What's new in IBM MQ?

David Ware
IBM MQ Chief Architect

IBM MQ

Celebrating
25 years

IBM MQ is *the* solution for business critical messaging

Your bank transfers complete without losing your money, with **all of the worlds top 50 banks using IBM MQ**[*]

The world depends on reliable, secure messaging and **85% of the fortune 100 depend on IBM MQ**[*]

Celebrating
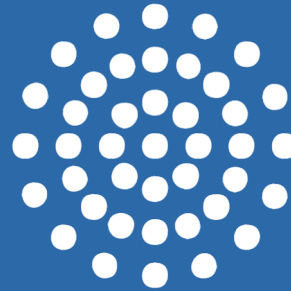
25
years

$$1 + 1 = 2$$

Simple

✔

Reliable

Precise

2

IBM MQ is *the* solution for business critical messaging

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25
years

[*]Correct as of end 2016 against http://www.relbanks.com/worlds-top-banks/assets and http://beta.fortune.com/fortune500/list/

Scalable

Connected

Secure

Run IBM MQ in any location or cloud exactly as you need it

IBM MQ

Celebrating 25 years

On-premise, software and the MQ Appliance

IBM Z
Linux
AIX
Windows
Solaris
HPE
IBMi
Appliance
. . .

Run it yourself in any cloud, public or private

AWS

IBM Cloud

Azure

IBM Cloud Private

Private cloud

Let IBM host it for you with its managed SaaS MQ service in public cloud

new

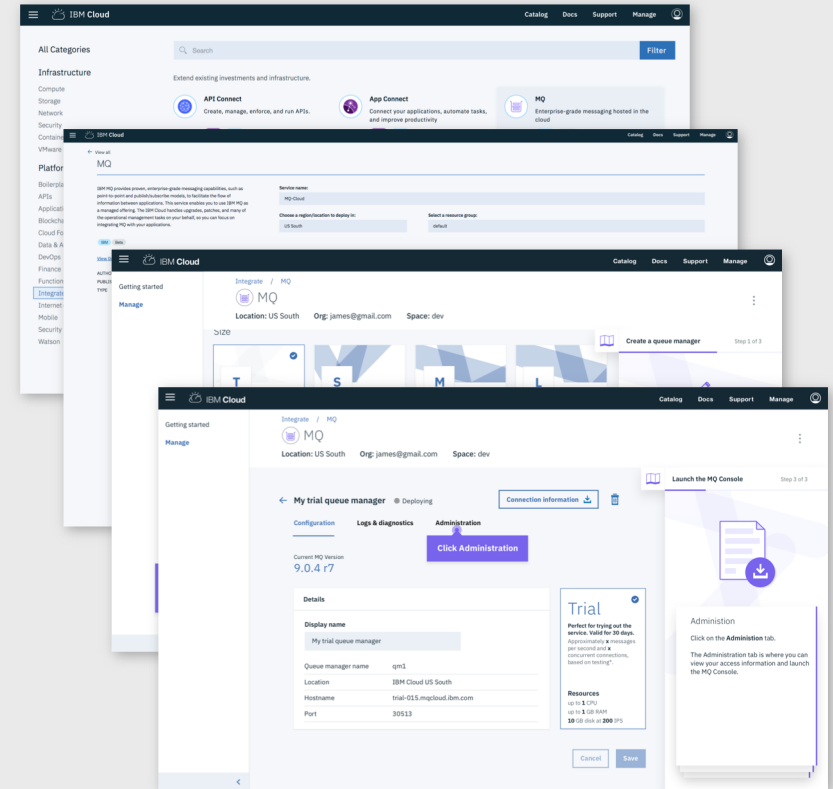MQ on Cloud

MQ on Cloud
MQ as a Service

MQ on Cloud

Have IBM provision your queue managers directly into the Cloud

IBM owns the infrastructure and the responsibility to keep the systems up to date and running

The user owns the configuration and the monitoring of the messaging

Try the service for free
www.ibm.com/cloud/mq

6

MQ on Cloud

MQ on Cloud queue managers can now be provisioned onto infrastructure in **IBM Cloud** and **AWS** ensuring that MQ is exactly where you need it - close to your applications.

new

Bring your own license to the Cloud

MQ in Containers

MQ has been supporting Docker containers since 2015 with images on Docker Hub and Docker Store and sample setups on Github

MQ provides Helm charts for deploying MQ into Kubernetes platform, on-prem or on cloud, such as IBM Kubernetes Service

MQ Advanced is available as a fully supported product with **IBM Cloud Private**

deploy IBM certified software containers into an IBM provided Kubernetes platform or an existing Red Hat OpenShift

new
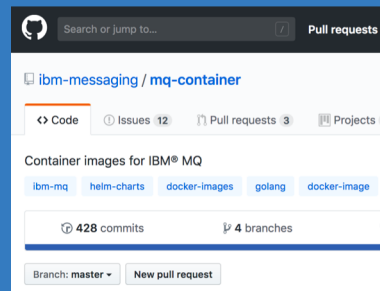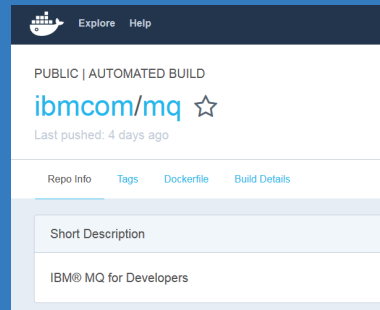
github.com/
ibm-messaging/
mq-container

© 2018 IBM Corporation

Hourly licensing

IBM has introduced the ability to purchase an entitlement based on the container size in Virtual Processor Cores and the number of hours that MQ was deployed in each container

New for MQ 9.1

Pre-purchase *core hours*

Use the hours as needed, whether that's constant or varies across the day, week or year.
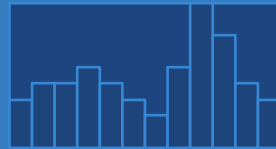
Traditional licensing
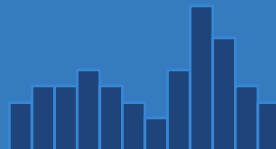
Hourly licensing

Fully portable

Deploy containers wherever and whenever you want, and move them with ease

Available for Docker containers (including Kubernetes and OpenShift) both on-prem and in the cloud

No ILMT requirement

On-prem metering service provided in IBM Cloud Private used to track usage

metering

© 2018 IBM Corporation

Continuous delivery of new MQ capabilities

IBM MQ: long term support and continuous delivery

| 2014 | 2015 | 2016 | 2017 | 2018 |

V8.0 V9.0 LTS V9.0.1 CD V9.0.2 CD V9.0.3 CD V9.0.4 CD V9.0.5 CD

IBM MQ Appliance
M2000

IBM MQ Appliance
M2001

MQ on IBM Cloud

In 2016 MQ introduced a dual Long Term Support and a Continuous Delivery model
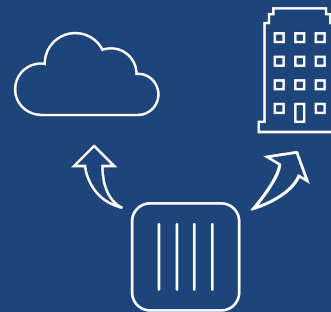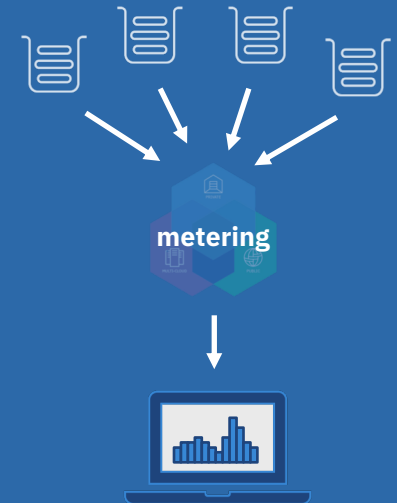
© 2018 IBM Corporation

Continuous Delivery

New CD versions of MQ are released approximately every four months, incrementally introducing new product capabilities.

