MQ Performance Analysis

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TxMQ

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- WMQ Process Modeling
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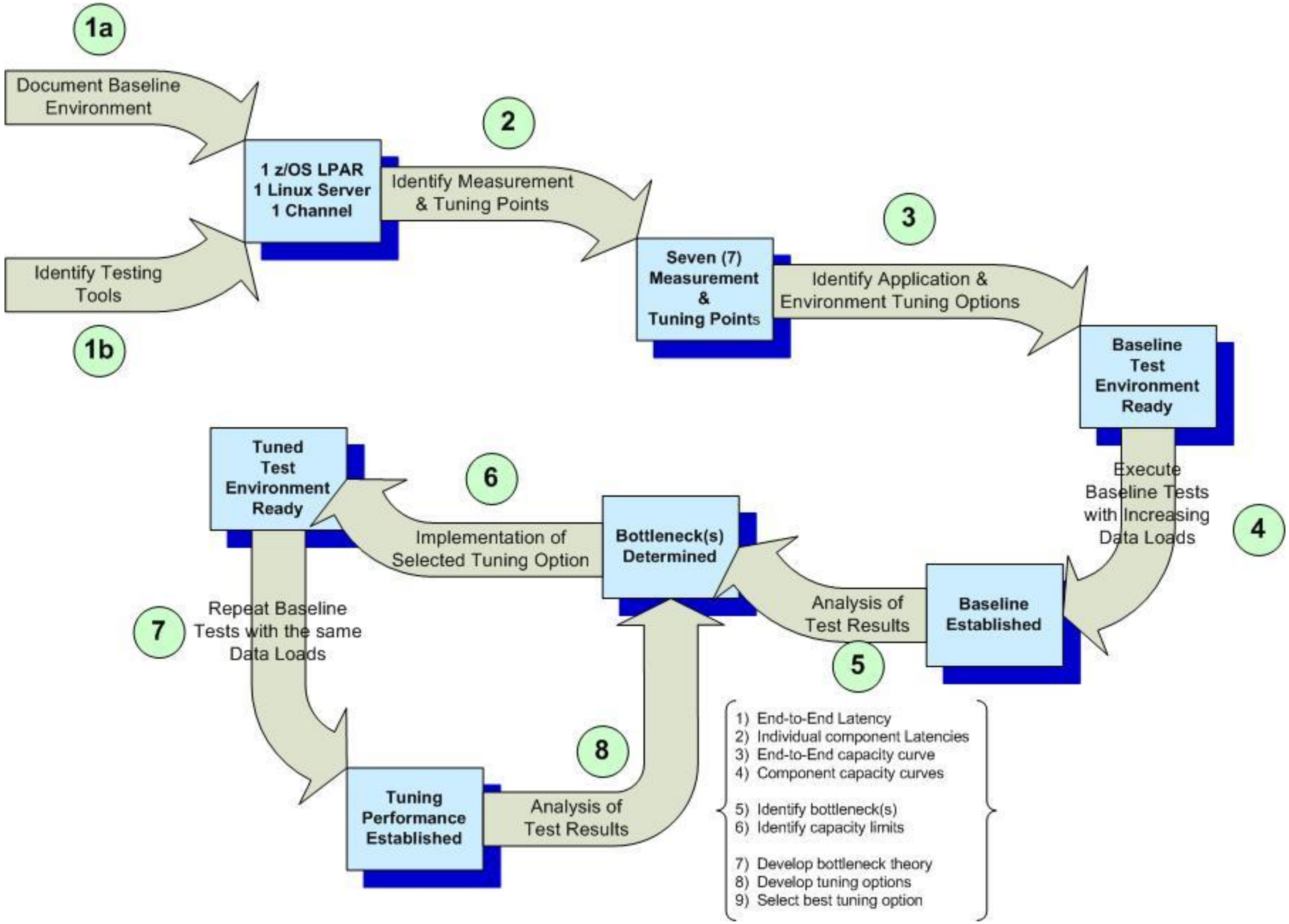
What is Performance Analysis?

What is Performance Analysis?

N O T E S

- **Modeling**
  - Creating maps (diagrams) of the application flows to be analyzed
  - Identifying bottlenecks and measurement points in each flow
- **Benchmarking**
  - Leveraging the model and taking measurements to establish a baseline
    - Single thread benchmarks
    - Horizontally scaling impacts
- **Tuning**
  - Leveraging the benchmarks & WMQ knowledge to modify the infrastructure
  - Leveraging the benchmarks & WMQ knowledge to modify the application
  - Iterative process that requires re-benchmarking
- **Capacity Planning**
  - Leveraging benchmarks and tuning against:
    - Current & Projected application load requirements
    - Peak load planning
- **Monitoring**
  - Proactively add capacity before the system breaks!

The Performance Analysis Process



What does Performance Analysis Require?

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- **Understanding your specific WMQ Infrastructure**
  - Infrastructure Topology
    - Clusters, Queue Managers, Channels
    - Brokers, Execution Groups
  - Application Resources
    - Servers, Languages, External Software (WMQ, WMB/IIB, DB2/Oracle, etc.)
- **Understanding WMQ Processing at a Resource Level**
  - CPU, Memory, Disk, Network
- **Creating a Performance Model**
  - Abstracting detailed WMQ internal processing into key steps & bottlenecks
  - Identifying key measurement points
    - Processing steps that can be directly measured
    - Processing steps that can be inferred
- **Key Measurement Points**
  - Identifying what metrics can be measured
  - Identifying how those metrics can be gathered

