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Creating Next Generation Cloud Computing based Network Services and The Contributions of Social Cloud Operation Support System (OSS) to Society

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Emerging virtualization technologies are making ubiquitous access to on-demand computing, network and storage resources to deliver various applications over public Internet. In this paper we present how the telecom operation support systems (OSS) that provide Enterprise to Enterprise (E2E) transactions, switching management, on-demand service management and scalability have evolved to provide next generation cloud management. Fujitsu's Social Cloud OSS provides multi-vendor, multi-network management, multi-layer Service Level Agreement (SLA) assurance, on-demand service management and impact analysis to businesses. The Social Cloud OSS service management solution for cloud computing will be the next killer application that will facilitate easy access to cloud services with appropriate SLAs and enable the society to use social networking applications that are currently being delivered using clouds.

I. Introduction

Over the years we have been observing that Telecom operators, service providers and systems integrators were all focusing on Network infrastructure and were providing only limited number of services. This resulted into lot of Capital and Operation expenses. In the last few years realization has set-in among all the telecom players (Carriers, Service providers, Data centers, enterprises and so on) that without new service creation ideas it is very difficult to improve the revenue prospects.

For a long time the focus was to manage carrier grade network systems and later enterprise IT and network systems. It was never on the consumer networks or the so-called social networks where in the complexity is enormous and mind-boggling. Current operation support systems do not have the necessary capabilities to handle such networks.

In this paper we present a methodology which explains how Fujitsu could provide an operation support system which would enable telecom players to use existing systems and services over the cloud to provide support for the entire society.

Before we proceed further it is essential to understand the current state of the Operation Support Systems, their underlying issues and how they have evolved into Social Cloud OSS.

II. Today's OSS and how Fujitsu evolved it into Next Generation Social Cloud OSS

According to Wikipedia, Operations Support Systems (also called Operational Support Systems or OSS) are computer systems used by telecommunications service providers. The term OSS most frequently describes "network systems" dealing with the telecom network itself, supporting processes such as maintaining network inventory, provisioning services, configuring network components and managing faults. Many different types of OSS came into play starting from 1975.

Current telecom OSS perform different functions in Carrier networks such as Billing, Customer Care, Inventory Management, Transaction, Switching Management, Provisioning, and end-to-end FCAPS (Fault, Configuration, Accounting, Performance, Security) management..

Though OSSs provide variety of functions, most of them focus on a particular network or domain. Some of them are proprietary in nature and work better with only a limited number of network elements. Very few OSSs supported multi-vendor or multi-technology. Adding to the above drawbacks, none of these OSSs could handle Social or Consumer Networks where scalability is one of the major factors to consider. Finally, most of them are not service centric; instead they are just a supporting application suite for Networks. Next generation OSSs need to eliminate all these short-comings for anyone to coin these as NGOSS.

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Fujitsu has been developing OSSs for carriers and service providers for a long time. In 1996 [Ref. 1: PCT] Fujitsu developed a new generation IP network and service management platform called "Proactnes" which provided various core functions such as:

1. Multiple views (jurisdictional management) ,
2. Domain management which realized multi technology management,
3. EAM(Element access module) which provided Multi-vendor management, and
4. Scalability which allowed distributed object management.

Fujitsu is marketing Proactnes in Japan for VPN, VoIP and VoD service management, Access network service management and Storage & Server management in various networks from government agencies to carriers to datacenters, and enterprise customers. [Ref. 2, 3, 4]

In 2007 Fujitsu, using Proactnes as a base started the development of Social OSS to provide support for many kinds of networks and later started providing support for Cloud Computing as well. Cloud Computing refers to both the applications delivered as services over the internet, and the hardware and systems software in the datacenters that provide those services. The data center hardware and software is what we call a Cloud [Ref. 5, 8].

Clouds [Ref. 7] aim to power the next generation data centers by architecting them as a network of virtual services (hardware, database, user-interface, application logic) so that users are able to access and deploy applications from anywhere in the world on demand at competitive costs depending on users QoS (Quality of Service) requirements [Ref. 6].

Currently at Fujitsu many components of Social Cloud OSS are in place to take it to the next level.

III. Social Cloud OSS as Killer solutions

The ease with which web services today can be developed and deployed to create social networking services are making it possible for people without technical savvy to participate by developing their own social networking services and reaching out to millions of users world-wide.

As these services grow worldwide and networks become available for everyone, the OSS role will become crucial to provide scalability, interoperability and mediation. Fujitsu's Social Cloud OSS will extend the market (not only vertically but also horizontally) as a killer solution in society by:

1. Providing the required scalability and interoperability to enable service creation, delivery and assurance on a massive scale with the same reliability, availability, performance and security as the telecommunications network or the ease of use of the Internet by integrating both Information Technology (IT) and Telecommunications infrastructure deployment and management that spans across multiple vendor products and multiple technologies.
2. Integrating management and mediation technologies from enterprise and Telecom carrier worlds
3. Providing a reliable, scalable, interoperable and secure services platform for integrating access routers, home-gateways, large distributed data bases and computing & storage connected to Cloud computing
4. Allowing home users, small and medium businesses and a host of social network developers who are users of Cloud computing to create their own services, deploy them and fulfill their personal and business goals.