Intended for those that can continually integrate.

Long Term Support

Approximately every two years a new LTS version is released, rolling up many of the CD capabilities into a release with 5+3 support attached.

Required by those looking for fixed function.

Mix and Match

Both are available under the same license.

Both can interoperate, just like any previous version of MQ.

IBM MQ: long term support and continuous delivery

2017   2018   2019   2020

V9.0.1 CD   V9.0.2 CD   V9.0.3 CD   V9.0.4 CD   V9.0.5 CD   V9.1 LTS   V9.1.1 CD   V9.1.2 CD   V9.1.3 CD   ...

...iance

MQ on IBM Cloud

From 9.1, CD releases are supported for **12 months** from the date of GA

In 2016 MQ introduced a dual Long Term Support and a Continuous Delivery model

Continuous Delivery

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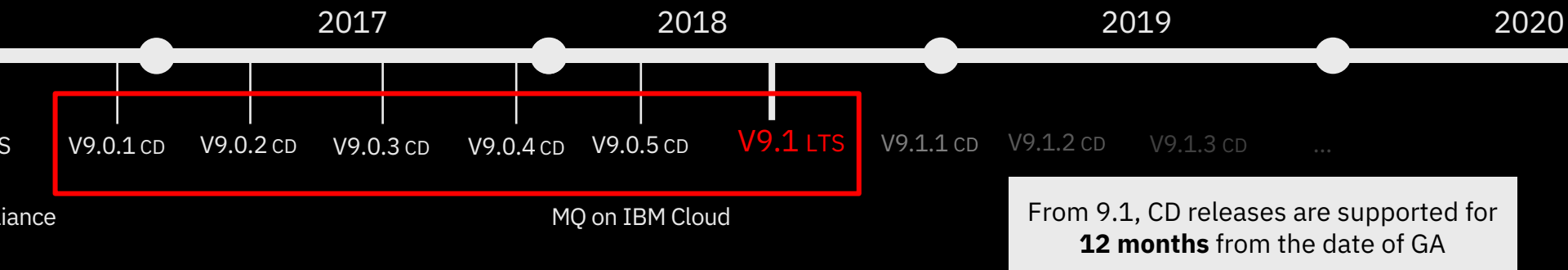
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The function previously delivered in the 9.0.x CD releases is now available in the long term support release **V9.1 LTS**

MQ 9.0.x CD content, available with V9.1 LTS

Replicated Data Queue Manager for MQ Advanced	Linear logging automation and performance	RESTful administration	Error log formatting	Web Console	RESTful messaging
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High availability and disaster recovery

Replicated Data Queue Manager for MQ Advanced	Linear logging automation and performance	RESTful administration	Error log formatting	Web Console	RESTful messaging
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HA, there are no excuses

MQ delivers HA through the ability to build horizontally scaled, active-active systems and typically **active-passive HA** of the data itself*, the messages.

Traditionally active-passive HA has been achieved through **HA clusters** or **multi instance** queue managers. Both rely on highly available infrastructure to be setup and relied on.

The **MQ Appliance** changed this with a fully integrated HA solution, providing built in machine to machine data replication and failover.

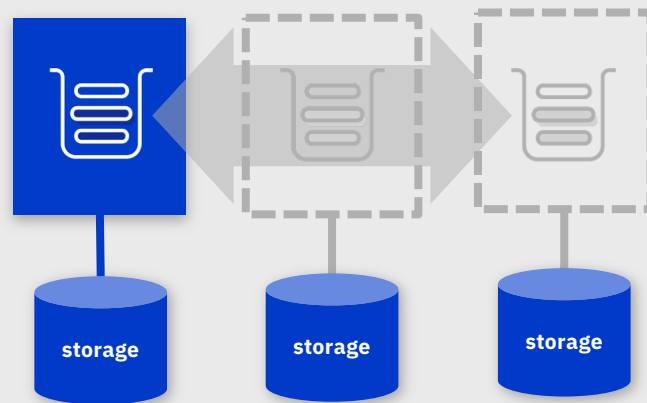* z/OS shared queue provides active-active HA of the message data!

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* z/OS shared queue provides active-active HA of the message data!

Replicated Data Queue Managers

Linux only, MQ Advanced HA solution with no need for a shared file system or HA cluster

MQ configures the underlying resources to make setup and operations natural to an MQ user
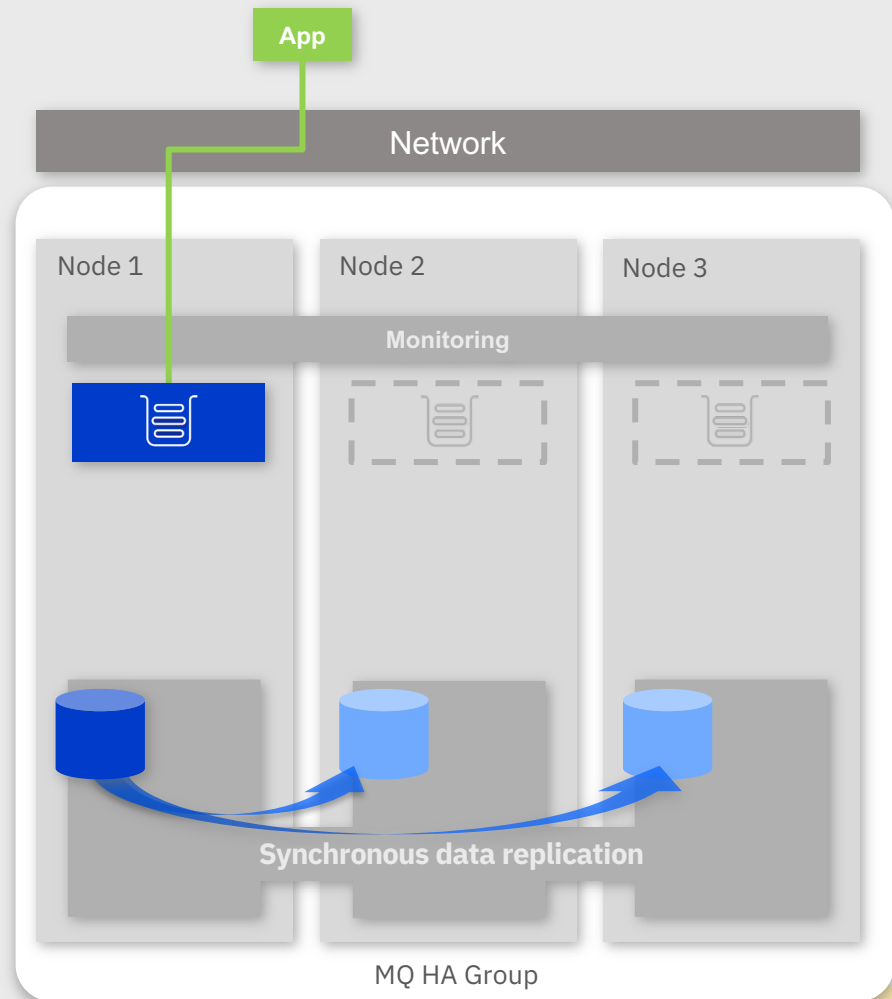
Three-way replication for quorum support

