

# Blueprint Proposal:

## CFN (Computing Force Network)

### Ubiquitous Computing Force Scheduling

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# What is CFN ( Computing Force Network ) ?

CFN, defined as computing force network, is a **new information infrastructure** that takes computing as the center, network as the foundation, and deeply integrates Network, Cloud, big Data, Artificial Intelligence, Security, Edge, Terminal and Block chain to **provide integrated services** .

Vision

Network is  
everywhere

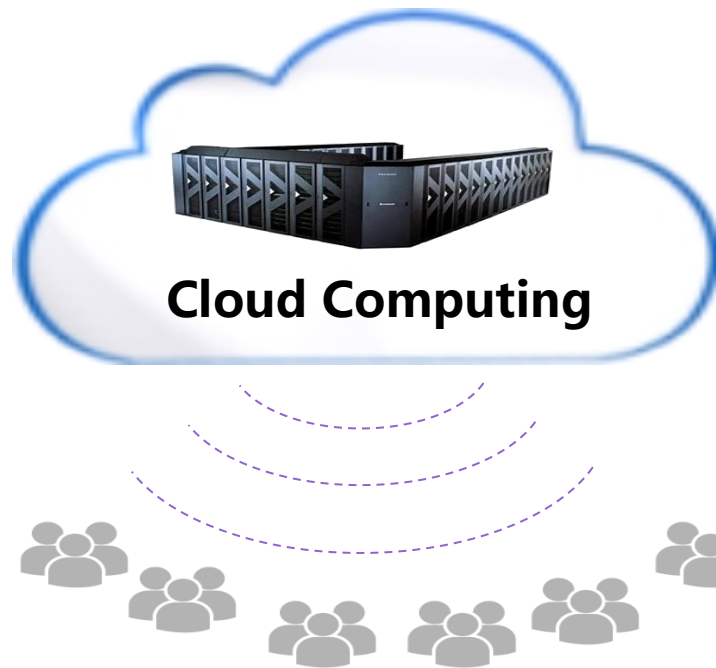
Computing is  
everywhere

Intelligence is  
everywhere

Social level service of "access from one point, instant get and use for everyone",  
just like water and electrics

