IBM MQ Futures

Hursley Summit 2017

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IBM Messaging

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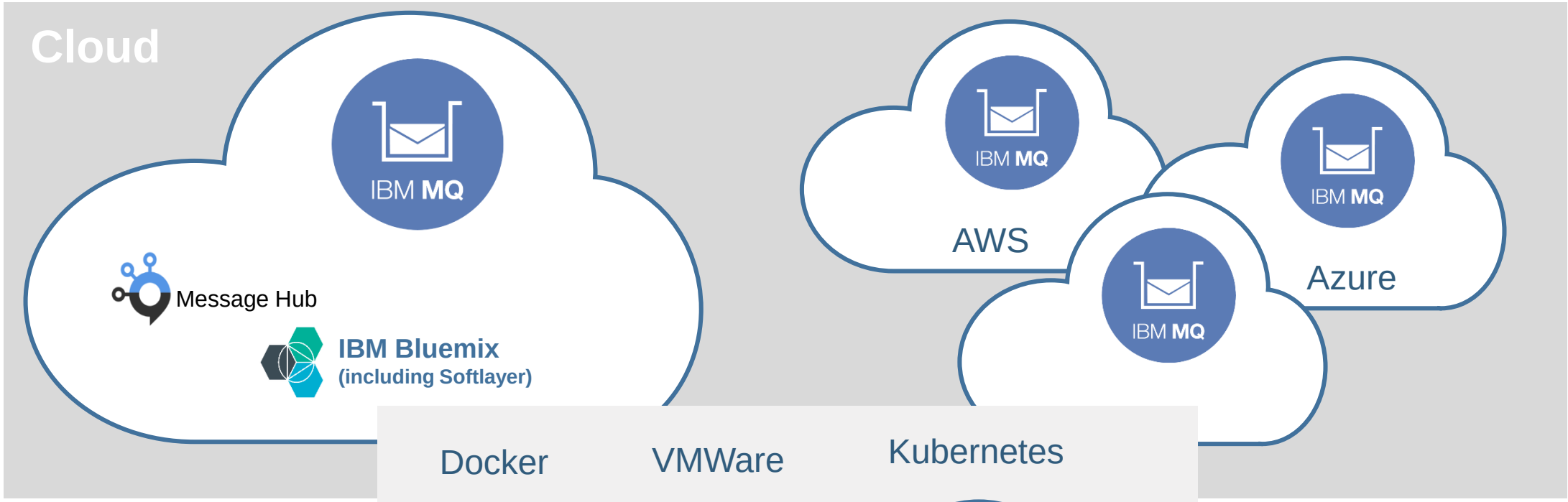
Today's evolving environment

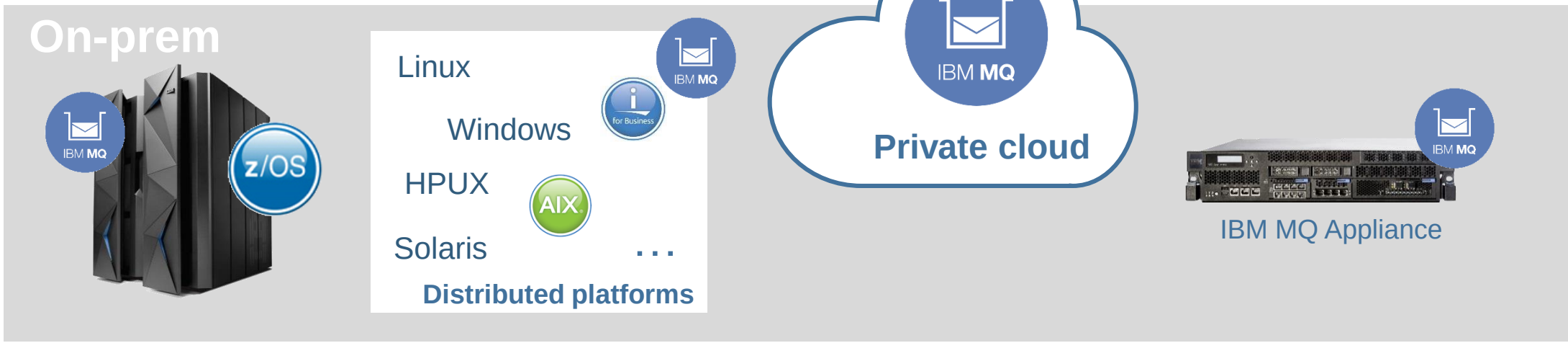
By end of 2017, over 80% of enterprise IT organizations will commit to multi-cloud architectures

- Mainframe to mobile
- Data center to public cloud – or clouds
- Internet of Things and 24x7 global reach

Fragmentation, and separation of applications, systems and data

Run MQ, exactly how and where you need it





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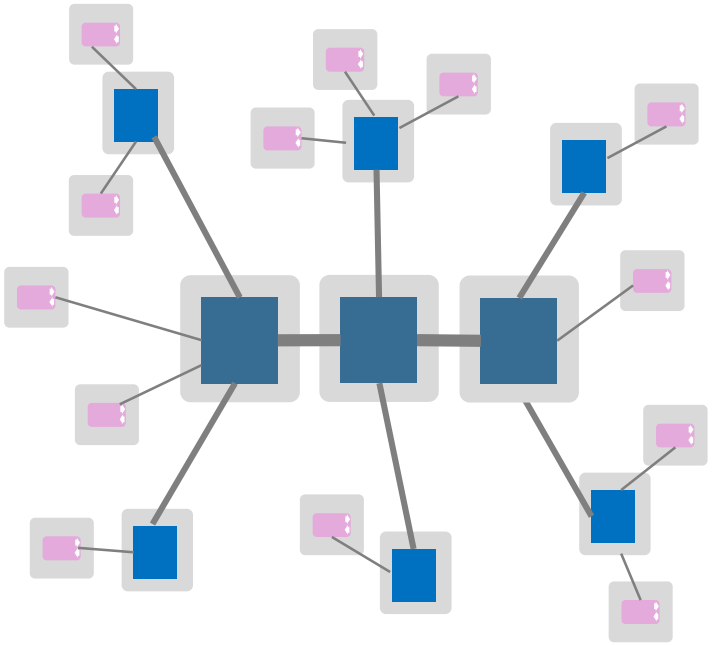
Changes in deployment choices accelerating



- Where and how?
  - Increasing deployments as messaging hubs
  - Rapid growth in container deployments alongside VMs
  - Clouds being used for both applications and MQ hosting
  - Architectures of MQ environments reflecting changes
    - MQ Queue Managers supporting individual application deployments
    - Easier to manage and maintain
    - Tying QMs to application instances also fits cloud deployments
  - Does MQ need to be more consumable within applications?
    - Embeddable? Persistent client?
- MQ deployment platforms consolidating…
  - Should MQ cover the same range of platforms?
    - “No further releases of MQ on HP-UX after 9.0 LTS”
    - Should Solaris be next in line? Does recent Oracle announcement make a difference?
  - Continued deployments on NSS?
    - Should we include MQ Advanced for NSS as an option to allow wider use of AMS (end to end encryption)?

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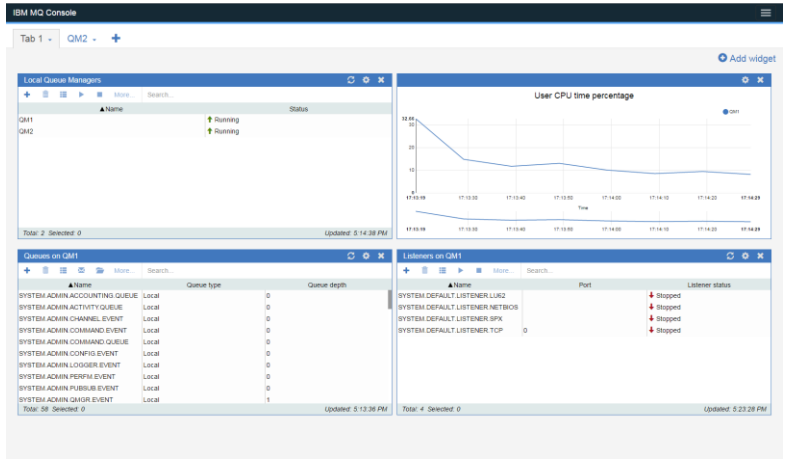
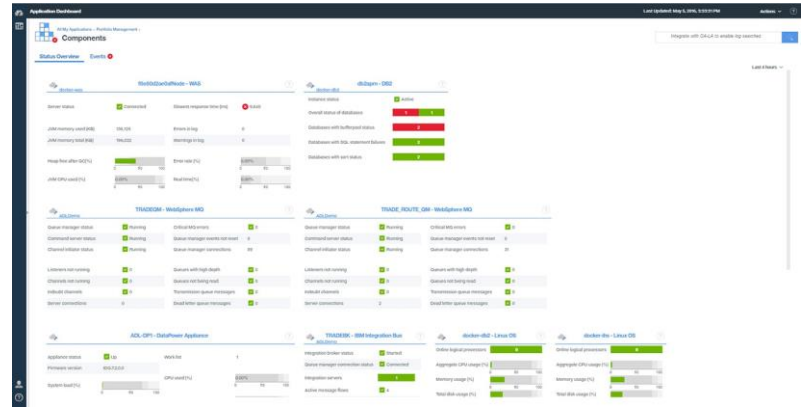
How does MQ fit into your wider business environment?