Synchronous data replication for once and once only transactional delivery of messages

Active/passive queue managers with **automatic takeover**

Per queue manager control to support active/active utilisation of nodes

Per queue manager **IP address** to provide simple application setup

Supported on **RHEL v7 x86-64 only**

App

Network

Node 1   Node 2   Node 3

Monitoring

Synchronous data replication

MQ HA Group

MQ Advanced for RHEL x86-64

21

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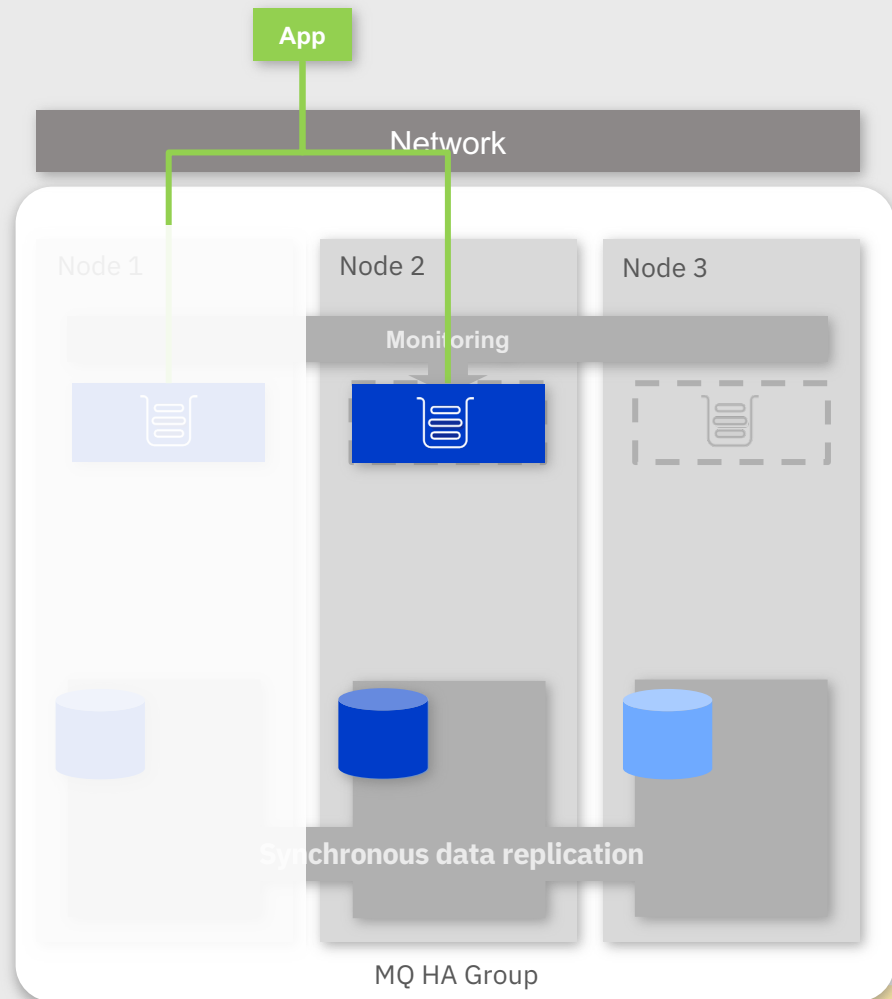
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App

Network

Node 1

Node 2

Node 3

Monitoring

Synchronous data replication

MQ HA Group

MQ Advanced for RHEL x86-64

22

Replicated Data Queue Managers

Recommended deployment pattern:

Spread the workload across multiple queue managers and distribute them across all three nodes

Even better, more than one queue manager per node for better failover distribution

Use MQ Clusters for additional routing of messages to work around problems

MQ **licensing** is aligned to maximise benefits

One full **IBM MQ Advanced** license and two **High Availability Replica** licenses (previously named *Idle Standby*)

