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An Enhanced SLA based Framework for Bulk Provisioning in Telecommunication networks

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Abstract: Telecom is a vast network and has many branches spread across technologies like Electronics, Communications, Information Technology and many. With the intersection of all these technologies only any Telco Operator can successfully provide his services best to its subscribers. The article dealt with Information Technology, Network Elements and how they are related with each other. This article proposes one of the operational support system (OSS) that helps for the smooth provisioning of various services to the mobile subscribers with Service Level Agreement (SLA) as a contract between a Service Provider (SP) and a customer. This framework which supports bulk provisioning can be used by any Telco operator for their efficient customer service. With this system architecture the end customer can be given a satisfied service within minimal time for the services like Provisioning of service to a new subscriber, providing various call features, data and voice services, GPRS, MMS, WAP and ring back tones as well. Such services/features can be provided/withdrawn for a given subscriber through this system.

Keywords: Bulk provisioning, Man Machine Language Command, Application Integrator, Home Location Registry (HLR), Virtual Location Registry (VLR), Short Messaging Service Center (SMSC), Caller Ring Back Tone (CRBT), Translated Provisioning Service Order (TPSO).

INTRODUCTION

There is a need for dynamic approach in maximizing profit and increasing optimization during the provision of services to end customers while ensuring the SLAs in place. A SLA is a Service Level Agreement i.e. made between the service provider and the customer to provide the services at its best. Violation of this SLAs lead to penalties to the service providers and puts them into revenue loss. Hence provisioning based on SLAs need to be taken on priority for any service provider. The traditional approach is based on the statistical approach and manual interventions. Also includes the legacy systems, slow in processing, more passive in mode while communicating with networks.

SLAs can be like provisioning of services in a stipulated time or customer notification on time or priority of the customers based on desired profiles or ensuring security of the customer's data over the network. SLAs are indirectly part of service provisioning since the resources that are necessary for a service to comply with SLA rules must be made available at the time of provisioning. Strict SLA rules may demand that redundant capacity is made available in the event of failure, whereas weaker or non-existent SLA rules may make it sufficient that an alternative path be found from available capacity and

be activated only if and when a failure occurs in provisioned capacity.

An SLA between a telecom carrier and its customers may specify the following:

- The minimum bandwidth that will be provided
- The amount of time the service provider guarantees the service will be up and running, usually a percentage such as 99.95 percent of the time
- Penalties for not meeting service requirements (e.g., an extra amount of free service in the next month), or nullification of the contract if the provider continues to fail to meet its requirements
- If the service is packet oriented over shared links, the level of QoS that will be provided for specific types of services
- Prioritization for real-time traffic such as voice

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The current study is done based on enhancing SLA based provisioning the customer services over various network elements. The network elements are those which we commonly find them in the telephone exchanges.

TELECOM NEEDS AND OPERATIONS

The bottom line is that telecom industry trends in OSS/BSS systems are just as critical as network hardware technology trends. According to network operators, the top telecom industry trends in OSS/BSS systems and architecture are being driven by service layer architecture and changing the need to manage customer experiences rather than subscription services. The major changes include the following:

A transformation from a supply-side to demand-side vision of the business;
A transformation from craft (operations personnel) support to automated support;
A transformation from management-as-an-overlay to management-as-service logic.

Here is the overview of what exactly the telecom support systems are and how they are related to each other.

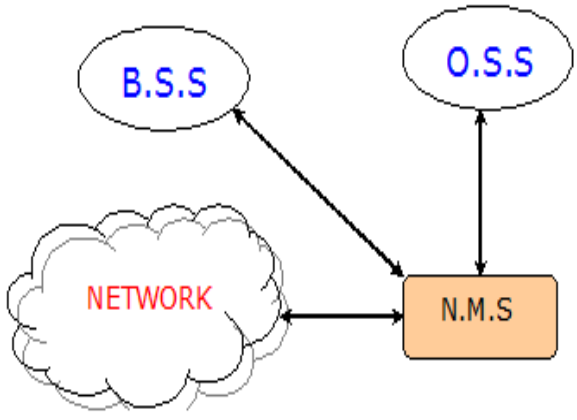

Fig 1. Telecom Network High level Model

- **Operational Support Systems(OSS)**

- These are the systems that are useful for the provisioning and execution of various services to its customer i.e. operations that leads to the business requirements. Ex: Service Provisioning, Inventory Systems, Work Flow engines etc.

- **Billing Support Systems(BSS)**

- These are the systems that are useful for the billing and charges related to customer related services that leads to the smooth business executions. Ex: Mediation, Billing and Revenue Assurance etc.

