

What's new with IBM MQ 9.2: Messaging for the Modern Era

July 2020



IBM MQ, supporting transformation

Developer Agility

Delivery teams are being empowered within the organization. They need to be enabled to complete their day to day operations independently.



Adopt Multi-Cloud

Delivery teams are empowered to select their cloud of choice, and expect connectivity to be provided across these.



Operational Agility

IBM MQ operational teams are being challenged to simplify the management of their infrastructure to drive cost savings.



Organic Growth

Organizations that originally deployed IBM MQ for a project that has matured, and now need improved scalability, availability and security.



IBM MQ, supporting transformation

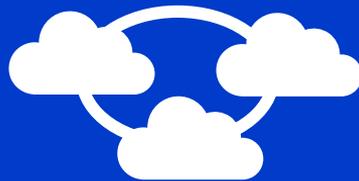
Developer Agility

Streamline development processes with CI/CD pipelines and self service MQ environments



Adopt Multi-Cloud

Rely on MQ's proven fast, secure and reliable communication to integrate your clouds and data centers



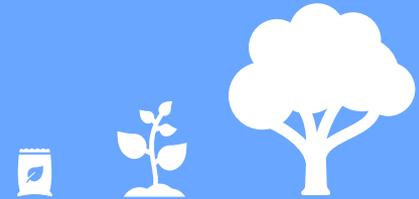
Operational Agility

Automate deployment of pattern based MQ queue managers as containers. Enable evergreening with automation and delivery pipelines

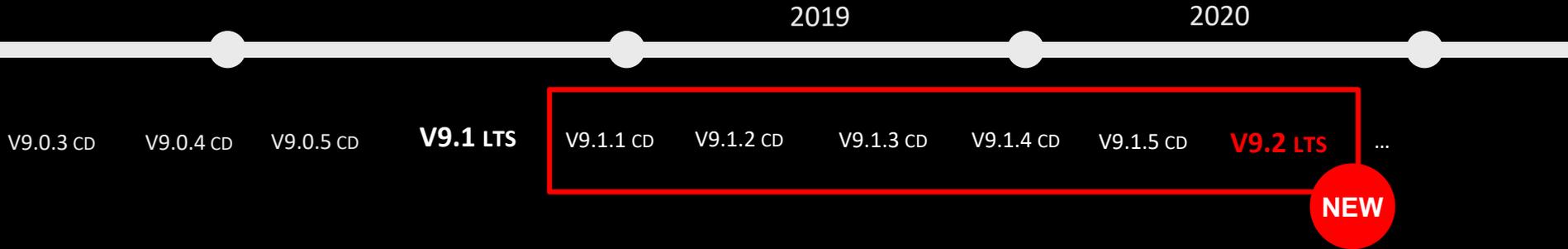


Organic Growth

Rethink MQ active/passive topologies to ensure cloud level availability and scale through active/active application and deployment patterns



IBM MQ: long term support and continuous delivery



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

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.

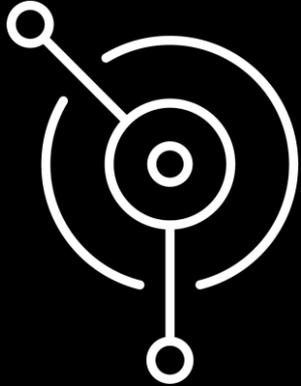
Both can interoperate, just like any previous version of MQ.

All the function delivered in the 9.1.x CD releases is available in the long term support release **V9.2 LTS**

MQ since 9.1 ...

Uniform Cluster automatic application rebalancing	Microsoft .NET Core support	Client connectivity with zCEE	Developer toolkit for MacOS	Automatic TLS CipherSpec negotiation	Enhanced Salesforce Bridge	Build toolkit for zCEE	Idempotent MQSC commands	Browse messages using REST	MQ Appliance certificate expiry notifications
Channel enabled AMS policies for z/OS	JSON format CCDT	Permitted TLS CipherSpec control	REST messaging performance enhancements	Full JSON-syntax REST administration	MQ Appliance HA event notifications	Improved distributed queue manager restart times	Stream MQ Appliance error logs	Rapid Uniform Cluster rebalancing	Improved MQIPT management
New application status checking	ini file and MQSC injection at startup	Escalating queue manager ending	MQFT REST list resource monitors	Enhanced Blockchain Bridge	WebSphere Liberty MDB pause	New consistent MQ samples	MFT REST create file transfer	FTP server support on IBM I for MFT	AMS HSM with Oracle JRE
MQ Appliance admin activity audit logging	XA support in Liberty for decoupled JMS connections	Automatic Uniform Cluster configuration	Packaged MQ Internet Passthru (IPT)	Highly available MFT Agent deployments	z/OS data set encryption support	User controlled application naming	Expanding TLS 1.3 support	High speed transfer over long distances with Fasp.io	Qpid JMS shared subscriptions
Publish messages over REST	.NET project templates	Increased queue size support for Distributed	New improved Web Console	Full HA-DR-HA replicated data queue manager deployments	Uniform Cluster application monitoring	Java 11 application support	Distributed queue size control	Simpler z/OS backwards migration	Simplified z/OS installation of MFT and CD

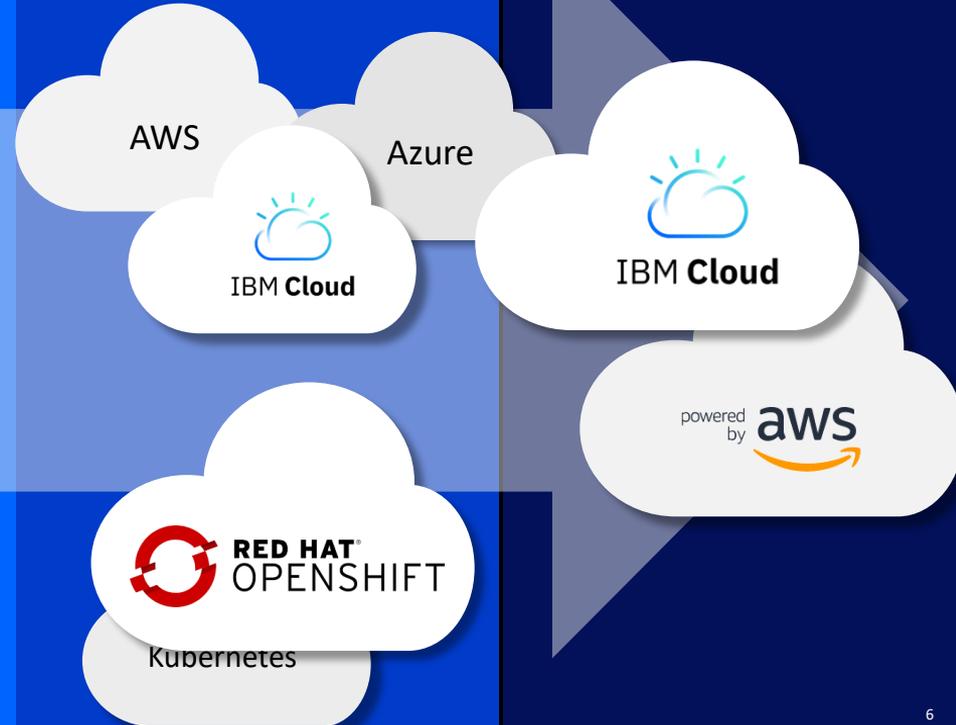
A focus on where you need MQ today



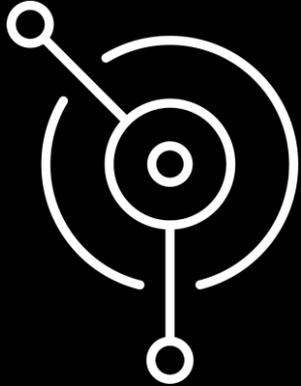
On-premise, software and the MQ Appliance, exactly as you need it



