DEFENCE AND SPACE

Kafka in space

CONFLUENT AIRBUS

Who are we?

Speakers

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Senior cloud architect
Airbus

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Senior cloud expert
Airbus

Nils BOUCHARDON
Senior solutions architect
Confluent

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Airbus: A European company

AIRBUS

Commercial Aircraft

Helicopter

Defence and Space

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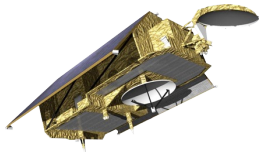
Context: Space missions

Navigation

Earth observation

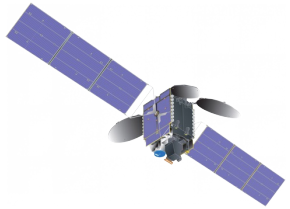
Images



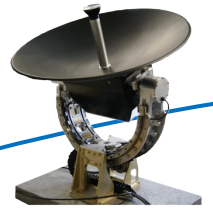
Altimetry

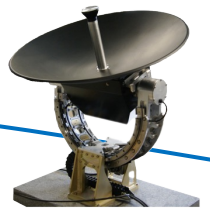
Radar

Telecommunications



Cloud Infra for massive processing





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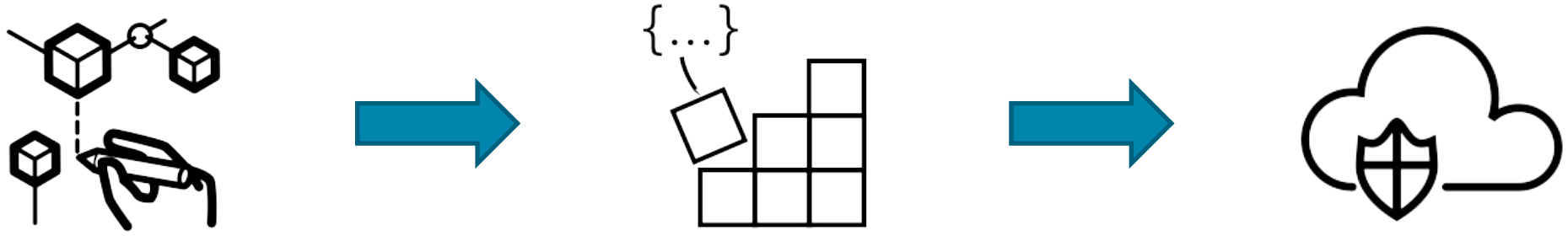
Our mission at Airbus Defence and Space

INFORMATION SYSTEM



DESIGN

INTEGRATE

DELIVER

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Let’s look at a use case!

Let’s take a use case

A tsunami hits somewhere on earth

In case of a natural disaster, observation space systems can:

- Map the area
- Guide the first responders
- Evaluate the disaster
- Analyze the disaster evolution

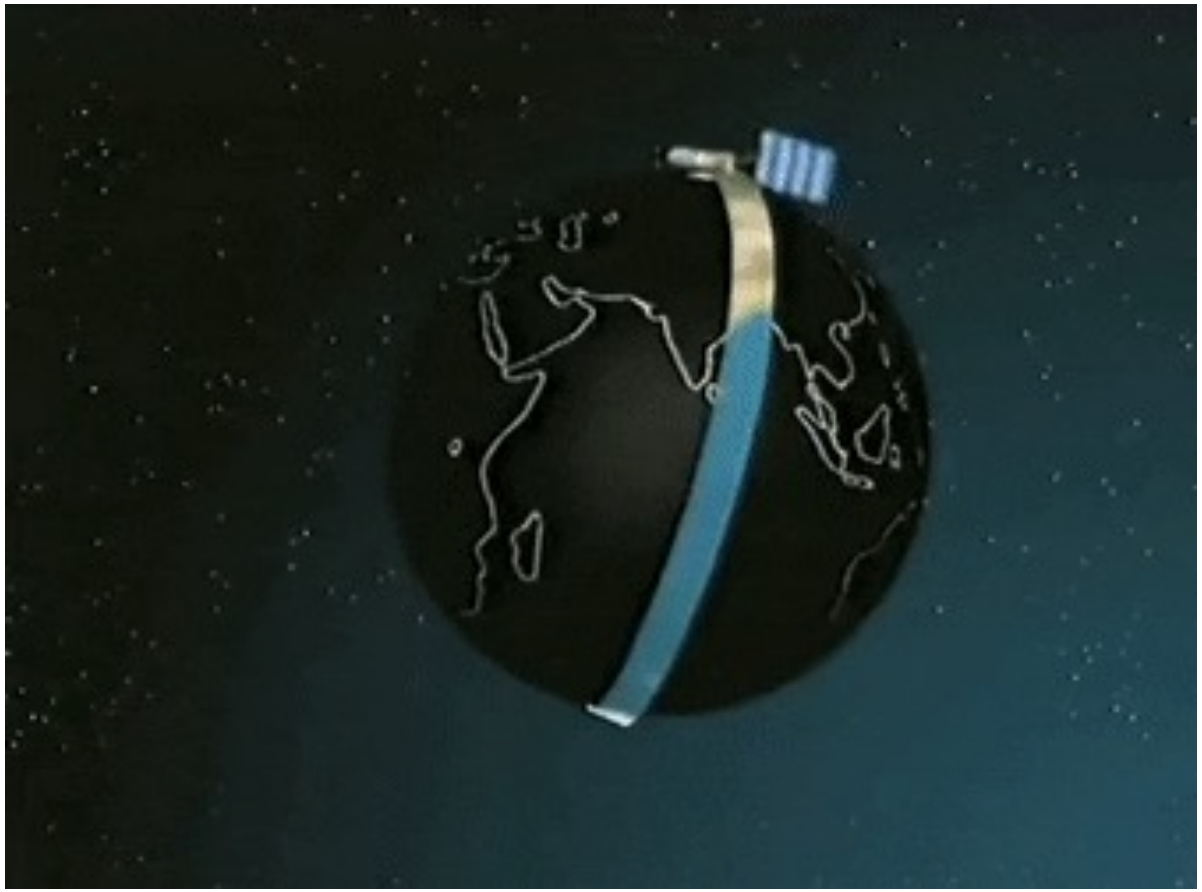
➔ Data needs to be ”fresh”, human lives are at stake, time is essential.

What do we need from our space observation system?

Observation satellites: characteristics

Earth observation satellites are on polar orbits:

- Low earth orbit (≈ 700 km)
- Consistently covers the entire globe
- Frequently goes over the poles (<1h)



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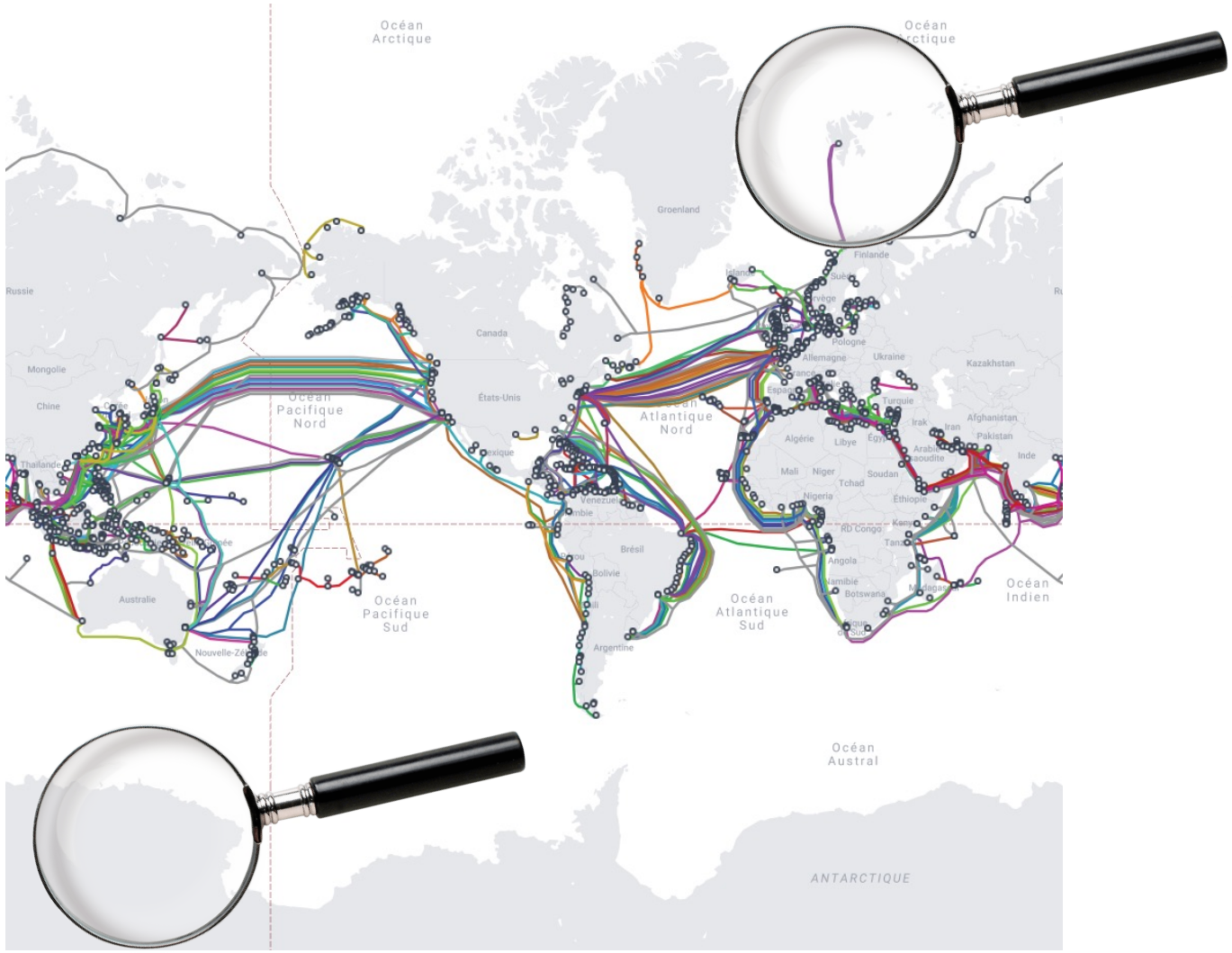
Polar stations



source: https://submarinecablemap.com

Some stations have dedicated submarine cables
Svalbard (Norway)

Other don’t
Troll Satellite Station (Norway)

