Please Note

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• Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.

• The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remains at our sole discretion.

• Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user’s job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.
Agenda

- Challenges for Core Banking Today

- What is WebSphere MQ Universal Connectivity

- WebSphere MQ Universal Connectivity Solutions for Core Banking
  - Solution 1. Two-Way Connectivity
  - Solution 2. End-to-End Mobile Banking
  - Solution 3. Active-Active Q Replication (based on WebSphere MQ)
  - Solution 4. Messaging Backbone within and cross Enterprises

- Summary

NOTES

Although this presentation mainly focuses on banking and experiences with banking customers in China market, the principles are applicable to any large organization, especially financial (insurance, loans), retail (supermarkets, restaurants), etc.

Solutions may vary depending on actual requirements, contexts, restrictions, etc. This presentation is not proposing any of the solutions as a best practice.
An Example of Banking IT Infrastructure

Banking Channels
- Tellers
- Call Center
- ATM
- POS
- Mobile & Tablet
- SMS
- Business Partners
- Web

Channel Applications
- Portal
- Front-end

Gateway & ESB & Intermediary Business
- ESB
- Gateway
- Intermediary Business Applications

Core Applications
- Credit Card
- Core Banking
- Ledger

Tellers
Call Center
ATM
POS
Mobile & Tablet
SMS
Business Partners
Web

Credit Card
Core Banking
Ledger

Branch Data Center
Headquarter Data Center
Complexity in the expansion of banking businesses

- Businesses increase the scope to span their enterprise

- E-Banking is increasingly important for delivering banking service to a greatly expanded customer base and business (like Corporate E-Banking).
  - Mobile Banking is rising quickly in recent years, spurred by the new trend of consumer behaviors around smart devices
  - More and more internal services are outsourced to improve operational efficiency; While more and more interactions with 3rd party services to enrich the lines of banking business across industries
  - Closer relationships with corporate clients to deliver financing and treasury services
    - Services like Corporate deposit, loans, billing, wealth management, settlement, securities, restructuring/merging/acquisition, and even investment banking services
  - Expansion of domestic branches and oversea representative offices, agencies, branches, affiliated banks and subsidiaries
  - With the financial crisis and economic slowdown in some areas in recent years, banks are striving hard to address the long term profitability challenge
    - Improve operational efficiency for existing line-of-businesses
    - Pursue financial innovations for new revenue growth
      - Flexible interest rates for deposit; Single contract for different accounts; ATM money withdrawal with SMS without cards; P2P payment; Contactless card payment; Instant loan by SMS/ATM; Video call service; etc
  - In this landscape, an interconnected enterprise can...
    - Accelerate new service delivery
    - Maximize the value of IT investments
    - Inform decisions with new information
    - Effectively embrace new channels
    - Integrate information and process anywhere
    - Rapidly implement changes
Challenges for Core Banking Today

• Extend core banking to support new business and workloads
  – Some banks are migrating business and workload to mainframe core banking platform, and the transaction middleware (CICS, IMS) on mainframe need to interact with more and more emerging technologies and applications.
  – Banks using SNA tend to adopt prevailing network protocol (TCP/IP) to improve interoperability, efficiency and simplification.

  ➢ Spurred by fast business expansion, One bank which has been using TXSeries on distributed platforms for core banking would like to migrate to use CICS on the mainframe.
  ➢ A large bank is running CICS and DB2 on z/OS for core banking but with SNA for network connectivity. Now it needs to evolve to TCP/IP based connectivity

Real Scenario

• New channels are arising in a changing market
  – Web services and cloud
  – Mobile (smart phones and tablets)
  – E-commerce and 3rd party payment

• Speed up time-to-market for new banking business
  – Seize transient opportunities in emerging markets like GMU, Africa
  – Leverage existing skill sets within the organization, and accelerate new banking application development and delivery

  ➢ A bank is seeking a mobile banking solution, which can provide easy mobile payment and efficient event notification to tens of millions of target mobile users, and can link with core banking to process payment transactions
Challenges for Core Banking Today

