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Service Oriented Network virtualization Architecture for Internet of Things

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Abstract: ***As a key technology to realize smart services of Internet of Things, network virtualization technology can support the network diversification and ubiquity which improve the utilization rate of network resources. The paper describes about the service oriented network virtualization architecture for IOT services. First the semantic description method for IOT services is proposed then the resource representation model and then the resource management model in the environment of network virtualization are described in the service.***

The Internet of Things has symbolized a new historical stage for the development of Internet.

The Main objective of the network is that it can be defined based on utilizing the integrated, synergic which provides well developed network services.

I. INTRODUCTION

Internet of Things(IoT) has symbolized a new historical stage for the development of Network ubiquitous utilizing the ubiquitous information network technology to deliver the ubiquitous intelligent services. The development of IoT needs future network to support enormous, personalized and intelligent services, but the current networks only act as the channel for information transmission. Especially, there is no synergy or perception between user service requirements and network functions which are divided into different levels. With the proliferation of IoT, the user requirements are becoming more and more complex and diverse, so the current networks are difficult to meet the requirements of intelligent services of IoT. In order to further promote the development of Internet of Things, it is imperative to break through the limitations of the previous network design. Network virtualization, as an emerging technology, can realize multiple and totally different virtual networks in one or more physical networks through mechanisms such as abstraction, distribution and isolation etc.

on previous observation, this paper studies service-oriented network virtualization architecture for Internet of Things. The semantic description model of Internet of Things services, and resource representation model and resource management model for IoT in the environment of network virtualization are presented, then based on the above models, the service-oriented virtual network architecture for IoT is established.

The remainder of this paper is organized as follows. In Part II, the service-oriented virtual network architecture for IoT is presented. In Part III,life cycle of IOT. In Part IV, the working process of service oriented network virtualization In Part V,network resources management. Finally in Part VI, applications of service oriented architecture in different areas.

II. SERVICE ORIENTED NETWORK VIRTUALIZATION FOR INTERNET OF THINGS

The current network is plagued by the defects, one major defect of the current network is in lack of it, which largely limits the expansibility and efficiency in aspects of network.Network virtualization technology can Through the abstraction, distribution and isolation technologies of network resources, effective utilization of network resources is realized, and meanwhile network management is significantly simplified and unique service applications and network technology innovations are supported. Therefor, the network virtualization technology, as a solution to the large-scale application of Internet of Things, is worth of in-depth researches. ITU has proposed the framework of network virtualization for future network, which divides the network virtualization environment into physical network, virtual resource and virtual network. The roles in network virtualization model include Infrastructure Provider (InP), Service Provider (SP) and End User (EU). InP is responsible for managing one.

It can be seen that emerging network service model represented by Internet of Things, cloud computing and mobile internet platforms has posed a more profound challenge to network architecture. Network virtualization is a right approach to solve the existed problems between service demand and current network architecture. Based on network virtualization, a service-oriented network architecture for Internet of Things, which is called smart service system(3S) is proposed in this paper. The proposed architecture can realize mutual understanding and coordination between Internet of Things service and network, hence enabling service to achieve dynamic choosing and use heterogeneous network of services and network resources.

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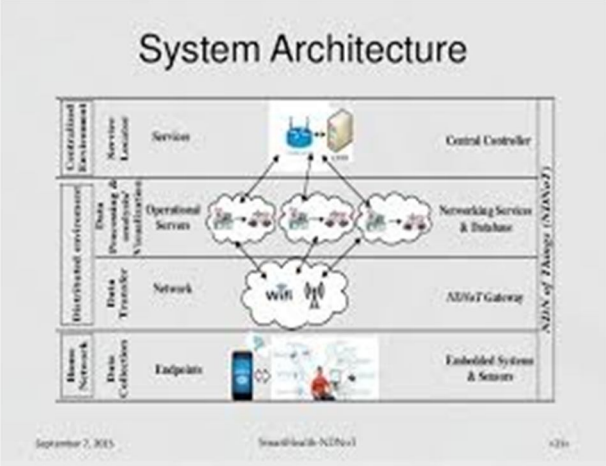

Fig1: Architecture of smart service

Essentially, from fig1 the proposed 3S architecture features with network resource sharing and effective management of heterogeneous and dynamic resources in physical networks through network virtualization according to the requirements of smart services. The layered resources management and control mechanism in the proposed 3S architecture facilitates real-time handling of virtual network requests and realizes high efficient management of virtual network resources. The 3S architecture, combining with management supporting system(MSS) and safety guarantee system(SGS), constructs an integrated and open smart service environment, which can provide safe, convenient and ubiquitous smart services to users and satisfy the personalized and differentiated requirements from different users. End users of the 3S system can log into authentication, and is able to use all the resources of networks to obtain intelligent services. This system integrates and coordinates various service platforms, access portals and networks, and terminal identities, so that it can realize resources sharing and integration of services.