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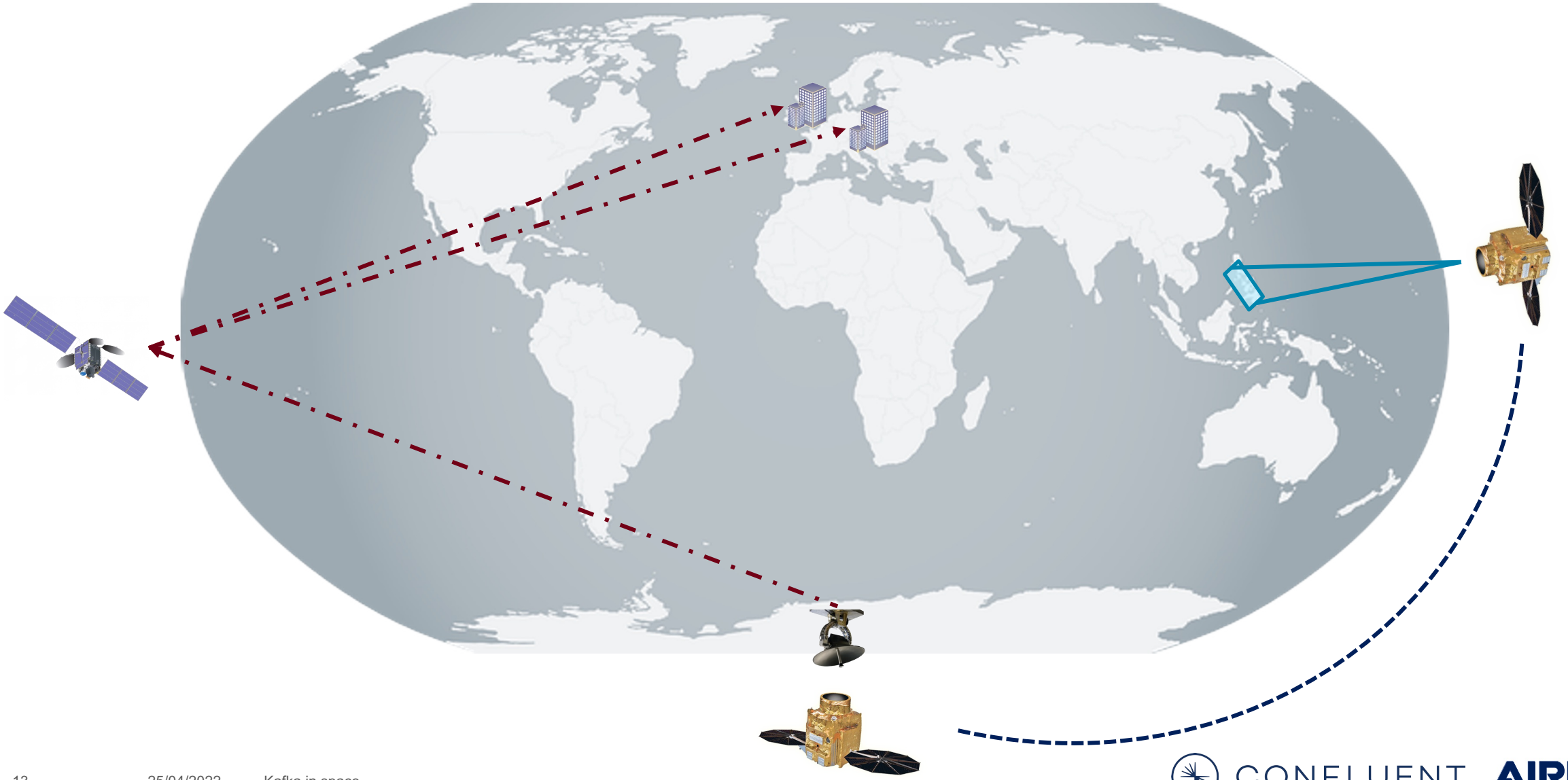
Data exchanges: context



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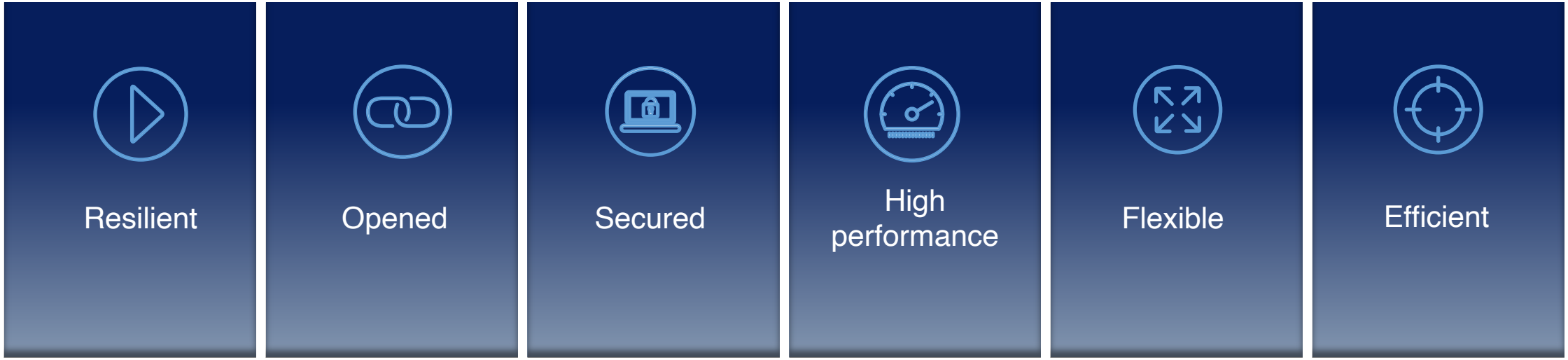
What are the requirements for exchanging critical data?

Data exchanges: objectives



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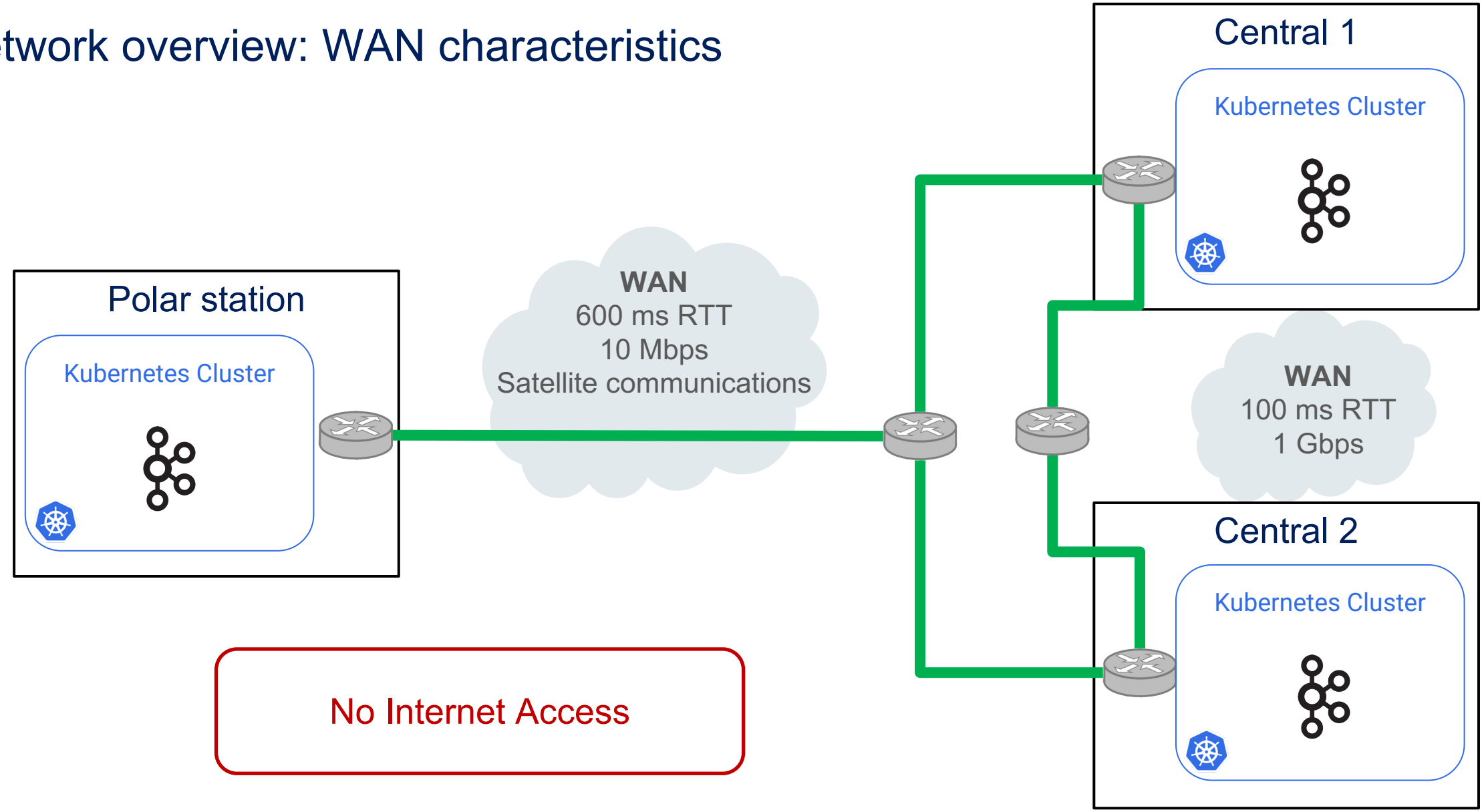
What are the characteristics of our environment?

