



IBM Systems

# MQ V8 Server Workshop

## GTUG Munich 2015

David Ward  
[davidward@us.ibm.com](mailto:davidward@us.ibm.com)

## Disclaimer

- IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion.
- 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.

## Broad Agenda

- **General MQ implementation remarks**
- **MQ Client**
- **XA Transactions**
- **MQ v8 Design**
- **MQ v8 Beta Overview or Demo**
- **MQ v8 Beta Upcoming Features**
- **MQ and Disaster Recovery**

## IBM MQ for HP Non Stop Server Early/Beta program

- **Beta program for next version of MQ on HP Non Stop Server**
  - Opportunity to try your applications with the beta code
  - Update and discussion calls with the development team for beta participants
  - Provide feedback to the product team
  - Support for any questions
  - Advance information to help with your planning
  - Invite to any beta program workshops/education events
  
- **Joining the beta program**
  - Nomination from either your local IBM contact or the beta program manager
  - IBM asks you to accept standard beta program terms and conditions
  - Any questions on the beta program
    - Please ask the beta program manager ....
    - Pete Murphy , Email : **pete\_murphy@uk.ibm.com** or **davidward@us.ibm.com**

## Multi-threading: Shades of meaning

- **Most distributed platforms (i.e. Unices) have a feature called Posix Threads (pthreads)**
- **Multiple executable units within a single process**
  - PS. Linux implements threads as light weight processes with the same pid.
- **Each thread has its own stack and is not necessarily aware of other threads in the process**
- **Advantages:**
  - Available on many platforms, even NonStop
  - In simpler cases, each thread can look like its own program

## Multi-threading: Shades of meaning

- **Some platforms implement their Posix threads (pthreads) in their OS kernel**
- **Often called “kernel-space” threads**
- **Advantages are that threads are dispatched by the kernel along side unthreaded process.**
- **On NonStop, pthreads are NOT kernel supported.**
- **HP provides a PUT DLL to support threading within a process.**
- **Sometimes called “User-space” threads**

## Multi-threading: Shades of meaning

- **Pthreads programming is quite easy if ...**
  - Threads don't need to synchronize with each other
  - But this isn't typically the case
  
- **Pthreads synchronization APIs are complex**
  - Mutex
  - Condition Variable
  - Synchronizing access to Global variables

## Multi-threading: Shades of meaning

- **On NonStop, the term “Multi-threading” often means**
  - A server program that uses no-wait I/O and AWAITIOX to process multiple requests in parallel
- **On Unix, this is often called multi-plexing**
- **MQ 5.3’s Queue Server is an example of a “multi-threaded” program in this sense**



## MQ on NonStop: Multi Threading

- **MQ v8 on NonStop makes heavy use of Posix threads**
- **MQ v5.3 on NonStop makes heavy use of no-waited “multi-threading”**
- **MQ v8 server is likely to evolve towards more use of no-waited I/O and less use of Posix threads.**