Run MQ yourself in public or private clouds, virtual machines or containers



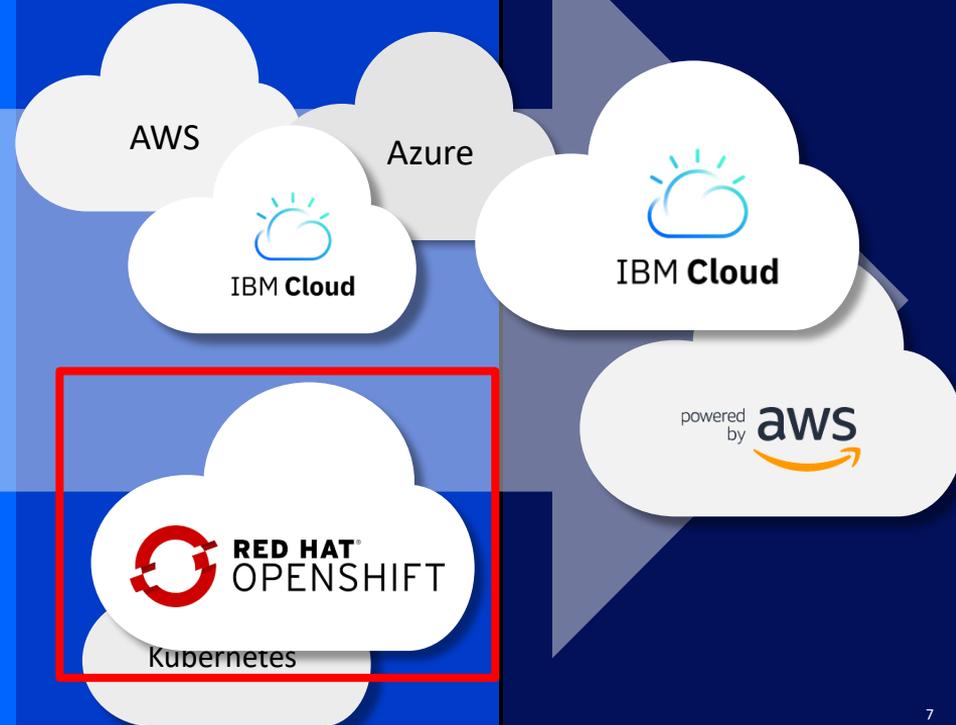
A focus on where you need MQ today



On-premise, software and the MQ Appliance, exactly as you need it



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MQ in Containers, continually evolving

MQ first supported Docker containers in 2015, showing how a stateful solution can run in an often stateless world.



MQ was one of the first certified containers available on IBM's Kubernetes platform, IBM Cloud Private. Showing how to run MQ in a managed container environment.



MQ added support for running on Red Hat OpenShift



MQ is a core component of IBM's Cloud Pak for Integration, providing enterprise messaging for the Integration Platform solution



2015

hub.docker.com/r/ibmcom/mq

github.com/ibm-messaging/mq-container

2020

Introducing the MQ Appliance M2002

The scalability and security of IBM MQ

The same familiar administration model for administrators with MQ skills

Supports the same MQ applications

But, with the convenience, fast time-to-value and low total cost of ownership of an appliance



Easy Integration

Integrates seamlessly into MQ networks and clusters

Improved Availability

Built-in support for High Availability and Disaster Recovery

Simplified ownership

Repeatable and fast, with less configuration or tuning required

Minimises dependencies on other resources and teams

Simpler licensing and easier to assess for security compliance and audit

The M2002

Choice of A/B models to suit different loads

Adds new 40GB network connectivity

- Particularly useful for HA replication

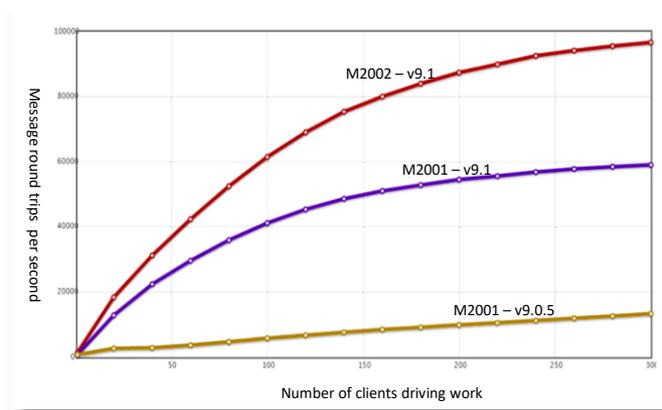
Doubled storage capacity with new RAID10 controller for improved performance

Based on MQ V9.1: Available to run both LTS and CD releases on the MQ Appliance

M2002 headline numbers

- Over **200 thousand persistent, HA replicated**, messages produced and consumed per second
- Over **600 thousand non-persistent** messages produced and consumed per second

- TLS 1.3 support
- Extended debugging and monitoring



MQ for z/OS

Maximum resilience, performance, and secure connectivity

zHyperWrite

Improves the I/O performance of synchronous replication solutions for disaster recovery

Direct connectivity with IBM Event Streams

Kafka connectors for MQ can be deployed into z/OS UNIX System Services, reducing latency and simplifying configuration

Advanced Message Security

Users are able to apply and remove Advanced Message Security (AMS) policies transparently between AMS and non-AMS enabled queue managers

Full data encryption

MQ 9.1.5 completed support for full DataSet encryption, integrating with the CryptoExpress coprocessor for encryption at the storage level

Resilience

Queue sharing groups exploit the z/OS Parallel Sysplex for unparalleled high availability

Performance

Create high performance environments able to process millions of messages every second

Secure connectivity

Adapters and bridges provide tight integration with your business critical Systems of Record

Consistent connectivity with a range of other on-premise and cloud platforms

MQ exploits System SSL on z/OS to utilize CPACF and CryptoExpress cards for pervasive encryption



MQ Fault tolerance

Protecting your critical data

Fault Tolerance

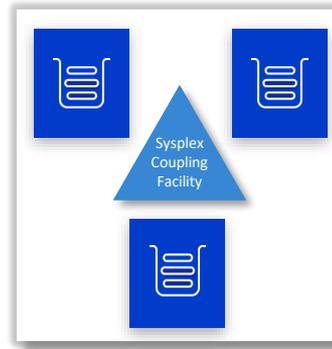
MQ delivers HA through the ability to build horizontally scaled, active-active systems and typically **active-passive HA** of the data itself*, the messages.

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.

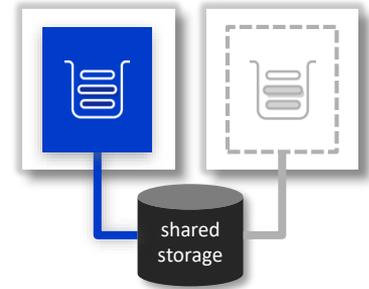
The **MQ Appliance** changed this with a fully integrated HA solution, providing built in machine to machine data replication and failover.

And even more recently, **Replicated Data Queue Managers** on RHEL x86 have provided more integrated HA and DR options.

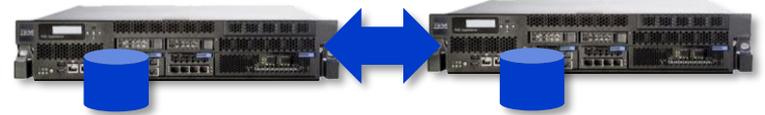
* z/OS shared queue provides active-active HA of the message data!