III. IOT LIFE CYCLE IN NETWORK

Internet of Things service refers to the process, in which users obtain smart services through information perception, information analysis under a heterogeneous network environment. The essence of Internet of Things service lies module by centering on service as well as coordinating and combining these service modules according to certain logical relations to obtain maximal service efficiency[16]. Internet of Things service model divides service process into service combination, resource consultation and network selection

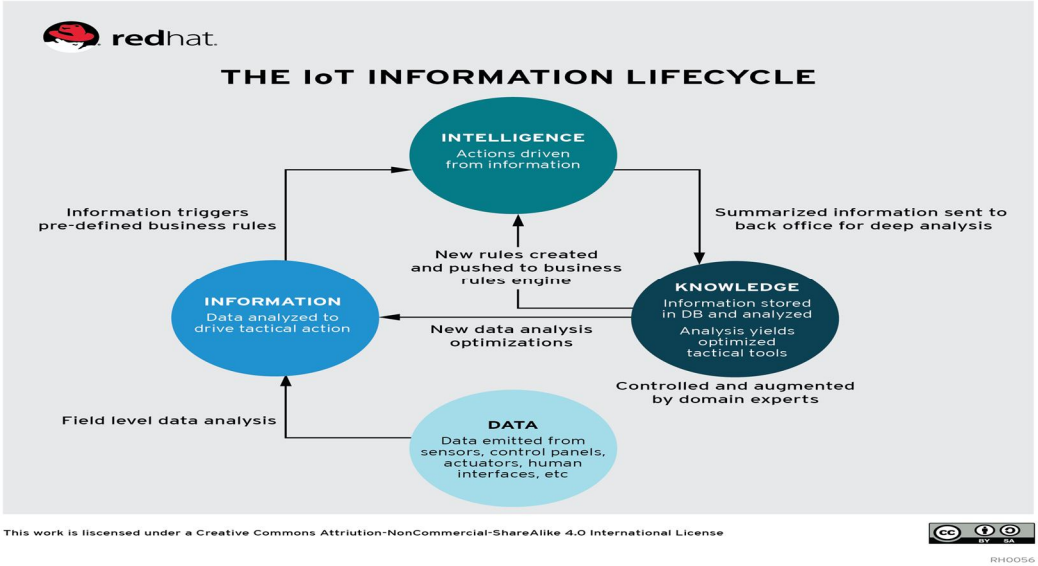

Fig2:Life cycle of IOT in network

From fig2 The system will automatically seek and combine services according to user demand, and provide the mutual understanding and coordination mechanism between service and service as well as between service and content. It also needs solve the coordination problem of the combination of enormous and differentiated services as well as coordination of multiple services, including the mutual perception and coordination between service and network, in order to enable service and network to have unified identification and understanding of resources.

IV. WORKING OF SERVICE ORIENTED NETWORK VIRTUALIZATION

Fig3: working of service oriented network virtualization

From fig3 The Internet of Things (IoT), also sometimes referred to as the Internet of Everything (IoE), consists of all the web-enabled devices that collect, send and act on data they acquire from their surrounding environments using embedded sensors, processors and communication hardware. These devices, often called "connected" or "smart" devices, can sometimes talk to other related devices, a process called machine-to-machine (M2M) communication, and act on the information they get from one another. Humans can interact with the gadgets to set them up, give them instructions or access the data, but the devices do most of the work on their own without human intervention. Their existence has been made possible by all the tiny mobile components that are available these days, as well as the always-online nature of our home and business networks.

Connected devices also generate massive amounts of Internet traffic, including loads of data that can be used to make the devices useful, but can also be mined for other purposes. All this new data, and the Internet-accessible nature of the devices, raises both privacy and security concerns.

V. NETWORK RESOURCES MANAGEMENT

The goal of resources management in virtual networks is to provide the required resource integration to virtual network users and allow them to carry out scheduling, management and operation of their own resources. In addition, resources management is also responsible for the constant communicating with bottom-layer physical networks and acquiring the bottom-layer resource information so as to ensure the use and deployment of bottom-layer physical network resources by virtual network.