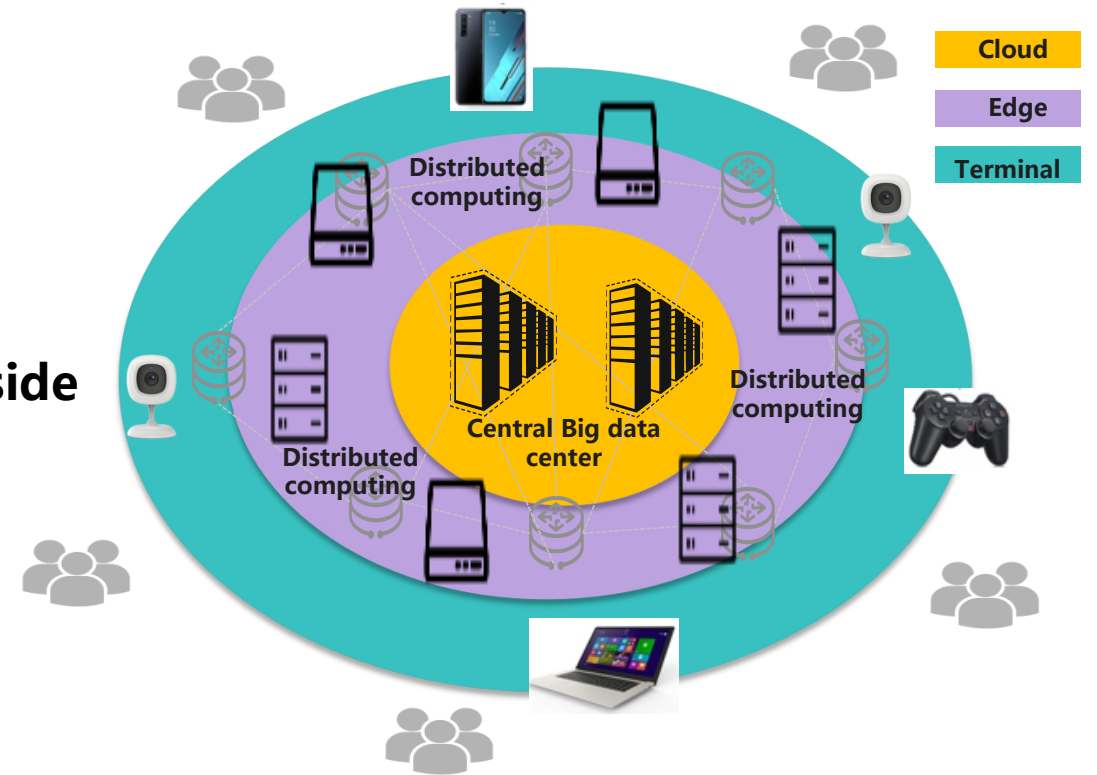
# Ubiquitous Computing Force in CFN

Logically, the computing force is more three-dimensional, including three levels: center, edge and terminal. Physically, resources span data centers in different regions. The kernel is heterogeneous, including general computing force ( x86/ARM ) and special computing force ( GPU/DPU... ).



Cloud Computing

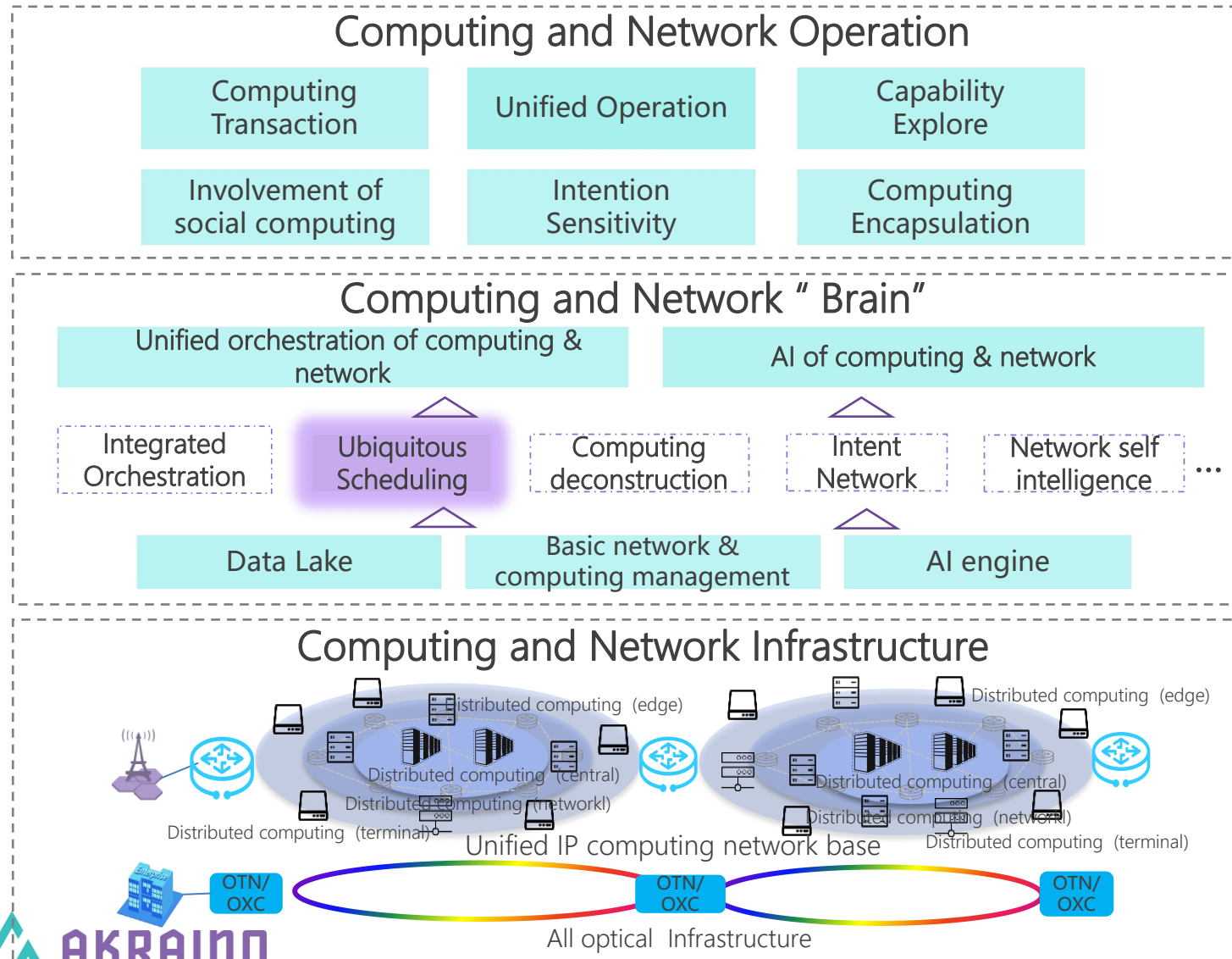
computing force extends to the user side