Background Concepts

Synchronous versus Asynchronous

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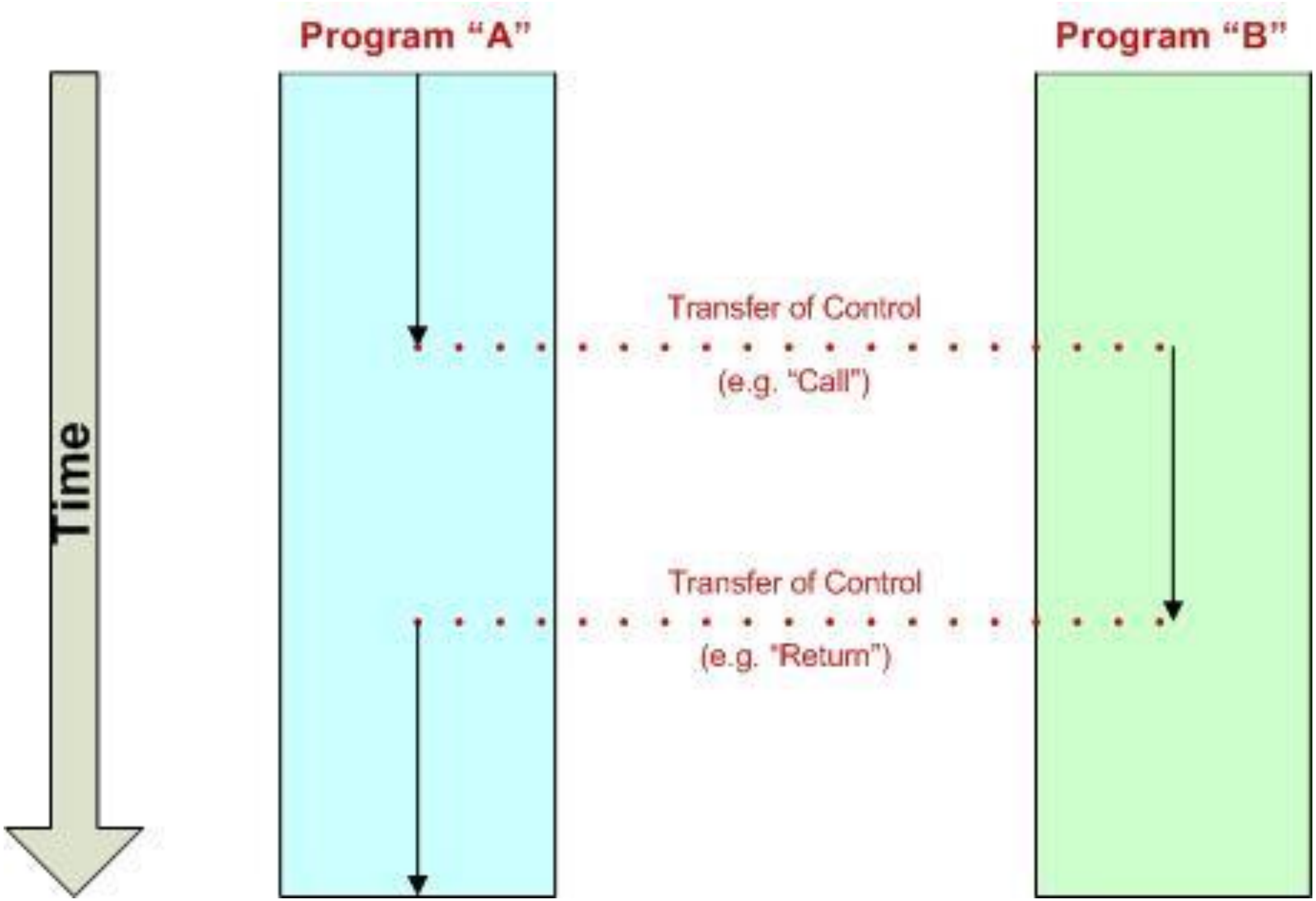
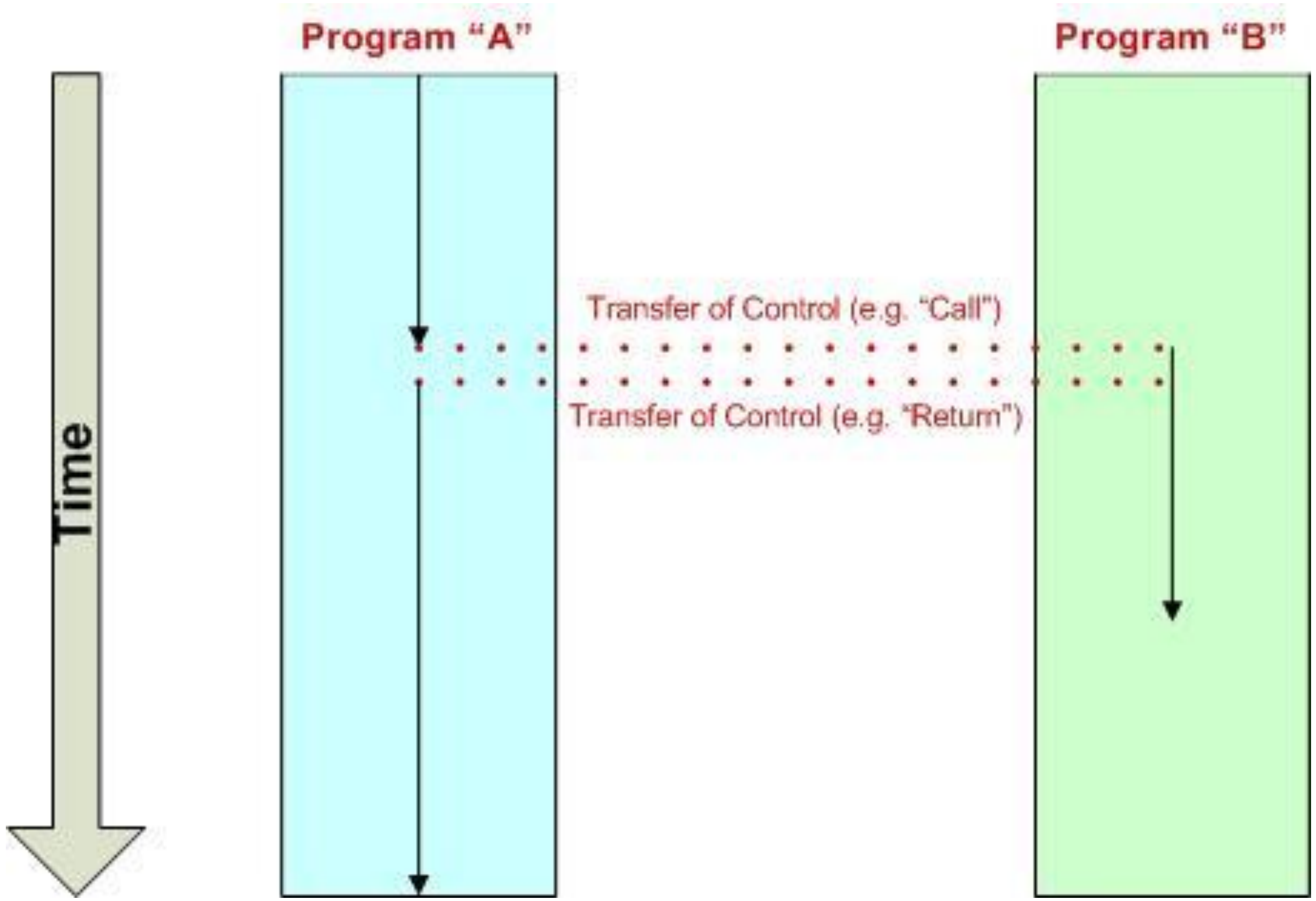
- **Synchronous Processing**
  - Communicating programs (e.g. Application & Database) tightly coupled in time
  - Calling program is blocked from executing while it waits for called program to complete
  - Delays in processing by called program are experienced by the calling program.
  - No backlogs, just increased latency!
- **Asynchronous Processing**
  - Communicating programs (e.g. Application and WMQ) loosely coupled in time
  - Calling program IS NOT blocked from executing while called program completes its work
  - Delays in processing by called program ARE NOT experienced by the calling program
  - No increased latency, just backlogs!
- **WMQ processing is <u>always</u> asynchronous!**
- **Programming patterns may simulate synchronous behavior**
  - Link two asynchronous calls together by the calling program. For example:
    - MQPut (Write a Message)
    - MQGet with a wait for response (Read a Message)