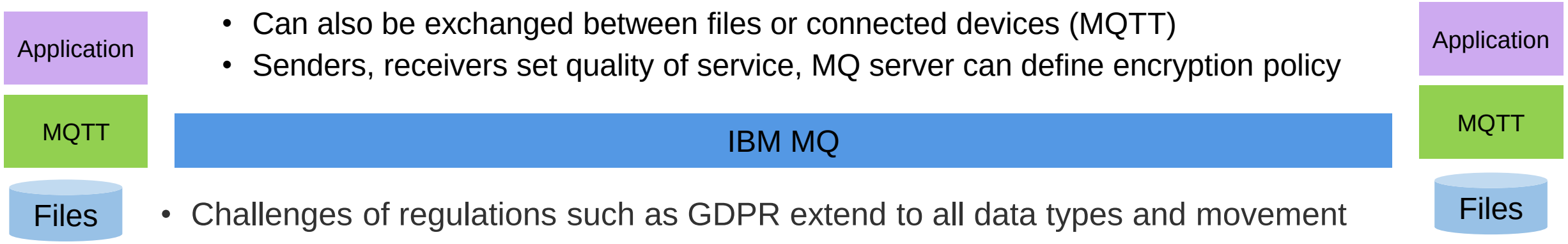
- Huge diversity in MQ deployment since Dec 1993
- MQ not simply reliable and secure delivery of messages
  - Monitoring and reporting are key
    - Understanding MQ status, and updating it
    - Where's my message…?
- MQ provides tools (MQSC, PCF, Explorer, Console) but otherwise relies on the partner ecosystem (plus IBM offerings)
  - Customer-written tools are also part of the mix
- Evolving architecture everywhere is changing this aspect of MQ use
  - MQ must fit into the tooling and skillset that customers want to use
- Changes in how admin and monitoring in MQ can be customized
  - No single answer but are we heading in the right direction?
  - What else would simplify the use of MQ in this area?



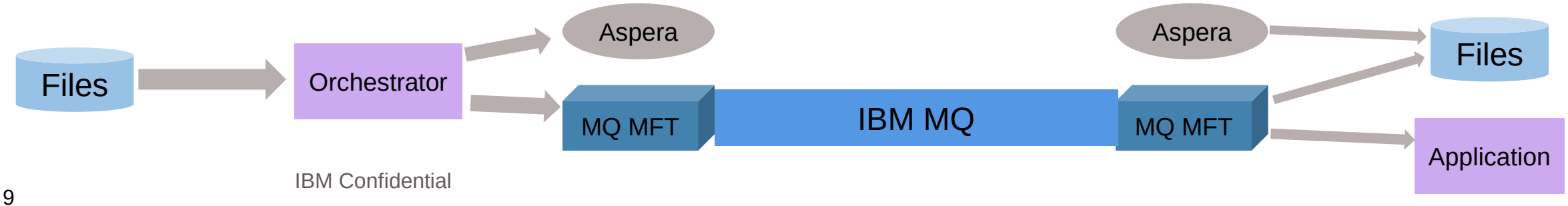


MQ helping to turn new challenges into opportunities

- MQ Messaging not just exchanged between applications
  - Can also be exchanged between files or connected devices (MQTT)
  - Senders, receivers set quality of service, MQ server can define encryption policy



- Challenges of regulations such as GDPR extend to all data types and movement
  - Leveraging MQ to move file data can help to reduce tasks associated with GDPR compliance
- Any size of data, over any distance…
  - MQ and MQ MFT can be used with flexibility for lots of deployments, but not perfect for all
  - Leveraging Aspera for larger files over longer distances
  - Not just linking the products together – but smarter flows of data



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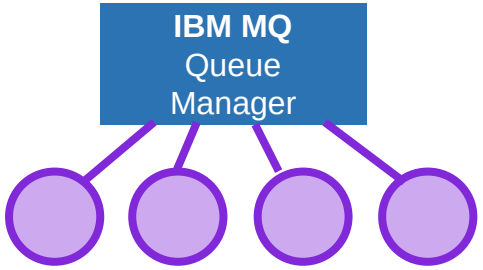
Pricing and licensing – platforms and clients

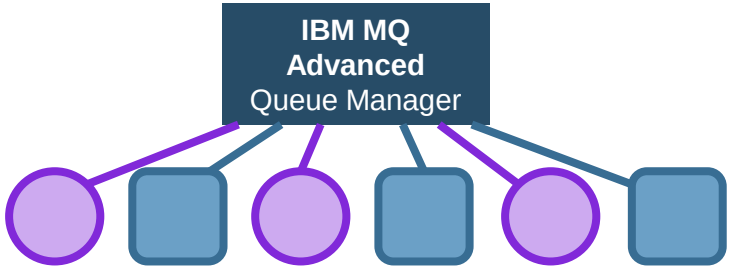
- MQ has always been licensed based on the server capacity
  - Pricing was perpetual on distributed and MLC on z/OS
  - Now have MQ Advanced VUE on z/OS for suitable workloads
  - Monthly PVUs and VPCs on distributed platforms
  - Physical appliances also available as an additional option
- Always free to connect clients to MQ Servers.
  - AMQP clients free to connect to MQ Servers
  - MQTT clients have been connectable at a ‘nominal charge’
  - MQ MFT Agents are now free to connect to MQ Advanced servers

Platform	Monthly	Perpetual
z/OS	MLC	MQ VUE MQ Advanced VUE
Distributed	PVU Monthly VPC Monthly	PVU Appliances



Licensed for MQ Clients only

IBM MQ Appliance



Licensed for MQ Clients and MFT agents

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Scaling up, flexible deployments & licensing

- The availability of MQ as core infrastructure provides benefits to application design and resiliency even at low utilization
  - Once MQ is selected and running, then unit costs decrease as use increases
- Sub-capacity hugely important in age of virtualization and cloud deployments
  - What needs to change with the move to Container deployments?
    - Today container pricing based on the capacity of the VM
  - Looking at a container pricing model based on container size
    - Initial plan to offer monthly licensing based on container size
      - Monitored and reported through Cloud Product Insights
    - Exploring future option for hourly container based licensing
      - Feedback? Use cases where this is suitable?

The details. . .

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High availability

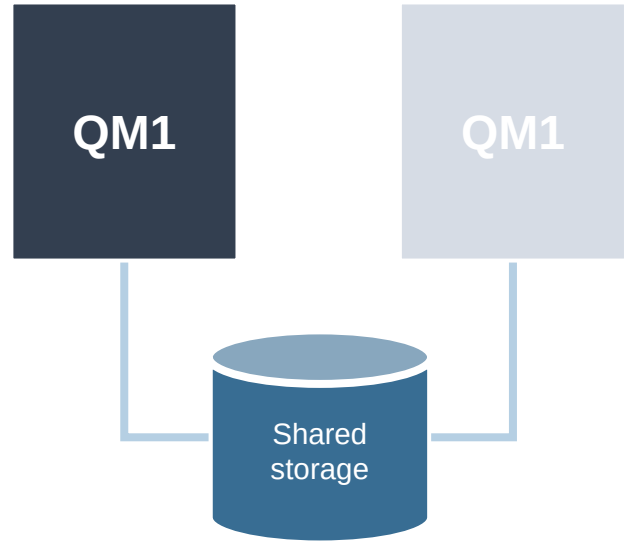
High availability, it’s no longer a luxury

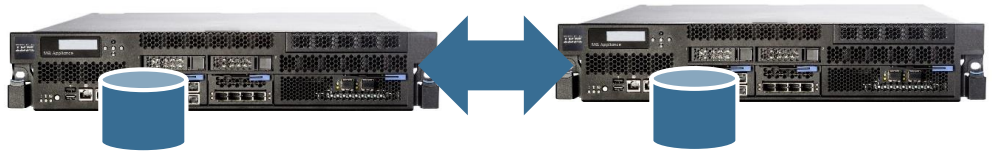
High availability is more important then ever. Users expect their messaging systems to always be available for work and for messages to reach their destination no matter what happens.

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.





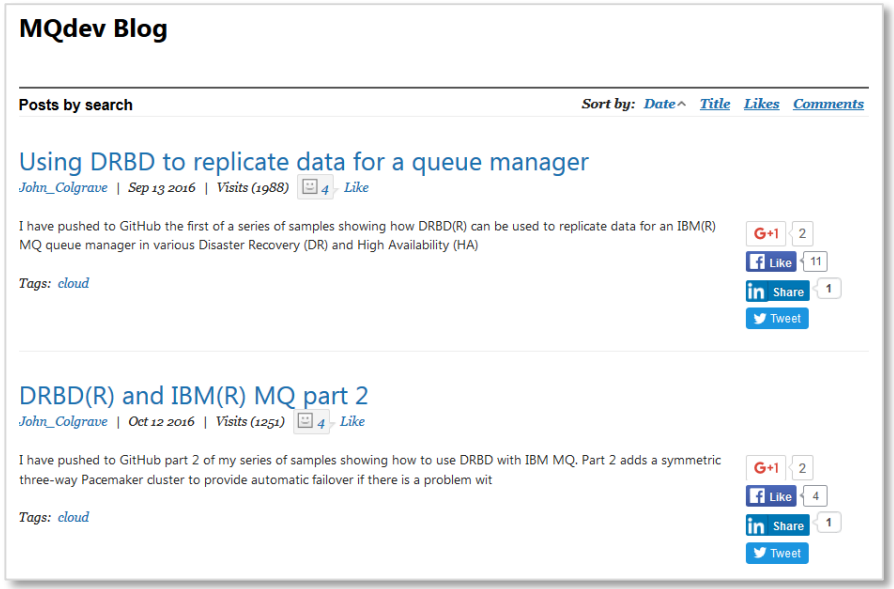
* z/OS shared queue provides active-active HA of the message data

Data replicated HA for Software MQ on Linux

The IBM MQ Appliance introduced shared nothing HA through direct data replication

One way to build your own equivalent is to look to a DRBD based solution (guidance given ➔)

But we're working on an HA solution to provide this capability built directly into **IBM MQ Advanced**…



https://www.ibm.com/developerworks/community/blogs/messaging/

IBM MQ Advanced

Replicated Data Queue Managers

A **Linux** HA solution with no external dependency

- No requirement for a network filesystem or for an HA cluster

Leverages the proven data replication and monitoring capabilities of **DRBD** and **Pacemaker**

MQ will configure the underlying resources to make setup and operations natural to an MQ user

