16

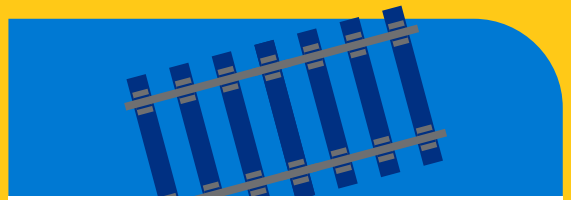
October 2024

Marc Hesselink

Building High Available Integrations for Mission Critical Applications

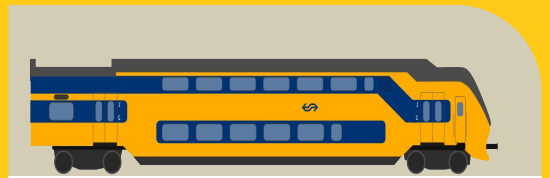
Largest passenger carrier in the Nederlands

Facts & Figures



2.100 kilometers track

1.3 miljoen travelers per day



About 4.800 journeys per day

Commercial exploitation of 380 stations

OV-Fiets


Displaying travel information such as destination, departure times and train information
Sensor data from the trains to monitor the fleet and plan (preventive) maintenance
Implementing the timetable and making adjustments in case of deviations
Monitor stock in stores for timely orders from suppliers

NS has hundreds of applications to provide a door-to-door journey

Shahadat Rahman (Unsplash)

Integration is necessary to allow these applications to communicate on different hosting environments

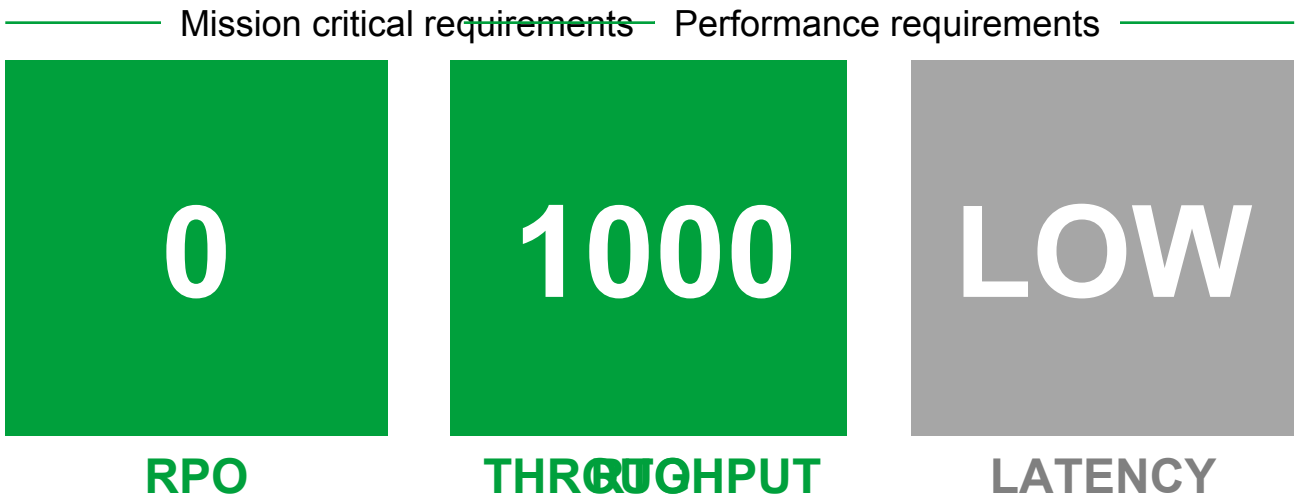
Marcus Urbenz (Unsplash)

Hybrid Integration Platform

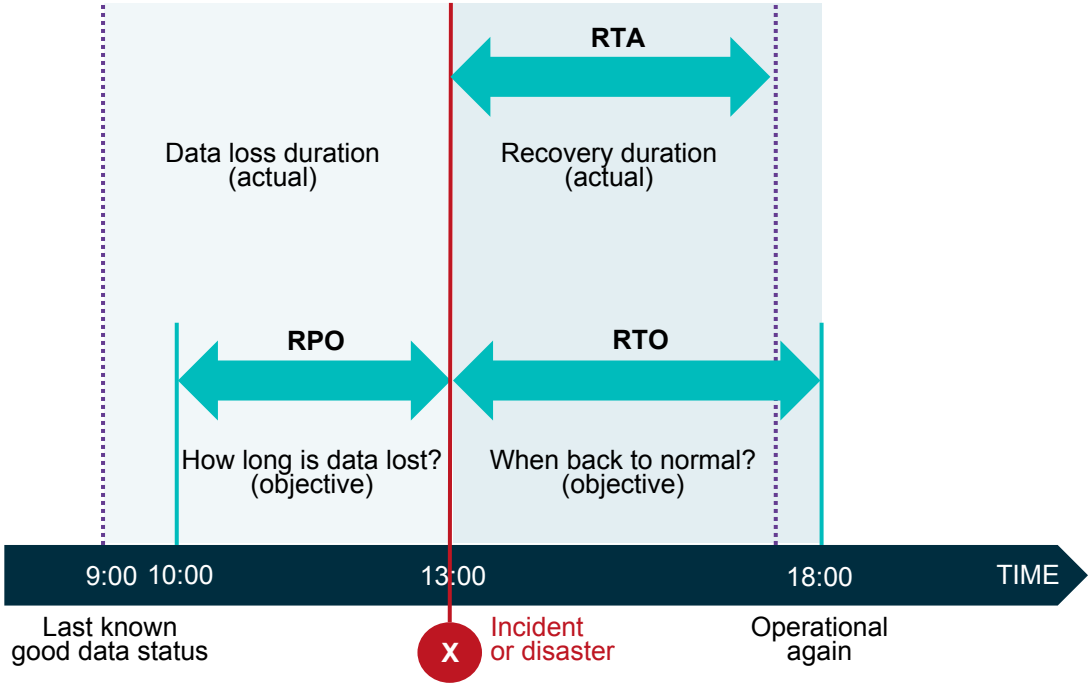
- The Hybrid Integration Platform is a Self Service Platform that allows product teams to independently develop, manage and maintain integrations.


HILVERSUM

Requirements of mission critical applications



Business resilience



Recovery **P**oint **O**bjective

The RPO is the **maximum acceptable amount of data loss** measured in time.

Recovery **T**o **O**peration

The RTO is the **intended time period** within which a business process must be restored after a disruption to prevent unacceptable consequences.

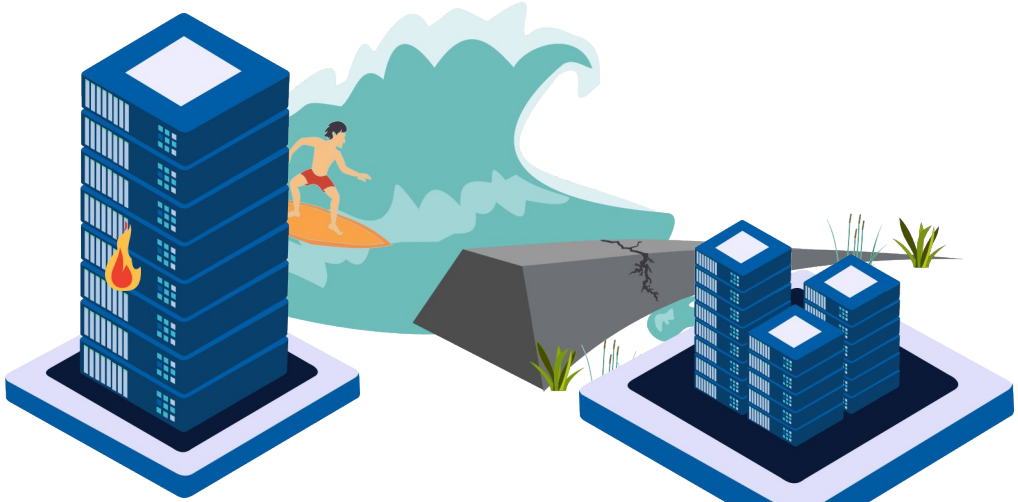
Consists of two components:

1. *How long it takes for the message flow to restart after a disaster;*
2. *Hoe How long it takes to catch up (Delayed messages).*

Recovery **T**ime **A**ctual

RTA is the **actual amount** of time it takes for an organization to restore an application. The RTA must always be equal to or less than the RTO to meet the SLA. The RTA is typically measured during a DRT.

Resilience

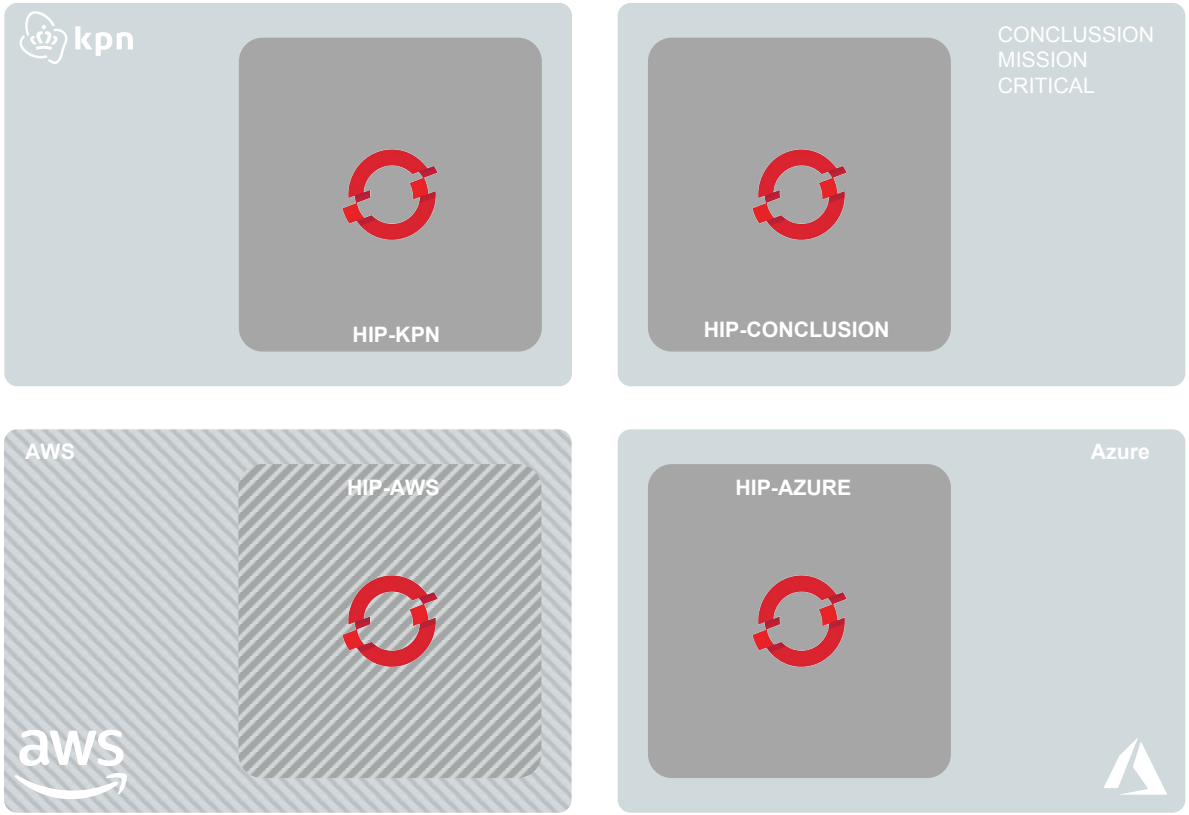


Node failure

Datacenter outage

Landingzone outage

Hybrid Integration Platform



The Hybrid Integration Platform covers three landing zones: Two private cloud and one public cloud landing zone. A second public cloud landing zone is on the roadmap.