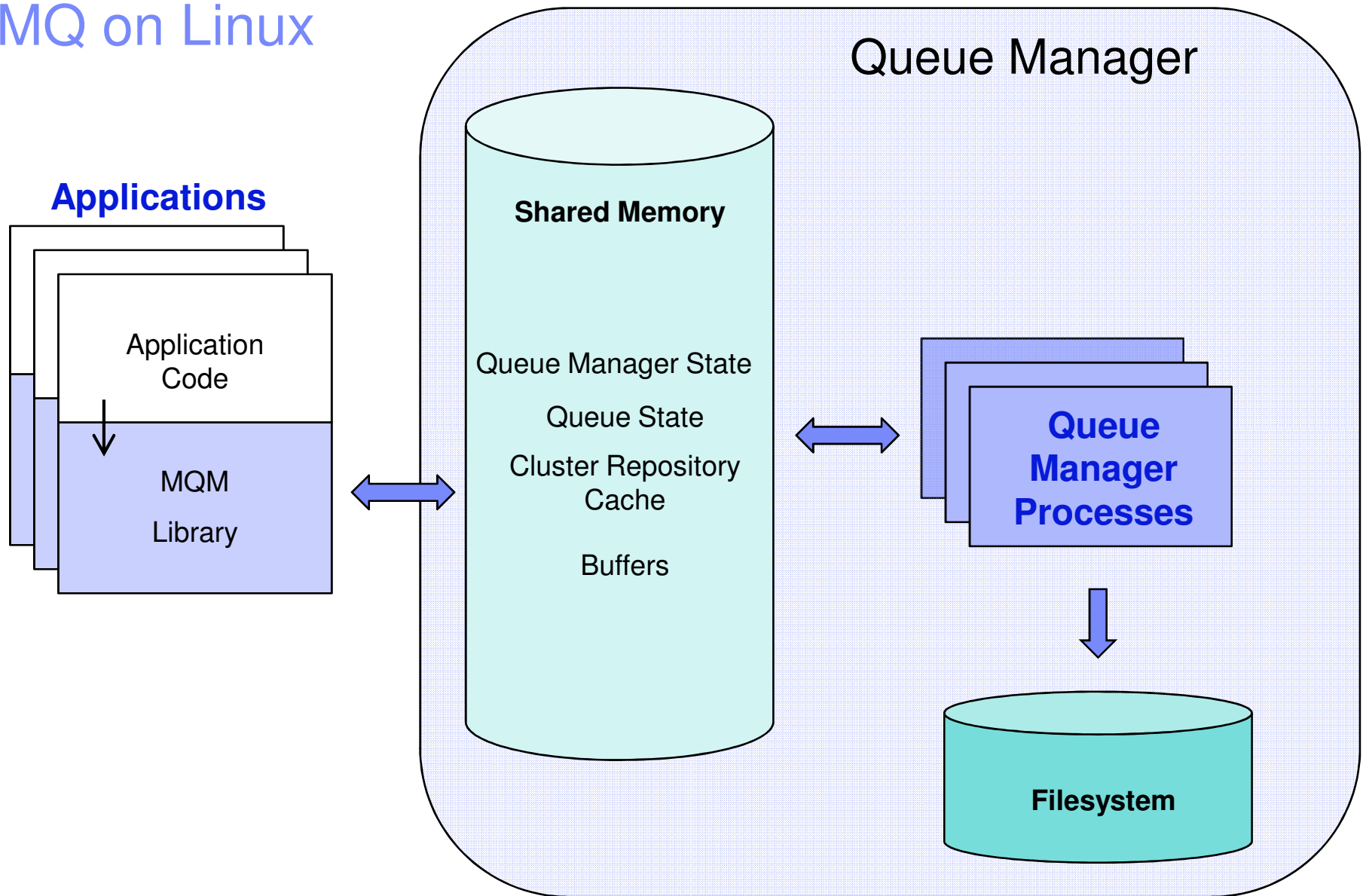
## MQ on NonStop: Multi Threading

- **Most Linux/Unix/Windows versions support kernel level threading**
- **The NonStop operating system does not support kernel level threading**
- **The NonStop compilers provide two kinds of thread libraries:  
SPT (older version)  
PUT (newer version)**
- **Program can use either version, but not both**

## MQ on NonStop: Shared Memory

- **MQ server makes heavy use of shared memory**
- **Why ? Using shared memory for inter-process-communication is very fast**

