


KubeCon | CloudNativeCon

North America 2021

RESILIENCE

REALIZED

RabbitMQ on Kubernetes Deep Dive

David Ansari
VMware

RabbitMQ

What
- Cloud-native message and streaming broker

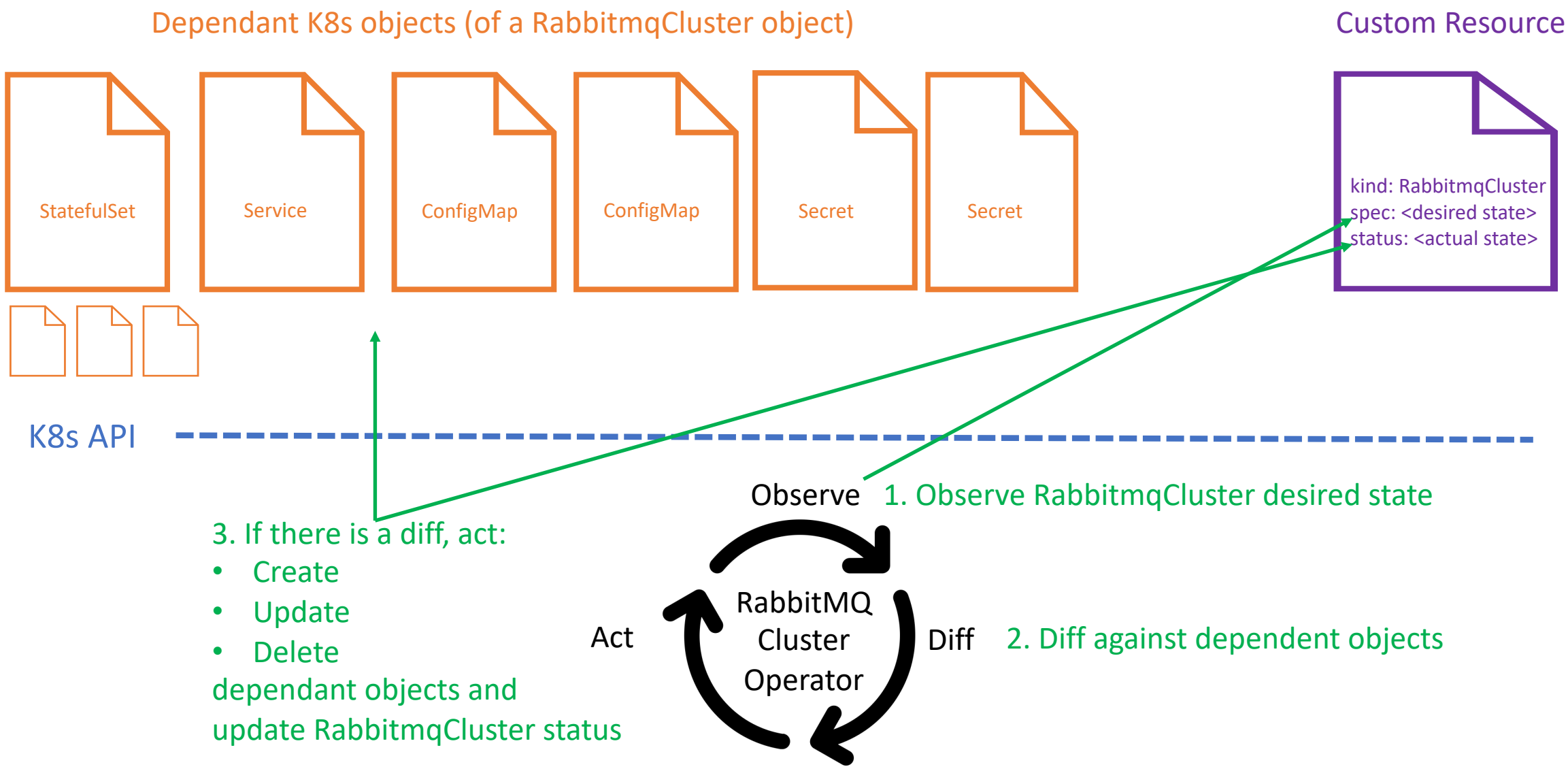
Why
- Loosely coupled micro services and apps
- High scalability by async data flow
- Complex routing topologies

How
- Highly available queues based on Raft and Streams
- AMQP 0.9.1, AMQP 1.0, MQTT, STOMP, Stream protocols
- Deploy on any K8s using operators
- Monitor with Prometheus and Grafana

Agenda

1. rabbitmq/cluster-operator
2. Observability
3. Upgrades
4. rabbitmq/messaging-topology-operator
5. RabbitMQ 3.9
6. Contribute
7. Roadmap

Operator Pattern



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Observability

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Upgrades: Container PreStop Hook

rabbitmq-upgrade await_online_quorum_plus_one

Waits for all quorum queues to have an above minimum online quorum.
Ensures no queues would lose their quorum if the target node is shut down.