Conclusion private coud
The **C**ontainer **E**nabled **A**pplication **P**latform a HA / HP private cloud container platform in Conclusion's data centers.

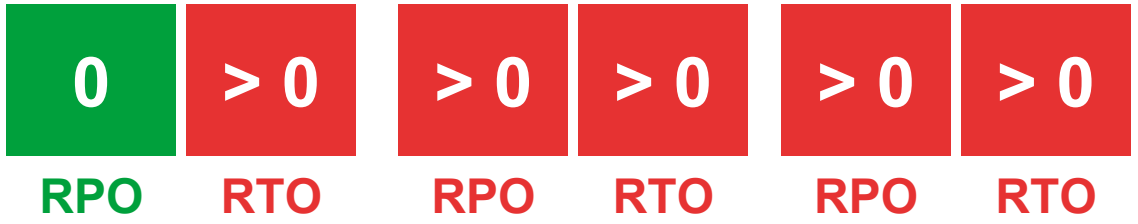
KPN private cloud
OpenShift platform in KPN's private cloud data centers.

Azure public cloud
Azure **R**ed Hat **O**penShift platform on Microsoft's public cloud.

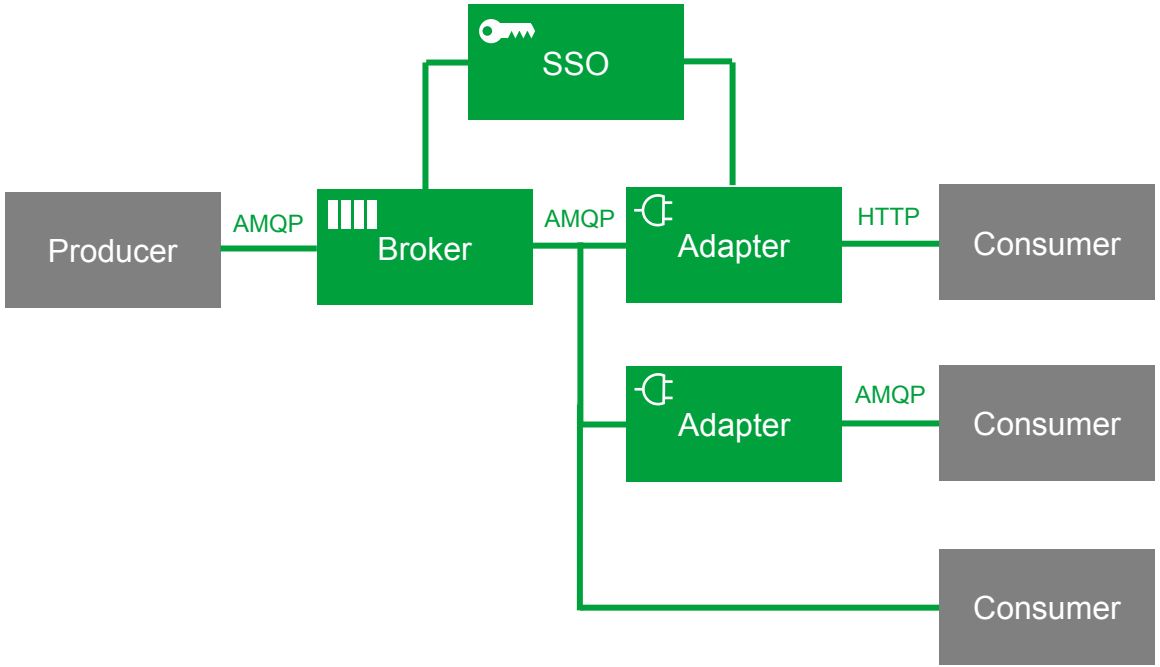
AWS public cloud
Red Hat **O**pen**S**hift **A**WS on Amazon's public cloud.

Landingzone service levels

	Conclusion Cloud	KPN Cloud	Azure Cloud
Setup	active-active	active-passive	active-active
RPO	0	< 1 hour	15 minutes
RTO	< 5 minutes	4-8 hours	4 hours



Example of a typical integration chain



Technology stack

- Red Hat AMQ Broker
- Red Hat build of Camel (Fuse)
- Red Hat build of Keycloak (SSO / Keycloak)

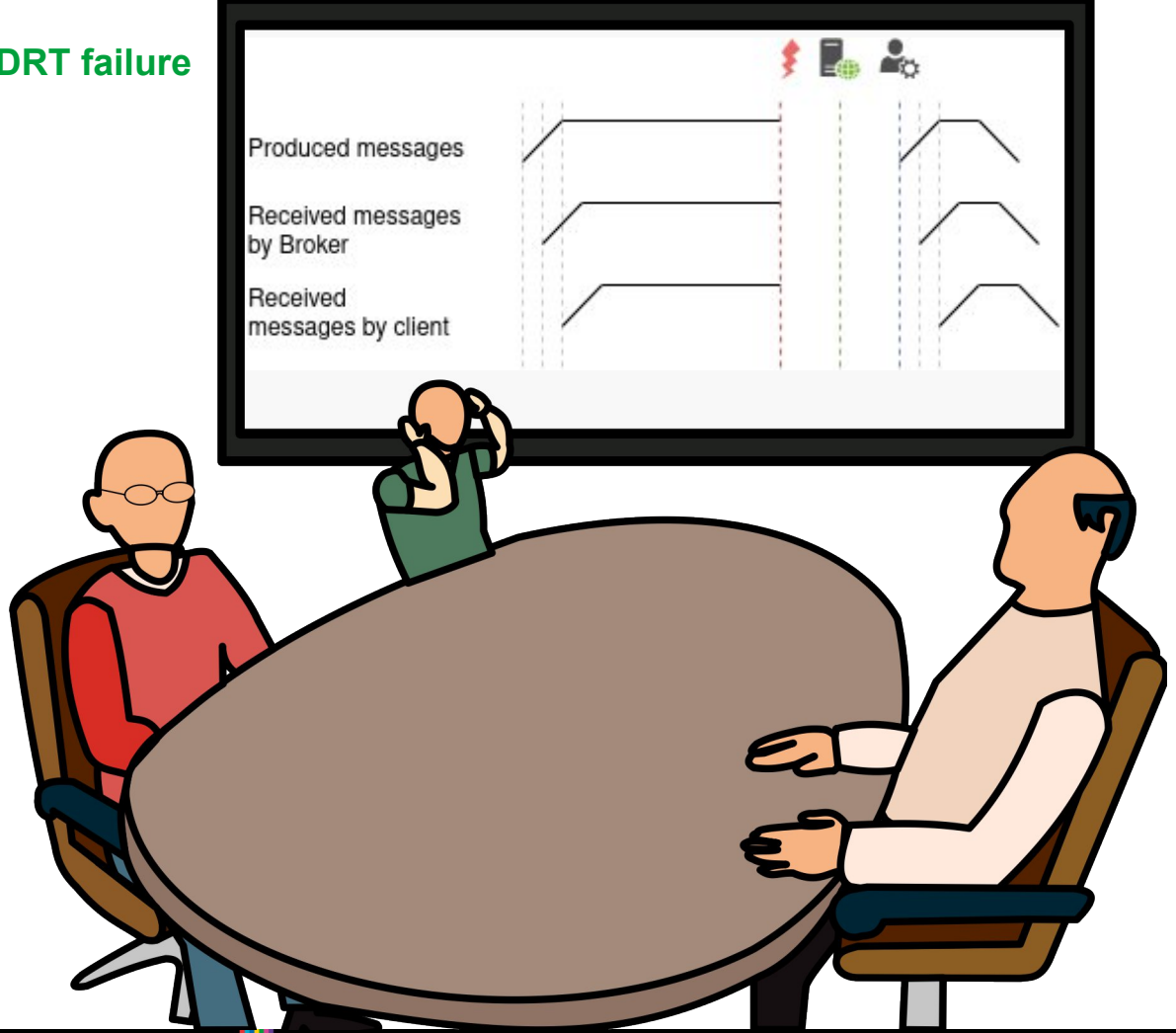
- Brokers use persistent queues.
- Transactional (AX).
- Certificate based authentication (Mutual TLS)

- Creating HA mediations is easy due to the stateless nature of mediations. Adapters can be made resilient by multiple pods on multiple nodes / DC's.

Single Broker setup

- High availability is controlled by OpenShift: When the POD crashes or the worker node dies, the POD is restarted (on a different worker node).

