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Research on data fusion scheme of power internet of things based on cloud and NFV

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Abstract

With the development of the cloud platform and power Internet of Things, how to effectively connect the physical world and the digital world, realize the interconnection of all things in power terminals, deeply integrate data, and tap the economic value of data is an important issue. Based on the company's business and technology development status, this paper proposes the power Internet of Things data fusion based on cloud and NFV, discusses data storage, circulation and management methods in the power Internet of Things cloud platform environment, and completes accurate and efficient data analysis. Responding to the access of a large number of distributed energy sources, multiple business concurrency and joint data analysis needs, and improve data analysis and sharing capabilities.

*Keywords:*Power Internet of Things; Cloud; NFV ; Data Fusion;

1. Introduction

The power Internet of Things is a new generation of information and communication system which comprehensively applies cloud computing, artificial intelligence and other new technologies[1].Through the mutual penetration and intelligent interaction between information physical fusion and power system, the real-time online connection and integration development of human, machine and material in all aspects of energy and power production and consumption can be realized[2].

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Currently, the intersection of the Internet of Things and big data has brought new challenges;chaotic business data management, diverse data models, the same kind of data in different business formats exist differences, lack of unified guidance standards. Insufficient planning of computing and processing capabilities of each power business, and a single design for centralized and decentralized data, seriously affecting business efficiency, cost, and timeliness[3]. In view of the problems in the data storage, integration and analysis of the power Internet of Things, this paper studies a data fusion solution based on cloud-side collaboration and NFV technology to support the power Internet of Things to complete accurate and efficient data analysis to deal with the access of a large number of distributed energy sources[4]. Multiple business concurrency and joint data analysis requirements realize the pattern of "full information application, full process connection, and full control" on the full business cloud, and support the construction of a modern service system.

2. Current status of data center architecture

Traditionally, power grid information data is transmitted and exchanged through independently laid network channels[5]. Various application servers are included in the power grid computer network system, and different service processes and memory databases are deployed on each application server, but only the data center and database server is installed with traditional Oracle database. The data is exchanged among the servers in a large amount and stored in the data storage center. The use of centralized data persistent storage makes the database an access bottleneck, which severely limits the access and processing speed of data, and the frequent exchange of large amounts of data between servers takes up a lot of network resources. The traditional centralized cloud platform architecture requires all data to be uploaded and sent after processing at the central node, which is often costly, time-consuming, and inefficient. If network problems or central node failures are encountered, it will have an important impact on the company's business operations.

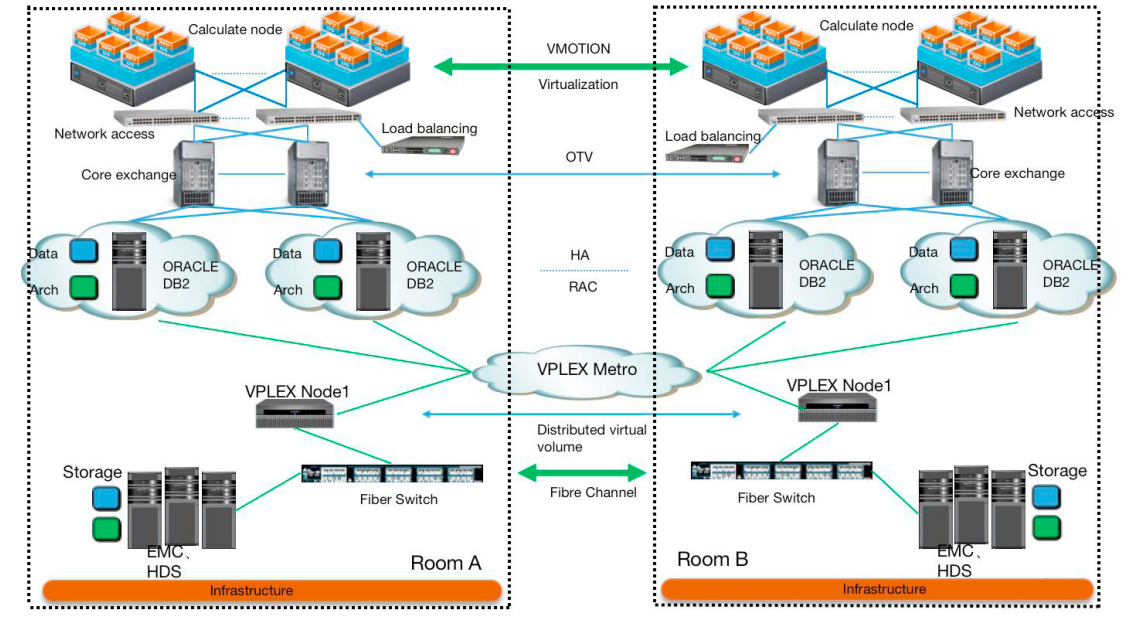

Fig. 1: Current status of data center architecture.