The social OSS will become "my OSS" (a sort of personal OSS catering to business needs) and enable participants to realize harmonious communication with their chosen social networks. In addition, Social networking is also expanding from human relationships and communication management fostered by many applications such as Facebook to business groups, using it for remote sensor management, Road/bridge construction knowledge management, and a multitude of domain specific relationships and interaction managements. In the future, social OSS will extend such human and business interests by offering a scalable networking and communication infrastructure to form human networks with specific community interest and blur the boundaries between personal and business workflows requiring collaboration. Thus Fujitsu's social OSS can create a new market for next generation services creation and delivery on a large subscriber base

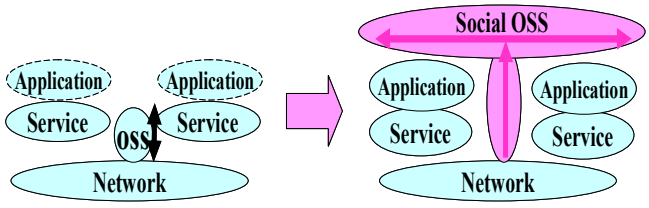


Diagram 1: Current OSS to Social Cloud OSS

IV. Social Cloud OSS - Key Technologies

Some of the Key Technologies that enable Telecom players to actively engage in development of new services using Social Cloud OSS include:

1. Enhanced Proactnes technologies
   - Jurisdictional Management.
   - "Object-based current status management" DB and Real status synchronization and analysis, Multi layer SLO（service level objects） management and execution by Management Agents
   - Scalability using Domain management; Management is carried out using sensor agents, and the design is based on Distributed Objects architecture which can scale from 10 to 100,000,000 subscribers.

2. Fujitsu's strong Telecom domain knowledge (enhancement of existing technologies):
   - Call center and ACD/MIS business process handling and impact analysis to business
   - Multi tenant, Multi service management DB along with profile distribution,
   - Real time cache and connection set up and routing for service and operating status in case of CPE and subscribers
   - Transaction and switching management
   - Domain knowledge capture and distribution to meet changing workload and business priorities on-demand

3. Special and original functions (newly added)
   - Multi layer SLA/SLO impact analysis and handling (among Subscriber, service, connection/pass/line, session, DB, Network Objects such as access, core network, storage, server) per network control, service creation, and impact to business
   - Link service management for Society
   - Scalable platform with the capability to grow to any level and provide the operation, and appropriate view (view management technology) to end customers (Subscribers).

V. Social Cloud OSS – Deployment scenarios over Cloud Computing:

[Domain1 : Carriers, Government agencies and Utility companies]: Integrated management of social service, emergency service, eco service, information service, access services and numerous other services over multitude of networks. Also provide services in a timely manner with enhanced service quality.

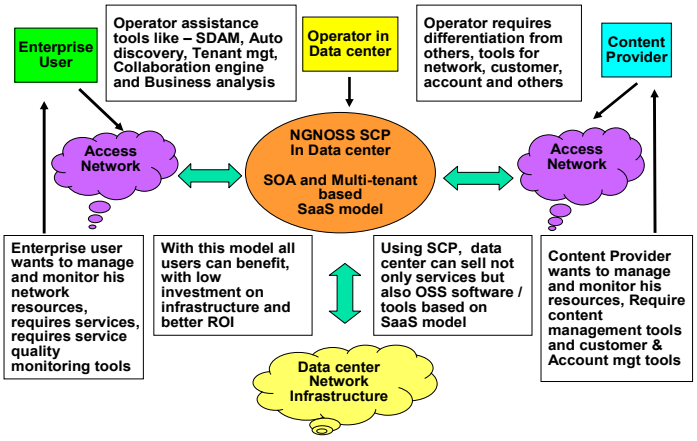
a. 100,000,000 subscribers service management over multi technology networks such as Core / Access network, mobile, in collaboration with sensor agents. (Agents will provide management information of the underlying networks)

b. Creation of Information service center by utilizing organization skills, knowledge databases and navigation information. As an example Utility services mapping can be created by using utility databases, location maps of various utility centers, navigation maps of various roads / building in which utilities reside and they all can be mapped similar to network mapping. Using this many new services can be provided to general public.

[Domain2 : Service provider and Enterprises]: Application development and deployment knowledge along with process knowledge in setting up operation information center could be outsourced to enterprises and others as part of Social cloud OSS.

