



IBM Software Group

WebSphere MQ Distributed Queuing

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WebSphere® Support Technical Exchange



Introduction

- The purpose of this presentation is to review the basic WebSphere MQ Distributed Queuing information and some of the common Distributed Queuing problems on zOS.
- We expect there to be baseline knowledge of the WebSphere MQSeries objects used in Distributed Queuing

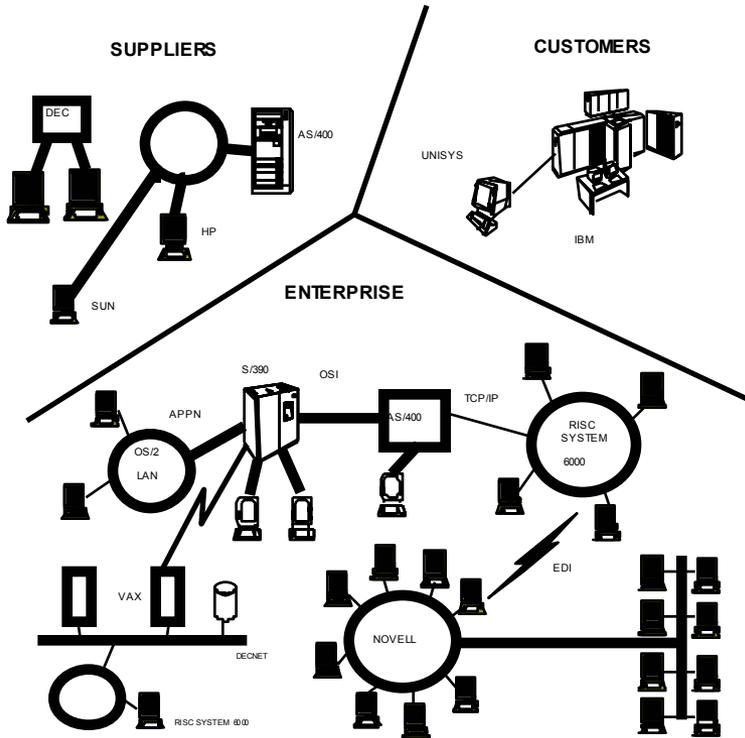
Agenda

- Messaging and Queuing Overview
- Distributed Queuing
- Common Problems
- Websites

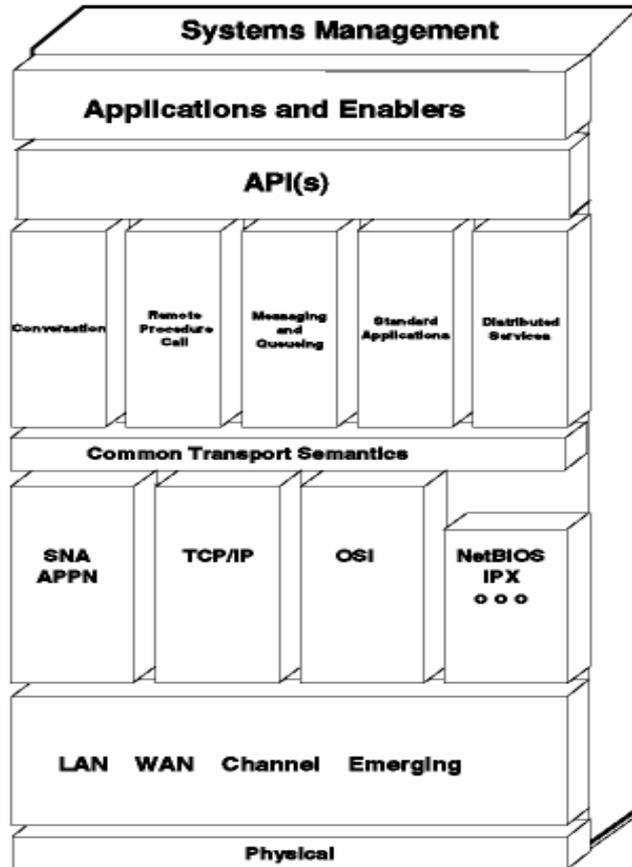
Participants should be familiar with one or more of these

- Intercommunications Guide for WebSphere MQSeries
- MQSeries Primer (Redbook)
- MQSeries Concepts and Architecture
- Message Queue Interface Technical Reference

The Challenge



IBM Network Blueprint



Applications

**Multivendor
Application Support**

**Multiprotocol
Networking**

Subnetworking



Advantages of WebSphere MQSeries Commercial Messaging

1. Time Independence

- Freedom from partner program or link availability (allows loose coupling)
- Overlapped (parallel) operations

2. Assured Delivery

- Assured message delivery and message recovery
- Transactional support

3. Cross-platform

- Application location transparency
- Integration of legacy applications

4. Shields Developers

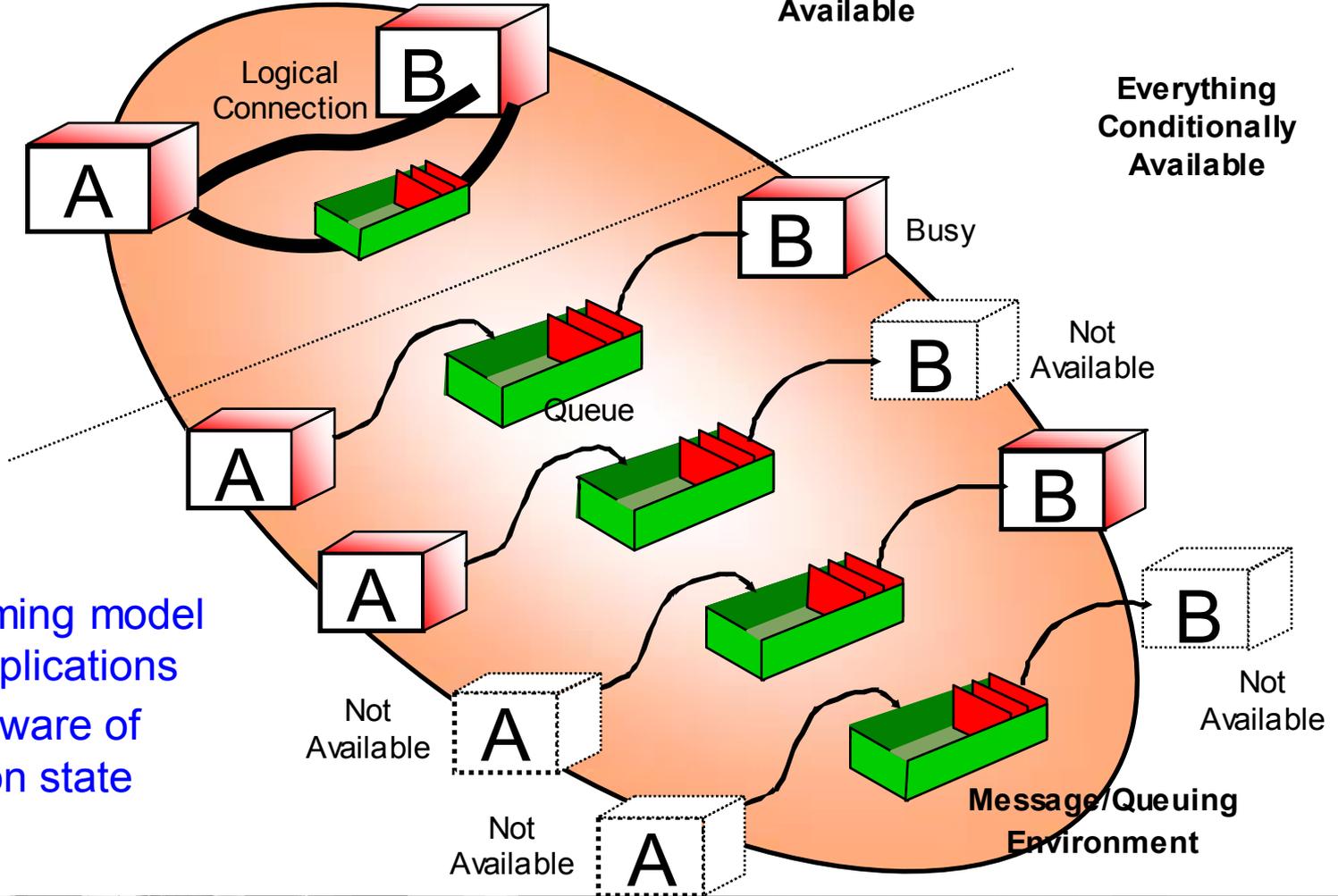
- Common message API
- Communication protocol independence
- Concentration on business applications

>> Loosely-Coupled, Reliable, Easy-to-Program Systems

Time Independence

Everything
Constantly
Available

Everything
Conditionally
Available



Programming model
allows applications
to be unaware of
connection state

Message



A Series of Message Attributes
Understood and augmented by the
Queue Manager

- Unique Message Id
- Correlation Id
- Routing information
- Reply routing information
- Message priority
- Message codepage/encoding
- Message format
-etc.

Any sequence of bytes

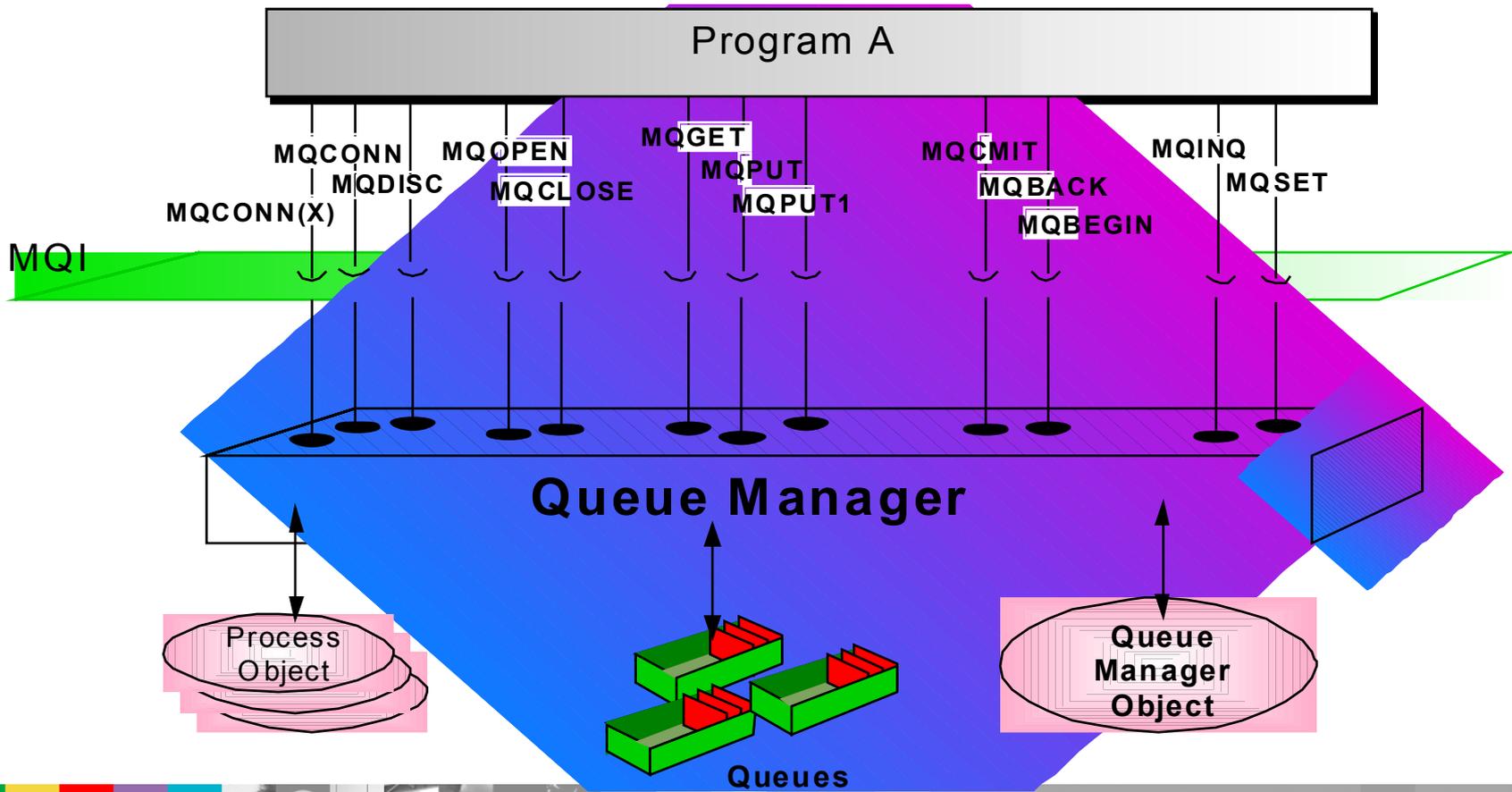
- Private to the sending and receiving programs
- Not meaningful to the Queue Manager