- **Network Management System(NMS)**

- All the support systems i.e. OSS, BSS and Network Element's health need to be monitored periodically. Hence a system that manages these elements in the network is Network Management System (NMS), to be configured with the details of the elements so that their health status will be monitored and alerted to the concerned engineers from time to time.

- **Network Elements**

A facility or equipment used in the provision of a telecommunications service. Such term also includes features, functions, and capabilities that are provided by means of such facility or equipment, including subscriber numbers, databases, signaling systems, and information sufficient for billing and collection or used in the transmission, routing, or other provision of a telecommunications service.

TELECOM DOMAIN E2E FLOW

- A customer purchases a new SIM card and he wants that to be activated.
- He then submits a form and relevant documents to the dealer.
- Dealer then submits it to the CRM application and feeds the details.
- He then sends details to Billing systems for data update and billing purpose.
- The number will be verified in the inventory and basic features and services will be provided for that number.
- It will be then sent to Provisioning Application for activation.
- This provisioning application then sends it to switch and activates it.
- Customer can now use the SIM card and make calls.

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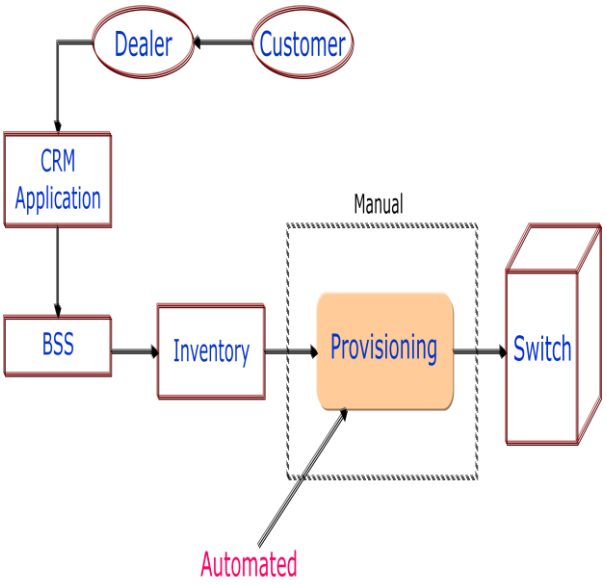

Fig2. E2E high level Telco Process

Legacy and Strategic Systems

Networks of old made money by providing technology to connect users, and services were derived from that technology. To achieve optimum return on investment (ROI), network equipment and services investments were made with a very long capital cycle. Products were expected to be in service from five-to-20 years or more.

Sustaining this long in-service period was critical, and OSS/BSS systems processes were tuned to manage the supply of transport bandwidth and connectivity, and to plan orderly capacity improvements. Network management and provisioning in this business framework were separated from service support and billing because the latter represented only the contractual commitments of resources from a pool. This vision of OSS/BSS systems is reflected in the TM Forum's venerable Enhanced Telecommunications Operations Map (eTOM).

Legacy system are built on outdated technologies and partially automated where it's consuming much amount of time in provisioning and communicating with the network elements and transforming the data across the networks. There are several systems being used in current environment for provisioning the services over different.

ENHANCED SERVICE PROVISIONING SYSTEM

Enhanced Service Provisioning (ESP) is one of the strategic operational support systems (OSS) that helps for the smooth provisioning of various services to the telecom subscribers i.e. mobile / landline / broadband / leased line subscribers. This support system can be used by any Telco operator for their efficient customer services. With this system the end customer can be given a satisfied service within minimal time.

These services can be like Provisioning of service to a new subscriber, providing various call features, data and voice services, GPRS, MMS, WAP and ring back tones as well. Such services/features can be provided / withdrawn for a given subscriber through this system. The current proposed system is dynamic system that can interact with various Network Elements (NEs) such as Home Location registry(HLR), Voice Messaging Service(VMS), Caller Ring Back Tone9CRBT), Multimedia Messaging Service Centre(MMSC), Wireless Access Protocol(WAP and Intelligent Network(IN) etc. To interact with these NEs the system should support with various communication protocols like HTTP, FTP, TCP/IP, Telnet etc. Also this system needs to interact with Customer Relationship Management System (CRM) to get the required inputs.

The below diagram depicts the eTOM framework and shows the importance of provisioning systems and activation of services.