[Domain 3 : Operation service provider]: Social cloud OSS support for large Operations service center where in using RFIDs, Sensor networks and Home gateways services could be provided. For example in the case of Life cycle Parts management, impact analysis is possible using RFID events, the FCAPS and Link technology which are all part of the Social Cloud OSS. This could be a valuable application for the Operation information center to manage parts vendors, system integrators, transportation companies, and repair centers. Using Social cloud OSS these operators will benefit in analyzing quickly where the fault lies in the supply chain and this will also improve tremendously the quality of communication among various participating players.

Diagram 2: Social Cloud OSS in Operation support center



SCP : Service Creation Platform

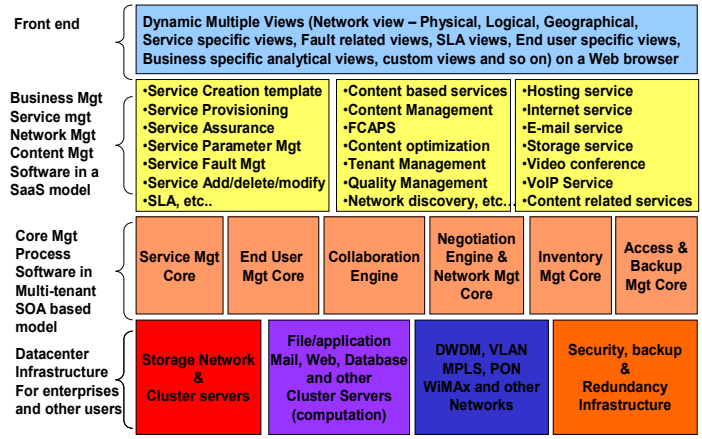


Diagram 3: Example of Operation management for Data center

VI. Key Activities for business advancement

In order to promote the concept of Social OSS and also to make it as a de-facto standard for Next Generation OSS development, Fujitsu has been actively participating in various standards community gatherings and numerous Telecom Expos. But, without the creation of a Social OSS Ecosystem, Standards communities and Strategic partnership for advancement activities, the desired progress is very difficult to achieve. Some of the activities planned are

1. Create a Social OSS ecosystem and participate in standards community for Social OSS advancement in domestic and overseas sites

2. Design Standard API and Open Source distribution for Multi layer SLO (service level objects)

3. Establish strategic partnership between value- added solution providers, value-added API for solution providers, operation service providers, carriers, equipment vendors, and ubiquitous and mobile vendors

VII. Conclusion

An attempt is made in this paper to show how OSS based services can combine with Cloud computing to deliver Social Cloud OSS based services for a larger community in a seamless way. At Fujitsu we are fervently working to enhance the Social Cloud OSS concept so that it can be taken to the market effectively.

Currently Fujitsu is developing an ecosystem to promote the use of Social OSS and also participating in standards development activities with world standard bodies to create new services markets and contribute to a bigger and better use of the next generation services network for the society at large.

Some of the other related activities that are going on in Fujitsu include:

1. Provide standards contributions especially for SLO and SLO storage technology definition

2. Technology deployment in Service Creation Platform by Model / Classification, SLO definition and handling, Architecture creation for core technologies and Functionalities such as benefit description taken from the real life next generation projects such as XaaServices (next Information center, Data center operation), Creation of Japan road map Information center, Creation of RFID-SENSOR service operation center.

3. Encapsulate domain specific services management business domain knowledge

It is our ardent hope that Social OSS will fuel next generation social networks to create a harmonious communications among its users using a multitude of services available on-demand anywhere, anytime, at a reasonable price based on usage. The idea is not only to develop a great product but also to create an eco system around it to enable anyone who has an intent and content to carry out business effortlessly

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IX. Authors Biography

Miyuki Sato is the General Manager and Principal Product Planner, Network Solution Unit, Telecommunication group, of Fujitsu Limited, Japan. Her current responsibilities include Product planning and development of Service/Network Operation Support System and applications based on "Modeling, Automation, and Service creation".

Past Experience:

Ms. Sato is part of the Telecommunications Systems development since 1995. She participated in the following development and support activities:

- CCITT CHILL Compiler development and participated in promoting PBX Business system and network management system for overseas market.
- CTI Call center application for Oversea market
- SONET/ATM VPN , VoD service /Network management

From 1995 to 2005 she was involved in Operation Support Systems and Services development activities.

- Published a paper on "Multi-media Integration for your Killer services," and created a product called Proactnes and new market for Service/Network Management-based on Top down approach- using Multi technology and Multi vendor environment.
- Also helped in the sale of Proactnes platform based service/network management systems to Carriers and large enterprise in Japan who are supporting IP VPN services, VoIP services and Streaming services

From 2005 to present:

- Created the idea of Social OSS and a new market for OSS to contribute to society and connect people by enabling social networking at both personal and professional levels