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Architecture of Computing Power Optical Network
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Abstract

This document describes the architecture of computing power optical network.

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Table of Contents

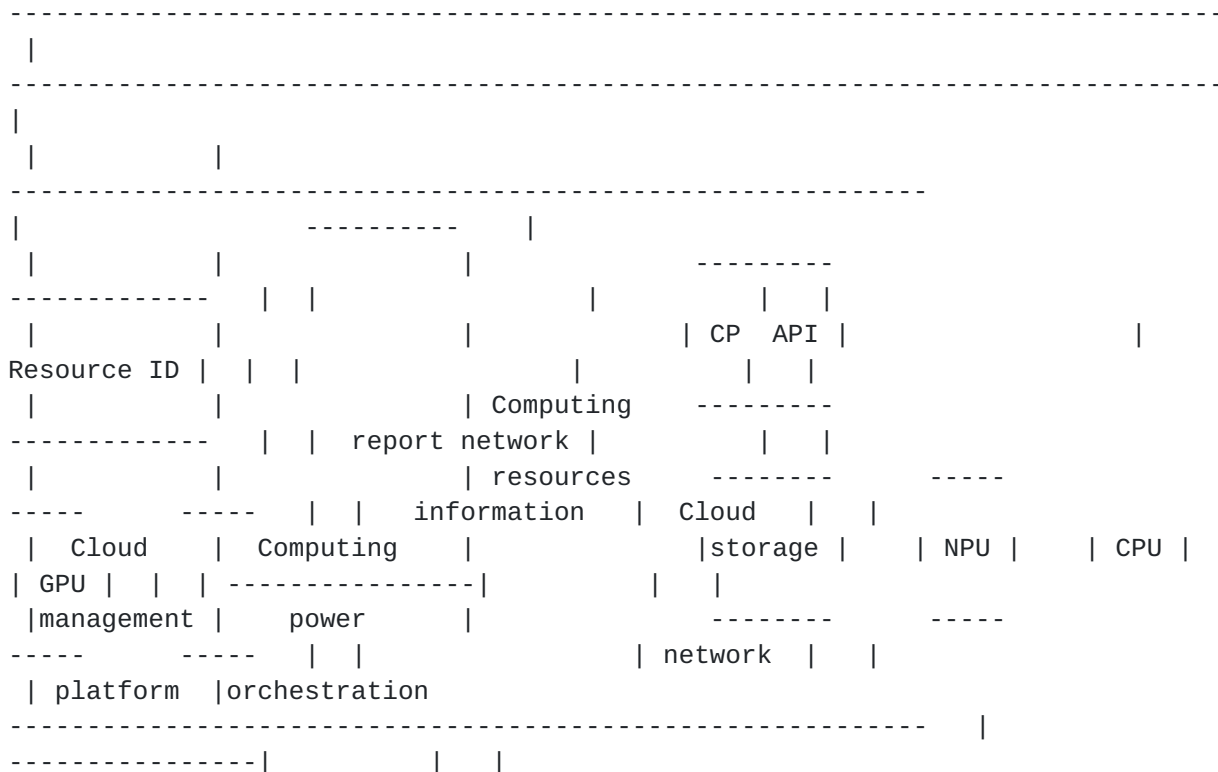
1.	Introduction	2
1.1.	Requirements Language	3
2.	Scenarios	3
2.1.	Network Resource Acquisition	3
3.	The architecture of Computing Power Optical Network	4
3.1.	Cloud management platform	4
3.2.	Edge management platform	4
4.	Manageability Considerations	4
5.	Security Considerations	4
6.	IANA Considerations	4
7.	References	5
7.1.	Normative References	5
7.2.	Informative References	5
	Acknowledgments	5
	Authors' Addresses	5

[1.](#) Introduction

With the rapid popularization and application of cloud computing, artificial intelligence and other technologies, the total amount of data has increased explosively, and the demand for data storage, computing and transmission has increased significantly. This puts forward higher requirements for flexible network scheduling and quality of service. More importantly, the upgrading of industrial intelligence will bring about the diversity of devices, such as the application of Internet of things (IOT) sensors, cameras and other devices will produce diverse data. The processing of these heterogeneous data needs ubiquitous computing power to support.

The computing power network is the link that efficiently connects ubiquitous computing power resources and massive user data. With the advantages of ultra-large capacity, ultra-long distance, low latency, and flexible scheduling, optical networks provide a wide coverage, flexible and efficient super-capacity guarantee for computing resources.

The architecture of Computing Power Optical Network supports network-aware applications, networks, computing power and user needs, coordinates the scheduling of computing power resources and network resources, and provides the best user experience. This architecture combines the computing power network with the optical network to realize the collaborative linkage between edge computing and cloud computing.



```

|               |      layer
-----|----- Distribute
management|   |
|         |           |
-----|| computing |         | |
|         |           |Computing |CP service notification| |CP state
perception| || power  |         | |
|         |           | power  -----
-----|| scheduling |         | |
|         |           |scheduling -----
-----|| information |         | |
|         |           |CP routing generation| |CP rerouting
monitoring|||         |         |
|         |           |-----
-----||          -/--/----- |
|         |
-----
|              /  /          |
|
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|

```

Delivering network / / Reporting edge

orchestration / / network

informarion / / information

[illegible]

