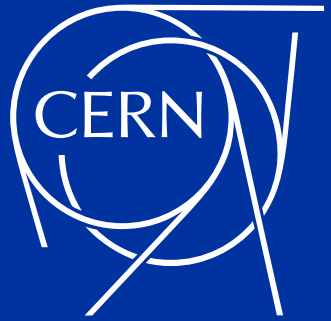

DISTRIBUTED CACHING AT CLOUD SCALE WITH APACHE IGNITE FOR THE C2MON FRAMEWORK

Tiago Oliveira

October 2021

- Introduction to C2MON
- Traditional Cache vs Distributed Cache
- Integration with Apache Ignite

Introduction to C2MON

Introduction to C2MON

Computing Center

Safety

Electricity

267k Endpoints

Cooling

QPS

Ventilation

Introduction to C2MON

Computing Center

Safety

Electricity

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Introduction to C2MON

Computing Center

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C2MON

- C2MON stands for CERN Control and Monitoring Platform
- Open-source platform
  https://cern.ch/c2mon/
- Industrial controls data acquisition
- Monitoring, control and data publishing
- It provides high availability and fault tolerance

Safety

Cooling

Ventilation

Introduction to C2MON

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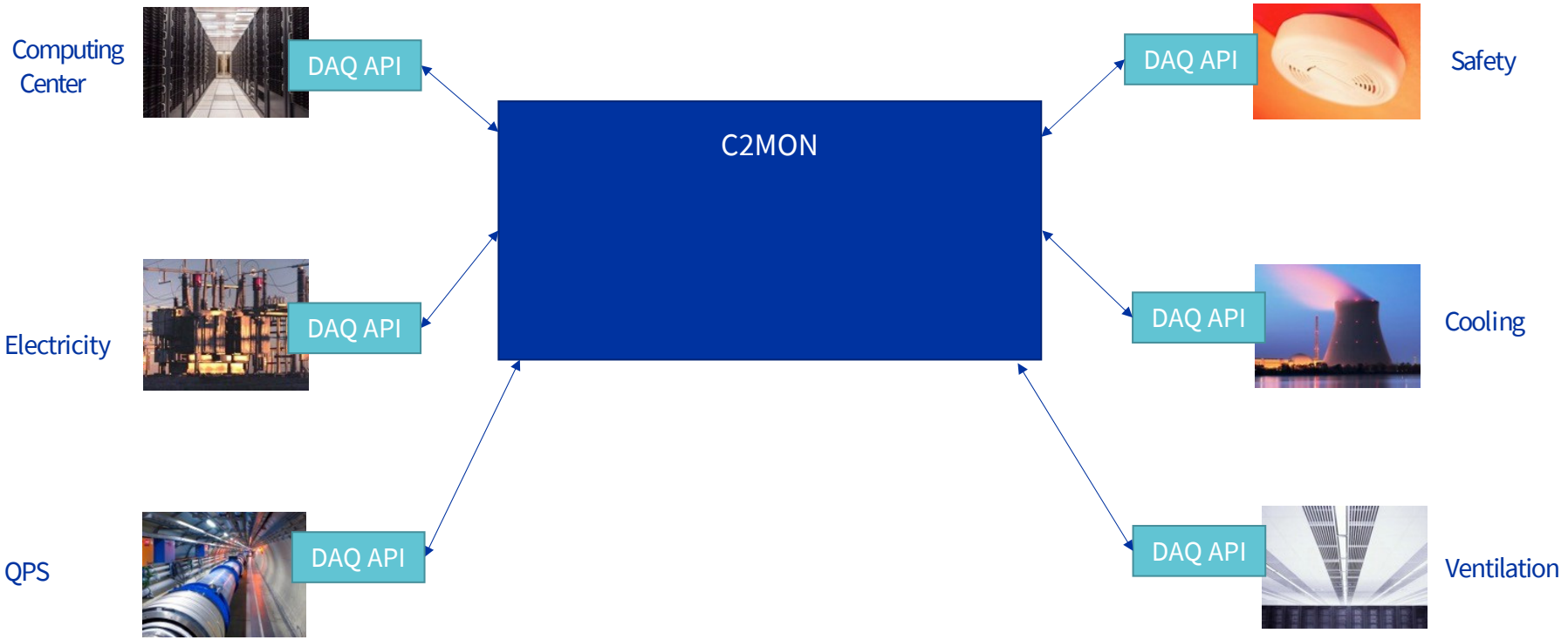

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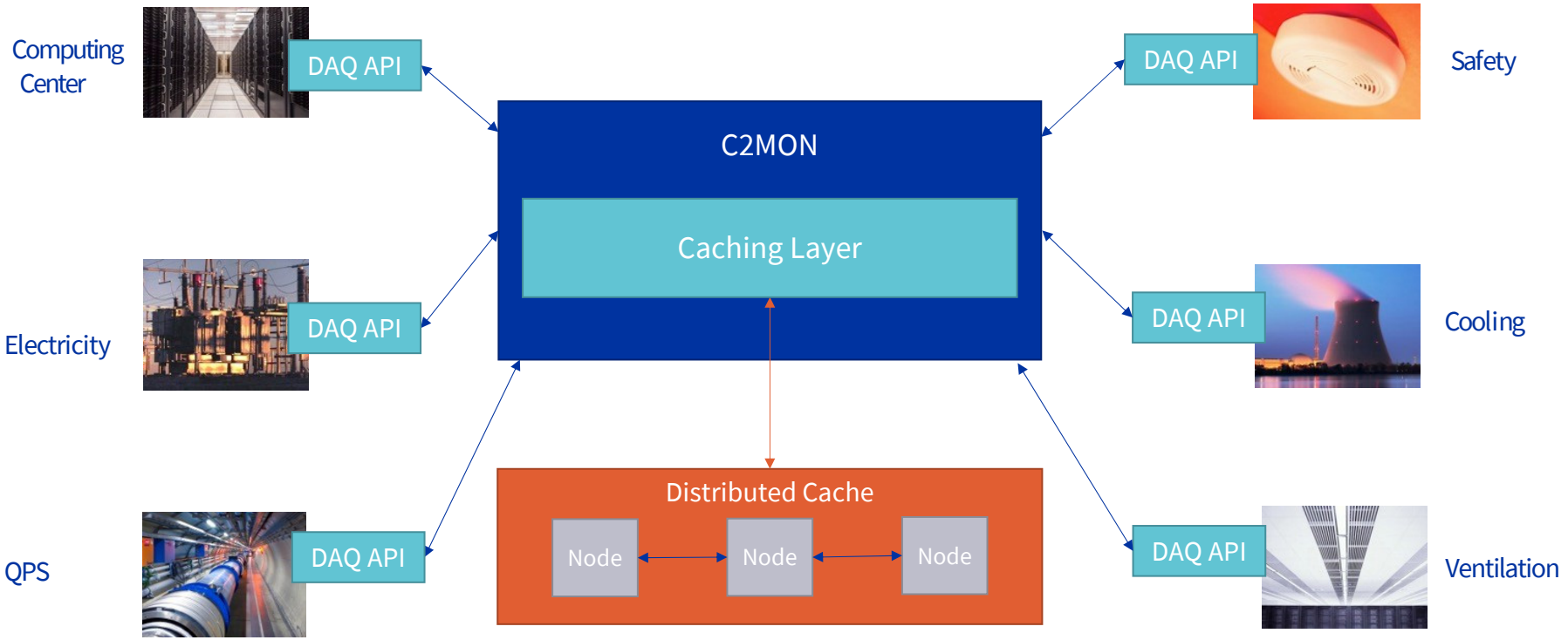