# MQ on Linux



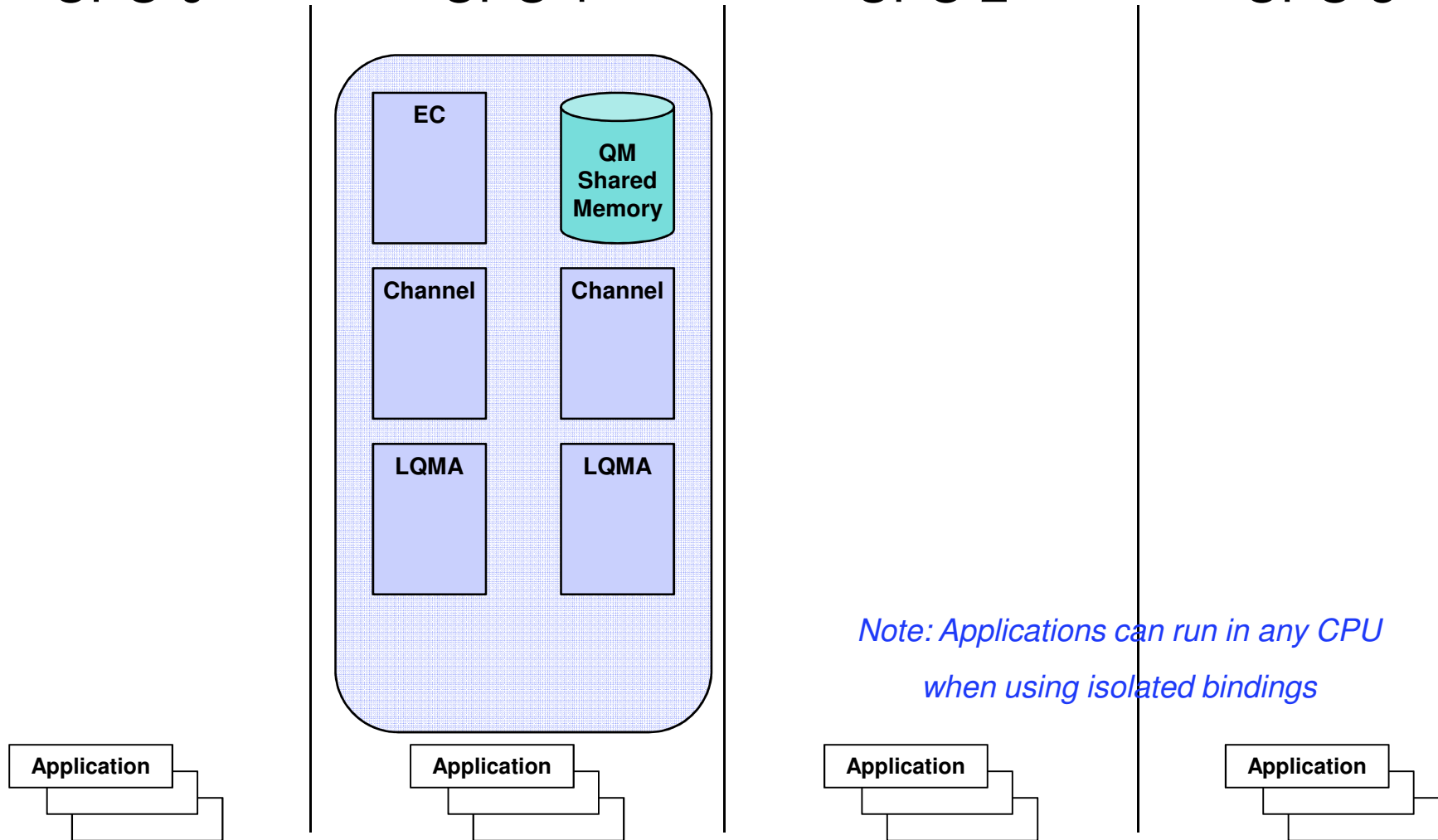
## MQ v8 on Nonstop

CPU 0

CPU 1

CPU 2

CPU 3

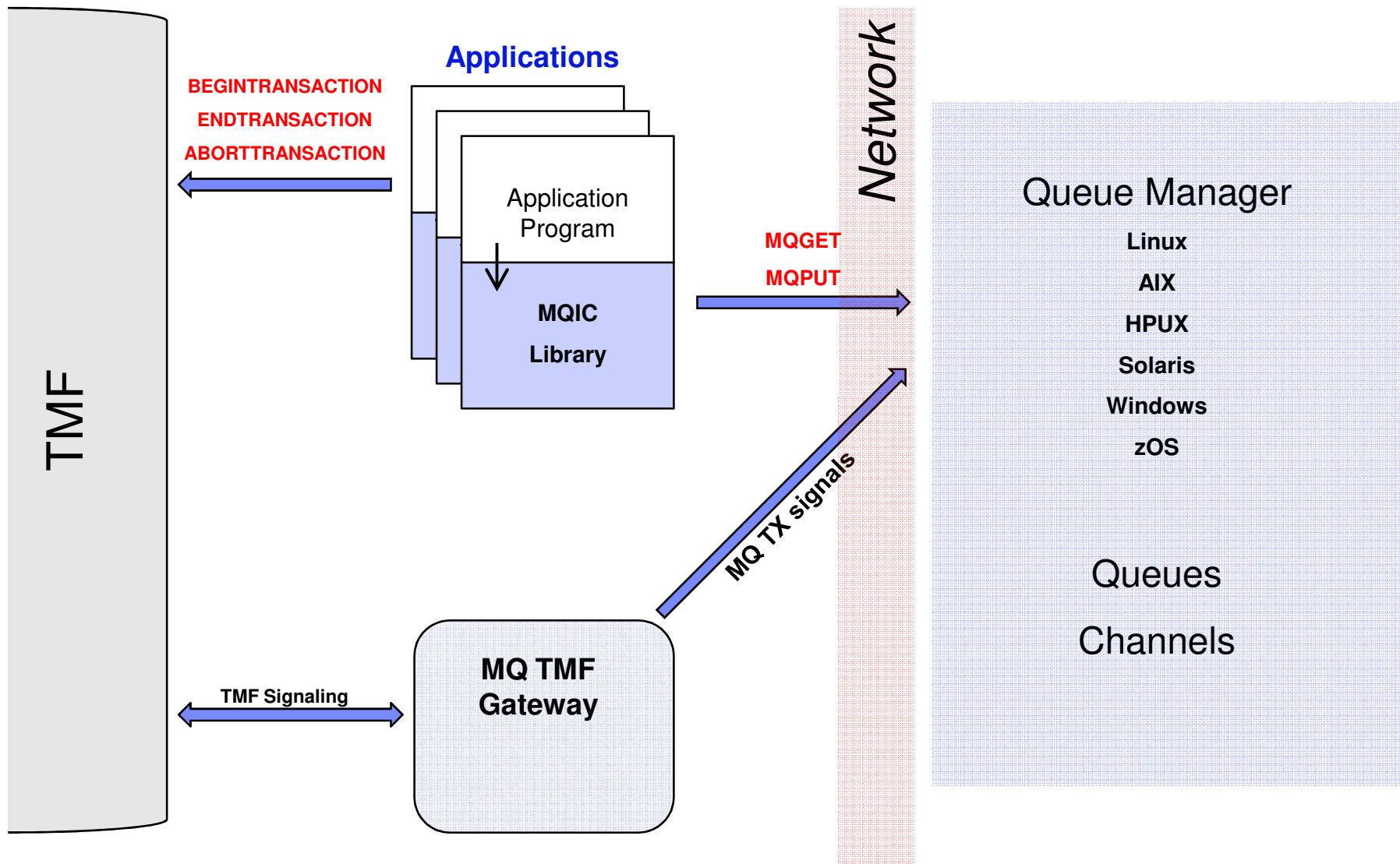


## MQ Client

### Connecting NonStop to other MQ Servers

- **MQ Client is a linkable (native only) library**
  - C-lang
  - COBOL
  - pTAL
- **Connects to other MQ Servers within the network on any platform**
- **Supports (almost) all MQ API functions**
- **Supports TMF transactional work**

# MQ Client – Connects to a remote Queue Manager



## MQ Client and TMF

- Applications do **BEGIN-/ENDTRANSACTION**
- **MQPUT** and **MQGET** done within transaction context
- Expectation: **COMMIT/ROLLBACK (ENDTRANSACTION/ABORTTRANSACTION)** will include MQ related work (if **SYNCPOINT** used)
- How does this work when MQ Server on different platform not knowing about TMF?



## Distributed Transactions – the non-TMF way

- **XA - eXtended Architecture**
- **X/Open Group Standard for Distributed Transactions**
- **Defines a 2-Phase Commit Protocol (2PC)**

## Transactions on other Platforms

- **Linux or Windows (as examples) do not have a transaction manager like TMF as part of the OS**
- **Databases on Linux or Windows come with their own integrated transaction manager**
- **So does MQ Server on those platforms**