• **Higher standard of quality of service and regulations**
  – Banks in markets with strong growths demand increased capacity and balanced workload
  – Regulations require business continuity, high availability and disaster recovery

  ➢ A large bank has a production site in city A and disaster recovery (DR) site in city B
  ➢ To support business growth, meet regulatory requirements, and ensure business continuity in the event of a system failure or site wide disaster, the bank plans to build a new production site

• **Maximum ROI and utilization of resources**
  – Leverage investments to serve the needs of multiple LOBs
  – Better integration of business systems to improve operational efficiency

  ➢ A bank needs to connect and integrate key business systems with core banking in a uniform approach.
  ➢ It also needs to ensure safe and efficient connectivity from the enterprise to 3rd party systems like inter-bank payments, oversea banking, etc
But how can WebSphere MQ help address these challenges?

More about WebSphere MQ

- WebSphere MQ provides once and once-only delivery of messages, which allows extending the transaction scope to other systems, without the requirement for immediate availability
  - This becomes vitally important in cases like: With business expanding across industries and global geographies, banking systems have to interact with more and more third party systems, which we can’t guarantee always online. On the other hand, customers demand more and more banking services to be provided in a 24x7 manner.
### WebSphere MQ - Universal Connectivity

<table>
<thead>
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<th>Product</th>
<th>Description</th>
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<td>WebSphere MQ for z/OS</td>
<td>For core business on mainframe</td>
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<tr>
<td>WebSphere MQ</td>
<td>For mission critical data and applications</td>
</tr>
<tr>
<td>WebSphere MQ Telemetry (MQTT)</td>
<td>For Mobile, Internet-of-Things and Web</td>
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<td>WebSphere MQ Managed File Transfer Edition</td>
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<td>WebSphere MQ Advanced Message Security</td>
<td>For end-to-end message security assurance</td>
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<td>WebSphere MQ Low Latency Messaging</td>
<td>For high speed delivery in financial network</td>
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<tr>
<td>WebSphere MQ Hypervisors &amp; Patterns</td>
<td>For Cloud and virtual environment</td>
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</table>
How to Enable Universal Connectivity for Core Banking System

Universal Connectivity Solutions for Core Banking
This is an overall architecture for a set of solutions of universal connectivity based on WebSphere MQ family products.

- Provides both inbound and outbound connectivity
- On mainframe, MQ for z/OS integrates CICS in two ways
  - MQ-CICS Adapter
    - For new or MQ-aware core banking transactions
    - Inbound:
      - CICS transactions invoke MQI to inquire queues and get messages actively
      - To start CICS transaction:
        - Long running transactions started by automation
        - Or using trigger monitor to start CICS transactions in an asynchronous style
    - Outbound:
      - Conversational (MOPUT + MQGET)
      - Fire-and-forget (MOPUT)
  - MQ-CICS Bridge
    - For 3270 and DPL programs
      - CICS 3270 applications are usually used for user interactions via 3270 terminal (screen)
      - DPL (Distributed Program Link) enables an application in a local CICS system to issue EXEC CICS LINK
        command to link to a program in a remote CICS system
- MQ for z/OS can also integrate with IMS and WebSphere Application Server (WAS) on z/OS
  - MQ-IMS Adapter and MQ-IMS Bridge
  - Applications on WAS interoperates with MQ using JMS
MQ queue managers on multiple LPARs within the same SYSPLEX consist of a Queue-Sharing Group (QSG)
- Shared queues defined on Coupling Facility (CF)
- MQ applications on different LPARs are able to access messages in the same shared queue
- Even if one queue manager or one LPAR is down, queue managers on the other LPARs within the same QSG can continue to process the messages/transactions
  - Other queue managers within QSG can perform peer recovery for in-flight units of work

Shared messages in CF can be offloaded either
- To SMDS (Shared Message Data Set, available since MQ V7.1), which is recommended
- To DB2 database
Universal Connectivity Solutions for Core Banking

- MQ queue managers on distributed platforms, such as AIX, Linux, Windows, are acting as messaging gateway.