Message Types

- Persistent ... recoverable
- Non Persistent

Up to 100MB message length

WebSphere MQ API (Application Programming Interface)



The MQI

MQCONN (+ MQCONNX)

connect to a queue manager

MQOPEN

open an object (e.g. a queue)

MQPUT (+ MQPUT1)

put a message on a queue

MQGET

get a message from a queue

MQCLOSE

close an object

MQDISC

disconnect from a queue manager

MQINQ

Inquire about attributes of object

MQSET

set attributes of a queue

MQBEGIN

start a unit of work

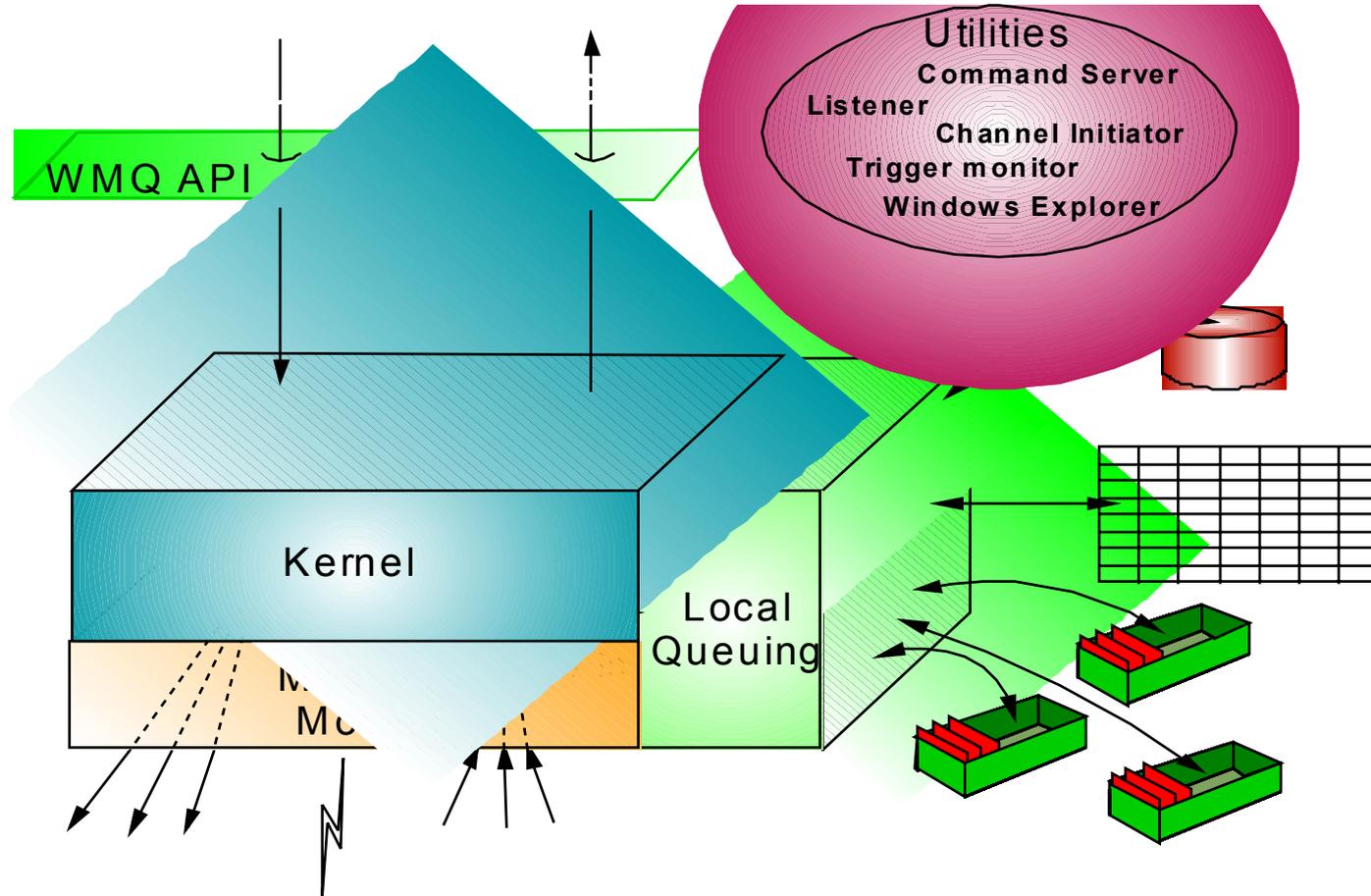
MQCMIT

commit changes

MQBACK

rollback changes

What's a Queue Manager?



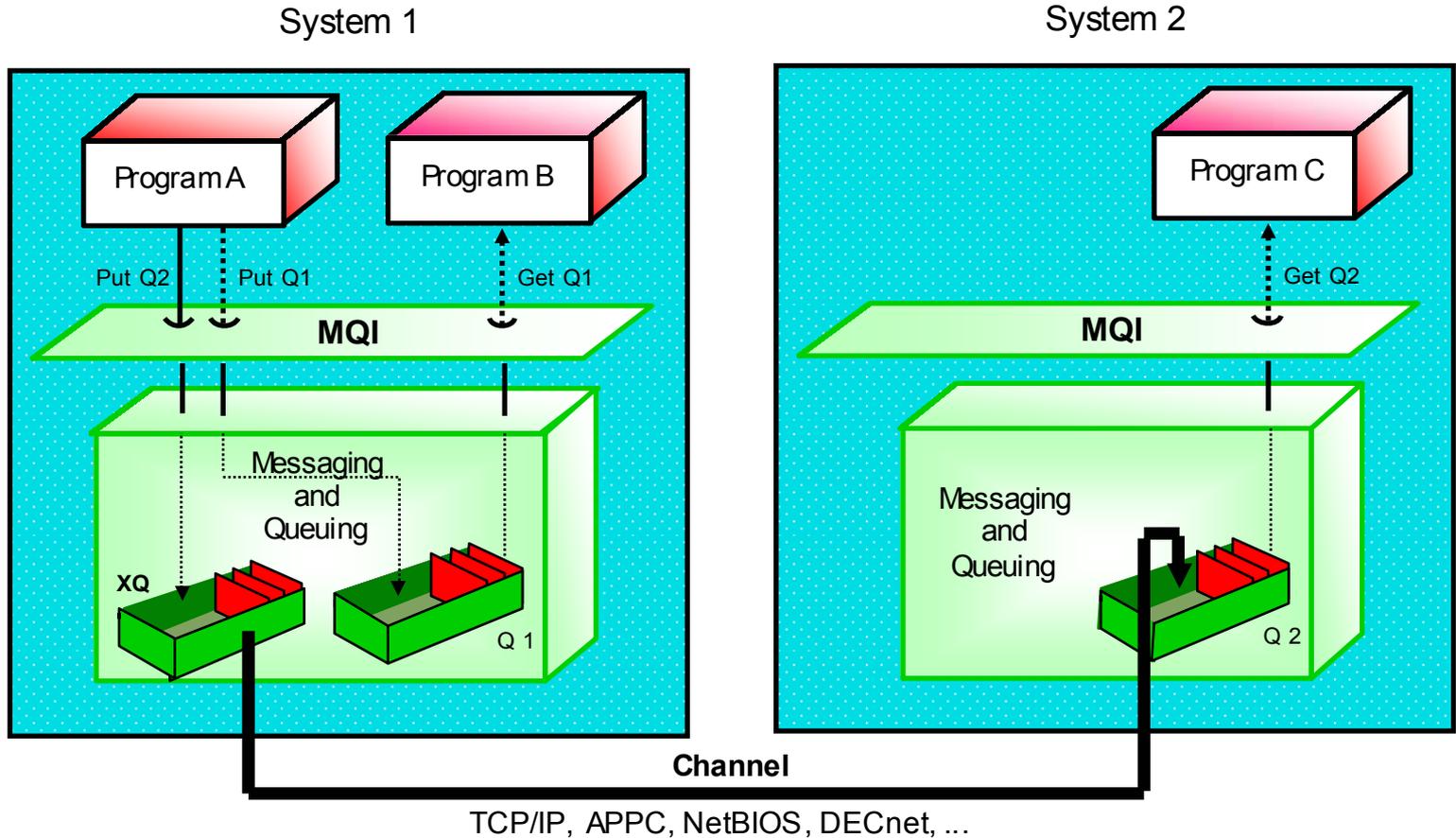
What is a Queue?

- **Place to hold messages**
- **Message Access**
 - ▶ FIFO
 - ▶ Priority
 - ▶ Destructive and nondestructive access
- **Queue creation**
 - ▶ Predefined
 - ▶ Dynamic definition
- **Parallel access by applications**
 - ▶ Managed by the queue manager

WebSphere MQ Queues

- Local Queues
 - Transmission queue (XMITQ)
 - Dead Letter queue (DLQ)
 - Alias queue
 - Initiation queue (IQ)
- Remote Queue (RQ)

Distributed Queuing is transparent



Distributed Queuing Component

- Message channels
- Message Channel agents
- Transmission queues
- Channel initiators and listeners
- Channel exit programs

What is a channel?

- A channel is a logical communication link between an WebSphere MQ client and an WebSphere MQ server, or between two WebSphere MQ servers.
- A channel has two definitions: one at each end of the connection.
- The same *channel name* must be used at each end of the connection, and the *channel type* used must be compatible.
- There are two categories of channel in WebSphere MQ, with different channel types within these categories:

What is a channel?