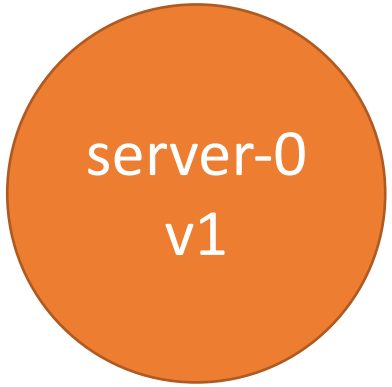
rabbitmq-upgrade await_online_synchronized_mirror

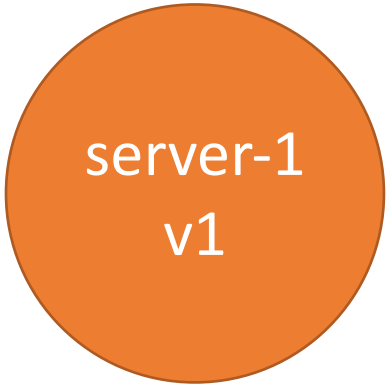
Waits for all classic mirrored queues hosted on the target node to have at least one synchronized mirror online.
Ensures there will be an up-to-date mirror to promote if target node is shut down.

rabbitmq-upgrade drain

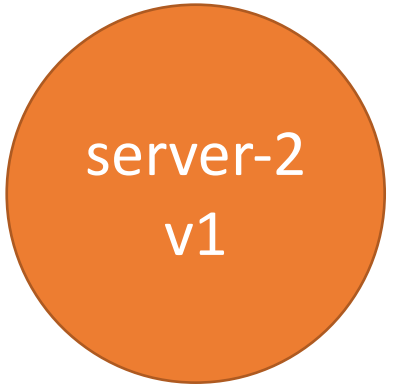
1. Suspend all client connection listeners.
2. Close all client connections. Applications are expected to reconnect to other nodes.
3. Transfer primary replicas of all quorum queues hosted on the target node.
4. Mark the node as down for maintenance.

Upgrades: Rolling Update





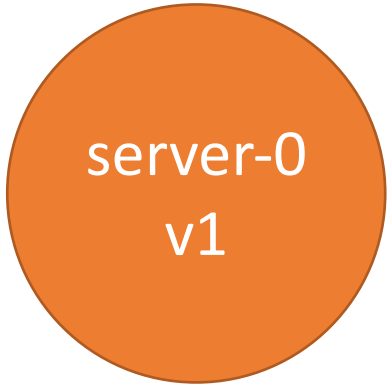
Quorum Queue A Leader



Quorum Queue B Leader

Quorum Queue C Leader

Upgrades: Rolling Update



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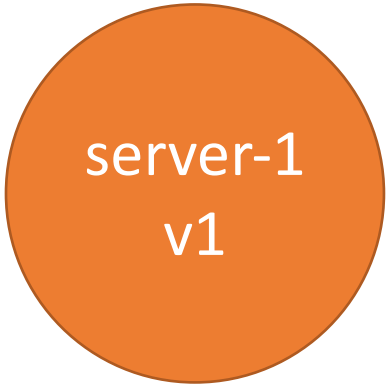

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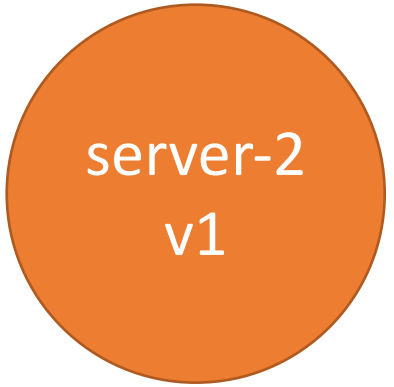

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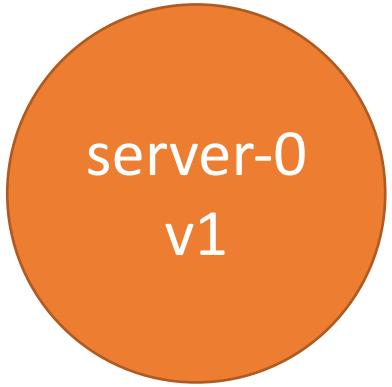

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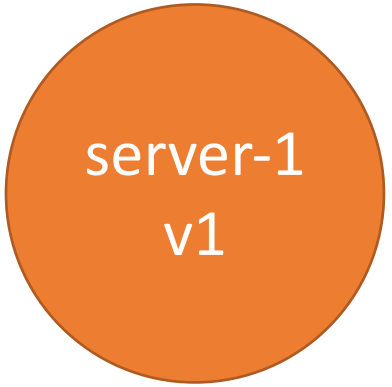

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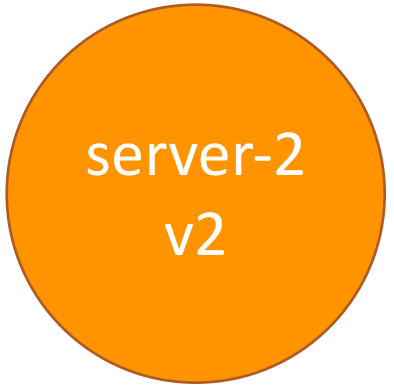

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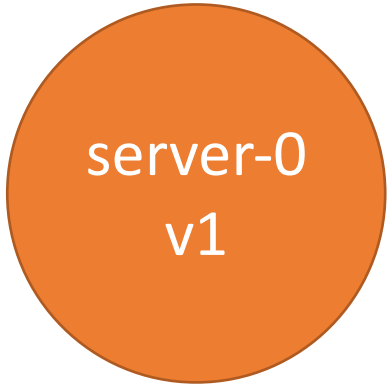