- **The XA technology allows to use one common transaction for database and MQ I/O**

## Platform – Transactions

- **A Linux Queue Manager can be configured to be**
  - XA Transaction Manager
  - XA Resource Manager
  - Neither
  
- **MQ applications can**
  - Start and use local uncoordinated transactions
  - Start and use global coordinated transactions
  - Use a global coordinated transaction started by a foreign TM

## Platform – Global Transactions with MQ as the coordinator

- **Configure the Queue Manager as an XA Transaction Manager (TM)**
- **Configure DB2 as an XA Resource Manager (RM) coordinated by MQ**
  
- **MQBEGIN( )** Starts a new global transaction
- **MQPUT() with SYNCPOINT** Puts a message within the global transaction
- **MQGET() with SYNCPOINT** Gets a message within the global transaction
- *Do some DB2 SQL work ...*
- **MQCMIT()** Commits the global transaction  
MQPUT, MQGET and DB2 are all committed
  
- Alternatively**
- **MQBACK()** Rolls back the global transaction  
MQPUT, MQGET and DB2 are all rolled back

## Platform – Global Transactions with MQ as the subordinate

- **Configure DB2 as an XA Transaction Manager (TM)**
- **Configure the Queue Manager as an XA Resource Manager (RM) coordinated by DB2**
  