MQ Advanced for RHEL x86-64

23

App   App   App

Network

Node 1   Node 2   Node 3

MQ HA Group
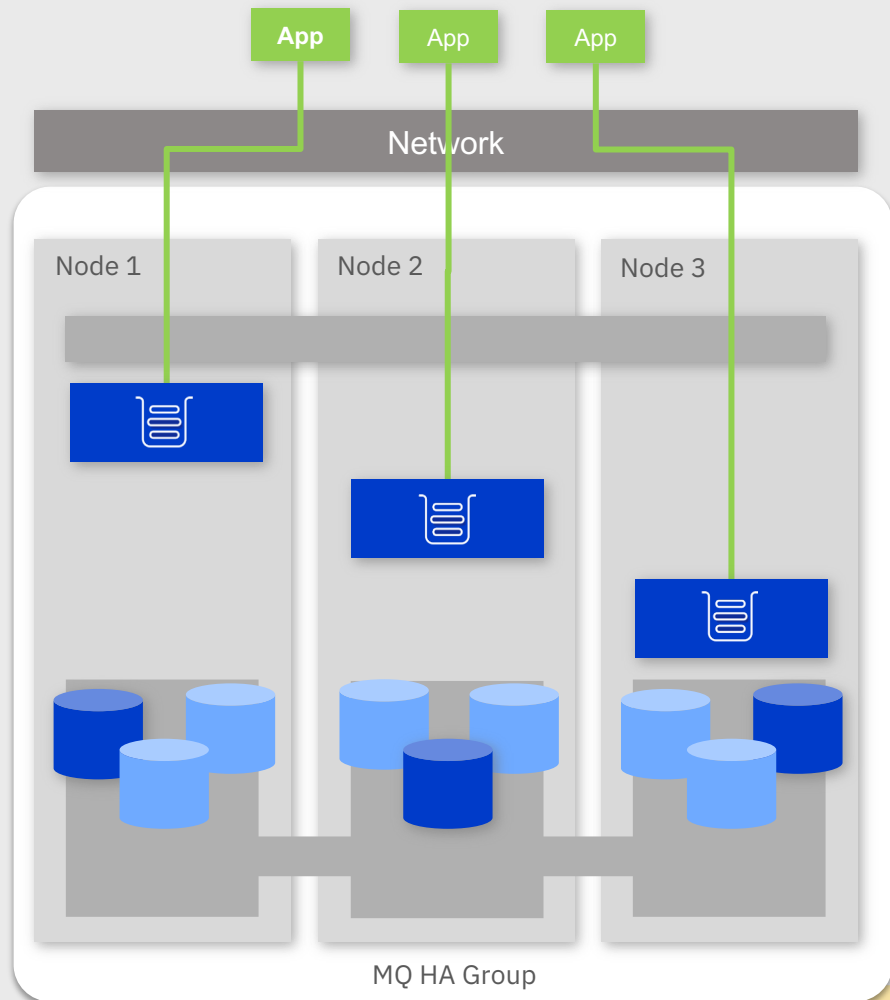
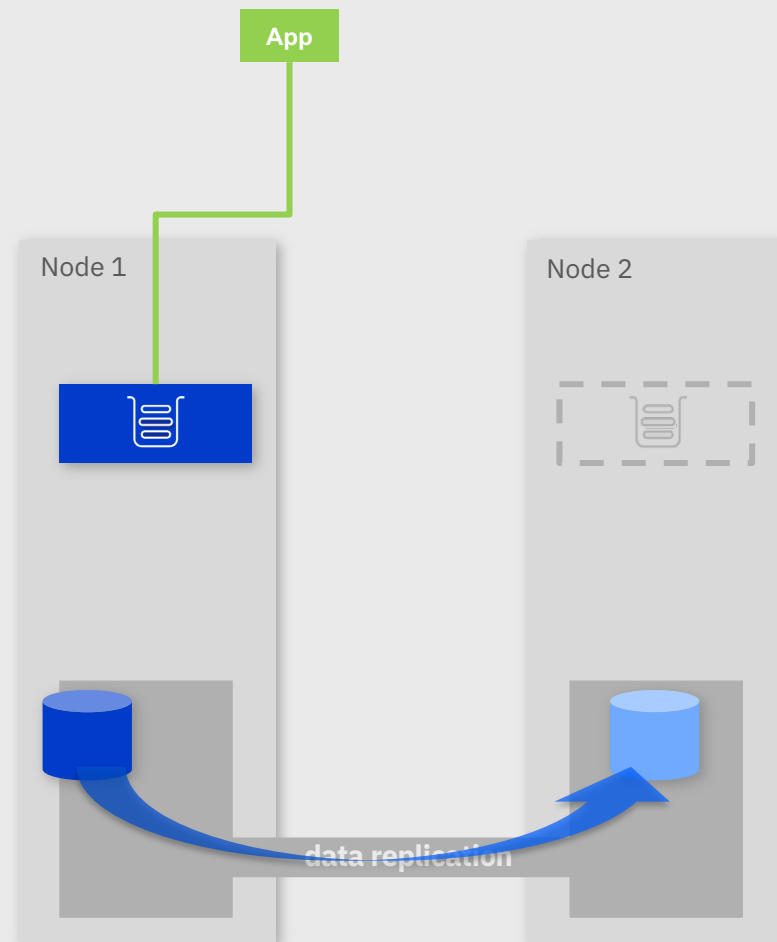# Replicated Data Queue Managers

Manual failover

9.0.5 CD MQ Advanced adds the ability to build a looser coupled pair of nodes for data replication but no automatic failover, typically for **Disaster Recovery**

Data replication can be

Asynchronous for systems separated by a high latency network

Synchronous for systems on a low latency network

No automatic takeover means no need for a third node to provide a quorum

26

App

Node 1

Node 2

data replication

MQ Advanced for RHEL x86-64

Supporting developers

Replicated Data Queue Manager for MQ Advanced	Linear logging automation and performance	RESTful administration	Error log formatting	Web Console	RESTful messaging
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Mission Statement

To enable a user instructed to use MQ for the first time, to go from zero understanding to running a sample application in a sandbox environment with a fundamental understanding of MQ concepts in two hours

To enable an application developer, instructed to use MQ for the first time, to go from zero understanding to writing their first MQ application in the language and environment of their choice within an afternoon

LearnMQ

Finding it hard to get developers started with MQ?

Point them to:

developer.ibm.com/ messaging/learn-mq

Totally new to MQ? Learn the basics

Step-by-step guide to getting up and running with MQ

Tutorials on building your applications

Developing with MQ

MQ JMS jars available through Maven

mvnrepository.com/artifact/
com.ibm.mq/com.ibm.mq.allclient

New open source language bindings for MQI

github.com/ibm-messaging/mq-mqi-nodejs
github.com/ibm-messaging/mq-golang

Redistributable clients available over direct download

ibm.biz/mqclientdownload

Spring Boot starter for MQ

ibm.biz/mqspringboot

RESTful messaging

MQ supports multiple protocols and APIs

HTTP and REST are the de facto standard for simple, micro service, applications

Messaging over REST provides *good enough* messaging for many applications and an excellent way to get data into a real messaging system as quickly as possible

MQ 9.0.4 delivered the first phase of the new REST messaging support. Providing a simple point-to-point messaging capability, integrated with the MQ installation

Simple messaging for near universal application use

HTTP

Traditional, high performance and rich interface

MQI

MQTT

Lightweight protocol for small devices

AMQP

Open standard protocol supporting open source clients
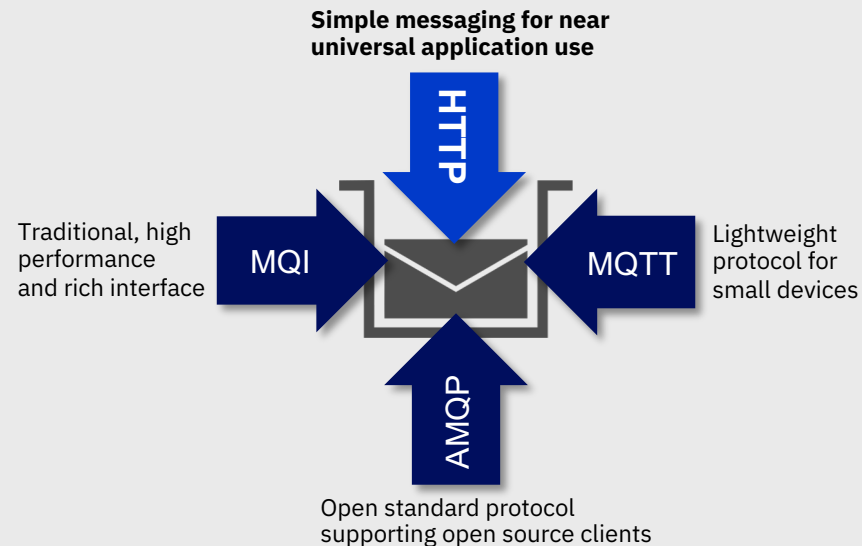
We see an ever growing need for messaging of many different types