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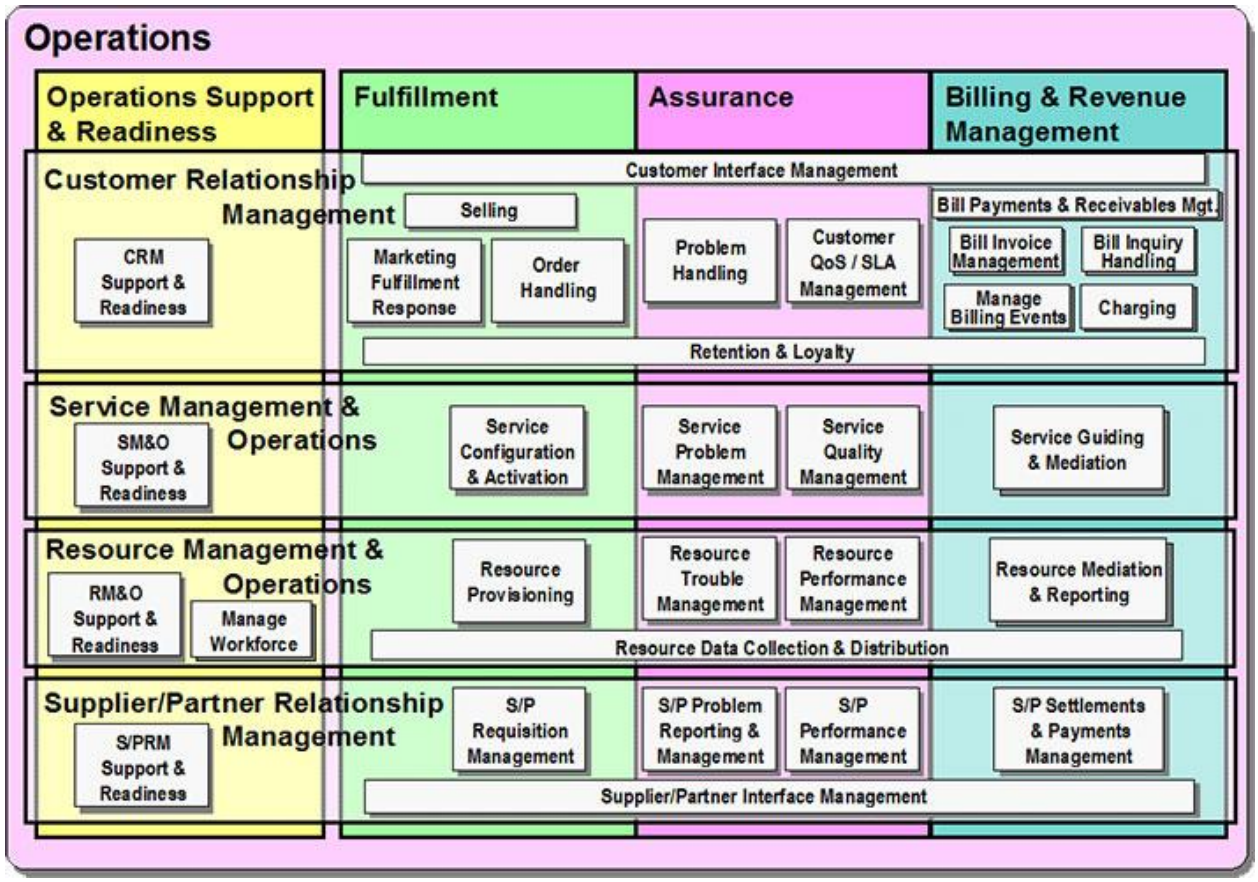

Fig 3. eTOM framework to be followed by Teclo

THE PROPOSED ARCHITECTURE

Provisioning Applications originates the provisioning requests such as new subscriber activation. The requests are stored in ***Application Databases*** that could be an RDBMS, ODBMS, XMLDBMS, LDAP, FTP and so on. Because the application database and structure of storage is proprietary to each provisioning application, ***Provisioning system*** will not be able to fetch the requests. In such case, an ***Application Integrator*** is used as a broker. An Application Integrator is a program that mediates between applications' proprietary database and ***Provisioning system***; the standard interface between Application Integrators and This is based on RMI. Once a request arrives at ***Provisioning system*** *through* Application Integrator, it will be mapped to one or more network (MML) commands and sent to ***NE Gateway*** which in turn forwards the commands to appropriate ***Network Elements*** for execution.

The features of the proposed system:

A configurable system that need to be made available for all generations of telecom i.e. 2G/3G/4G and future versions too.

Need to be made available for communicating with various network elements of different protocols i.e. telnet, ftp, ldap, web services, socket, tcp/ip, http etc.

Generic format need to be available for communicating with integrating systems i.e. usage of XMLs etc.

Concurrent execution of the orders to enable the Service provider meets the SLAs on time.

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Data will be encrypted to ensure that security is maintained along the data transmission.

Failure of order notifications to concerned engineers is made available.