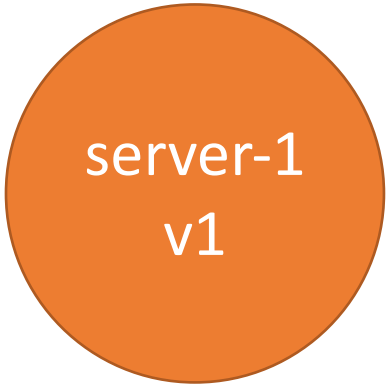

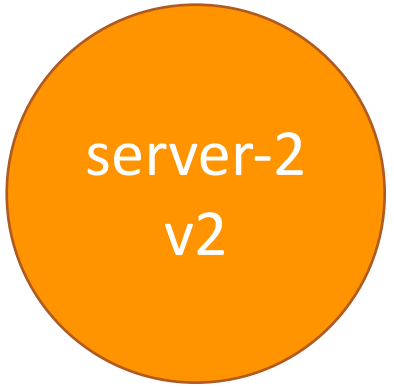

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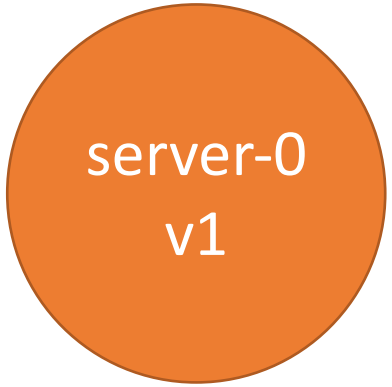

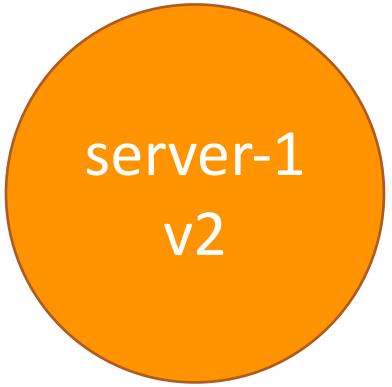

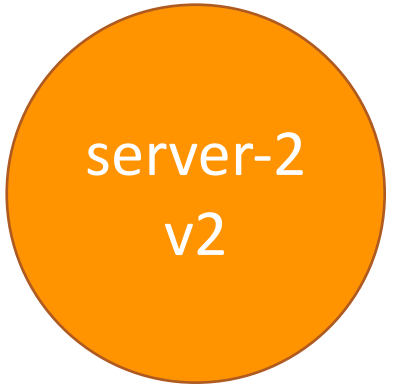

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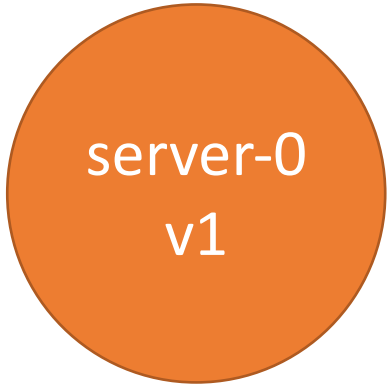

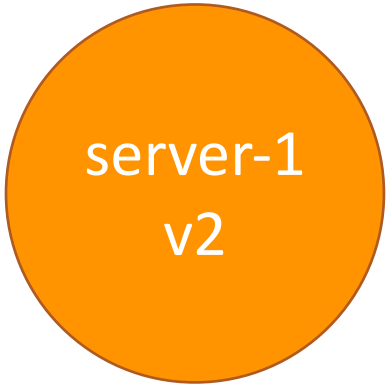

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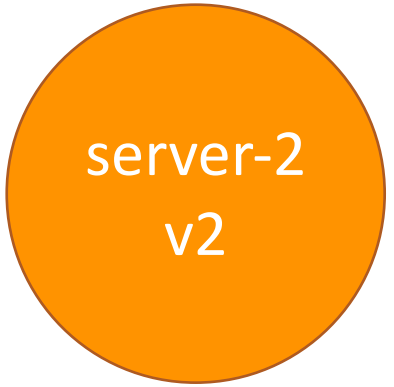

Quorum Queue C Leader

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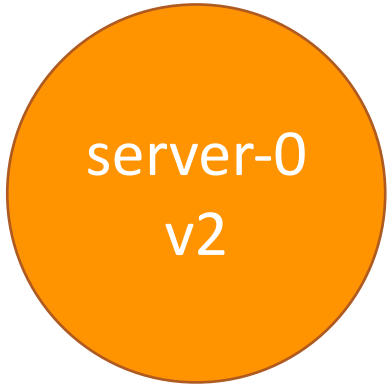