- Cluster can be defined with queue managers on distributed platforms (and queue managers on mainframe)
  - Achieve workload balancing within cluster.

- High availability of gateway can be achieved to avoid Single-Point-Of-Failure (SPOF)
  - Option 1. PowerHA (HACMP) or MSCS
    - MQ is running a service. It will be started along with OS on standby node during failover
  - Option 2. Multi-instance Queue Managers
    - One active instance and one standby instance (hot-backup)
    - MQ logs, queue data and configuration are stored in NFS.
Universal Connectivity Solutions for Core Banking

Various channel applications and business systems can connect to MQ easily:
- Remote client-server mode
- Local binding mode

Data is uniformly represented as messages:
- Simplify data format among numerous systems
- Can leverage WebSphere Message Broker for data transformation

WebSphere Message Broker is natively based on MQ, and provides Enterprise Service Bus (ESB) capability for building enterprise SOA.

Applications (eg. Internet Banking) deployed on application servers (like IBM WebSphere Application Server) can interact with MQ using JMS or JCA (implemented as MQ Resource Adapter within WAS).

Web Services (SOAP, REST) can also interact with MQ, like using MQ HTTP Bridge

Applications developed with Java, C/C++, C#, COBOL etc can connect to remote MQ queue managers as clients. This is suitable for remote and massive client access model.

A more common way to build up messaging backbone is to have hierarchical queue manager network (through sender-receiver channel or cluster) across headquarters and regional offices/branches, ensuring reliable and efficient message transfer

By using MQTT protocol and WebSphere MQ Telemetry product (now shipped within MQ), sensors, actuators, smart phones, tablets, web applications can interact with backend servers in a publish-scribe fashion. This protocol has been widely applied in Internet-Of-Things (IOT), Machine-to-Machine(M2M), Mobile area, across industries like E&U, Health, Retail, Finance & Banking, etc.
Further Application Connectivity based on WebSphere MQ
with IBM Integration Bus (WebSphere Message Broker)

- Unlock the value of your business data
- Simply Connect FROM anywhere, TO anywhere
- Simple & Easy –to Install, Learn, Develop, Deploy and Manage
- Visually Map and Transform between any two message or file formats

MATCHES & ROUTES communications between services
CONVERTS between different transport protocols
TRANSFORMS between different data formats
IDENTIFIES & DISTRIBUTES business events

Universal Connectivity Solutions for Core Banking

- To address the four challenges for core banking

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### Solution 1. Two-Way Connectivity for Core Banking

**Scenario:**
- OLTP transactions like deposit, withdrawal, transfer, payment between various channels and CICS-based core banking system

**Problem & Need:**
- Data format may vary greatly from different channels. Need common data transport to simplify data integration
- More and more transactions need two way interactions with clients or external systems. So need both inbound and outbound capability
- Failure or maintenance should have small impact on business continuity

**Solution Description**
- MQ for z/OS is used to provide inbound and outbound capability for CICS.
- Conversational (Request-Response) application design
  - Since most transactions require user interactions, confirmation or returning processing results to users
- CICS-MQ Adapter is used for interaction between CICS and MQ
  - CICS transactions invoke MQI (MQINQ, MQGET, MQPUT, etc) directly to manipulate messages in MQ queues
  - Long running transactions with get-wait to improve throughput and efficiency
  - To start CICS transactions: use either automation or triggering
  - CICS-MQ Bridge can also be leveraged for reusing existing applications
- The solution provides extremely high availability, scalability and multiple levels of workload balance
- All business data is represented as MQ messages, which is common inside and outside the bank (described in solution 4)
• Pattern 1 - I want one CICS transaction per message
  – Easy to implement
  – Use trigger every
  – But expensive due to extra messages

![Diagram of Pattern 1]

• Pattern 2 - I want to reduce my CPU costs and balance transactions across CICS
  – Use multiple long running transactions
    • Inquire queue depth and start more instances if required
    • Transaction stops if no messages
    • Avoids trigger messages, and transaction startup costs
  – Stop after processing known number of messages,
    • To get Accounting record
    • Next transaction starts on best system

![Diagram of Pattern 2]
• **Pattern 3 - I want to reuse my existing CICS programs**
  
  - Get message – passes data in COMMAREA to EXEC CICS LINK, data passed back – put to Queue
  - CICS bridge does this – program name in MQ Header
One sample implementation

An account transfer request is initiated from channels and enter MQ gateway on AIX as a message.

