Abstract

The recent decades have witnessed telecommunication service providers continuously invest in development and operations of OSS. This development has the primary purpose of supporting stable and efficient networks and service management. The number of OSSs that operate in the field has also increased, making OSS one of the most important investment areas for service providers. However, there appears to be lack of judgment for OSS development in respect to enterprise and long term vision. It is suggested that a new OSS architecture and an advanced OSS architecture model. In order to implement such an advance, it is suggested OSS architecture utilizing a TMF eTOM model be used. This paper introduces this approach and also shows standard(reference) application architecture for KT NMS. Finally, this paper introduces the target OSS architecture for integrated network management.
1 Introduction

Since the 1980s telecom network have expanded dramatically and accomplished a level of quality not previously seen. This has enabled today’s service providers to offer and array of telecom services. Similar to other carriers, KT invested considerable resources in developing OSS systems and operations to support automated operation of various network resources and services, and these works are on going in many diverse ways.

KT’s OSS development started in the middle of the 1980s and represents 20 years of progress. In the beginning, service providers to KT had PSTN centric business, later as various data network and services appeared many systems were developed to rapidly handle individual services. This resulted in KT having approximately 20 different OSS systems by the middle of 1990s, and the number of OSS systems has continue to increased to about 120 by 2006[1].

This trend resulted in IT resources becoming one of the most important areas in management; not only for service providers but also for companies in general. This has led to OSS having greater impact regarding investment with costs continuing to grow.

However, much of the OSS development and investment has been achieved through separate business and service development rather than done within a long- term strategic plan. Consequently, many silo systems were produced with a short-term view and have produced redundancy due to overlapping functions[2]. This lead to many network managers and/or system operators in the field becoming dissatisfied with the many OSS systems that are in place.

Clearly a number of factors have shaped the IT industry. The rate of expansion the IT industry has experienced over the previous 20 years would be a phenomena in any industry; coupled with a lack of historical benchmarks, a lack of experience in growth management within IT, and difficulties in administrating the interface of service providers, management, operators, along with other issues of expected of a new industry has contributed to the lack of strategic planning. Suggestions of an apparent inability to recognize the importance of strategic planning is to oversimplify the issues. Now, however, service providers are better placed to understand and plan for the future. The value an OSS plays as a main resource for strategically managing KT’s future as the data and management architecture. Without a long-term roadmap and OSS architecture for the whole enterprise it will be difficult to manage KT’s future with certainty.

This paper firstly examines a macro view of KT’s total OSS status with an analysis of KT’s current situation and problems. The paper then introduces a particular OSS architecture and explores OSS improvements designed to strategically manage future investment and long term development.

2 Current OSS Architecture Analysis based on NGOSS eTOM

This section describes the result of enterprise OSS status analysis before building the OSS improvement directions. In this paper we utilize the eTOM[3] which is a standard business framework tool to analyze the various roles and functions of OSSs based on the standard framework. Furthermore we suggest a to-be reference application (functional) model and discuss the improvement point of OSS architecture for KT through the gap analysis between the current OSS architecture and the to-be architecture.
To make a macro view of the current OSS status of KT, the OSS systems were positioned on the eTOM map allowing each system’s supporting business process area and positioning to be seen easily at one time. This provides a basic information map which enables analysis of each OSS role and function redundancy. An example of current OSS system analysis results is show in Fig. 1. This example was achieved by mapping all the systems to eTOM Level2 business processes. System information was based on data collected over a three month period.

As a result of this analysis, the following 2 main issues were derived.

A lack of supporting systems and architecture for the eTOM SIP area.

System development has focused on the eTOM Operations area, especially RM&O (Resource Management & Operations). This has resulted in major investment being made on the network and related facilities which are the foundation for the various services. Alternatively, eTOM SIP (Strategy, Infrastructure Product lifecycle management) area i.e. product development/strategy establishment/Infrastructure design (e.g. network engineering) is lacking any supporting system. But, recently there’s a trend of development, and support is gradually being achieved in the SIP area.

Absence of SQM business process supporting systems.

Actual support for SQM (Service Quality Management)[4] area is absent relative to the eTOM Operations area. It is assumed that this absence was caused by the legacy ‘network = service’ business structure. However, when it comes to other future environments requiring diverse services be delivered on an all IP simple network, the focus must be to move to the integrated end-to-end quality management and control of various points of network and service in customer and service view, rather than the preexisting network management view[5,6].

3 Building an Advanced OSS Architecture

Section 3 focused on the landscape for OSS status. This section describes a methodology for building an advanced OSS architecture model, finding improvement directions, discusses some output from the process, describes the reference architecture model for network management that comes from the process, and finally describes the major improvement point in an OSS architecture through a gap analysis.