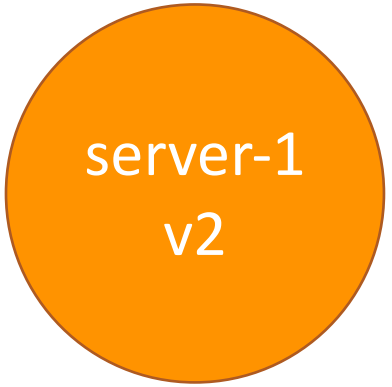

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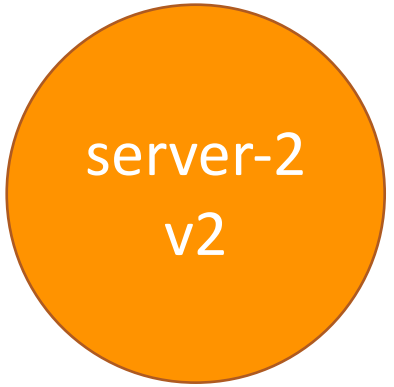


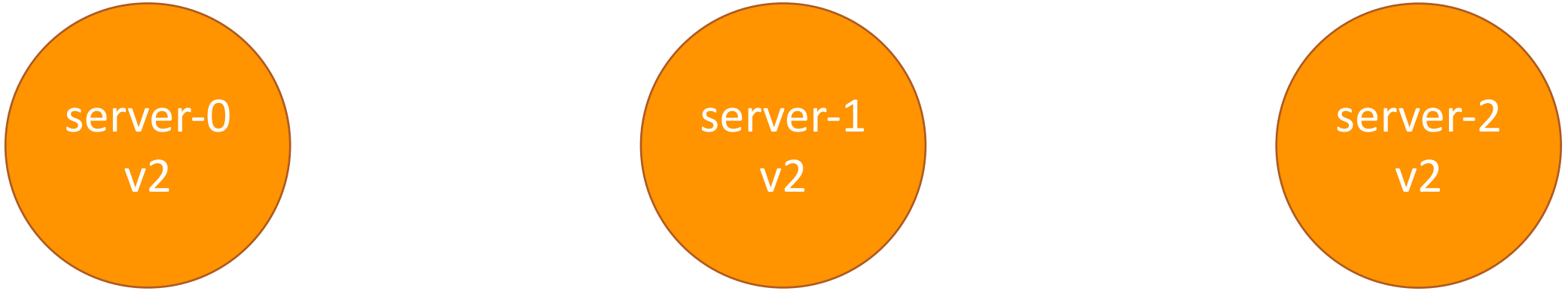
Quorum Queue C Leader

Quorum Queue B Leader

Upgrades: Rolling Update

rabbitmq-queues rebalance all

Re-balances leaders of replicated queues across up-and-running cluster nodes.
Executed by cluster-operator on server-0 after StatefulSet rolling update completed.



Upgrades – Pause Reconciliation

If upgrading cluster-operator should not trigger rolling upgrade of RabbitMQ clusters:

```
kubectl rabbitmq pause-reconciliation <rabbitmqcluster>
kubectl rabbitmq resume-reconciliation < rabbitmqcluster>
```

More cluster-operator Features

- Enable plugins without restarting StatefulSet

```
apiVersion:
  rabbitmq.com/v1beta1
kind:
  RabbitmqCluster
spec:
  rabbitmq:
    additionalPlugins:
    - rabbitmq_federation
    - rabbitmq_federation_management
```

- Increasing PersistentVolume
- TLS configuration

Agenda

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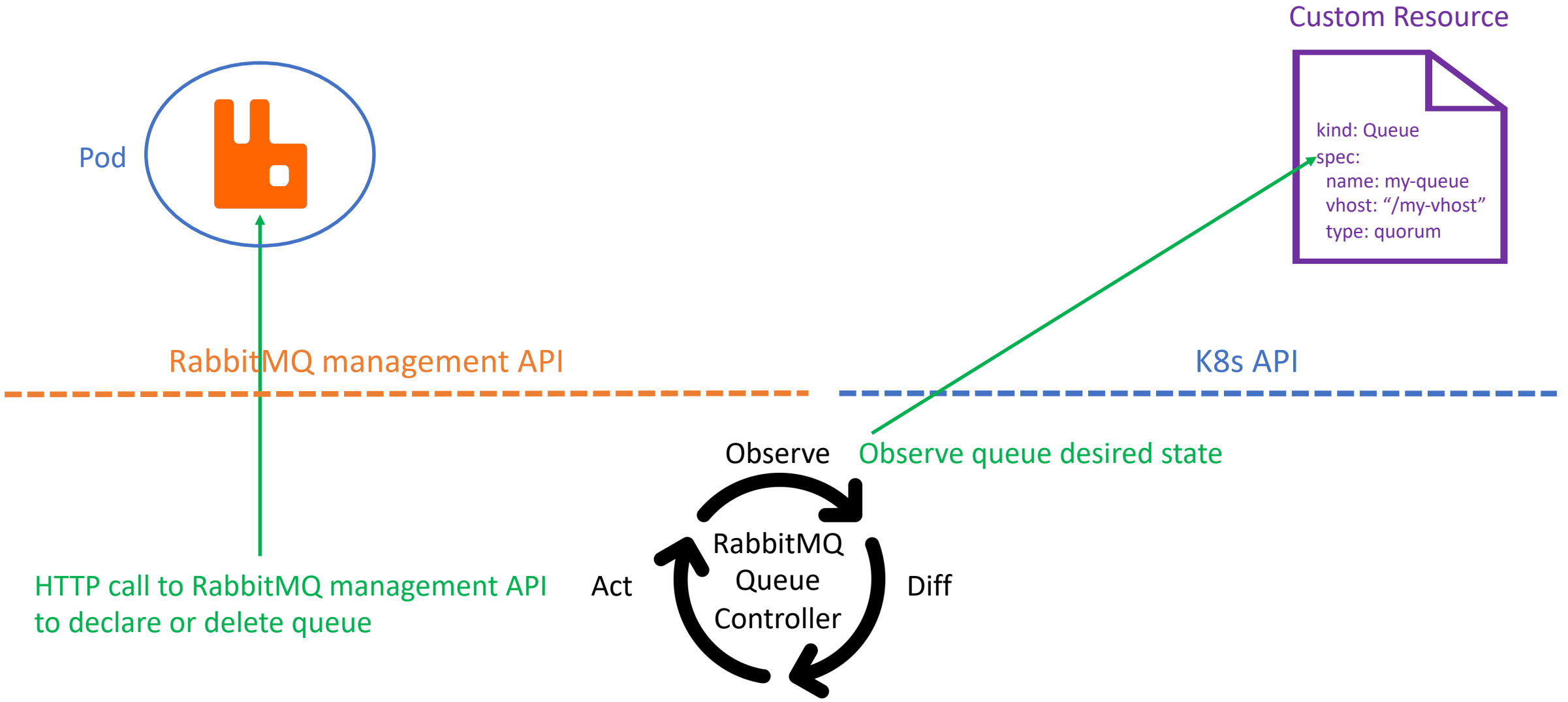
messaging-topology-operator