Three-way replication for **quorum** support

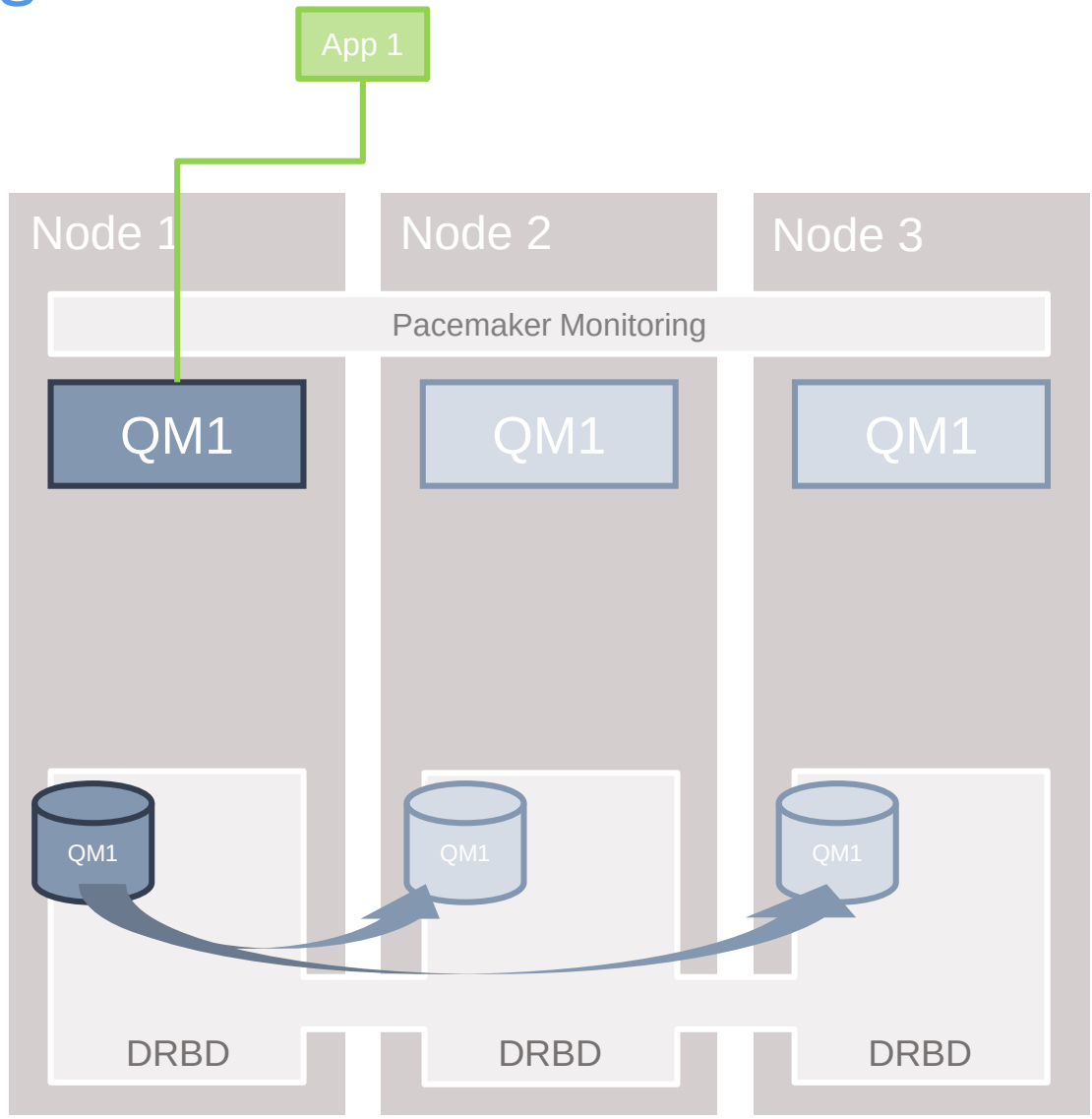
Synchronous data replication for once and once only delivery of messages

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

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

Floating IP support per queue manager to provide simple application setup

Delivered through CD, initially focused on **RHEL v7 on x86-64 only**



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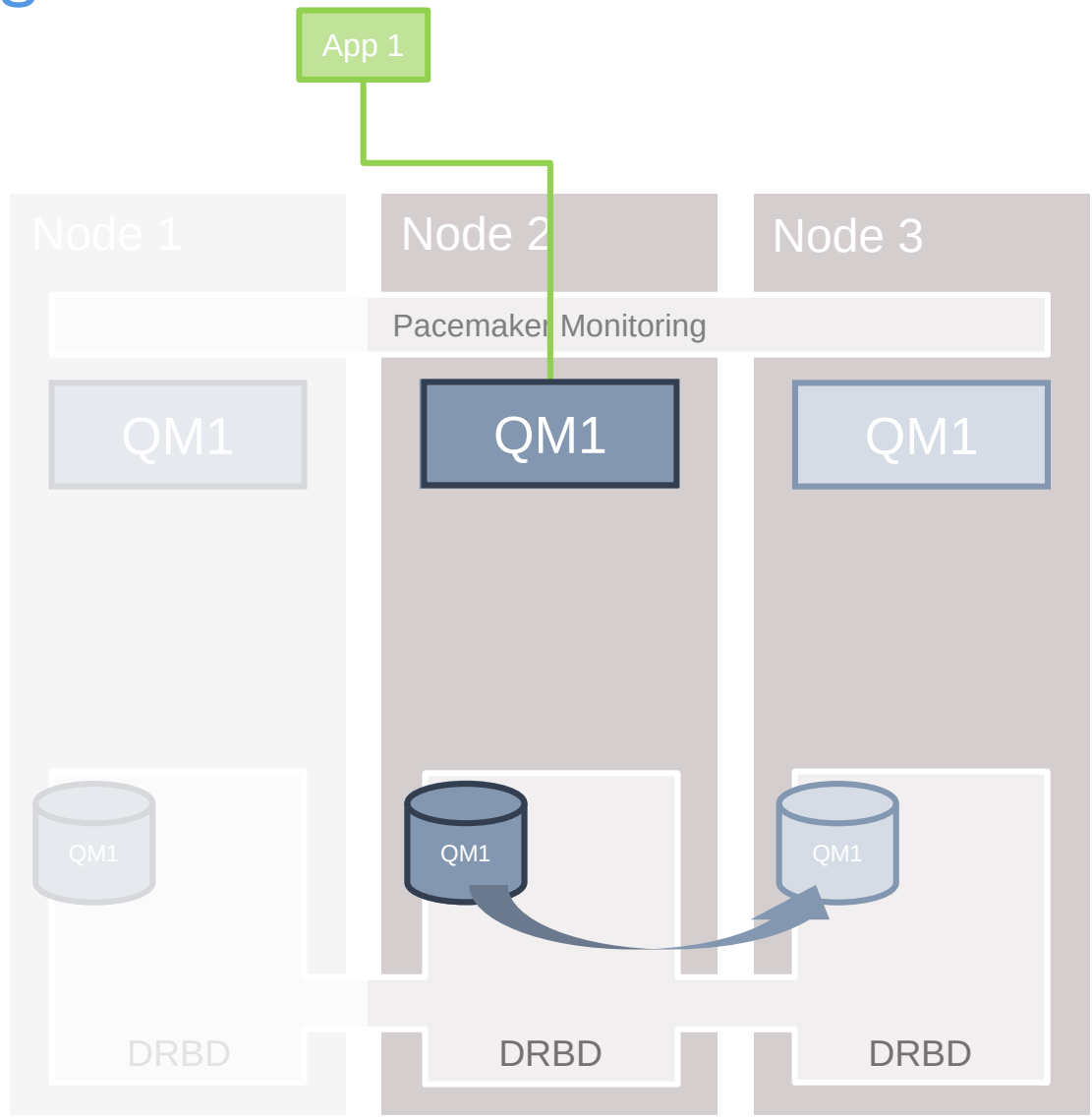