DRT failure



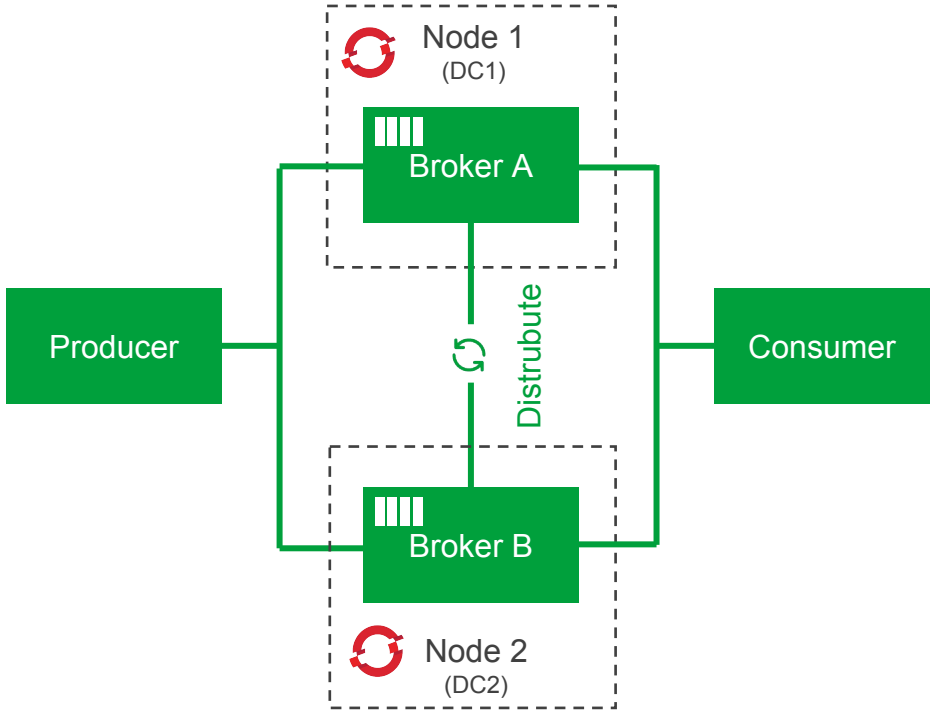
DRT with Single Broker setup

- Message stream is **disrupted**.
- Storage lock.
- 15 minutes restart time due to large amount of messages
- After recovery, **no messages were lost**
- No RPO = 0 for every Landingzone

0* RPO

>15 RTO

Clustered Broker setup

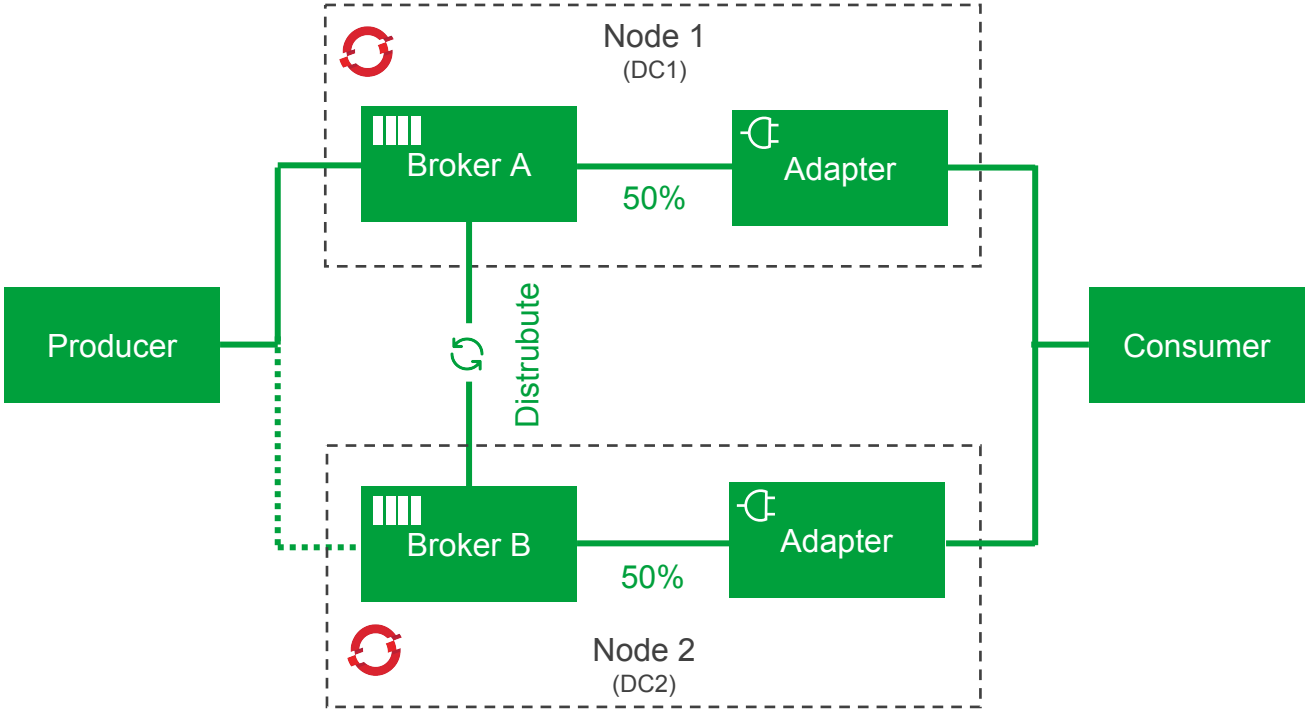


- Cluster Broker setup
- Intended for scalability

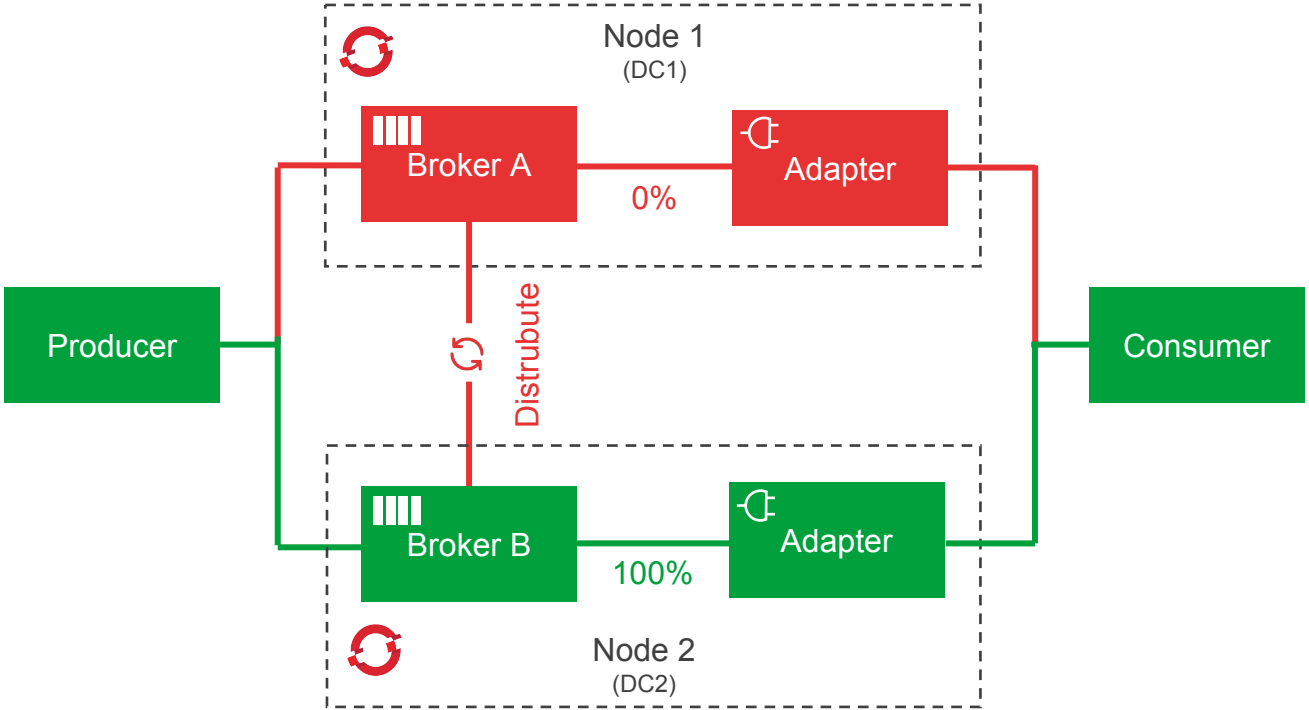
- Stateful set
- Custom Resource
- Each Broker has its own PV

- Broker instances deployed on two data centers within a landingzone.