- Request message is distributed (eg. evenly) to either MQ queue manager on z/OS
  - MQ cluster workload balance.
  - MQ cluster workload balance.

- Request message arrives in shared queue,
  - Either having long running CICS transactions on multiple CICS regions to GET wait request messages from shared queue directly
    - for heavy workloads
  - Or, trigger to start transactions on multiple CICS regions to process request messages from shared queue
    - For less frequent workloads

After transfer transaction is done, result is sent by CICS transaction back to the requesting client.

Even if any node is down, business continuity is still guaranteed.
Solution 2. End-to-End Mobile Banking Solution For Core Banking

- **Scenario**
  - Personal Money Transfer
  - C2B Payment
  - Personalized Event notification for customers

- **Problem & Need**
  - The number of mobile clients connected into banking systems tends to grow rapidly and become huge. So scalability, reliability and cost are key concerns
  - Solution should be mature, secured and “end-to-end”: Covering not only front-end, but also the backend (even to core banking)
  - Rapid delivery, which implies leveraging existing skill sets and fast integration with existing business systems.

- **Solution description**
  - Combining CICS, MQ, MQTT, Worklight to provide an end-to-end mobile banking capability
  - Mobile application development is done using Worklight, enabling support for Android, iOS, Windows Phone etc
  - MQTT provides connectivity between mobile clients (within mobile applications) and mobile servers (in banks)
  - MQ connects mobile servers to core banking system, leveraging mature integration with CICS
  - With CICS EP (event processing) and MQTT, banks are able to push highly personalized events or promotion to target users in real time.
Scenario: Personal Money Transfer

1: Person A requests money transfer
2: Mobile access server calls Core Banking to update accounts A and B
3: Mobile access server receives the response from Core Banking
4: Person A and person B receives notifications

Scenario: C2B Payment

1: Merchant’s tablet takes photo for person A’s bar code (QR code)
2: Merchant’s tablet submits the charge request
3: Person A’s mobile receives notification to confirm the payment
4: Once person A confirms the payment, server invokes the Core Banking transactions
5: Both the merchant and person A receive notifications of transaction done
### System Architecture

- **Worklight Server**
- **CICS TOR**
- **MQ/z**
- **Message Dispatching Server**
- **IBM MessageSight**
- **IBM WebSphere MQ for z/OS**

#### Core banking system (zAIM Bank)

- **Bank Gateway**
- **Converter (service)**
- **Core Banking System**

#### Scenarios: Personalized Event Notification

1. **CICS Event Processing**
   - Generates events according to business rules and bank users’ characteristics.
   - MQ/z guarantees event delivery from z/OS to mobile server.

2. **Mobile server**
   - Publishes or point-to-point delivers notifications to mobile users.
Universal Connectivity Solutions for Core Banking

Solution 1
Two-Way Connectivity

Solution 2
End-to-End Mobile Banking

Solution 3
Active-Active Q Replication (based on WebSphere MQ)

Solution 4
Messaging Backbone within and cross Enterprises

Concept of Active-Active Sites

z/OS transaction workloads

Workload Distributor

replication
Active-Active Direction
System Architecture

Active Production 1

- z/OS
- Lifeline Agent
- Workload
- IMS/DB2
- Replication Capture
- MQ
- TCP/IP
- NetView SA
- Other Automation Product