Replicated Data Queue Managers

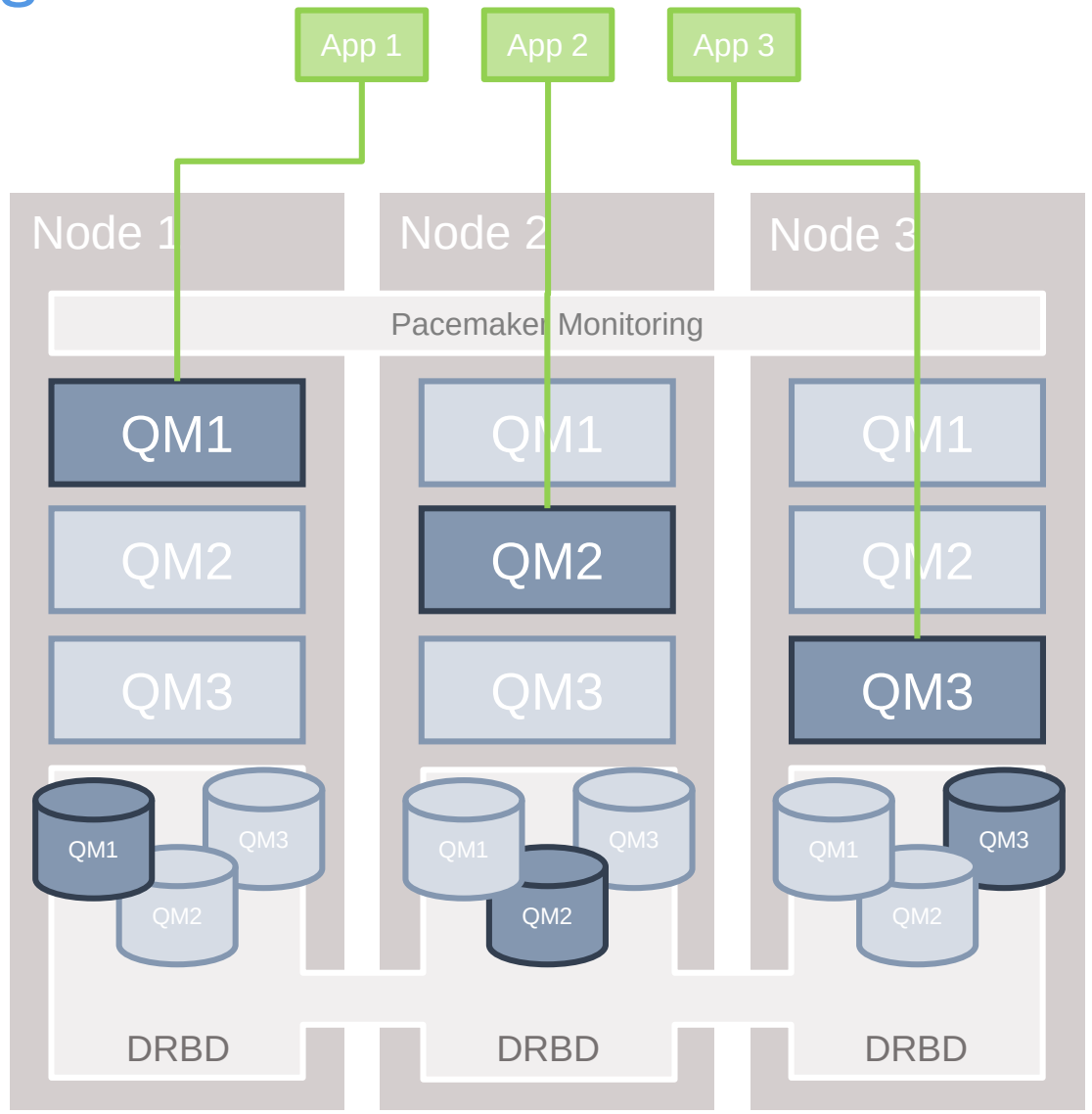
IBM MQ Advanced

Recommended deployment pattern:

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

No one node runs at total capacity, allowing for failed over queue managers when required

MQ **licensing** will be aligned to minimise costs



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Initial focus

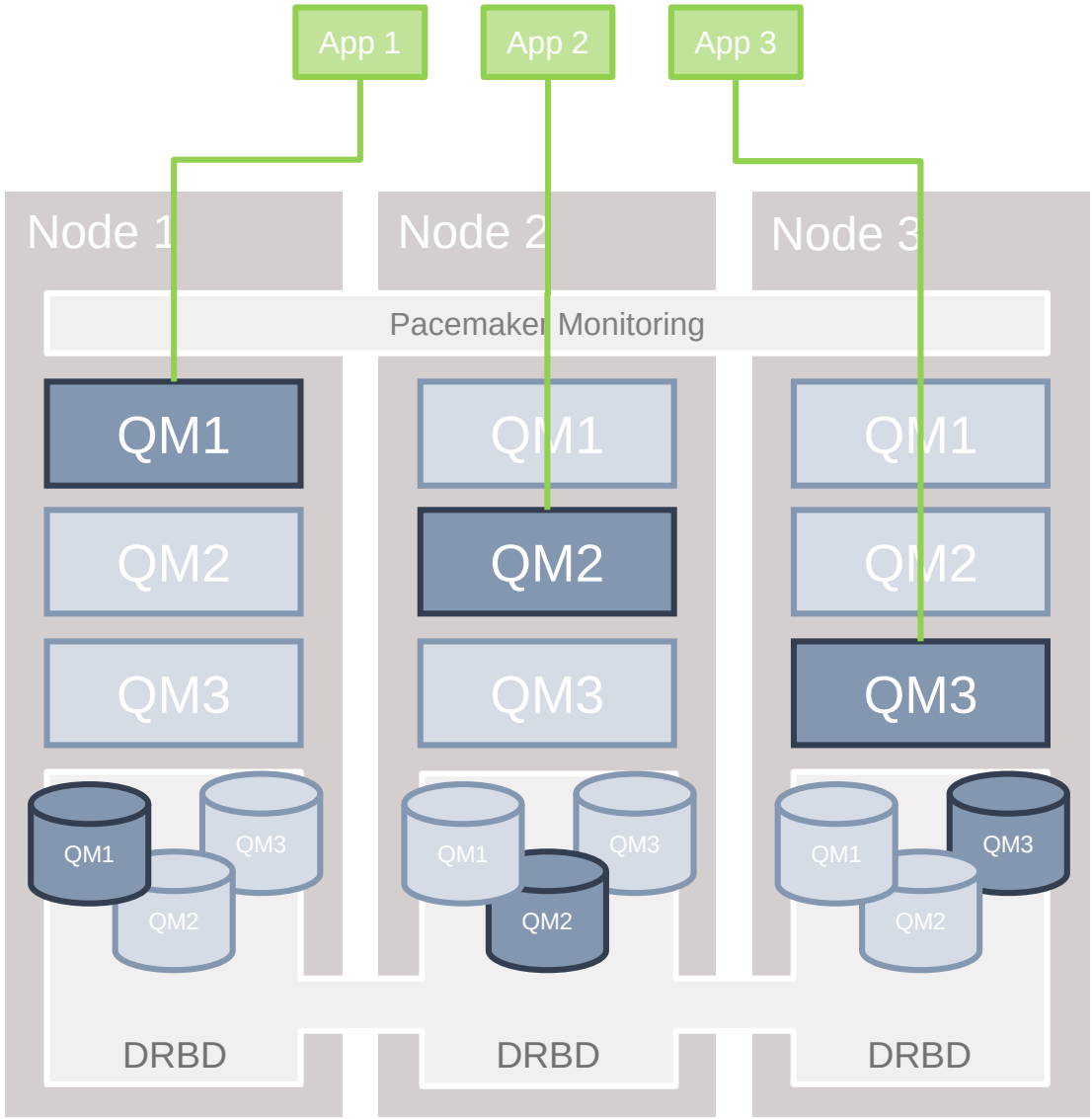
IBM MQ Advanced

Always **Linux only**
but only **RHEL 7.3/4 x86-64** initially

Focus on bare metal and VM environments
(orchestration layers provide alternative capabilities when using containers)

Three nodes are required for quorum, no more, no less

Initially only **synchronous replication** with **automatic HA**



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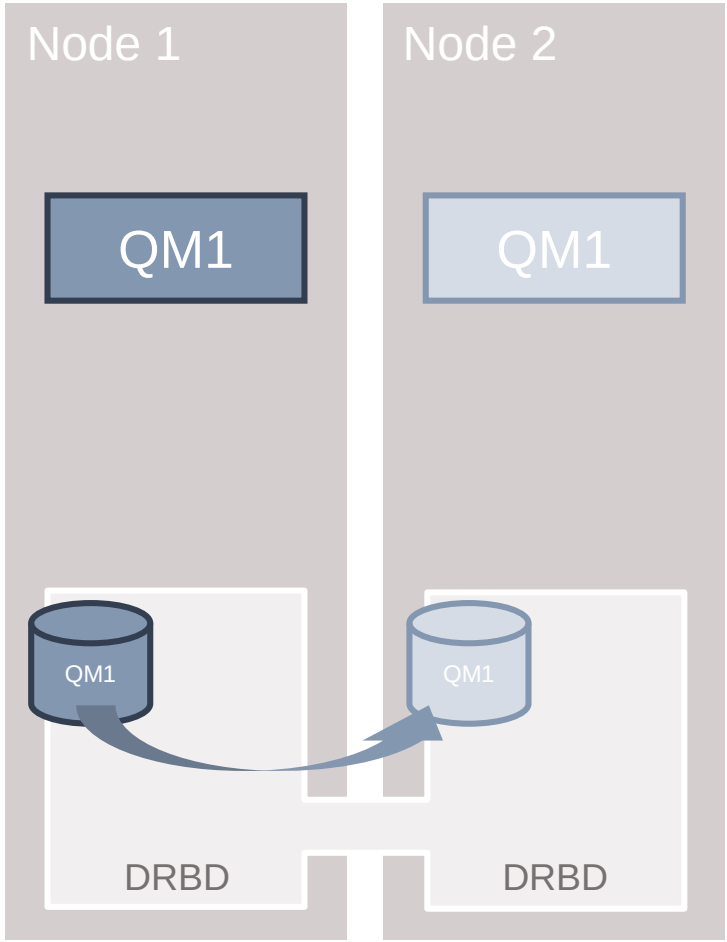
Following that

Manual takeover of queue managers with **synchronous replication**

Removes the need for a three node quorum configuration

Enables *close* dual site fail over configurations



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Supporting your applications

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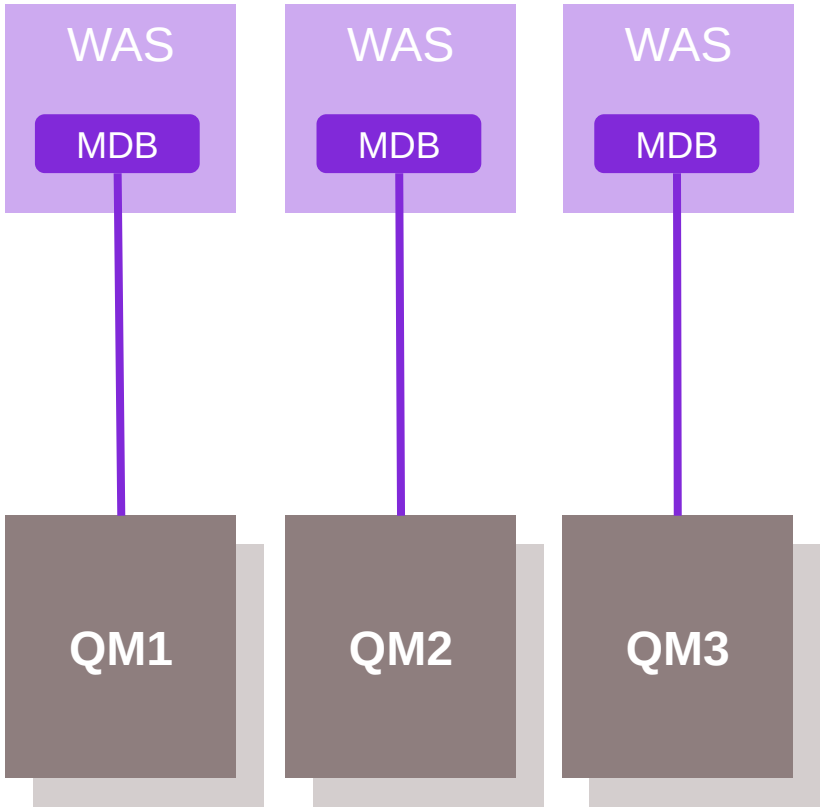
Horizontal scaling and failover with transactions