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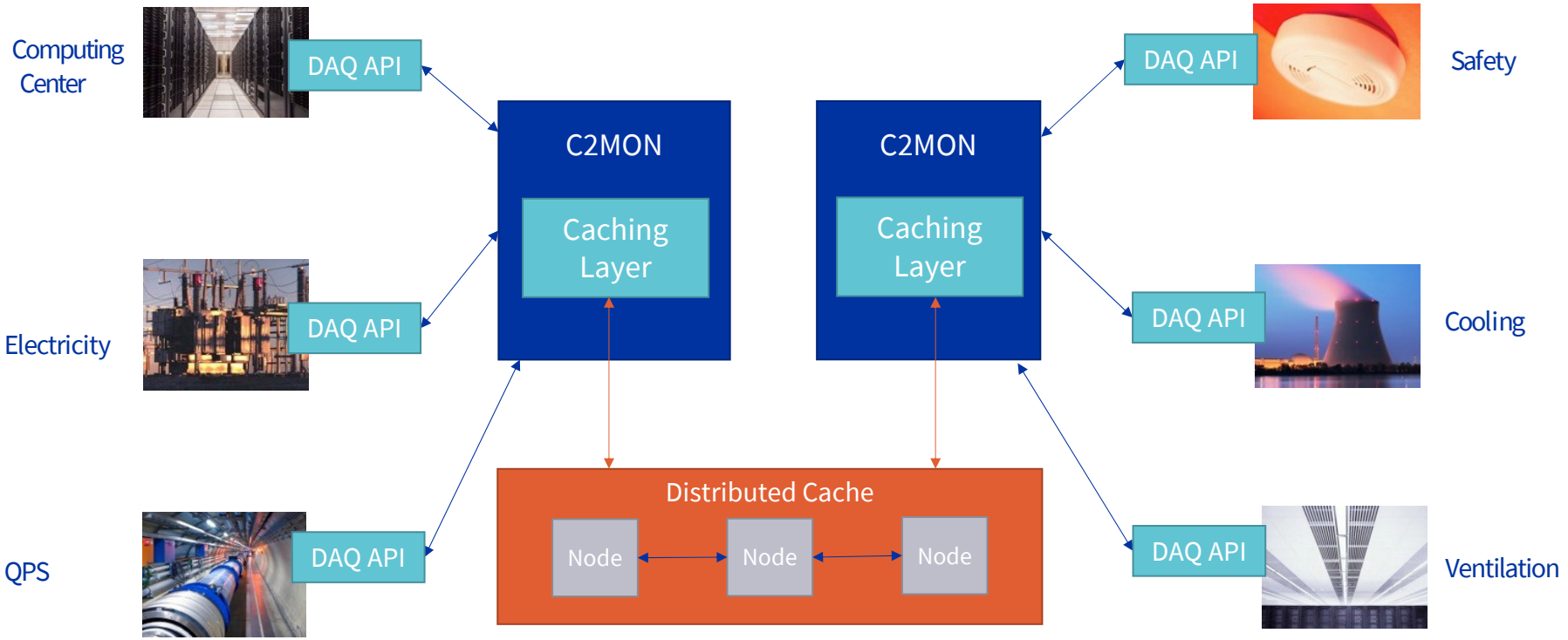

Traditional Cache vs Distributed Cache

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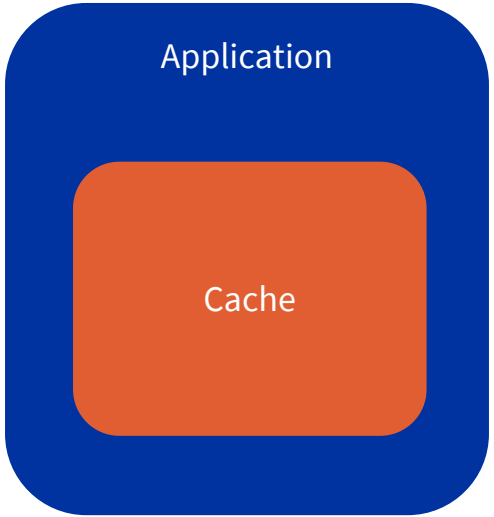

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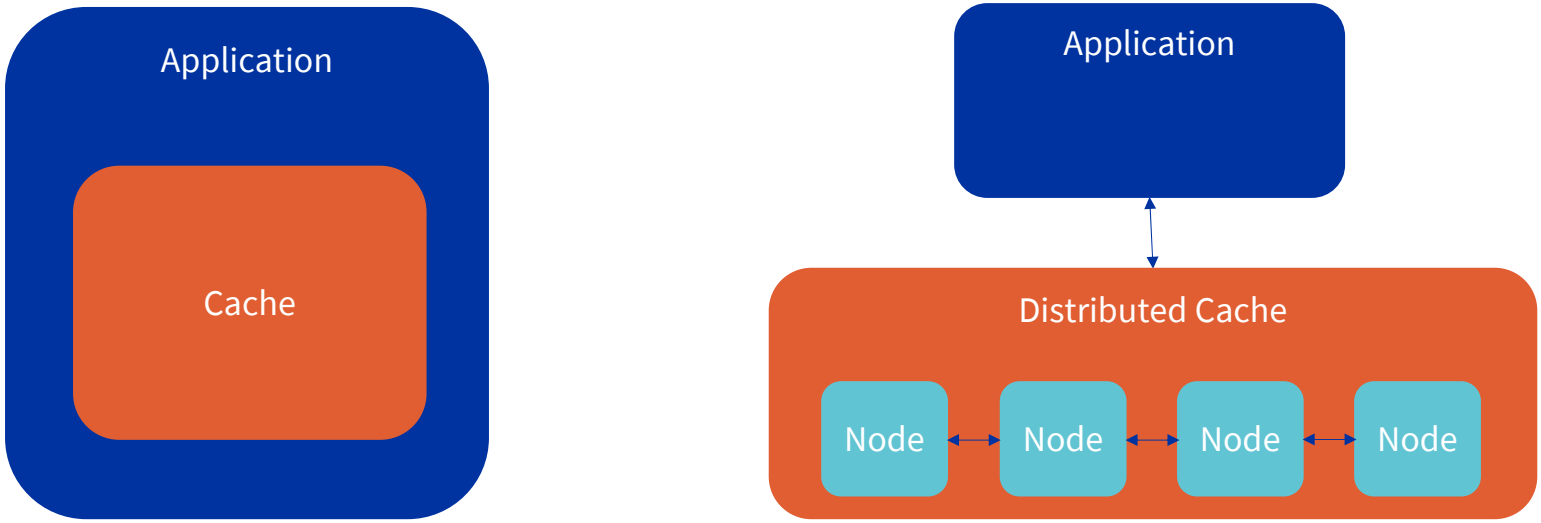