Message channels

Message channels are the channels that carry messages from one queue manager to another. The definition of each end of a message channel can be one of the following types:

Sender , Receiver , Server , Requester ,
Cluster sender , Cluster receiver

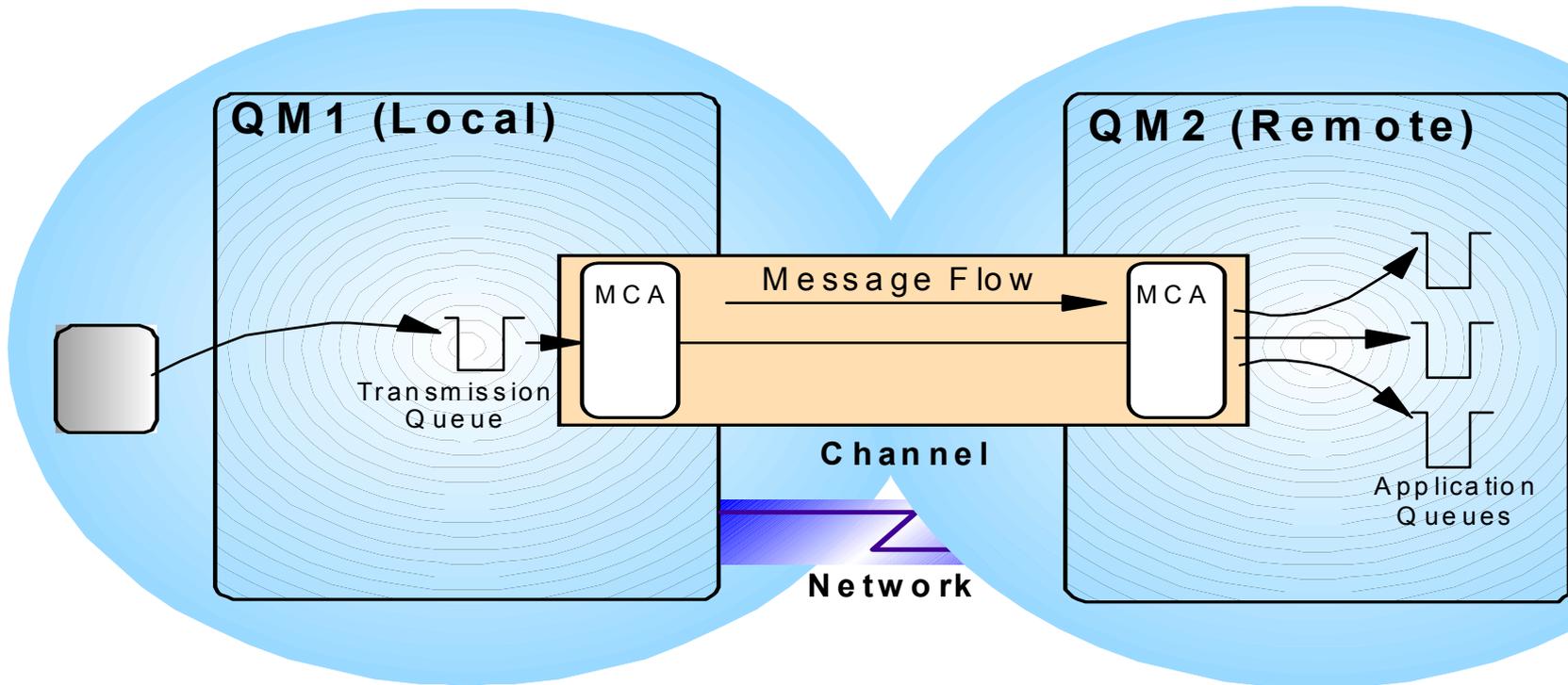
Possible combinations are:

Sender-receiver	Requester-server
Requester-sender (callback)	Server-receiver
Cluster sender-cluster receiver	

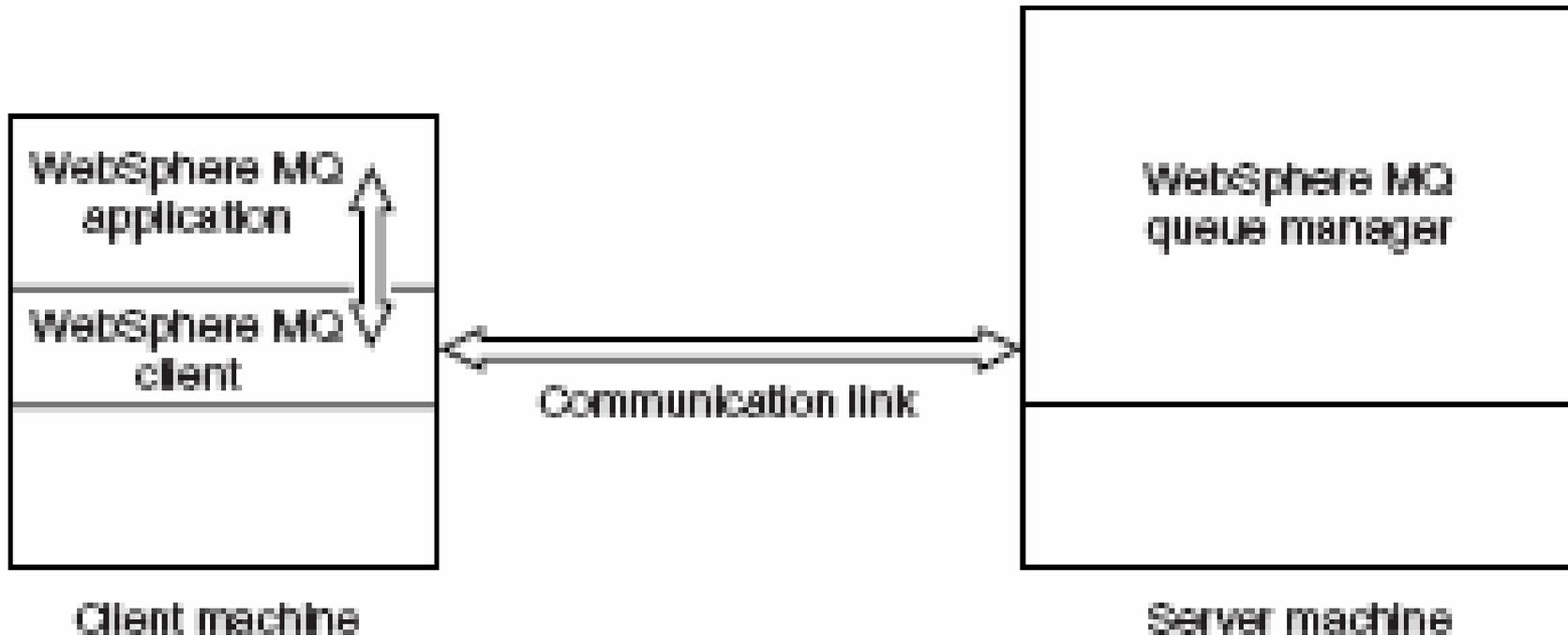
MQI channels.

There are two types of MQI channel, **server-connection** and **client-connection**. These are discussed in **WebSphere MQ Clients** manual.