Network overview: WAN characteristics



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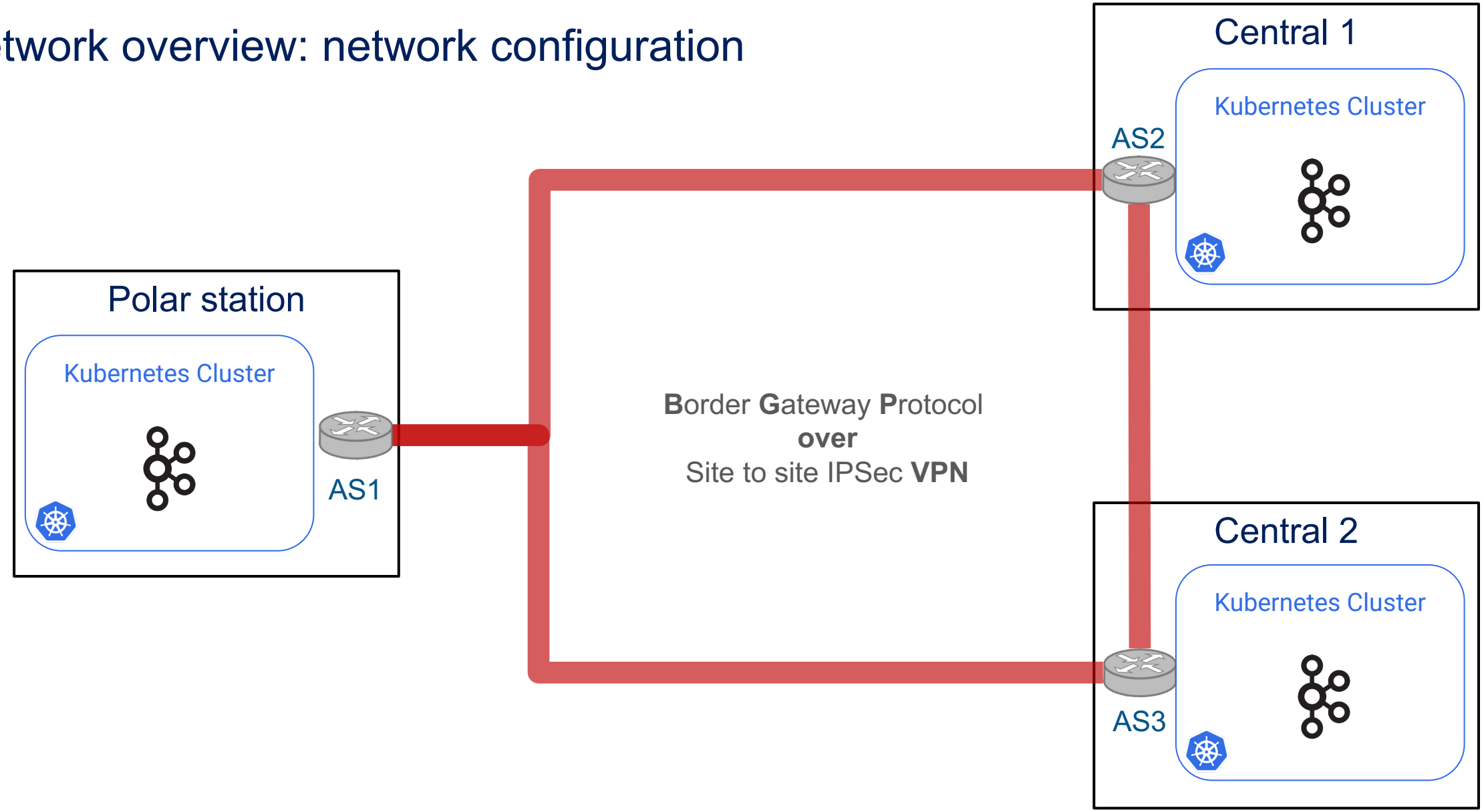
Network overview: network configuration



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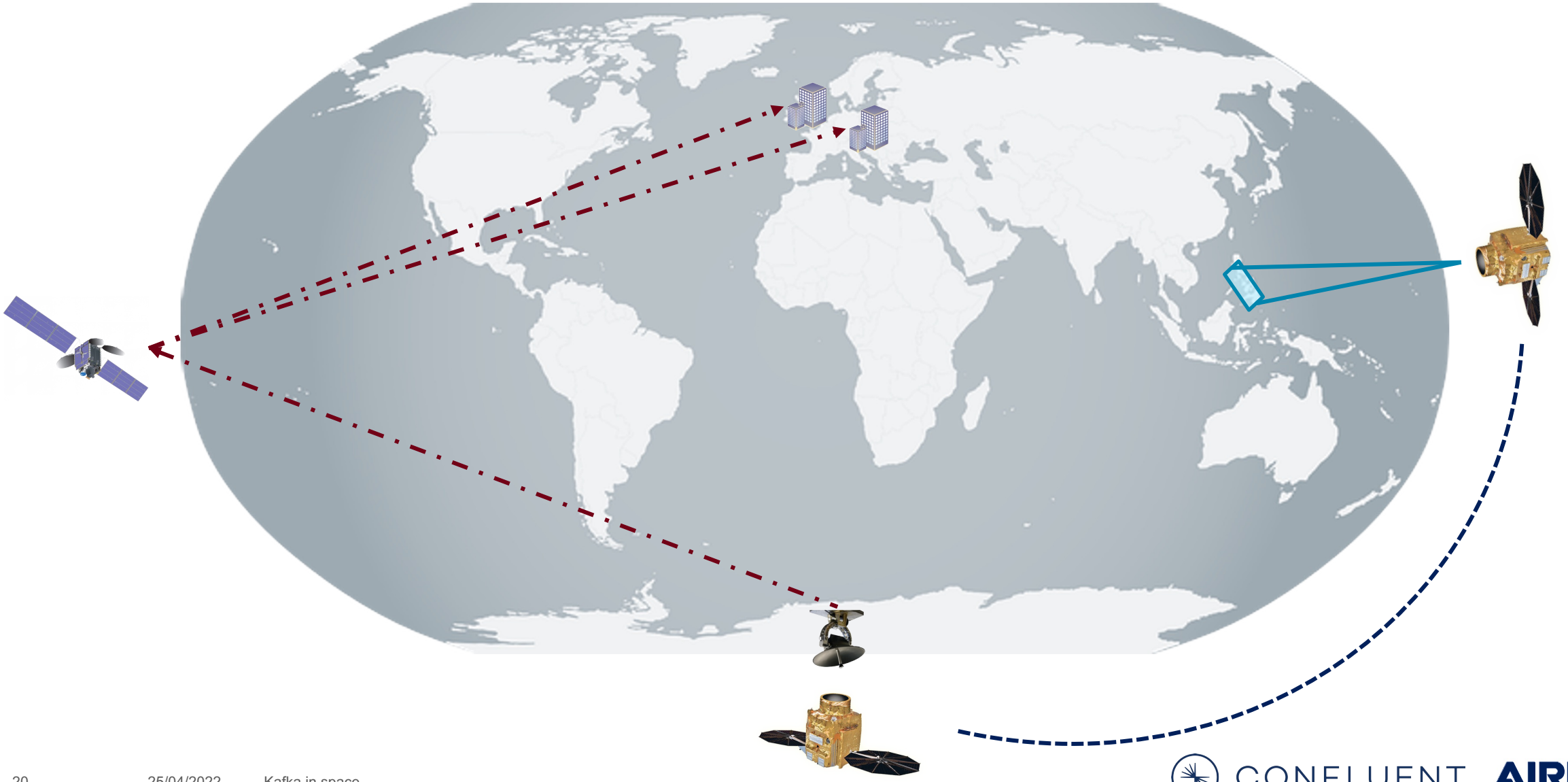
How can we optimize network usage?

Data exchanges: reminder



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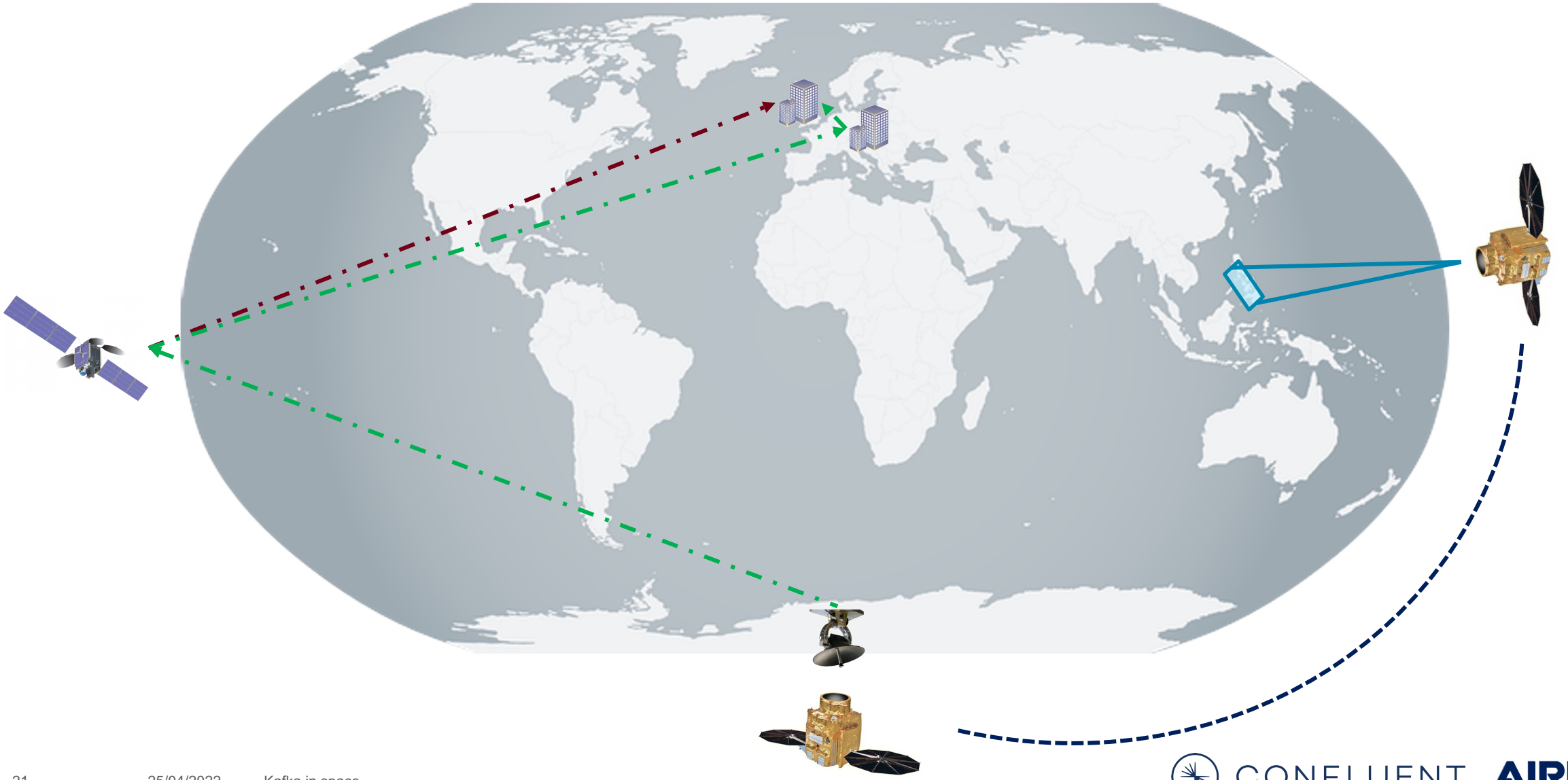
Data exchanges: network optimization