- *DB2 BEGIN TRANSACTION*                      Tells DB2 start a new global transaction
- *MQPUT() with SYNCPOINT*                      Puts a message within the global transaction
- *MQGET() with SYNCPOINT*                      Gets a message within the global transaction
- *DB2 END TRANSACTION*                      Tells DB2 to commit the global transaction  
MQPUT, MQGET and DB2 are all committed

### Alternatively

- *DB2 ROLLBACK*                      Tells DB2 to rollback the global transaction  
MQPUT, MQGET and DB2 are all rolled back

## Platform – Global TMF Transactions with MQ

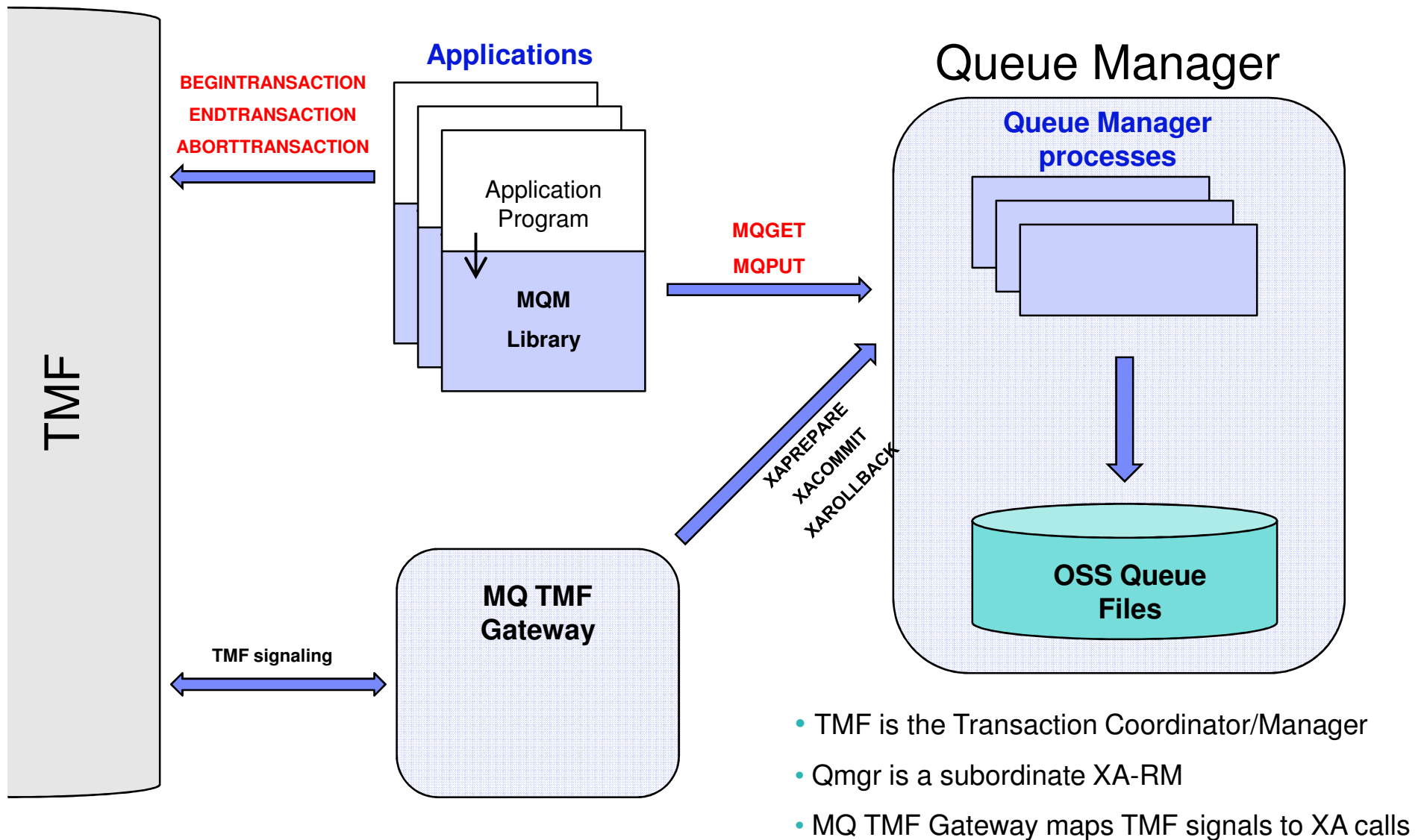
*This is what NonStop customers expect MQ to support*