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3.9 Features

- Erlang 24 support
  - 35% - 55% higher throughput for RabbitMQ
  - Blog Post Performance testing the JIT compiler for the BEAM VM

- JSON logging

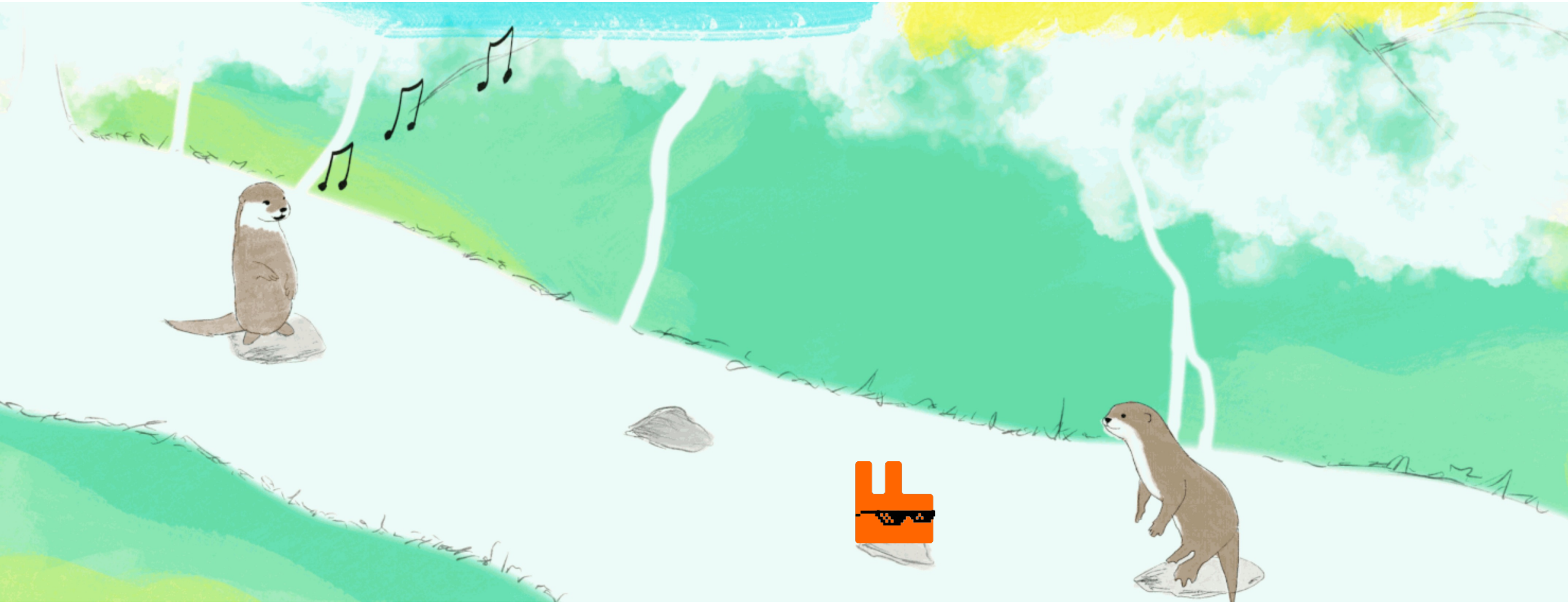
plain

```
2021-08-26 15:27:47.759533+00:00 [info] <0.951.0> accepting AMQP connection <0.951.0> (10.244.0.8:36748 -> 10.244.0.7:5672)
```

JSON

```
{"v":7,"time":1629991764124833,"msg":"accepting AMQP connection <0.951.0> (10.244.0.8:36748 -> 10.244.0.7:5672)","domain":"rabbitmq.connection","pid":" <0.951.0> ","gl":"<0.221.0>"}
```

