ISSN 2616-7433 Vol. 1, Issue 10: 135-140, DOI: 10.25236/FSST.2019.011017

Mobile Edge Computing Technology and Local Shunt Design

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ABSTRACT. *With the continuous innovation of new technologies in social development, mobile edge computing is a new technology widely used in the field of mobile communications. This paper will focus on the analysis of MEC technology used in mobile communications, including the low latency of MEC technology. The role of high-bandwidth advantages, as well as detailed technical solutions for mobile edge computing technology and local shunt technology, provide reference for subsequent research.*

KEYWORDS: *Mobile edge calculation base; 5g; Local shunt*

1. MEC Technology Overview

1.1 MEC

According to the definition of ETSI, MEC technology mainly refers to the ability to provide IT and cloud computing for wireless access networks by deploying a general-purpose server on the wireless access side [1]. In other words, the MEC technology enables the traditional radio access network to have the conditions of localization and close-range deployment of the service. The radio access network thus has low-latency and high-bandwidth transmission capability, which effectively alleviates the transmission of the mobile network in the future. Bandwidth and latency requirements. At the same time, the downsizing of the business surface, that is, the localized deployment can effectively reduce the network load and the demand for the network backhaul bandwidth, thereby achieving the purpose of reducing the network operation cost.

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1.2 MEC Platform

(1) Outdoor Macro Base Station

MEC technology adds MEC platform functions/network elements to traditional wireless networks, enabling it to provide service localization and close-range deployment. However, the deployment mode of the MEC function/platform is related to a specific application scenario, and mainly includes an outdoor macro base station scenario and an indoor micro base station scenario[2]. Since the outdoor macro base station has certain computing and storage capabilities, the MEC platform function can be directly embedded in the macro base station, which is more conducive to reducing network delay, improving network facility utilization, obtaining wireless network context information, and supporting various types. Vertical industry business applications, such as car networking with low latency requirements.

(2) Indoor Micro Base Station

Considering the coverage of the micro base station and the number of service users, the MEC platform should be in the form of a local aggregation gateway. By deploying multiple service applications on the MEC platform, operational support for multiple services in the region, such as the IoT application scenario gateway aggregation function, the local gateway function of the enterprise, the school local network, and the user/network big data analysis function.

In order to enable MEC to support a variety of mobile Internet and IoT services more effectively, the functions of the MEC platform need to be gradually complemented and opened to the second party business applications according to the needs of business applications, thereby improving the network capabilities while improving the users. Business experience and promote R&D deployment of innovative services[3]. In summary, the scope of application of the MEC technology depends on the capabilities of the MEC platform. Figure 3 shows the MEC platform, including the MEC platform physical facility layer, MEC application platform layer, and MEC application layer.

(1) MEC platform infrastructure layer. Based on the general-purpose server, the network function virtualization method is used to provide physical resources such as calculation and storage of the underlying hardware for the MEC application platform layer.

(2) MEC application platform layer. The functional components of the MEC application platform mainly include functions such as data offloading, wireless network information management, network self-organizing management, user/network big data analysis, network acceleration, and service registration, and are open to the upper layer application through an open API.

(3) MEC application layer. Based on the network function virtualization VM application architecture, the MEC application platform functional components are further combined and packaged into virtual applications (local offload, wireless

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cache, augmented reality, service optimization, positioning, etc.), and opened to the second party through a standard interface. A business application or software developer that enables the opening and invocation of wireless network capabilities[4].

The above can find that the wireless network based on the MEC platform can provide capabilities such as local offloading, wireless caching, augmented reality, service optimization, positioning, etc., and promote the development of innovative services by opening the wireless network capability to the second party business application/software opener. deploy. It should be noted that local offloading is a prerequisite for localization and close-range deployment of service applications, and thus becomes one of the most basic functions of the MEC platform, so that the wireless network has the capability of low latency and high bandwidth transmission.

2. This Shunt Scheme Design

2.1 Based on MEC Local Shunt

(1) Local Business

The MEC platform can directly access the local network through the MEC platform. The local service data flow is directly transmitted from the MEC platform to the local network without going through the core network. Therefore, the local service offload not only reduces the bandwidth consumption of the backhaul, but also reduces the service access delay and improves the user experience. In other words, the MEC-based local offloading goal is to implement an LTE local area network similar to SFIF.