Cloud  
Edge  
Terminal

Ubiquitous Computing Force

# Core Architecture of CFN ( Computing Force Network )



## Operation Service Layer

- > Multi factor integrated supply
- > Integrated supply of social computing resources
- > Integrated supply of digital-intelligence services

## Orchestration and Management Layer

- > Unified orchestration
- > Ubiquitous scheduling: Cloud、 edge、 multi-cloud
- > Unified management and maintenance of computing and network

## Infrastructure Layer

- > Multi-level and ubiquitous distributed computing force system on the cloud, edge and terminal;
- > All-optical infrastructure and unified IP bearer technology



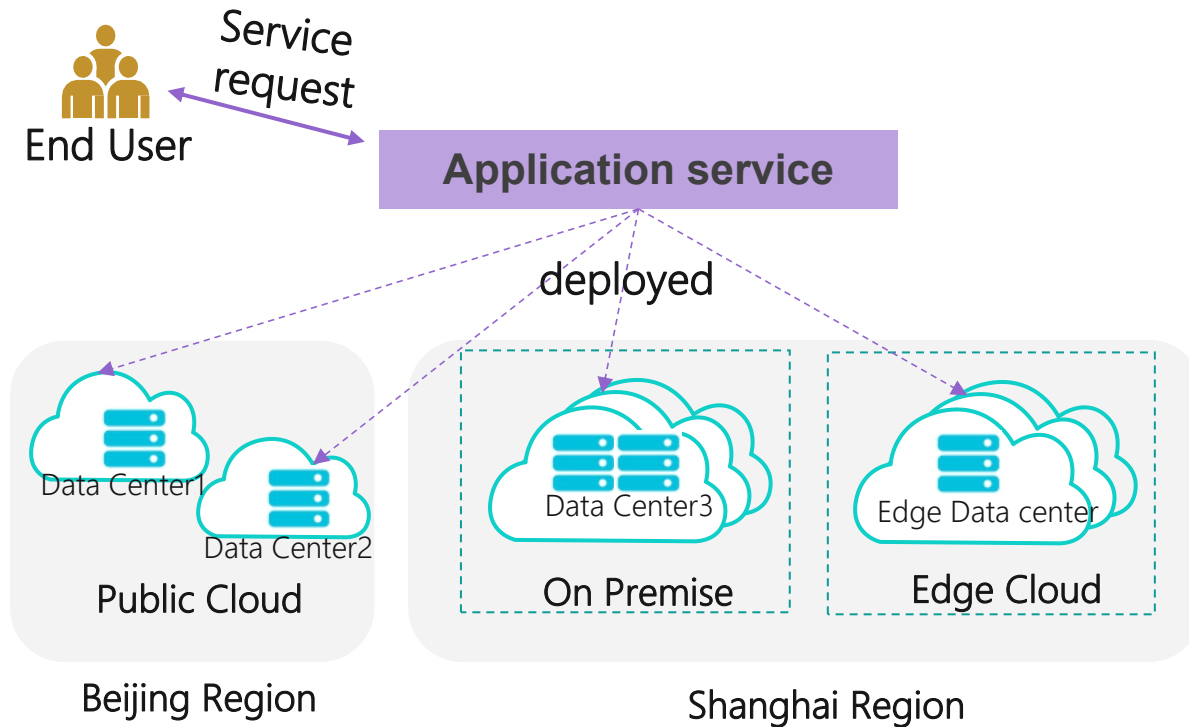
# Real world business deployment environment and challenges