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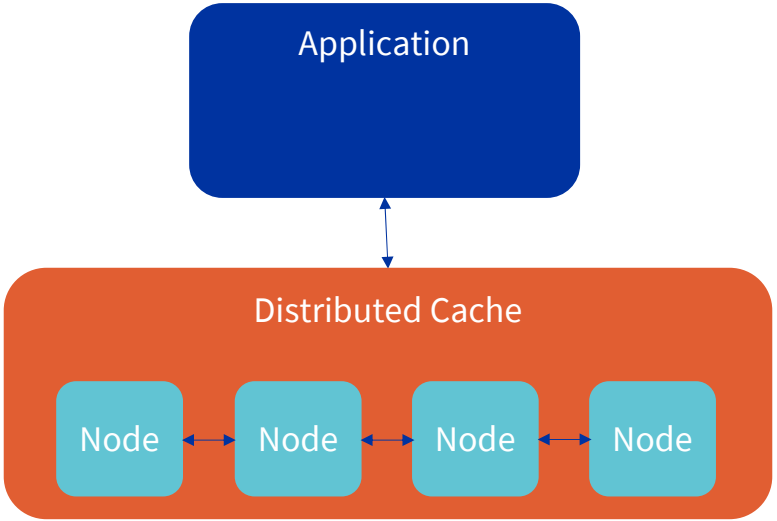
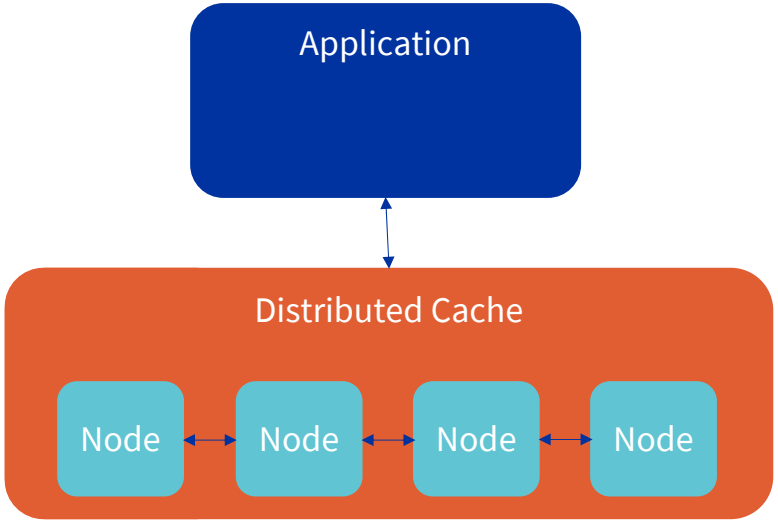


How Distributed Caches Work



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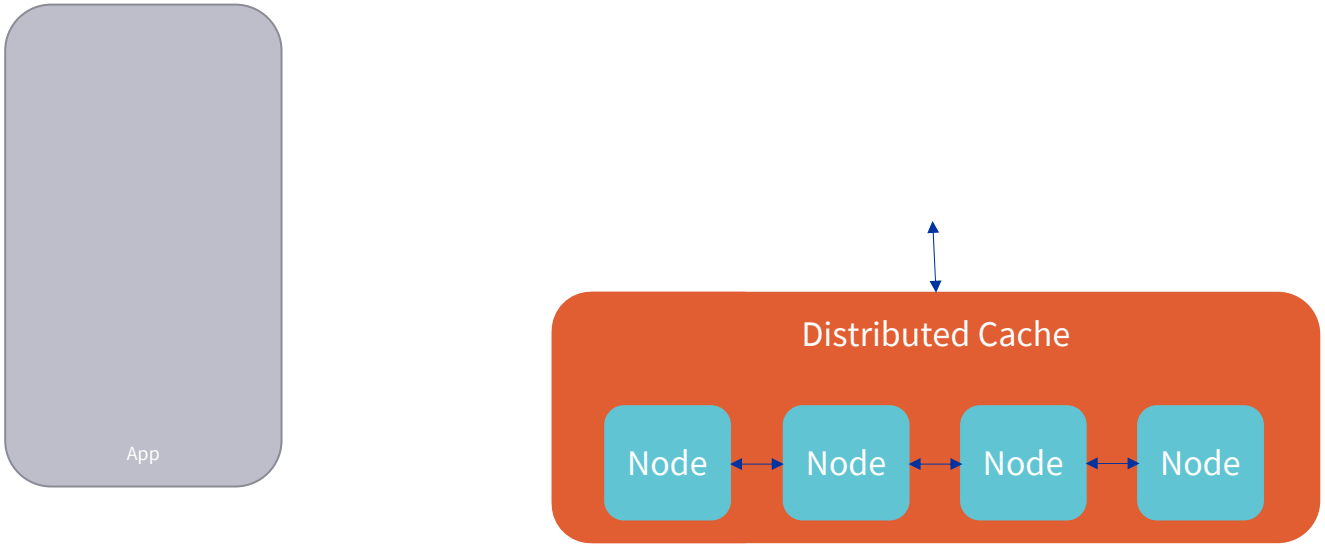

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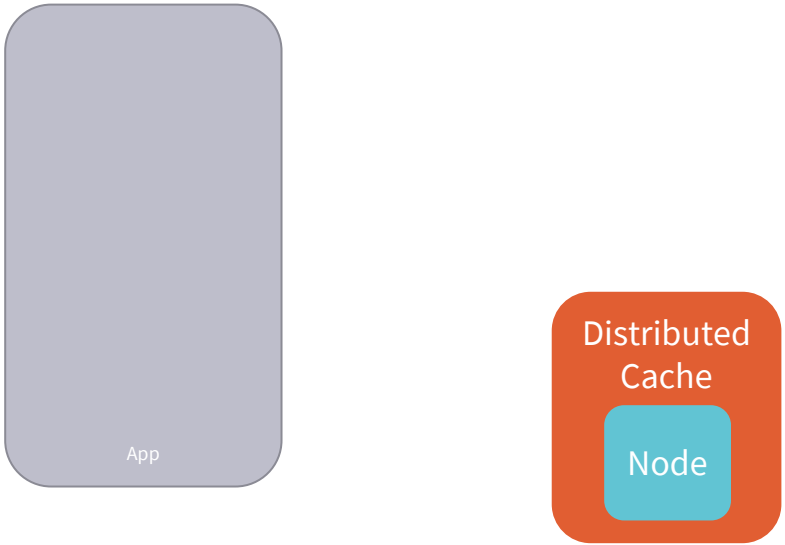