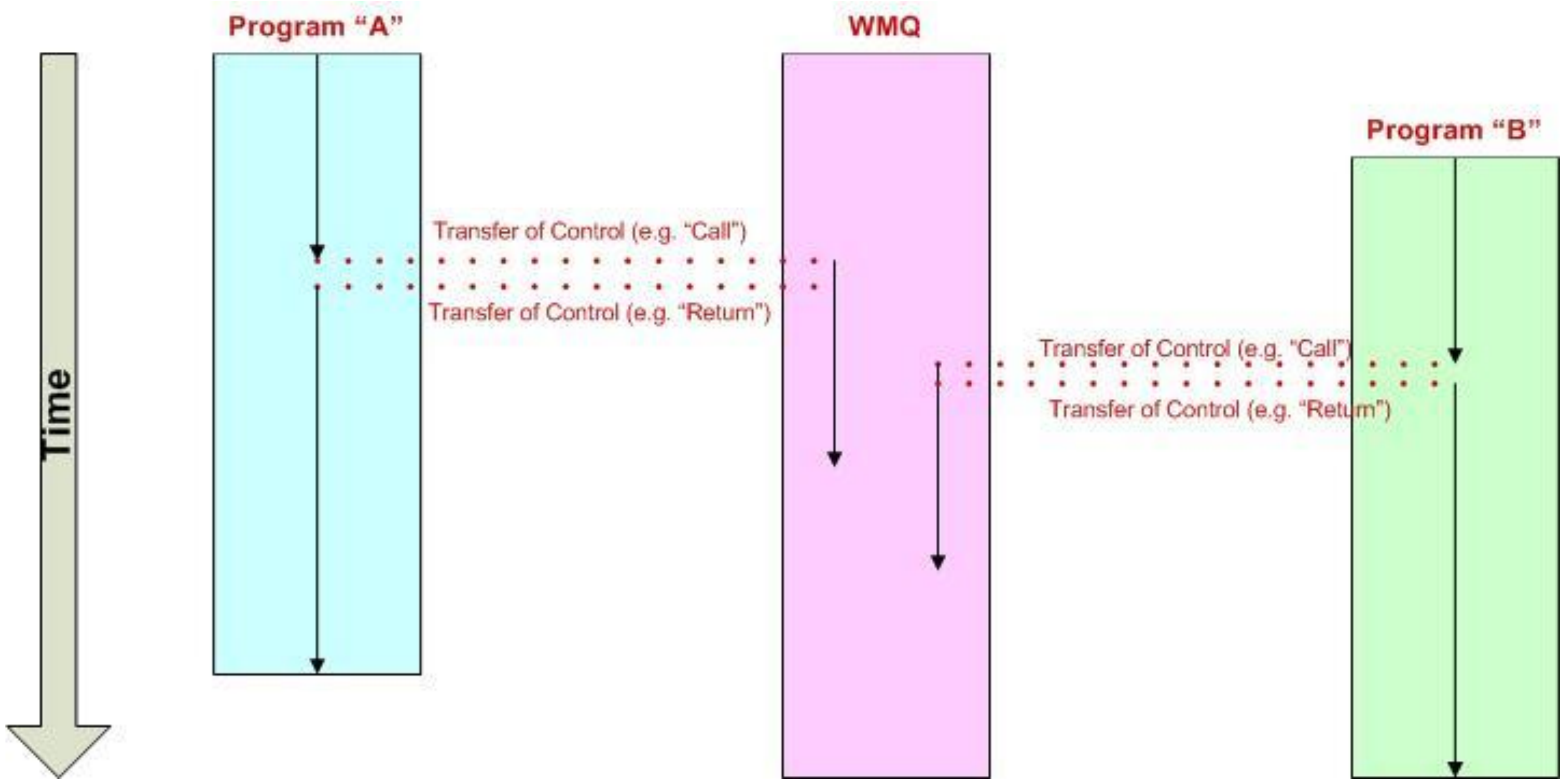
Synchronous Processing Diagram



Asynchronous Processing Diagram



Multiple Asynchronous Processes Diagram



WMQ Programming Interfaces

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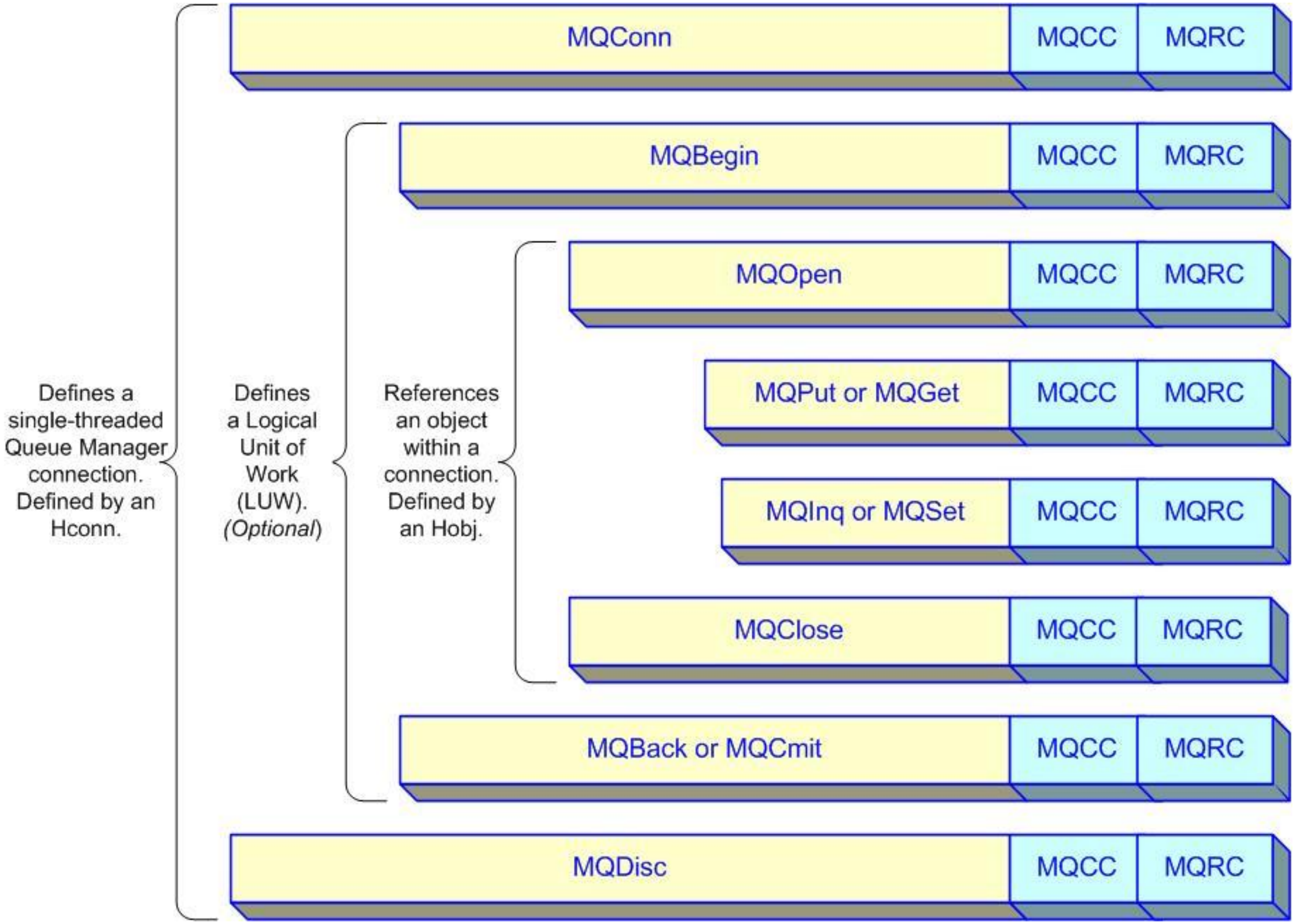
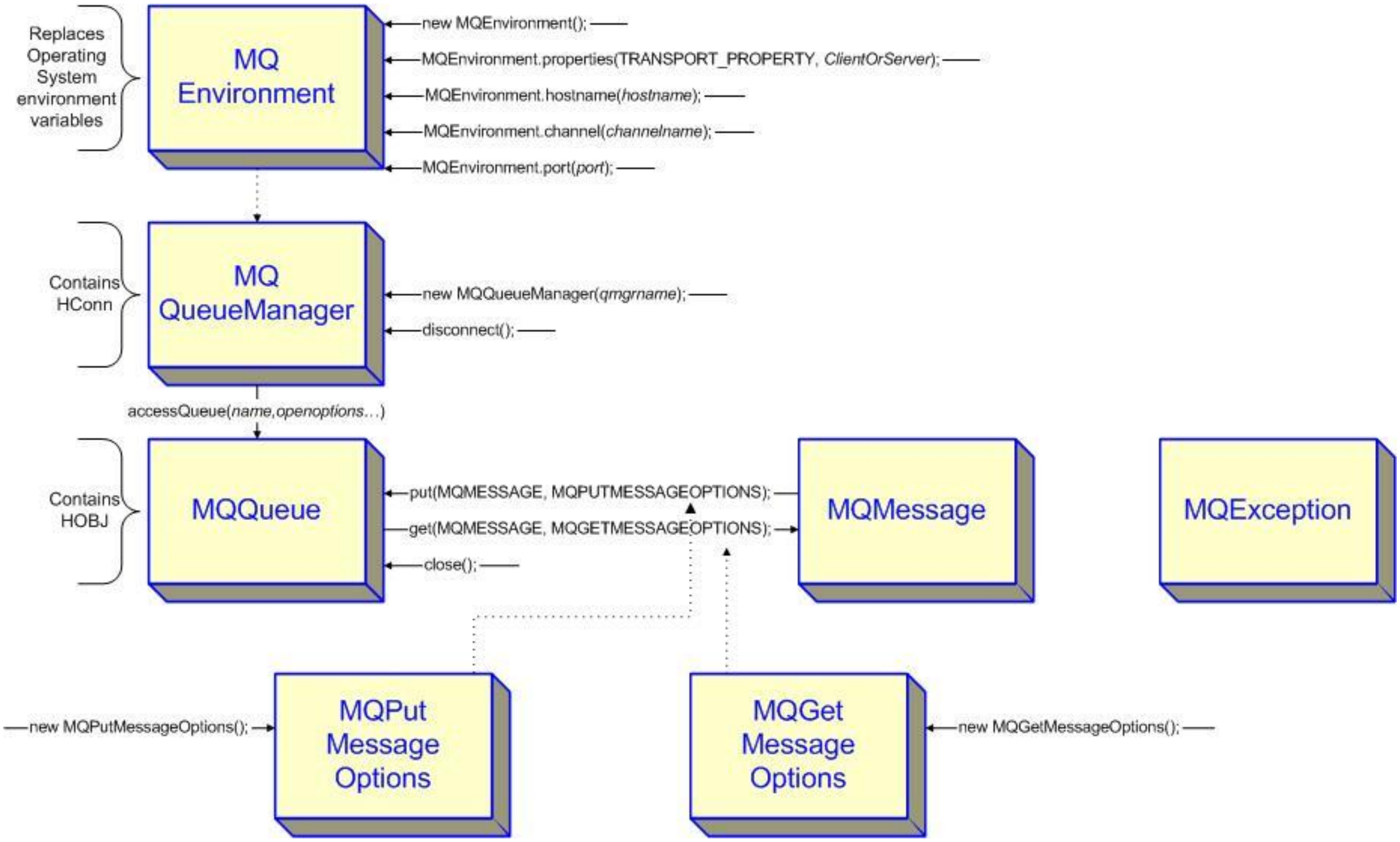
- **MQI**
  - Original API
  - For Procedural languages (C, COBOL, RPG, Visual Basic)
- **WMQ Classes for Java**
  - First Java API for MQSeries
    - Designed by IBM, initially as SupportPac MA88
    - Predates JMS
- **WMQ Classes for JMS**
  - Second Java API for MQSeries
    - Designed by Sun Microsystems
    - Intended to be platform agnostic, but heavily influenced by the WMQ Classes for Java
    - Designed for feature set, not necessarily for performance
      - Message Selectors
- **WMQ Classes for .NET, ActiveX, and C++**
  - Supplied by IBM to support specific language and runtime environments