## Real World Needs

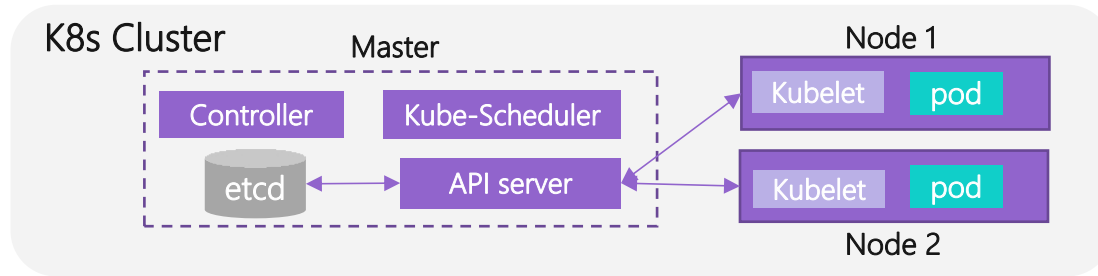
- > 92 percent of respondents reported having a **multi-cloud strategy\*** and has multi cloud vendors.
- > **Hybrid cloud** management including public cloud, on premise / private cloud and edge cloud.
- > **Multi-cluster deployment strategy** to achieve high availability.
- > **Disaster recovery scenario.** The application system is usually deployed in the geo-redundant mode.
- > ...

## Challenges

- > Differences between infrastructure of multi cloud vendors.
- > End user request scheduling based on multi-cloud & edge cooperation.
- > Log & Monitoring consistency.
- > ...

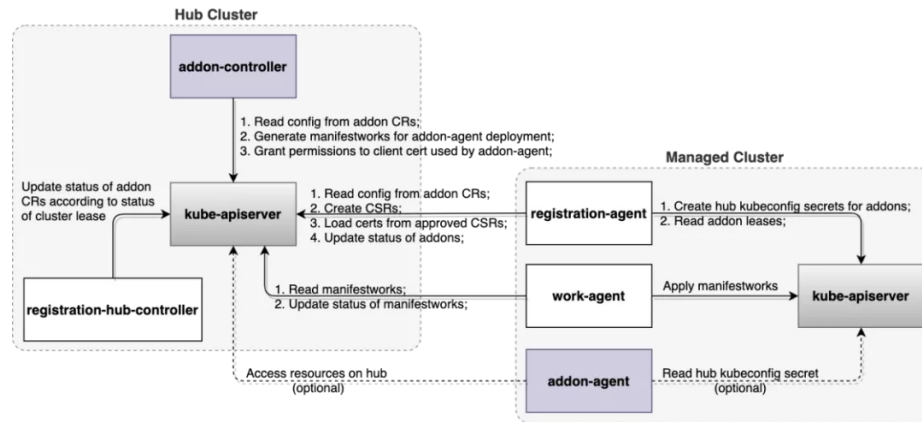


# Some Existing Solutions(1)



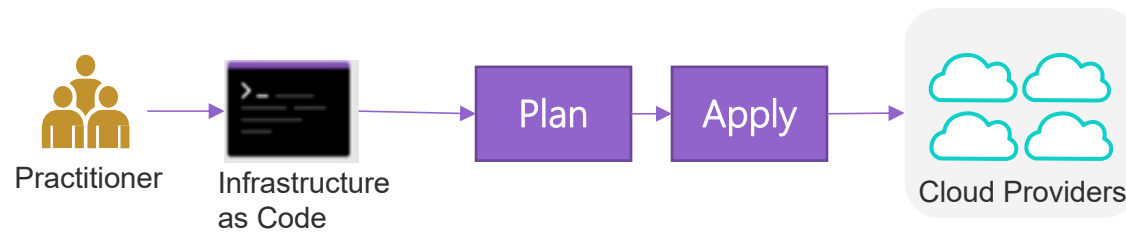
## Kubernetes: **focus on single cluster**

- > Scheduling resources in single cluster
- > The scheduling strategy is simple and does not consider network or service characteristics



## OCM: **focus on multi-cluster management**

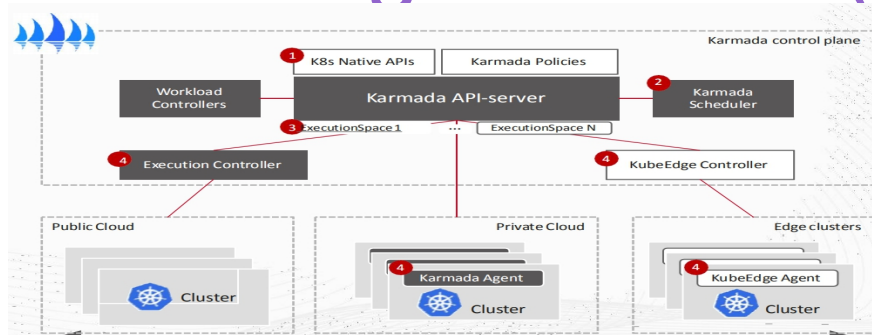
- > The scheduling strategy is oriented to one or more clusters ( the cluster is selected by labelSelector or ClusterClaims )
- > Do not care how to distribute the configuration and deploy the application