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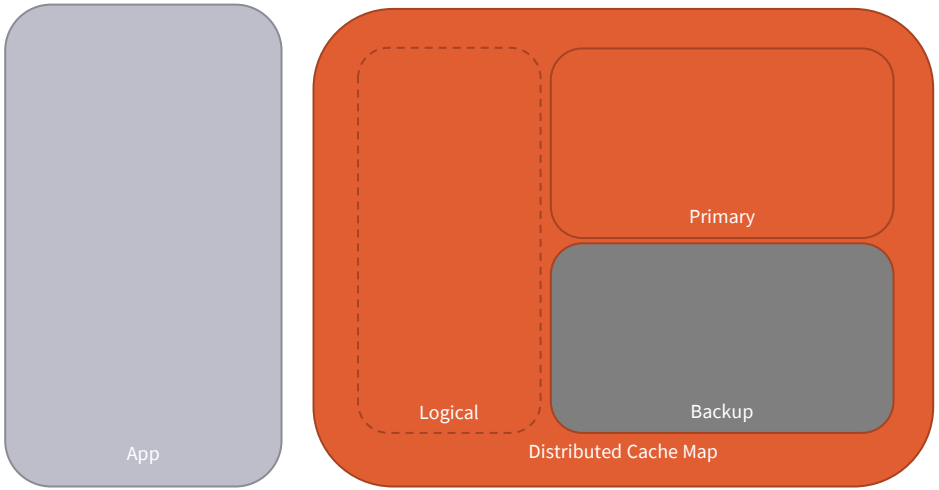

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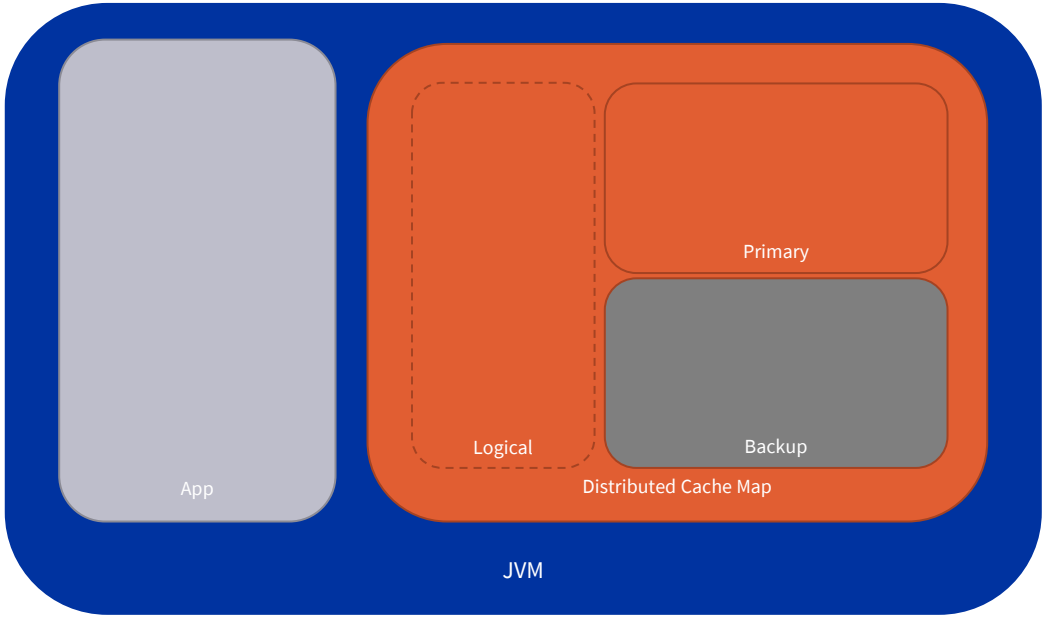