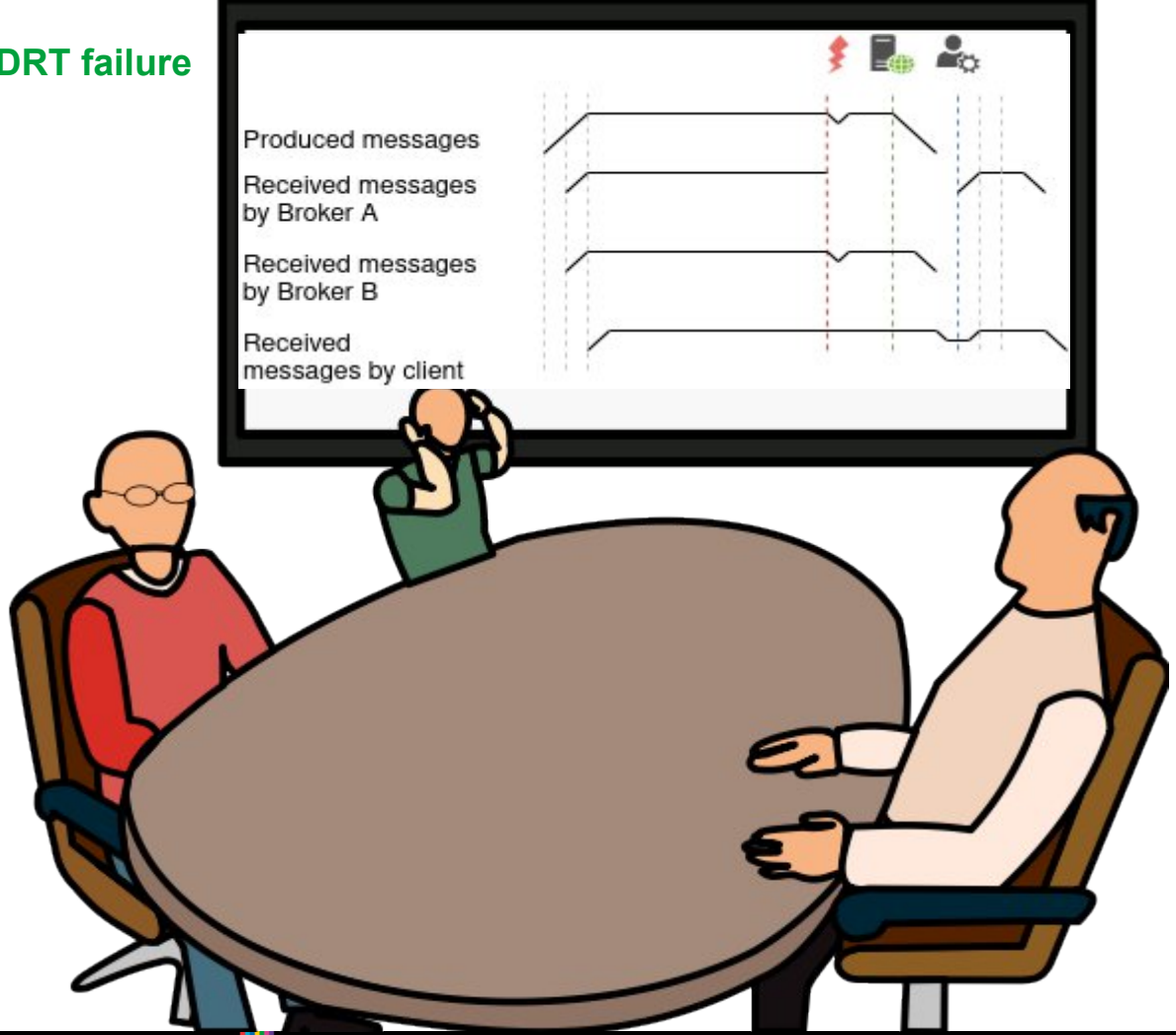
Clustered Broker setup



Clustered Broker setup



DRT failure



Cluster Broker setup

- Message stream is **not interrupted**
- Messages are received through broker B

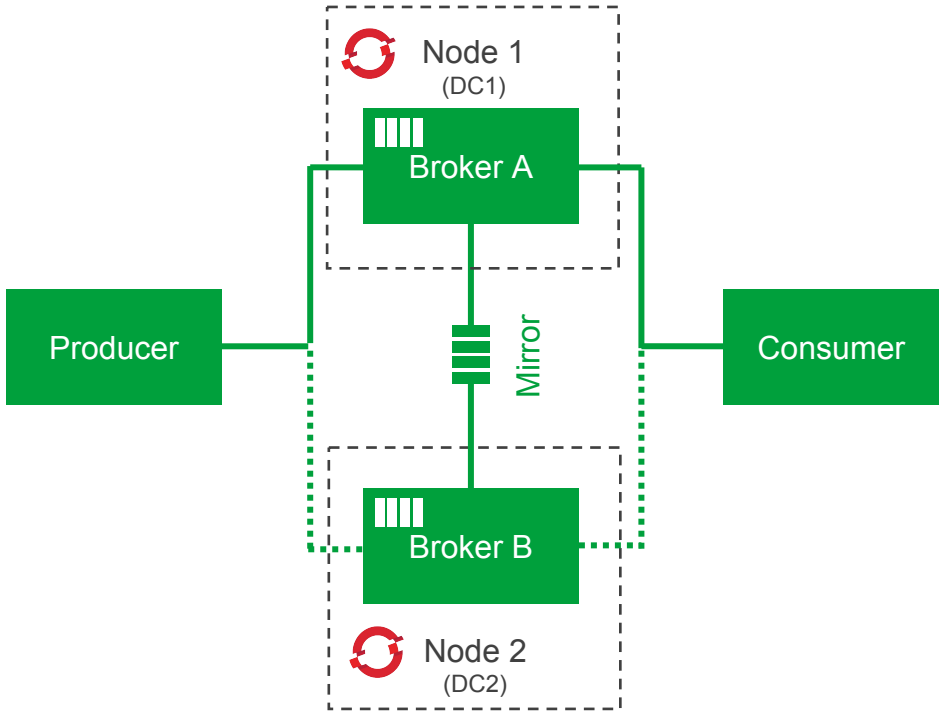
- Storage lock.
- 15 minutes restart time due to large amount of messages

- After recovery, no messages were lost
- Remaining messages in broker A are being delivered late.

0* RPO

>15 RTO

Mirrored Broker setup



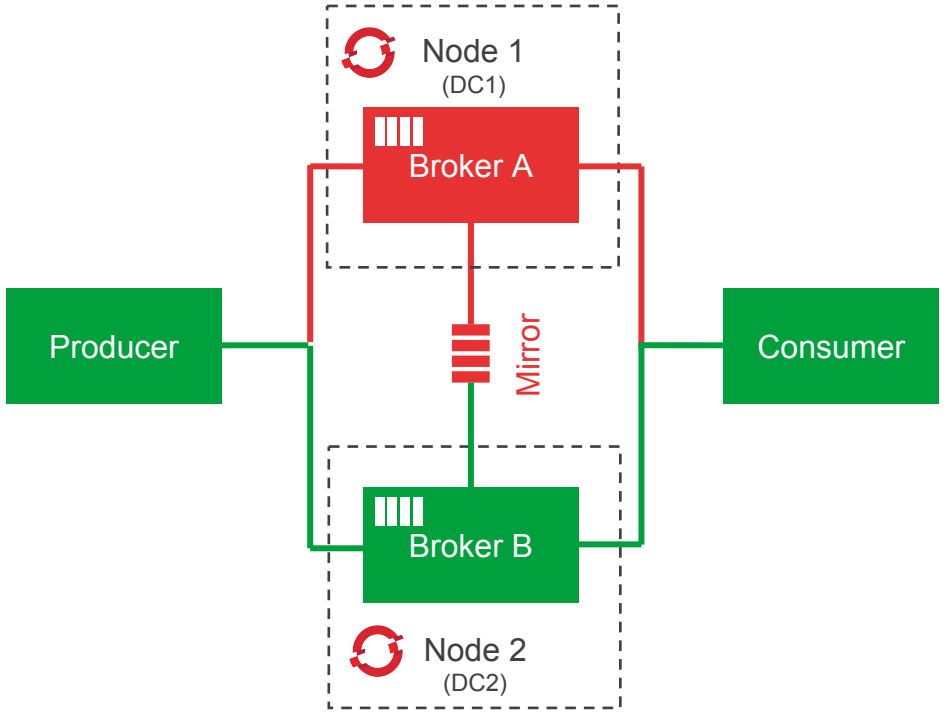
Mirrored Broker

Messages are replicated (mirrored) between Brokers.
One of the first companies to use this setup.

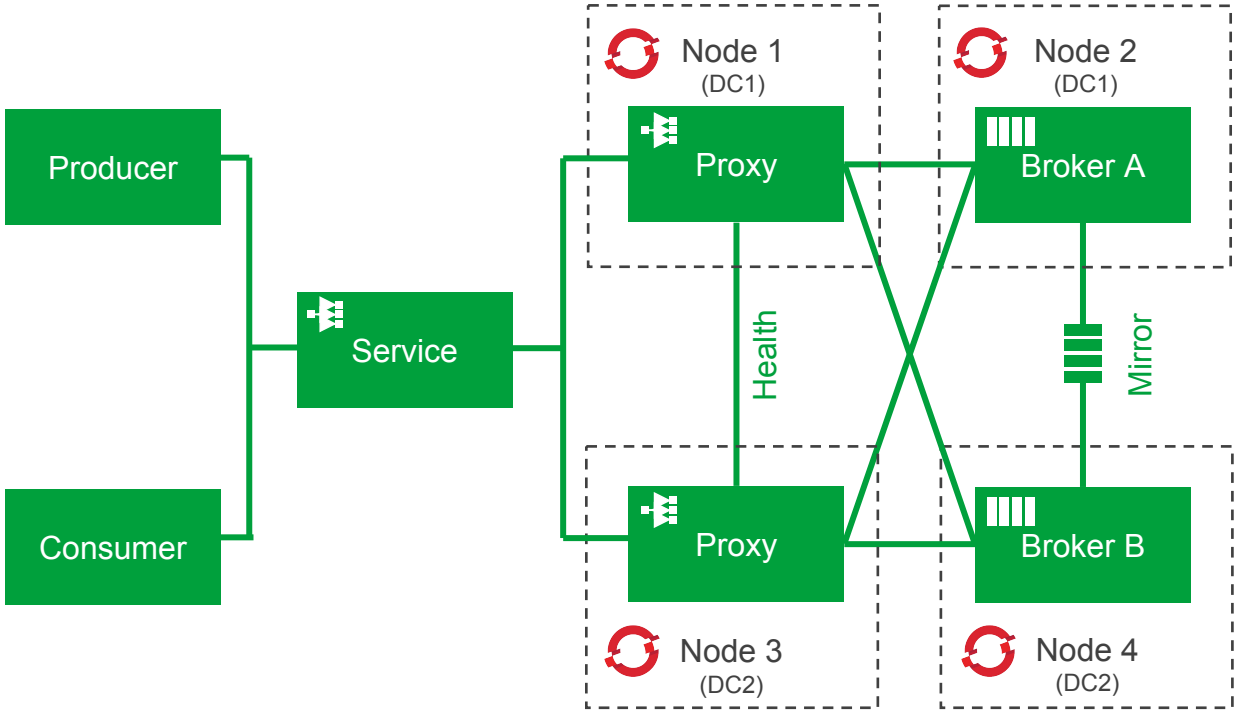
- Two stateful sets
- Requires all clients on the same Broker

- Broker instances deployed on two data centers within a landingzone.