Primary Controller

- z/OS
- Lifeline Advisor
- NetView SA
- GDPS/A-A

Backup Controller

- z/OS
- Lifeline Advisor
- NetView SA
- GDPS/A-A

SASP-compliant Routers used for workload distribution

Active Production 2

- z/OS
- Lifeline Agent
- Workload
- IMS/DB2
- Replication Apply
- MQ
- TCP/IP
- NetView SA
- Other Automation Product

31/05/2013

Active-Standby Today with WebSphere MQ
System Architecture

Active Production

- z/OS
- Workload
- IMS/DB2
- Replication Capture
- MQ
- TCP/IP

Standby/Query

- z/OS
- Workload
- IMS/DB2
- Replication Apply
- MQ
- TCP/IP

31/05/2013
Q Replication (based on WebSphere MQ)

- Leverages WebSphere MQ for Staging/Transport
- Part of the InfoSphere Data Replication product
- A software-based asynchronous replication solution
  - For Relational Databases
  - For selected tables/columns/transactions/operations
  - Changes are captured from the database recovery log; transmitted as (compact) binary data; and then applied to the remote database(s) using SQL statements. Technology is log-capture/transaction-replay
- Each DB2 is ACTIVE and can be used for READ/WRITE operations

Q Replication also supports N-sites topologies; with conflict detection/resolution.

Q Replication Design

- Leverages WebSphere MQ for Staging/Transport
  - Each captured database transactions published in an MQ message (messages sent at each commit_interval)
- Designed for High-throughput. Low-latency and Continuous Operations
  - Parallel Capture program publishes captured database transactions as compact MQ messages, only data is sent
  - Apply program applies non-dependent transactions in parallel using multiple database agents
  - Each component run independently and can be individually stopped/restarted

Source server

Target servers

31/05/2013
Leveraging MQ Staging for Continuous Operations

- Staging allows for moving data from the DB2 log to the remote site quickly, even if target database is down. Logs can be processed near real-time, there is no need to hold them back for replication.

- Allows:
  - Zero-downtime maintenance, upgrades, and migrations
  - Disaster Recovery (unplanned failover) with RTO of sub-second, even during maintenance of the target DB2

Universal Connectivity Solutions for Core Banking

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Solution 4. Messaging Backbone within and cross Enterprises

- **Scenario**
  - Oversea payment
  - Transactions via central bank (payment, credit reference, citizen ID check, etc)
  - Transactions between headquarter and branches (domestic & oversea)

- **Problem & Need**
  - With the expansion and globalization of banking business, core banking needs more and more in-line interactions with central bank, other domestic banks, oversea banks, 3rd party payment providers, etc
  - Need uniform integration with core banking to reduce system complexity
  - Maximize utilization of existing assets to guarantee cost efficiency

- **Solution description**
  - Use MQ to provide industry-standard connectivity between headquarter and branches, and between core banking and external business systems of other financial institutions.
  - A rich set of security features can be applied based on security needs
    - SSL, security exits, RACF, channel authentication records, Advanced Message Security (AMS), etc
  - A unified data format (MQ messages) inside and cross enterprises
    - Even for files, MQ Managed File Transfer (MFT, a.k.a FTE) can also provide enterprise-level reliable and secure transfer, based on existing MQ network

---

**System Architecture**

![System Architecture Diagram]
Summary

- **Solutions to enable universal connectivity for core banking system**
  - Solution 1. Two-Way Connectivity
    - Providing a unified and flexible way for transactions flowing in and out of core banking
  - Solution 2. End-to-End Mobile Banking Solution
    - Extending core banking services to mobile users
  - Solution 3. Active-Active Q Replication (based on WebSphere MQ)
    - Building up Active-Active data centers
  - Solution 4. Messaging Backbone within and cross Enterprises
    - Enabling core banking to interact with external financial institutions efficiently

*One common infrastructure for all these applications helps you to leverage skills and to reuse computing resources!*

31/05/2013

Morag Hughson - hughson@uk.ibm.com
IBM UK
Session 507

THINK GLOBAL – ACT LOCAL

Questions?