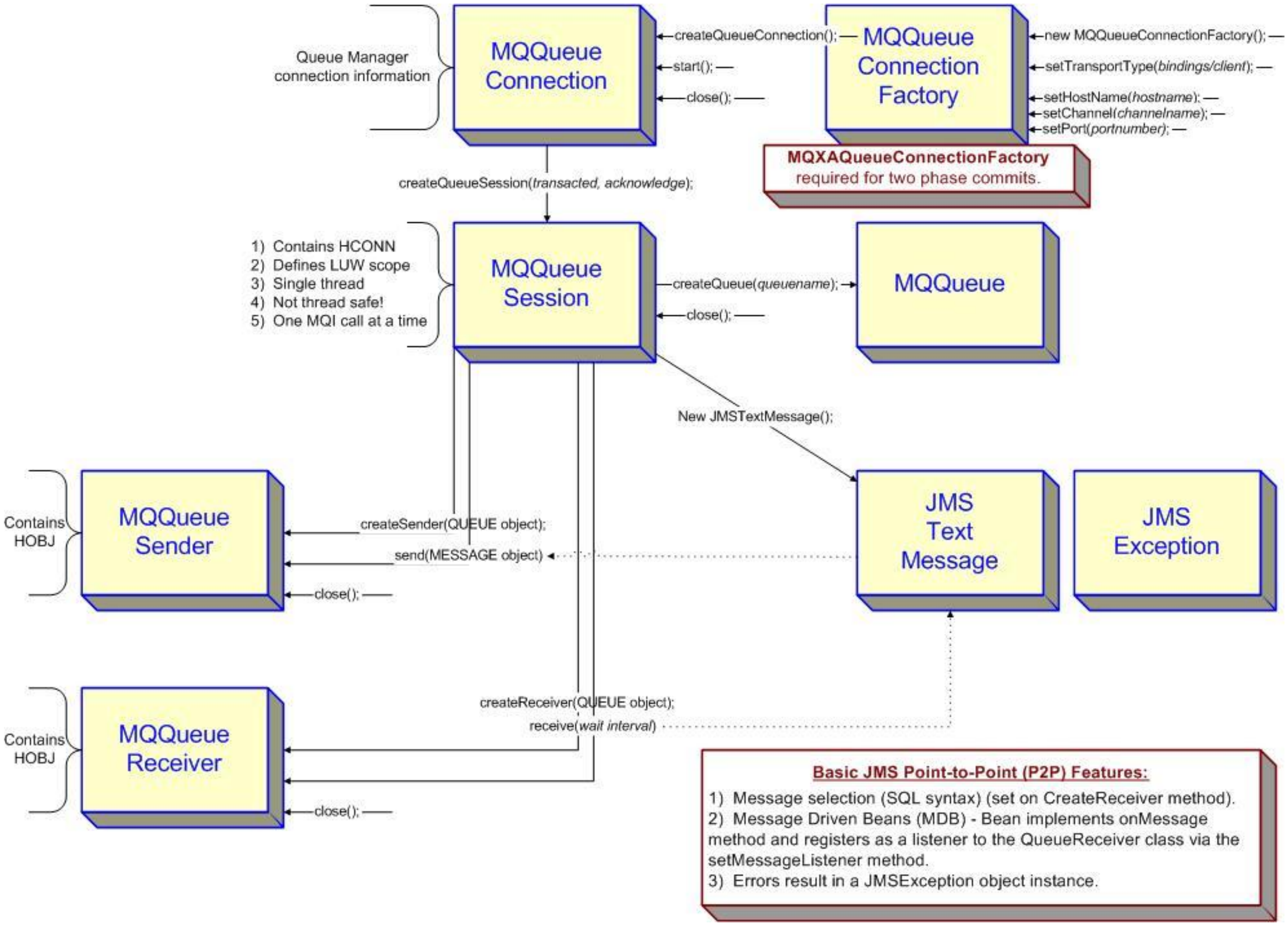
MQI (Message Queue Interface)



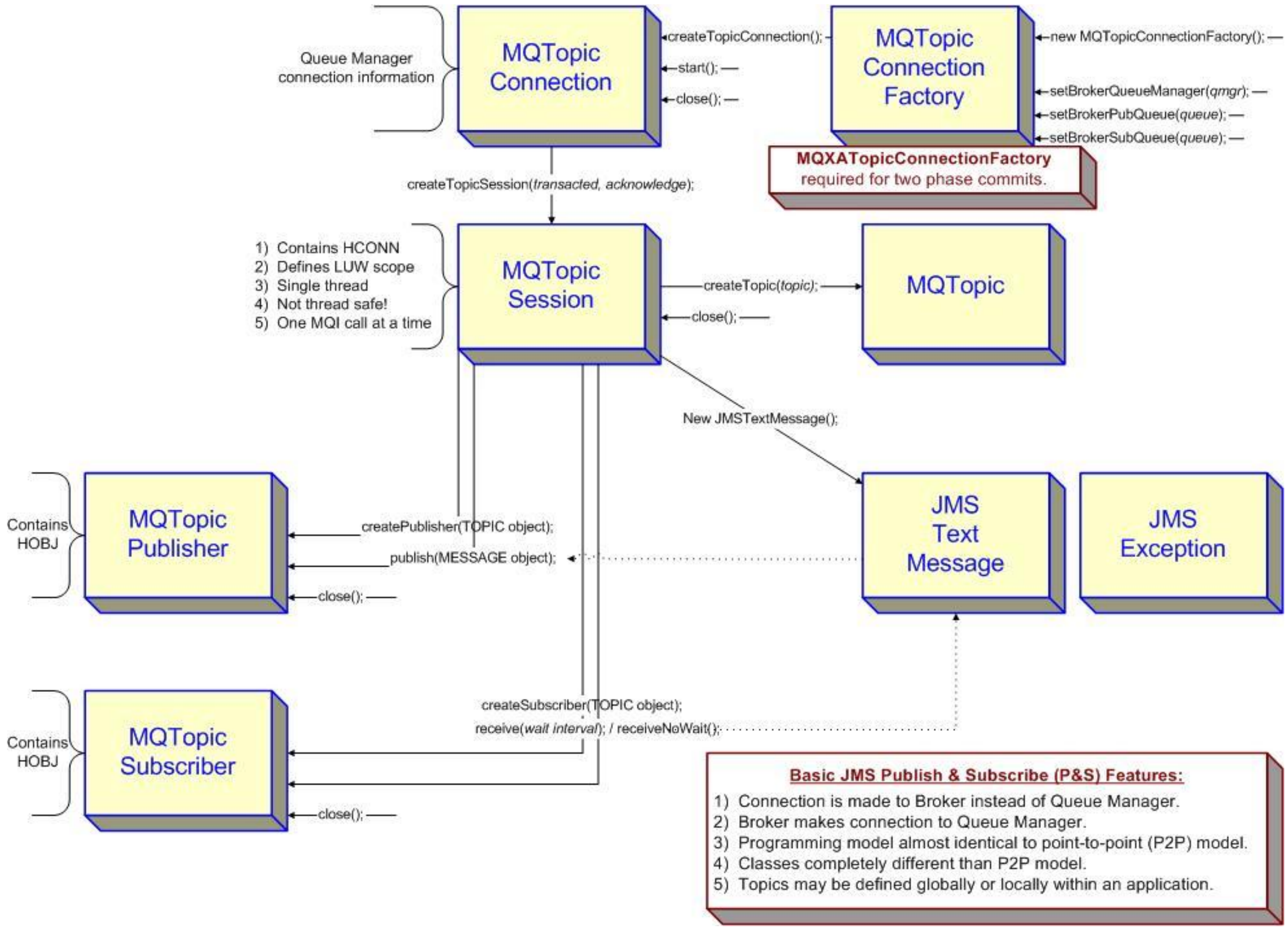
WMQ Classes for Java



WMQ Classes for JMS (Point to Point)



WMQ Classes for JMS (Publish/Subscribe)



Key API Points

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- Different APIs will have different performance characteristics
- Different API calls have different costs
  - "Connect "is the most expensive call (in terms of latency)
  - "Get" calls have things to consider
    - Message Filters – response times degrade as queue depths increase
    - Lock Contention – response time degrades as number of "Readers" increases
- API Calls are one of the WMQ Bottlenecks!
  - Maximum number of API calls / second based upon the API call path length
  - Application Architects and WMQ Administrators should know this number!
  - Easy to determine, use the "Q" program: SupportPac MA01 (Thank you Paul Clarke)
    - crtmqm TempQmgr
    - strmqm TempQmgr
    - echo "define qlocal('TempQueue')" | runmqsc TempQmgr
    - date
    - echo "#!1000000/1024" | /…path…/q -m TempQmgr -ap –p1 -O TempQueue
    - date
    - The preceding commands write 1,000,000 messages of 1K size