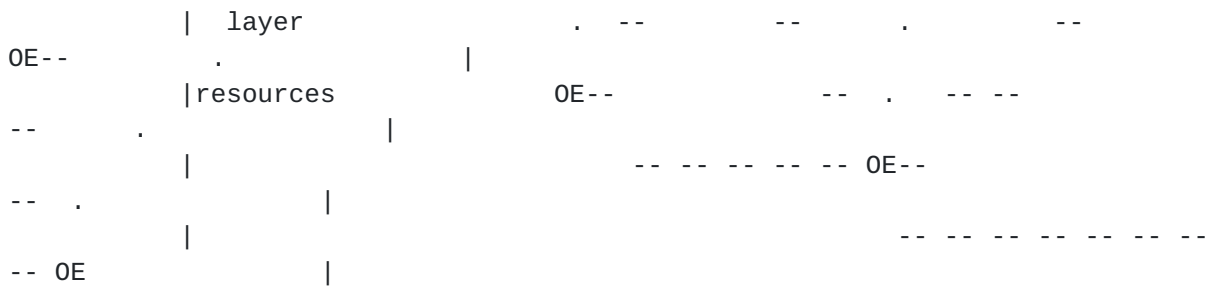


Fig.1 The architecture of computing power optical network.

3.1. Cloud management platform

In order to realize the perception of ubiquitous computing and services, cloud management platform includes computing power scheduling and network management. Computing power scheduling can be divided into computing power resources and computing power scheduling. Computing resources are the use of existing computing infrastructure to provide computing resources. The computing infrastructure is mainly composed of edge computing nodes and network devices, which are controlled by the computing network control layer through the north interface, and provide computing, storage and network facility resources for the serverless edge computing network reference architecture. The computing infrastructure includes a combination of various computing capabilities such as single core central processing unit (CPU), graphics processor (GPU), network processor (NPU). In order to meet the diverse computing needs of the edge computing field, this layer can provide functions such as algorithm library, computing application programming interface (API), computing network resource identification, etc.

The computing power scheduling layer is the core of the computing power aware network, which consists of computing power service notification, computing power state awareness, computing power route generation and computing power route monitoring. Based on the abstracted computing network resources, and considering the network status and computing resource status comprehensively, the computing power routes that can flexibly schedule services to different computing resource nodes on demand are generated, and the real-time monitoring of computing routes is carried out. Computing power nodes, including terminals, edges and cloud data centers, need to collect and distribute information about their computing power resource status, such as CPU processing capacity, queue status, cache status, computing power node address, etc. through the control surface network mechanism, that is, create a global computing power routing table at

the forwarding node of the whole network computing power network, in case of application requests for optimal routing scheduling in the whole network computing resource pool. The cloud network management layer reports the current information of the network to the computing force arrangement layer and accepts the computing force arrangement information issued by the computing force arrangement layer.

3.2. Edge management platform

Edge management platform includes edge computing force arrangement and edge network management. Edge computing scheduling can be divided into computing resources and computing routing forwarding. Computing resources include computing application programming interface (API), central processing

unit (CPU), graphics processor (GPU), network processor (NPU), and storage composition. They are controlled by the computing network control layer through

the north interface, providing computing, storage and other resources for the

server free edge computing network reference architecture.

The computing power route forwarding layer is composed of computing power route

identification, computing power route addressing, computing power route notification .

Through the distributed edge computing nodes, through the automatic deployment of

services, optimal routing and cross layer optimization, the edge computing power aware

network is built, which can truly call different computing resources on demand and in real

time, improve the utilization efficiency of computing resources, and finally realize the

optimization of user experience Optimization of computing resource utilization and

network efficiency.

The management layer of the edge network reports the network information and the

arrangement information of the edge computing power to the arrangement layer of

the edge computing power, and accepts the final strategy of the arrangement of

the distributed computing power to be implemented. And the edge network management

layer reports the edge network status information to the cloud network management

layer, and accepts the distributed network resource arrangement information.

When the edge management platform receives an application request from a user,

it will forward the request to the cloud management platform after verifying the user.

The cloud network management layer reports the network information to the

computing

power scheduling layer, which receives the network information, informs the computing

power service and perceives the computing power status through the computing power

scheduling layer, so as to generate the computing power route and monitor the route

in real time. The cloud management platform sends the generated computing power

arrangement information to cloud network management. Cloud network management will

distribute the received computing power arrangement information to edge network management.

Edge network management reports network information and computing power scheduling

information. Edge computing power scheduling performs computing power routing forwarding

operations, and issues the final computing power scheduling strategy through computing

power routing addressing, computing power routing notification.

Computational applications carry all kinds of services and applications in ubiquitous computing, and

transfer the user's requests for service SLA (including computing requests) parameters to the computing routing layer.

Computing management layer: complete the arrangement of computing services, as well as the management

of computing resources and network resources. The specific work includes the perception of computing resources

and OAM management, etc., to realize the computing network operation of end users and the management of computing

routing layer and network resource layer.

Computing power routing is based on the abstract computing network resources, and comprehensively considers the network

status and computing resource status, so that services can be flexibly scheduled to different computing resource nodes on demand.

Computing resources refer to the use of existing computing infrastructure to provide computing resources. It mainly includes the

combination of a single core central processing unit (CPU), multi-core CPUs, CPU+graphics processor (GPU) and other computing capabilities,

and provides computing models, computing application programming interfaces (APIs), computing network resource identification and other functions.

Network resources use the existing network infrastructure to provide ubiquitous network connections for all corners of the network, including access

networks, metropolitan area networks and backbone networks.

4. Manageability Considerations

TBD

5. Security Considerations

TBD

6. IANA Considerations

This document requires no IANA actions.

7. References

Sun, et al.

Expires 6 September 2022

[Page 4]

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

Acknowledgments

TBD

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