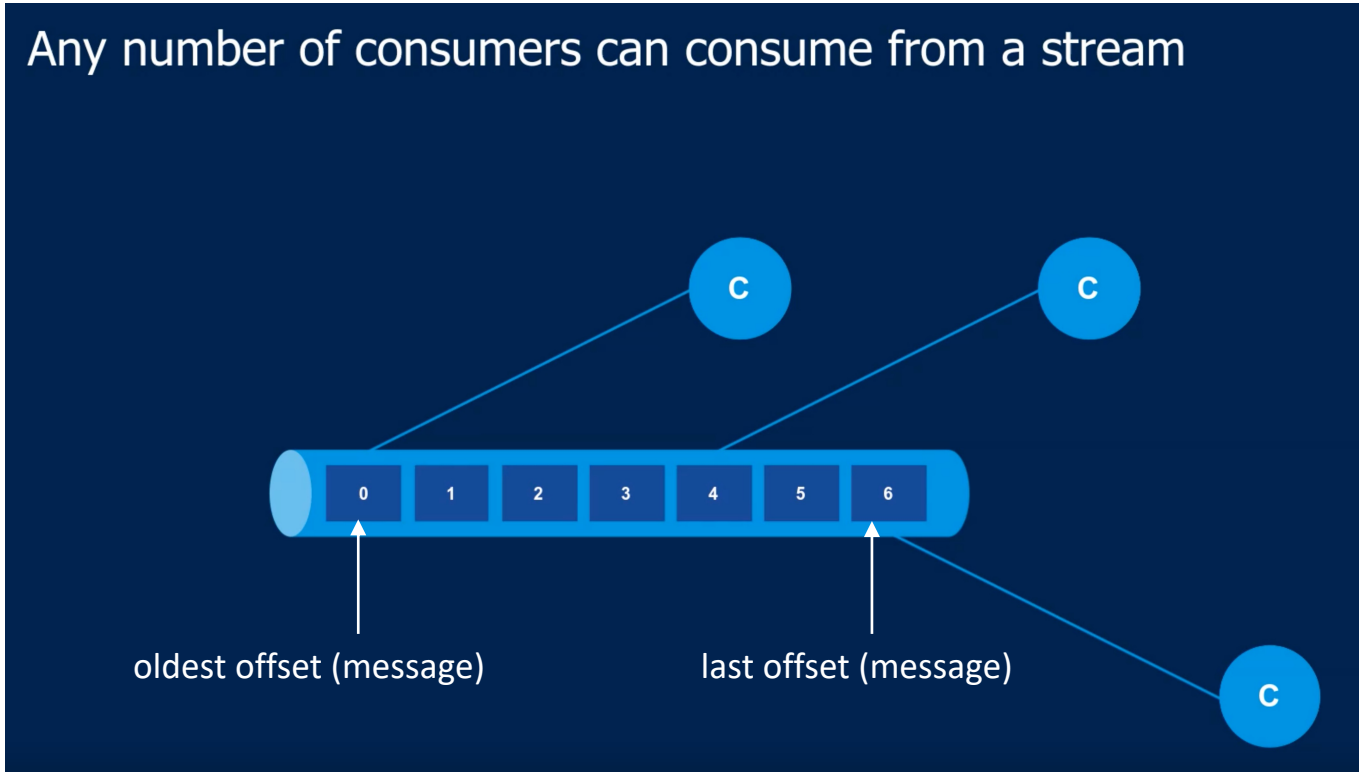
Streams



https://www.gentlydownthe.stream/

Streams

- New type of data structure in RabbitMQ
- Models an append-only log
- Persistent and replicated
- Non-destructive consumer semantics
- AMQP 0.9.1 and new Stream protocol
- Large fanouts
- Replay / Time travelling
- High throughput
- Large logs
- At-least-once
- Message de-duplication (publishing)
- Flow control