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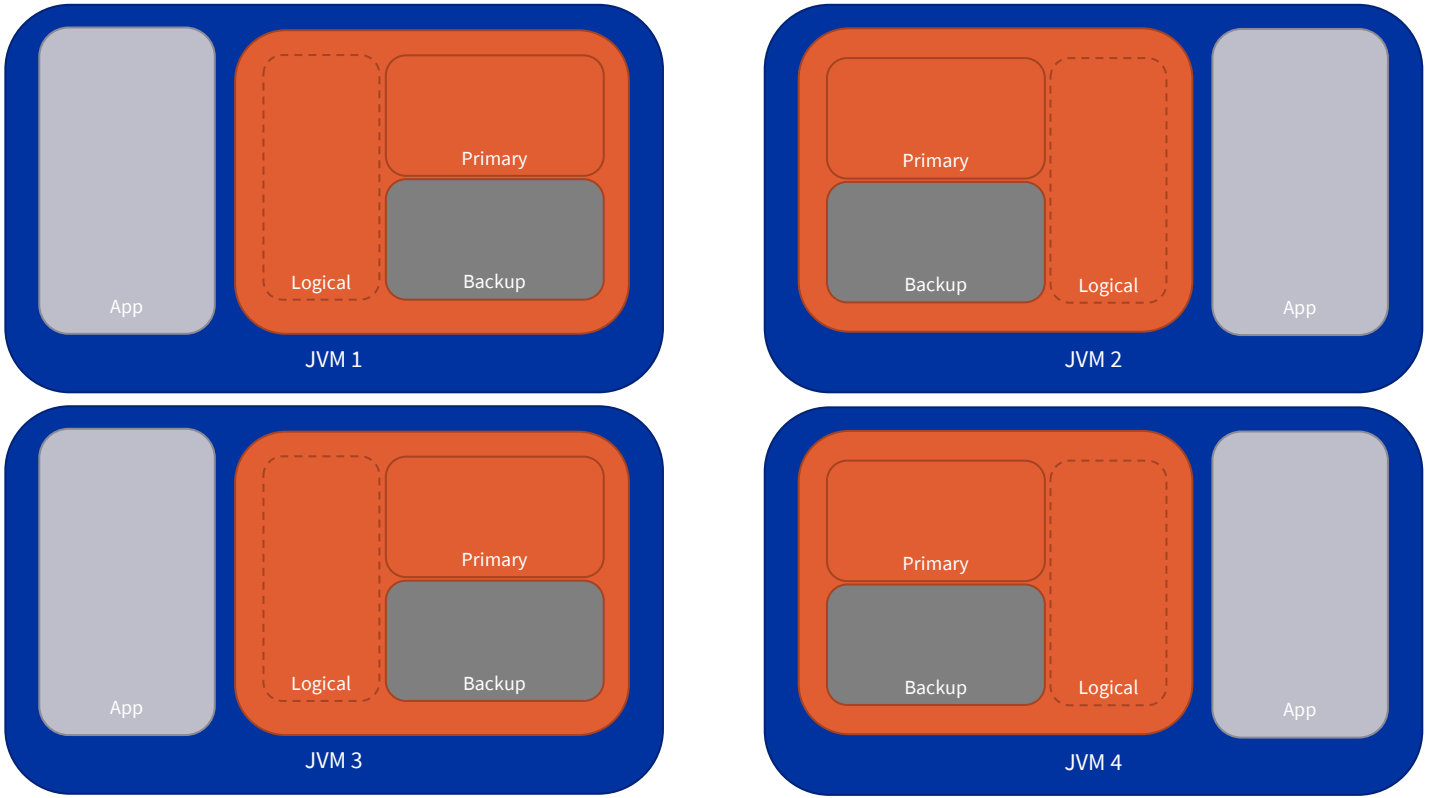
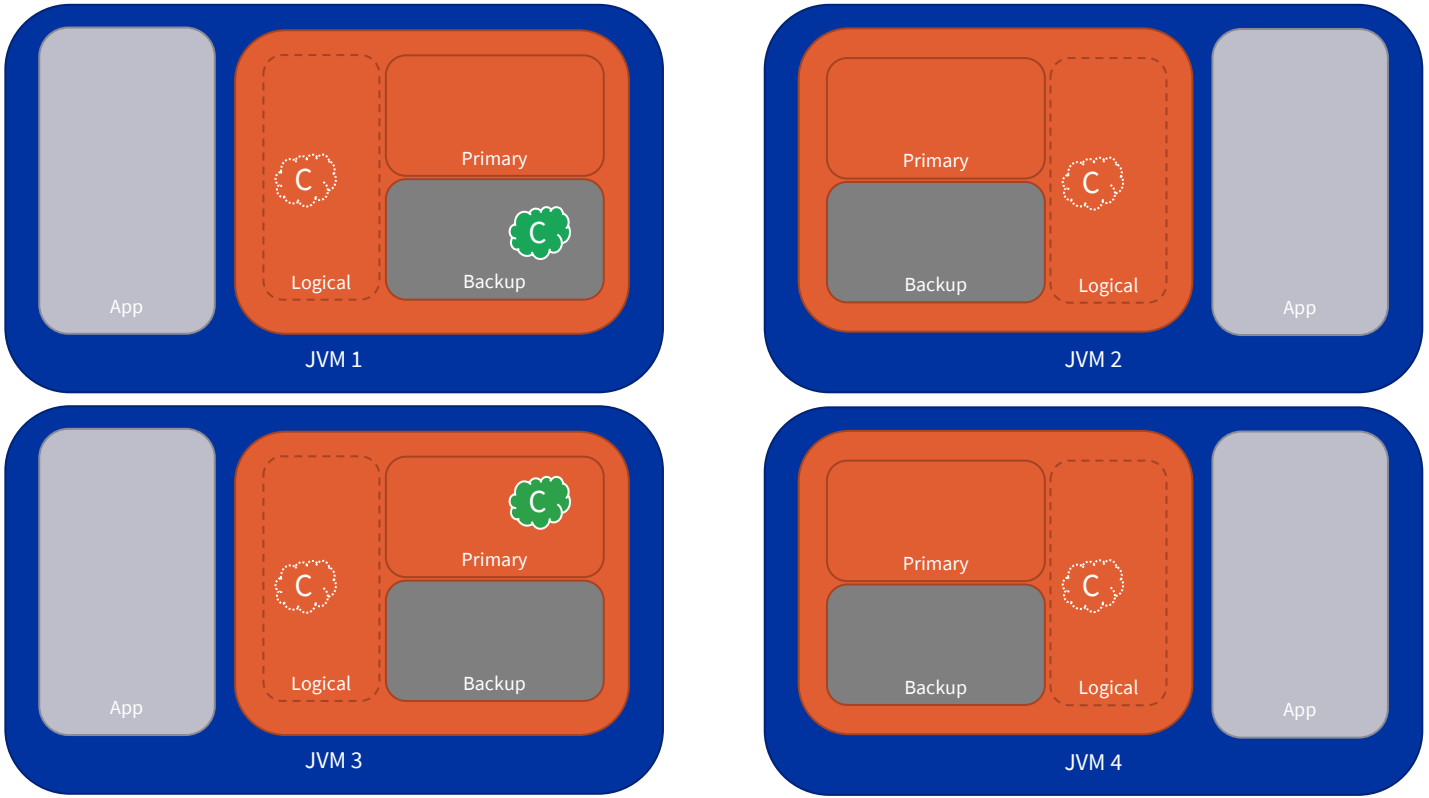


Add new data to a Distributed Cache



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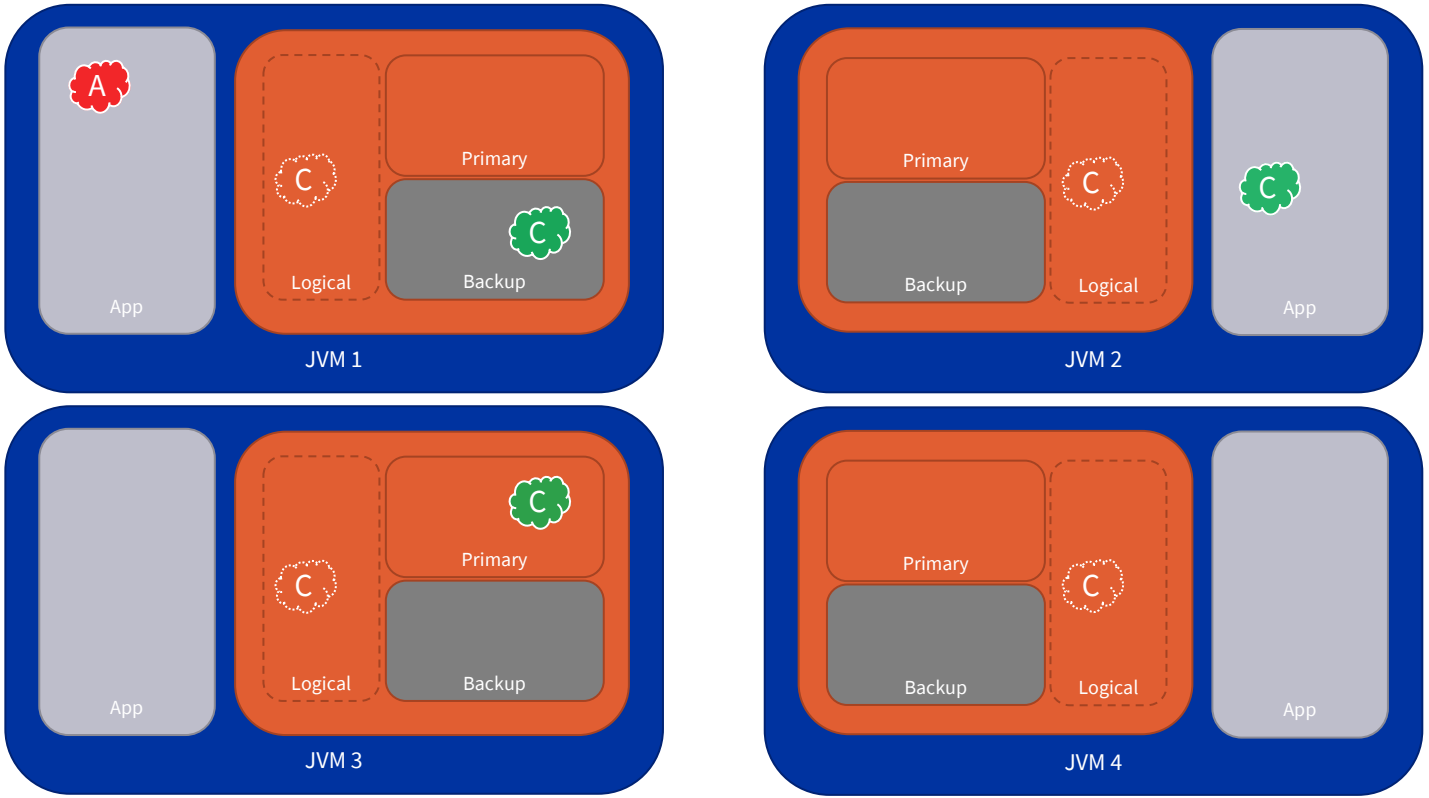