WMQ Process Modeling

Building a Process Model

N O T E S

- Determine the Infrastructure or Application to be modeled (Scope of Model)
  - Models may be generic (Model of a single thread putting messages)
  - Models may be Application specific (Incorporates Application threading model & latency)
- Consider limitations to testing (Limits of Model)
  - Application architecture and Internal processing knowledge
  - WMQ architecture and Internal processing knowledge
  - Application & WMQ statistics gathering capabilities
  - Test tool availability
- Consider the goals of the testing (Purpose of Model)
  - Testing to identify and understand the bottlenecks
  - Testing to establish a baseline
  - Testing of tuning options
- Build the Performance Model for the test (Create the Model)
  - Identify measurement points, data collection tools, and data analysis methodology
  - Remember that not all of the processing steps can be easily measured
- Iterative process (Use the Model)
  - Test execution often yields data that requires additional testing to understand
  - The additional testing usually requires gathering additional data

Process Model – Differing Views of Scope

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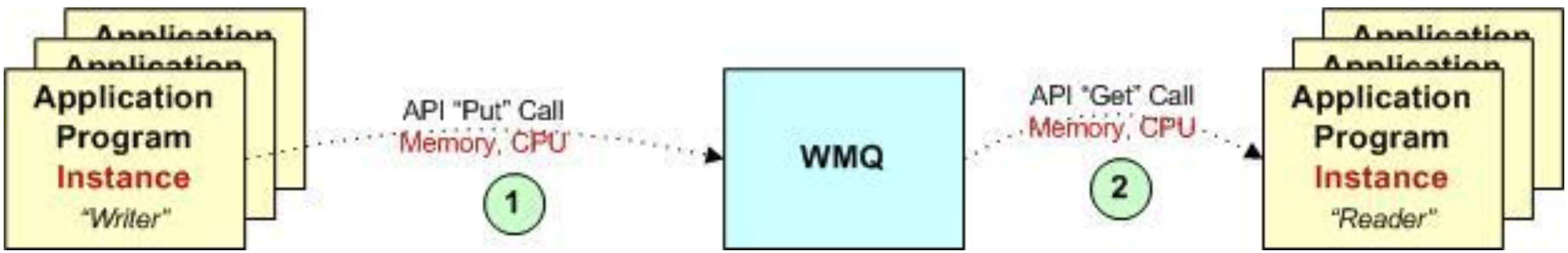
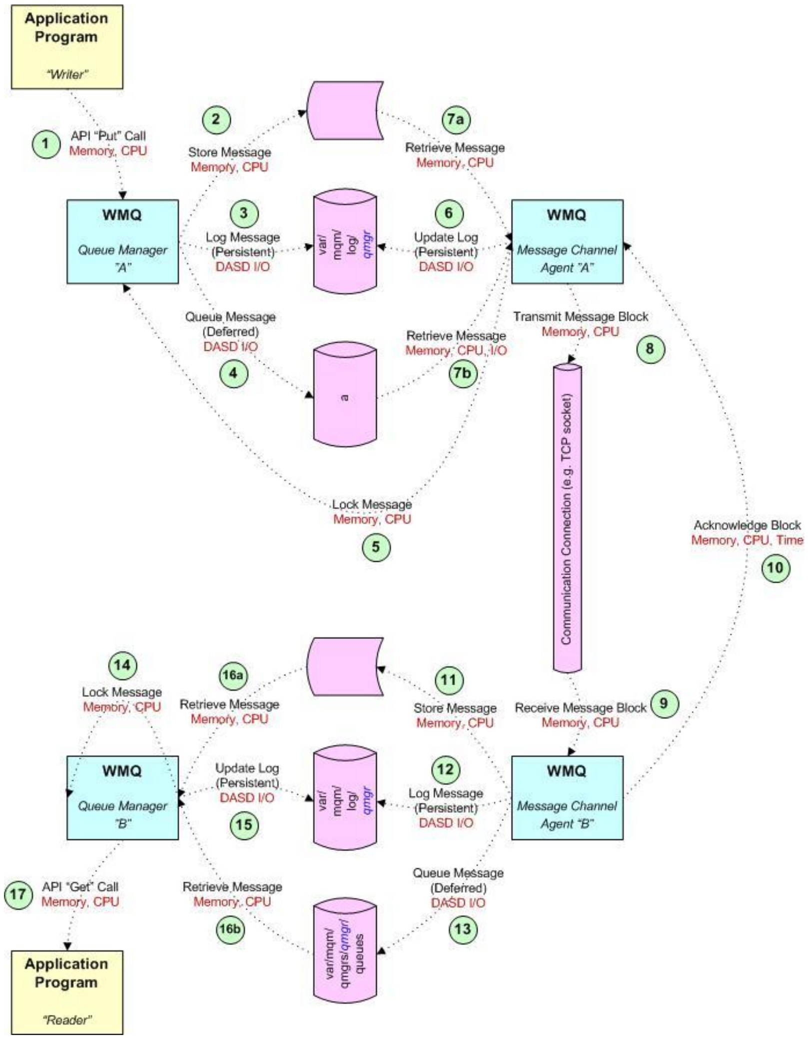
- Application Developers
  - Understand their application and its resource requirements (e.g. Databases)
  - Understand their application threading model for processing business work
  - Understand their application architecture (e.g. Number of servers, instances, etc.)
  - Knowledge of WMQ varies
- WMQ Administrators
  - Understand WMQ internal processing
  - Understand WMQ network architecture (e.g. Clusters)
  - Knowledge of application programming varies
- Network Administrators
  - Understand network topology
  - Understand network architecture (e.g. Routers, Firewalls, etc.)
  - Knowledge of WMQ and application programming varies
- Other Parties
  - Database administrators
  - Help Desk. Etc.

Process Model – Application View

- Application view of WMQ
  - WMQ is a "Black Box"
  - Puts go in, Gets come out
- Application view of Puts
  - Due to asynchronous nature of the "Put", application unaware of the impacts
  - From application perspective, more "Puts" equals more throughput
- Horizontal Scaling
  - Applications will add additional instances and/or threads
  - Often without regard, understanding, or consultation with WMQ

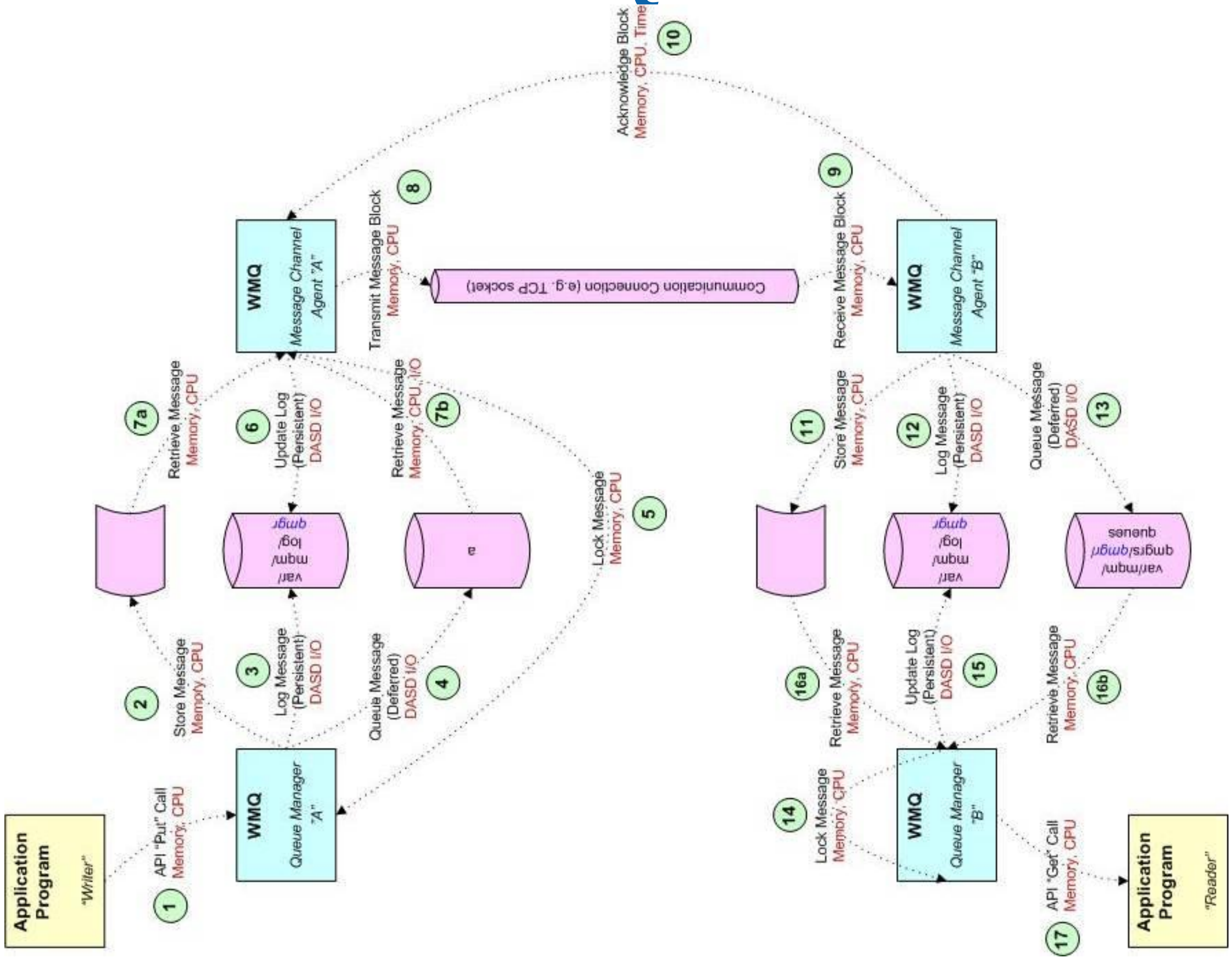


Process Model – WMQ View #1



- (01) MQPut by application
- (02) Move message to WMQ memory
- (03) Write persistent message to log
- (04) Move message from RAM to Disk
- (05) Acquire message lock
- (06) Update Log
- (07) Retrieve message (RAM or Disk)
- (08) Transmit message block
- (09) Receive message block
- (10) Acknowledge receipt of block
- (11) Move message into WMQ memory
- (12) Log Message
- (13) Move message from RAM to DISK
- (14) Acquire message lock
- (15) Update Log
- (16) Retrieve message (RAM or Disk)
- (17) MQGet & commit by application