- **BEGINTRANSACTION()** Asks TMF to start a new transaction
- **MQPUT() with SYNCPOINT** Puts a message within the TMF transaction
- **MQGET() with SYNCPOINT** Gets a message within the TMF transaction
- **Do some Guardian file or SQL work**
- **ENDTRANSACTION()** Asks TMF to commit the transaction  
MQPUT, MQGET and file/db are all committed

### Alternatively

- **ABORTTRANSACTION()** Asks TMF to rollback the global transaction  
MQPUT, MQGET and file/db are all rolled back

## MQ beta – TMF integration with MQ server



## MQ on NonStop Products (Now and Future)

	IA64	x86
Client	MQ 8 Client Released Sept 2014 SupportPac MQC8	TBD
	MQ 7.1 Client Released Jun 2013 Supportpac MAT1	
Server	Intended MQ 8 Server	
	MQ 5.3.1 Server Current fixpack 5.3.1.10	



## MQ 8 Server beta

- **IA64 platform (x86 later)**
- **Major upgrade to MQ 5.3.1 server**
- **Contains most MQ v6.x, v7.x and v8 features**
- **Notable exceptions**
  - Advanced Message Security
  - LDAP authentication
  - MFT/File Transfer Edition

## MQ 8 server - features carried over from 5.3.1

- **Guardian native application support**
- **OSS unthreaded and multi-threaded application support**
- **Multiple MQ installations per NonStop system**
- **TMF integration**
- **EMS events \***
- **Java/JMS \***
- **MQGET SET\_SIGNAL \***
- **SSL channels \***

## MQ 8 server - features *not* carried over from 5.3.1

- **Non-native (TNS) application support**
  - Non-native C, COBOL and TAL\*\*\* not supported
- **Standard Posix Threads (SPT) OSS application support \***
- **PATHWAY control over MQ processes \*\***

\* SPT may be added for JDK 6 support

\*\* PATHWAY support being reviewed

\*\*\* Native pTAL is supported

## MQ 8 Server Beta 1

- Released Thursday March 19<sup>th</sup>
- H-Series and J-Series
- Requires at least **J06.15** or **H06.26**
- Install package

`mqs-8.0-hpns-nse64-beta1.run`

- Requires OSS and TMF to be enabled

## MQ 8 server Installation

- Packaged as a runnable OSS program file

```
mqs-8.0-hpns-nse64.run
```

- Installed from an OSS shell prompt
- No separate instmqm script needed
- One OSS path and one Guardian path

```
./mqs-8.0-hpns-nse64.run
```

```
-i <OSSpath>
```

```
-g <Guardianpath>
```

# MQ 8 server Installation

```
./mq8-8.0-hpns-nse64-beta2.run -i mq8beta2 -g data09.mq8beta2
#-----
#  WebSphere MQ Server 8.0 for HP NonStop Server
#
#  Fixpack           : 8.0.0.2
#  Architecture      : nse64
#  Build             : p800-L150420-085849
#
#  MQ Install Path   : /home/david/mq8beta2
#                      $DATA09.MQ8BETA2      (/G/data09/mq8beta2)
#
#  MQ owner          : MQM.DAVE  44,11
#
#  System Name       : MARVIN
#  RVU               : J06.18.01
#  UNAME             : NONSTOP_KERNEL marvin J06 18 NSE-AB
#
#  Fri Apr 24 13:03:40 EDT 2015
#-----

Creating OSS 'opt' tree and Guardian sub-volume ...

100% [=====] 827/827 files    543MB ET 01:05

Setting OSS 'opt' tree attributes [OK]
Setting OSS 'opt' tree permissions [OK]
Setting Guardian file attributes [OK]
Setup misc 'opt' tree files [OK]
Creating OSS 'var' tree [OK]
MQ install successful [01:43 time elapsed] [OK]
```

## MQ Installation Awareness

- **MQ v8 is very different from MQ 5.3 in this area**
- **MQ 5.3 required `MQNSKOPTPATH/MQNSKVARPATH` environment variables and TACL params for**
  - MQ commands
  - Application programs
- **MQ v8 does not need any environment variables or TACL params (normally)**
  - MQ commands (crtmqm, strmqm, runmqsc etc)
  - Application programs

## Co-existence

- **MQ 8 server can be installed multiple times on the same Nonstop system**
- **MQ 8 server can be installed on the same Nonstop system as:**
  - MQ 5.3 server
  - MQ 7.1 client
  - MQ 8 client
- **Each installation needs unique OSS and Guardian install locations**



