IBM Software Group

WebSphere MQ z/OS a-z Proof of Technology

MQ for z/OS Architecture

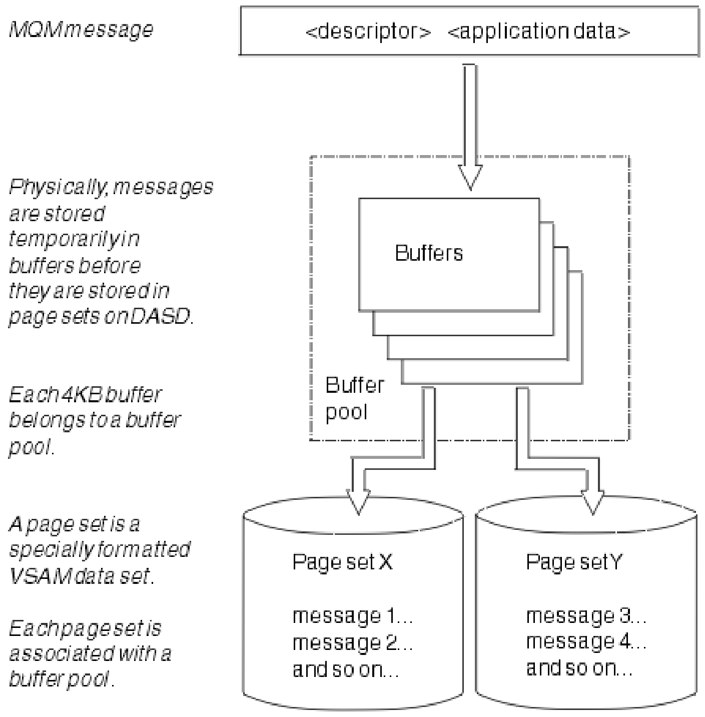
An IBM Educational Approach

What is a z/OS queue manager?

- WebSphere MQ queue managers run as z/OS subsystems

The resources managed by a queue manager are:

- **Page sets**
  - VSAM data sets
  - Hold MQ object definitions and message data
  - Storage classes map one or more queues on to a page set
- **Bufferpools**
  - Used to reduce DASD I/O
  - Configurable
  - 16 possible Buffer pools
  - Class of messages
- **Logs**
  - VSAM data sets
  - Transaction log for in flight and recovery
  - Regular checkpoints are taken to reduce queue manager start-up time
  - MQ writes to a log data set called the active log
  - Name and size of active log held in a bootstrap data set (BSDS)
  - MQ cycles through a number of log data sets as they become full
  - Full active logs can be archived


MQM message
<descriptor> <application data>
Physically, messages are stored temporarily in buffers before they are stored in page sets on DASD.
Buffers
Buffer pool
Each 4KB buffer belongs to a buffer pool.
A page set is a specially formatted VSAM data set.
Each page set is associated with a buffer pool.
Page set X
message 1...
message 2...
and so on...
Page set Y
message 3...
message 4...
and so on...

Shared queues and queue-sharing groups

Allows high availability of WebSphere MQ resources

Several queue managers share the same queues and messages

Queue managers that can access the same set of shared queues form a queue-sharing group (QSG)