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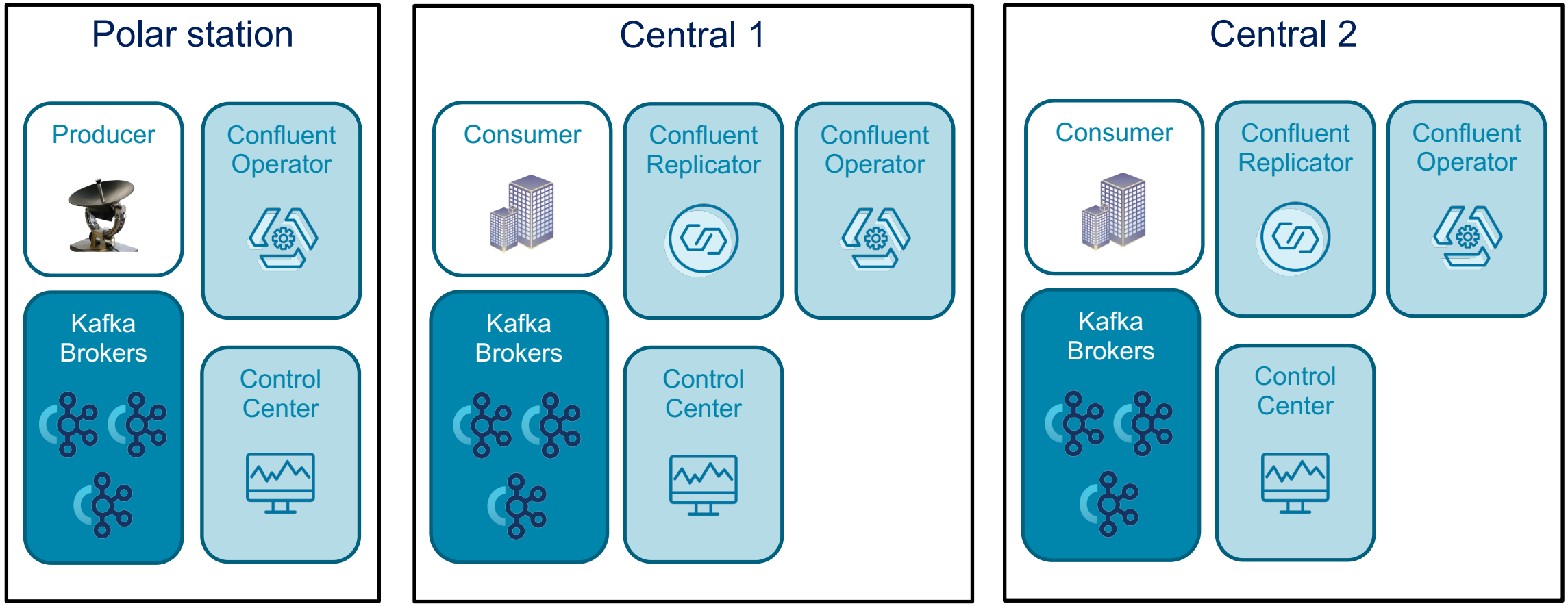
How do we use the Kafka ecosystem to exchange data?

Overall Architecture



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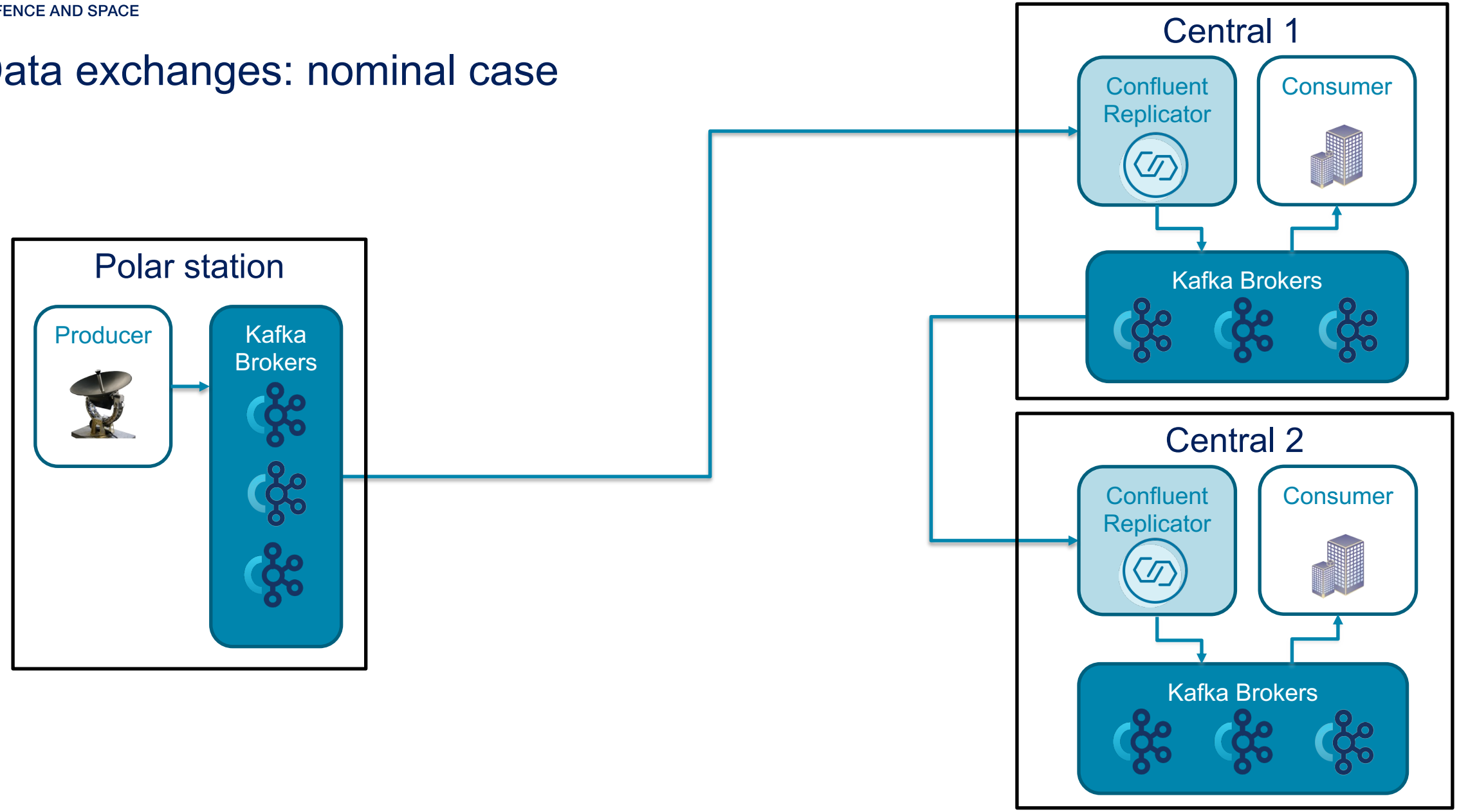
Data exchanges: nominal case



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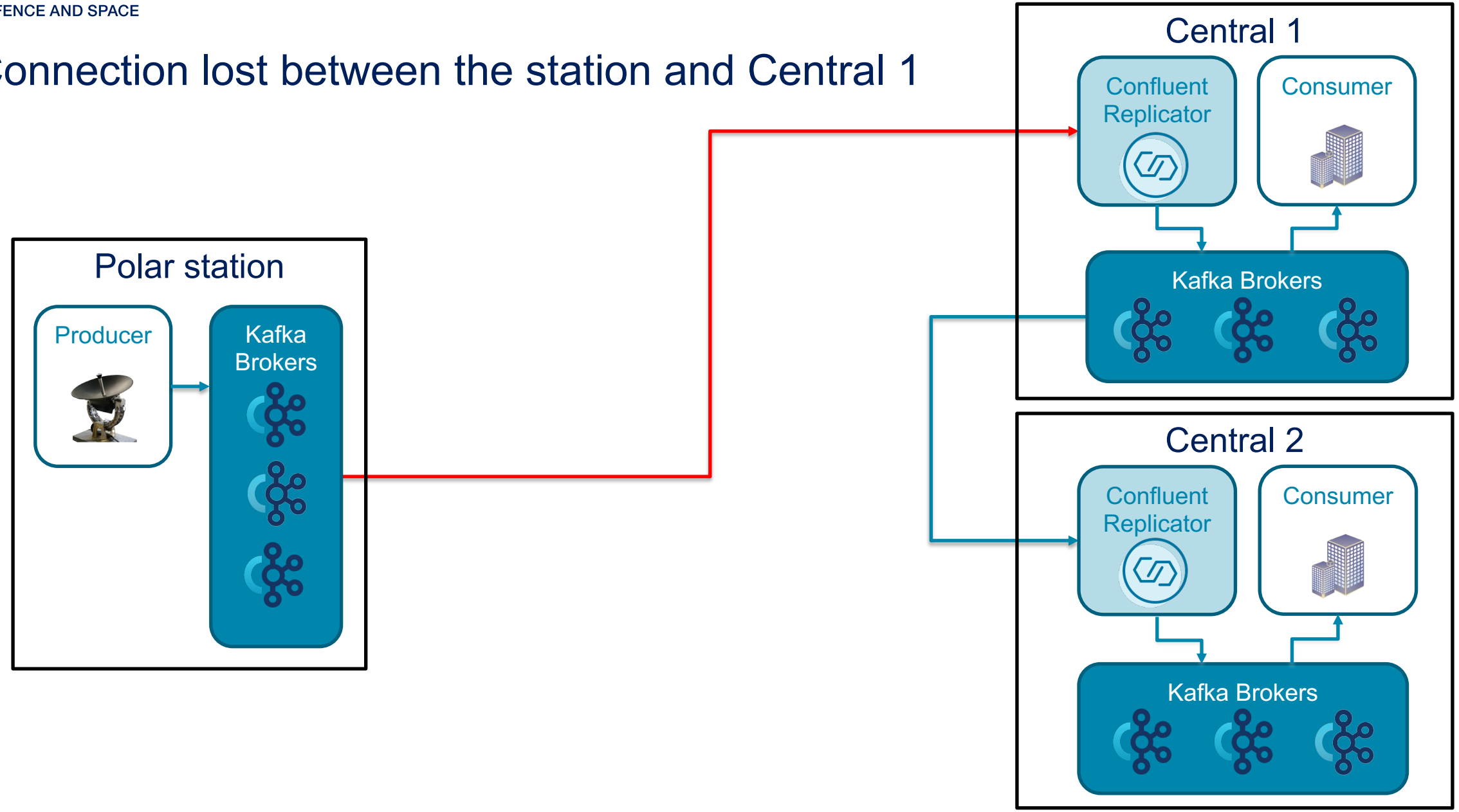
It’s time for a demo!

What if we lose the connectivity
between the polar station and central1?