Logging

Status

Errors

Request

Monitoring

Response

Updates

Which require a widening range of capabilities

Transient Data

Request / Reply

Targeted Reliable Delivery

Stream History

Scalable consumption
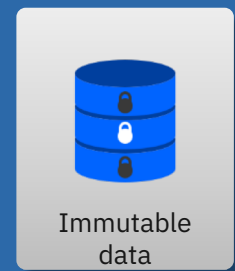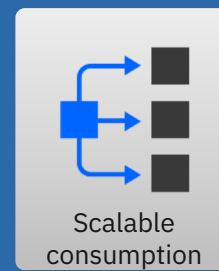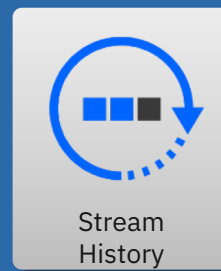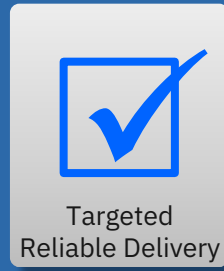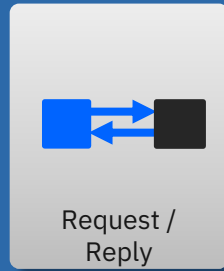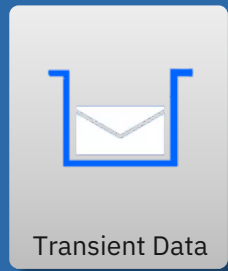
Immutable data

Special problems require specialised solutions

Transient Data | Request / Reply | Targeted Reliable Delivery

Business critical operations

Stream History | Scalable consumption | Immutable data

Event streaming

Announcing IBM Event Streams!

Apache Kafka for the Enterprise

Deploy **production ready Apache Kafka** onto IBM Cloud Private **in minutes**

Build intelligent apps on Kafka with the **confidence IBM is supporting you**
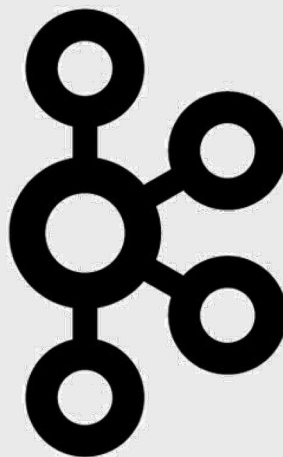
APACHE
kafka®

Rely on disaster recovery & security designed for **mission-critical use**

Exploit existing data to become a real Event Driven Enterprise

Connectivity

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Bridging to MQ

As well as connecting a wide array of applications directly to an MQ system, there are a growing set of bridges and connectors between MQ and external systems

Salesforce

Integrate MQ's publish/subscribe with Salesforce. Exchange **Salesforce events** and **MQ publications** using the MQ Bridge for Salesforce with no need for your backend applications to connect to Salesforce directly.

Salesforce

IBM **MQ**

Blockchain

Use MQ messages to query and update a Blockchain ledger. Connects to **Hyperledger** Fabric networks in IBM Cloud and locally. Supported for use with V9.0.x **MQ Advanced** queue managers

Blockchain

IBM **MQ**

Kafka

IBM MQ sink and source connectors are currently being openly developed by IBM and provides **as-is**, allowing you to connect your MQ systems with your Kafka clusters

www.confluent.io/product/connectors

Kafka

IBM **MQ**

Managing MQ

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MQ Web Console

Point a browser at the MQ installation to create and manage queue managers and their resources

Provides a very simple way to access MQ resources

The same solution for all forms of MQ

      MQ for Distributed

      MQ for z/OS

      MQ Appliance

      MQ on Cloud
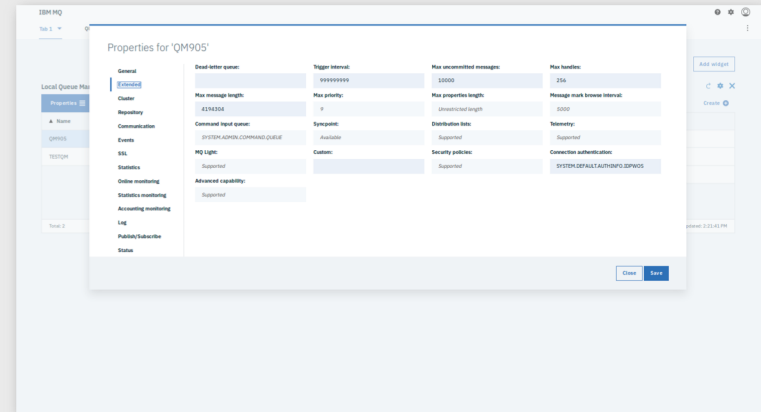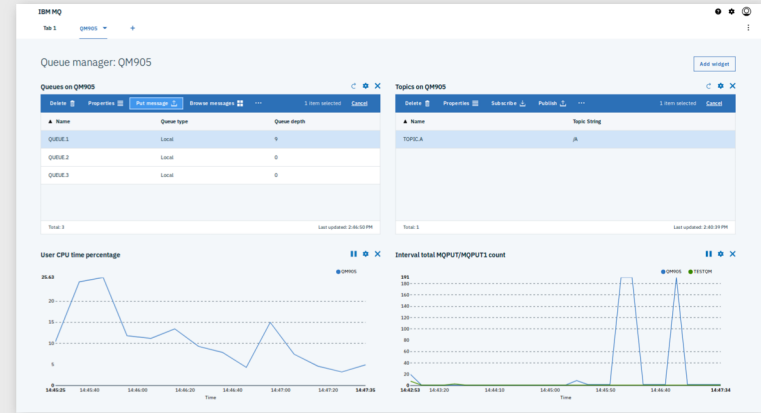
Restful administration

MQ has supported scripting and programmatic administration for many years, but it requires MQ knowledge and tooling.

MQ has been incrementally increasing support for RESTful administrative APIs to provide equivalents of what's available today with MQSC and PCF.

Being over **HTTPS** enables the embedding of MQ administrative operations into many environments and tools that previously would not be possible

HTTP   MQSC

HTTP	MQSC
POST send JSON	DEFINE
GET receive JSON	DISPLAY
PATCH send JSON	UPDATE
DELETE	DELETE

Two approaches

Per object REST

JSON payload a single
MQSC command

URL represents target
object for command

HTTPS POST:
https://host:port/ibmmq/v1/admin/qmgr/QM1/queue

```
{
  "name": "QUEUE.1",
  "type": "local",
  "cluster": {
    "name": "CLUSTER1" }
}
```