Process Model – WMQ View #2

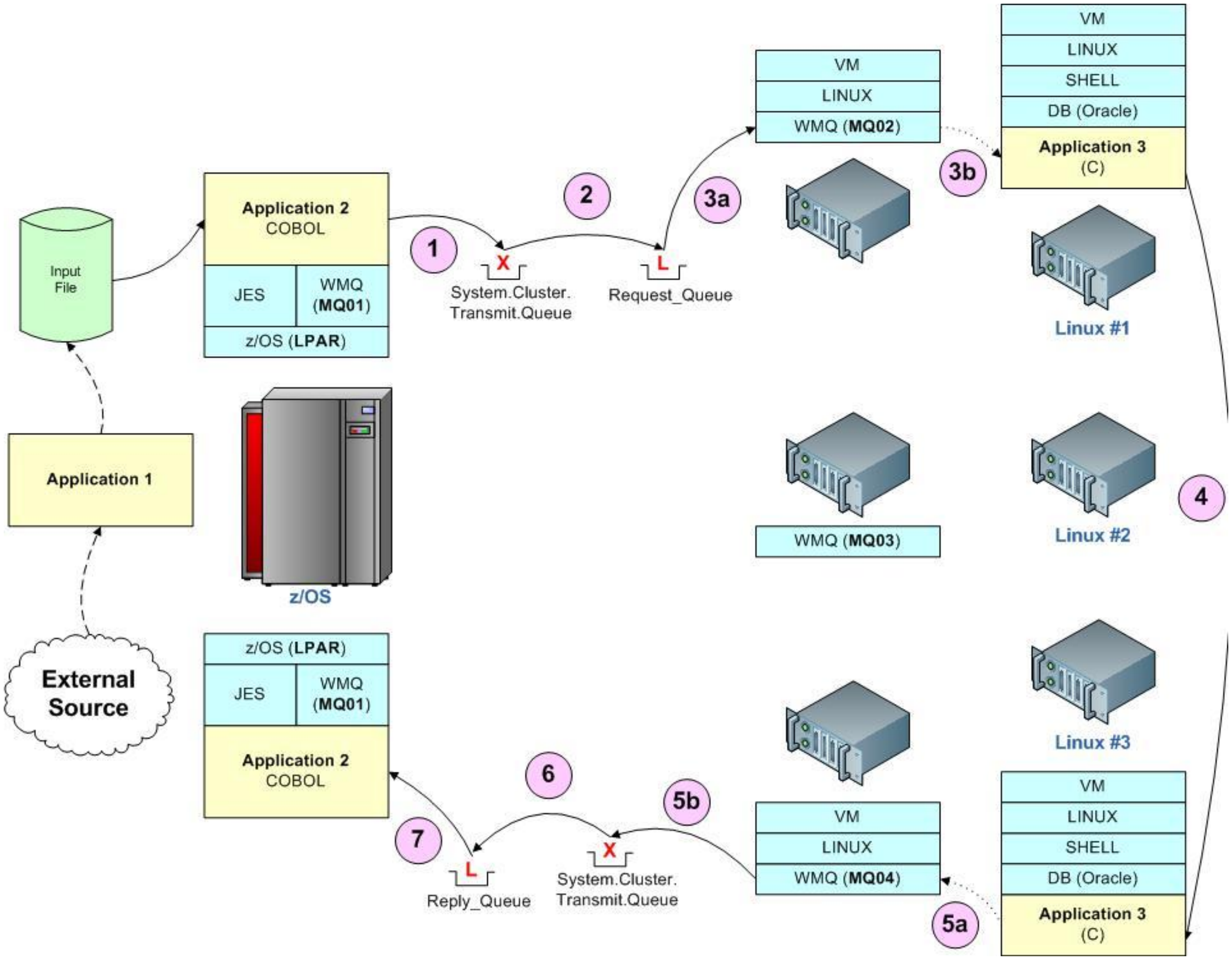


Processing Model – Scope Considerations

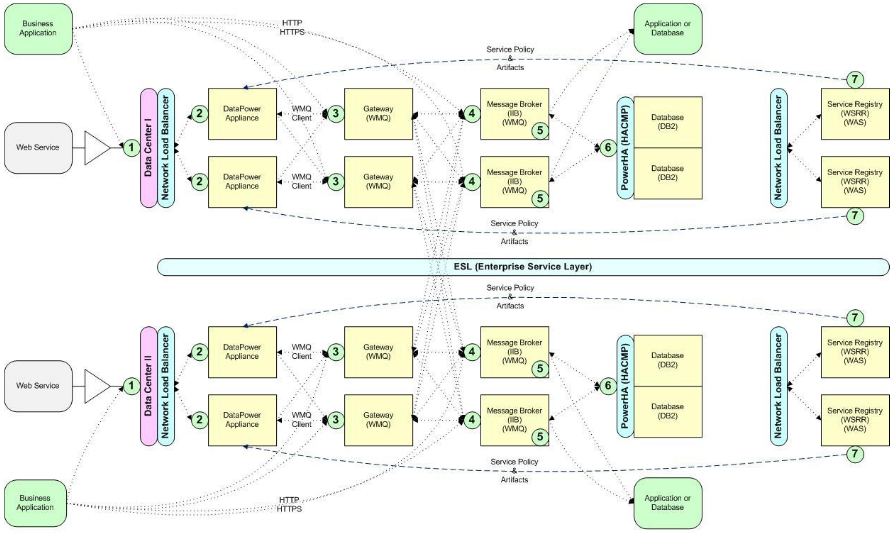
N O T E S

- App – MQ – App
  - Single Queue Manger (e.g. Message Broker Flows)
  - Reading and Writing processes executing concurrently
  - Number of both Reading and Writing threads can vary
- App – MQ – MQ – App
  - Multiple Queue Mangers (e.g. Front-End to Back-End)
  - May or may not have Clustering
  - Number of both Reading and Writing threads can vary
- App – MQ
  - Write Only
  - Single Queue Manger (e.g. Publisher)
  - Number of Writing threads can vary
- MQ– App
  - Read Only
  - Single Queue Manger (e.g. Subscriber)
  - Number of Reading threads can vary
- Writing Application Behavior
  - Post (e.g. Publish)
  - Request Reply

WMQ Process Model – Sample #1



WMQ Process Model – Sample #2



(1) Benchmark load into a NLB URL. Web Calls per second from a single source (e.g. single TCP/IP socket).
Benchmark load into a NLB URL. Web Calls per second from multiple sources (e.g. multiple TCP/IP sockets).

(2) Benchmark load into a single DataPower appliance. Web Calls per second from a single source (e.g. single TCP/IP socket).
Benchmark load into a single DataPower appliance. Web Calls per second from multiple sources (e.g. multiple TCP/IP sockets).

(3) Benchmark asynchronous load (Datagram) into a single Gateway Queue Manager MQI Channel. WMQ Puts per second from a single source/thread (e.g. single Backend Handler).
Benchmark load into a single Gateway Queue Manager MQI Channel. WMQ Puts per second from multiple sources (e.g. multiple Backend Handlers).
Benchmark load into a multiple Gateway Queue Manager MQI Channels. WMQ Puts per second from multiple sources (e.g. multiple Backend Handlers).
Repeat tests for synchronous Request/Reply loads (Put & Get with wait).

(4) Benchmark asynchronous load into a single Message Broker Queue Manager (One channel). WMQ Puts per second from a single source (Transmit Queue). (1K payload).
Benchmark asynchronous load into a single Message Broker Queue Manager (Two channels). WMQ Puts per second from a multiple sources (Transmit Queues). (1K payload).
Benchmark asynchronous load into a two Message Broker Queue Managers (Two channels). WMQ Puts per second from a multiple sources (Transmit Queues). (1K payload).
Benchmark asynchronous load between a single Gateway and Broker across the Data Centers. WMQ Puts per second from a single source (Transmit Queue) (1K payload).
Benchmark asynchronous load between a single Gateway and Broker across the Data Centers. WMQ Puts per second from multiple sources (Transmit Queues) (1K payload).