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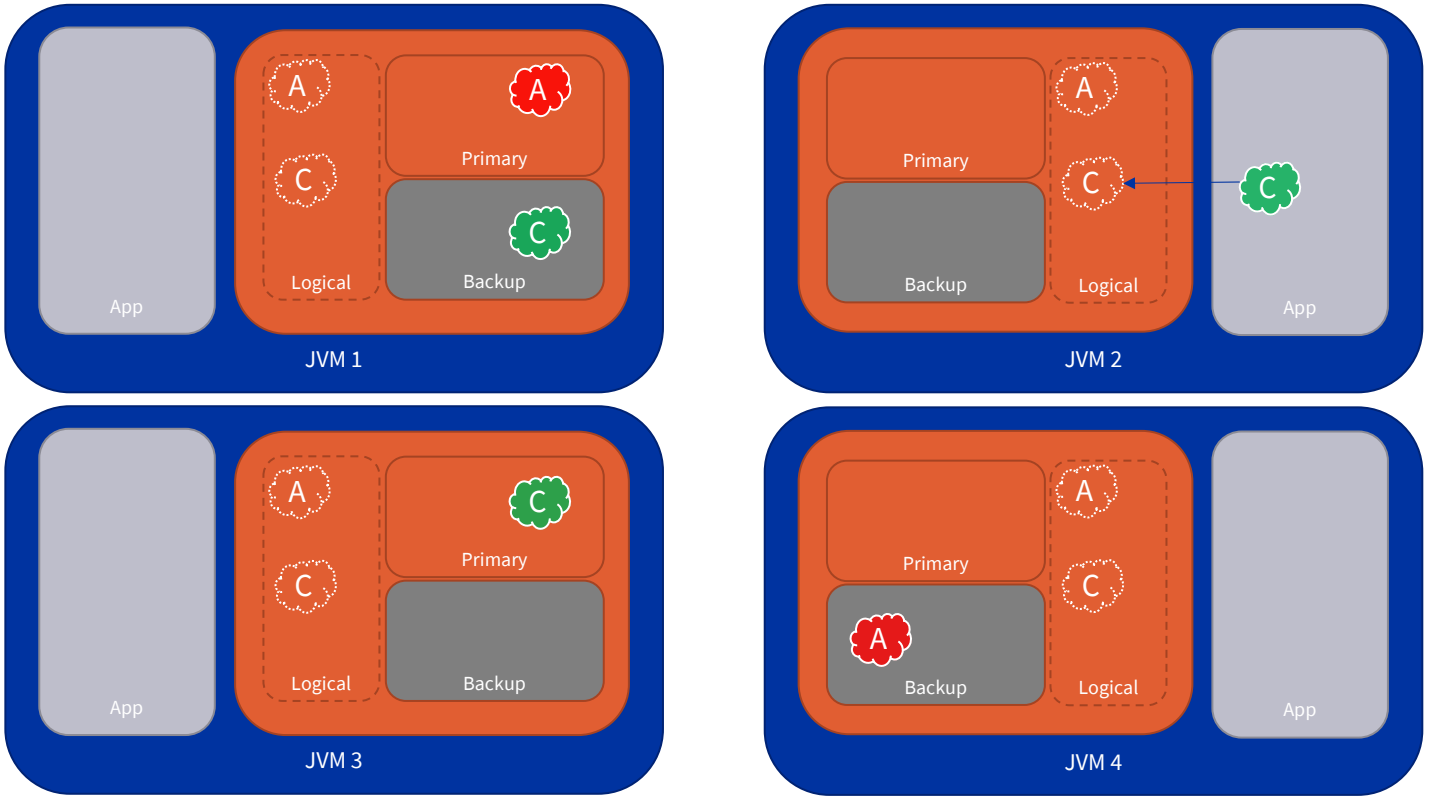

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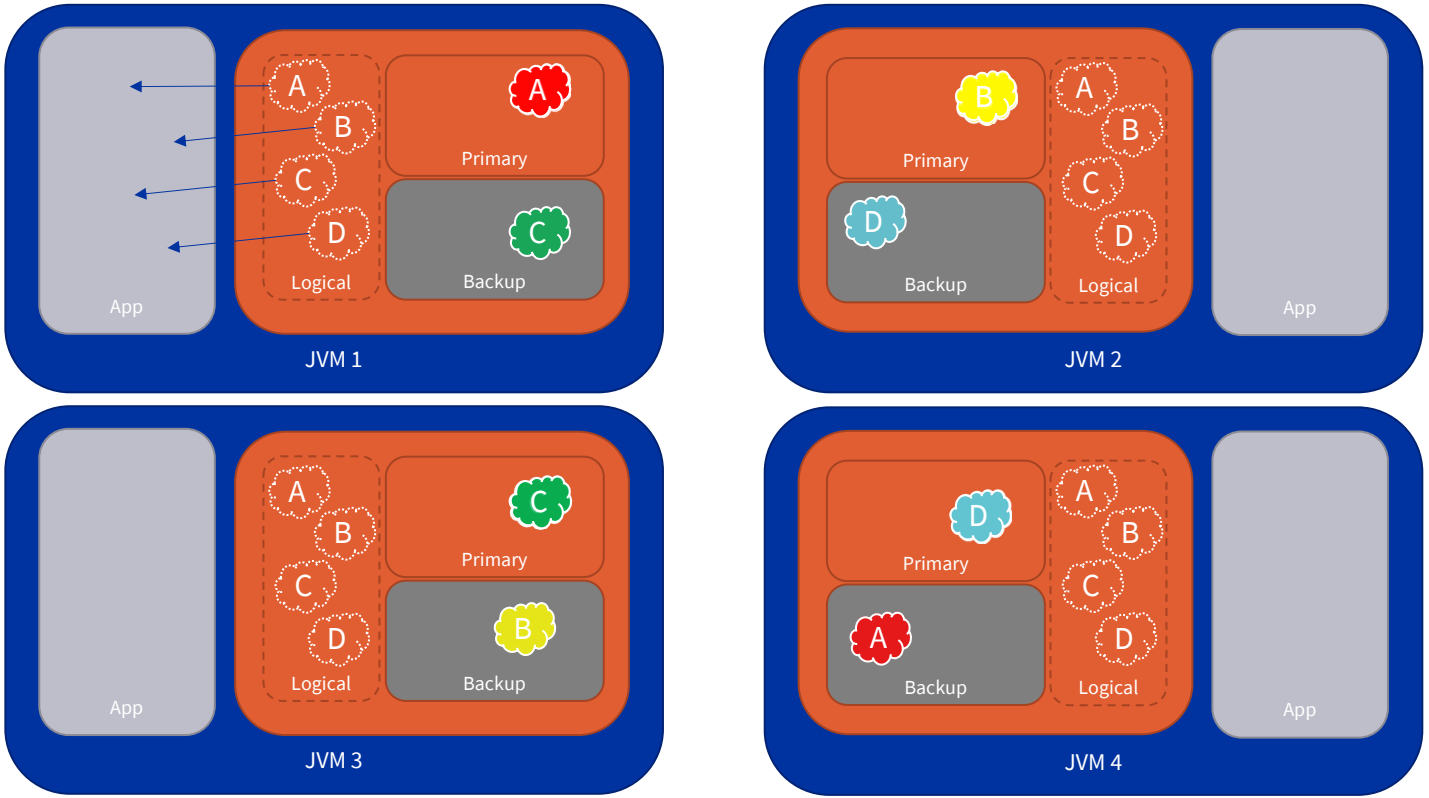
Retrieve data in a Distributed Cache