Building a resilient and scalable system requires the application to be isolated from the individual queue managers

- Enables multiple instances of applications to be easily distributed across multiple queue managers to horizontally scale
- Allows an application to continue to run by failing over from a failed queue manager to an available one

CCDTs (client channel definition tables) are a way to enable this behaviour

Their use in **WebSphere Application Server** has been prevented when the work is **transactional**, forcing an application to be tied to a single queue manager



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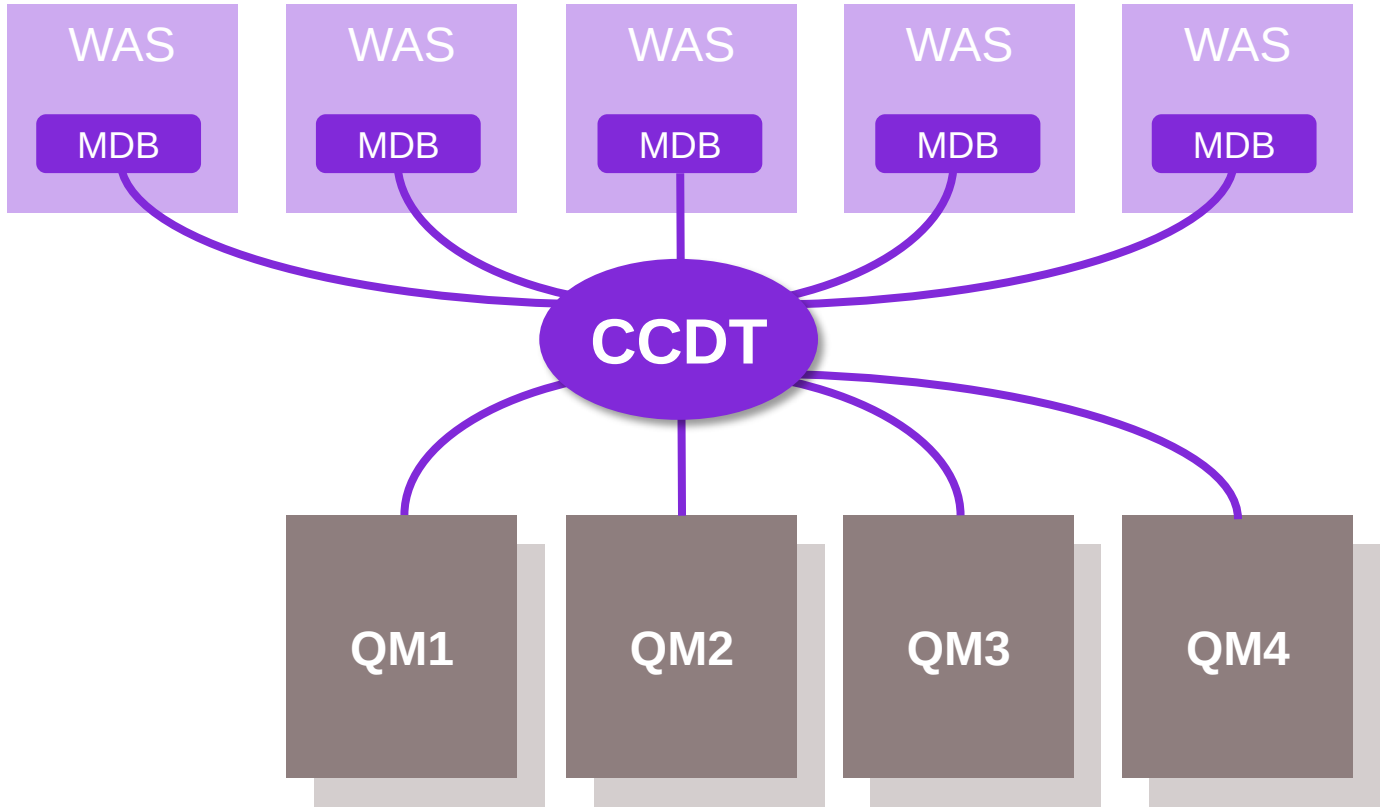

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Multiple APIs and Protocols

IBM MQ supports multiple APIs and multiple client protocols. Both proprietary and open.

APIs: **MQI**, **JMS**, **MQ Light**, **REST** …

Protocols: **MQ**, **AMQP**, **MQTT**, **HTTP**

These support a wide range of application styles, from the simplest of messaging needs through to the richest

MQ is the transport, messages produced from any API or protocol can be received by any other API or protocol.

APIs and Protocols

MQI
Exposes the full set of MQ capabilities
Uses the MQ protocol

MQ
MQ's highly reliable and performant messaging protocol

JMS 2.0
Supports the full JMS API for use in many JSE or JEE environments
Uses the MQ protocol

MQTT
Supports the open standard MQTT API and protocol
Open source Eclipse Paho clients

MQ Light
A simple pub/sub messaging API
Uses the AMQP 1.0 protocol

AMQP
Support for AMQP 1.0 enables support for open source clients such as Qpid Proton

REST
A very simple but secure messaging API over REST
…

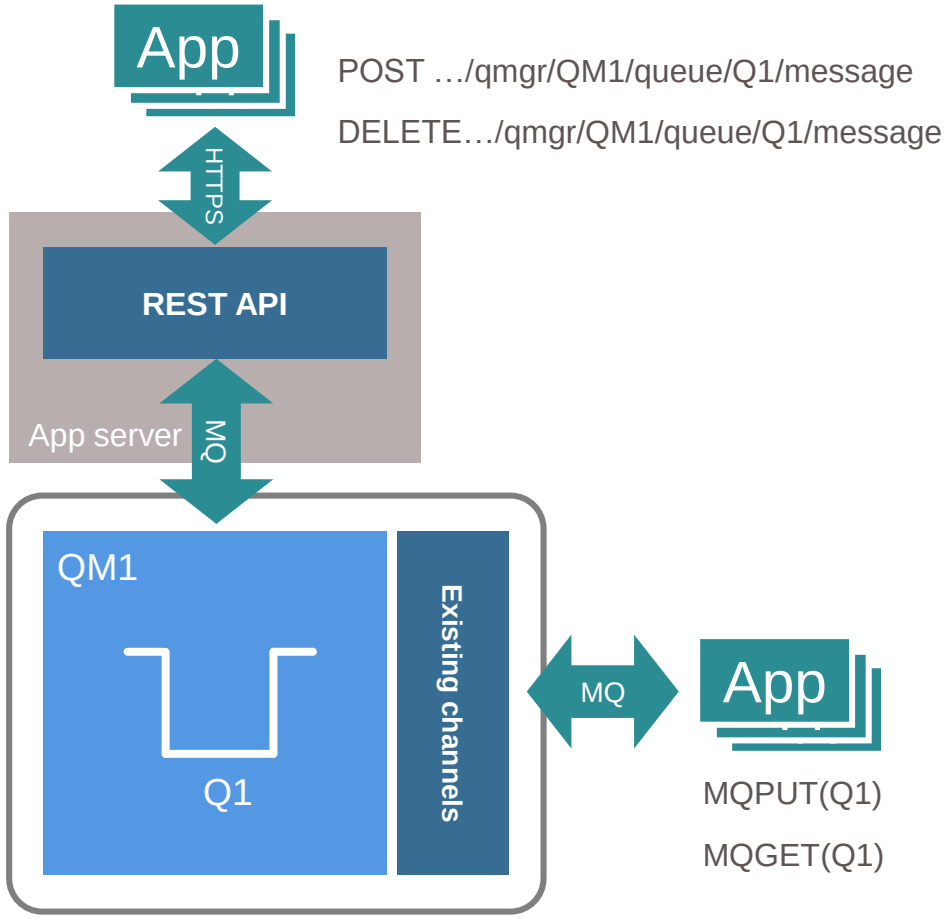
REST Messaging

Many users just want the **simplest** way to get messages in and out of an MQ system

A RESTful API gives you just that. Easily enabling messaging from just about **any environment** with no need for an MQ client or platform/language limitations

MQ currently exposes its messaging capabilities using the ***IBM MQ bridge for HTTP***. This requires your own HTTP server and setup. This feature has been **deprecated** since MQ V8. MQ support for z/OS Connect now provides a similar mechanism on z/OS.

Neither provide all the components, ready configured, inside MQ.



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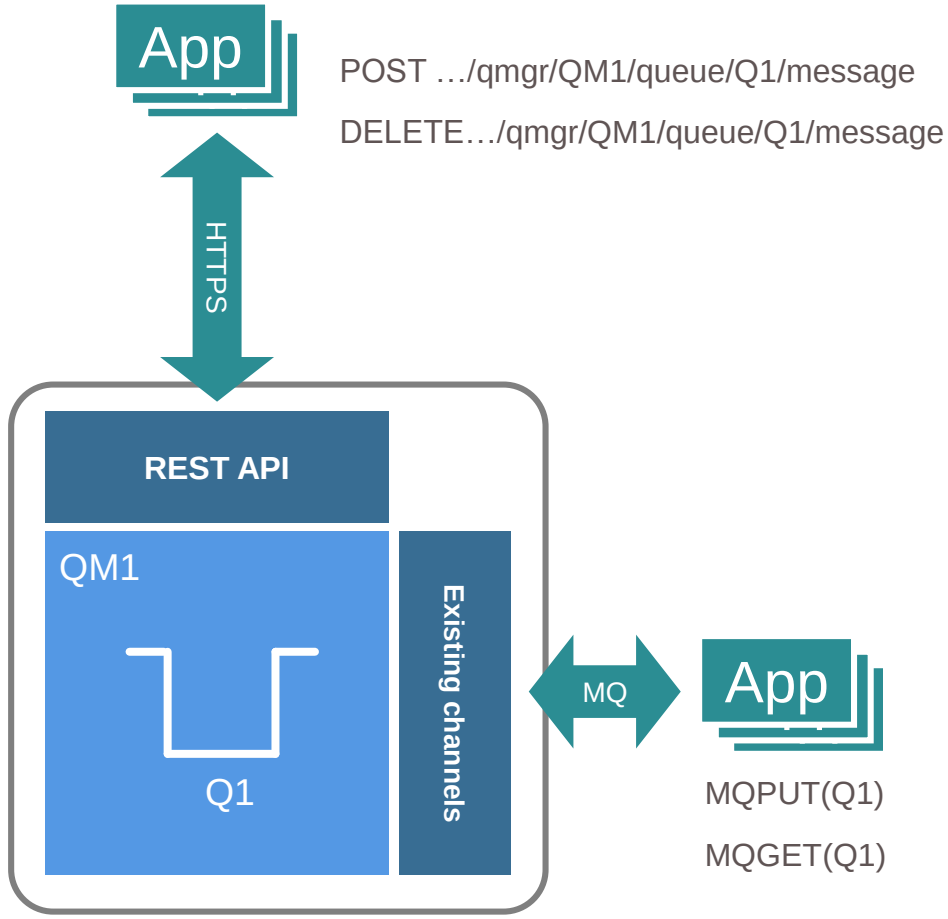
REST Messaging

The new HTTP server support in MQ 9.0.x provides the platform for a properly integrated REST API solution

CD releases will start to see a messaging REST API evolve, first with simple synchronous point-to-point support.

