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Deploying and scaling distributed systems for IoT data aggregation and analysis

Requirements

Running in the cloud



Google Cloud

Modularity



Microservice architecture

Scalability



Kubernetes

Efficiency



Rust

MQTT

What is MQTT?

- M2M binary protocol
- Follows the Pub/Sub pattern
- Running over TCP

Why has it been chosen?

- Simplicity
- Low resource requirements (Memory, Network)

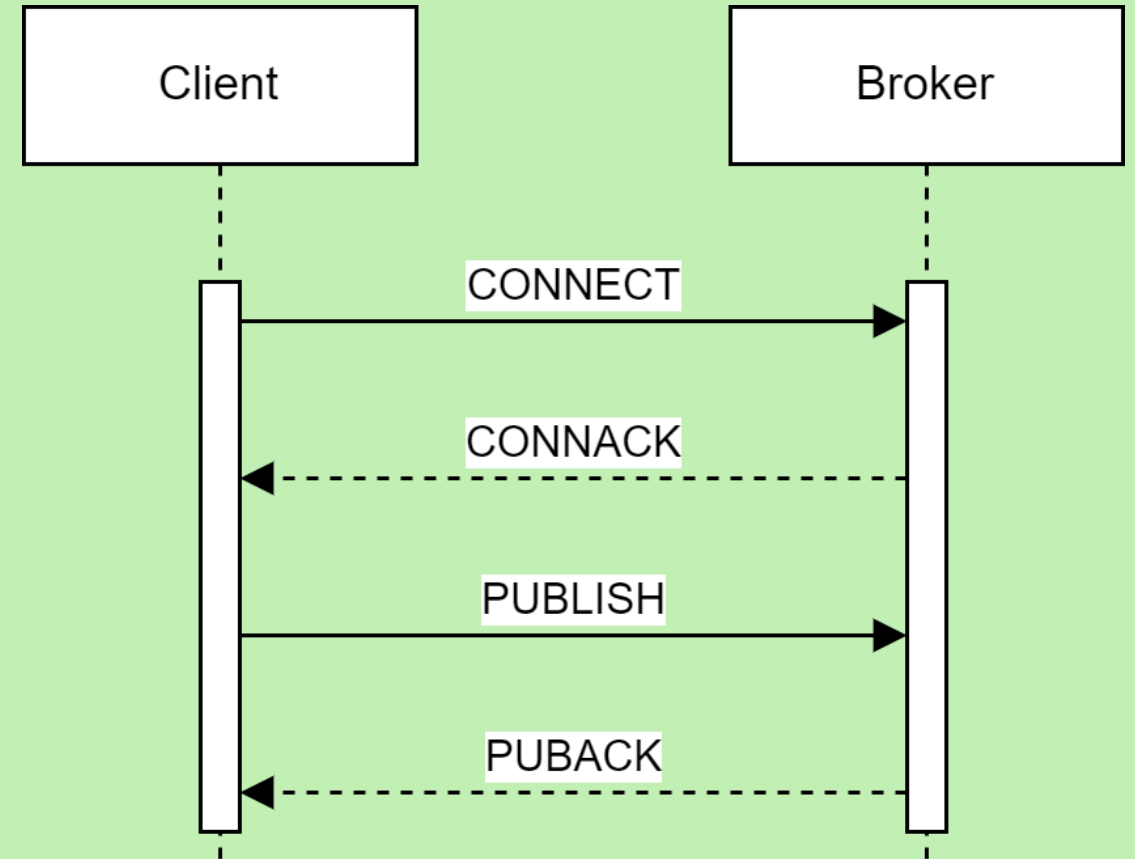


Fig. 1: Publishing a message using MQTT and QoS 1

Architecture

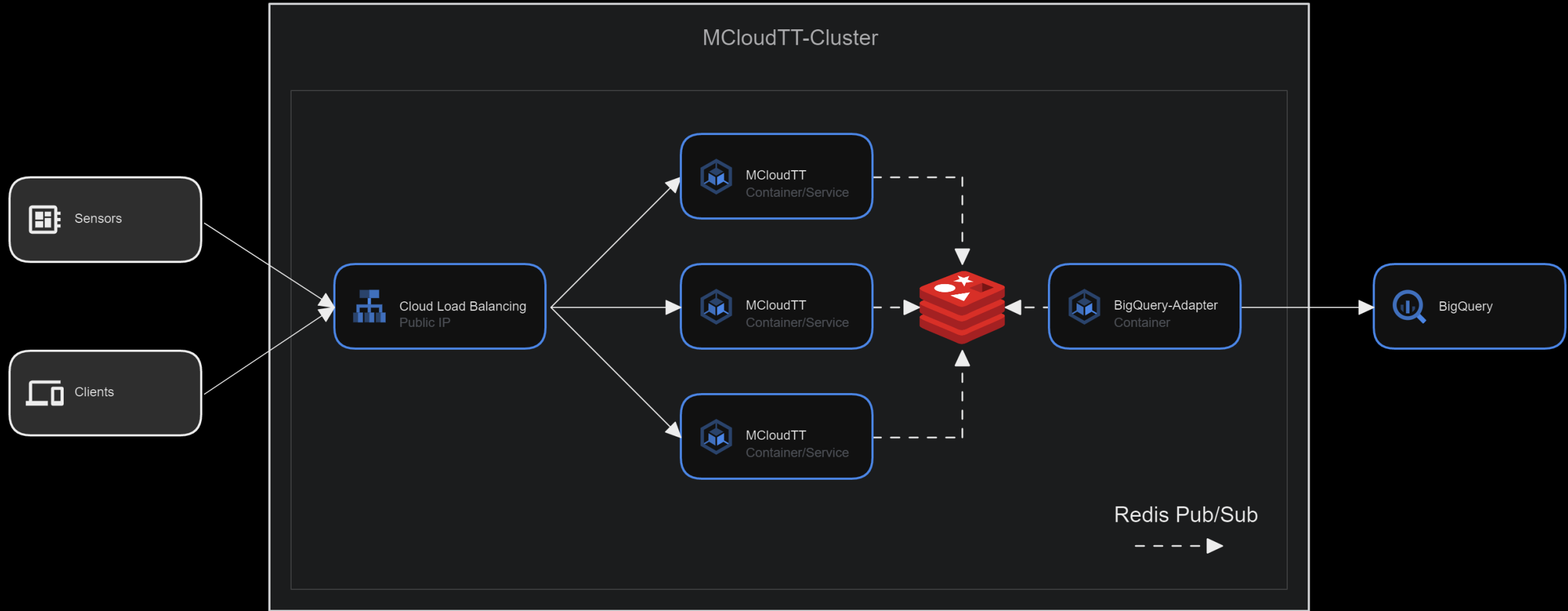


Fig. 2: Architecture of MCloudTT

Inter-broker communication

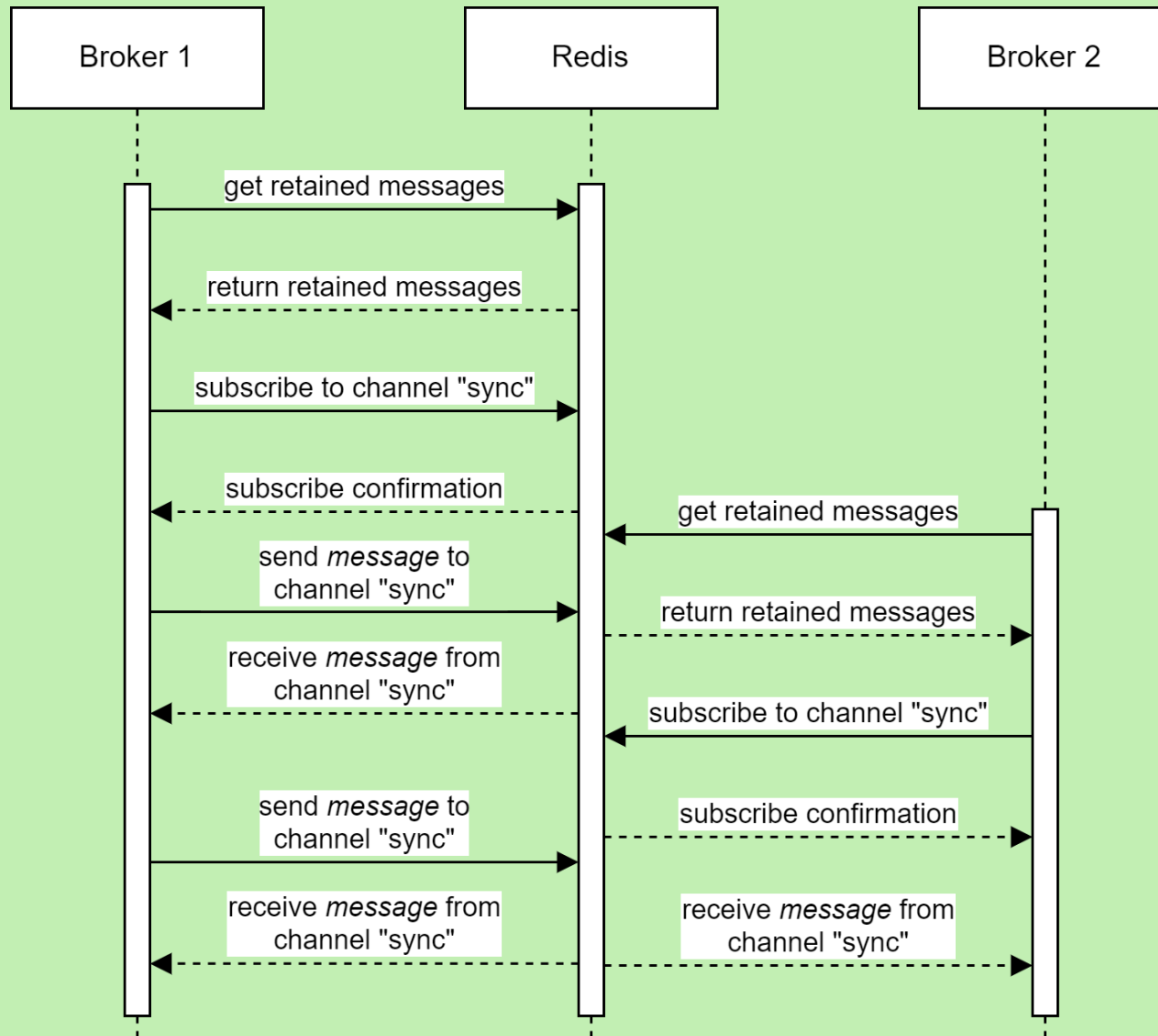


Fig. 3: Brokers exchanging messages via Redis Pub/Sub

- Message exchange via Redis Pub/Sub
- Other components can tap into same channel
- Brokers have unique identifiers