Network resources management includes virtual physical resource management module, virtual network management module and virtual resource management module . Virtual physical resource management module rents network resources from bottom-layer physical network to form virtual resources pool (including virtual nodes and links) that will be provided to virtual network management module. Virtual network management module establishes and manages virtual sub-networks according to the requirements of Internet of Things services. Virtual resources mapping management module is responsible for coordinating bottom-layer physical network resources and operation of virtual network control module

VI. APPLICATION OF SERVICE ORIENTED NETWORK VIRTUALIZATION ARCHITECTURE

Currently university information system is typically composed of multiple independent information sub-systems. Different information sub-systems run in isolated style, without sssinformation sharing with each other. Additionally, current university information systems are without things' information, so they only provide ordinary information services. With the rapid development of Internet of Things, it is possible to build new generation university information system to provide smart services for students and university management

A. Smart home

Smart Home clearly stands out, ranking as highest Internet of Things application on all measured channels. More than 60,000 people currently search for the term "Smart Home" each month. This is not a surprise. The IoT Analytics company database for Smart Home includes 256 companies and startups. More companies are active in smart home than any other application in the field of IoT. The total amount of funding for Smart Home startups currently exceeds $2.5bn. This list includes prominent startup names such as Nest or AlertMe as well as a number of multinational corporations like Philips, Haier, or Belkin.

B. Wearables

Wearables remains a hot topic too. As consumers await the release of Apple's new smart watch in April 2015, there are plenty of other wearable innovations to be excited about: like the Sony Smart B Trainer, the Myo gesture control, or LookSee bracelet. Of all the IoT startups, wearables maker Jawbone is probably the one with the biggest funding to date. It stands at more than half a billion dollars!

C. Smart City

Smart city spans a wide variety of use cases, from traffic management to water distribution, to waste management, urban security and environmental monitoring. Its popularity is fueled by the fact that many Smart City solutions promise to alleviate real pains of people living in cities these days. IoT solutions in the area of Smart City solve traffic congestion problems, reduce noise and pollution and help make cities safer.

D. Smart grids

Smart grids is a special one. A future smart grid promises to use information about the behaviors of electricity suppliers and consumers in an automated fashion to improve the efficiency, reliability, and economics of electricity. 41,000 monthly Google searches highlights the concept's popularity. However, the lack of tweets (Just 100 per month) shows that people don't have much to say about it.

E. Industrial internet

The industrial internet is also one of the special Internet of Things applications. While many market researches such as Gartner or Cisco see the industrial internet as the IoT concept with the highest overall potential, its popularity currently doesn't reach the masses like smart home or wearables do. The industrial internet however has a lot going for it. The industrial internet gets the biggest push of people on Twitter (~1,700 tweets per month) compared to other non-consumer-oriented IoT concepts.

F. Connected car

The connected car is coming up slowly. Owing to the fact that the development cycles in the automotive industry typically take 2-4 years, we haven't seen much buzz around the connected car yet. But it seems we are getting there. Most large auto makers as well as some brave startups are working on connected car solutions. And if the BMWs and Fords of this world don't present the next generation internet connected car soon, other well-known giants will: Google, Microsoft, and Apple have all announced connected car platforms.

Connected Health (Digital health/Telehealth/Telemedicine)

Connected health remains the sleeping giant of the Internet of Things applications. The concept of a connected health care system and smart medical devices bears enormous potential not just for companies also for the well-being of people in general. Yet, Connected Health has not reached the masses yet. Prominent use cases and large-scale startup successes are still to be seen.

G. Smart retail

Proximity-based advertising as a subset of smart retail is starting to take off. But the popularity ranking shows that it is still a niche segment. One LinkedIn post per month is nothing compared to 430 for smart home.

H. Smart supply chain

Supply chains have been getting smarter for some years already. Solutions for tracking goods while they are on the road, or getting suppliers to exchange inventory information have been on the market for years. So while it is perfectly logic that the topic will get a new push with the Internet of Things, it seems that so far its popularity remains limited.