Future capabilities may include asynchronous flows and publish/subscribe support.



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Developer outreach

MQ is hard to get going with!

How do we make it easier for new application teams to pick up MQ and start?

Potential ideas

- A much better getting started experience with simple introductions and exercises
- Updated samples available through Github
- MQ clients available through package managers
- Pre-configured MQ Advanced for Developers package
- More language support
- …?

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 2 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 of their choice within an afternoon.

Tell us what we're missing

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Bridging MQ with external systems

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

Message Hub
Connect MQ to the Bluemix messaging service

Salesforce
Integrate MQ's publish/subscribe with Salesforce events

Blockchain
Use MQ messages to query and update the blockchain

Kafka
Use open source Kafka connectors to join MQ with Kafka

IBM Integration Bus
IBM's integration solution for everything else!

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IBM MQ Advanced

Blockchain Bridge

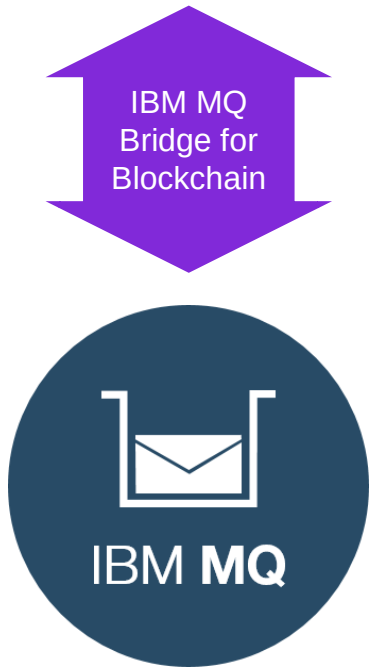
Asynchronous request/reply MQ message flow for applications to request information from Blockchain ("what is the value of the balance on this account") over MQ queues

Currently

- Provided with **MQ Advanced for z/OS VUE V9.0.3**
- Connects to Hyperledger Fabric networks in IBM Bluemix
- **Query** the ledger only

Next

- Provided with MQ **Linux server** and **client** images
- Supported for use with **9.0.x MQ Advanced** queue managers
- Connects to local Hyperledger Fabric networks
- Ability to make **updates** to the ledger



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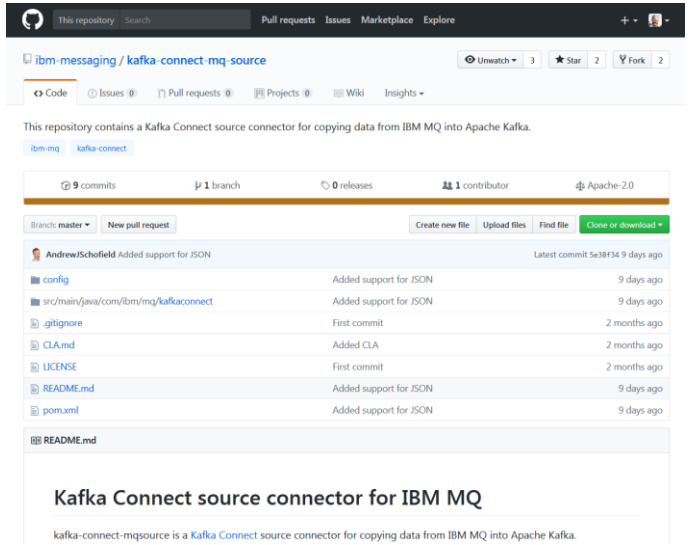
Kafka Connectors for MQ

There is an increasing need to bridge between your MQ messaging platform and your Kafka stream data platform, unlocking your enterprise and your stream data

Kafka Connect is a framework included in Apache Kafka that enables this

IBM MQ sink and source connectors are currently being openly developed by IBM

https://www.confluent.io/product/connectors/



Salesforce Bridge

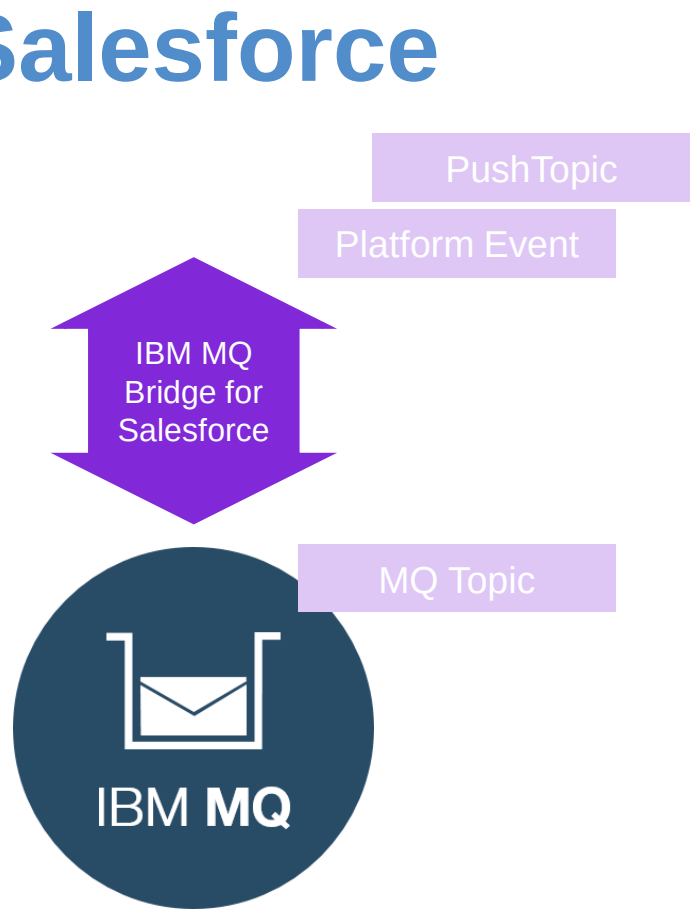
Safesforce's cloud-based CRM platform enables events to be emitted when changes are made to data, or when applications run

Currently

- Supports Salesforce Platform Events and PushTopics
- Events are published into the MQ publish/subscribe network

Next

- Events originating in the MQ publish/subscribe network are published into Salesforce



Becoming an event-driven Enterprise
Wednesday
3:10pm / 4:30pm

Managed Event Streams

API Management for Event Streams

> As the world becomes more event driven...
>
> Managed Event Streams takes real time data from existing applications, IoT initiatives and cognitive systems and makes these events available to apps, partners and developers, powering a new context aware digital experience

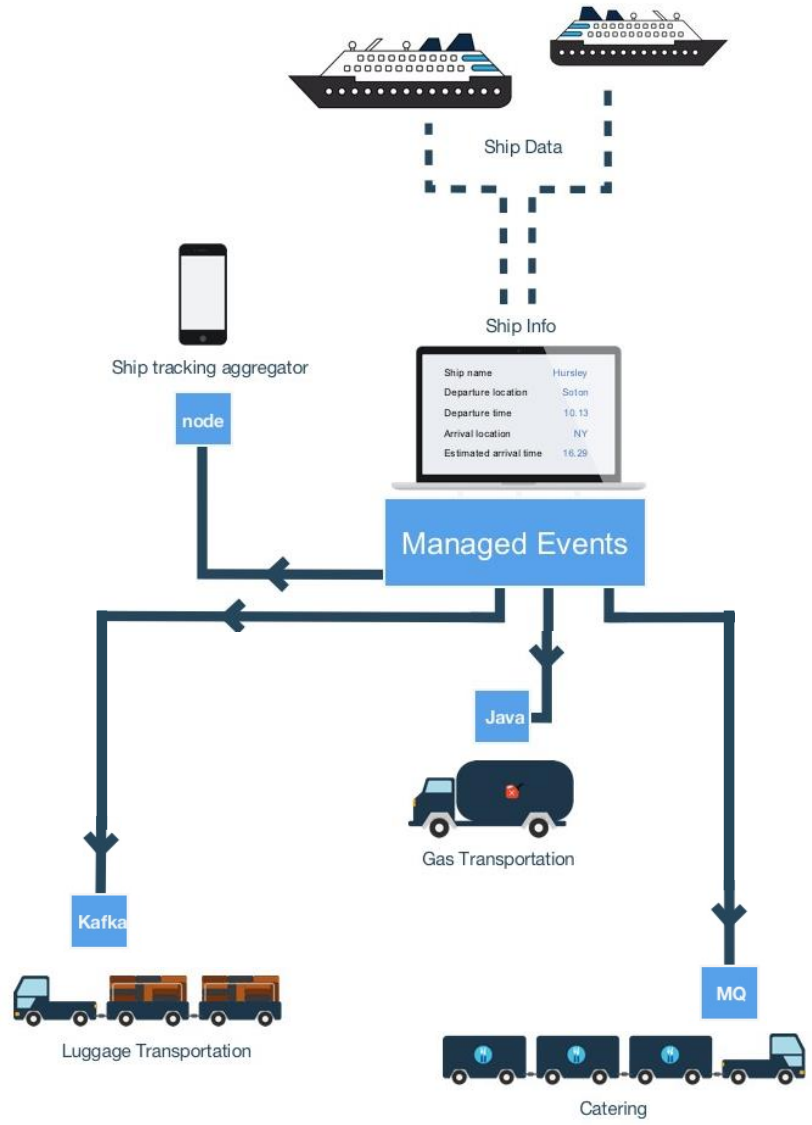
Discoverable

Decoupled

Consumable

Delivered

Monitored



Managing MQ

Managing your MQ estate

Management of MQ is evolving into a **cattle** not **pets** model.