## Terraform: **the tool of Infrastructure as Code**

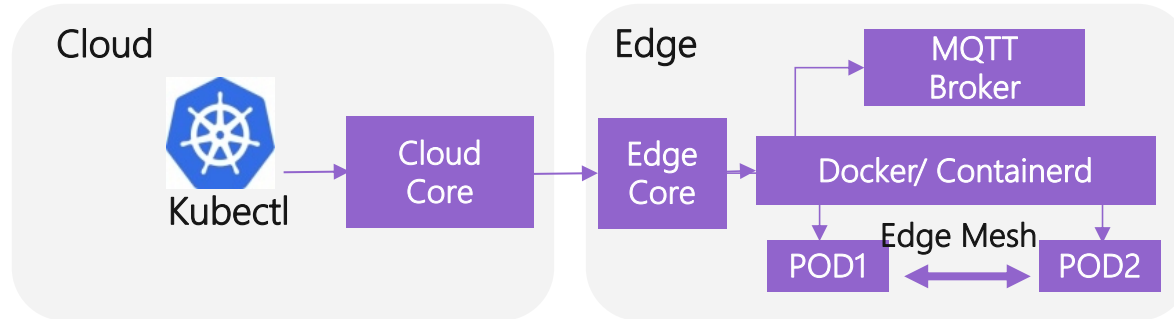
- > The automatic management of cloud resources to improve deployment efficiency
- > Unified templates and syntax, different cloud vendors can use different providers and define different resource templates.

# Some Existing Solutions(2)



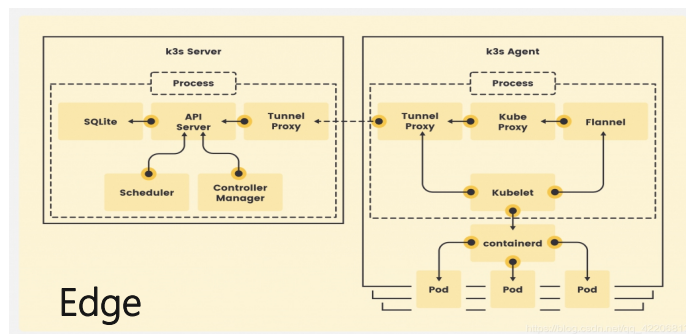
## Karmada: focus on multi-cluster management

- › Manage resource scheduling between clusters, multi-cluster scheduling strategy
- › Configurations and Applications can be deployed in multiple clusters



## KubeEdge: focus on cloud & edge collaboration

- › Support cloud & edge collaboration
- › Support communication between edge nodes (edge mesh)
- › Support edge node autonomy