(5) Benchmark asynchronous load (Datagram) into a single Message Broker Execution Group. WMQ Gets per second from a single source (Local Queue).
Benchmark asynchronous load (WMQ Datagram) into multiple Message Broker Execution Groups. WMQ Gets per second from a single source (Local Queue).
Benchmark synchronous load (Request/Reply) into a single Message Broker Execution Group. WMQ Get with Puts per second from a single source (Local Queue).
Benchmark synchronous load (Request/Reply) into multiple Message Broker Execution Groups. WMQ Get with Puts per second from a single source (Local Queue).
Benchmark asynchronous load (SOAP Calls) into a single Message Broker Execution Group. Calls per second from multiple sources (TCP/IP Sockets).
Benchmark asynchronous load (SOAP Calls) into a single Message Broker Execution Group. Calls per second from a single source (TCP/IP Socket).

(6) Benchmark SQL Calls into a single table. SQL operations per second from a single source (thread). (Create, Read, Update, Delete).
Benchmark SQL Calls into a single table. SQL operations per second from a multiple sources (threads). (Create, Read, Update, Delete).

(7) Benchmark WSRR Calls to a single node. Calls per second from a single appliance (thread).
Benchmark WSRR Calls to a single node. Calls per second from multiple appliances (threads).

Performance Benchmarking

Infrastructure Benchmarking – Execution I

N O T E S

- Benchmarking Goals
  - Identify Key Bottlenecks at the component/thread level
  - Evaluate horizontal scaling solutions for bottlenecks
  - Establish baseline performance numbers
    - Infrastructure
    - Application
- Benchmark Infrastructure First
  - WMQ & Message Broker Capacities
  - Test Load Generation
    - Begin with single thread generating messages
    - Add threads until backlog develops (e.g. Queue Depth > 0)
  - Horizontally Scaling Behavior
    - Adding Queue Managers (Clustering)
    - Adding Channels (Parallel Processing)
  - Traffic Behavior
    - Client Bindings versus Server Bindings
    - Persistent versus Non-persistent messages
    - Small Message sizes versus Large Message sizes

Infrastructure Benchmarking – Execution II

N O T E S

- Test Execution
  - Leave End-to-End tests for last (unless a “smoke test” is needed first)
  - Test Performance Model one hop at a time
    - Tests are simpler to understand and execute
    - Results illustrate basic capacities and bottlenecks
    - This approach tends to more easily identify tuning opportunities
- Test Tools
  - WebSphere MQ Settings
    - MonQ and MonChl
  - MA01 SupportPac (“Q” program) by Paul Clarke
    - A “must have” tool.
    - Easily generates single-threaded test loads.
    - Can act as a back-end application for Request/Reply testing.
  - MH04 SupportPac (“xmqstat” program) by Oliver Fisse
    - Another “must have” tool.
    - Summarizes queue statistics over duration of test.
  - SoapUI & LoadUI
    - Generate Web Service requests.

SupportPac MA01 – “q”

N O T E S

- Overview
  - Queue I/O tool
  - Category 2 SupportPac (“As Is” – no official IBM Support)
  - Authored by Paul Clarke of MQGem (formerly of IBM Hursley Laboratory)
  - Single executable to download; available for most Windows and UNIX platforms
  - More options than you will ever need (The Swiss Army knife of WMQ)
- Usage
  - Processing controlled by flags
    - WMQ Connection (Client or Server bindings)
    - Input and Output (File, Queue, Stdin, Stdout)
      - Each record from stdin equates to either one command or one message
    - MQ API Options (e.g. Persistence, Priority, etc.)
  - Input Data
    - Messages to be processed
    - Commands to the ‘q’ program
    - Input data may be “piped” into the command (Stdin)
      - echo “#!100000/1024 Test Message” | q –m *qmgrName* –O *queueName*

SupportPac MA01 – “q” (continued)

N O T E S

- Invocation Examples
  - q -m *QmgrName* -I *InQueue* -O *OutQueue* *(Queue → Queue)*
  - q -m *QmgrName* -f *InFile* -O *OutQueue* *(File → Queue)*
  - q -m *QmgrName* -I *InQueue* > *OutFile* *(Queue → File)*
  - q -m *QmgrName* -O *QueueName* *(Stdin → Queue)*

- Input Commands
  - “#” → First character indicates this is a command and not a message
  - ! → Second character indicates not to echo the command to ouput (optional)
  - 9999 → Number of messages to generate
  - /9999 → Size of message to be generated (Optional)
  - xxx → Text of message

- Queue name specification
  - Queue Name may be preceded by a Queue Manager name
  - Name separator characters (use only one)
    - : “#”, “/”, “\”, or “,”

SupportPac MA01 – "q" (continued)

N O T E S

- Request Reply – Generating Request messages
  - q -m *QmgrName* -O *RemoteQmgr#RequestQueue* *-r ReplyToQmgr#ReplyToQueue* -apR
    - Puts message to a request type queue on a remote Queue Manager
      - Messages are put as Request messages (-aR)
      - Messages are put as Persistent (-ap)
      - Messages specify to the "Reply To" Qmgr and Queue (-r)

- Request Reply – Generating Reply messages
  - q -m *QmgrName* -l *RequestQueue* *-E* –apr -w 300
    - Gets request message and generates a reply message
      - Messages are put as Reply messages (-ar)
      - Messages are put as Persistent (-ap)
      - Messages are written to the "Reply To" Qmgr and Queue (-E)
      - Process will wait for incoming messages 5 minutes (-w 300)

- See slide notes for many additional parameters

- Better yet, see the MA01 readme.txt file!

SupportPac MH04 - xmqstat

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- Overview
  - Queue Statistics monitoring and reporting tool
  - Category 2 SupportPac (“As Is” – no official IBM Support)
  - Authored by Oliver Fisse of IBM Software Group (ISSW)
  - Some minor configuration is required.

- Reported Data
  - Time → Current Time
  - OIC → Open Input Count (Number of input handles; e.g. reading threads)
  - OOC → Open Output Count (Number of output handles; e.g. writing threads)
  - MxML → Maximum Message Length
  - MEC → Message Enqueue count (Number of messages written)
  - MDC → Message Dequeue count (Number of messages read)
  - UNC → Uncommited messages (at end of monitoring interval)
  - QCD → Current Queue Depth (at end of monitoring interval)
  - MxQD → Maximum Queue Depth (during monitoring interval)
  - GET → Get Enabled/Disabled
  - PUT → Put Enabled/Disabled

SupportPac MH04 – xmqstat (continued)

N O T E S

- Extended Reported Data (-e option)
  - PQF → Percentage Queue Full (during monitoring interval)
  - TQF → Time to Queue Full (at present enqueue rate)
  - TQE → Time to Queue Empty (at present dequeue rate)
  - The following extended data requires Queue Monitoring (MonQ) to be turned on
    - QOM → Queue Oldest Message (Age of oldest message in queue)
    - OQTS → Output Queue Time (Short) – Average time messages spent in queue
    - OQTL → Output Queue Time (Long) – Average time messages spent in queue
- Application Handle Information Reported (-h option)
  - Data displayed as per DIS QS(*queue*) TYPE(HANDLE)
- Key Parameters
  - -d Duration to collect statistics (in Seconds)
  - -e Extended statistics (some require MONQ enabled)
  - -f File name to write statistics to (default is stdout)
  - -h Display information about Application Handles
  - -i Statistics collection interval (in Seconds)
  - -m Queue Manager name
  - -q Queue name
  - -s Suppress display if no activity during interval
  - -t Display time

SupportPac MH04 – xmqstat (continued)

N O T E S

- Queue Manager Connection Parameters
  - -v Use the *MQSERVER* environment variable for client connection
  - -c Channel name to use for Client Connection
  - -x ConnectionName (”address(port)”)

- Invocation Examples
  - xmqqstat -m *Qmgr* -q *Queue* -d 300 -i 60 -h -e -s -t
    - Connect to local Queue Manager using Server bindings
    - Collect statistics on *Queue* on *Qmgr* (-m and –q)
    - Collect statistics for 5 minutes (-d)
    - Reportstatistics every minute (-i)
    - Display Handle information (-h)
    - Collect extended statistics (-e)
    - Don’t report an interval if there is no activity (-s)
    - Display the time (-t)
  - xmqqstat -c *SYSTEM.DEF.SVRCONN* -x *hostname(1414)* -m *Qmgr* -q *Queue* …
    - Connect to server hostname using port1414 (-x)
    - Use SYSTEM.DEF.SVRCONN channel (-c)

- Notes
  - Use Ctrl-C to stop execution

SupportPac MH04 – xmqstat (continued)

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```
C:\MQ>xmqqstat -m TEST -q TEST -i 1 -s -t -h
Xmqqstat v1.1 - Developed by Oliver Fisse (IBM)

Connected to queue manager 'TEST'

PLATFORM(WINDOWS NT) LEVEL(701) CCSID(437)
MAXHANDS(256) MAXMSGL(4194304) MAXPRTY(9) MAXUMSGS(250000) MONQ(HIGH)

Processing LOCAL queue 'TEST'

DESC()
CRDATE(2010-09-09) CRTIME(15.29.02) ALTDATE(2010-10-03) ALTTIME(09.14.32)
CLUSTER() CLUSNL() DEFBIND(OPEN)
BOTHRESH(0) BOQNAME()
MONQ(QMGR) USAGE(NORMAL) NOTRIGGER


 Dumping 1 handle(s)...