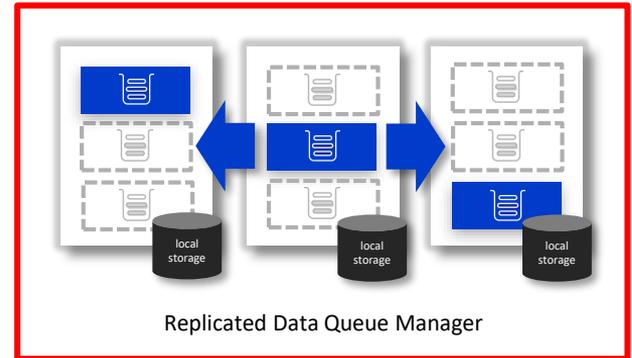
z/OS Queue Sharing Groups



Multi-instance queue managers and HA Cluster



MQ Appliance



Replicated Data Queue Manager

Replicated Data Queue Managers

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

Three-way replication and monitoring for quorum support

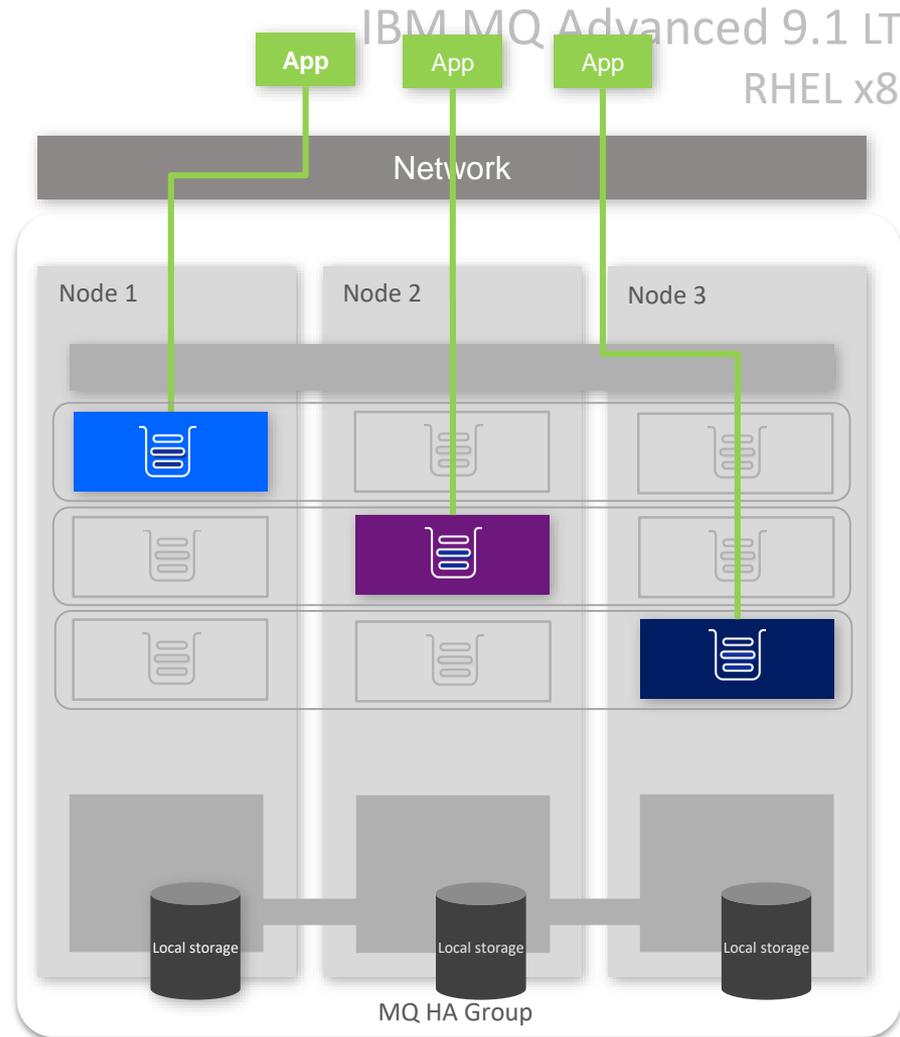
Synchronous data replication for once and once only transactional delivery of messages

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

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

MQ **licensing** is aligned to maximise benefits

IBM MQ Advanced 9.1 LTS
RHEL x86

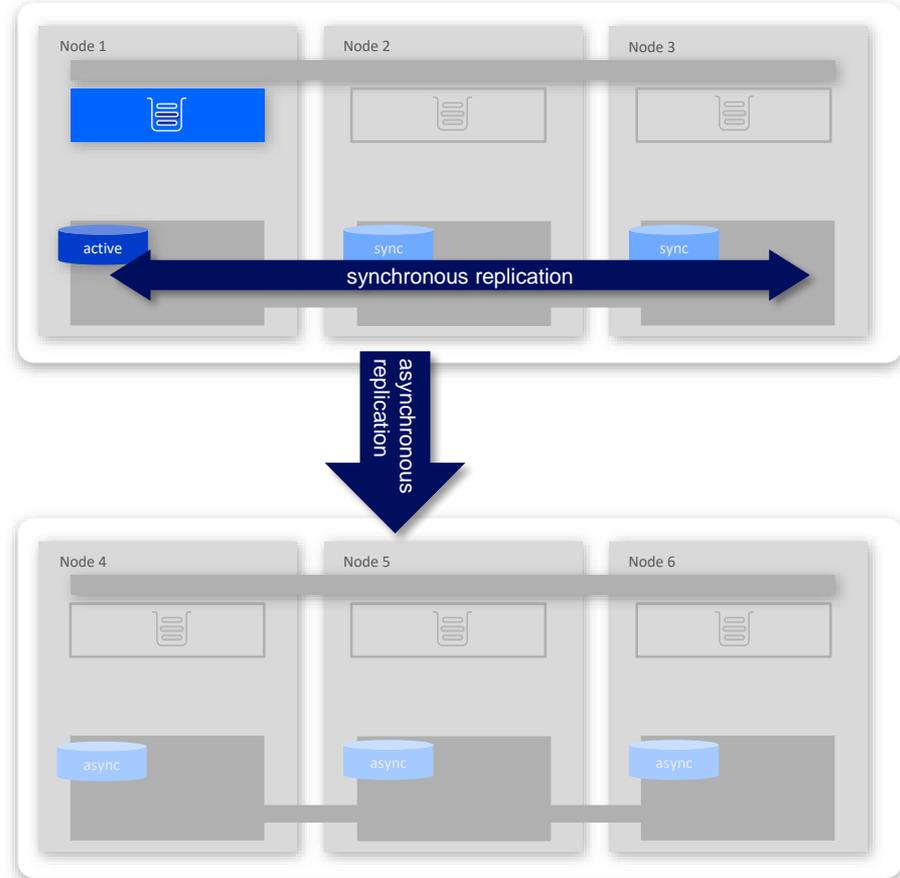


Combining HA with DR

IBM MQ 9.1.5 CD combined two existing RDQM topologies into one

Previously it was a choice between either automatic HA failover with a three node HA group or a manual two node failover configuration supporting asynchronous replication for higher latency deployments (e.g. DR). Not both together.

You can now build a three node HA quorum system, asynchronously replicating queue manager state to a matching three node HA quorum system for simpler DR switch over setups



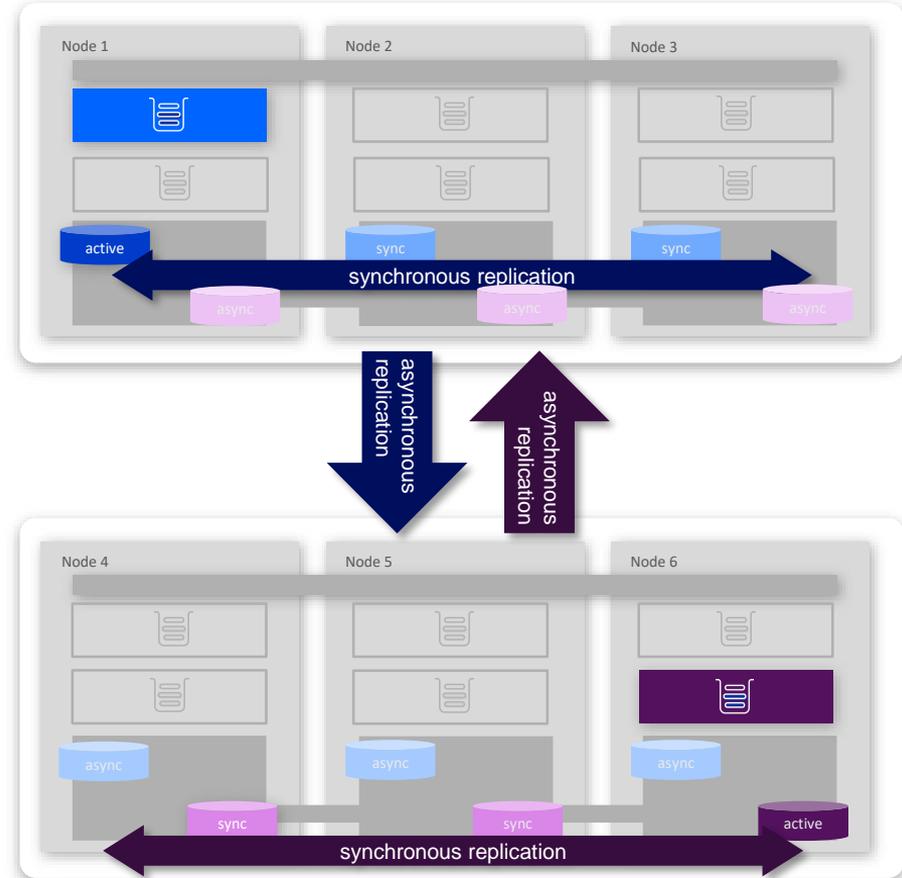
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Both HA quorum systems can be running different active queue managers, with bidirectional asynchronous replication, supporting active/active DR topologies



