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Authors: Z. Du
China Mobile

Coordination of Networks in Computing Centric Network

Abstract

This document describes a coordinatable mechanism for the networks that each contains a service node in the Computing Centric Network (CCN). The CCN stands for an overlay network or called a network federation that focuses on the computing service providing. In CCN, many service nodes in different networks can join in or leave the federation dynamically.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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1. Introduction

In the future, AI applications would become more popular, and service scheduling would become generalized, even providing a common invoking function interface. At the same time, computing resource would be more ubiquitous, and clients can get access to a nearby computing node to obtain a faster service response speed. In this situation, the coordination of networks is needed, so that computing nodes in different networks can flexibly communicate to each other and complete the client's computing service.

In this document, we introduce a preliminary mechanism to coordinate different networks in the Computing Centric Network (CCN).

2. Problem Statement

The CCN in this document means an overlay network or called a federation that focuses on the computing service providing. In CCN, many service nodes in different networks can join in or leave the federation dynamically. Currently, we suggest a distributed way to manage the federation, and thus the coordination of the different service nodes is a key issue in CCN.

From the aspect of the client, it does not care where the service is, and the main concern is that the service could be completed in time. In CCN, we assume that the service can be provided either in the clouds or in the MECs.

As an example, the federation can own a common anycast address. The associated anycast address will allow clients to access a nearby network service node, however it may not be optimal. For example, in the scenarios of CAN [I-D.liu-can-ps-usecases], the nearest node may be busy and can not complete the job quickly because the computing ability in an MEC is limited. In this document, we suggest that it can send this request to other service nodes if it is busy, in order to do the service steering or load balancing.

In this situation, the request packet of the client appears like a DNS query, and the network federation will return a proper service node to the client.

3. A Preliminary Distributed Mechanism for CCN

In this distributed system, each network service node needs to know the statuses of the surrounding service nodes, such as whether they can accept more client sessions for a specific service, so as to make a better offload. In this way, each node maintains part of the information of the whole federation, but they can provide a resolution mechanism and return a computing node address for the client. A general procedure is described as follows.

Firstly, each computing node needs to know the information of some of the surrounding nodes.

Secondly, after receiving the client's request, the computing node will decide whether to provide the service by itself or offload to other nodes according to its own status and the computing information of nearby service nodes. The looking up of the proper service node could be recursive.

Finally, a feedback is given to the client.

As a conclusion, a computing node needs to store and update the computing statuses of neighboring computing nodes that are currently available for the service. If necessary, it can select a proper neighbor node for offloading according to a certain policy.

4. IANA Considerations

TBD.

5. Security Considerations

TBD.

6. Acknowledgements

TBD.

7. References

7.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

7.2. Informative References

[I-D.liu-can-ps-usecases] Liu, P., Eardley, P., Trossen, D., Boucadair, M., Contreras, L. M., Li, C., and Y. Li, "Computing-Aware Networking (CAN) Problem Statement and Use Cases", Work in Progress, Internet-Draft, draft-liu-can-ps-usecases-00, 23 October 2022, <https://www.ietf.org/archive/id/draft-liu-can-ps-usecases-00.txt>.

Author's Address

Zongpeng Du
China Mobile
No.32 XuanWuMen West Street
Beijing
100053
China

Email: duzongpeng@foxmail.com