## K3s: the lightweight K8s at edge

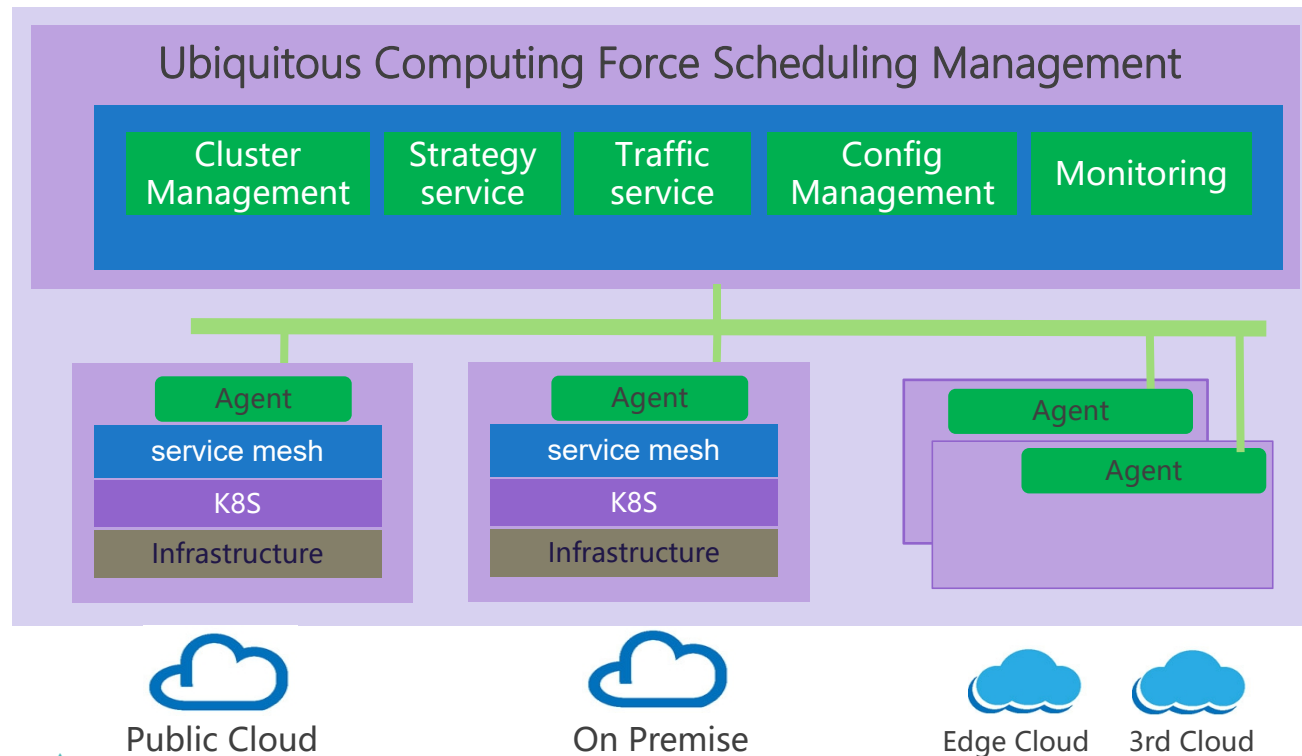
- › All components (Server and Agent) run on the edge
- › Do not concern cloud & edge collaboration
- › No multi-cluster management solution



Existing solutions are solved problems in some specific fields. The real world environment is usually complex, and individual products cannot fully meet the needs of customers.

# Next Step and What We Would Like to Do

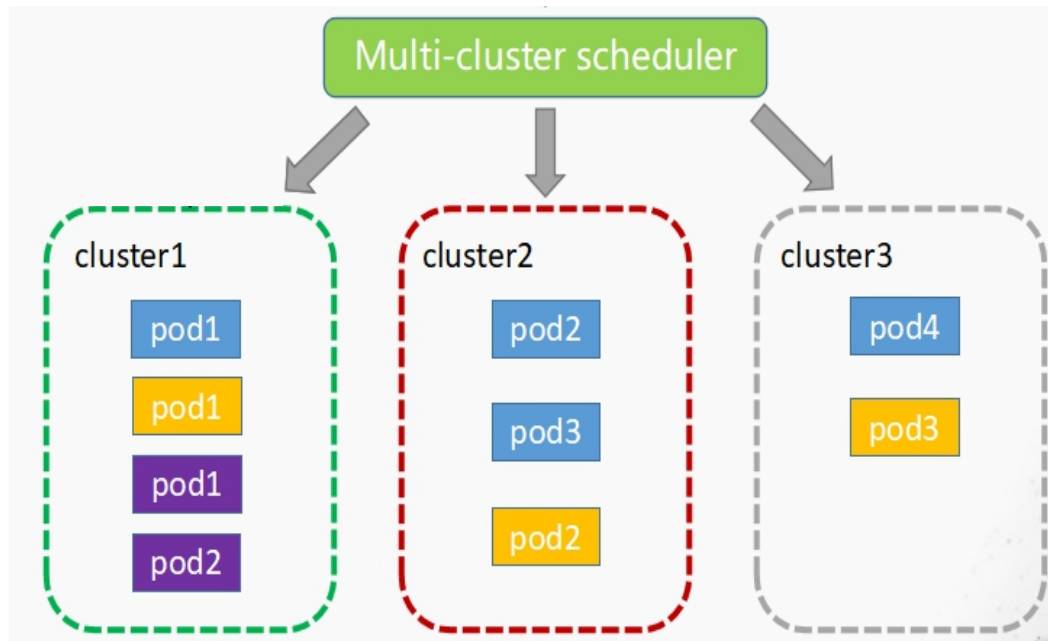
- According to the unified ubiquitous scheduling management layer, the computing force of public cloud, on premise, edge cloud or external third parties is managed to achieve **consistent cluster, strategy, configuration and traffic management**, and to achieve **resource-level and task-level scheduling**.
- The cloud-native technology stack is adopted to perform consistent configuration management and scheduling across environments by deploying agents.