Queue Manager HA with Kubernetes

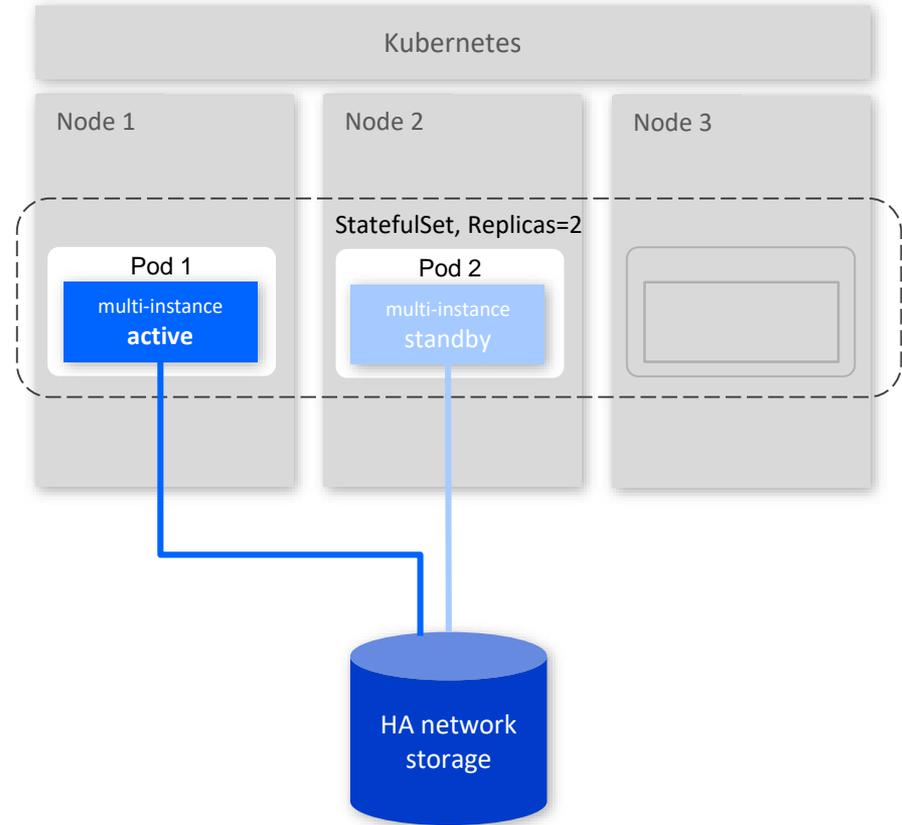
Even with multiple queue managers, each queue manager must be made highly available to ensure queued messages can be accessed quickly

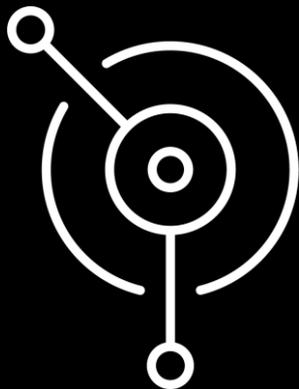
High availability of a queue manager in Kubernetes is through a combination of Kubernetes monitoring and automatic rescheduling of pods combined with the added resiliency of a multi-instance queue manager deployment built into the MQ solution

High availability of the MQ data requires highly available replicated storage such as **OpenShift Container Storage**

Best practice for HA in Kubernetes, deployed by the MQ Operator

https://www.ibm.com/support/knowledgecenter/SSFKSJ_9.1.0/com.ibm.mq.ctr.doc/ha_for_ctr.htm





Active/active messaging

Building scalable, fault tolerant, solutions

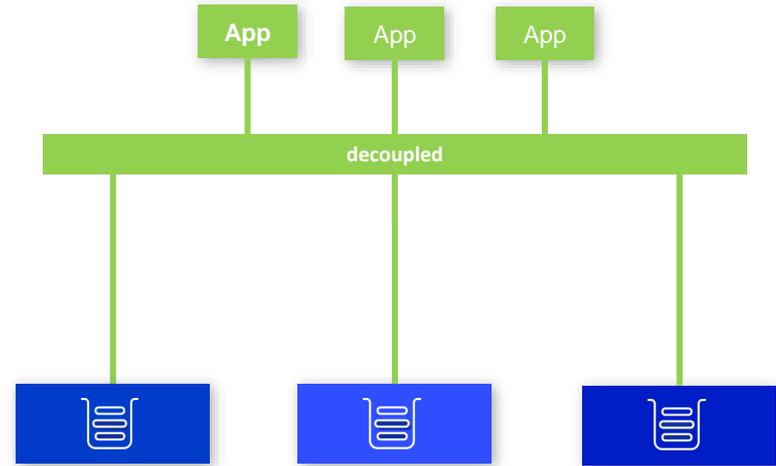
Building scalable, fault tolerant, solutions

To provide an active/active, solution you need to consider multiple active queue managers acting as a *single service*

Applications also run as multiple instances for availability and scale

Applications treat the queue managers as interchangeable and want to connect to the group in the most efficient and available distribution

MQ introduced the **Uniform Cluster** capability across the 9.1.x CD releases to enable such deployments much more easily



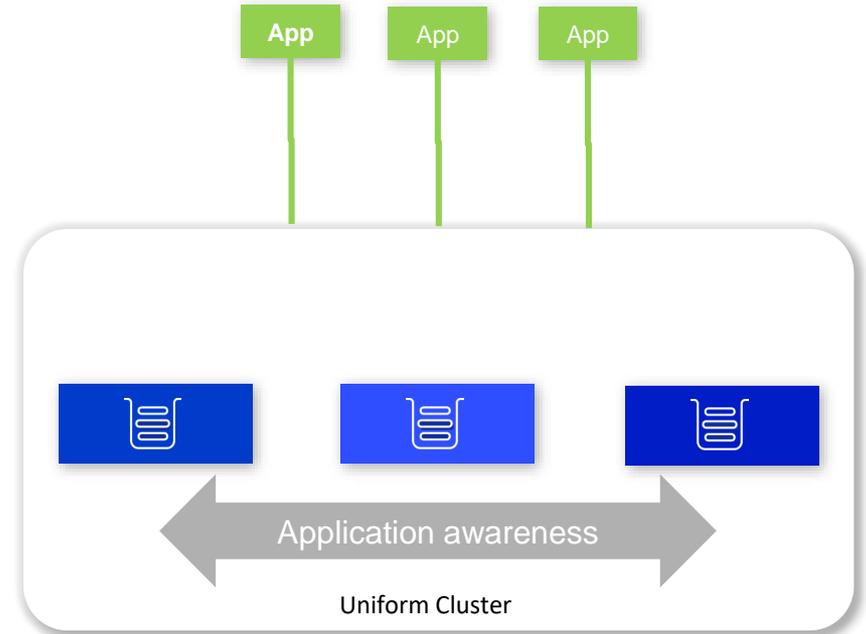
Building scalable, fault tolerant, solutions

Uniform Clusters are a special type of MQ Cluster. One where all the queue managers provide the same service, such as queues.

Application instances are dynamically distributed across the available queue managers, adjusting as queue managers and application instances stop and start.

