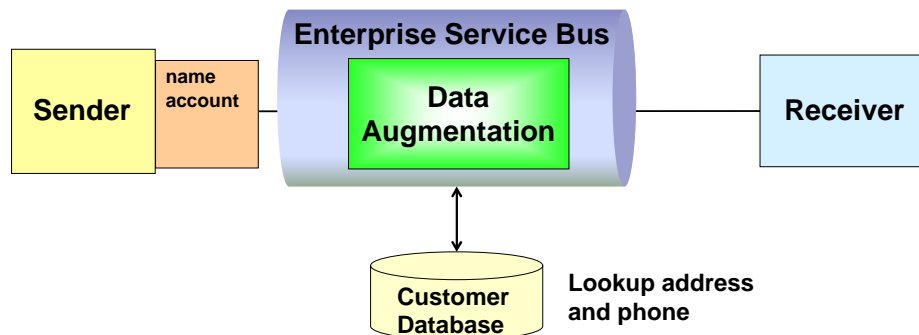# Mediation Service: Transport Switching

Example: Switch from SOAP/HTTP to a JMS message

SOAP/HTTP

Sender

Web Service

SOAP Envelope

XML
<amount>
56.83
</amount>

Enterprise Service Bus

Transport Switch

JMS

Receiver

JMS Application

Point-to-Point or
Publish/Subscribe

Mediation Service: Data Augmentation

Example: Add customer information from an external database

Enterprise Service Bus

Sender

name account

Data Augmentation

Receiver

Customer Database

Lookup address and phone

Complex Event Processing

Example: Fraud detection and alerting

Enterprise Service Bus

Sender	450 USD InvNum= 1234567

Complex Event Processing

Normal route → **Receiver**

Exception route
More than 2 payments on same day to same invoice number → **Exceptions Receiver**

Keeps track of all past payments
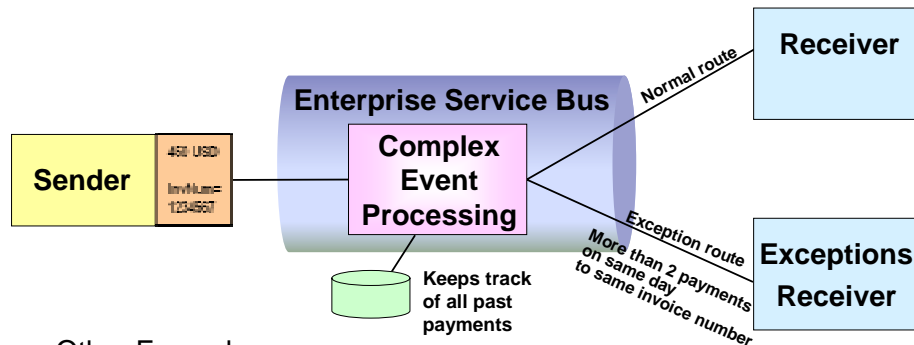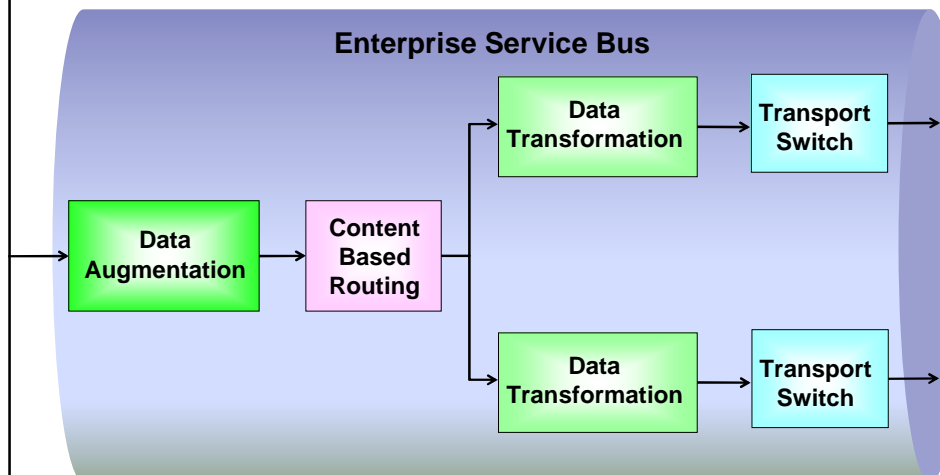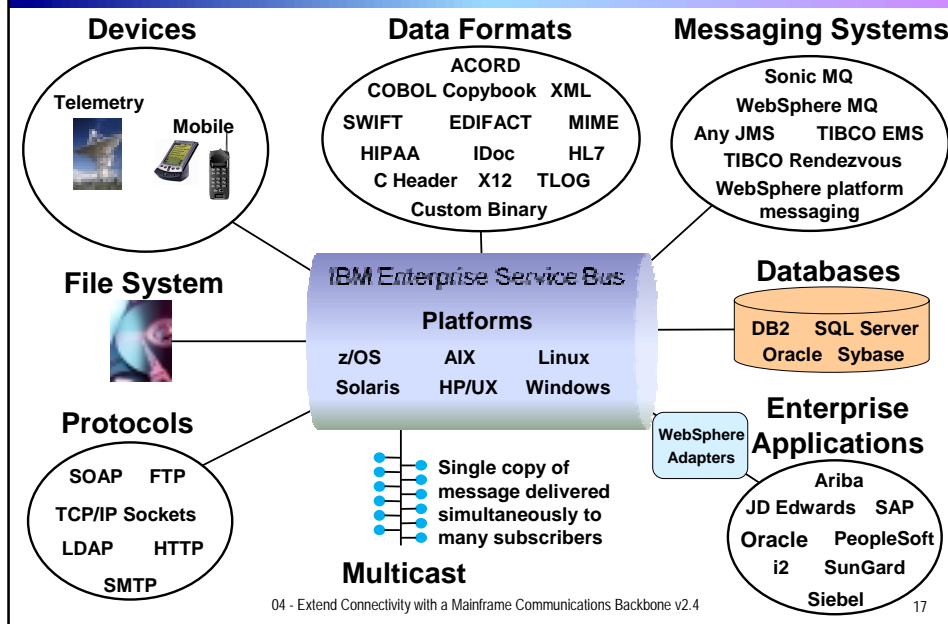
<u>Other Examples</u>