Benefits of Proposed System

- Any format can be easily translated to the system understandable format/order.
- A unique format is maintained and configurable integrator adapter is made ready in order to make this provisioning system readily integrable with any of the CRM systems.
- Orders are maintained at each state levels in different queues in order to identify them and manage them for better SLAs.
- MML Commands against each network element will be identified based on the configured network elements for that operator.
- Generic adapters will be written for each network elements and data will be sent as packets through the secured protocol layers to the NEs.
- SMTP and SNMP protocols are used to send alerts based on the monitoring events
- Failures of orders need to be maintained on priority basis i.e. critical errors need to be notified immediately.
- SLA based provisioning is done i.e. VIP customers; regular customer etc. will be separated.
- Failed orders shouldn't be archived immediately and has ability to retry them when recovered from issues.
- Tracing of the each and every activity in the system is done through tracking mechanisms that enables the user to find out what's happening in the system at any point of time and makes him to debug easily when system fails.
- Security of provisioning the features is maintained at each level using customized user management.
- Bulk provisioning of orders is supported to enable SP reach the market at the earliest.
- This system provides the best provisioning of atleast 1 million orders per day on different network elements with which SLAs are met very easily.

INTERNAL FUNCTIONALITY AND MODULAR APPROACH

SLA management

Enhanced SLAs can be achieved through the configurable features like retry mechanism, SNMP MIB, recycling, priority provisioning, concurrent executions, future dated order mgmt etc.

Catalogue management

When a request Order arrives, it is parsed for Service activities. For each action, the configured MML are retrieved from ***Catalog*** Management. In case an activities cannot be resolved through (i.e., not present in) Catalogue manager, then an error is returned and incoming order is rejected. A order which is combination of actions and MML commands, its structure and its journey is drawn here.

Execution

The Orders Execution fetches all orders that are ready. Multiple subscribers orders can be fetched for execution through concurrent execution features. Priority of orders is given and based on priority also uses high to Low factor.

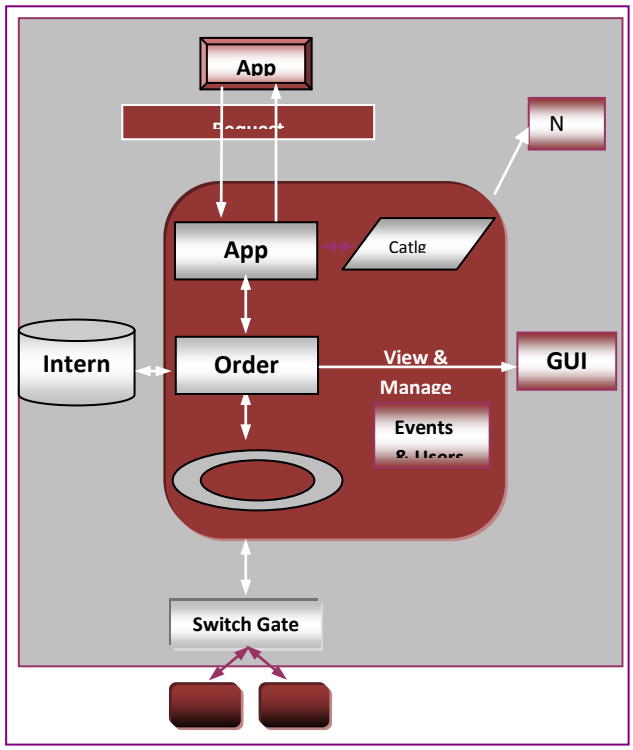

Fig4. Proposed system Modular Approach

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Switching Gate

The MML commands will be routed through switching gate with secured packets form to the different NEs.

Security Management

Security management does in two ways.

1. Data Security through user management module/activity level restrictions and

2. **Transmission security** through BASE64 encoding/decoding mechanisms.

Events Management

It's been identified that many events around 50 are happening in the system and those need to be tracked. The events such as enabling/ disabling the network elements or switching gates, order executions etc.

Notification Management:

- **SNMP Traps: SNMP (Simple Network Management Protocol)** which needs to be used to send traps (A string in a specific format that's understood by other application) to NMS application. So that NMS will notify the alarms based on the priority. This also needs to be handled on GUI as well.

- **Email Notification:** The **Events Handler** module introduced in the above will be tracking all events and not all events need to be notified and only few of them need to be notified. Hence those events need to be configured by the user when system is in live and then those need to be sent as mails to the particular user who ever is configured on the system.

Reports Management:

The required search functionality of orders through various filters can be done and also reports can be generated based on configured features. The different charts and graphs also can be generated for better presentation.

CONCLUSION

This proposed system is multi tired architecture and supports GSM, CDMA, PSTN, Broadband etc. Also can be connected to any upcoming and existing network elements. This is proposed for enhancing the SLAs with secured data management across the networks. This architecture enables to enhance for future requirements too.

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