A uniform cluster builds on top of existing MQ building blocks -

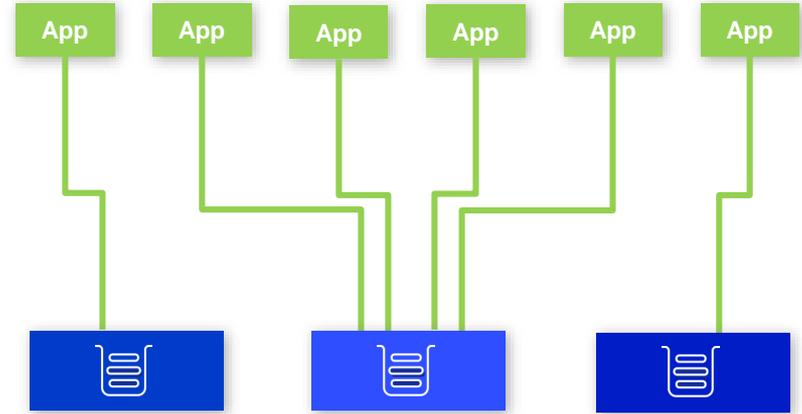
- Client auto-reconnect
- CCDT queue manager groups
- MQ Clustering



Automatic Application balancing

When multiple instances of the *same** application connect into a Uniform Cluster they may connect to any of the queue managers

Often, the connections will not be evenly distributed**



* Based on application name

** For example when using a CCDT queue manager group

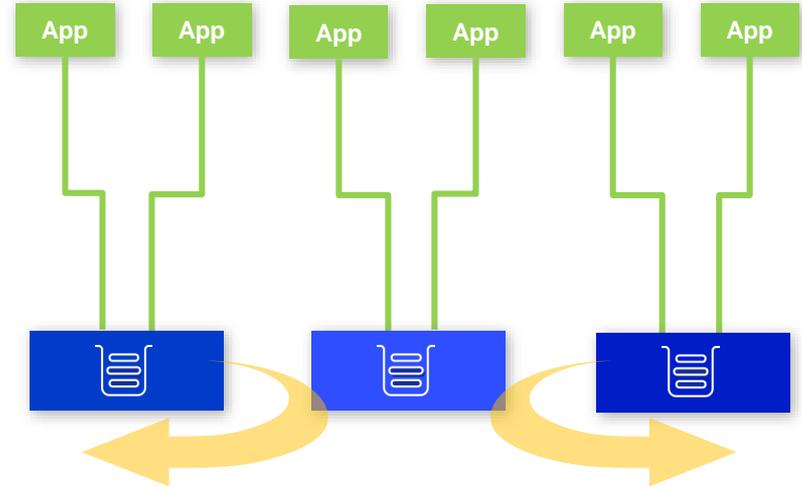
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The Uniform Cluster is constantly monitoring the connections and will automatically move connections between queue managers to maintain an even balance

The applications do not see the reconnection occurring



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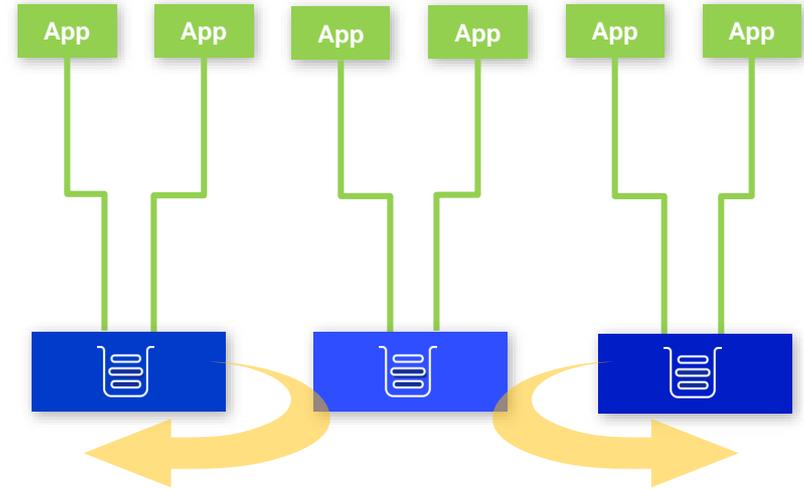
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This even occurs when queue managers stop and start or are added to the cluster



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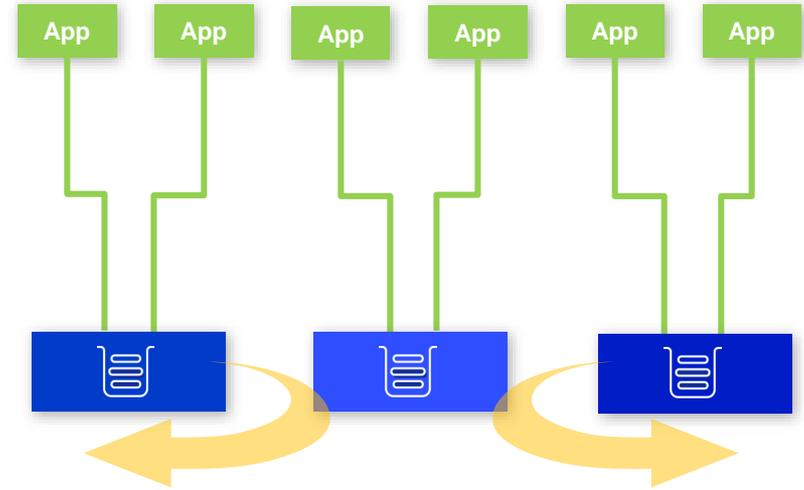
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Uniform Cluster capabilities have been incrementally delivered across multiple CD releases expanding support and capability each time

* Based on application name

** For example when using a CCDT queue manager group

View application status

Now that MQ is taking a more application centric view, a new command has been added to Distributed runmqsc to aid the understanding of how applications are balanced across a Uniform Cluster

From any member of the Uniform Cluster, displays applications by name and highlights instances that are not evenly balanced

community.ibm.com/community/user/imwuc/viewdocument/display-application-status-on-a-uni

MQ 9.1.5 CD adds to this by regularly publishing metrics to the system topics on how each application is being rebalanced, enabling live monitoring

community.ibm.com/community/user/imwuc/blogs/louis-horsley1/2020/04/06/uniform-cluster-monitor-application-resource-usage

DISPLAY APSTATUS(*) TYPE(APPL)

AMQ8932I: Display application status details.

APPLNAME(AMQSPHAC)	CLUSTER(UNIDEMO)
COUNT(8)	MOVCOUNT(8)
BALANCED(YES)	

AMQ8932I: Display application status details.

APPLNAME(AMQSPUTC)	CLUSTER()
COUNT(2)	MOVCOUNT(0)
BALANCED(NOTAPPLIC)	

DISPLAY APSTATUS(*) TYPE(QMGR)

AMQ8932I: Display application status details.

APPLNAME(AMQSPHAC)	ACTIVE(YES)
COUNT(3)	MOVCOUNT(3)
BALSTATE(OK)	LMSGDATE(2019-05-08)
LMSGTIME(14:05:36)	QMNAME(UNID001)
QMID(UNID001_2019-05-08_13.59.31)	

AMQ8932I: Display application status details.

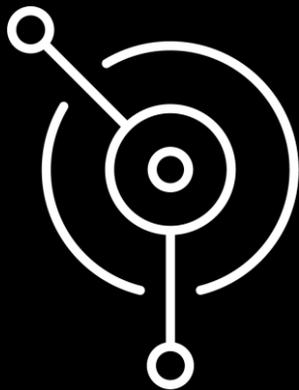
APPLNAME(AMQSPHAC)	ACTIVE(YES)
COUNT(3)	MOVCOUNT(3)
BALSTATE(OK)	LMSGDATE(2019-05-08)
LMSGTIME(14:04:50)	QMNAME(UNID002)
QMID(UNID002_2019-05-08_13.59.35)	

AMQ8932I: Display application status details.

APPLNAME(AMQSPHAC)	ACTIVE(YES)
COUNT(2)	MOVCOUNT(2)
BALSTATE(OK)	LMSGDATE(2019-05-08)
LMSGTIME(14:04:44)	QMNAME(UNID003)
QMID(UNID003_2019-05-08_13.59.40)	

AMQ8932I: Display application status details.