- 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

Data Augmentation → **Content Based Routing**

Data Transformation → **Transport Switch** →

Data Transformation → **Transport Switch** →

- 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

Databases

DB2   SQL Server
Oracle   Sybase

IBM Enterprise Service Bus

Platforms

z/OS   AIX   Linux
Solaris   HP/UX   Windows

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

04 - Extend Connectivity with a Mainframe Communications Backbone v2.4

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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 v2.4

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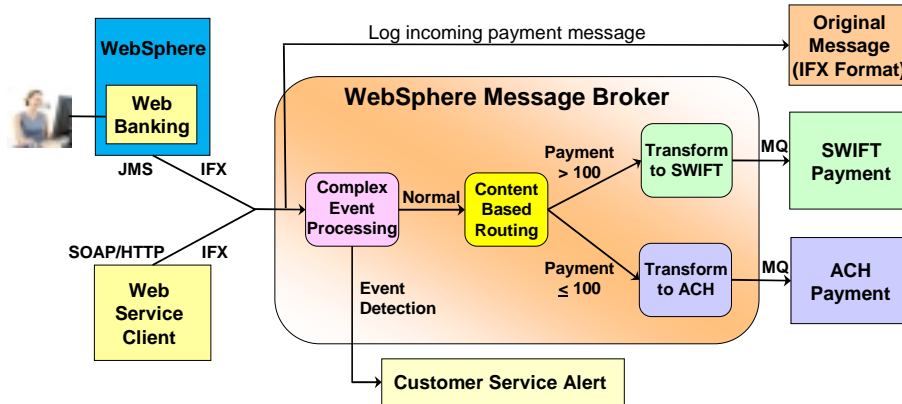
- Web banking payments routed to payment system based on amount
- Transformation from IFX to SWIFT and ACH formats
- 3rd payment on same invoice number on same day creates customer service alert
- Payments are processed exactly the same for a web service client