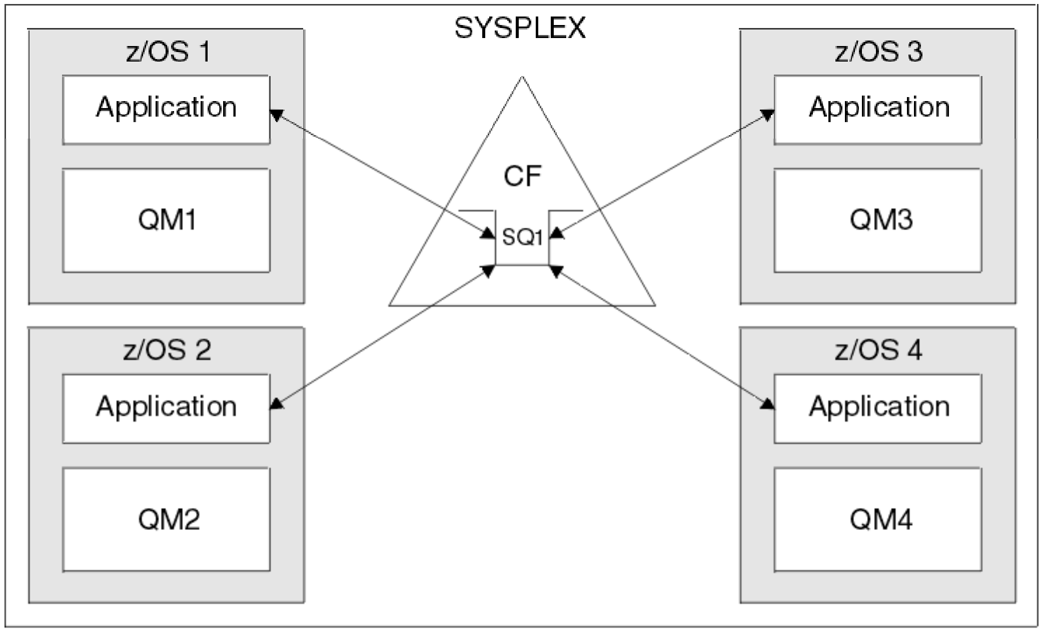
Applications can access shared queues from any queue manager in the QSG

Shared queue definitions kept in DB2

- Non-shared queue definitions kept on page set zero of the owning queue manager

Messages kept in the Coupling Facility

- - if >63KB then kept in DB2 instead



Advantages of using shared-queues

Allows WebSphere MQ applications to be:

- **Scalable**
- **Highly available**

Allows workload balancing to be implemented

- **Naturally performs pull workload balancing**
  - ➢ **based on processing capacity of each queue manager**

➢ **Workload manager (WLM) on z/OS can select the 'least busy' queue manager**

➢ **No outages for shared queue applications**

- ➢ **Can stagger outages of each queue manager in the QSG**

➢ **Flexible capacity management**

- ➢ **Can dynamically add or remove queue managers**

High Availability & Peer recovery

Enhances message availability in a queue-sharing group (QSG)

- **MQ detects if a queue manager abnormally disconnects from the Coupling Facility**
- **Another queue manager in the QSG completes pending units of work (where possible)**
- **Uncommitted gets (under sync-point) are backed out**
  - **Messages can be 're-got' by another queue manager**
- **Uncommitted puts (under sync-point) are committed**
  - **Message made available as soon as possible**
- **MQ cannot always complete pending units of work (for example 2-phase commit transactions)**
  - **If required, can administratively resolve the shared-queue portion**

Intra-group queuing

- **Communication between queue managers normally requires channel pairs**
- **Intra-group queuing (IGQ) uses a shared system queue**
- **Simpler administration - no need for channels**
- **Fast message transfer between queue managers in a QSG**
- **Enabled via a queue manager attribute**

Shared channels

- A networking product such as SYSPLEX Distributor provides a generic port
- Multiple queue managers in a QSG can listen on the same generic port
- Applications connect to the QSG not a specific queue manager
- Inbound requests routed to one of the available queue managers
- Shared channel defined once for the QSG
- Status of shared channels kept in DB2
  - Allows the queue managers to synchronise with each other

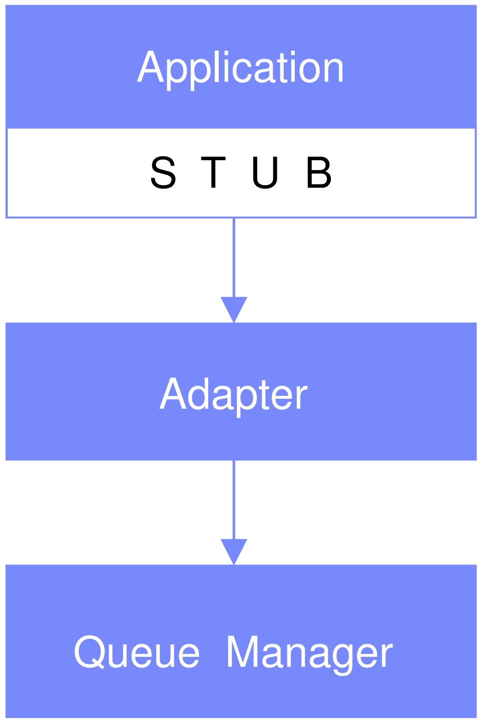
Adapters

- **z/OS applications connect to MQ via adapters**
- **Adapters act as a ‘middle man’ between the application and the queue manager subsystem**