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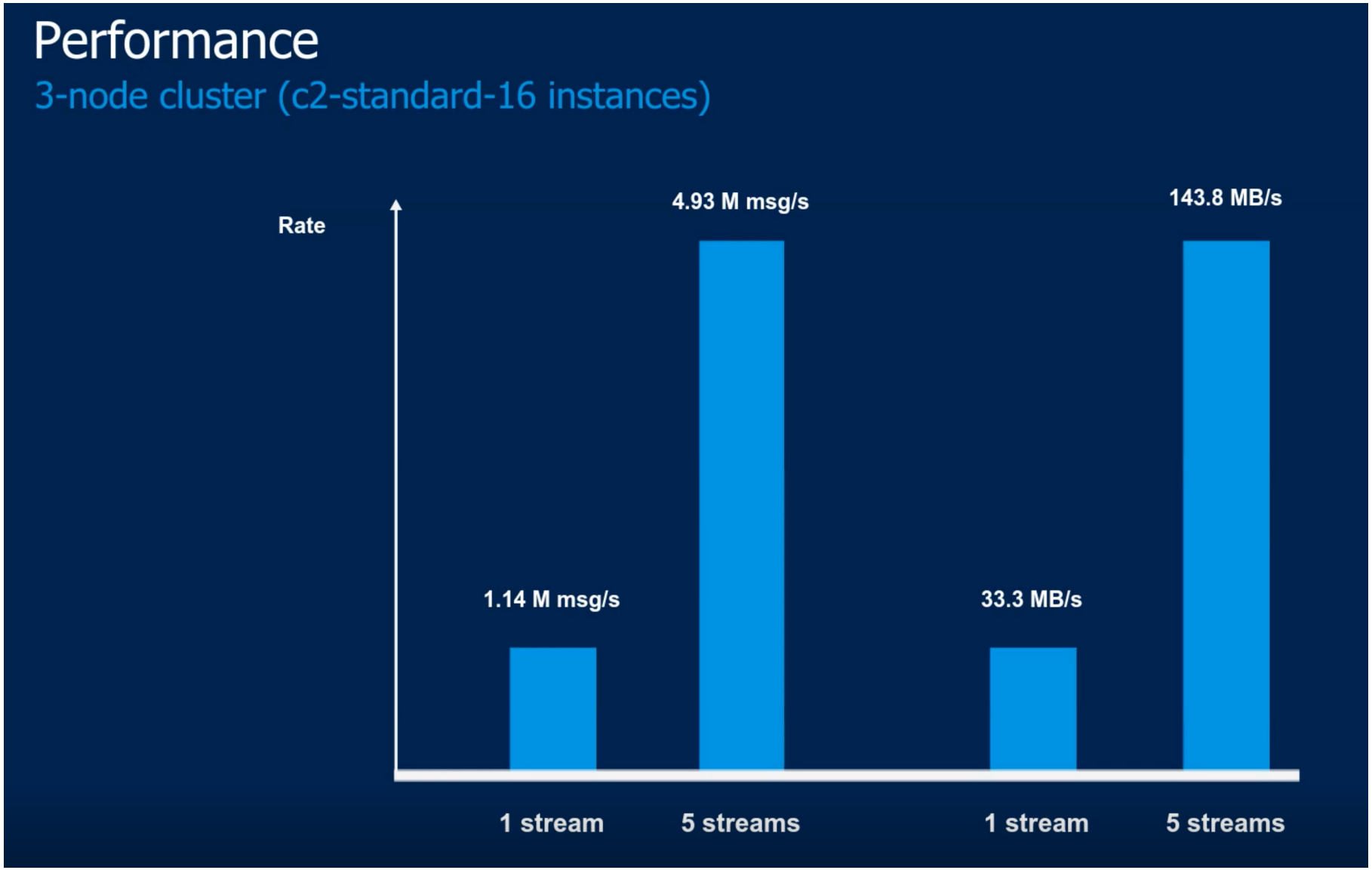
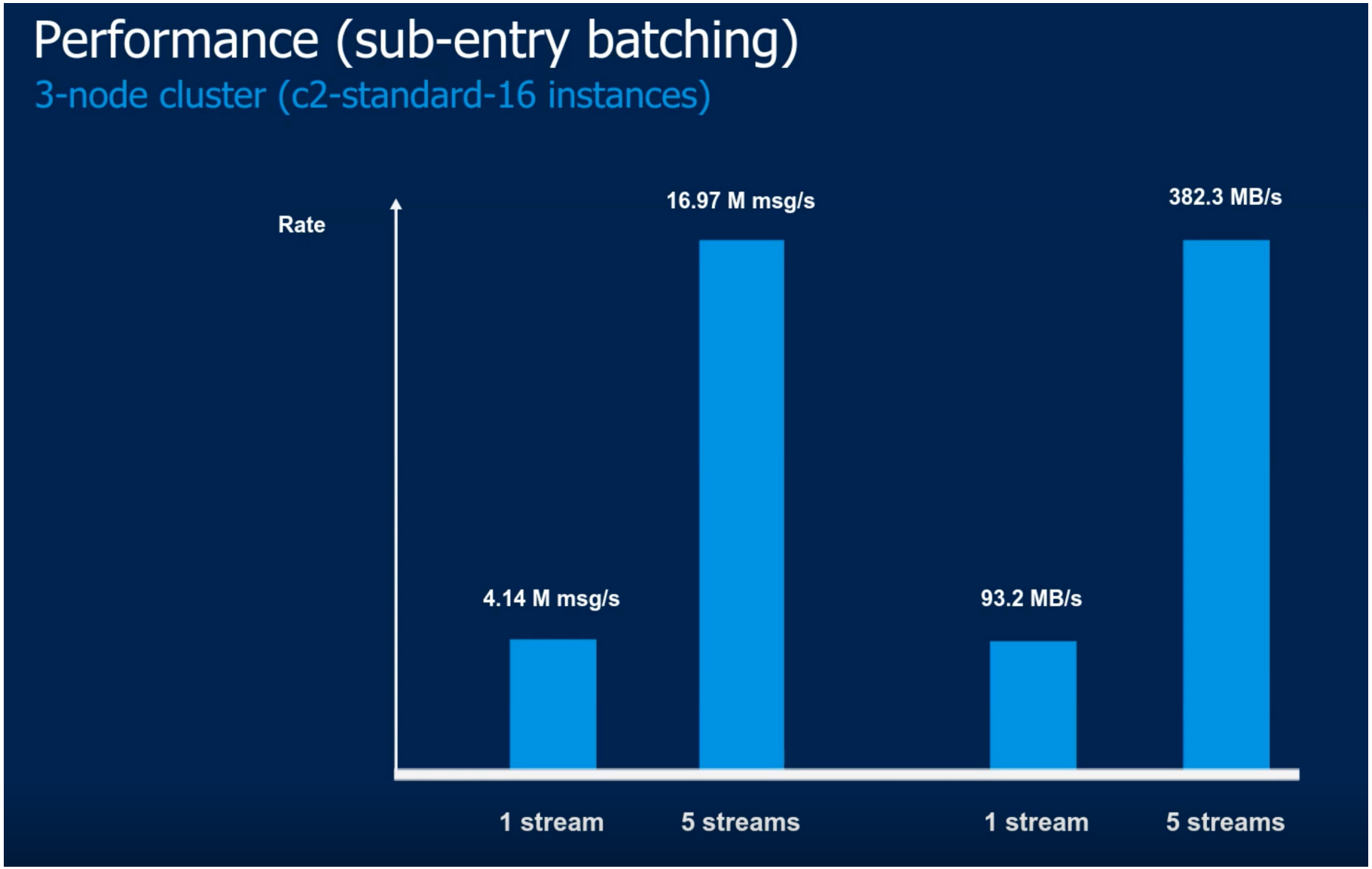