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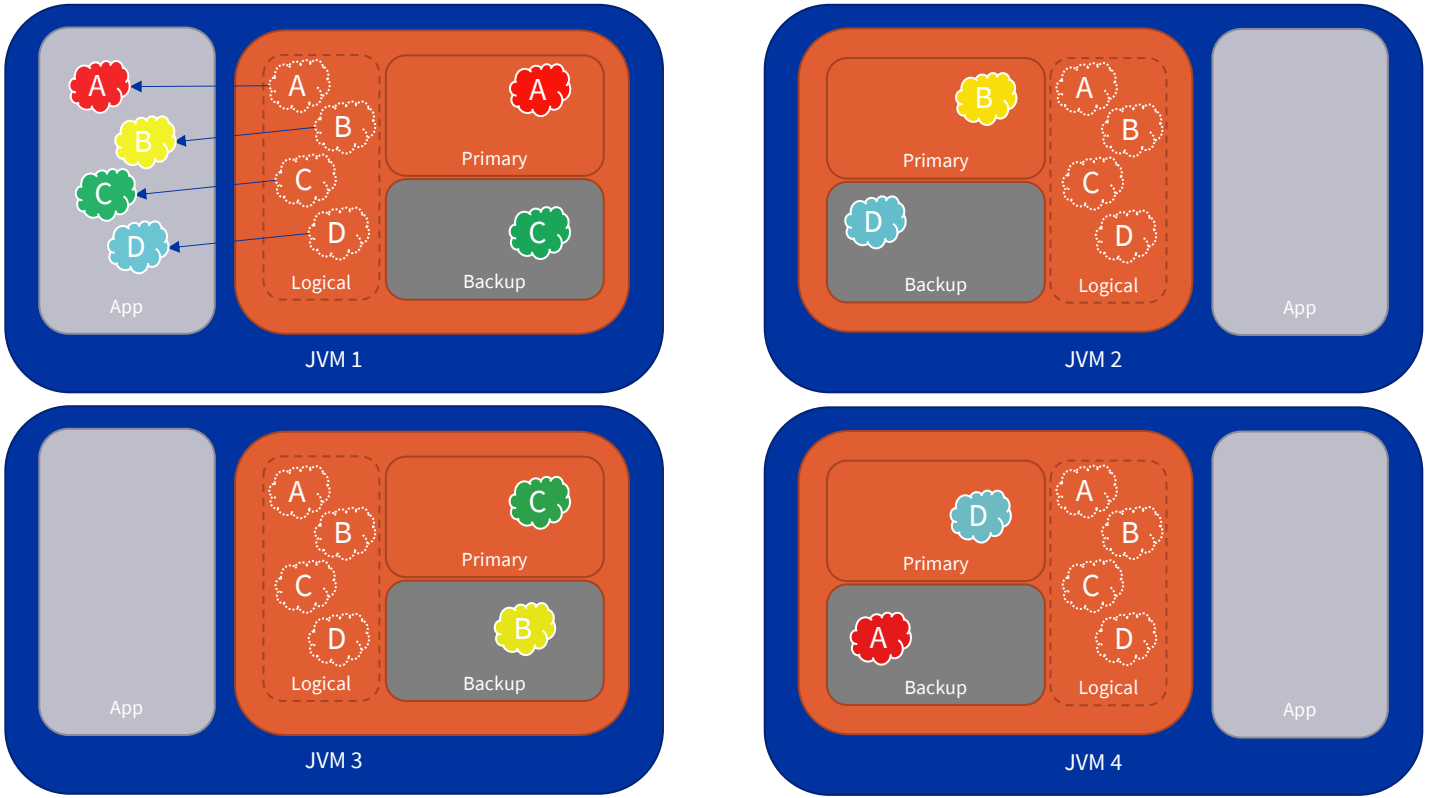