- Consistent configuration and operations across multiple queue managers
- Automated deployment
- Configuration as code
- Self service
- Collection and analysis of diagnostic data
- Simple integration into standard devops and automation tooling

REST Admin, the story continues…

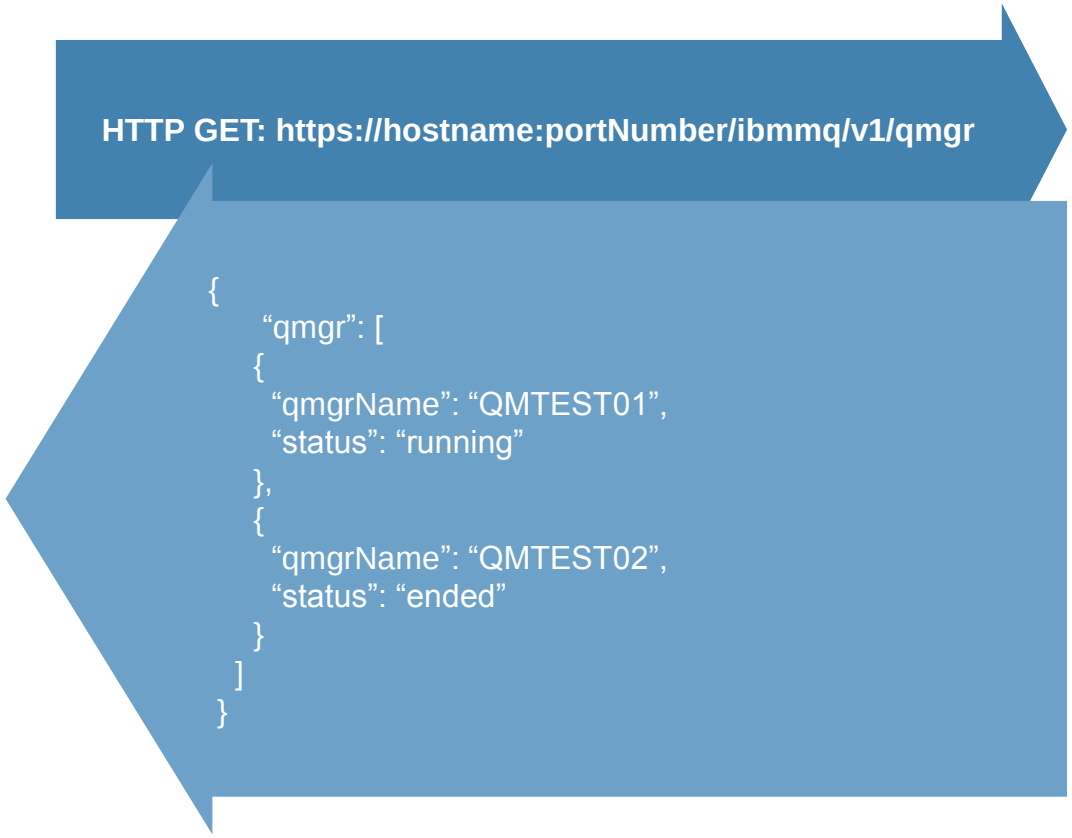
RESTful interface to MQ systems

- Published, supported interface
- Simpler alternative to existing PCF and MQSC mechanisms for tooling
- Secure

MQ resource configuration

- Queue managers, Queues, Channels, Topics, etc.

The MQ REST API is being iteratively delivered across the CD releases, adding control over more MQ objects each time



An MQSC catchall for REST

Tailored RESTful support for individual MQ objects and actions are in the works…

However, to speed up full MQ admin support over REST we will be adding the ability to submit arbitrary MQSC commands over REST

- ✓ Gives complete MQSC coverage quickly
- ✓ Simple to convert existing scripts
- ✘ Does not benefit from improved usability

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

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

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

Stopping a channel

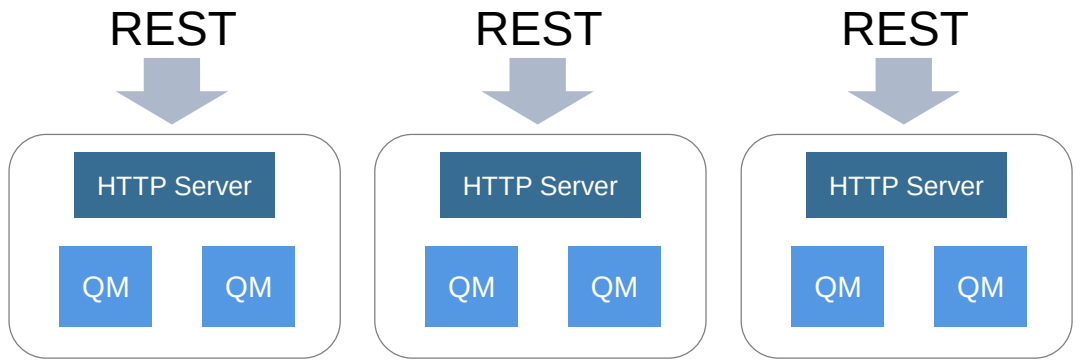
Enabling your whole estate for REST administration

Currently REST enables you to administer each MQ installation separately, they must all be on the MQ 9.0.x CD release

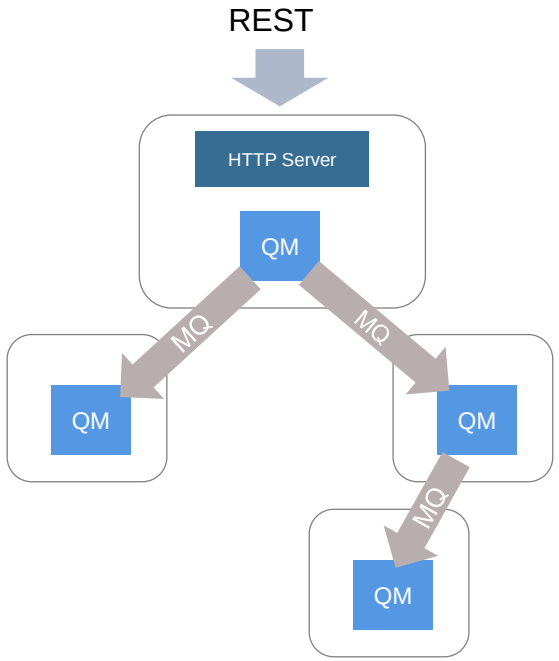
We are looking at managing a network of systems through gateway entry points

This will mean that not every queue manager will need to expose HTTPS endpoints

Pre-9.0.x queue managers will be able to be administered through those 9.0.x gateways



Currently



Next

Monitoring MFT with REST

Rest interface to discover MFT Agents availability and File transfer status within MFT landscape

List all the MFT Agents available and their status

List all the managed file transfers that are completed/in progress.

Query for details of a particular managed file transfer request.

HTTP POST: https://host:port/ibmmq/v1/mft/transfer


```
{
  "transfer": [ {
    "transferId":
          414d512050524d465444454d4f3120203e1b7859227a5c02",
    "state": "completed",
    "sourceAgent": {
        "name": "AGENT2"
    },
    "destinationAgent": {
        "name": "AGENT1"
    },
    "originator": {
       "userId": "IBM_ADMIN"
    }
  },
}
```


List all transfers

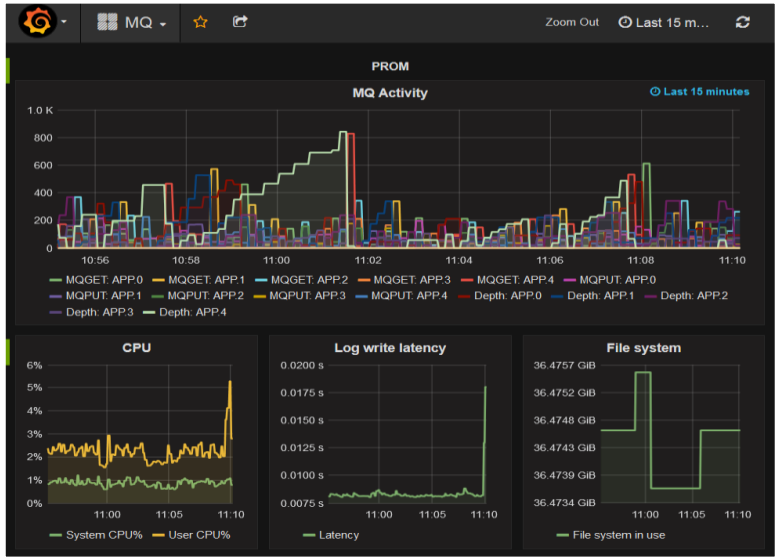
Managing diagnostic data

Collecting system information in a way that can be monitored and analysed is now more important than ever with larger, more dynamic and remotely administered systems