    PID    TID    AT   CHL/APPL TAG/CONN     USER ID                    B INP I O S
 ---------------------------------------------------------------------------------
     7968     0 USER                         Administrator@IBM-6AE723B N  NO N Y N
                   ere MQ\java\jre\bin\java.exe


    Time          MxML        MxQD G P    OIC     OUC       MDC      MEC    UNC        CQD
 ---------------------------------------------------------------------------------
  10:19:09     4194304    2500000 E E      0       1         0     6300      0       6300
  10:19:10     4194304    2500000 E E      0       1         0      350      0       6650
  10:19:11     4194304    2500000 E E      0       1         0        0      0       6650
  10:19:12     4194304    2500000 E E      0       1         0      350      0       7000
  10:19:14     4194304    2500000 E E      1       1      7000        0      0          0
  10:19:15     4194304    2500000 E E      1       1       350      350      0          0
  10:19:16     4194304    2500000 E E      1       1         0        0      0          0
  10:19:17     4194304    2500000 E E      1       1       350      350      0          0
  10:19:18     4194304    2500000 E E      1       1         0        0      0          0
  10:19:19     4194304    2500000 E E      1       1       350      350      0          0
  10:19:20     4194304    2500000 E E      1       1         0        0      0          0
  10:19:21     4194304    2500000 E E      1       1       350      350      0          0
  10:19:22     4194304    2500000 E E      1       1         0        0      0          0
  10:19:23     4194304    2500000 E E      1       1       303      316      0         16
  10:19:24     4194304    2500000 E E      1       1        47       34      0          0
  10:19:25     4194304    2500000 E E      1       1        18       62      0         40

Control-C caught. Shutting down...

Disconnected from queue manager 'TEST'
Xmqqstat v1.1 ended.
```

Application Benchmarking

N O T E S

- Far more difficult than Infrastructure testing!
  - Requires co-ordination with one or more Application teams
    - Communications
    - Scheduling
  - May require data setup and/or cleanup for each test
  - More resource intensive; fewer iterations
- End-to-End Testing
  - Different groups and tools collecting data
  - Difficult to correlate all of the different data
  - Frequently, too many cooks in the kitchen!
  - Not very useful for fine grained analysis and tuning
  - However, essential to benchmark application throughput and latency
- Latency versus Capacity
  - Latency → The round trip time of a single transaction
  - Capacity → The number of transaction per period of time (Seconds, Minutes, Days, etc)
- IBM Performance Reports
  - Don’t forget to compare your results against IBMs!

Key Performance Indicators (KPIs)

N O T E S

- API Puts - Calls/Second; Bytes/Second
  - First set of tests with no threads reading messages.
  - Second set of tests with threads reading messages.
    - Keep queue depth close to or equal to zero.
  - Single Thread – 1K message size.
  - Multiple Threads – 1K message size.
  - Run Tests with Large Messages (e.g. 10 MB).
    - Keep an eye on disk space utilization.
  - Evaluate horizontal scaling (e.g. adding threads).
  - Keep an eye on queue depths and disk space usage.
  - Clean up messages after the test.
- API Gets - Calls/Second; Bytes/Second
  - Single Thread – 1K message size.
  - Multiple Threads – 1K message size.
  - Run Tests with Large Messages (e.g. 10 MB).
- Message Channels
  - Messages/Second; Bytes/Second
  - Add additional channels and transmission queues to test scaling options

Next Steps

What's Next?

N O T E S

- Out of the scope of this presentation
  - But come back next year for Part II
- Essential parts of the overall Performance Analysis Process
  - So definitely come back next year
- Tuning
  - Iterative process
  - Infrastructure Tuning (Channels) & Application Tuning (Architecture, Design, and Programming)
  - Requires considerable WMQ knowledge
    - Application Design and Programming
    - WMQ Internal Processing
    - WMQ Data Gathering (measurements) & Testing tools
  - Results are sometimes counter-intuitive
- Capacity Planning
  - With benchmarks in place, overall system capacity can be estimated
  - Will capacity meet business requirements and/or SLAs?
  - Will capacity handle peak loads?
- Monitoring
  - Now that you know how it will break, monitor to determine when it will break!
  - Proactive upgrades before the Production outage takes place.

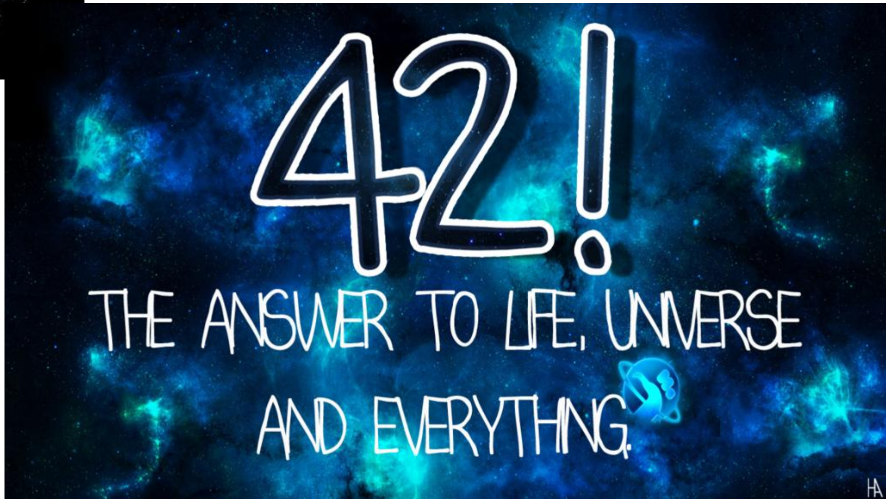
Conclusions

Key Takeaways

N O T E S

- WMQ processing is asynchronous
  - Some application processes are “Writers”
  - Some application processes are “Readers”
  - Speed of writers unrelated to speed of readers
- Applications Scale Horizontally
  - Applications increase capacity by adding additional instances
    - Application Instances (e.g. Application Servers)
    - Application threads
- When capacity of “Readers” exceeds capacity of “Writers”
  - Performance is at maximum throughput
  - Messages are processed in memory
  - Queue Depths are at or near zero
- When capacity of “Writers” exceeds capacity of “Readers”
  - Performance is at minimum throughput
  - Messages are processed from disk
  - Queue Depths are increasing

Deep Thoughts



Questions & Answers

Presenter

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- Computer Science Background
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  - Adjunct Professor in Information Systems, Golden Gate University, San Francisco
- WebSphere MQ Background (20 years plus)
  - IBM Business Enterprise Solutions Team (BEST)
    - Initial support for MQSeries v1.0
    - Trained and mentored by Hursley MQSeries staff
  - IBM U.S. Messaging Solutions Lead, GTS
  - Platforms Supported
    - MVS aka z/OS
    - UNIX (AIX, Linux, Sun OS, Sun Solaris, HP-UX)
    - Windows
    - iSeries (i5OS)
  - Programming Languages
    - C, COBOL, Java (JNI, WMQ for Java, WMQ for JMS)

Reference Material

- IBM Developer Works
  - Tuning for Performance
    - http://www.ibm.com/developerworks/websphere/library/techarticles/0712_dunn/0712_dunn.htmlText
- IBM SupportPacs
  - http://www-01.ibm.com/support/docview.wss?rs=977&uid=swg27007205
  - Performance Reports (MPxx)
    - READ THESE!!! They have lots of information NOT FOUND ELSEWHERE!
    - http://www-01.ibm.com/support/docview.wss?rs=171&uid=swg27007150&loc=en_US&cs=utf-8&lang=en
  - MA01 SupportPac (“q”)
    - http://www-01.ibm.com/support/docview.wss?rs=171&uid=swg24000647&loc=en_US&cs=utf-8&lang=en
  - MH04 SupportPac (“xmqstat”)
    - http://www-01.ibm.com/support/docview.wss?rs=171&q1=Xa02&uid=swg24025857%20&loc=en_US&cs=utf-8&lang=en

MQ Performance Analysis