APPLNAME(AMQSPUTC)	ACTIVE(YES)
COUNT(2)	MOVCOUNT(0)
BALSTATE(NOTAPPLIC)	LMSGDATE(2019-05-08)
LMSGTIME(14:05:36)	QMNAME(UNID001)
QMID(UNID001_2019-05-08_13.59.31)	



Expand your MQ network

Building hybrid cloud MQ systems

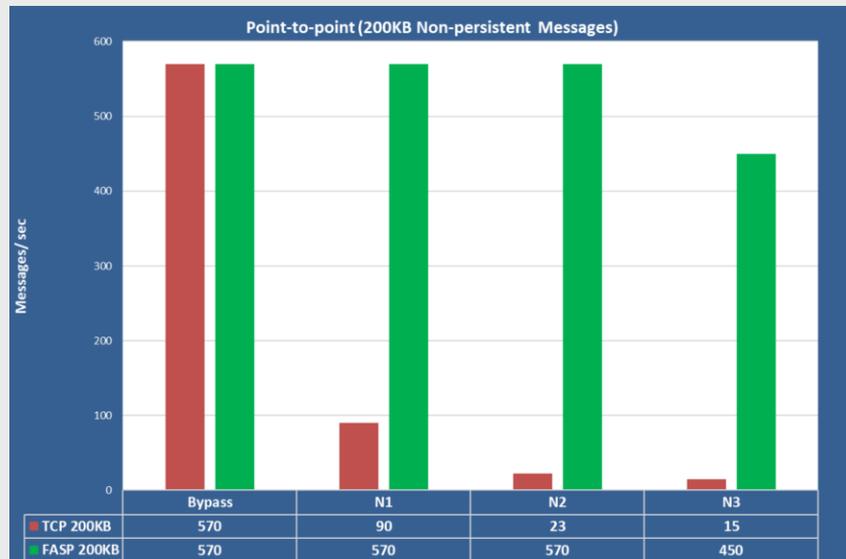
A Global Messaging Network

IBM MQ Advanced and Aspera

At the heart of Aspera is the FASP protocol, accelerating the speed of data transport across long distances and poor networks



MQ Advanced brings you the benefits of this when communicating between distant queue managers



Bypass: 0ms network latency (no packet loss)

N1: 25ms network latency (no packet loss)

N2: 40ms network latency (0.1% packet loss)

N3: 50ms network latency (0.5% packet loss)

ibm-messaging.github.io/mqperf/MQ914_fasp_gw.pdf

A Global Messaging Network

Internet Pass Through

With a Hybrid Multi-Cloud Architecture connecting to external MQ networks is becoming increasingly important.

Internet Pass Through (IPT) has been an IBM MQ support Pac ([MS81](#)) for many years. It provides a proxy layer within your architecture which can be useful when exposing MQ outside of the organization data center.

MQ 9.1.4 aligned IPT with the MQ product delivery

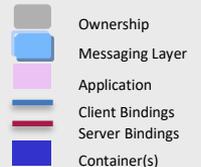
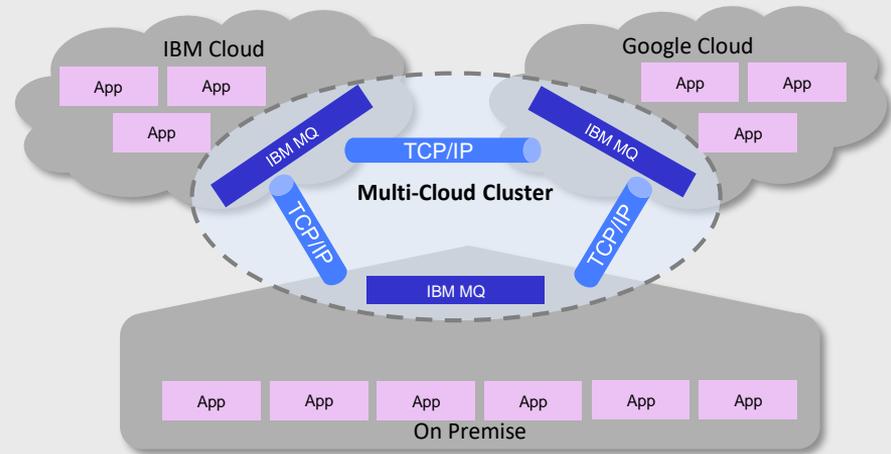
MQ Advanced now provides an enhanced IPT entitlement where a Hardware Security Module (HSM) can be used with IPT.

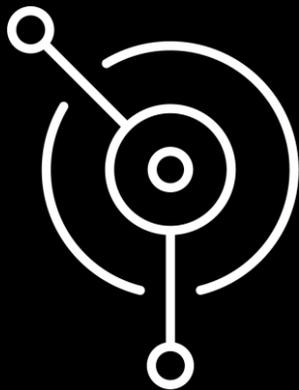
Guidance on how to expose MQ is also provided here:

ibm.biz/MQSecureConn

- Local administration without a command port
- TLS and authentication for administration using the command port

9.2





Managing MQ

Administering and securing your messaging system

Making management simpler

Web console

Simple to use, web based administration for Distributed, z/OS, Cloud and the Appliance

RESTful administration

Administer and manage your queue managers over HTTPS

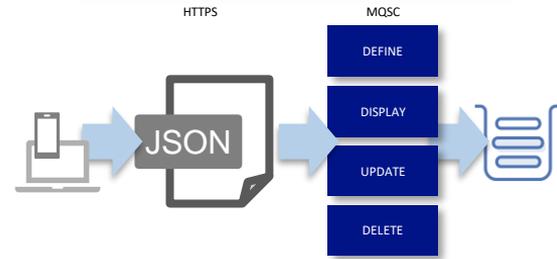
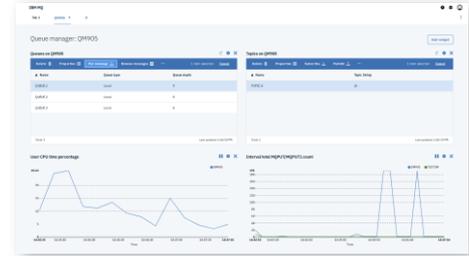
Logging and monitoring

Simplify the streaming of logs and metrics for centralized storage and analyzes

Support for Linux upgrade in place Streamline the process of upgrading from MQ V9.2, eliminating steps that were required previously

9.2

IBM MQ 9.1, 9.2 LTS



REST administration

JSON format, MQSC style, REST commands

Send request body in **HTTP POST** to **admin/action/qmgr/{qmgrName}/mqsc** resource

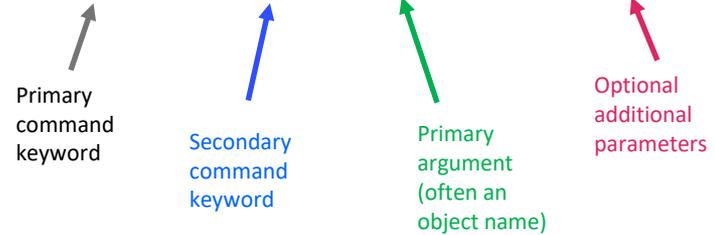
New command type of **“runCommandJson”**

Existing command type of **“runCommand”** can still be used to run a plain text MQSC command

MQ 9.1.5 CD carried these APIs over into a new **V2** of the REST API. Earlier APIs for per-object manipulation have been stabilised at V1

www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.1.0/com.ibm.mq.pro.doc/q133690_hm#q133690__restapiv2

DEFINE QLOCAL(Q1) DESCR('My queue')



JSON
equivalent

```
{  
  "type": "runCommandJSON",  
  "command": "define",  
  "qualifier": "qlocal",  
  "name": "q1",  
  "parameters": {  
    "descr": "My queue"  
  }  
}
```

Code as Config for the applications too

Applications should never encode the MQ connection details, not even the queue manager

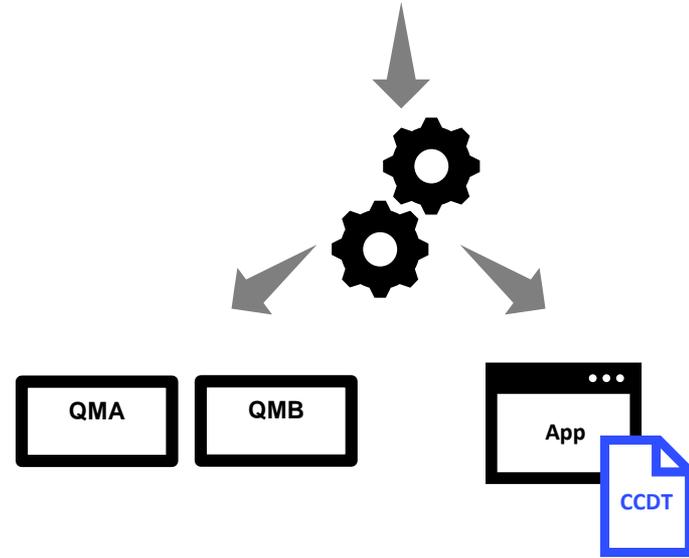
MQ CCDTs encapsulate the connection details

You can now build your **own JSON format CCDTs**

These can be deployed as part of the same pipeline that deploys your queue managers and applications

Supports multiple channels of the same name on different queue managers to simplify the building of uniform clusters

IBM MQ 9.1.2+ CD
Clients



```
{
  "channel":[
    {
      "name":"ABC",
      "queueManager":"QMA"
    },
    {
      "name":"ABC",
      "queueManager":"QMB"
    },
  ],
}
```

Queue size control

Distributed platforms and the Appliance have introduced per-queue disk space control with MQ 9.1.5 CD.