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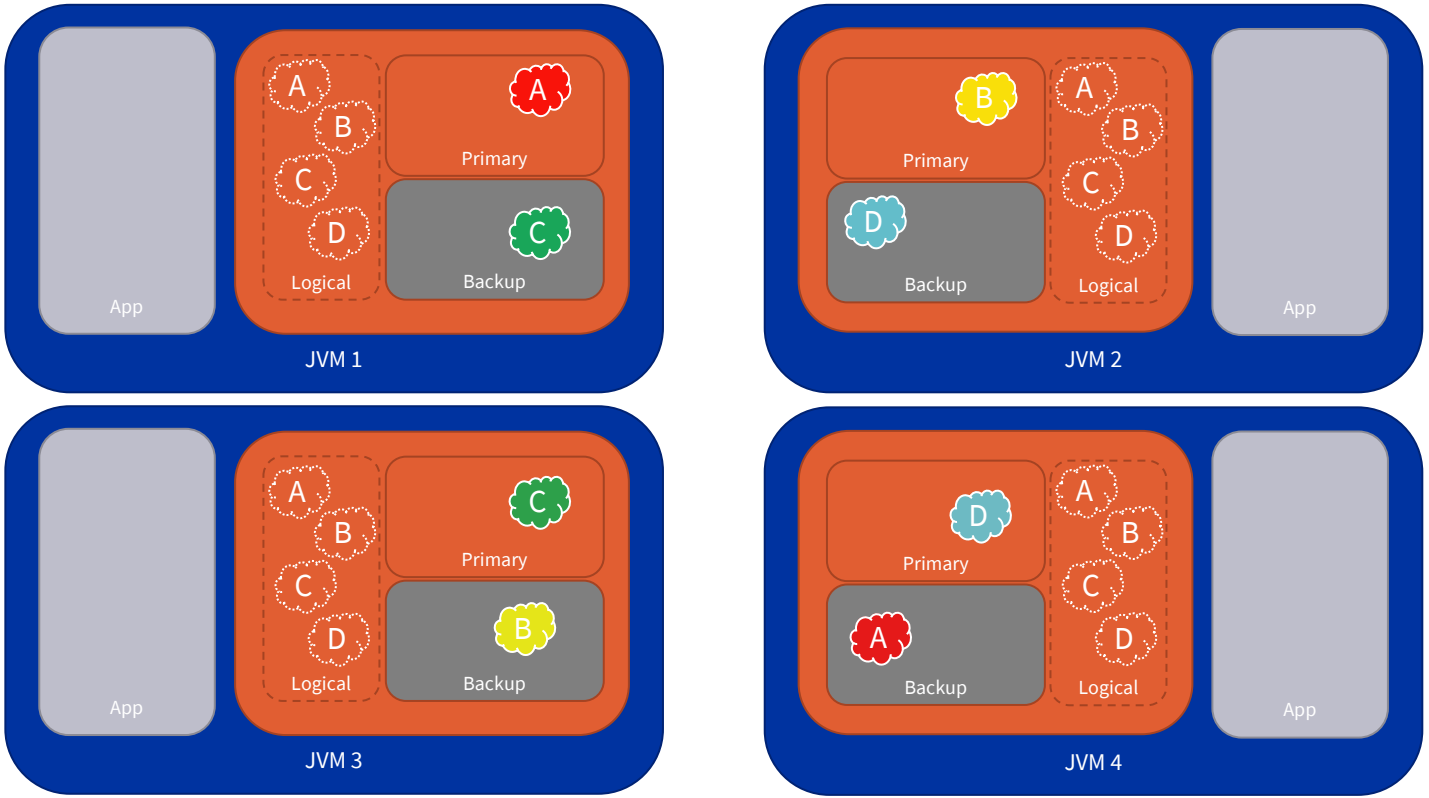
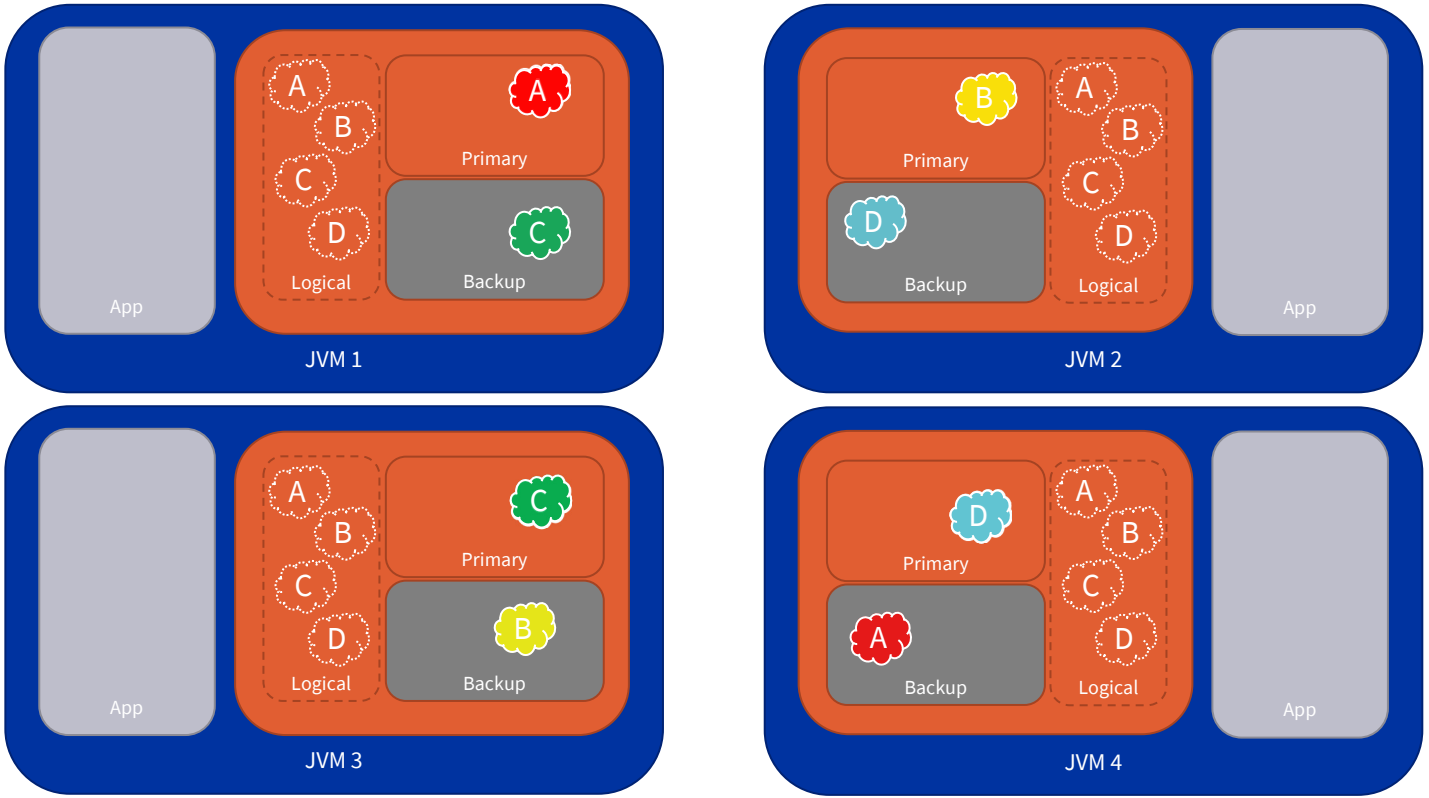


Distributed Cache on Failover



Distributed Cache on Failover

Distributed Cache on Failover

Traditional Cache vs Distributed Cache

Scalability

- A distributed caching architecture scales horizontally whereas a traditional caching architecture only supports vertical scaling

Redundancy

- In a single instance caching, there is no redundancy of data

Reliability

- Traditional caches use the same heap space as the application so it’s bound to the constraints of memory
- Distributed caches run as independent processes across multiple nodes in a cluster which makes it transparent to the program is if one node dies or is killed

Integration with Apache Ignite

Steps to integrate Apache Ignite in C2MON

- **Create simple serializable and stable POJOs**
  - Avoid breaking changes

```
public class Equipment implements Serializable{

  private String address;

  private Long processId;

  private final SupervisionEntity enitity = SupervisionEntity.EQUIPMENT;
```

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- **Use of Java Generics**
  - Restrict what types of objects can be persisted

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public class IgniteC2monCache<V extends Cacheable>
```

- **Use Spring to interact with Apache Ignite**
  - @Transactional annotations

```
@Transactional(propagation = Propagation.REQUIRED)
<T> T executeTransaction(Supplier<T> callable);
```

Orchestration of C2MON integrated with Apache Ignite

- **Rolling Updates**
- **Load Balancing**
- **Scalability**

Orchestration of C2MON integrated with Apache Ignite

- **Rolling Updates**
- **Load Balancing**
- **Scalability**

Thursday, October 21st

14:00-14:15 THBL03 **The State of Containerization in CERN Accelerator Controls**

Rémi Voirin (CERN, Geneva)

Summary

Summary

- C2MON is a critical piece of infrastructure which needs to run 24/7/365
- Scalability, consistency of data and rolling upgrades are crucial
- Distributed cache is a good solution to achieve those goals
- The integration of Apache Ignite with Spring makes it easier to setup and configure
- This paves the way to move to the cloud