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Run Your Communications Backbone on the Mainframe
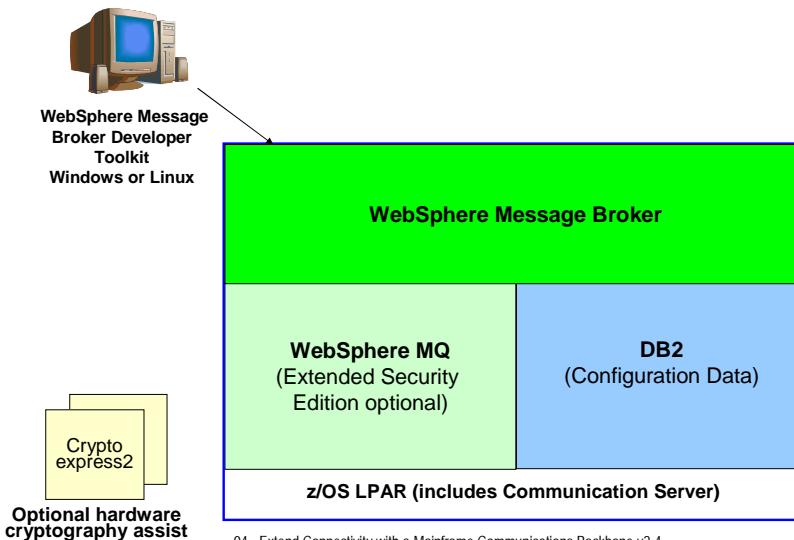
What platform should I use to run my communications backbone?

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

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Mainframe Extension Solution – Communications Backbone

- 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
- RACF security
- Disaster recovery via GDPS
- Leverage Crypto Cards
- System z design delivers unmatched hardware reliability
- Capacity upgrade on-demand for unexpected peaks
- Hipersocket in-memory networking eliminates latency
- Message mediation done in memory
- Fully Automatic Restart Manager (ARM) enabled

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

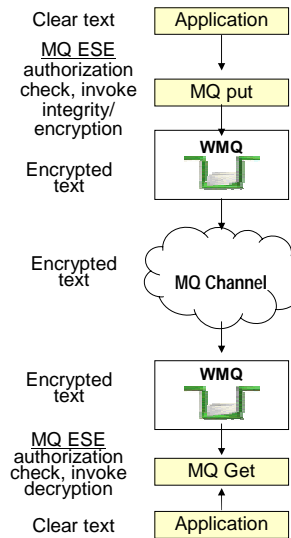**Coupling Facility**

1

MQPUT
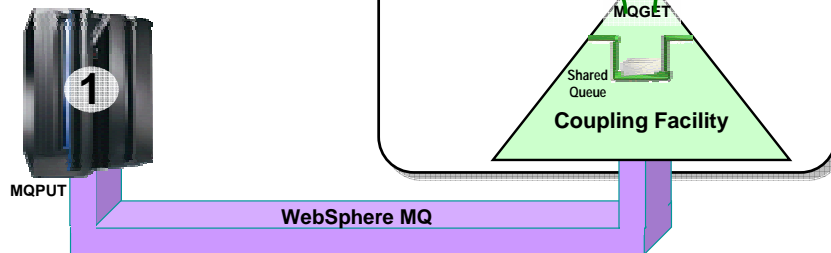
WebSphere MQ

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
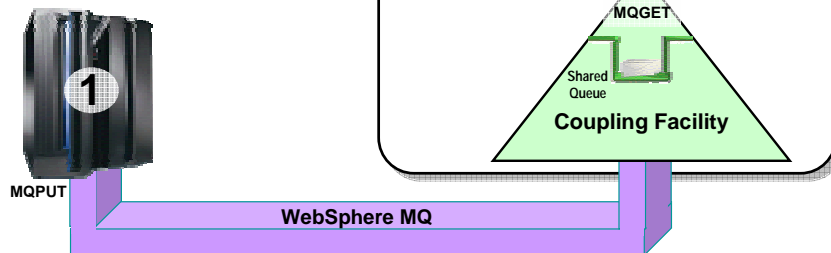
WebSphere MQ

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

Clear text — Application

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

WMQ

Encrypted text

Encrypted text — MQ Channel

Encrypted text — WMQ

MQ ESE authorization check, invoke decryption — MQ Get

Clear text — Application

A Communications Backbone on System z Benefits From Systematic Disaster Recovery

- Leverages Geographically Dispersed Parallel Sysplex (GDPS) capabilities in case of a data center disaster

  - Capacity backup to support critical workloads
  - Disk mirroring avoids message loss
  - Automated scripts drive automatic failover

Primary Site   **Backup Site**

Takeover and Restart

Disk Mirroring
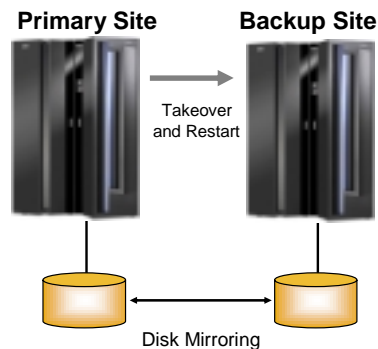
Summary

IBM's communication backbone solution provides the availability, scalability, and security I need

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CIO**