Mirrored Broker setup



Mirrored Broker setup



Mirrored Broker

- Two stateful sets
- Two custom resources
- Each Broker has its own PV

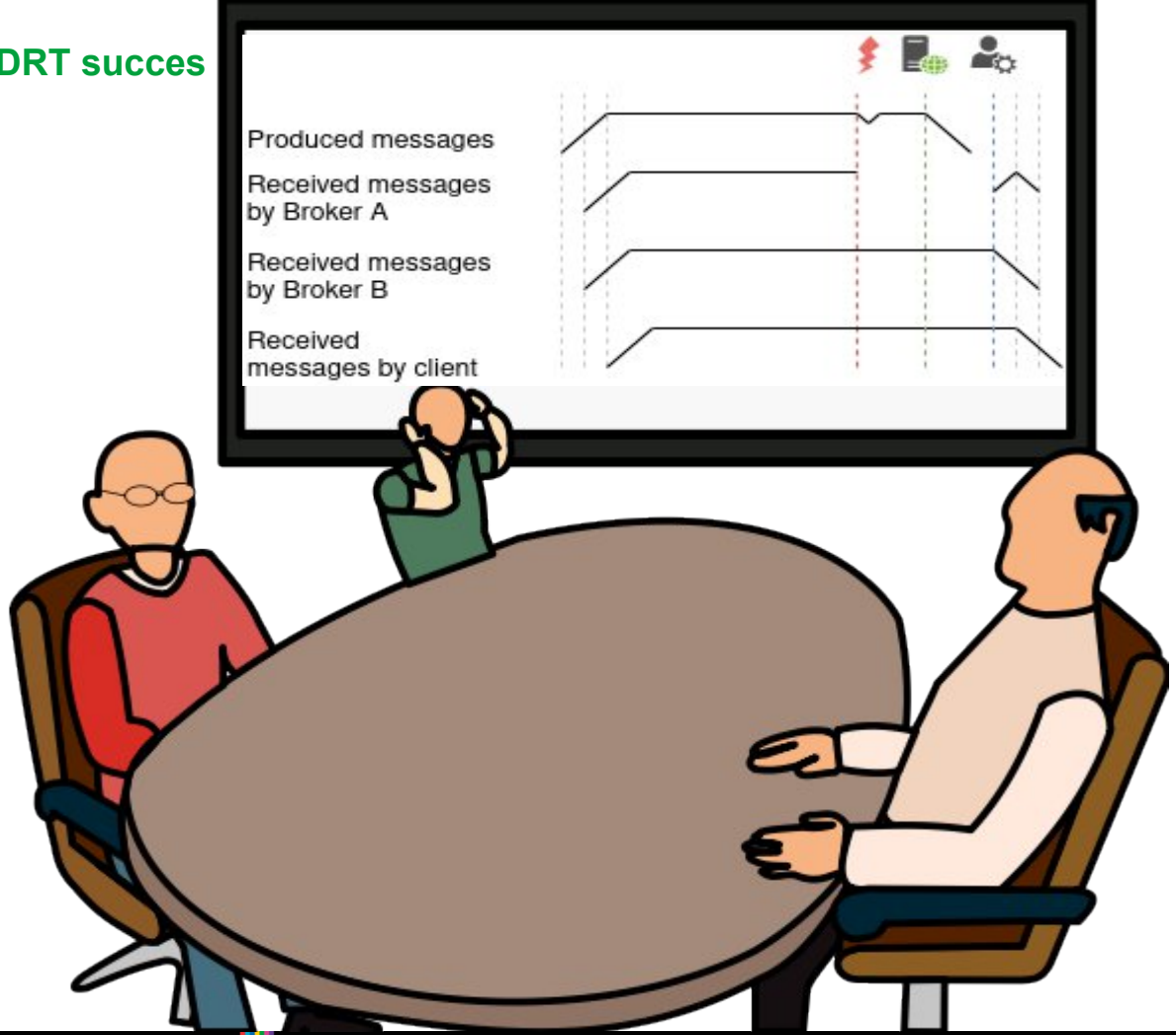
- Node anti-affinity rules are used to ensure components are deployed on seperate nodes in different DC's.

- Mirrored broker requires one broker to be active.

- HA Proxy stateful set

- Service has to have the same name as the Broker(Services) for TLS validation to work.

DRT succes



Mirrored Broker

- No messages lost;
- No messages delivered late;
- Message stream not interrupted;
- A single message was received twice.

- Storage solvable with some automation;

- 15 minutes restart time remains, but no longer an issue due to message mirroring.

0 RPO

0* RTO

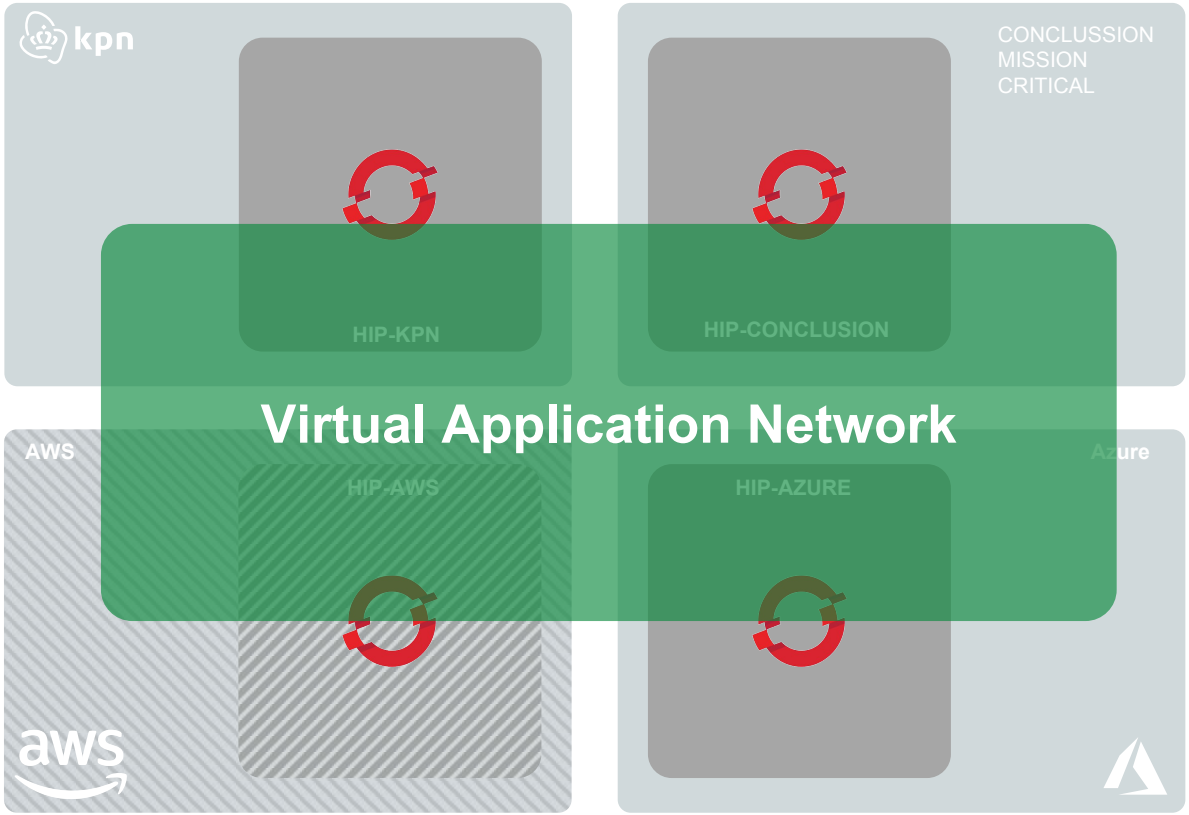
Heads up...

Node failure

Datacenter outage

Landingzone outage

Hybrid Integration Platform



Resilient against

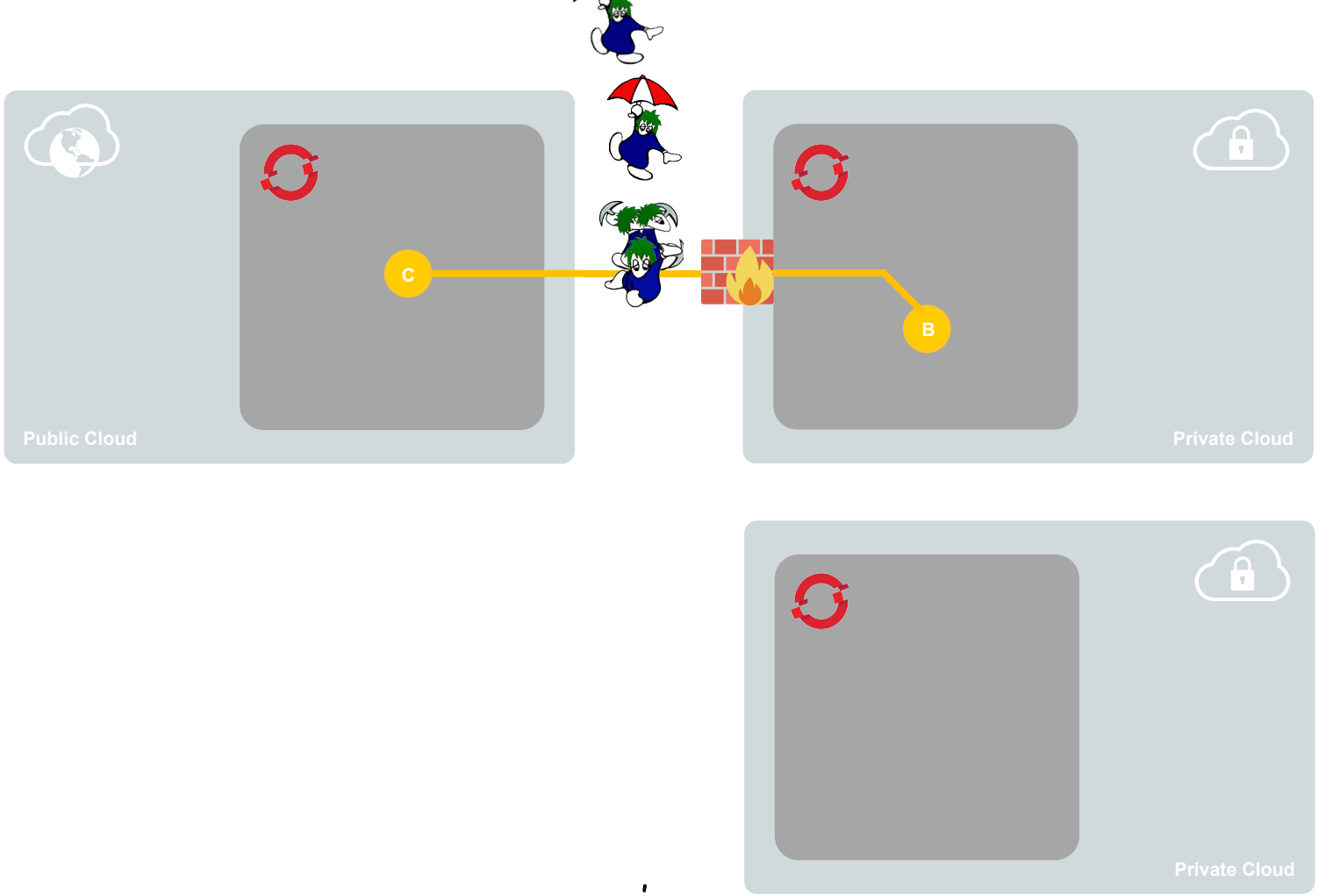
- Failure of a link between landingzones
- Loss of a landingzone