## Running MQ administration tools

- **MQ 8 tools do not require environment variables**
  - MQNSKOPTPATH and MQNSKVARPATH are ignored
- **Either run the tool directly or put the `opt/mqm/bin` directory in your PATH**

```
<mqinstall>/opt/mqm/bin/dspmqr
```

or

```
export PATH=<mqinstall>/opt/mqm/bin:$PATH  
dspmqr
```

# Building MQ applications

## Guardian

```
CCOMP /in mqprog/ mqprog;  
    runnable,extensions,nolist,  
    ssv0 "$system.system",  
    ssv1 "$data04.mq8",  
    eld(-L$data04.mq8 -lmqm)
```

## OSS

```
c89 -Wextensions  
    -I<mqinstall>/opt/mqm/inc  
    -L<mqinstall>/opt/mqm/lib -lmqm  
    -o mqprogram  
    mqprogram.c
```

## Running MQ Applications

- **An application that has been linked against the MQ 8 libraries ...**
  - Does not need any MQ or `_RLD_LIB_PATH` environment variables or defines.
  - Will use the MQ installation that it was (last) linked with.
- **Re-link or set `_RLD_LIB_PATH` to use a different MQ installation**
- **MQ 5.3 applications can be run against MQ 8**

```
export _RLD_FIRST_LIB_PATH=<mqinstall>/opt/mqm/lib
```

```
add define = _RLD_FIRST_LIB_PATH, class search,  
          subvol0 $data04.mq8
```
- ***Note: known problem described later (RLD warnings)***

## Limitations

- **The following features are not supported in beta 1**
  - Java/JMS bindings
  - SSL channels
  - runmqsc FIXCOMMAND (FC and !)
  - MQ EMS events
  - MQGET SET SIGNAL
  - crtmqm and runmqslr selection of TCPIP process name (-g)
- **Non-native TNS C, COBOL and TAL applications are not supported**

## Limitations – Single CPU

- **MQ v8 beta uses a single-CPU design**
- **The CPU used to start the queue manager is called the *HOME CPU* of the queue manager.**  
e.g. run `–cpu=3 <mqinstall>/opt/mqm/bin/strmqm QMGR`
- **Most MQ admin tooling *must* be run in the HOME CPU**  
e.g. run `–cpu=3 <mqinstall>/opt/mqm/bin/runmqsc QMGR`
- ***MQ (standard-bound) applications can run in any CPU***  
e.g. run `–cpu=3 mqprogram`  
`mqprog /cpu 3/`
- **Using the wrong CPU will result in MQCONN 2059 reason code or “Queue Manager not available”**

## Known problems (beta 1)

- **Creating a queue manager with periods in its name will result in TMF gateway start failure FDC**
  - Workaround: avoid queue manager names containing non-alphanumeric characters
  - Fixed in beta 2
- **Deadlock or MQCONN failure reason 2059 when simultaneous applications call MQCONN**
  - Being investigated    Fixed in beta 2
- **amqzmgr0 may be left running with runmqlsr after endmqm**
  - Workaround: Use “endmqlsr -m QMGR” to stop the listener
- **RLD warnings when running MQ v8 admin tools in an OSS window with \_RLD\_FIRST\_LIB\_PATH environment variable**
  - Workaround: use separate OSS logins for MQ admin tools and MQ applications

## Compatibility

- **MQ 5.3 native application programs can run without change**
  - OSS unthreaded
  - OSS PUT multi-threaded
  - Guardian (native)
- **Native C-language (c89 and c99)**
- **Native C++ (version 3 only if using IMQI classes)**
- **Native COBOL**

## Security - CHLAUTH

- **Set rules (via MQSC, PCF or Explorer) to permit/deny inbound connections**
  - Inbound clients
  - Inbound message channels
- **CHLAUTH Rules can**
  - Allow a connection
  - Allow a connection and assign an MCAUSER
  - Block a connection
  - Block privileged access
  - Control SSL Peer Name matching
- **CHLAUTH Rules can use any of the following identifying data**
  - IP address
  - SSL/TLS DN
  - Client userid
  - Remote queue manager name



## Security - CHLAUTH

- **Create CHLAUTH rules using**
  - MQSC
  - PCF
  - MQ Explorer

## Security - CONNAUTH

- The ability for an application to provide a user ID and password when connecting to MQ
- **ALTER QMGR CONNAUTH(USE.PW)**
- **DEFINE AUTHINFO(USE.PW)**
- **AUTHTYPE(xxxxxx)**
- **CHCKCLNT(REQUIRED)**
- **CHCKLOCL(OPTIONAL)**
- **REFRESH SECURITY TYPE(CONNAUTH)**