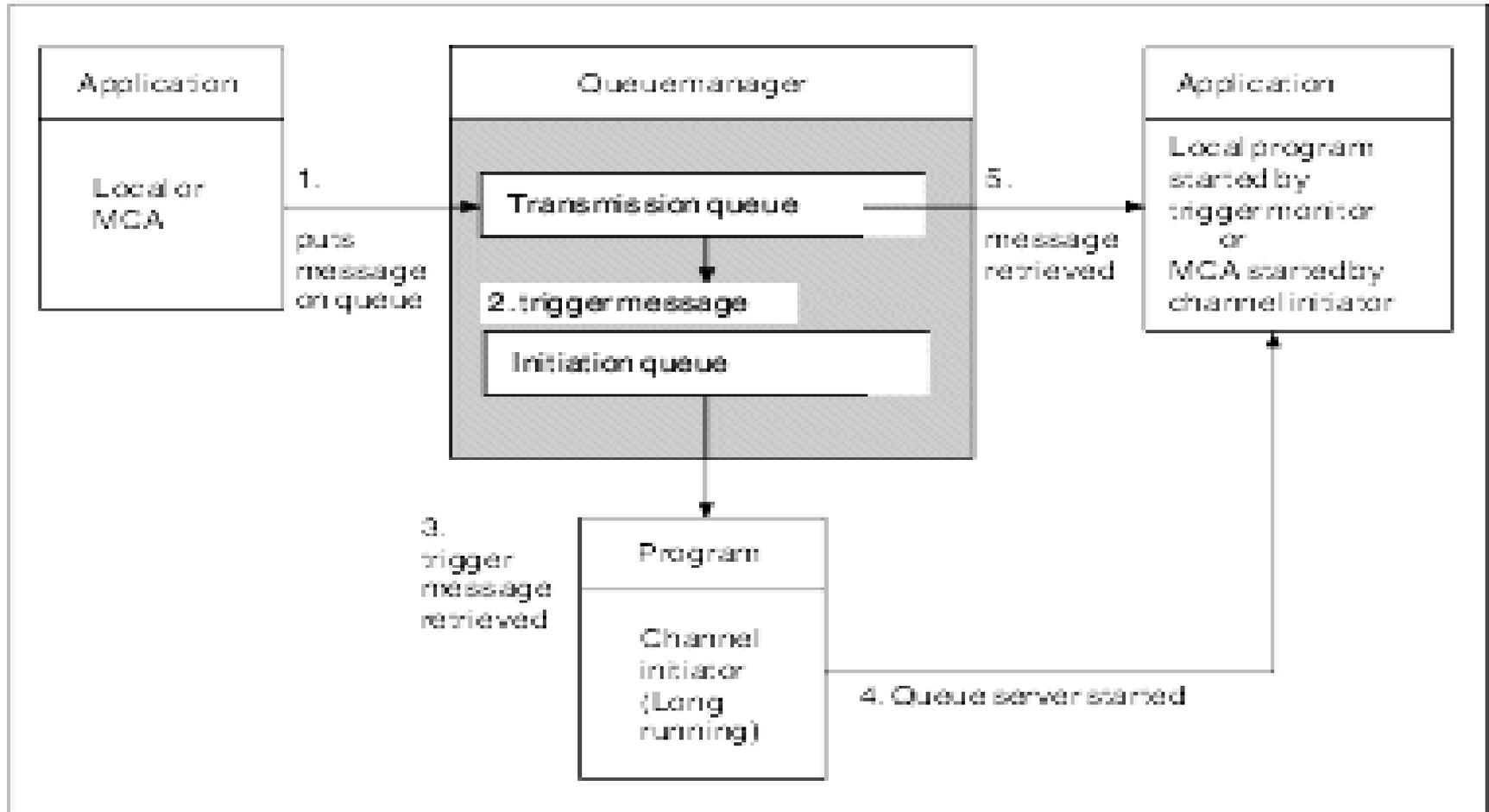
Channel Architecture



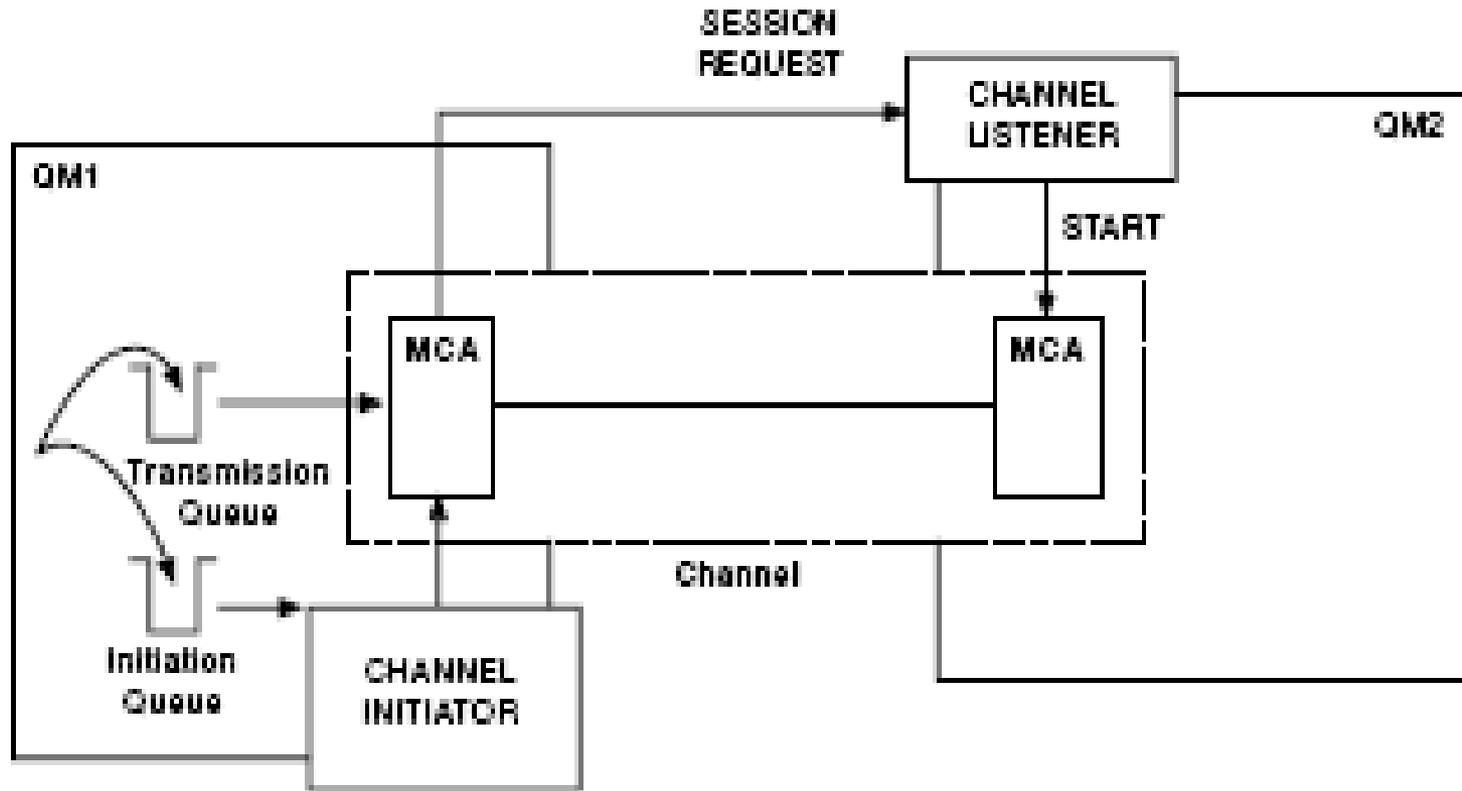
Defining Client (MQI) Channel



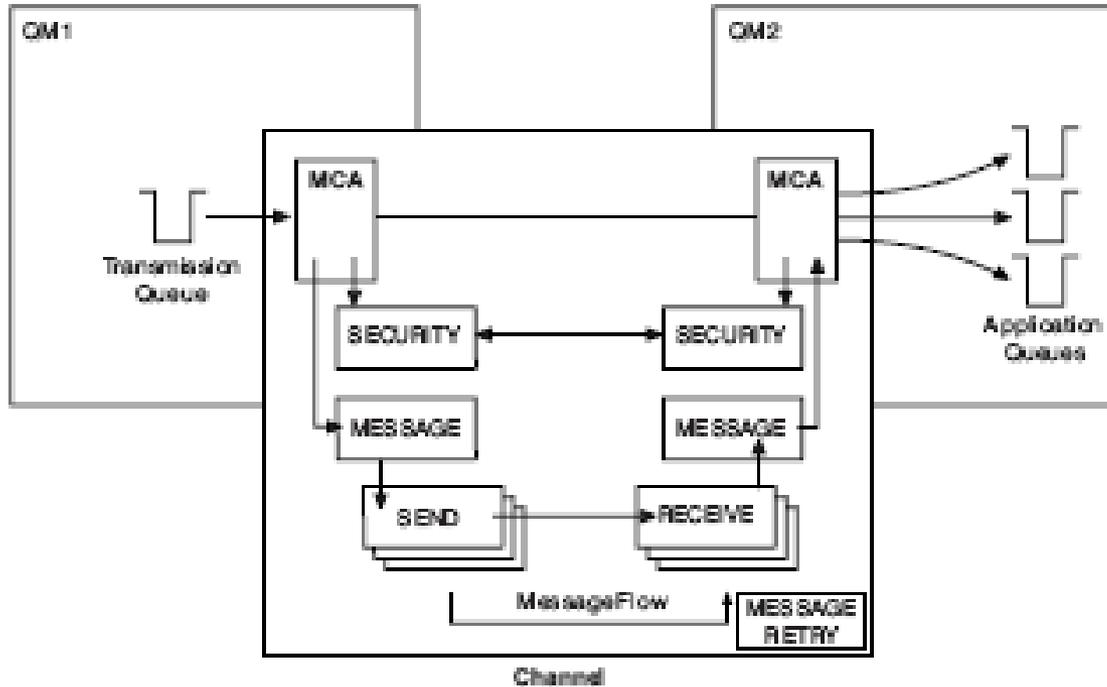
Trigger channel start



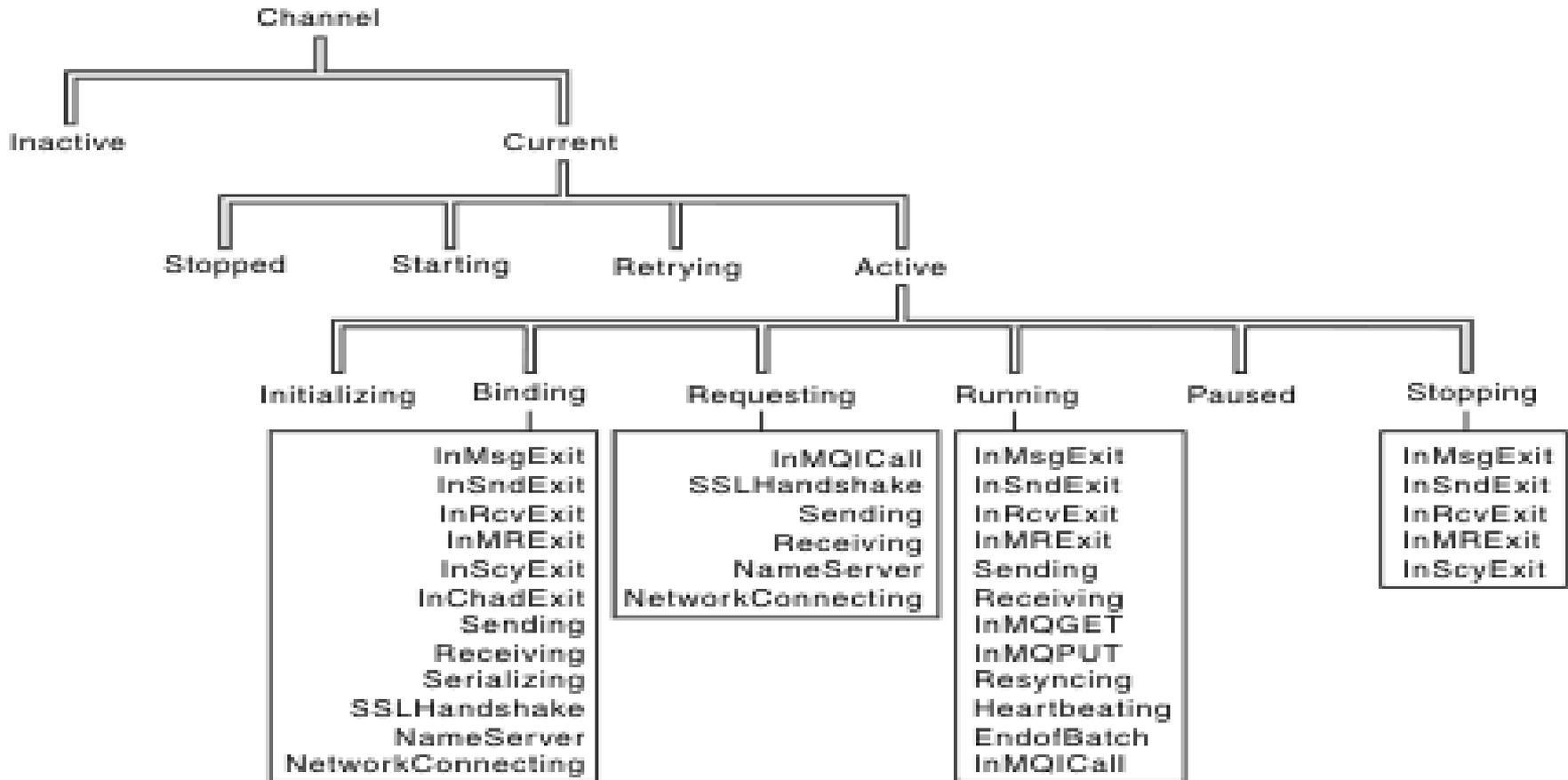
Channel Initiator and Listener



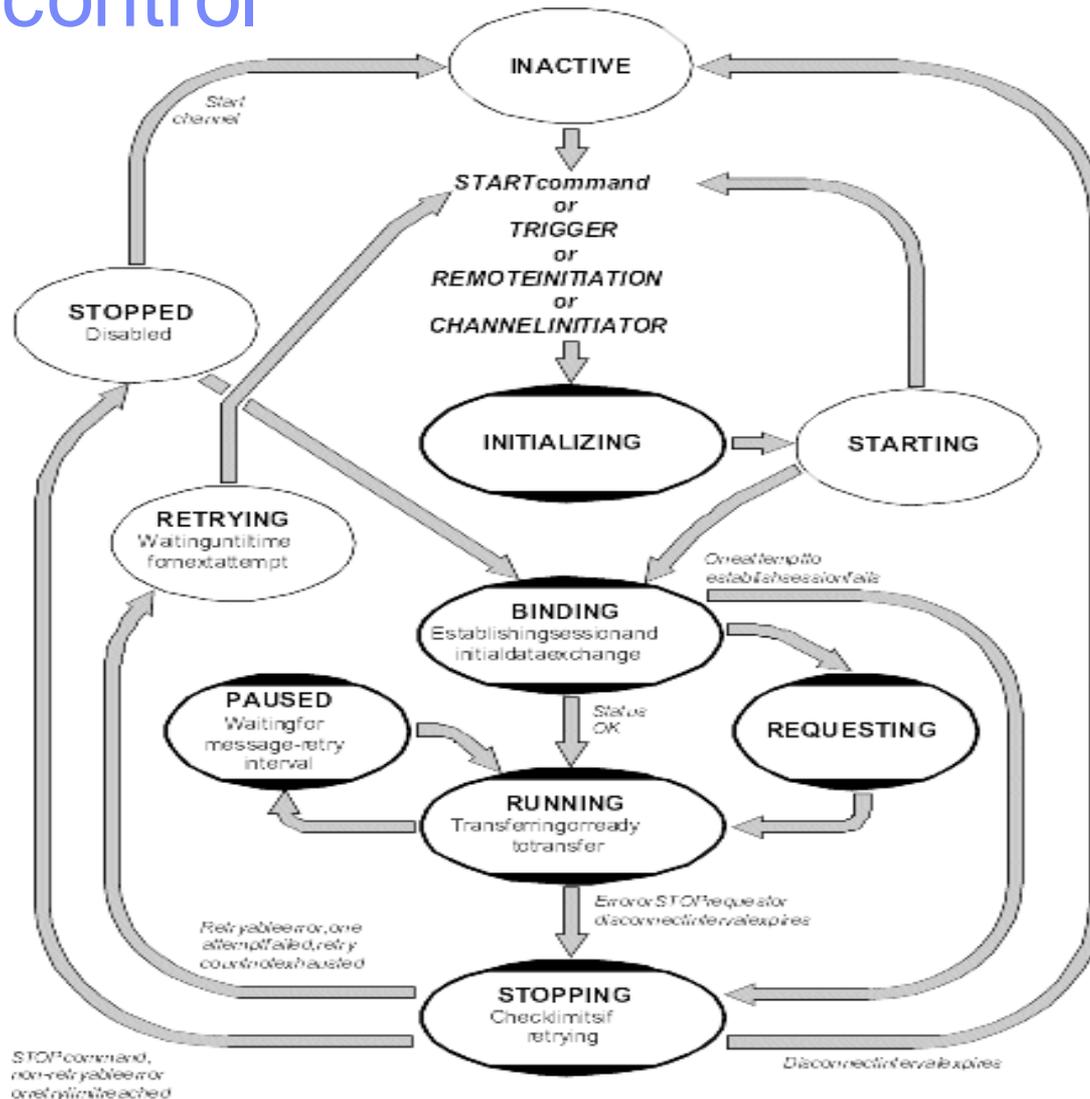
Channel Exits



Channel Status



Channel control



Queue Name Resolution

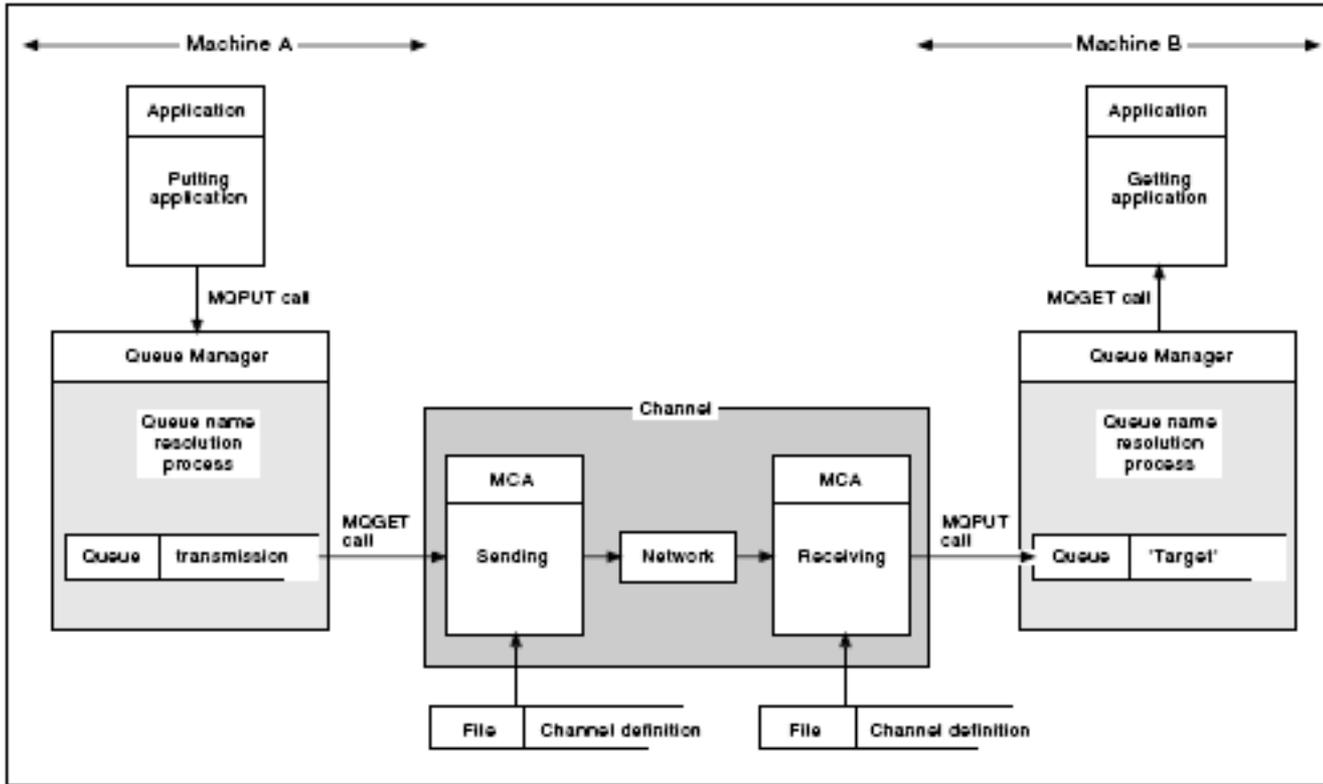
- This describes queue name resolution as performed by queue managers at both sending and receiving ends of a channel.
- In larger networks, the use of queue managers has a number of advantages over other forms of communication.
- These advantages derive from the name resolution function in DQM and the main benefits are:
 - Applications do not need to make routing decisions
 - Applications do not need to know the network structure
 - Network links are created by systems administrators
 - Network structure is controlled by network planners
 - Multiple channels can be used between nodes to partition traffic



What is queue name resolution?

- Queue name resolution is vital to DQM.
- It removes the need for applications to be concerned with the physical location of queues, and insulates them against the details of networks.
- A systems administrator can move queues from one queue manager to another, and change the routing between queue managers without applications needing to know anything about it.
- In order to uncouple from the application design the exact path over which the data travels, it is necessary to introduce a level of indirection between the name used by the application when it refers to the target queue, and the naming of the channel over which the flow occurs.
- This indirection is achieved using the queue name resolution mechanism.
- In essence, when an application refers to a queue name, the name is
- mapped by the resolution mechanism either to a transmission queue or
- to a local queue that is not a transmission queue.
- In the case of mapping to a transmission queue, a second name resolution is needed at the destination, and the received message is placed on the target queue as intended by the application designer.
- The application remains unaware of the transmission queue and channel used for moving the message.

