An Effective End-To-End Resource Elastic Allocation Mechanism for SDN Based on Deep Learning

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Abstract. Aiming at power network QoS requirements and high and risky failure scenarios, this paper proposes an effective voice service communication and network resource scheduling mechanism based on knowledge communication technology to ensure efficient and stable operation of the power network. The proposed mechanism uses the cloud as an auxiliary computing node of the power communication network to provide flexible space-time services for large-scale power communication services. It effectively solves the problem of long fault response time caused by insufficient computing resources due to the huge power communication network, and is of great significance to the realization of the reliable operation of the power grid.

Keywords: QoS · Deep learning · Power communication network

1 Introduction

With the rapid development of the electric power communication industry, electric power communication has emerged to ensure the safe and stable operation of the power system. The power system relay protection, safety control system and dispatching automation system are the three major networks for the safe and stable operation of the power system. At present, the main research directions for power communication network are power grid dispatching automation, efficient operation of the network, and so on. Market-oriented and modern management is an important means for the safe, stable, and economic operation of power networks. Due to the fast and accurate requirements of the electric power communication network for communication, protection and control information transmission, the electric power sector has special resource advantages for the development of communication, and most of the power companies in the world have established their own dedicated communication networks for power systems.

As an important national infrastructure, the electric power communication network is of great significance to ensure its stable and efficient operation. The electric power communication network is a special complex network. Its topological structure includes

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a large number of micro grids, and its service quality is closely related to grid dispatching control. Therefore, the power communication network is very different from the communication network built by the operator. The essence of studying the communication network management strategy is to use the complex network theory and the relationship between the network structure and the network to achieve efficient network scheduling to ensure user service quality. The network topology determines its dispatch control function, and the structural characteristics of the network are usually characteristic statistical measures.

Because the maintenance strategy of power communication network needs to first ensure that its dispatching control function is not affected, the research on complex network for power communication network only focuses on its network reliability and focuses on the characteristics of network structure. Existing researches [1] and [2] have carried out relevant exploration and Research on Software Defined Network in power communication network. Research [3] puts forward the software definition network architecture and operation mechanism in the Internet of things, which has reference significance for the establishment of software definition network elastic resource deployment mechanism of power communication network. Researches [4, 5] proposed deep learning-based resource allocation methods for 5G Broadband TV Service and IoT, which inspired us to introduce machine learning methods into SDN networks. Research [6] proposes a software defined network method with a tradeoff between energy consumption and performance. Research [7] proposed the software definition network method and architecture in smart city, and proposed the load balancing method. Research [8] proposed the architecture of combining fog computing with software defined network, and studied the implementation of elastic resource adjustment in software defined network. Research [9] proposes an Internet of things architecture combining blockchain and software defined network. Researches [10–12] proposed various methods to gain scalable and flexible for 5G H-CRAN and energy efficient goals. Research [13] proposes multi hop routing algorithms and protocols in software defined networks. Research [14] proposes an optimization algorithm for routing efficiency in software defined networks to further improve network performance. Research [15] studies the software definition and network security of power communication network. Researches [16, 17] put forward the application management method of power backbone network based on software defined network, which effectively realizes the application management of power backbone network. Researches [18, 19] proposed intelligent machine learning methods for heterogeneous M2M network and 6G, which using cloud and new energy infrastructure.

However, the above research can not solve the resource elastic deployment of software defined network in power communication network, and solve the problem of time and space flexibility in the process of resource deployment. Therefore, this paper proposes an end-to-end elastic resource deployment mechanism of software defined network of power communication network, introduces cloud computing into software defined power communication network as computing resources, and provides a flexible resource deployment method for power communication network combined with software defined network.

2 Cloud Computing Combined SDN Resource Elastic Allocation Mechanism

This paper proposed a cloud computing combined SDN resource elastic allocation mechanism (see Fig. 1). This mechanism uses cloud computing as computing center to provides computing resource in the way of virtual machines. Cloud computing and virtualization technology provide time flexibility and space flexibility for the in-depth learning of power communication network.