## Administration

- **MQSC DISPLAY QSTATUS**
- **MQSC LISTENERs and SERVICEs**
- **MQSC FILTER**
- **Accounting Reports**
- **Statistics Reports**
- **TraceRoute Messages**

## MQ 8 server – MQI enhancements

- **Publish-subscribe**
- **Message Selectors**
- **Message Properties**
- **Asynchronous Consume**

## MQI – Publish/Subscribe

- **Previously provided by the MQ 5.3.1 Pubsub Broker** (strmqbrk/endmqbrk)
- **Now supported directly by the queue manager**
- **runmqsc support for TOPICs as well as QUEUEs**
- **Publish done using MQPUT to a TOPIC**
- **Subscribe done using new MQSUB call ; then receive publications using an MQGET call**
- **MQOPEN extended to support TOPICs**

## MQI Asynchronous Consume

- **A message-driven function or routine called by the Queue Manager when a message is ready to be delivered**
- **No MQGET needed and no buffer need be provided by the applications**
- **Fewer resources allocated waiting for a message to arrive**
- **Enabled using the MQCB and MQCTL calls**

## Client Conversation Sharing

- **Also known as client connection multiplexing**
- **Multiple client connections can flow down the same TCPIP socket**
- **Resource usage on queue manager is reduced**
  - Fewer threads
  - Much lower memory footprint
- **New SHARECNV channel attribute**

## MQ V6 Features

Feature	Version
IPV6 Channels	MQ v6.x
Cluster Workload Balancing	MQ v6.x
MQSC DISPLAY QSTATUS (enhanced in v6 ??)	MQ v6.x
MQSC LISTENER	MQ v6.x
MQSC SERVICES	MQ v6.x
MQSC FILTER	MQ v6.x
Accounting Reports	MQ v6.x
Statistics Reports	MQ v6.x
TraceRoute Messages	MQ v6.x



## MQ V7.0, 7.0.1, 7.1, 7.5 Features

Feature	Version
<b>Publish-Subscribe MQI</b>	<b>MQ v7.0</b>
<b>Message Selectors</b>	<b>MQ v7.0</b>
<b>Message Properties</b>	<b>MQ v7.0</b>
<b>Async Consume</b>	<b>MQ v7.0</b>
<b>Conversation Sharing</b>	<b>MQ v7.0</b>
<b>Multi-Instance Queue Managers</b>	<b>MQ v7.0.1</b>
<b>Command &amp; Configuration Events</b>	<b>MQ v7.0.1</b>
<b>Pubsub Routing Exit</b>	<b>MQ v7.0.1</b>
<b>Channel access control with CHLAUTH</b>	<b>MQ 7.1</b>
<b>setmqaut on non-local objects</b>	<b>MQ 7.1</b>
<b>Channel USEDLC attribute</b>	<b>MQ 7.1</b>
<b>dmpmqcfg</b>	<b>MQ 7.1</b>
<b>Multiple Cluster Transmit Queues</b>	<b>MQ v7.5</b>
<b>Advanced Message Security</b>	<b>MQ v7.5</b>

## MQ V8 Features

Feature	Version
Topic Host Routing for Pubsub Clusters	MQ V8
JMS 2.0	MQ V8
LDAP or Local OS authentication	MQ V8
CHLAUTH domain name support	MQ V8
QLOAD utility	MQ V8

## IBM MQ for HP Non Stop Server Early/Beta program

- **Beta program for next version of MQ on HP Non Stop Server**
  - Opportunity to try your applications with the beta code
  - Update and discussion calls with the development team for beta participants
  - Provide feedback to the product team
  - Support for any questions
  - Advance information to help with your planning
  - Invite to any beta program workshops/education events
- **Joining the beta program**
  - Nomination from either your local IBM contact or the beta program manager
  - IBM asks you to accept standard beta program terms and conditions
  - Any questions on the beta program
    - Please ask the beta program manager ....
    - Pete Murphy , Email : **pete\_murphy@uk.ibm.com** or **davidward@us.ibm.com**

## More information

- **MQ v8 Knowledge Center**
- **MQ v8 PDF documents**

`ftp://public.dhe.ibm.com/software/integration/wmq/docs/V8.0/PDFs/`

- **davidward@us.ibm.com**