This enables much greater control over resource usage by individual applications.

Queue size control has also introduced the ability for queues to be much larger than the previously fixed 2 terabytes. This improves MQ's ability to temporarily buffer significant messaging traffic during an extended outage.

community.ibm.com/community/user/imwuc/blogs/louis-horsley1/2020/04/08/easily-controllable-queue-file-sizes

IBM MQ 9.1.5 CD
Distributed



New Web Console

MQ 9.2 replaces the existing web console with a new web console across all platforms

Focus is on user experience and consistency across IBM products

IBM MQ 9.1.5+ CD

Manage: Queue managers

541 Local Queue Managers | 7 Remote Queue Managers | 12 Stopped

Queue manager name	Connection type	Version	Number of connections	Status
QM1	Local	1.1.1	123	Running
QM231264804713480212	Remote	1.1.1	123	Running
QM468099	Remote	1.1.1	123	Running
QM231264804713480212	Local	1.1.1	123	Stopped
QM23795427394237940486V24337985L	Local	1.1.1	123	Running
QM231264804713480212	Remote	1.1.1	123	Running
QM293495	Remote	1.1.1	123	Deploying

Queue manager: QM1

13 Full capacity | 7 >50% capacity | 23 <1% capacity

Queue name	Queue type	Queue depth %	Maximum queue depth	Queue manager name
Q24605	Local	XX / XXX		QM63235
QM468400	Model	XXX /	XX / XXX	QM63235
Q123799427394223467	Remote	XXX /	XX / XXX	QM63235
QM8993	Local	XXX /	XX / XXX	QM63235
Q4179434239245494242423192542L	Local	XXX /	XX / XXX	QM883239082450963

Local Queue: Q24601

11 messages (5.5%)

Timestamp	Application ID	User ID	Application Data
Oct 21, 2019 3:06:45 PM	App1	admin	Hello World
Oct 21, 2019 3:06:45 PM	App1	admin	Commodo Vestibulum
Oct 21, 2019 3:06:45 PM	App1	admin	Hello World
Oct 21, 2019 3:06:45 PM	App1	admin	Vestibulum id Egesta
Oct 21, 2019 3:06:45 PM	App1	admin	Hello World
Oct 21, 2019 3:06:45 PM	App1	admin	Hello World

<https://community.ibm.com/community/user/imwuc/blogs/callum-jackson1/2020/04/09/enhanced-web-console-in-ibm-mq-915>

Managing channel CipherSpecs

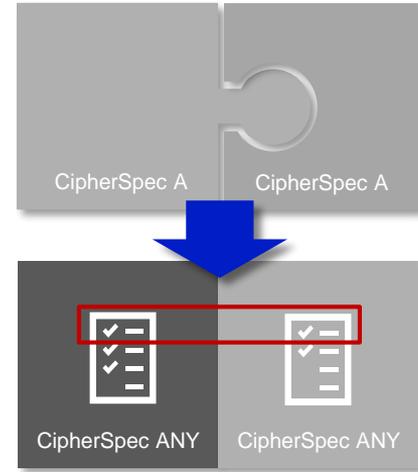
You no longer need to configure a matching single CipherSpec on both ends of a channel

MQ has introduced a range of **ANY_TLSxx** and **ANY_TLSxx_OR_HIGHER** CipherSpecs and MQ will negotiate the most preferred CipherSpec available to both ends

Migration between versions and ease of configuration are both simplified

If you need more control over the exact CipherSpecs appropriate to a queue manager, this can be configured

MQ is expanding its support of TLS 1.3 across its range of platforms, languages and protocols



Dataset encryption with MQ on z/OS

z/OS added support for policy based dataset encryption in z/OS 2.2 and later, utilising a CryptoExpress coprocessor

From MQ 9.1.5 CD, Dataset encryption can be used with all of MQ's datasets

This provides encryption at rest for MQ data, although MQ's Advanced Message Security capability goes further by providing true end-to-end encryption

Pervasive encryption with IBM z Systems

Integrated Crypto Hardware



Data at Rest



Network



Clustering



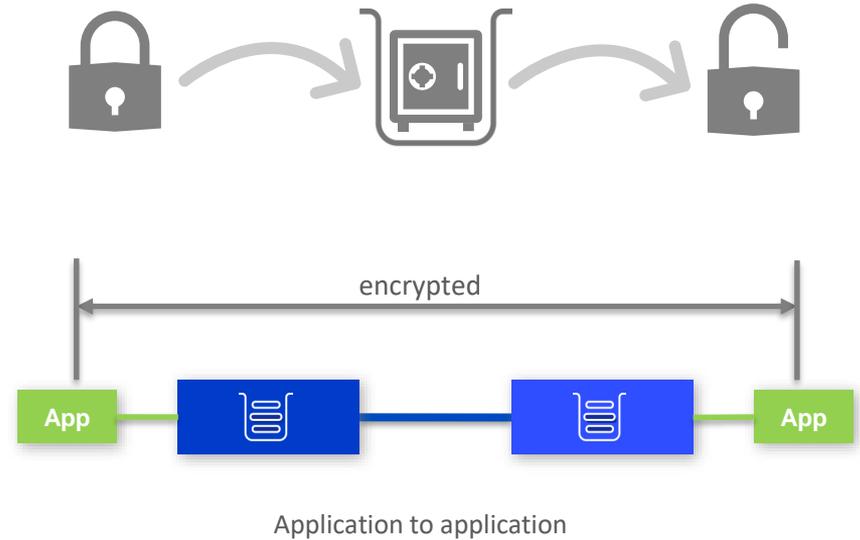
Data in Use



<https://developer.ibm.com/messaging/2017/08/30/mq-use-dataset-encryption-ibm-zos-v2-2/>

Advanced Message Security

End-to-end application-to-application encryption may give you the highest level of security, but it's not always possible to use. For example, where the applications are not AMS enabled or where the originators or recipients of the messages are outside of your domain



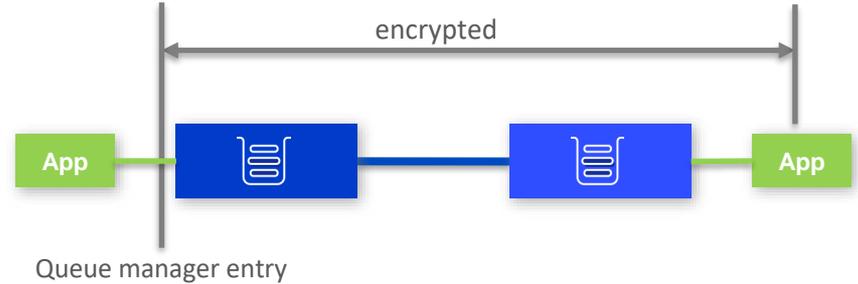
PKCS #11 (including HSM) support for Java and JMS clients

9.2

Advanced Message Security

End-to-end application-to-application encryption may give you the highest level of security, but it's not always possible to use. For example, where the applications are not AMS enabled or where the originators or recipients of the messages are outside of your domain