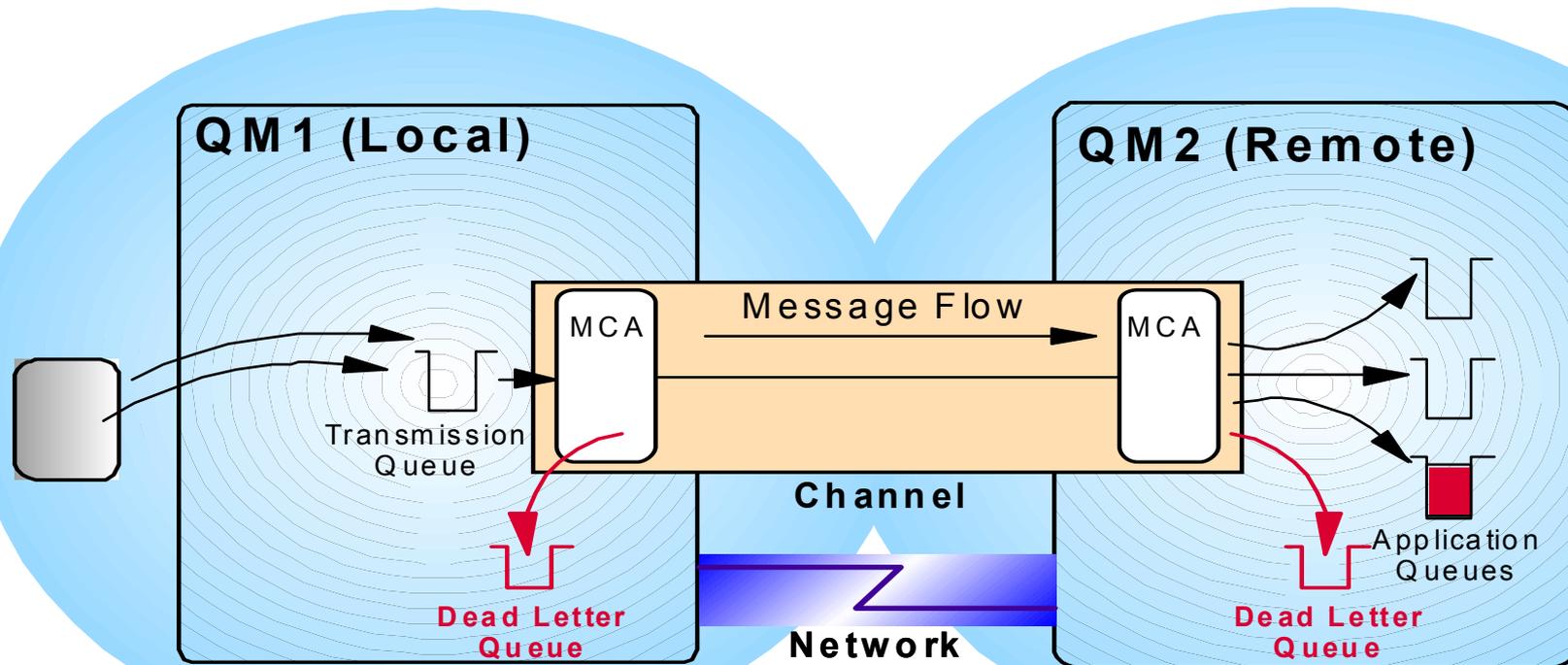
Queue Name Resolution



Queue Manager Alias

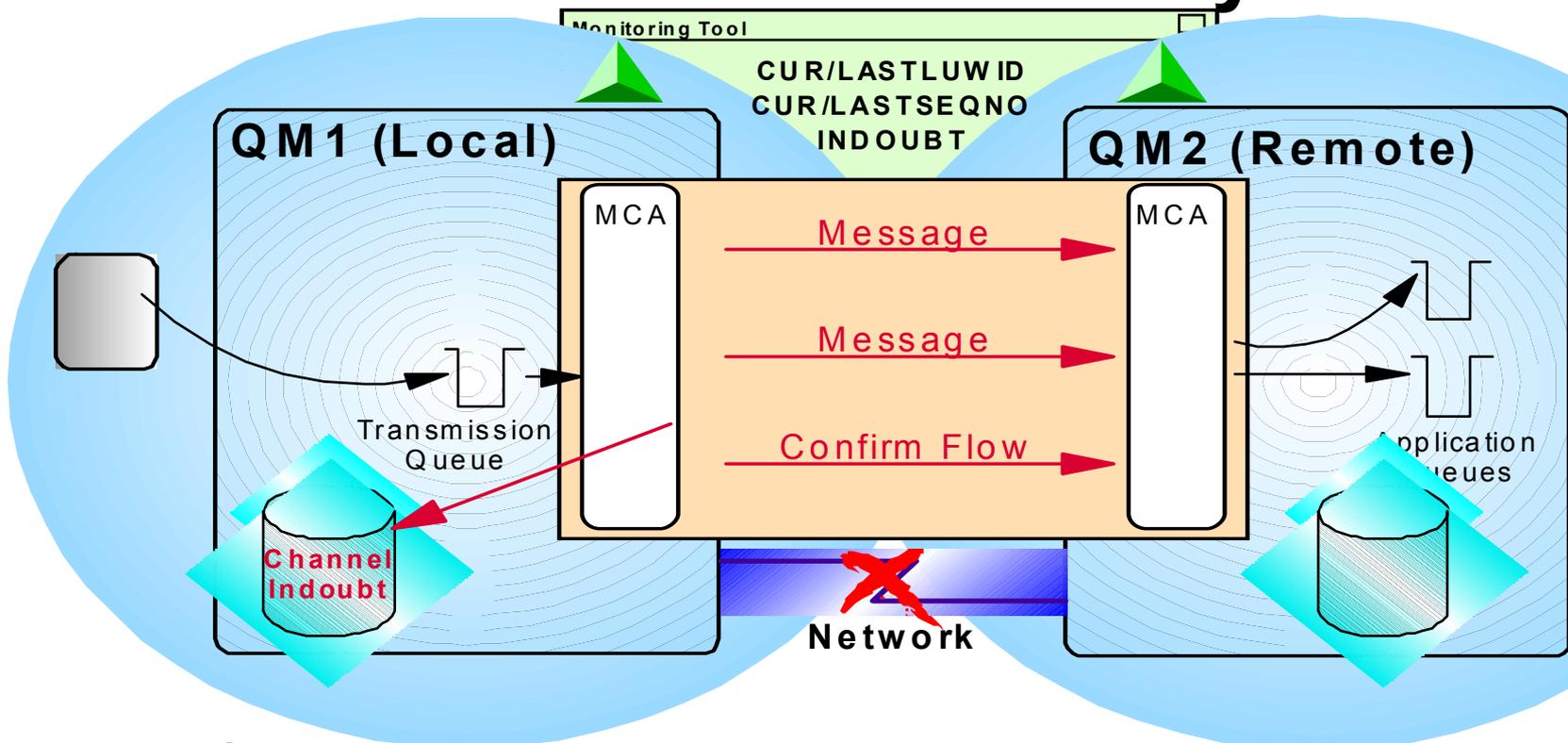
- The concept of queue-manager aliasing is described in detail in the *WebSphere MQ Intercommunication* book
- Queue-manager aliases, which are created using a remote-queue definition with a blank RNAME, have four uses:
- Remapping the queue-manager name when sending messages
- Altering or specifying the transmission queue when sending messages
- Determining the destination when receiving message
- Using a queue manager as a gateway into the cluster

Dead-Letter Queue



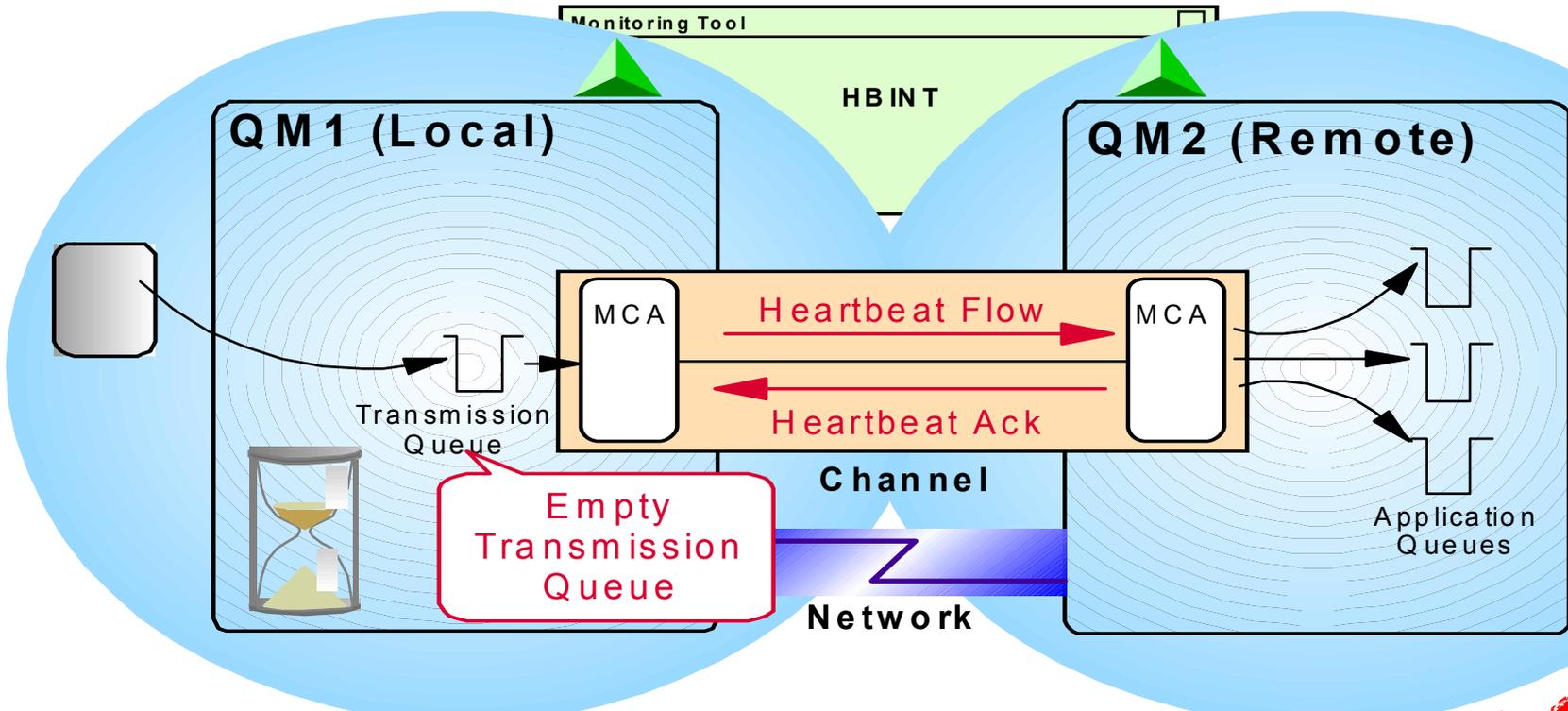
- Storage area for messages which are, for example :-
 - ▶ Wrongly addressed

Assured Delivery



- Synchronisation Data written to disc at both ends
 - ▶ Allows rescynchronisation after a

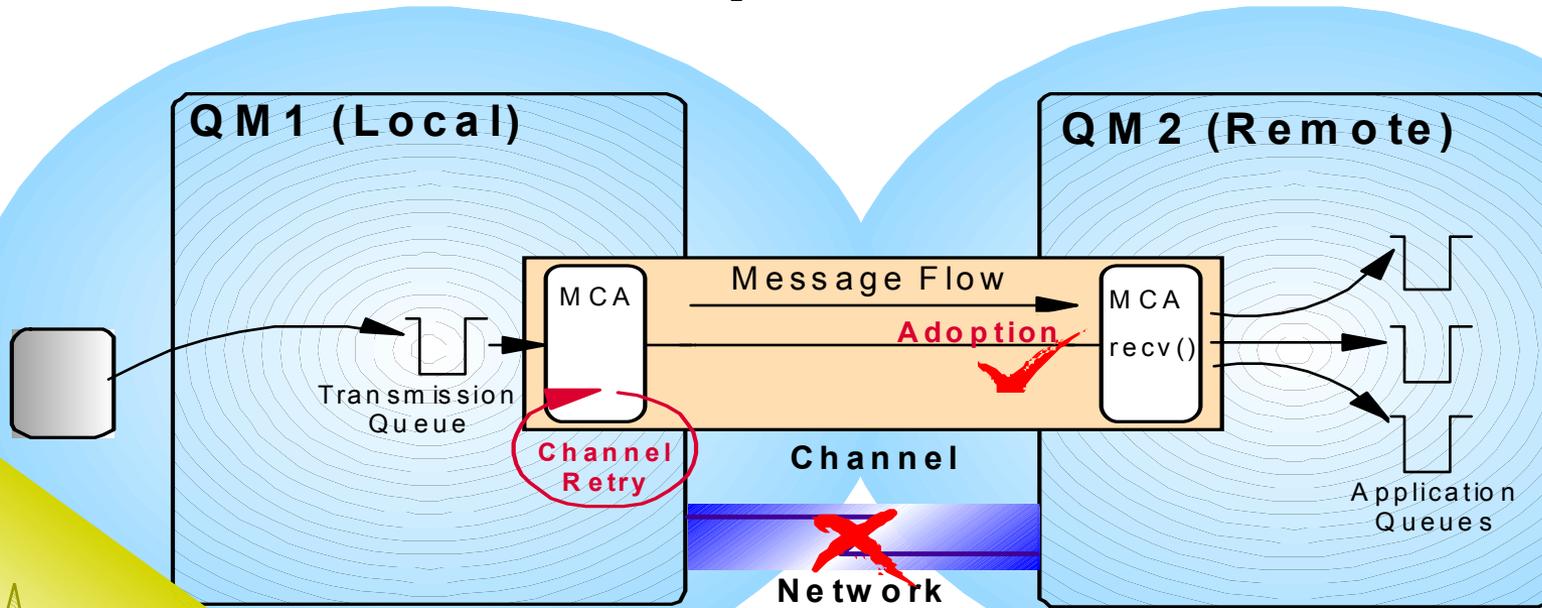
Heartbeats



- DEF CHL
HBINT(300)

Free Buffers ✓
Close Queues ✓

Adopt MCA

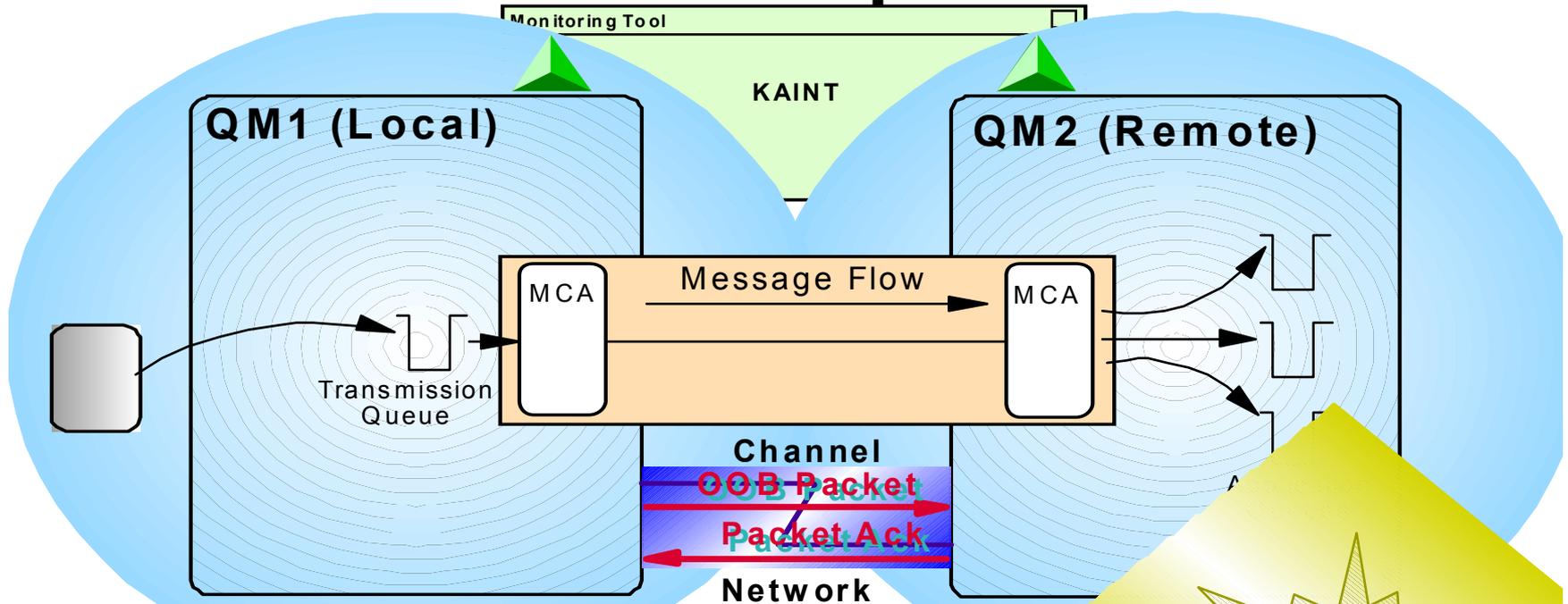


XPARMS
changed
in MQV6
for z/OS

MQM.INI | AdoptNewMCA, AdoptNewMCATimeout,
AdoptNewMCACheck

- ALTER QMGR ADOPTMCA(ALL)
ADOPTCHK(ALL)