(2) Public Network Service

Users can access public network services normally. There are two ways: First, the MEC platform sends the data flow of all public network services directly to the core network through transparent transmission[5]; Second, the MEC platform accesses the Internet from the local proxy server for specific IP services/users through local offloading (Since this kind of service is performed by means of local offloading, the local service described later includes this part of the local offloaded public network service).

(3)Terminal Network

The local offloading solution needs to be transparently deployed on the MEC platform to the terminal and the network, and complete local data offloading. That is to say, the MEC-based local offloading scheme does not need to modify the end user and the core network, and it is difficult to deploy the MEC local offloading scheme on the live network application.

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2.2 Detailed Technical Design

(1) Local Distribution Rules

You need to configure the DNS query rule on the MEC platform to associate the local IP address to be configured with its local domain name. Secondly, the MEC platform receives the uplink packet of the terminal. If the packet is specified in the local subnet, it is forwarded to the local network, otherwise it is directly transmitted to the core network. At the same time, the MEC platform returns the received local network packet to the end user. When there is no DNS query function, the terminal user can directly use the local IP address access mode. The MEC platform can process the corresponding packet according to the corresponding IP traffic distribution rule. In addition, the corresponding public network IF offloading rule can also be configured to implement access to the packet domain network from the local proxy server for a specific IP service/user through local shunting, thereby implementing selective IP data offloading for the public network service.

(2) Control Panel Data

The MEC platform controls the end user and the data, that is, S1-C., is directly transmitted to the core network, and the normal authentication, registration, service initiation, and handover processes of the terminal are completed, which is indistinguishable from the traditional LTE network. That is, whether it is a local service or a public network service, the control of the end user is still performed on the core network, ensuring that the MEC-based local offloading scheme is transparent to the existing network.

(3) Upstream and Downlink User Plane Data Processing

The uplink service data is transparently transmitted to the operator core network SGW device through the MEC platform, and the uplink data packet conforming to the local distribution rule is forwarded to the local network through the MEC platform. The downlink service data is transparently transmitted to the base station through the MEC platform, and for the downlink data packet from the local network, the MEC platform needs to re-encapsulate the data packet into GTP-one to the base station, and complete the processing of the data packet of the local network downlink user.

In summary, the MEC-based local offloading scheme can be widely applied in applications such as enterprises, schools, shopping malls, and scenic spots that require local connections and local high-traffic service transmission (high-definition video).

2.3 Lipa/Sipto Local Offloading Scheme

(1) Family/Enterprise Lipa/Sipto Solution

After discussion, it is determined that the local scheme of L-S5 is used to implement LIPA local offloading, which is applicable to traffic offloading of HeNB

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LIPA. In this scheme, a local gateway (LGW) network element is added to the HeNB, and the LGW and the HeNB can be set up or separated. The LGW and the SGW are connected through a new L-S5 interface, and the HeNB and the MME and the SGW pass the original S1 interface. connection. When LGW supports SIPTO, LIPA and SIPTO can use the same APN, and HeNB SIPTO does not occupy carrier network equipment and transmission resources, but LGW needs to perform routing control on LIPA and SIPTO.

(2) Macro Network Sipto Solution

For the LTE macro network SIPTO scheme, 3GPP finally determines the scheme (local gateway) using the PDI} connection. It can be seen that the scheme is implemented by deploying the SGW and the L-PGW in the vicinity of the wireless network, and the SGW and the L-PGW are connected through the S5 interface (the L-PGW and the SGW can also be combined), and the SIPTO data and the core network data stream pass first. The same SGW, and then use a different PDN connection for transmission. Implement SIPTO of the macro network. It can be seen that the SIPTO of the macro network is still controlled by the network side and is based on a dedicated APN.

3. Program Comparison

After the above discussion, it can be concluded that the local offloading scheme based on MEC and the LIPA/SIPTO scheme in 3GPP can meet the application scenarios of local distribution of wireless networks, namely local service access, SIPTO of local network and SIPTO of macro network. It should be noted that the 3GPP LIPA/SIPTO solution requires the terminal to support multiple APN connections, and a new interface needs to be added to implement APN-based PDN transmission establishment.

4. Conclusion

This paper introduces the MEC technology and the MEC platform block diagram in detail, and gives a detailed technical solution for the local shunt function based on the MEC platform. In addition, compared to the 3GPP existing local offloading scheme LIPA/SIPTO, the MEC-based local offloading scheme is transparent to the terminal and the network. It is more suitable for the deployment of the local offloading service of the LTE live network.

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ISSN 2616-7433 Vol. 1, Issue 10: 135-140, DOI: 10.25236/FSST.2019.011017

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