Environment	Adapter	Commit Protocol	Commit / Back-out
JES/TSO/USS	BATCH	1-phase	MQCMIT / MQBACK
JES/TSO/USS	RRS BATCH	multi-phase	SRRCMIT / SRRBACK
CICS	CICS	multi-phase	EXEC CICS SYNCPOINT [ROLLBACK]
IMS	IMS	multi-phase	CHKP / ROLB

Adapters

- Compiled MQ application linked with a stub
- Different stub for each adapter
- At runtime the stub loads and calls the adapter
- Adapter communicates with the queue manager subsystem
- Adapter runs in application address space
- For queue-sharing groups the adapter identifies and connects to an available queue manager
- If you upgrade the queue manager you just have to change your STEPLIB to find the new version of the adapter



Bridges

- MQ provides bridges for CICS and IMS
- Allows direct access from MQ applications to applications running in CICS and IMS
- The CICS and IMS applications do not make MQ API calls
  - The bridge enables implicit MQI support
- For example a legacy CICS application driven by 3270 can be called via an MQ message
  - No need to rewrite, recompile or re-link
  - Bridge converts output in to reply messages
- The MQ application can make the request from anywhere in the MQ network
- The IMS bridge is an IMS Open Transaction Manager Access (OTMA) client
- An MQ header provides information to the bridge on what to run
  - CICS bridge uses a MQCIH
  - IMS bridge uses a MQIIH

Security

- **On distributed you use the setmqaut command**
- **On z/OS you use Security Server (RACF) classes**
- **You can restrict:**
  - **Who can connect to a queue manager**
  - **Who can access MQ objects, such as queues (and what they can do to them)**
  - **Who can administer a queue manager using commands ....and what they can administer**
  - **Who can use MQ channels (using SSL) – also encrypts data over network**
- **In queue-sharing groups you can:**
  - **Define security definitions for each queue manager**
  - **Define security definitions once for the QSG**
  - **Use a combination of both**
- **Can restrict access to MQ objects either case sensitively or case insensitively**