HTTP Response: 201

JSON payload when
defining/updating objects

HTTP response indicates
success/failure
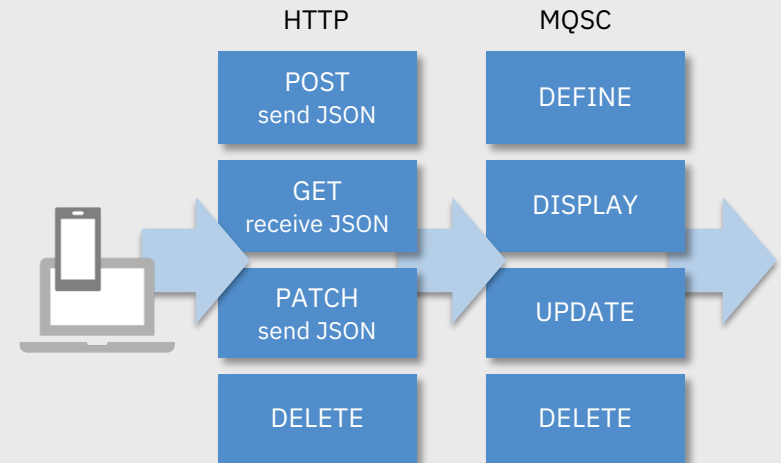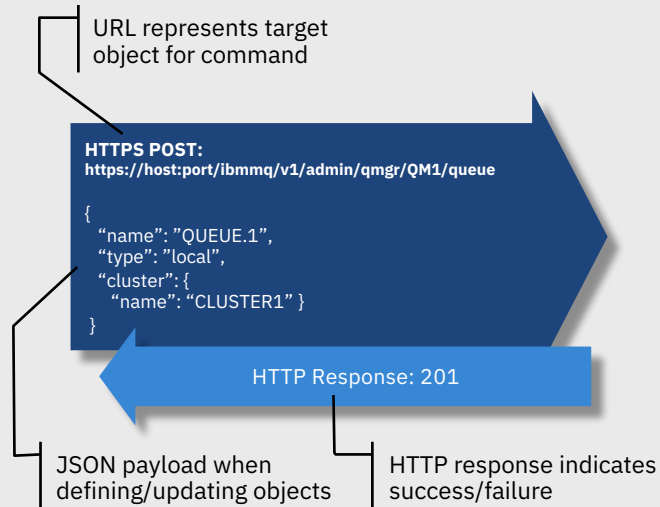
Native JSON based REST calls

MQSC over REST

JSON payload a single
MQSC command

Shared URL for all MQSC
command input

HTTPS POST:
https://host:port/ibmmq/v1/admin/action/qmgr/QMGR1/mqsc

```
{
  "type": "runCommand",
  "parameters": {
    "command": "STOP CHANNEL(CHANNEL.TEST)"
  }
}
```

```
HTTP Response: 201
{
  "commandResponse": [{
    "completionCode": 0,
    "reasonCode": 0,
    "text": ["AMQ8019: Stop IBM MQ channel accepted."]
  }],
  "overallCompletionCode" : 0,
  "overallReasonCode" : 0
}
```

JSON response contains MQSC
output
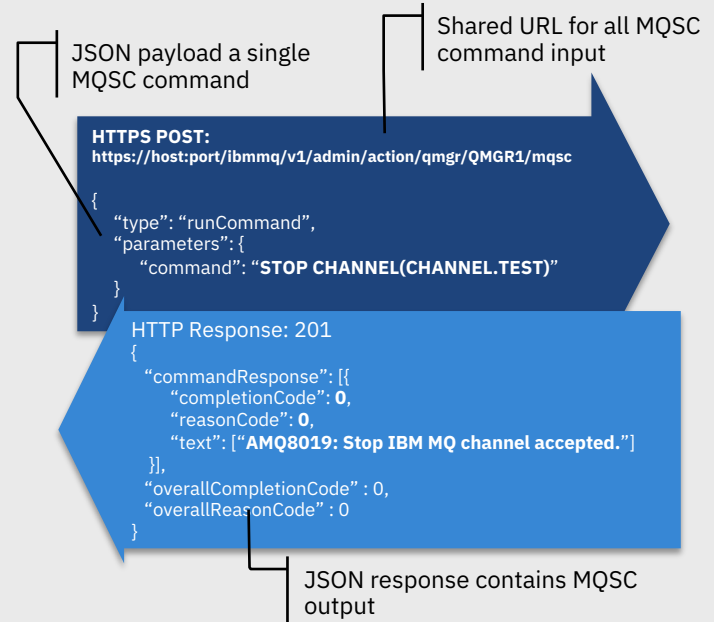
Direct MQSC command input over REST
MQSC output over REST, minimal parsing

Two approaches

Per object REST

MQSC over REST

- o Natural REST APIs
- o Restructured definitions to aid understanding
- o Further definition validation

- o Not a straight swap for existing users
- o **Incomplete coverage of MQ administration**

- o Simple mapping from existing scripts
- o Complete coverage of MQSC capabilities

- o Not pure REST
- o Just as *simple* as existing runmqsc for input and parsing of output

• • •

Native JSON based REST calls

Direct MQSC command input over REST
MQSC output over REST, minimal parsing

Restful administration with Managed File Transfer

As well as queue manager administration, MQ has added support for monitoring your Managed File Transfer system with **agent** and **transfer** status lists over REST

HTTPS GET:
https://host:port/ibmmq/v1/mft/transfer

```
{"transfer": [
  {
    "destinationAgent": {"name": "AGENT.X.BANK"},
    "originator": {
      "host": "192.168.99.1",
      "userId": "ramsubbarao"
    },
    "sourceAgent": {"name": "TESTAGENT"},
    "statistics": {
      "endTime": "2018-01-08T16:22:15.569Z",
      "numberOfFileFailures": 0,
      "numberOfFileSuccesses": 2,
      "numberOfFileWarnings": 0,
      "numberOfFiles": 2,
      "startTime": "2018-01-08T16:22:15.242Z"
    },
    "status": {
      "state": "successful"
    },
    "id": "414D51204D465444454D4F3320202020513E525A21109908"
  }
```

Managing diagnostic data

The need to centrally collect and analyse diagnostic data is increasing, using tools such as Splunk, Elasticsearch and Grafana

MQ generates a wide range of information and has demonstrated how this can be collected using off the shelf tooling
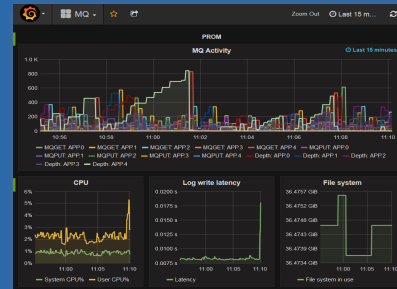
Subscribing to metrics with *system topics* in MQ V9 makes that even easier

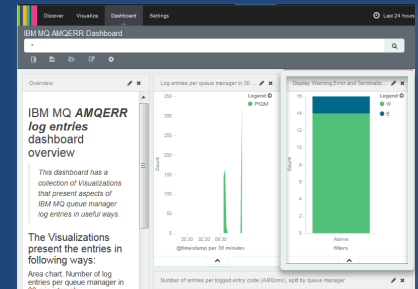MQ has seen enhancements to the error log data it generates to aid such solutions

Universal timestamps	JSON output
severity levels	Multiple logs
separated inserts	Syslog output