Connection lost between the station and Central 1



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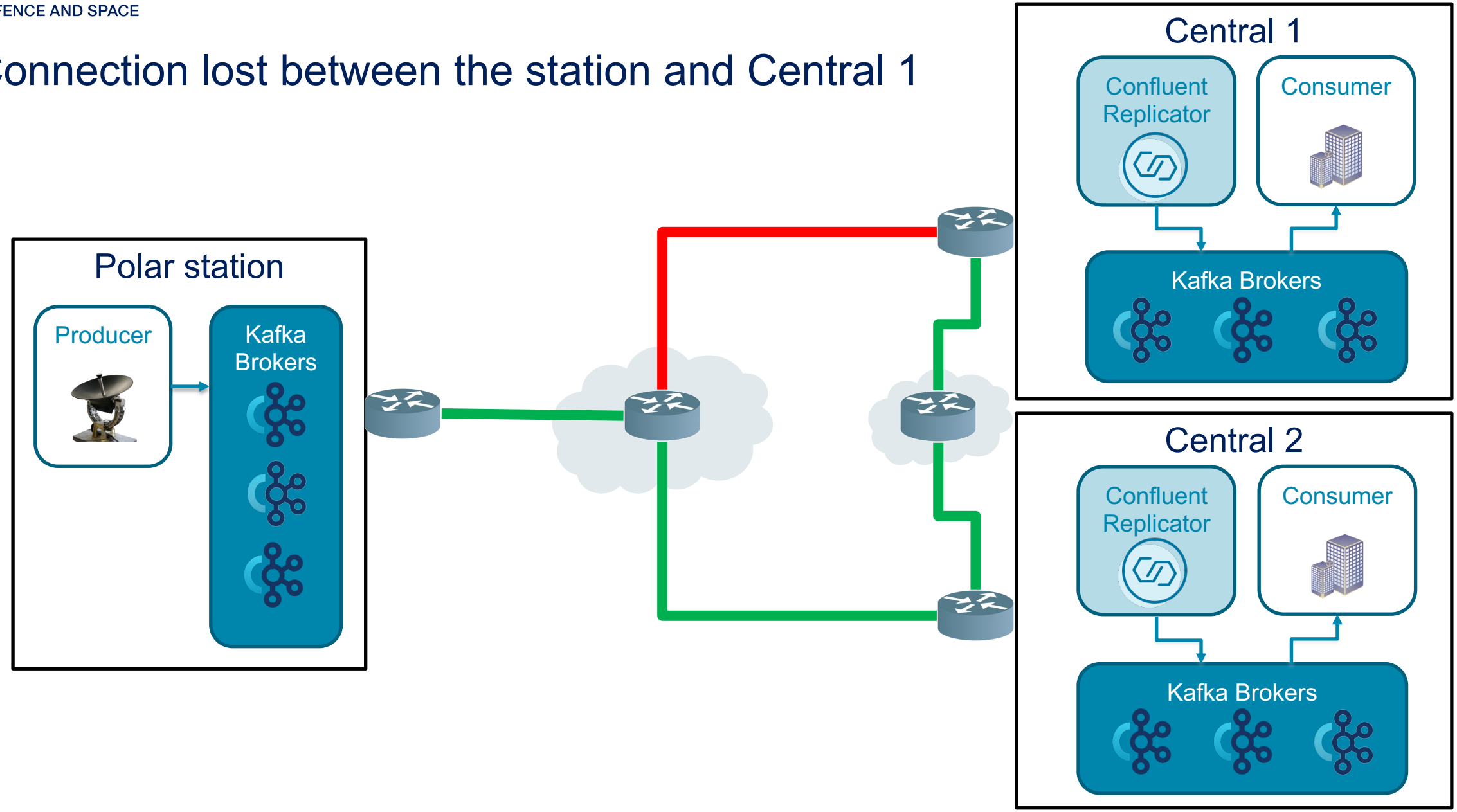
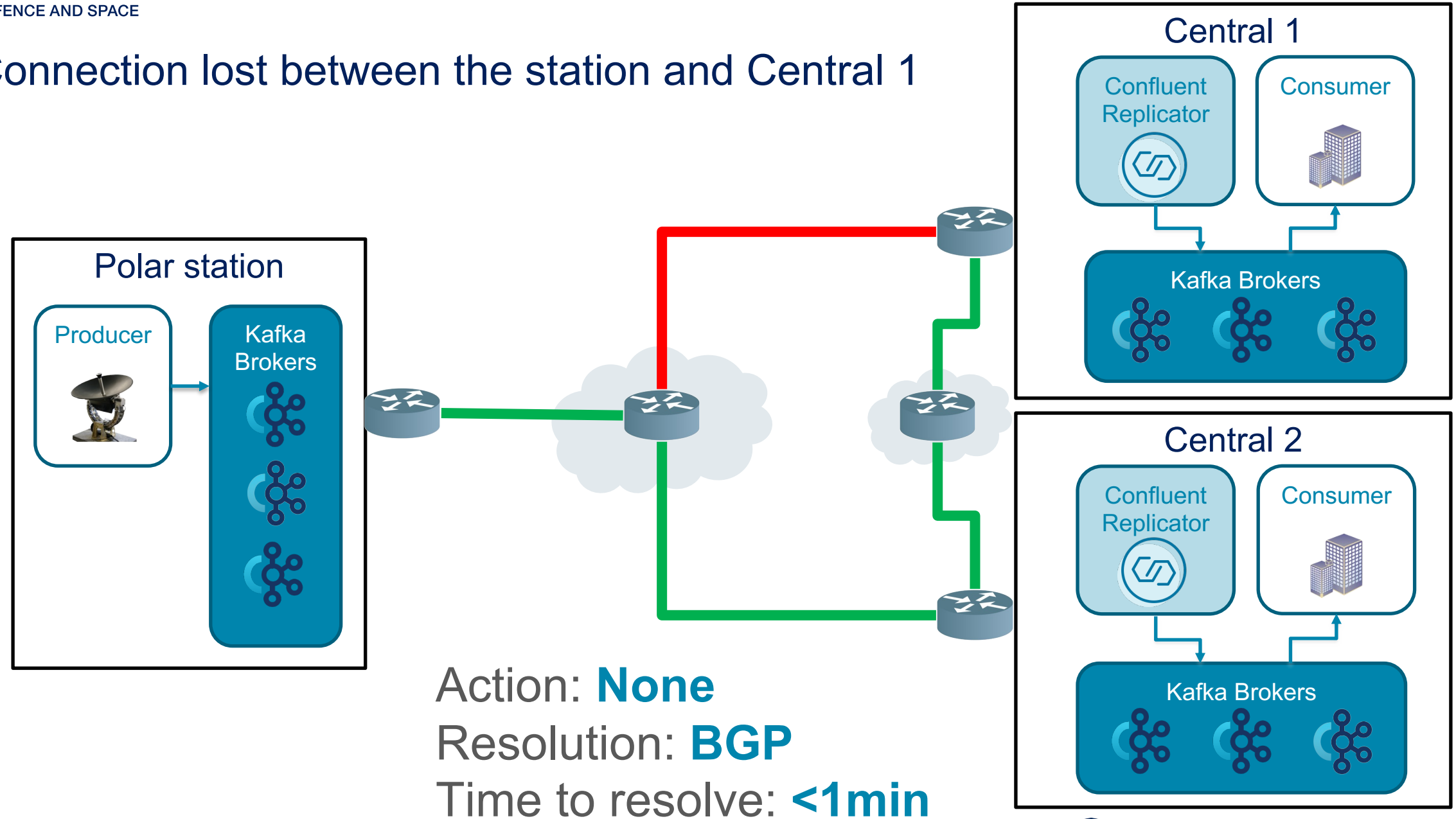
Connection lost between the station and Central 1



CONFLUENT AIRBUS

It’s time for a demo!

Connection lost between the station and Central 1



Action: **None**
Resolution: **BGP**
Time to resolve: **<1min**

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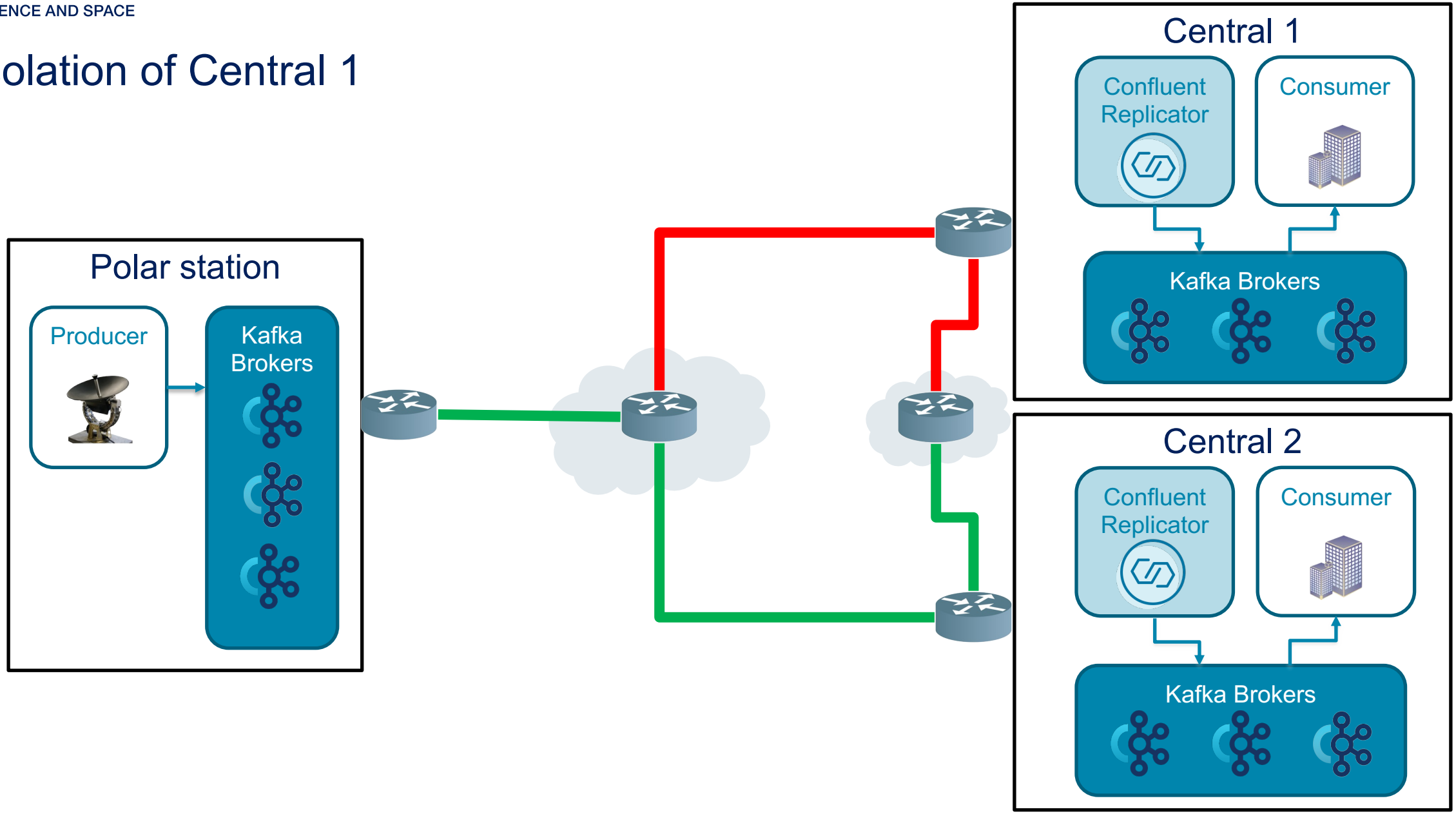
What if central 1 is isolated?