TCP/IP Keepalive



- QM.INI **KEEPALIVE=YES**
 - ALTER QMGR TCPKEEP(YES)
 - DEF CHL ... KAIN T(360)
(z/OS only)

XPARMS
changed
in MQV6
for z/OS

Parameter Reference

Channel	Description
HBINT	Heartbeat Interval
BATCHSZ	Maximum number of Messages in a Batch
BATCHINT	Minimum lifetime of a Batch of Messages
DISCINT	Interval after which a channel will end
SHORTRTY, SHORTTMR LONGRTY, LONGTMR	Channel retry counts and timers
MRRTY, MRTMR MREXIT, MRDATA	Message retry counts and timers and exit

QM.INI - Channel Stanza	ALT QMGR	Description
AdoptNewMCA	ADOPTMCA	Adopt Channel types
AdoptNewMCATimeout		Adopt Quiesce time-out
AdoptNewMCACheck	ADOPTCHK	Adopt parameter check
KeepAlive	TCPKEEP	Use Keepalive

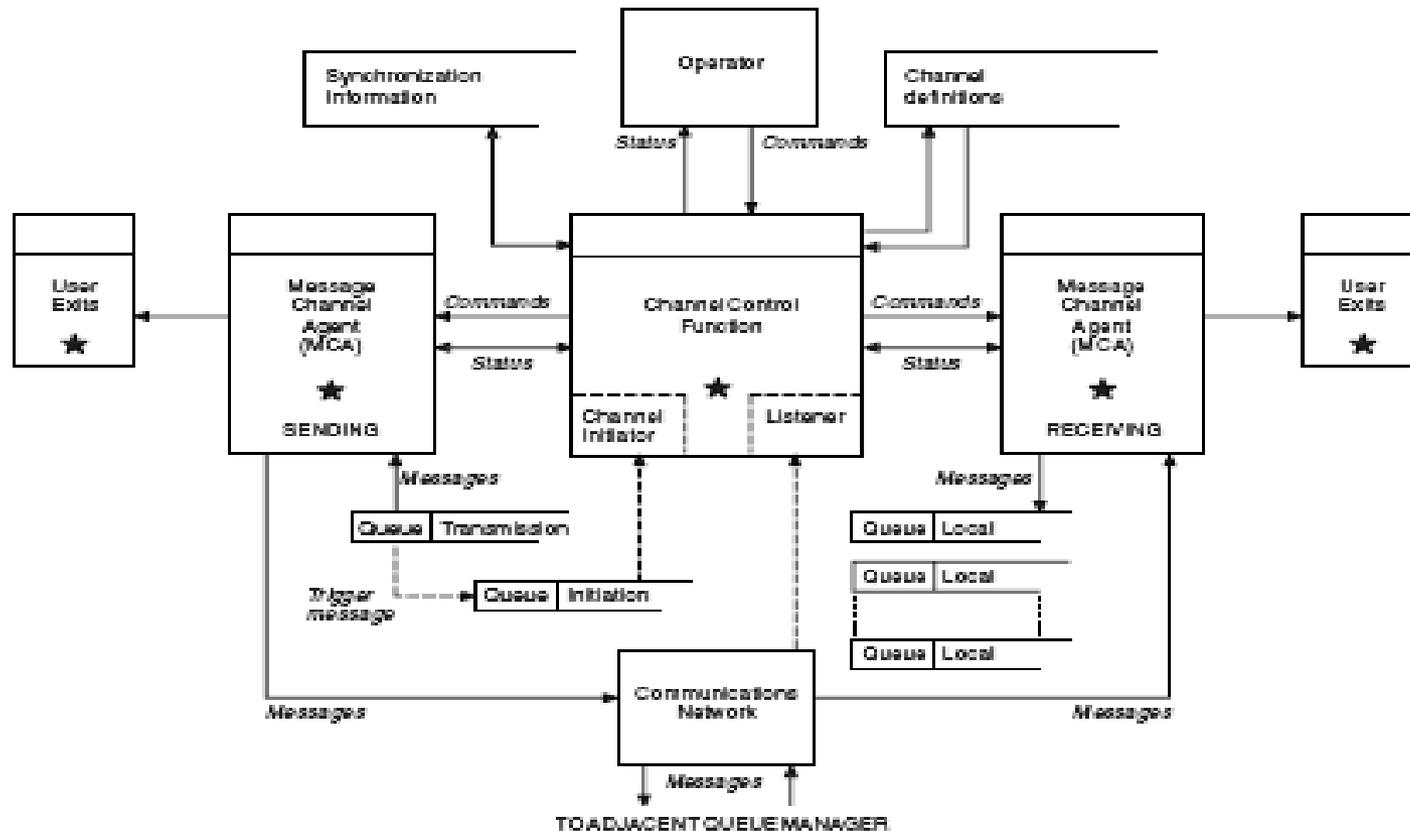
Environment Variables	ALT QMGR	Description
MQRCVBLKTO	RCVTIME	Receive Wait Timeout
	RCVTTYPE	Receive Wait Timeout Qualifier
MQRCVBLKMIN	RCVTMIN	Receive Wait Minimum Timeout

XPARMS
changed
in MQV6
for z/OS

Channel Status

- PING CHANNEL(channel-name) DATALEN(integer)
- DISPLAY QMGR ALL
- DISPLAY QUEUE(generic-queue)
- DISPLAY CHANNEL(generic-channel-name) ALL
- DISPLAY CHSTATUS(generic-channel-name) ALL

WebSphere MQ Distributed Environment



Common WebSphere MQ Distributed Queuing problems on z/OS



Standard WMQ Distributed Messages

- z/OS start with CSQXnnn
- Distributed start with AMQ9nnn
- Most correspond one to one:
 - CSQX208 = AMQ9208
 - CSQX213 = AMQ9213
 - CSQX526 = AMQ9526

CSQX208E Errors

- Multiple problems can result in the following error in the channel initiator joblog:
- CSQX208E Error receiving data,
TRPTYPE=TCP RC=xxxx
- Sender or Receiver channel issued TCP/IP read, waiting for data or response from remote partner but the read call fails with a TCP/IP error.
- RC represents the error number returned from TCP/IP

CSQX208E Errors

- RC 461 means the connection is reset by peer
- Econnreset usually means a problem has occurred in the TCP/IP network.
- Indicates some type of TCP/IP network problem
- +CSQX208E ! CSQXRESP Error receiving data, channel, connection 172.30.123.9 (queue manager ????) TRPTYPE=TCP RC=00000461

Reasons For TCP/IP Resets

- An application requests a connect to a port and ip address for which no server is Listening
- An application closes a socket with data still in the application receive buffer.
- Data arrives for a connection that has been closed.
- An application closes a socket and sets the linger socket option to zero. This will notify TCP/IP that the connection should not linger.
- An invalid tcp segment arrives for a connection, for example, a bad acknowledge or sequence number.
- The connect request times out. TCP gives up trying to connect to an particular port and ip address and resets the connection.
- A Firewall can reset connections if the packet does not adhere to the firewall rules and policies. For example a source or destination port or ip address does not match the firewall rule or policy.
- The retransmit timer expires. TCP gives up trying to retransmit a packet and resets the connection.
- A bad hardware device can cause resets

CSQX208E Errors

- +CSQX208E ! CSQXRESP Error receiving data, channel, connection 172.30.124.9 (queue manager ????) TRPTYPE=TCP RC=00000480
- RC 480 means that an ASYNC I/O call has been cancelled.
- Either the channel is being forced down or the channel is a receiver channel and has been adopted.
- Adopted means that the sender channel has lost connectivity to the receiver channel and needs to reestablish another connection. The channel initiator will force the old channel down and allow another connection to start.

CSQX208E Errors

The following sequence of message will appear in the Channel Initiator Joblog if the channel has been adopted.

```
CSQX208E Error receiving data,  
channel ,  
connection (172.30.124.9)  
(queue manager ????)  
TRPTYPE=TCP RC=00000480  
+CSQX599E QT CSQXRESP Channel ended abnormally  
+CSQX475I QT CSQXRESP Channel adopted  
+CSQX500I QT CSQXRESP Channel started
```

The following is also an indication that of an RC=00000480
CSQX208E Error receiving data,
channel ,CONNECTION 170.104.210.197
(QUEUE MANAGER ????)
TRPTYPE=TCP RC=00010101

The 010101 RC means that we issued aio#cancel, BUT found that the ECB had not been posted - so we post it ourselves with 010101 so that we can continue with channel termination

CSQX213E Errors

- Getpeername socket call returns with -1 the CSQX213E message is issued.
- Retcode indicates the actual TCPIP error
- rc=464 (socket not connected)
- WLM router will connect to listener to see if still available.
- By the time we issue getpeername, connection has been closed causing rc=464.
- MQ will accept connections from other sources but will not communicate with them.
- Invalid data returned

CSQX053E Errors

CSQX053E CSQXFFST Error information recorded in CSQSNAP data set

CSQX207E CSQXRESP Invalid data received,

CSQSNAP shows:

```
*      X...XFFSccxGetConvType..*
*      .....MOVR.....k...c *
*X...XINS.....in012345 (www.xx*
*x.yyy.zzz).....TCP/IP*      .... bad initial data flow..... *
```

- This indicates that some source on IP address www.xxx.yyy.zzz sent bad data to the listener.
- In the case of bad initial data, it is often seen if someone tried to telnet in to the MQ listener by mistake, or otherwise connect in to it.
- WLM routers that will poll the listener by connecting to the listener to see if it's available. It may also point to router corrupting packets

CSQX202E Errors

- Sender channel issue connect to Receiver channel's Listener
- If connect returns with rc=467, connect timed out. (usually about 3 minutes)
- CSQX202E CSQXRCTL Connection or remote listener unavailable, rc=00000468
- Another indication of network problem

CSQX209E Errors

- Sender or Receiver Channel issue Tcpi read call issued waiting for data from remote partner.
- If read returns with rc =0 the CSQX209E message issued.
- Remote partner closed it's side of connection
- Examine remote partner's log for reason for closing connection
- Heartbeat interval
- Invalid Data Returned
- Port Scanner – check listener's port.
listener accept connection and issue read
port scanner close connection, read rc=0

Sample Problem

**10.15.07 STC00342 +CSQX206E RTPA CSQXRCTL Error sending data,
channel RTPA.TO.RTPB,
connection 9.21.103.6**

(queue manager ????)