3. Power Internet of Things Data Fusion Solution

3.1. Cloud-Edge Collaboration

After decades of development, cloud computing technology provides users with convenient and efficient services through resource sharing and flexible scheduling, speeding up the company's digital construction process. The traditional centralized cloud platform architecture cannot adapt to the challenges of massive computing nodes and data processing in the power Internet of Things. Therefore, this paper proposes the architecture of provincial central cloud + prefecture and city edge cloud. The SaaS layer mainly defines the user SLA, the PaaS layer mainly arranges the resources and issues the policy for the business application instance, and the IaaS layer mainly provides the standardized resource interface.

The provincial company's core cloud platform performs tenant management, network management, resource management, and application life cycle management on edge clouds. Each edge cloud is used to access and manage IoTs agent equipment. The edge cloud provides localized computing, network, storage, and Security capabilities. When developing the Internet of Things business, the company's core cloud platform can flexibly orchestrate services and conveniently distribute configurations to the edge cloud, so as to quickly implement IoTs device access, IoTs business activation/change, and security protection strategies.

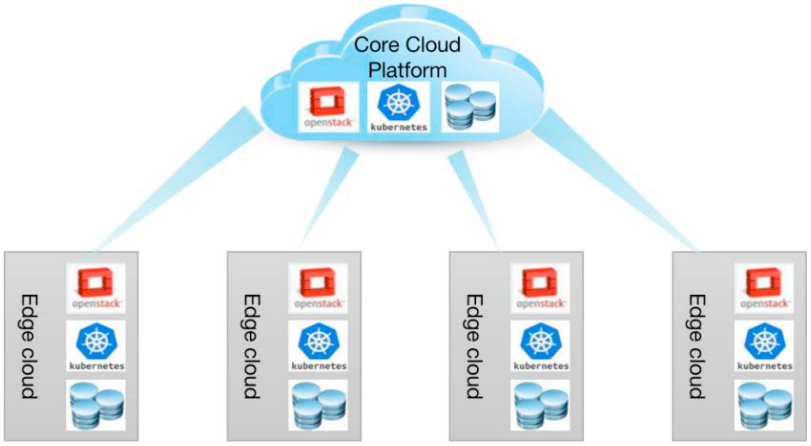

Fig. 2. Cloud-edge collaborative architecture.

3.2. NFV technology

The Network Functions Virtualization (NFV) realizes the unified management, business orchestration, and life cycle management functions of virtual network elements[6]; virtual network elements realize north-south traffic control, server load balancing, virtual tunnels and other functions; virtual network element manager realizes virtual network elements Operation and maintenance functions. This will enable the unified management of network services to decouple dedicated hardware for network functions, the flexible definition and independent orchestration of network services, and the full life cycle management of virtual network functions.

The NFV network service platform as a whole can provide:

- Provide a full range of security protection for the final tenant's north-south traffic, such as 7-layer virus filtering;
- Provide load balancing for the main business of production, marketing, management and other systems to achieve the purpose of efficient and smooth business access;
- Establish virtual dedicated channels for 4 prefectures and cities to realize the reachability of the prefecture and city intranet and the secure encryption of communications in the public network;

- While providing reliable safety protection for end users, it also provides stronger reliability and ease of operation and maintenance management;
- Save the hardware cost, resource cost and operation and maintenance cost of the end user. General guidelines for the preparation of your text.

4. Data Fusion Architecture and Solutions

4.1. Data Fusion Architecture

On the basis of cloud platform, NFV, cloud-side collaboration and other technologies, in view of the problems existing in the current data transmission and management architecture, this paper proposes a data fusion architecture for the power Internet of Things. The architecture is divided into three levels, data source, data center and business application. The data source is the collection of power Internet of Things data, and the collected data is uploaded to the edge cloud through cloud edge coordination; the data center integrates edge cloud data into the data center through NFV, data capture and other technologies, and performs data cleaning and analysis . Business applications directly call the analyzed data for business applications. The data fusion architecture is suitable for both offline computing and real-time computing scenarios, meeting the requirements of high fault tolerance, low latency, scalability, and universal service. In the power Internet of Things, Kafka is used to collect terminal data, and the local Flink and spark tools are used to calculate and return incremental results in real time. The global offline data processing is realized through the high-performance computing storage resources in the State Grid cloud to meet the needs of data query services without scenarios.