Isolation of Central 1



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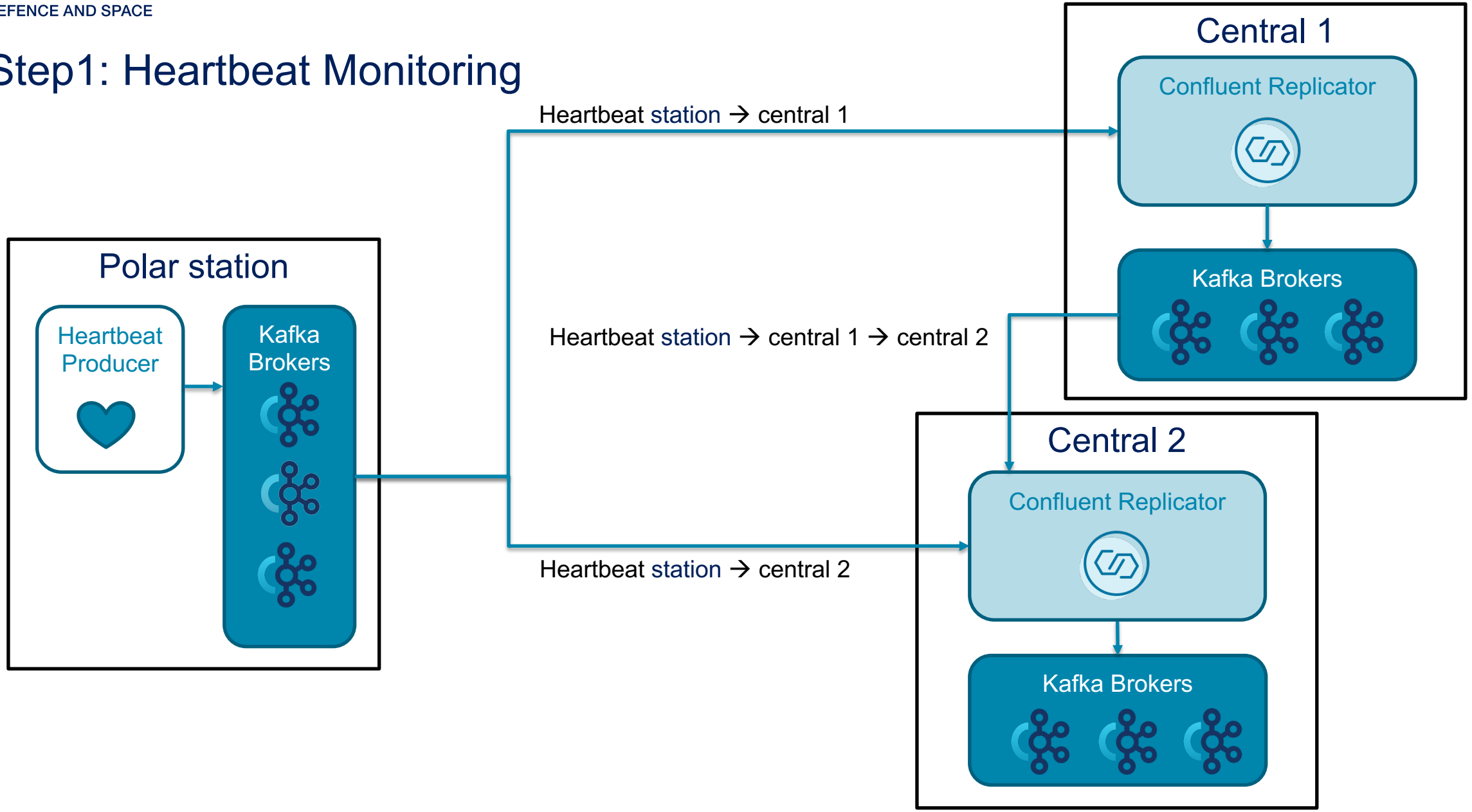
How can we dynamically update the replicator configuration?

Step1: Heartbeat Monitoring



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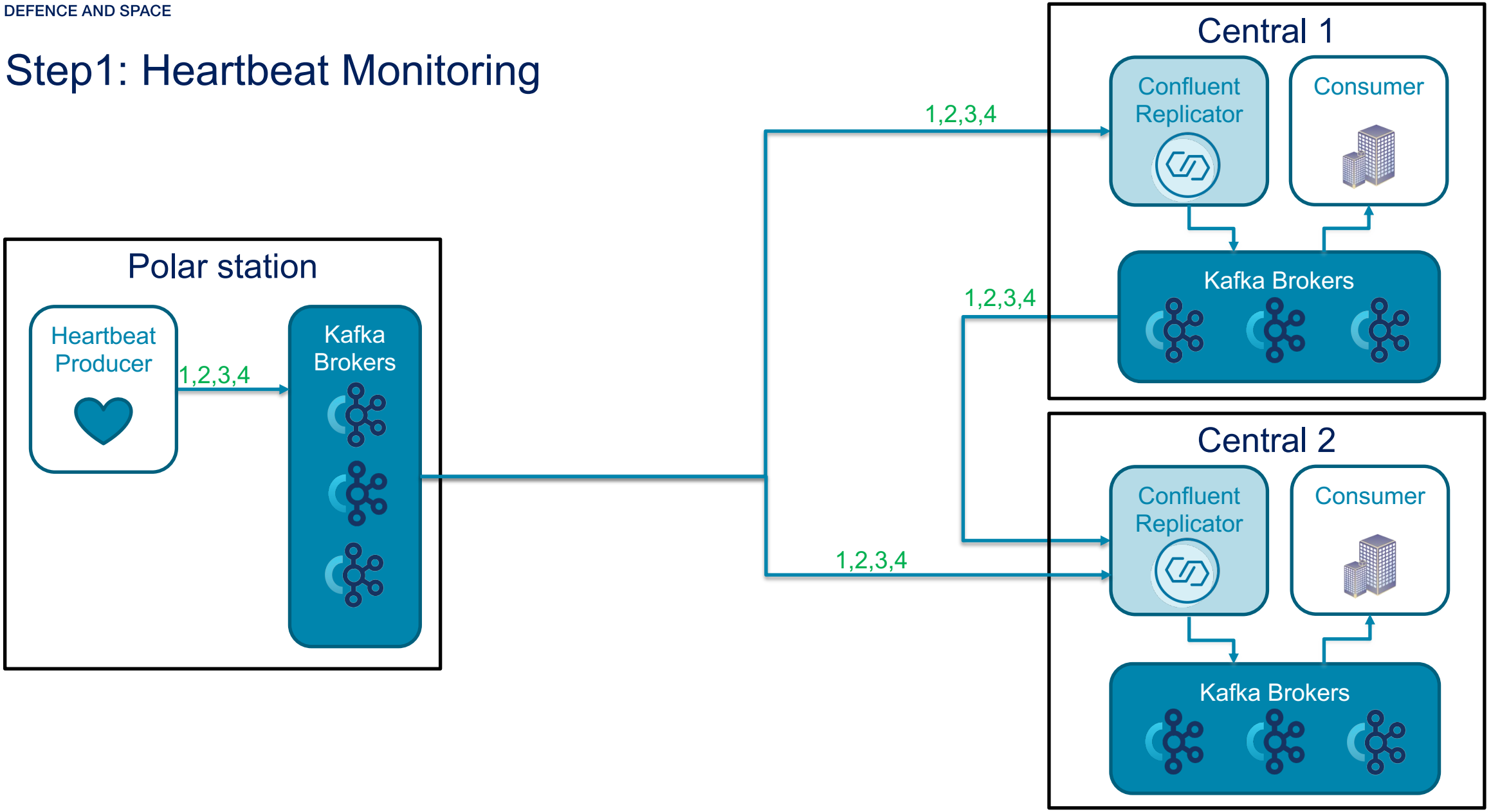
Step1: Heartbeat Monitoring



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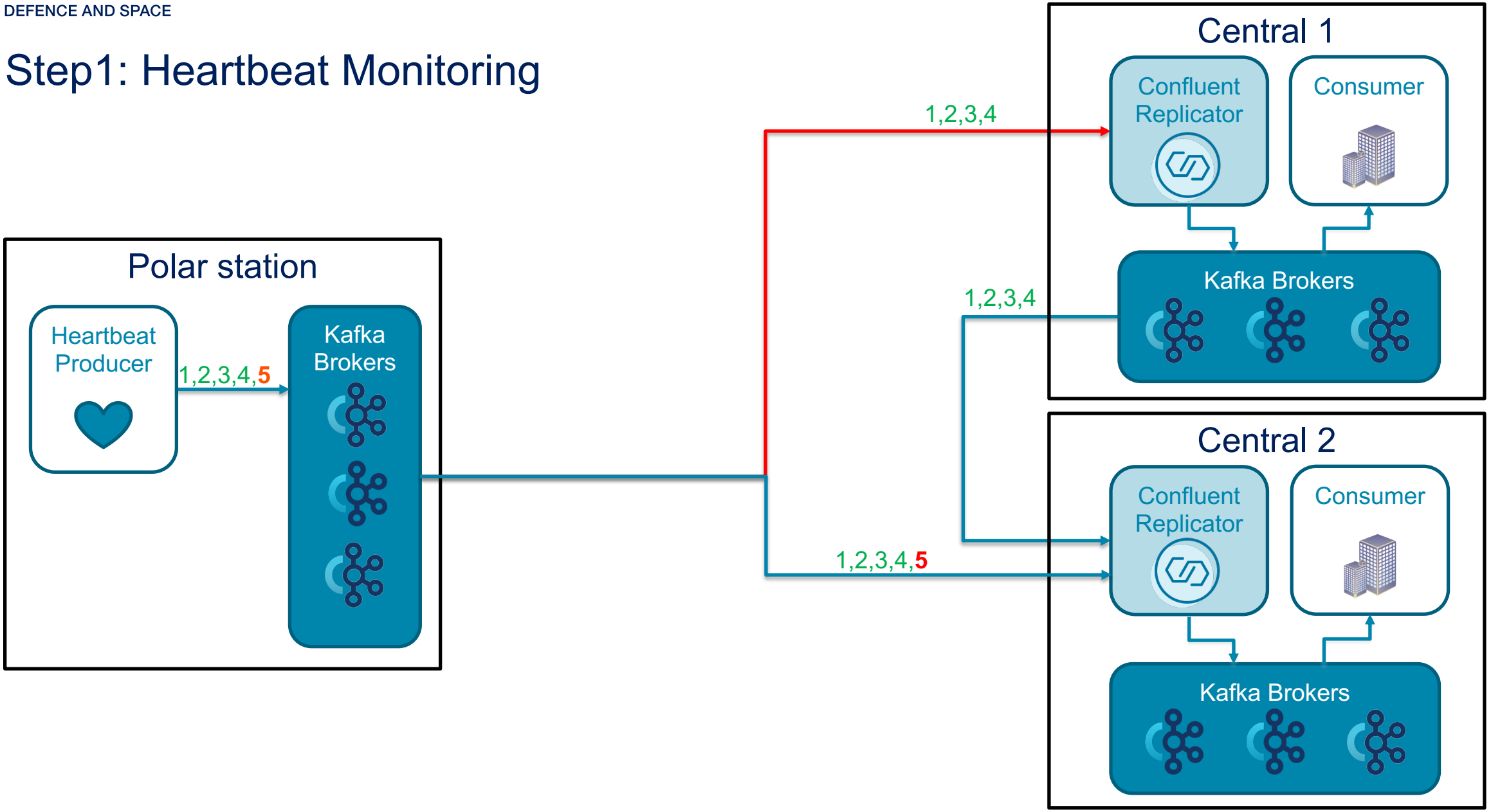
Step1: Heartbeat Monitoring