Publish MQ statistics to Prometheus and Grafana

Forward MQ error logs to ElasticSearch or Splunk

Error logs output JSON for easy parsing

```
{
    "ibm_messageId":"AMQ6287I",
    "ibm_arithInsert1":0,
    "ibm_arithInsert2":0,
    "ibm_commentInsert1":"Linux 4.13.0-36-generic (MQ Linux (x86-64 platform) 64-bit)",
    "ibm_commentInsert2":"/opt/mqm (Installation1)",
    "ibm_commentInsert3":"9.0.5.0 (p905-L180228.1)",
    "ibm_datetime":"2018-03-04T13:18:27.506Z",
    "ibm_serverName":"QM905",
    "type":"mq_log",
    "host":"david-VirtualBox",
    "loglevel":"INFO",
    "module":"amqxeida.c:6238",
    "ibm_sequence":"1520169507_506462655",
    "ibm_processId":2119,
    "ibm_threadId":1,
    "ibm_version":"9.0.5.0",
    "ibm_processName":"strmqm",
    "ibm_userName":"david",
    "ibm_installationName":"Installation1",
    "ibm_installationDir":"/opt/mqm",
    "message":"AMQ6287I: IBM MQ V9.0.5.0 (p905-L180228.1)."
}
```

Distributed recovery logs

Linear logging

MQ always logs all the data you need to recover from a queue manager failure in a recovery log. Linear logging adds media recovery support to rebuild MQ resources in the event of losing or corrupting MQ data

Circular logging

Linear logging
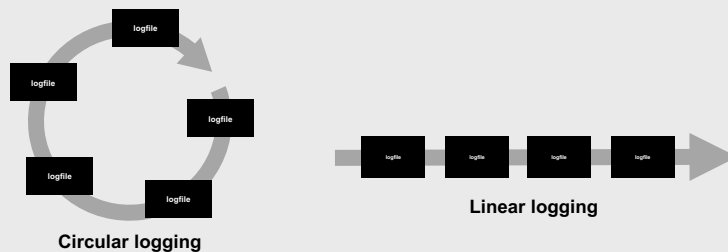
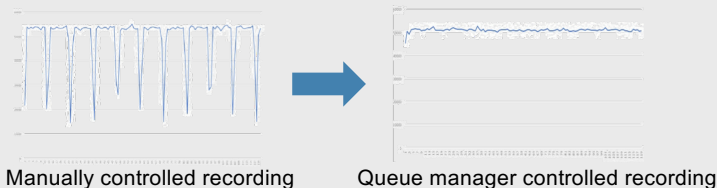## Automatic media imaging

Media images can now be automatically scheduled by the queue manager, simplifying the administrative tasks and smoothing out the performance impact, simplifying the problem of when to take an image

Manually controlled recording   Queue manager controlled recording

Automatic log reuse

Constantly creating new linear logs reduces MQ's performance. Logs can now be reused by a queue manager to regain that performance. Choosing automatic reuse removes another administrative task of constantly deleting linear logs

Persistent message throughput

— 9.0.2 Circular Logging
— 9.0.1 Manual Linear Logging
— 9.0.2 Automatic Linear Logging
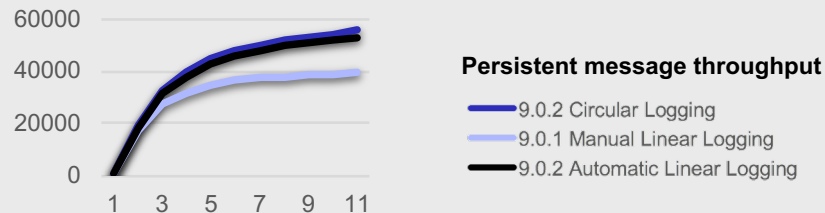
Migrating between linear and circular

MQ now makes it possible to migrate a queue manager from linear to circular logging and vice versa
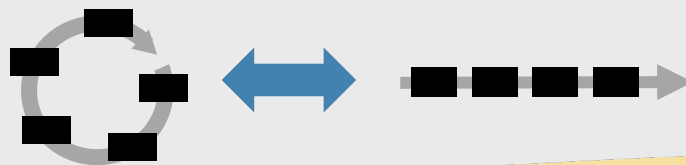
MQ on z/OS

Replicated Data Queue Manager for MQ Advanced	Linear logging automation and performance	RESTful administration	Error log formatting	Web Console	RESTful messaging
MQ Appliance SAN support	MQ JMS in CICS Liberty Profile	Salesforce bridge	AMS confidentiality performance on z/OS Advanced	Blockchain bridge for MQ Advanced	Floating IP support for MQ Appliance
Code repository integration	Backup and Restore on MQ Appliance	Redistributable MFT agent for MQ Advanced	Enhanced MFT diagnostics	Cross LPAR MFT agents for z/OS Advanced	SNMP and REST support for MQ Appliance

Significant improvement in performance when applying AMS policies

Compare AMS transaction cost across MQ releases
2KB non-persistent request/reply workload

A cost comparison between version 9.1.0 and 9.0.0 shows:

Integrity: 37% of the equivalent version 9.0.0 measurement
Privacy: 44% of the equivalent version 9.0.0 measurement
Confidentiality: 17-32% of the equivalent version 9.0.0 measurements

MQ Appliance

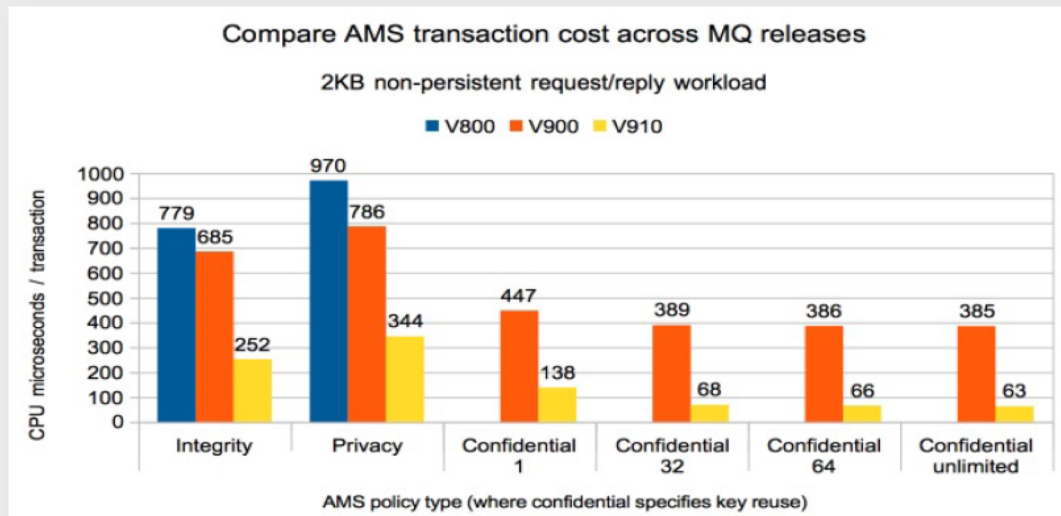|					
Replicated Data Queue Manager for MQ Advanced	Linear logging automation and performance	RESTful administration	Error log formatting	Web Console	RESTful messaging
MQ Appliance SAN support*	MQ JMS in CICS Liberty Profile	Salesforce bridge	AMS confidentiality performance on z/OS Advanced	Blockchain bridge for MQ Advanced	Floating IP support for MQ Appliance
Code repository integration	Backup and Restore on MQ Appliance	Redistributable MFT agent for MQ Advanced	Enhanced MFT diagnostics	Cross LPAR MFT agents for z/OS Advanced	SNMP and REST support for MQ Appliance