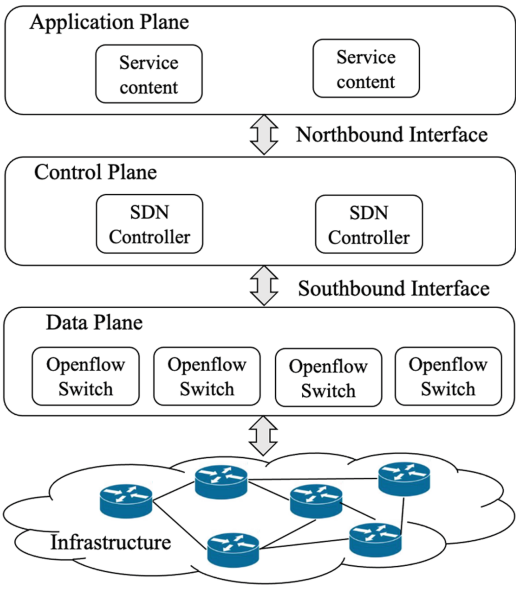

Fig. 1. Cloud computing combined SDN resource elastic allocation mechanism

3 The Openflow Switch and Controller in SDN

Openflow can start the remote controller and determine the path of network packets through the network switch through the network switch. The inventor of this protocol regarded it as the initiator of software defined networking. Openflow allows you to change the path of packet forwarding from the packet forwarding table of the remote control network switch by adding, modifying and removing packet control rules and actions. Allows more complex traffic management than using access control tables (ACLS) and routing protocols. At the same time, openflow allows different suppliers to remotely manage switches with a simple, open source protocol (usually providing proprietary interfaces and description languages). Openflow protocol is used to describe the standard of information used in the interaction between controller and switch, as well as the interface standard between controller and switch. As shown in Fig. 2. The core part of the protocol is the collection of information structures for openflow protocol. Openflow

protocol supports three information types: controller to switch, asynchronous and symmetric. Each type has multiple subtypes. The controller to switch information is initiated by the controller and is directly used to detect the status of the switch. Asynchronous information is initiated by the switch and is usually used to update network events of the controller and change the state of the switch. Symmetric information can be initiated by a director or switch without a request.

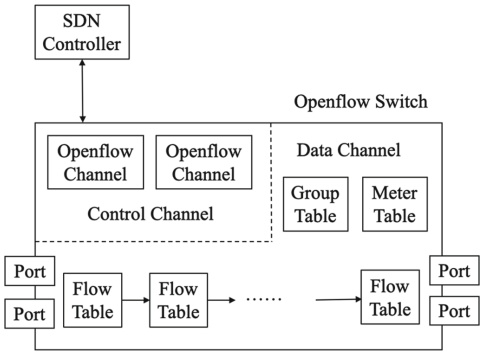

Fig. 2. Openflow switch

SDN controller is an application program in software defined network (SDN), which is responsible for flow control to ensure intelligent network. As shown in Fig. 3. The SDN controller is based on protocols such as openflow and allows the server to tell the switch where to send data packets. In fact, SDN controller is an operating system (OS) as a network. The controller does not control the network hardware, but runs as software, which is conducive to the automatic management of the network. Software based network control makes it easier to integrate business applications and networks.

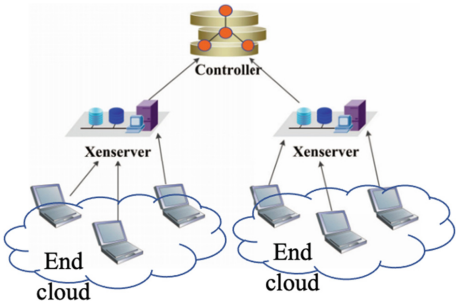

Fig. 3. The virtual platform and controller

4 Cloud Computing Combined SDN Resource Elastic Allocation Mechanism

The workflow of proposed cloud computing combined SDN resource elastic allocation mechanism is shown in Fig. 4. The bottom layer is the power communication network, next to the cloud computing node, which is used to realize the elastic resource allocation decision-making mechanism, deeply learn the operation location, distribute the policy template and processing mechanism to the cloud computing node through the controller for in-depth learning training, return the results to the controller, and the controller sends the results to the power communication network. The result types include: network fault recovery strategy, network configuration strategy, etc.

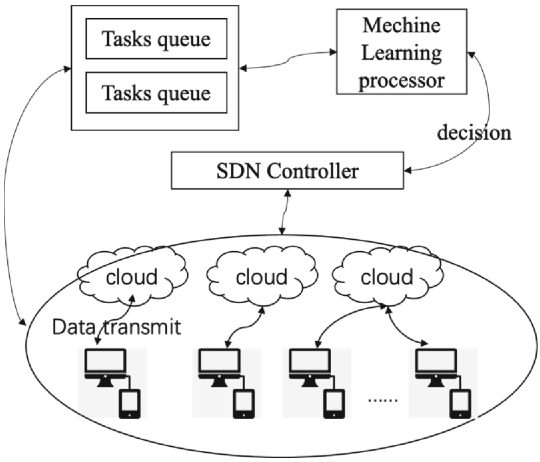

Fig. 4. The workflow of proposed mechanism

Deep learning can calculate more accurately and requires a lot of computing resources. The traditional SDN network does not have computing resources and can not realize large-scale deep learning.

5 Conclusion

This paper proposes an effective end-to-end service routing and network resource elastic scheduling mechanism based on the combination of cloud computing and SDN to ensure the efficient and stable operation of power communication network. The mechanism uses cloud computing as the auxiliary computing node of power communication network to provide flexible time and space services for large-scale power communication services. It effectively solves the problems of large scale, insufficient computing resources and long fault response time of power communication network, which is of great significance to realize the reliable operation of power grid.

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