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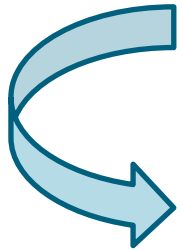
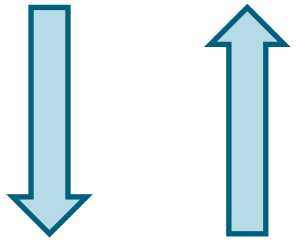
Step2: Replicator Controller on Central 2

Control Heartbeat delta



Nominal Mode:

- Data source: Central 1



- Switch Replicator configuration
- Reset offsets

Failover Mode:

- Data from Polar Station

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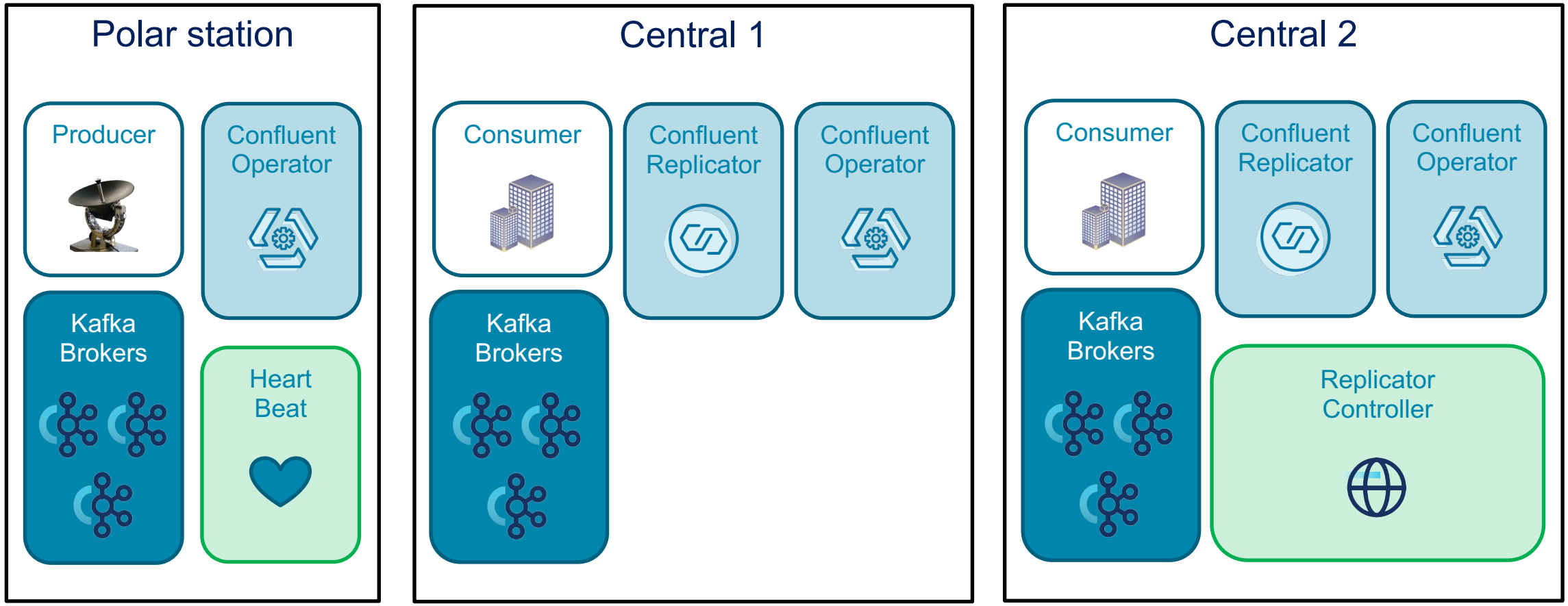
Replicator Controller - Components



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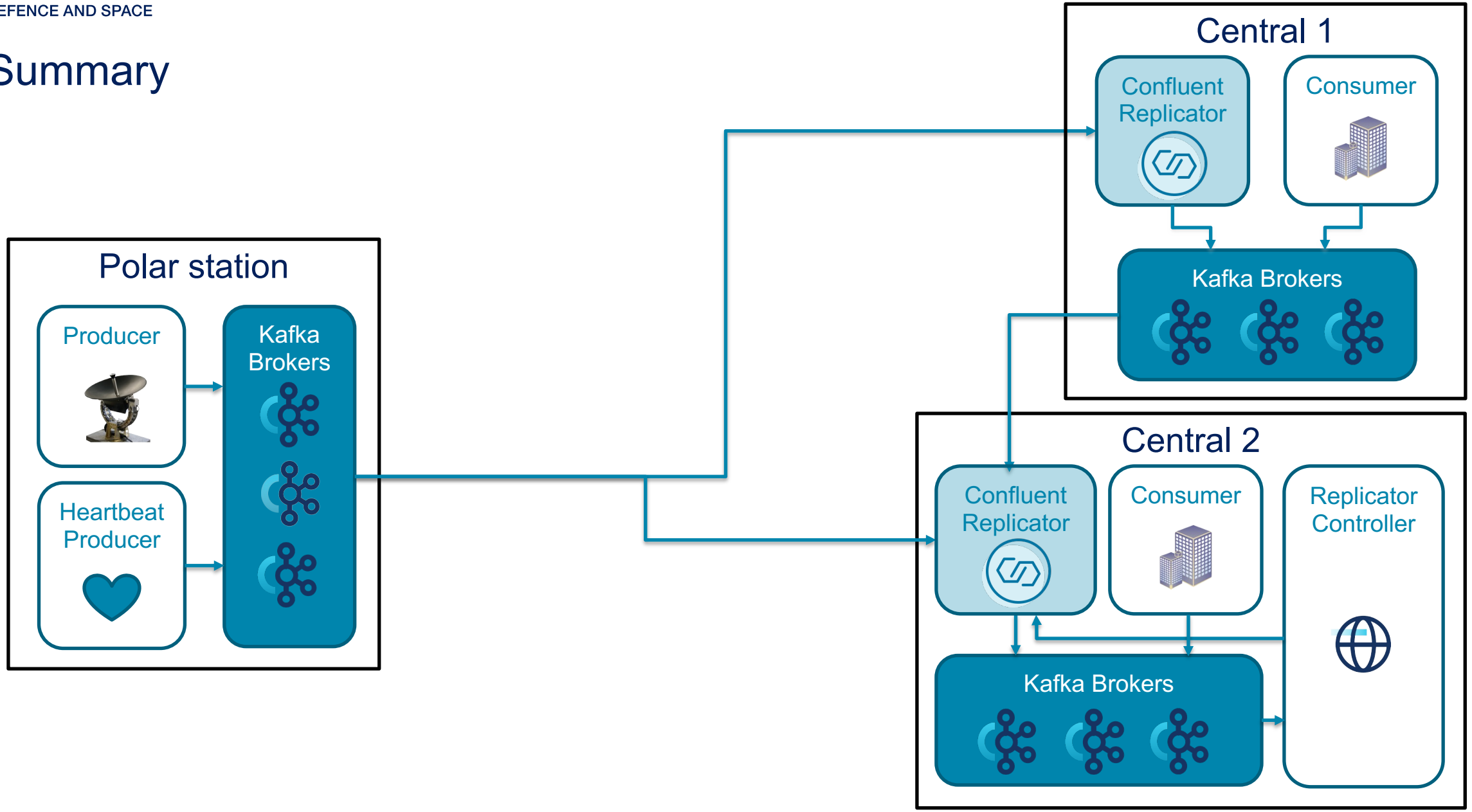
Summary



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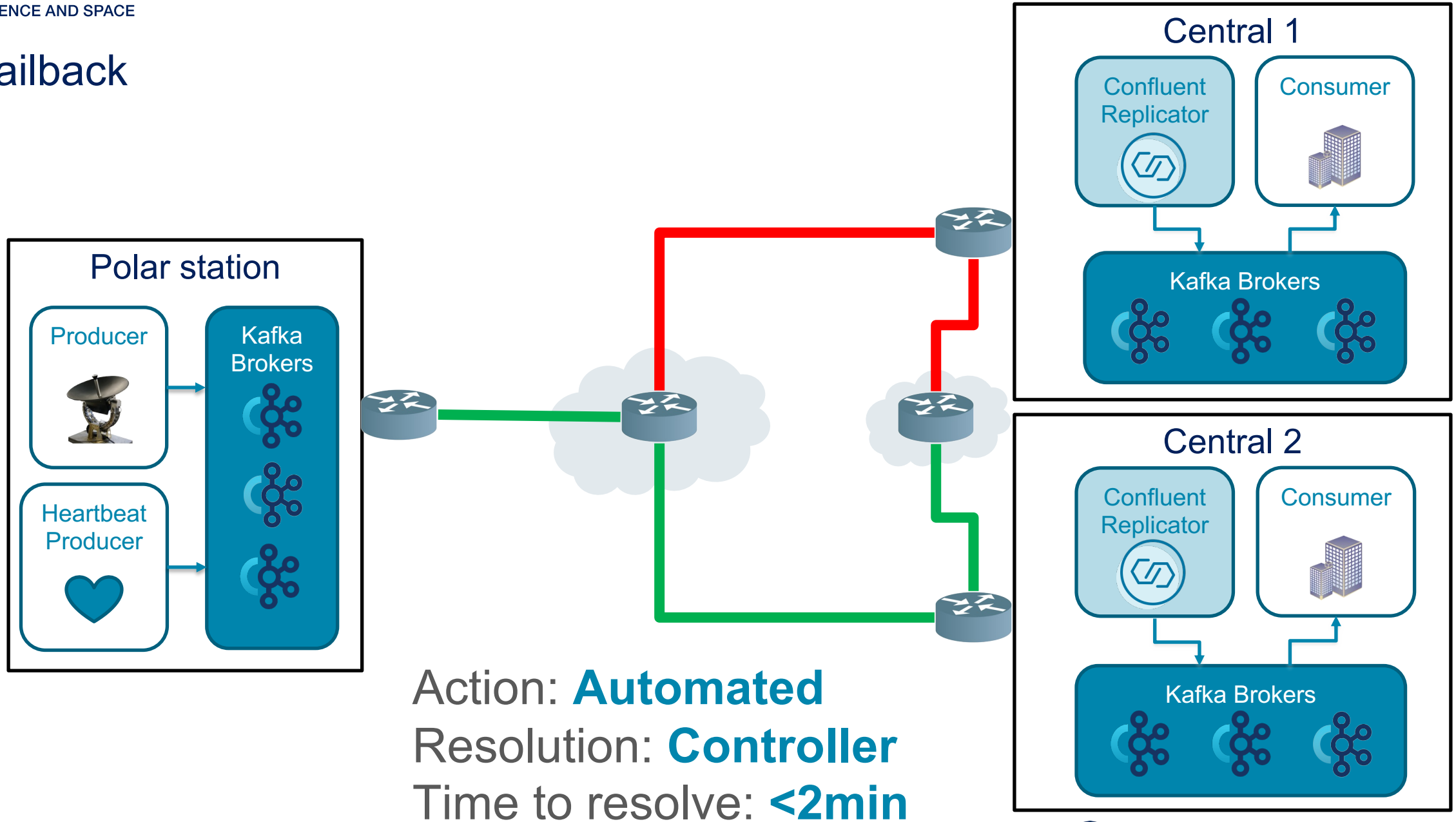
It’s time for a demo!