- > **Unified life cycle management** of computing force; (including clusters of cloud, edge, terminal)
- > Multi-cloud / Hybrid Cloud / Edge / Terminal **global and ubiquitous scheduling**;
- > **Large scale** node and cluster management;
- > **Enrich scheduling strategy**;
- > **Global monitoring** of computing resource;
- > **Service mesh** in multi-cloud or cloud & edge environment;
- > ...

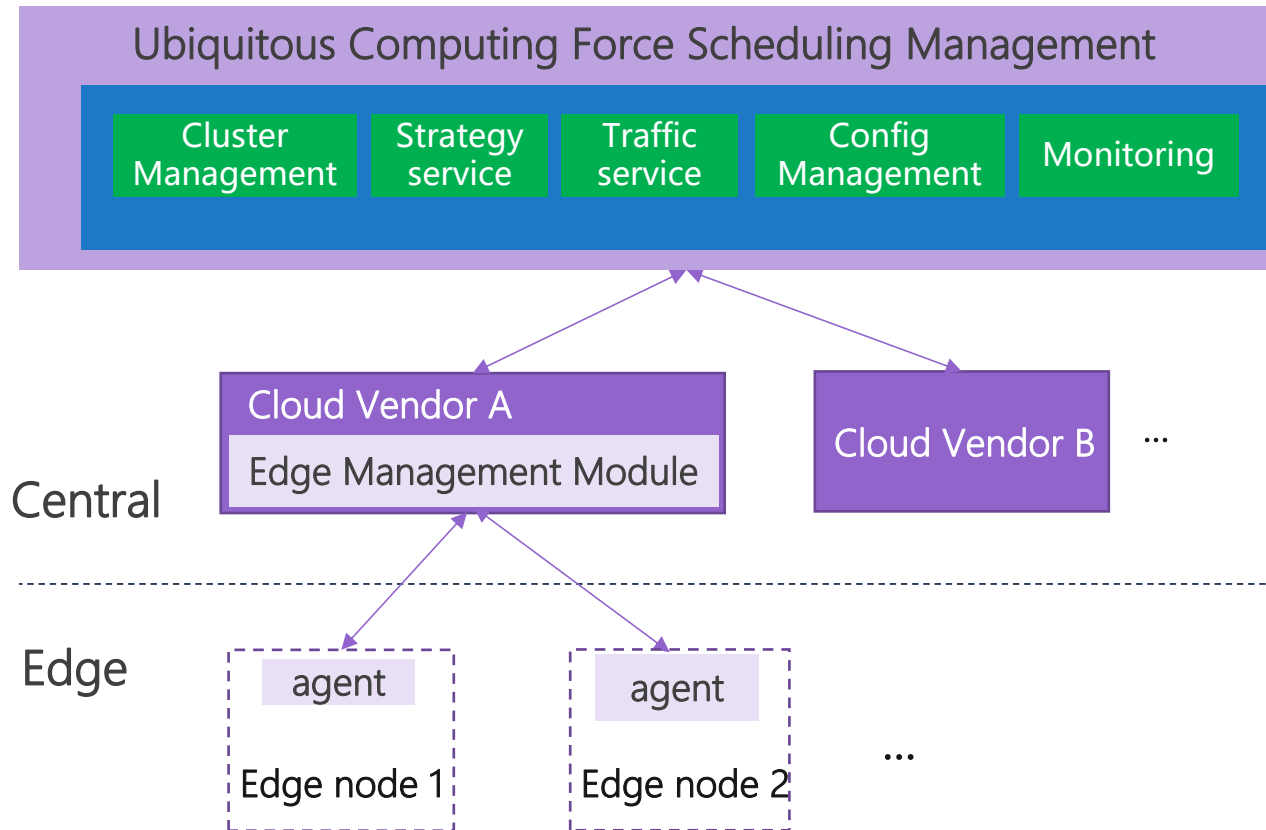


# BP Phase 1 : Multi-cluster management



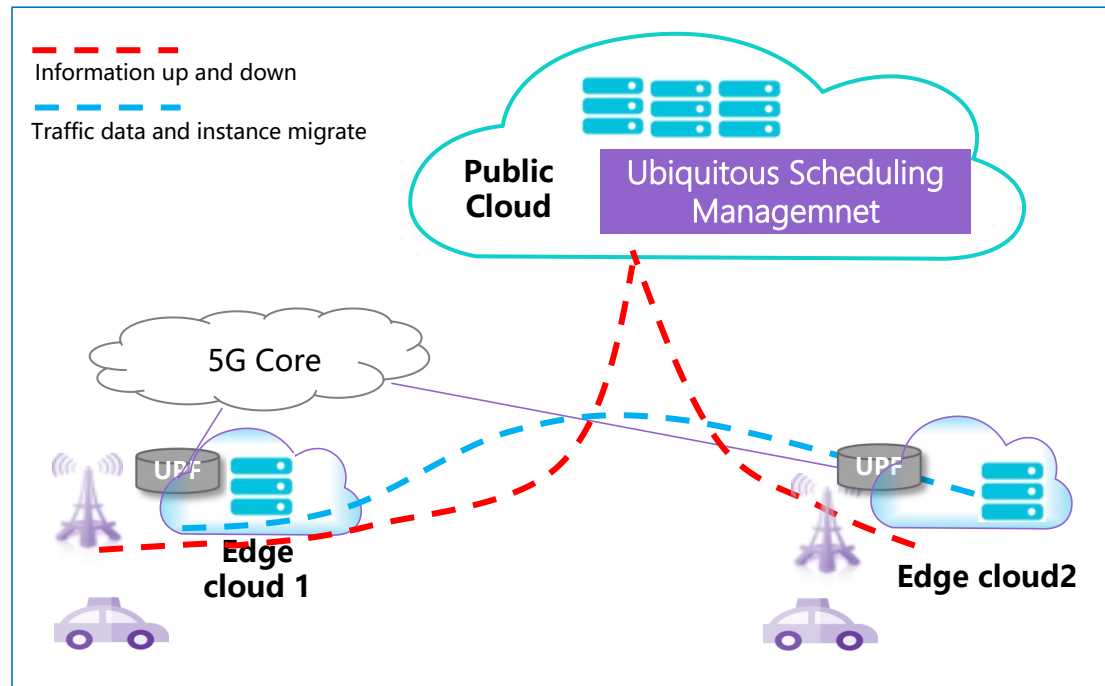
- > Set up, infrastructure environment preparation;
- > Access and manage multiple clusters;
- > Multi-cluster monitoring;
- > Multi-cluster lifecycle management;
- > Multi-cluster resource scheduling strategy;
- > ...

# BP Phase 2 : Expand to edge node and manage the edge cluster



- > Function and structure enhanced, the computing nodes are extended to the edge;
- > The management and monitoring of cloud and edge clusters;
- > Enrich scheduling strategy; ( latency, task type, etc. )
- > Multi-cluster resource scheduling mechanism based on cloud-edge collaboration, such as traffic governance and scheduling across nodes;
- > ...

# BP Phase 3 : Verify Multi-cluster Collaborative Scheduling



*The specific application may be re-selected according to the project progress.*

## Traffic Requirements

1. The collection results of many sensor devices on the road and the data collected by the vehicle dynamic sensor devices are uploaded to the edge nodes;
2. The edge node analyzes road conditions, accident information, vehicle information, and environmental information (location), and transmits it to the vehicle;
3. Predict vehicle action trajectories in advance, and migrate traffic vehicle context data to adjacent edge nodes in advance;

- > Coordinated scheduling of edge cloud nodes:  
Coordinated and interoperable scheduling of multiple edge cloud nodes.
- > Continuity service: Scheduling switching of services that provide computing power and network assurance.

# Summary

- › With 5G / B5G, more and more users will be using edge computing tech and multi-clusters (usually are multi-cloud vendors ). How to efficiently and conveniently manage multi-clusters including public cloud, edge cloud or private cloud is an invaluable issue to be discussed, especially in open source community.
- › Bringing opensource solutions in the real world and enhance them, however, is often challenging, not just for the developers, but for the real-world end-users who need to stitch multiple open source and solutions together.

Thank you!