Topology problem

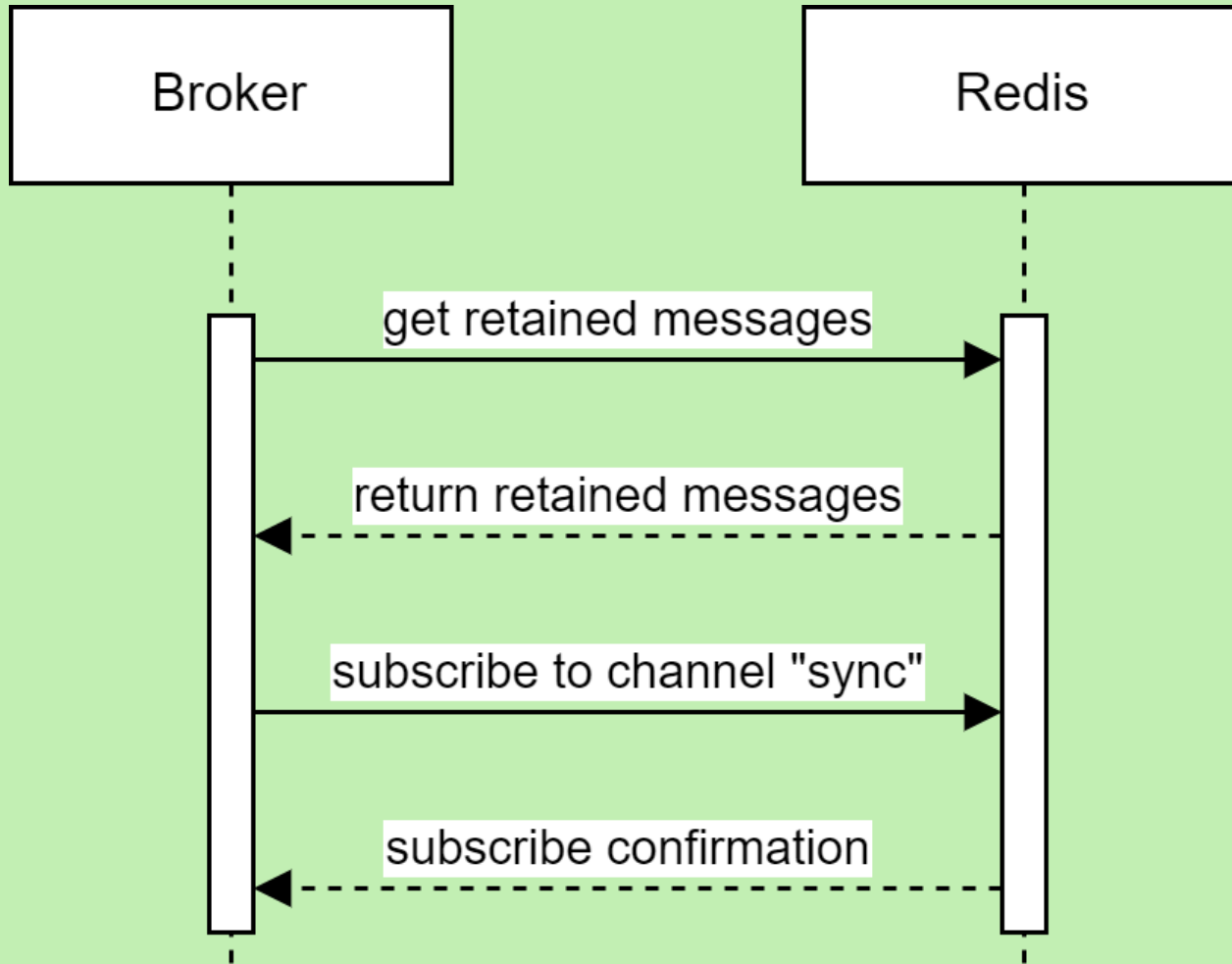


Fig. 4: Desired initialization process

Broker service is available
before Redis service
→ Fails to connect
→ Broker crashes

Fallacy of DS: "Topology does
not change"
Solution: Retry pattern

Deployment

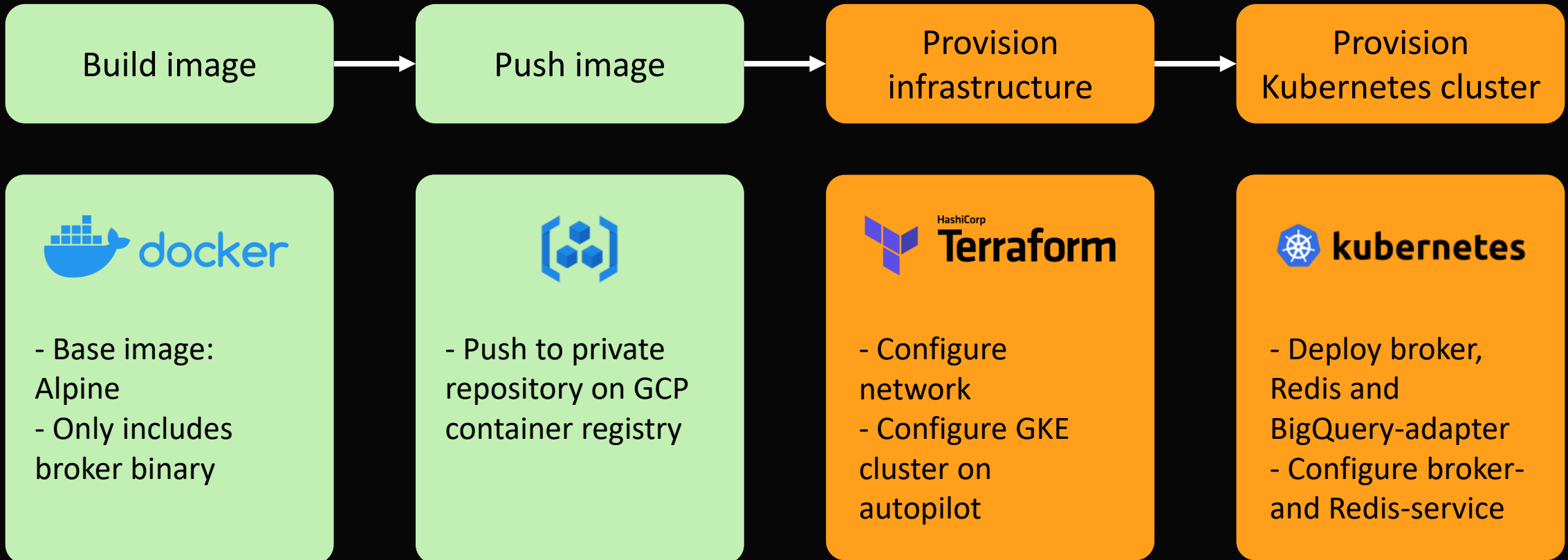


Fig. 5: Simplified deployment process

Conclusion



- Memory safety
- Low resource usage
- C-like performance

- Developing time



- Simple protocol
- Large eco system
- Good documentation

- Limited to small payloads



- Good documentation
- Powerful services
- High availability

- Vendor-lockin



- Good documentation
- Easy to work with
- Good performance

- Single point of failure
(if no redis cluster)



[1][6]

Sources

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