TRPTYPE=TCP RC=0000008C

**10.15.07 STC00342 +CSQX599E RTPA CSQXRCTL Channel RTPA.TO.RTPB
ended abnormally**

**10.18.26 STC00342 +CSQX500I RTPA CSQXRCTL Channel RTPA.TO.RTPB
started**

.....

**10.21.31 STC00342 +CSQX208E RTPA CSQXRESP Error receiving data,
channel RTPB.TO.RTPA,
connection 9.21.103.6**

(queue manager ????)

TRPTYPE=TCP RC=00000480

**10.21.31 STC00342 +CSQX599E RTPA CSQXRESP Channel RTPB.TO.RTPA
ended abnormally**

**10.21.31 STC00342 +CSQX475I RTPA CSQXRESP Channel RTPB.TO.RTPA
adopted**

**10.21.31 STC00342 +CSQX500I RTPA CSQXRESP Channel RTPB.TO.RTPA
started**

Sample Packet Trace

..CTRACE COMP(SYSTCPDA) LOCAL FULL OPTIONS((SESSION))

1844 packets summarized

Local Ip Address:		9.106.2.210
Remote Ip Address:		9.21.103.6
Host:	Local,	Remote
Port:	2739,	1414

Connection:

First timestamp:	2005/08/18 04:42:12.022042
Last timestamp:	2005/08/18 10:15:06.395679
Duration:	05:32:54.373637
Final state:	CLOSED (PASSIVE RESET)

Sample Packet Trace

TcpHdr	IO	Seq	Ack	Data	State	Ip_id
S	O	697237160	0	0	SYN_SENT	B4E8
A S	I	765617605	697237161	0	SYN_SENT	57BD
A	O	697237161	765617606	0	ESTABLISHED	B4E9
AP	O	697237161	765617606	132	ESTABLISHED	B4EA
A	I	765617606	697237293	0	ESTABLISHED	57BE
AP	I	765617606	697237293	132	ESTABLISHED	57BF
AP	O	697237293	765617738	1019	ESTABLISHED	B4EB
A	I	765617738	697238312	0	ESTABLISHED	57C0
AP	O	697238312	765617738	28	ESTABLISHED	B4EF
A	I	765617738	697238340	0	ESTABLISHED	57C1
AP	I	765617738	697238340	28	ESTABLISHED	57C2
.....						
A	O	697622747	765628126	1368	ESTABLISHED	97E2
AP	O	697624115	765628126	240	ESTABLISHED	97E3
A	I	765628126	697624355	0	ESTABLISHED	E778
AP	O	697624355	765628126	28	ESTABLISHED	97FC
AP	I	765628126	697624383	28	ESTABLISHED	E779
AP	O	697624383	765628154	0	ESTABLISHED	9838
AP	O	697624383	765628154	1020	ESTABLISHED	<u>EE0D</u>
A R	I	765628154	697624383	1020	CLOSED	<u>EE0D</u>

Sample Packet Trace

```

45643 BCMS   PACKET 00000001 10:15:06.392167 Packet Trace
To Interface : ETH1           Device: LCS Ethernet/802.3 Full=1072
Tod Clock   : 2005/08/18 10:15:06.392166 Intfx: 2
IpHeader: Version : 4           Header Length: 20
Tos         : 00              QOS: Routine Normal Service
Packet Length : 1072         ID Number: EE0D
Fragment    :                Offset: 0
TTL         : 64           Protocol: TCP           CheckSum: 45AF FF
Source      : 9.106.2.210
Destination : 9.21.103.6
TCP
Source Port : 2739 ()         Destination Port: 1414 ()
Sequence Number : 697624383   Ack Number: 765628154
Header Length   : 32          Flags: Ack Psh
Window Size     : 32740       CheckSum: F75B FFFF Urgent Data Pointer: 0
  IP Header      : 20
  000000 45000430 EE0D0000 400645AF 096A02D2 09156706
  Protocol Header : 32
  000000 0AB30586 2994E73F 2DA28EFA 80187FE4 F75B0000 0101080A
  EB7B58EF 8BFA82EA
  Data          : 1020 Data Length: 1020

```

Sample Packet Trace

```

45644 BCMS   PACKET 00000001 10:15:06.395679 Packet Trace
From Interface : ETH1           Device: LCS Ethernet/802.3 Full=1072
Tod Clock      : 2005/08/18 10:15:06.395678      Intfx: 1
Sequence #     : 0              Flags: Pkt
Source         : 9.21.103.6
Destination    : 9.106.2.210
Source Port    : 1414           Dest Port: 2739  Asid: 00A3 TCB: 00000000
IpHeader: Version : 4           Header Length: 20
Tos            : 00             QOS: Routine Normal Service
Packet Length  : 1072          ID Number: EE0D
Fragment      :                Offset: 0
TTL           : 63             Protocol: TCP      CheckSum: 46AF FF
Source        : 9.21.103.6
Destination   : 9.106.2.210
TCP
Source Port   : 1414 ()        Destination Port: 2739 ()
Sequence Number : 765628154    Ack Number: 697624383
Header Length  : 32           Flags: Ack Rst
Window Size   : 32740         CheckSum: F75F FFFF Urgent Data Pointer: 0
  ■ IP Header      : 20
  ■ 000000 45000430 EE0D0000 3F0646AF 09156706 096A02D2
  ■ Protocol Header : 32
  ■ 000000 05860AB3 2DA28EFA 2994E73F 80147FE4 F75F0000 0101080A
  ■ EB7B58EF 8BFA82EA
  ■ Data           : 1020 Data Length: 1020

```

Sample Problem Solution

- Packet trace shows RESETs from source port 1414 to ephemeral port 2739
- The RESET has a TTL of 63 and is in response to the previous packet
- The TTL (Time To Live) on the previous packet is 64 one less than the TTL of the RESET packet
- Indication that the RESET back to the host may be 1-hop away.
- Firewall policies changing in the middle of the day causing broken pipes and resets

Messages Not Drained from the Transmit queue

- CSQX506E Message receipt confirmation not received for channel
- A Batch of messages and a confirm request sent by the Sender Channel but no confirm reply has been received.

Channel Initiator hangs on shutdown

- Channel initiator will issue a `gethostbyaddr` call to ensure the correct ip address is included in the terminating message.
- The `gethostbyaddr` call can be delayed causing the shutdown of the Channel Initiator address space.
- The delay can be attributed to:
 - Providing an incorrect nameserver ip address
 - No `NSINTERADDR` parameter is provided and an incorrect local file is used.
- The resolved ip address is not coded in name server



Documentation Required for network problems

- Display channel status
- MQ internal Trace
- Dump of MSTR and CHIN
- Packet trace/Sniffer
- CHIN/MSTR joblog
- FDCs and error logs from remote partner

Sending Documentation to MQ Level 2 support

- **To send your documentation using FTP:**
- **1 Compress ALL datasets using TRSMAIN which can be downloaded from: <ftp://ftp.software.ibm.com/s390/mvs/tools/packlib/>**
- **2 Connect to FTP site: <ftp.emea.ibm.com> (or 192.109.81.7)**
- **USER: anonymous PASSWORD: your e-mail address**
- **3 Specify BINary transfer mode for the compressed dataset.**
- **4 Place the compressed dataset in the /toibm/mvs directory with put cmd**
- **Ensure the dataset name conforms to the following naming convention:**
- **PPPPP.BBB.CCC.DDD.DDD.TRS where: PPPPP =PMR #; BBB =Branch #;**
- **CCC =Numeric Country Code (USA=000) ; DDD.DDD =Short Descriptive Name;**
- **TRS =Indicator that dataset is tersed using TRSMAIN**
- **5 When transfer is complete, update the PMR with MVS Dataset Attributes**
- **PRIOR to tersing, include RECFM, BLKSIZE, Primary and Sec. space**
- *** For additional details on transferring documentation via FTP, see ***
- *** <http://www.ibm.com/de/support/ecurep/mvs.html> ***

Noteworthy APARs

- PK07095: Fix required for WMQ V5 QMGRS using SSL to coexist with WMQ V6 QMGR
- PQ81627: Fixed required for coexistence of V6 and V5.3 QMGRs in QSG
- PK12705: Fix required for backward migration from WMQ for z/OS V6
- II13776KEY APARS FOR WEBSPHERE MQ FOR Z/OS (5655F1000) AND WEBSPHERE APPLICATION SERVER FOR Z/OS (5655I3500 AND 5655A9801)

WebSphere MQ WebSites

WebSphere MQ Family Home Page

<http://www-306.ibm.com/software/integration/wmq/support/>

MQSeries Primer

<http://www.redbooks.ibm.com/redpapers/pdfs/redp0021.pdf>

Support Pacs

<http://www-3.ibm.com/software/integration/support/supportpacs/>

Books and Manuals

<http://www-306.ibm.com/software/integration/wmq/library>

Redbooks

<http://www.redbooks.ibm.com>

Welcome to the WebSphere MQ information center

The screenshot shows a Microsoft Internet Explorer browser window displaying the IBM WebSphere MQ information center. The address bar shows the URL: <http://publib.boulder.ibm.com/infocenter/wmqv6/v6r0/index.jsp>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The address bar also shows a search icon, a star for Favorites, and a Go button. The page header features the IBM logo, a search bar, and navigation links for Information Management, Lotus, Rational, Tivoli, WebSphere, and Workplace. The main content area is titled "Welcome to the IBM® WebSphere® MQ information center" and includes a search bar, a search scope dropdown set to "All topics", and a list of links under "Contents". The main content area is divided into sections: "Getting started", "Service and support", and "Third-party information".

Contents

- WebSphere MQ information center home
- Viewing information in the help system
- Viewing information in the information center
- WebSphere MQ
- ibm.com: About IBM - Privacy - Contact

Welcome to the IBM® WebSphere® MQ information center

The IBM WebSphere MQ information center contains the documentation for WebSphere MQ Version 6.0.

Getting started

What's new

- [What's new in WebSphere MQ.](#)
- [What's new and what's changed in WebSphere MQ Explorer.](#)

Highlights

- [File Transfer Application.](#)

Service and support

Downloads

- Access the latest [WebSphere MQ family product readmes.](#)
- Expand WebSphere MQ with [WebSphere MQ SupportPacs.](#)

Education

- Review other offerings from the [Software Training Web page.](#)

Redbooks

- Browse for [Redbooks™.](#)

Third-party information

- [Search for Business Partners.](#)
- Find out about complimentary offerings from the [WebSphere software platform Web page](#) (select the IBM Business Partners link).

Additional WebSphere Product Resources

- Discover the latest trends in WebSphere Technology and implementation, participate in technically-focused briefings, webcasts and podcasts at:
www.ibm.com/developerworks/websphere/community/
- Learn about other upcoming webcasts, conferences and events:
www.ibm.com/software/websphere/events_1.html
- Join the Global WebSphere User Group Community: www.websphere.org
- Access key product show-me demos and tutorials by visiting IBM Education Assistant: ibm.com/software/info/education/assistant
- Learn about the Electronic Service Request (ESR) tool for submitting problems electronically:
www.ibm.com/software/support/viewlet/probsub/ESR_Overview_viewlet_swf.html
- Sign up to receive weekly technical My support emails:
www.ibm.com/software/support/einfo.html

Questions and Answers