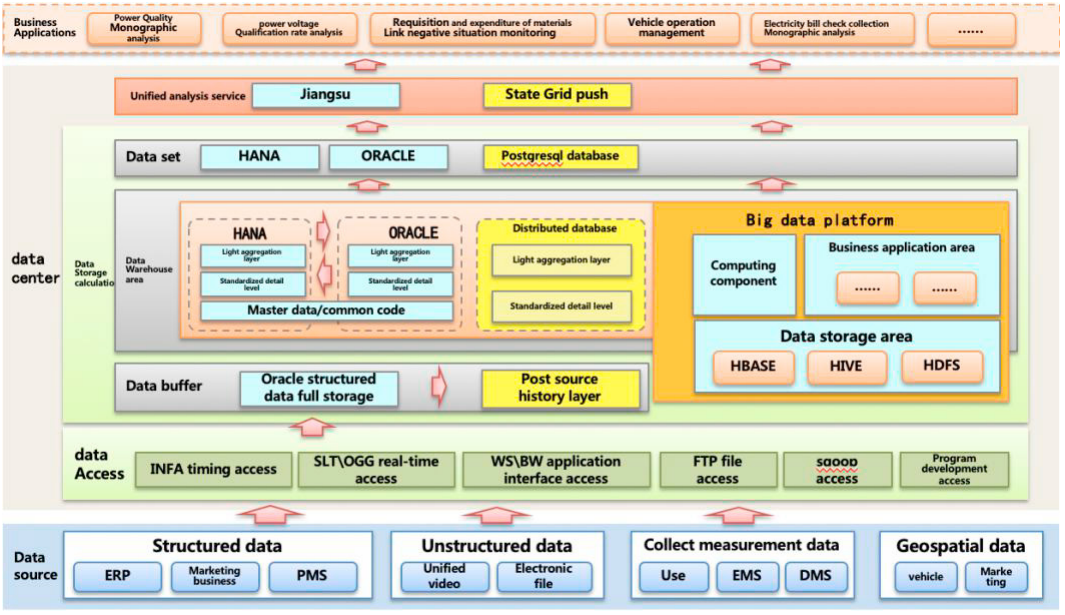

Fig. 3. Data Fusion Architecture Diagram.

4.2. Data management

In terms of data management, it is necessary to build a data and service standard system covering the entire chain of energy and power business on the existing basis, expand the data model, and support unified management of all data. Through the inquiry and analysis of about 90 key business index data in six business areas of industrial human resources management, financial management, investment project management, production management, marketing management, and international business, the centralized management of data is realized, and the effective sharing

and opening of the data is formed. The index system with the company's strategic goals as the core supports the company's direct industry operation monitoring and standardized management of business data.

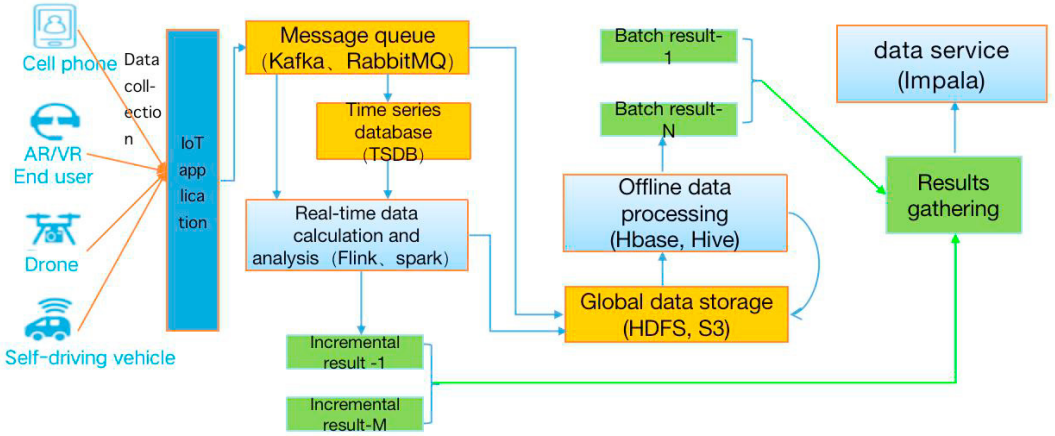

Fig. 4. Data management flowchart.

5. Summary

Based on the current situation of company data fusion, this paper proposes the power Internet of Things data fusion solution based on cloud and NFV . Data is collected intelligently at IoTs terminals through cloud-side collaboration, and collected data is directly transferred to the cloud platform through edge-cloud collaboration. Processing and management in the cloud platform enables data to be collected once and reused everywhere. It can effectively improve data utilization efficiency and provide data support for company operation and management.

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