Performance
3-node cluster (c2-standard-16 instances)
Rate
4.93 M msg/s
143.8 MB/s
1.14 M msg/s
33.3 MB/s
1 stream
5 streams
1 stream
5 streams

Streams


Performance (sub-entry batching)
3-node cluster (c2-standard-16 instances)
Rate
16.97 M msg/s
382.3 MB/s
4.14 M msg/s
93.2 MB/s
1 stream
5 streams
1 stream
5 streams

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Want to Contribute?

- RabbitMQ Stream Client Library
  - Pick a language of your choice
  - Java, Golang, C#, Rust are already under development
- Connectors from data processing engines (such as Apache Spark, Apache Flink, Apache Storm, etc.) to RabbitMQ Streams via new RabbitMQ Stream protocol
- Choose an issue in https://github.com/rabbitmq repos

You can reach us via

- Slack: workspace RabbitMQ, channel #kubernetes
- Mailing list: https://groups.google.com/g/rabbitmq-users
- Twitter: @RabbitMQ
- GitHub discussions:
  - https://github.com/rabbitmq/cluster-operator/discussions
  - https://github.com/rabbitmq/rabbitmq-server/discussions

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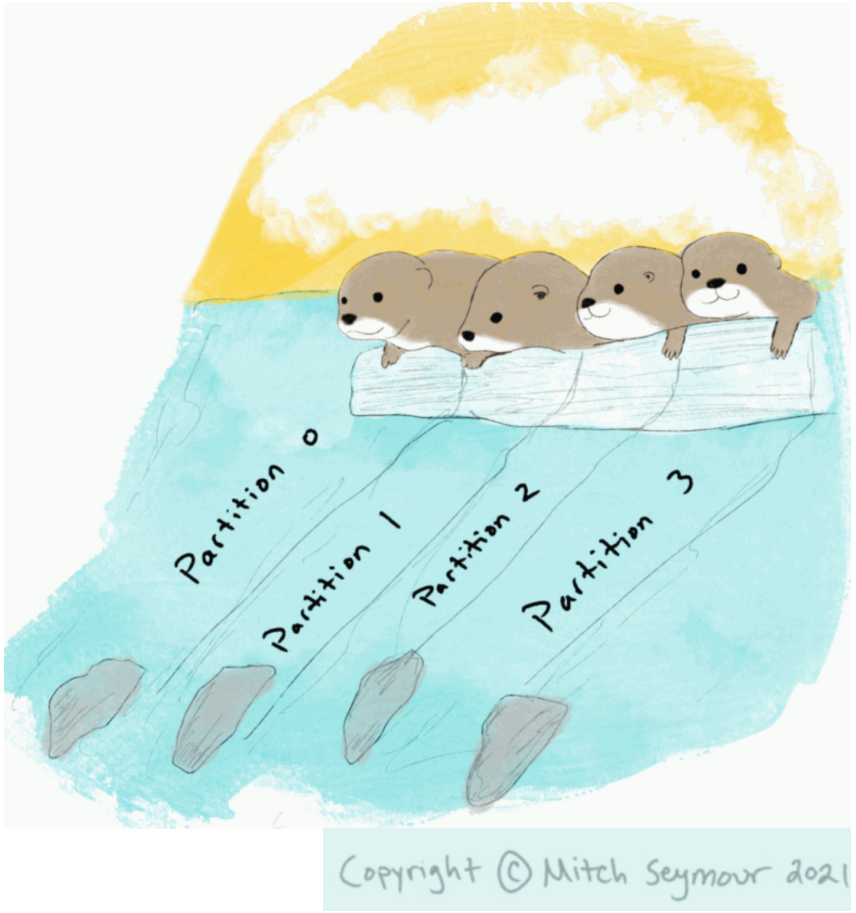
7. ▶ Roadmap

Roadmap

Depending on feedback. No promises.

- Streams
  - Partitioning
  - Competing consumers
- Khepri (Mnesia replacement)
- Support external secrets (e.g. Vault) in K8s
- Commercial RabbitMQ plugin and K8s operator
  - Multi datacenter (active-passive) replication



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