Virtual Application Network

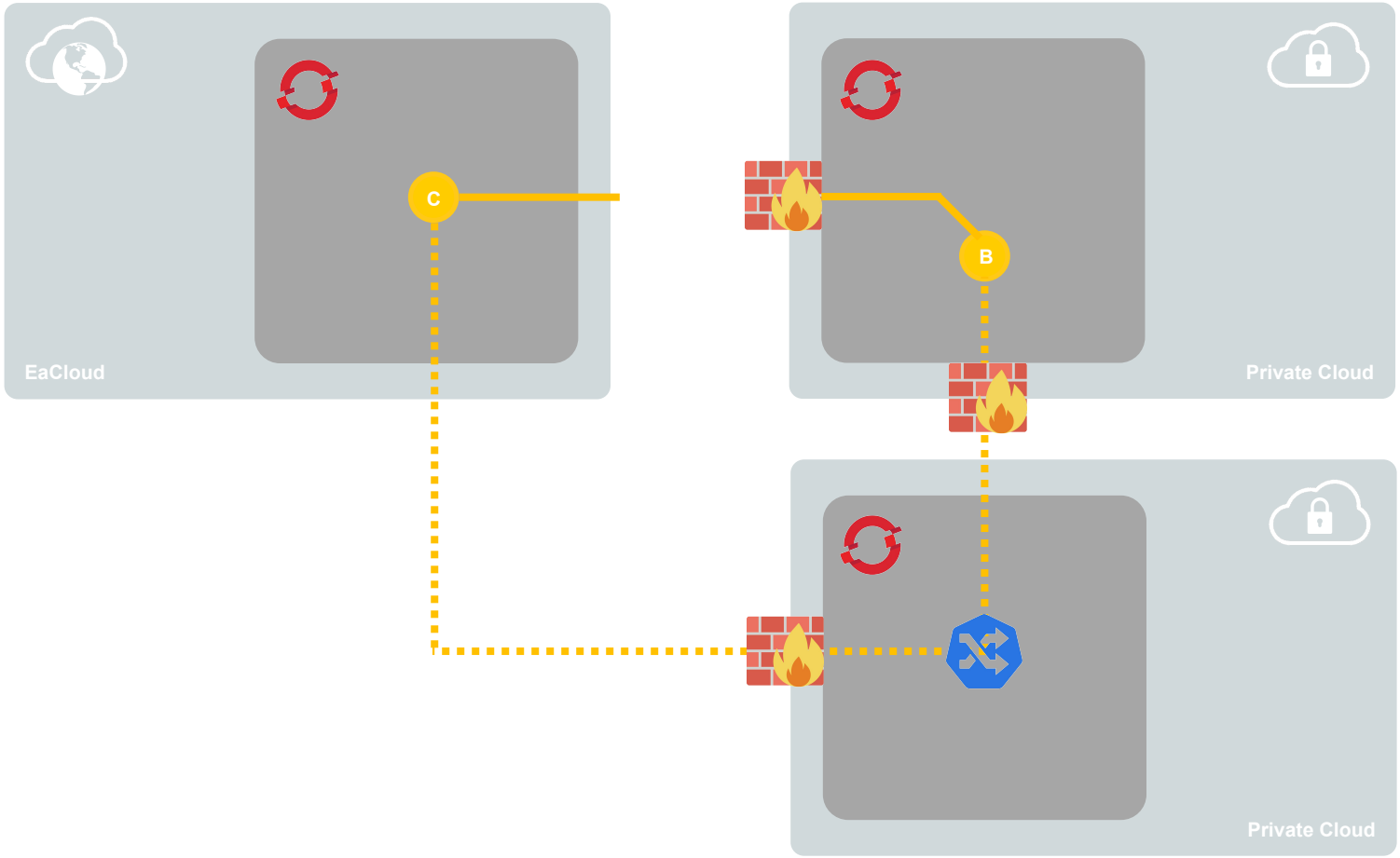
Virtual Application Networks offer robust, secure, transparent and flexible cloud agnostic interconnectivity for applications