Introducing the **M2002**

4 High capacity, High speed SSDs
with hardware RAID10
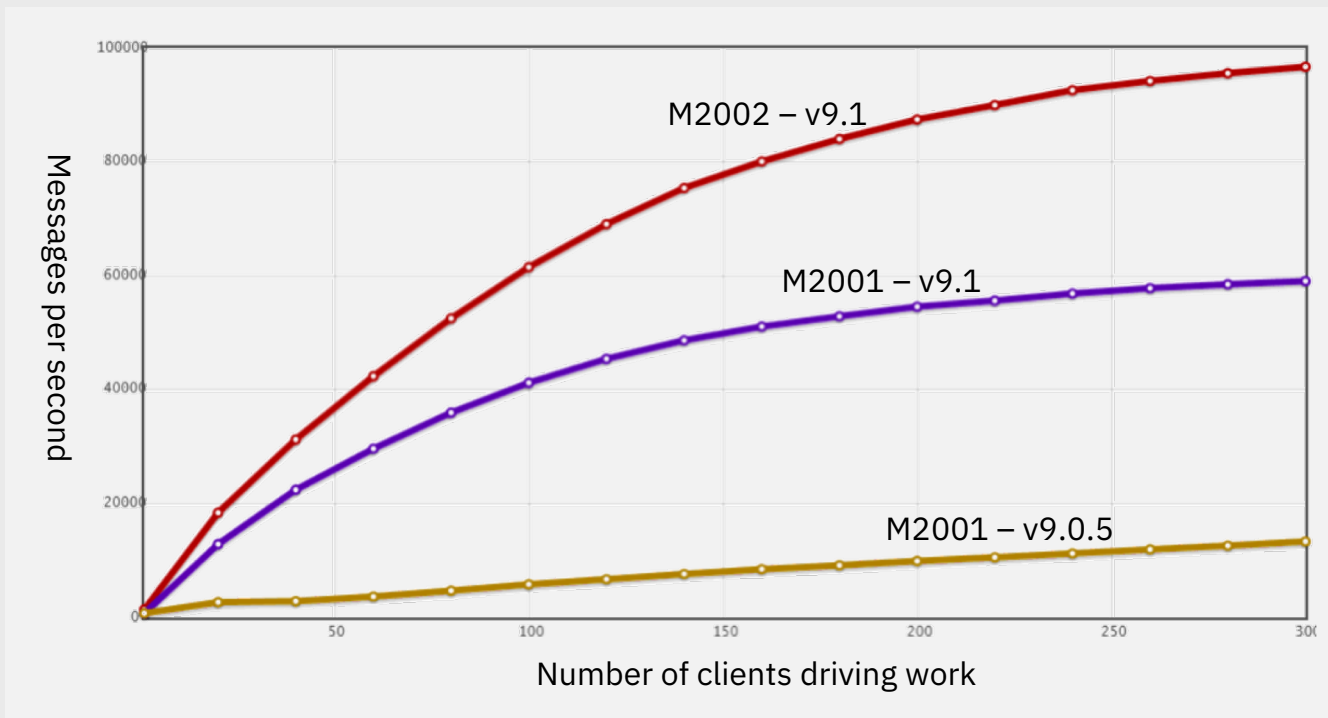

Additional 10GB SFP+ interfaces

NEW 40GB QSFP+ modules

Plus what you can't see...
- increased CPU cores
- significant jump from Intel™ 'Ivy Bridge' to 'Skylake' architecture
- Doubled RAID cache for increased I/O performance

* Note there is no longer a SAN interface

Appliance performance
(multi-queue manager, Highly Available, many client applications)

Platform Coverage for IBM MQ

Historically 'niche' offerings

MQ for HP OpenVMS
- IBM version now EOS
- 3rd party version available from Willow Technology

MQ for HPE NonStop Server
- Continuing to be developed
- V8.0.3 now available

MQ Low Latency Messaging
- IBM version EOM. EOS April 2019.
- 3rd party version available as Confinity Low Latency Messaging

Core MQ platform news

MQ on HP-UX
- Not on CD stream: Last release: MQ **V9.0** LTS
- Statement of Direction:
  No further releases

MQ on Solaris
- Not on CD stream: Last release: MQ **V9.1** LTS
- Statement of Direction:
  No further releases after 9.1

Already announced End of Support dates:
- MQ V7.1: September 30 2017
- MQ V7.5: April 30 2018
- MQ V8.0: April 30 2020

And a few little extras since 9.0.0.0 LTS that are easy to miss...

We'll fix your bad apps!

Faster non-transacted persistent puts

TLS 1.0 is now turned off

Customise your prompt in runmqsc

No more OPMODE!

It confused the hell out of you (and us)

Lose the JRE

If you don't need it, don't install it

Transactions get a timestamp in dmpmqlog

Universal timestamps and severities in the error logs

(did I mention that already?)

MFT agents are now included in the MQ Advanced license

Run IBM MQ in any location or cloud exactly as you need it
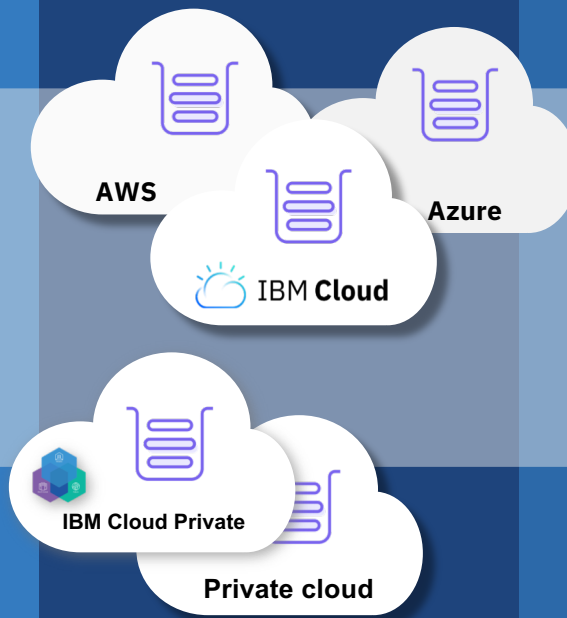
IBM MQ

Celebrating **25** years

On-premise, software and the MQ Appliance

IBM Z
Linux
AIX
Windows
Solaris
HPE
IBMi
Appliance
...

Run it yourself in any cloud, public or private

AWS
IBM Cloud
Azure
IBM Cloud Private
Private cloud

Let IBM host it for you with its managed SaaS MQ service in public cloud

MQ on Cloud

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MQ Technical Conference v2.0.1.8

IBM MQ

Celebrating
25
years

Enjoy the conference!

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