Administering MQ on z/OS

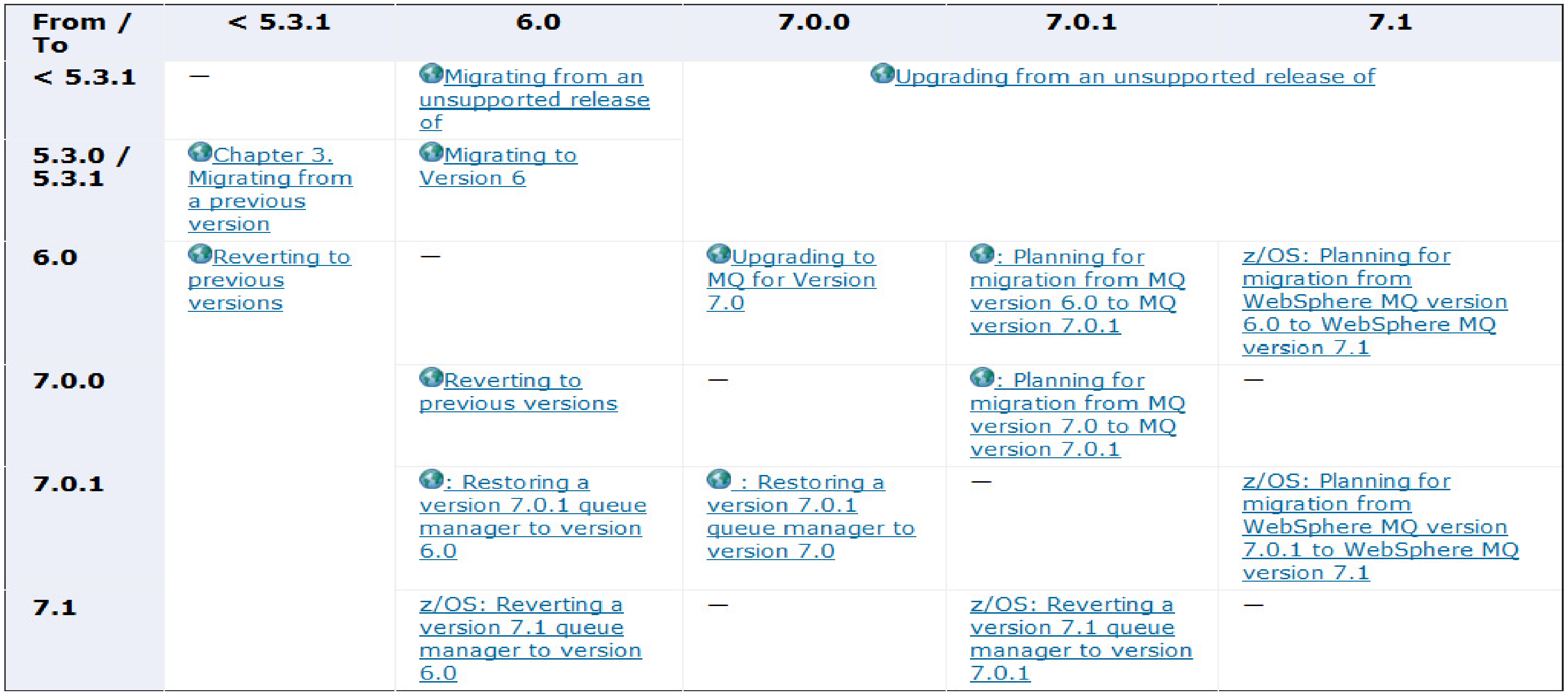
- Console
  - Start queue managers
  - Issue MQSC commands
- CSQUTIL
  - A utility program that can be run via a batch job
  - Administer page sets
  - Issue MQSC commands
  - Manage queues
  - Generate a list of definitions for all existing MQ objects
- ISPF operations and control panels
- MQ Explorer
  - Windows or Linux Intel – now available as a standalone SupportPac
  - If you are running a channel initiator

Monitoring performance and resource usage

- MQ can write messages to certain queues whenever noteworthy events occur
  - Configuration changes
  - Thresholds reached – i.e. queue depth
  - Channels started / stopped
- Display commands – i.e. channel status, queue status, active connections
- System Management Facility (SMF)
  - z/OS service aid
  - System utilisation and performance
  - Accounting information
  - Information dumped and reported periodically, for example hourly
  - Accounting information customisable at the queue or queue manager level
- Customers can pay for WebSphere MQ based on:
  - Capacity of their z/OS system
  - CPU usage

Migration and co-existence

- You can migrate a queue manager backwards and forwards
  - Unless you've enabled new function mode (as of v7.0.1)
  - Allows customers to upgrade but fall back if they encounter problems
- Different queue managers on z/OS can run at different versions at the same time
  - Can migrate queue managers in a QSG one at a time



From / To	< 5.3.1	6.0	7.0.0	7.0.1	7.1
< 5.3.1	—	Migrating from an unsupported release of	Upgrading from an unsupported release of		
5.3.0 / 5.3.1	Chapter 3. Migrating from a previous version	Migrating to Version 6			
6.0	Reverting to previous versions	—	Upgrading to MQ for Version 7.0	: Planning for migration from MQ version 6.0 to MQ version 7.0.1	z/OS: Planning for migration from WebSphere MQ version 6.0 to WebSphere MQ version 7.1
7.0.0		Reverting to previous versions	—	: Planning for migration from MQ version 7.0 to MQ version 7.0.1	—
7.0.1		: Restoring a version 7.0.1 queue manager to version 6.0	: Restoring a version 7.0.1 queue manager to version 7.0	—	z/OS: Planning for migration from WebSphere MQ version 7.0.1 to WebSphere MQ version 7.1
7.1		z/OS: Reverting a version 7.1 queue manager to version 6.0	—	z/OS: Reverting a version 7.1 queue manager to version 7.0.1	—

THANK YOU