- Red Hat Service Interconnect
- Early adopter

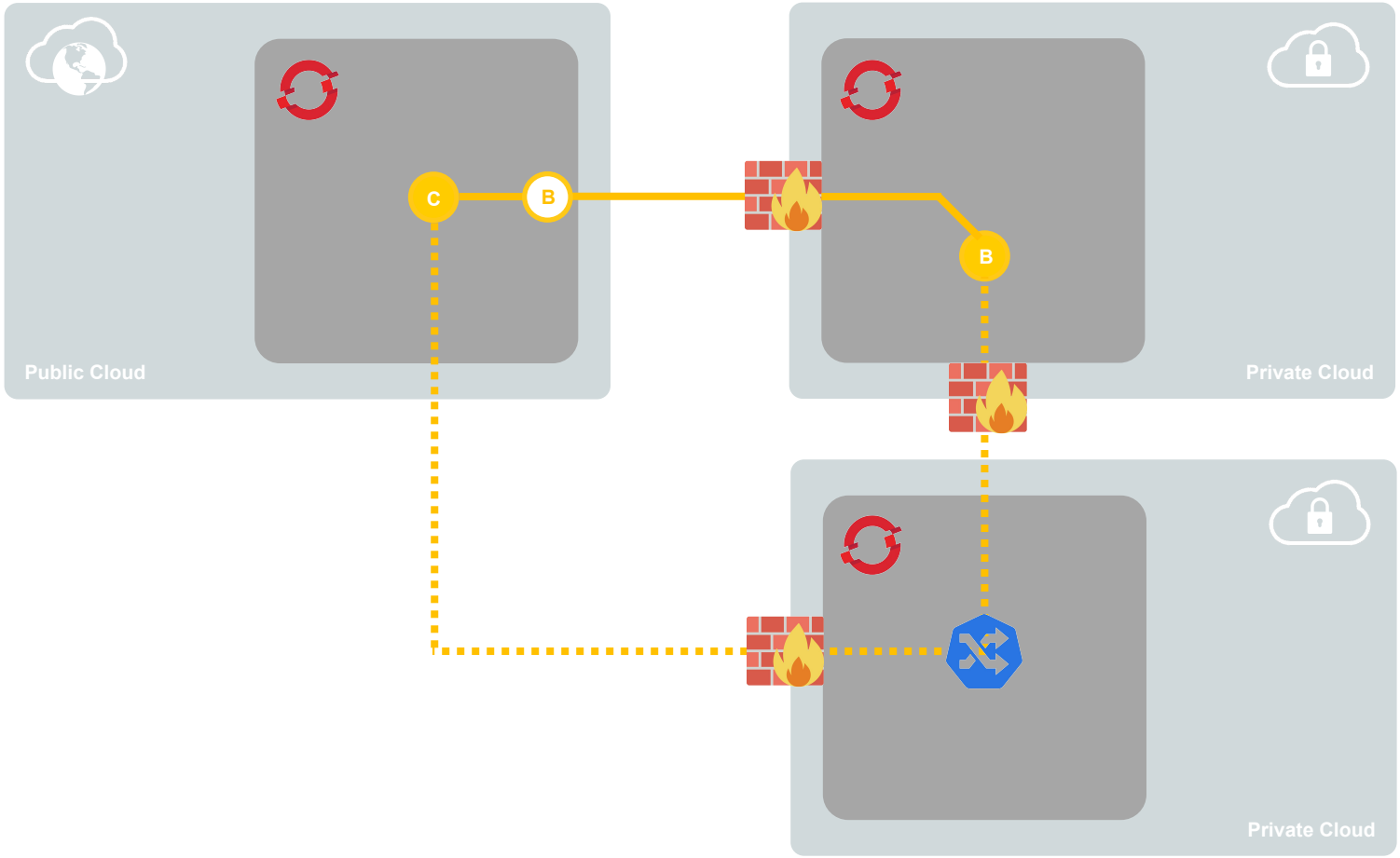
Robust



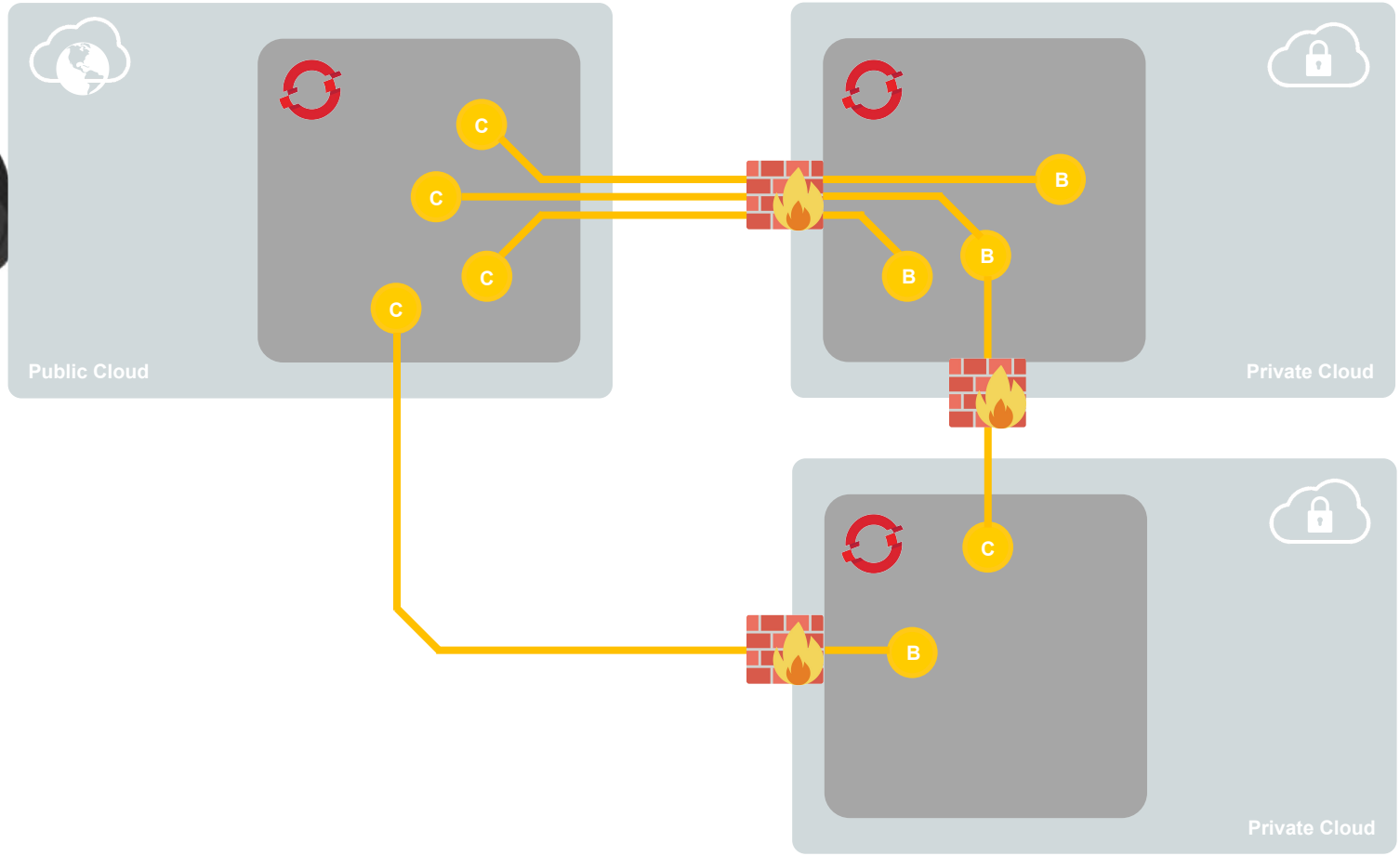
Robust



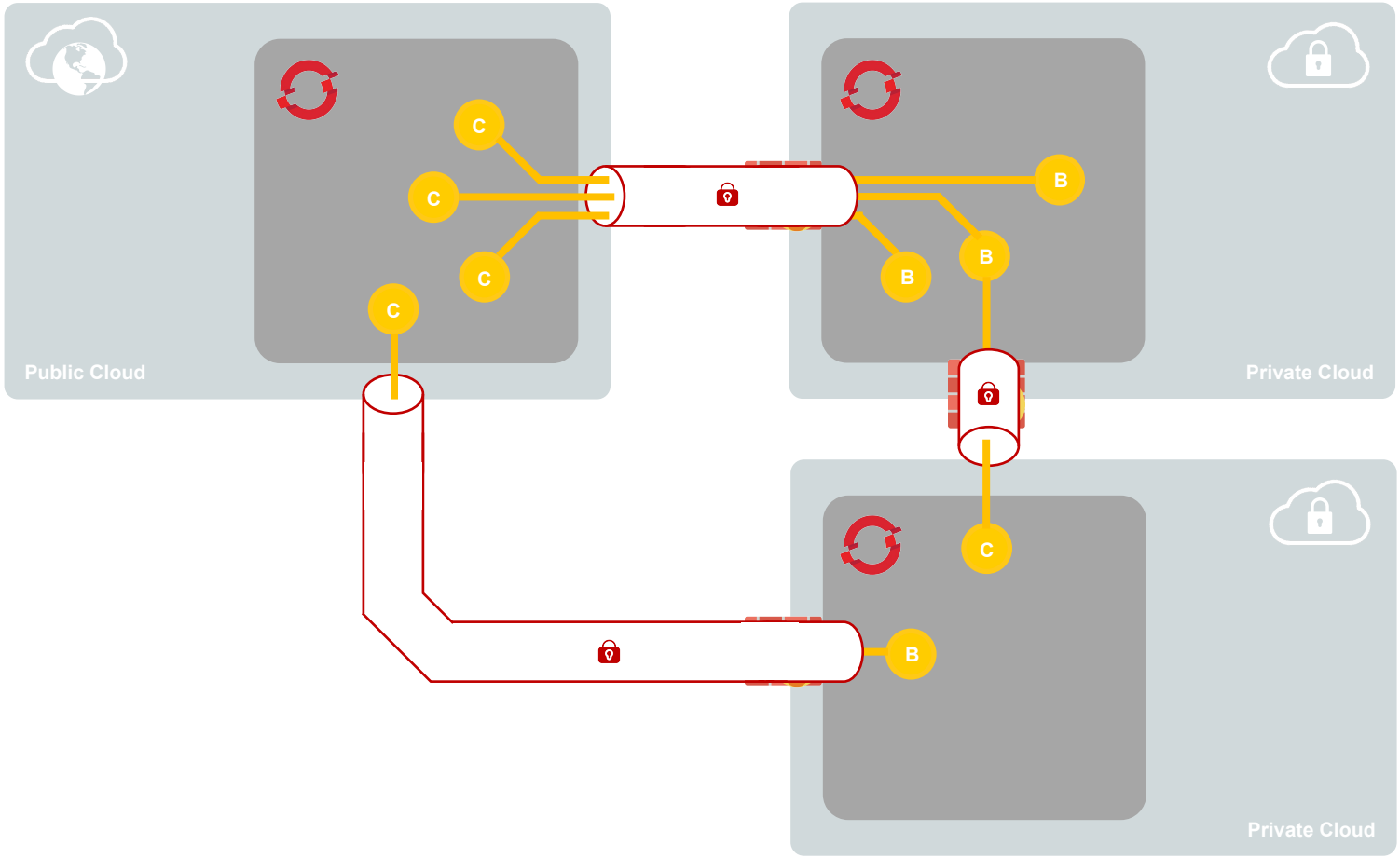
Transparent



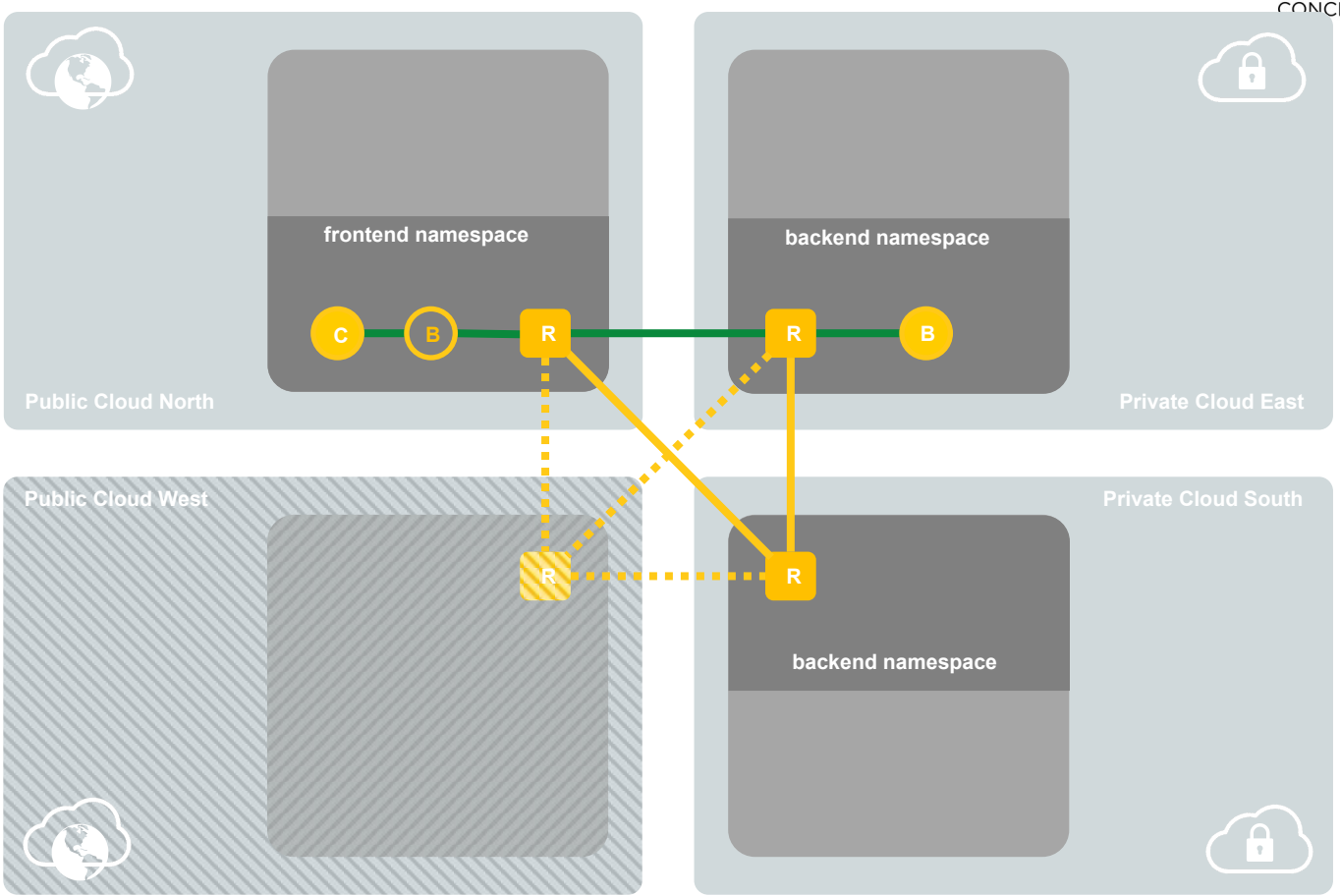
Secure



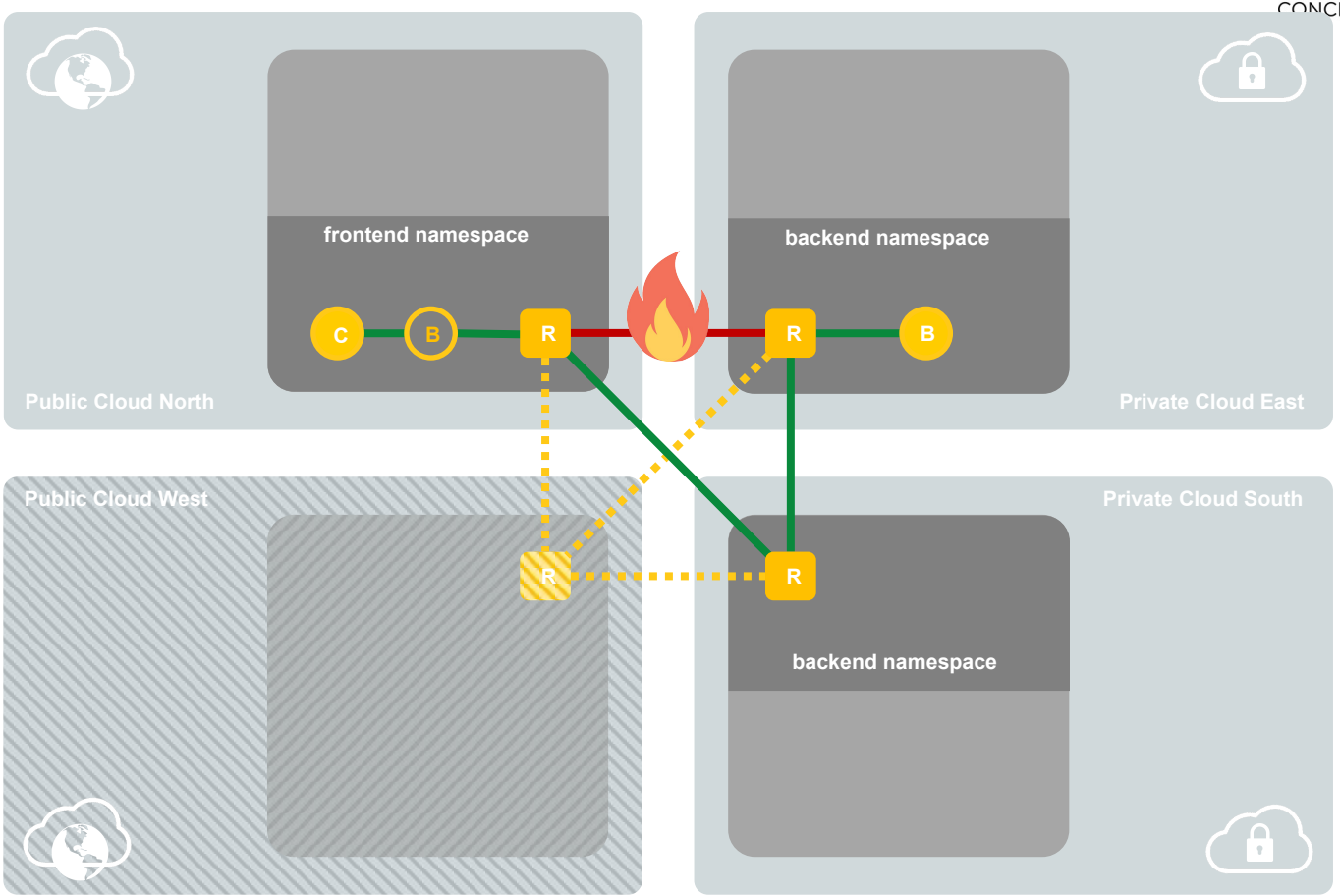
Secure



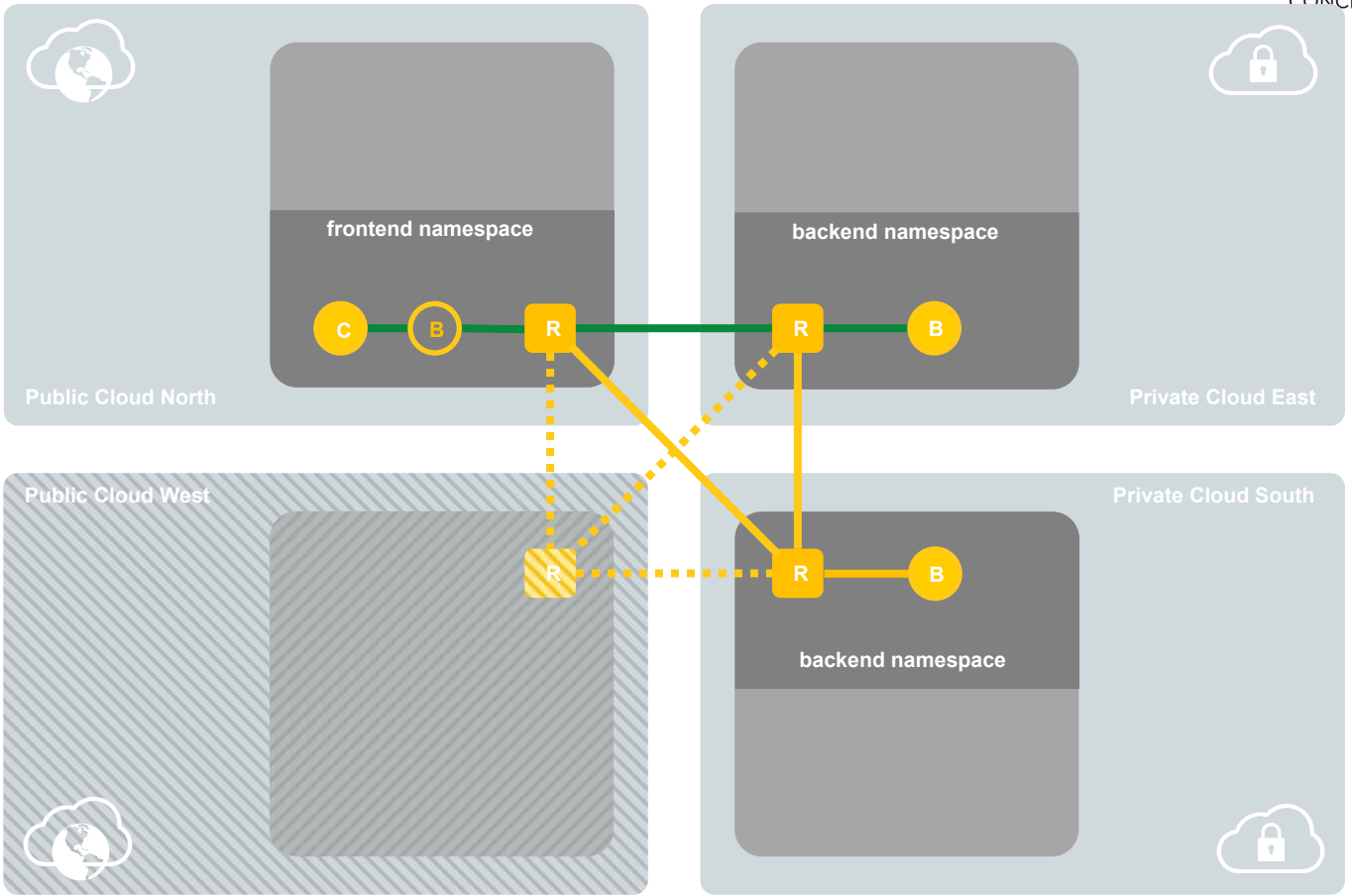
Network resilience



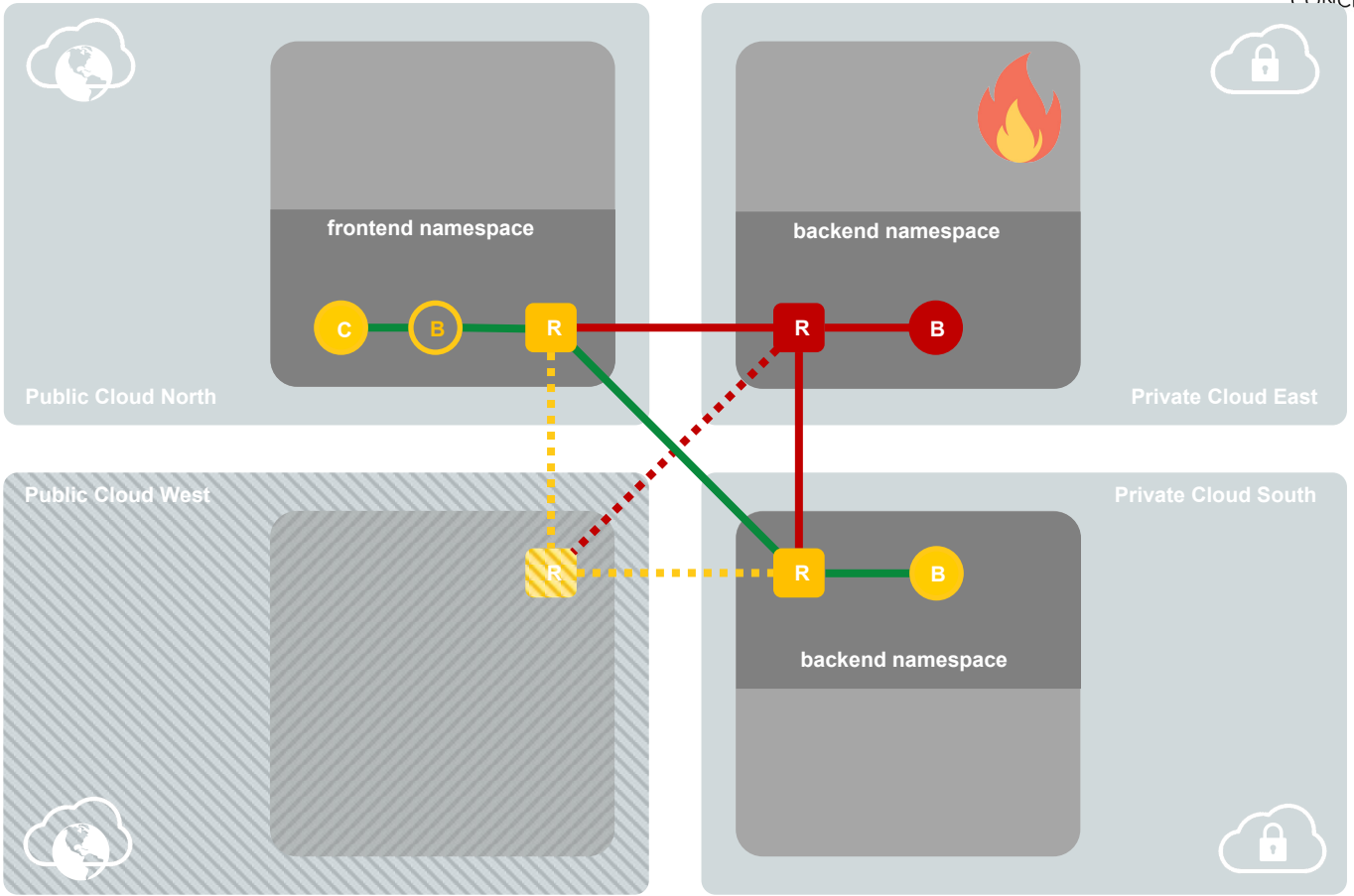
Network resilience - Failover



Multi-cloud / multi-cluster resilience (Geo-resilience)



Multi-cloud / multi-cluster resilience (Geo-resilience) - Failover



End Result

Node failure

Datacenter outage

Landingzone outage

Thanks for attending. Do you have any questions?
You are all invited to our deep dive session

Scan the QR code, or go to the following URL: https://www.conclusion.nl/virtual-sciences/red-hat-deep-dive