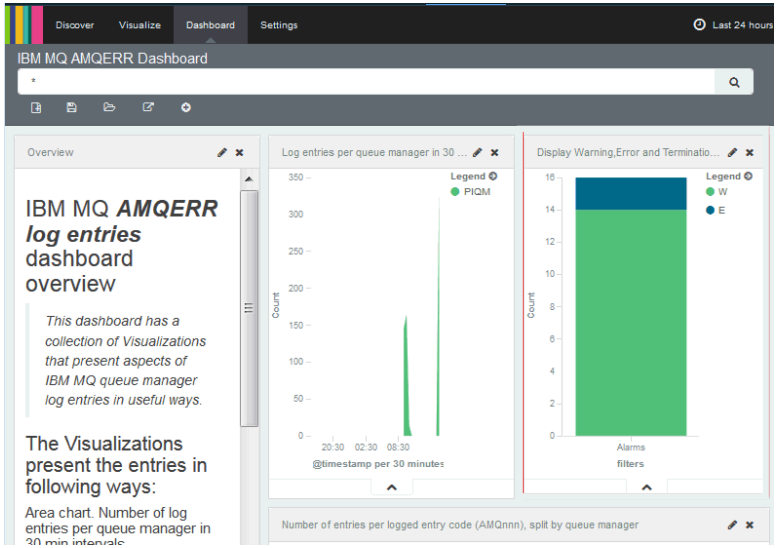
MQ has demonstrated how metrics and error logs can be collected today

Metrics that are easily enabled using MQ V9 system topics, forwarded into Prometheus

Error logs parsed and forwarded using Logstash into Elastic Search



System topic data feeds your own Grafana dashboard
github.com/ibm-messaging/mq-golang



Use Logstash to forward queue manager errors logs to an ELK stack
https://www.ibm.com/developerworks/community/blogs/messaging/entry/Storing_and_searching_MQ_logs_in_Elasticsearch

Managing diagnostic data

MQ 9.0.3 delivered improvements to the error log content

- Universal timestamps
- Message severity

Future improvements to error logs

- Easily parsable **JSON** error log formats
- Multiple **error log targets** (file, Syslog, standard out, …)
- Message **filtering** at source (by severity, by category)

```
05/10/2017 12:22:01 - Process(69708.1) User(another) Program(runmqchi.exe)
                      Host(DUMMY) Installation(MQNI09000400)
                      VRMF(9.0.4.0) QMgr(QM1)
                      Time(2017-10-05T11:22:01.376Z)
                      ArithInsert1(0) ArithInsert2(0)

AMQ9542W: Queue manager is ending.

EXPLANATION:
The program will end because the queue manager is quiescing.
ACTION:
None.
```


```
{
  "ibm_messageId":"AMQ9542W",
  "arith_insert_1":0,
  "arith_insert_2":0,
  "ibm_datetime":"2017-10-05T11:22:01.376Z",
  "ibm_serverName":"QM1",
  "type":"mq_log",
  "host":“DUMMY",
  "loglevel":"WARNING",
  "module":"amqrimna.c:1071",
  "ibm_sequence":"1507202521376344_4991908185865",
  "ibm_processId":69708,
  "ibm_threadId":1,
  "ibm_version":"9.0.4.0",
  "ibm_processName":"runmqchi.exe",
  "ibm_userName":“another",
  "ibm_installationName":"MQNI09000400",
  "ibm_installationDir":"C:\\Development\\errl2\\p900_D\\obj\\amd64_nt_4",
  "message":"AMQ9542W: Queue manager is ending."
}
```


IBM Confidential

MQ in the Cloud

IBM MQ in the Cloud
Tuesday
2:00pm / 3:15pm

IBM MQ as a Hosted Service
Wednesday
3:10pm / 4:30pm

IBM Messaging

Tuesday, 10 October 2017

IBM Confidential

Run MQ exactly how and where you need it

Options Available today

IBM MQ Appliance

Distributed Platforms Linux, Windows, AIX, HP-UX, Solaris, …

Traditional on-premises, customer managed

Azure

AWS

SoftLayer

Bluemix

Docker

Kubernetes

OpenStack

Packer

Public or Private clouds (bring-your-own license)

Option in the Future

Hosted SaaS offering managed by IBM

Everything we're doing is *cloud*

Cloud deployments of MQ will directly benefit from many of the features we're building into MQ

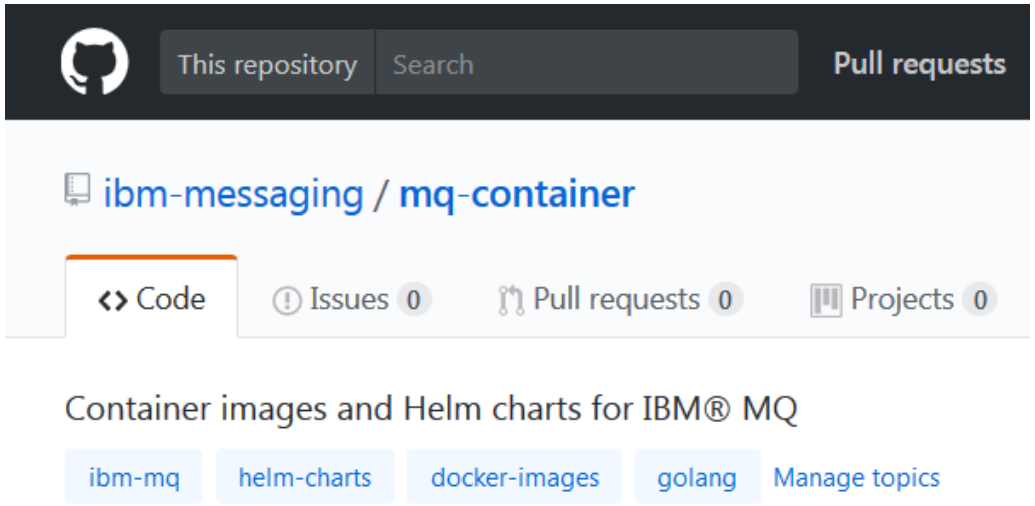
- Direct data replication HA
- Support for dynamic client connectivity
- REST messaging
- Connectivity to cloud services
- REST administration
- Metrics and log forwarding

IBM Confidential

MQ in Containers

The Docker support for MQ is continually improving

- Extending the set of supported MQ packages to include **MQ Advanced** packages
- Evolving the Docker image to improve error logging and health checking
- Publishing new **Helm charts** for running MQ in **Kubernetes**



Providing MQ Advanced in **IBM Cloud Private**

- IBM Cloud Private is IBM's Kubernetes-based container platform that provides a catalogue of IBM middleware including MQ Advanced. It includes an integrated DevOps toolchain and core operations services.

Run MQ exactly how and where you need it

Options Available today

IBM MQ Appliance

Distributed Platforms Linux, Windows, AIX, HP-UX, Solaris, …

Azure

AWS

SoftLayer

Bluemix

Docker

Kubernetes

OpenStack

Packer

Traditional on-premises, customer managed

Public or Private clouds (bring-your-own license)

Option in the Future

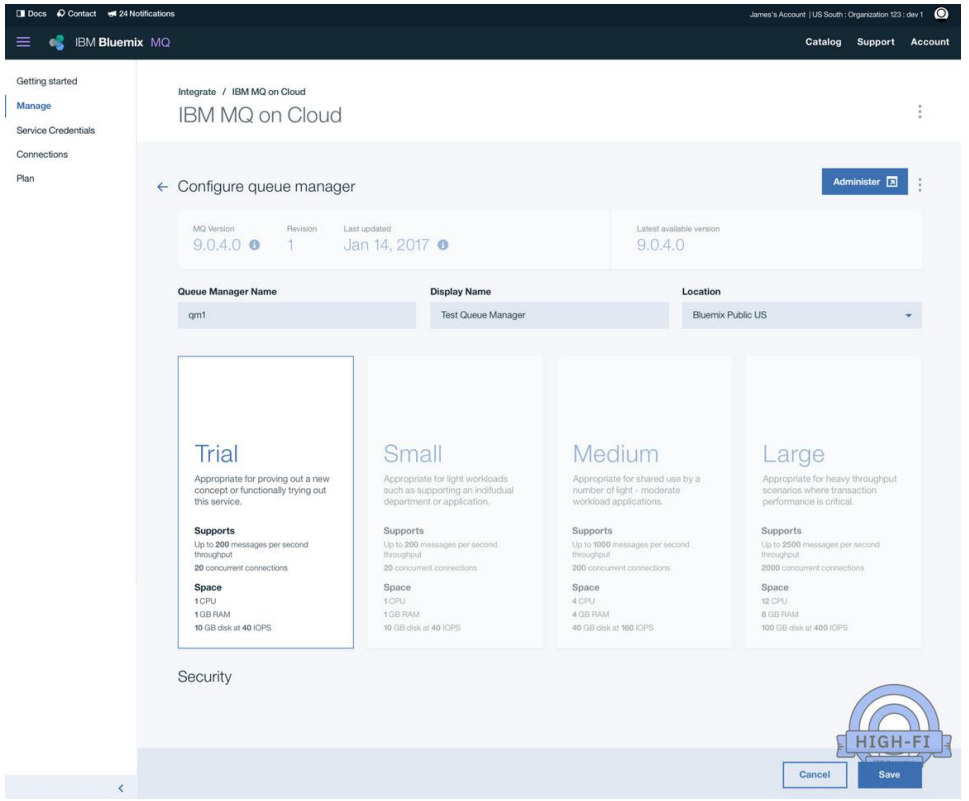
Hosted SaaS offering managed by IBM

MQ in Bluemix *very* high level solution

Provision queue managers directly into Bluemix

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

You own the configuration and the monitoring of the messaging



Configured & monitored by the **customer**

Queues, topics, channels, clustering, applications

Managed & operated by **IBM**

MQ installation, basic configuration, security, maintenance

Hardware, virtualization, servers, network, storage

Hosted initially on

IBM **Bluemix**
Public

Plan your summit . . .

IBM MQ Futures
Tuesday
10:10am / 11:30am

IBM MQ Appliance
Wednesday
9:15am / 10:20am

IBM MQ in the Cloud
Tuesday
2:00pm / 3:15pm

IBM MQ as a Hosted Service
Wednesday
3:10pm / 4:30pm

Becoming an event-driven Enterprise
Wednesday
3:10pm / 4:30pm

Thank you

IBM Messaging

Tuesday, 10 October 2017

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