Failback



Action: **Automated**
Resolution: **Controller**
Time to resolve: **<2min**

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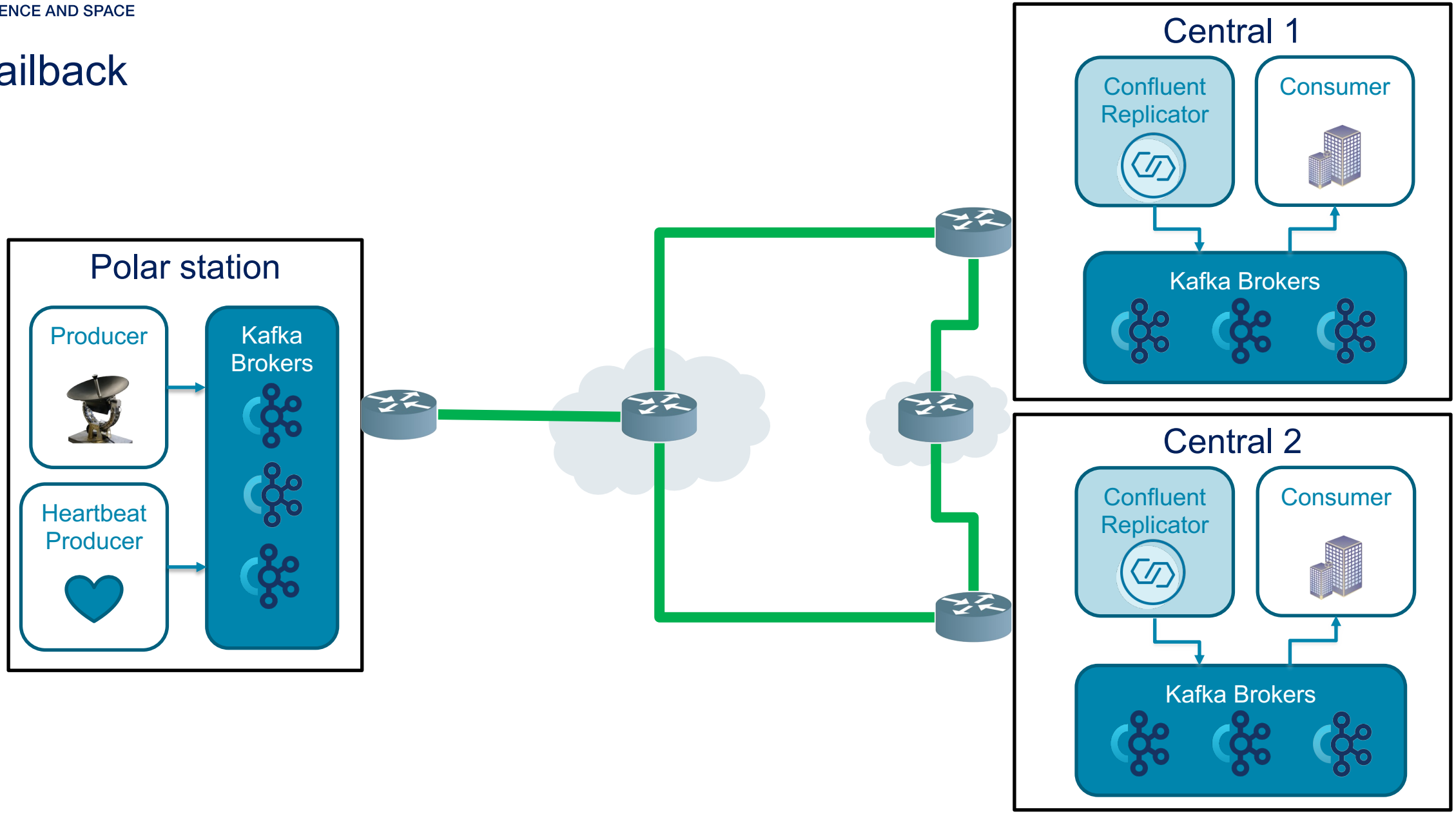
What happens when network returns to normal?

Failback



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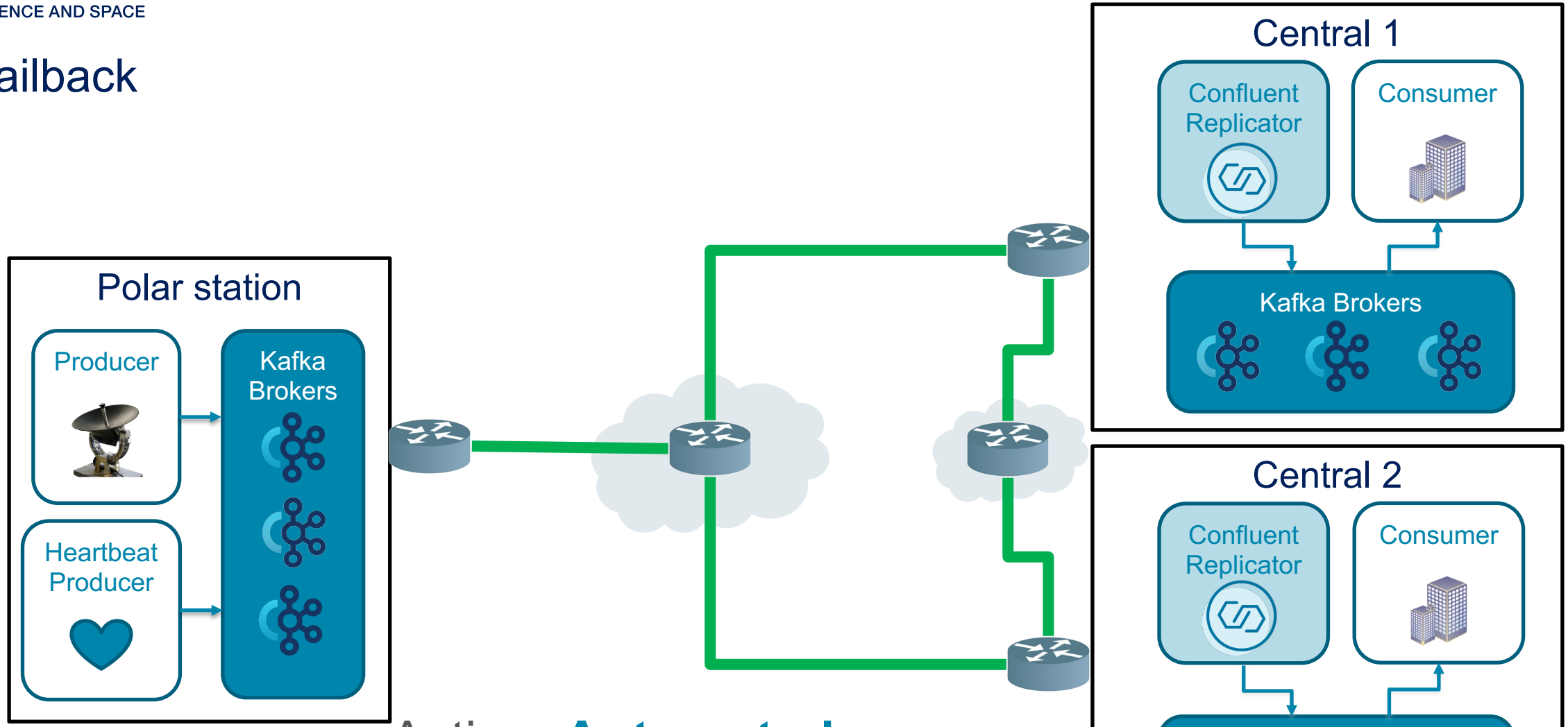
It’s time for a demo!

Failback



Action: **Automated**

Resolution: **BGP + Controller**

Time to resolve: **<1min**

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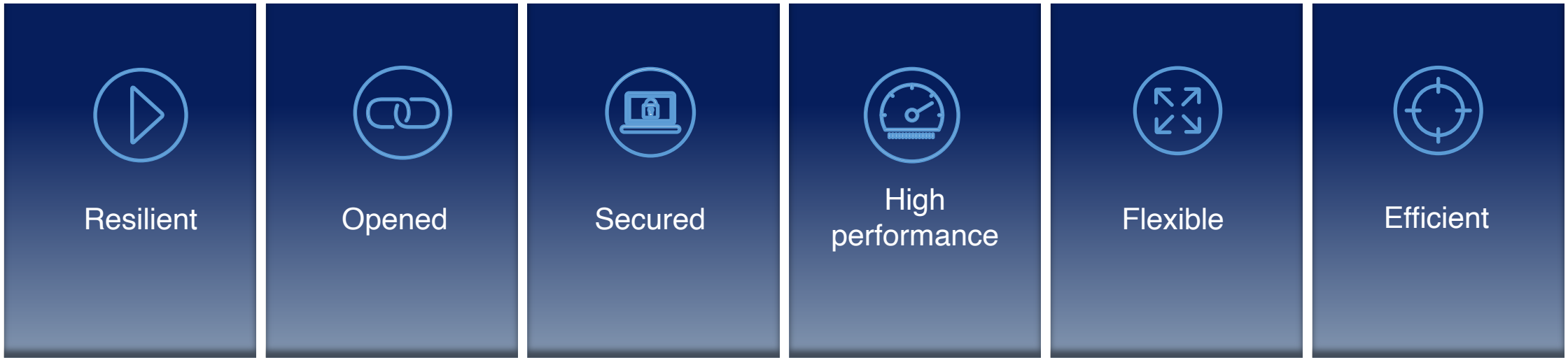
Conclusion



No data loss
Highly available

Modular approach
Open Source based

Kafka deployed with TLS and authentication

High throughput communications

Scalable
Reversible

Low latency
Automatic recovery
Bandwidth optimization

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Way forward / Enhancements

- Manage Replicator configuration through CRDs
- Optimize duration of Failback / Failover
- Explore Cluster Linking capabilities to replace Replicator
- Smarter offset reset strategy

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