I. Smart farming

Smart farming is an often overlooked business-case for the internet of Things because it does not really fit into the well-known categories such as health, mobility, or industrial. However, due to the remoteness of farming operations and the large number of livestock that could be monitored the Internet of Things could revolutionize the way farmers work. But this idea has not yet reached large-scale attention. Nevertheless, one of the Internet of Things applications that should not be underestimated. Smart farming will become the important application field in the predominantly agricultural-product exporting countries

VII. CONCLUSION

In light of the features and requirements of the semantic description methods of Internet of Things services, and then discusses the resource representation model and resource management model with the network virtualization. This paper focuses on the network resources optimization design algorithm matching with the service behaviours of users and the resources optimization-based virtual networking mapping algorithm under the environment establishes the Internet of Things services-oriented 3S virtual network model. Finally, the proposed scheme realize the optimization of resources distribution in the user-side network under the environment of Internet of Things and thus provide a nice solution to the large scale application of Internet of Things.

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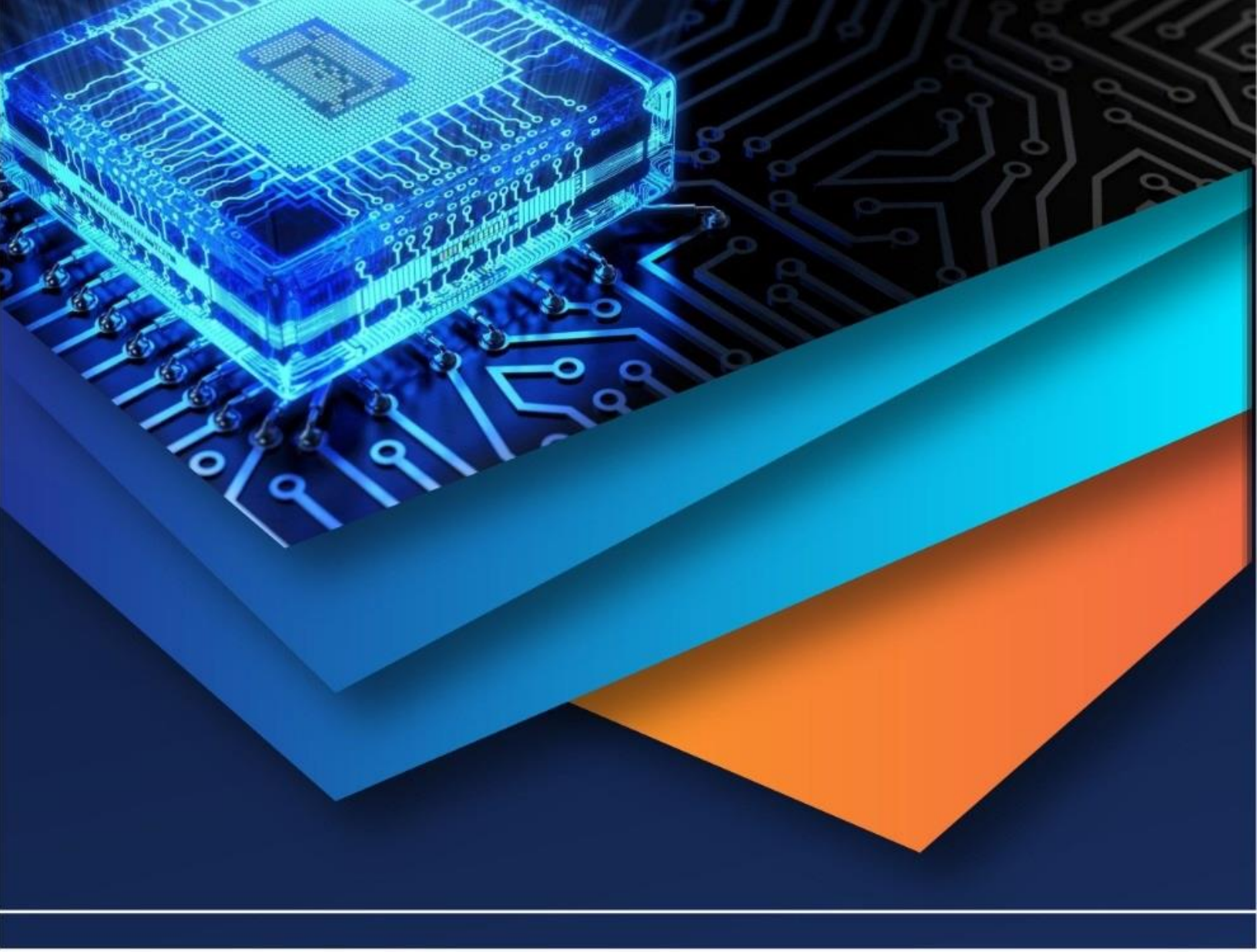

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