MQ on Distributed has always had client level interception to apply AMS policies once messages reach or leave their first queue manager



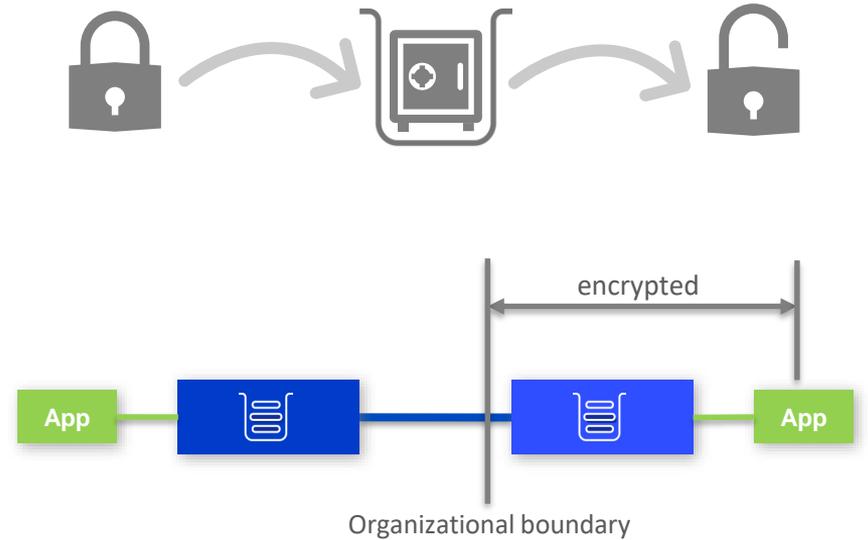
Advanced Message Security

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MQ on Distributed has always had client level interception to apply AMS policies once messages reach or leave their first queue manager

MQ 9.1.3 on z/OS added the ability to apply those policies at a queue manager-to-queue manager boundary. This enables the use of AMS within one domain without affecting another

IBM MQ Advanced 9.1.3 CD
z/OS



New sender and receiver channel property, SPLPROT controls the use of AMS policies for inbound and outbound messages

Managed File Transfer

MFT manages your file transfers, with file-to-file and file-to-message.

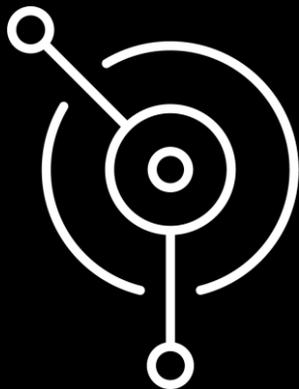
MQ 9.1.x continued to focus on resiliency and ease of administration.

Active/standby MFT agent support adds highly available topologies

Expanded the breadth of REST APIs, both for monitoring and configuring MFT resources and for initiating file transfers.

IBM MQ Advanced 9.1 LTS +
All platforms





Helping developers

Making it easy to build MQ into your applications

Getting Started

A site for Developers

ibm.biz/MQDevCenter

Teach yourself the basics of MQ

ibm.biz/learn-mq

Build on top of simple samples

ibm.biz/mq-dev-patterns

...and prove your skills

The screenshot shows the 'Learning path: IBM MQ Developer Essentials Badge' page. The page title is 'Learning path: IBM MQ Developer Essentials Badge' with the subtitle 'Learn how to build powerful messaging applications with IBM MQ.' The author is 'By Richard J. Coppen', updated on 'June 23, 2020' and published on 'August 3, 2018'. The page includes a 'Learning objectives' section with a bulleted list: 'Understand IBM MQ messaging concepts', 'Create and configure a queue manager, queue, and topic', 'Develop a simple point-to-point JMS application that can connect and interact with the queue manager', 'Demonstrate your learning and skills by taking up a coding challenge and developing a solution to a problem', and 'Troubleshoot and debug your application'. There are also sections for 'Get MQ client libraries' and 'Get MQ client libraries' with instructions on how to proceed.



Demonstrating the simplicity of MQ

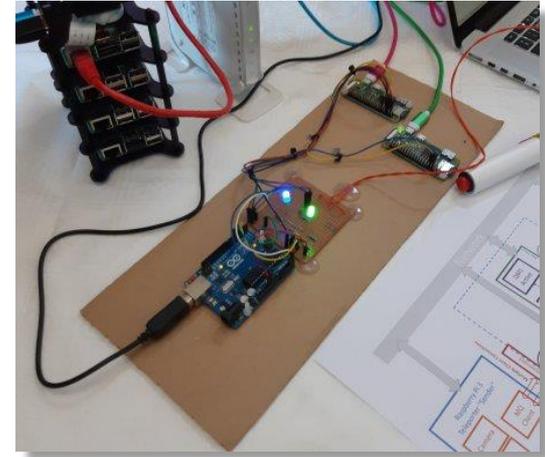
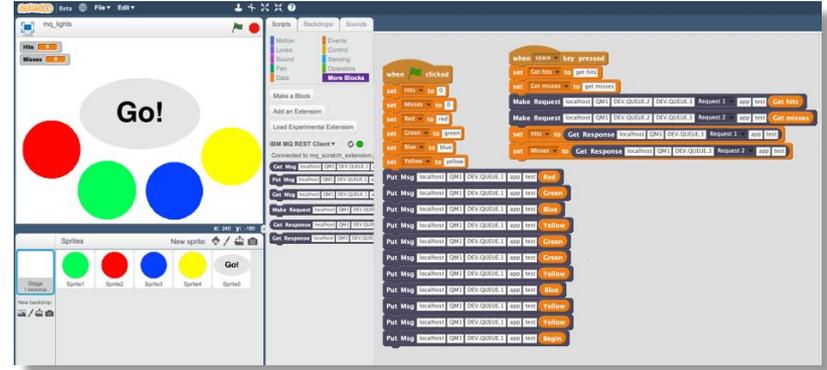
There's nothing like flashing lights and wires to grab people's attention. We want everyone to know how easy it is to write messaging applications and how powerful MQ is in supporting them

Ever tried **Scratch**, a graphical way to code, aimed at kids but ideal to show how easily asynchronous messaging can improve your applications with an MQ plugin

ibm.biz/ibmmq-scratch

Heard of the **Raspberry PI**? You think MQ is a heavyweight solution? You can try a development queue manager on a \$5 Raspberry PI Zero!

ibm.biz/ibmmq-pi



Developing applications

Build your applications simply, with no need for an MQ installation

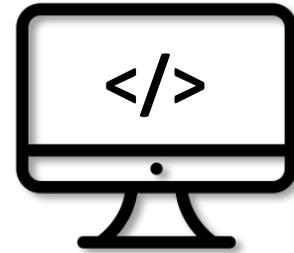
Pull Java directly from the **Maven** repository and .NET from NuGet

The **SDK** has been added to the MQ redistributable client, removing the need to install it to build from

ibm.biz/mq-downloads

Develop your applications on the platform of your choice for free

The full MQ Advanced for Developers is available on Windows and Linux with the addition of a MacOS MQ client and SDK for Developers



Writing new applications

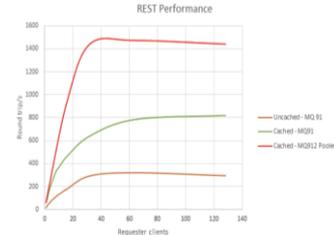
REST Messaging

Providing a very simple way to get messages in and out of your MQ system
9.1.2 CD boosted the performance capability, 9.1.3 CD added message browse and 9.1.5 CD added publish



REST

put, get, browse,
publish



.NET Core

9.1.1 CD brought support for .NET Core on Windows
9.1.2 CD added Linux support



.NET Core

Windows

Linux

Open Source language bindings

Write MQI applications in Node.js and Golang
New simpler JMS style API for Golang

github.com/ibm-messaging



Node.js MQI



Golang MQI



Golang JMS

AMQP Shared-Subscriptions

Consumption of data from subscriptions and shared-subscriptions
e.g. with the QPID JMS library

9.2



AMQP



QPId JMS

Thank you

John Clifton

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AskMessaging@uk.ibm.com



Join the **MQ Beta** program to see *and influence* how the Uniform Cluster pattern and all other MQ features continue to evolve

MQ.Early.Program@uk.ibm.com

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