In this paper we utilize the eTOM which is a standard business framework tool to analyze the various roles and functions of OSSs based on the standard framework. Furthermore we make a to-be reference application (functional) model and discuss the improvement point for the OSS architecture at KT through a gap analysis between the current OSS architecture and the to-be architecture.

There are many ways for diagnosing the current OSS status and establishing advanced directions; this paper adopted a Top-down methodology. First, each OSS system’s role and detail functions is analyzed for the entire OSSs, then an application (functional) architecture is drawn by standard functions which comes from combination of eTOM process decomposition and current OSS function analysis. The application architecture will be used as a reference model for network management OSS architecture.
OSS Function Analysis

- Performed Function Analysis Procedure for each OSS systems in KT
  - Extraction and classification of each OSS’ major function
  - The OSS functions were classified to Level 1~4 and normalized.
  - The OSS functions were mapped to eTOM level3 processes.

- Purpose
  - Gives base material for analyzing the current OSS status and problems more correctly
  - OSS Function analysis shows AS-IS status of KT OSS situation and also used for Gap analysis between the AS-IS and To-be(reference application model)
  - The specific functions are utilized for supplementing the standard functions from eTOM decomposition.

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OSS Function Analysis Example

3.1 OSS Function Analysis

OSS function analysis is a process that extracts each OSS’s major function, then classifies and arranges the system’s functional architecture. To analyze all system’s specific functions, we collected and examined the system development document and some in depth analysis was conducted by interviewing system developers.

Each system’s functions which were extracted by the above process were classified to the levels 1~4 and these were mapped to eTOM level3 functions. The function analysis result is used as basic data for current gap analysis OSS architecture and advanced reference functional architecture in later stage, and is also used as basic data for writing an application model.
3.2 Standard Recommendation Functions by eTOM Process Analysis

The maximum detail level of eTOM process is now in level3 just as a guideline and it explains rough core business artifacts for each job area. Therefore, it needs more subdivision to write a new advanced reference application map or architecture in functional level for actual OSS development.

In this paper, the eTOM RM&O assurance process in Operations part was decomposed and standard core functions regarded as essential for the business process support were derived in the (1-2) eTOM process analysis step and (2-2) eTOM process decomposition. However direct eTOM process decomposition has a limit, so first the actual functions were extracted from the current OSS systems in place as bottom-up approach and generalized these functions and then merged with eTOM decomposition results. That is, first more detail function level process was derived from the eTOM decomposition to lower than level4 and merged with the OSS function analysis data. This enables establishing more real world reflecting standard architecture.

Some standard or recommendation functions of RM&O process decomposition derived from this process step are show in Table 1 and are representative of standard functions for Resource Trouble Management and Resource Performance Management process.
3.3 Reference Architecture Model

Based on the standard functions for each eTOM process from the above processes, new application architecture for network management system was written by grouping the functions to proper components. This reference application architecture will be used for gap analysis with the current OSS functions and function blocks and then this produces a base data for building a to-be NMS architecture.

The reference application architecture includes Rule/Policy Management additionally, requiring the future advanced NMS goals to end-to-end process management and automation, therefore this is enabled by rule management. Network management system’s role was extended to include Provisioning functions also.

3.4 Gap Analysis and Advanced Capabilities for Network Management

This section explains a To-be integrated NMS model and some advanced capabilities that are derived from a gap analysis performed between the current OSS function, architecture and reference application architecture.

This paper conducted a gap analysis to grasp the differences between the reference application model for network management as described above and the OSS function analysis results. In this gap analysis, a comparison of core functions’ existence, nonexistence in the current system, analysis of the function structure, and the complementary and additional functions were derived for future NMS. From this gap analysis, current problems and some major recommended functions for future NMS implementation were produced as follows.

- **RCA (Root Cause Analysis) Function**

This function traces the location of trouble occurrence, analyzes the root cause for the network trouble and reports the analysis result using various testing methods. Currently most RCA process is done manually initiated by an operator’s decision, although the main role of NMS is still imbedded in an alarm event report. Therefore this function targets the total trouble recovery process time and raise the effectiveness through the pre-built normalized and automated trouble analysis procedure.
Advanced Capabilities for NMS

- **Gap between As-is and To-be**
  - **RCA (Root Cause Analysis)**
    - Capabilities as finding, analyzing root cause when network trouble occurred
    - Finding trouble event starting point on network topology
    - Separating root trouble and branch trouble
  - **RPDR (Resource Performance Degradation Report) Creation and Control**
    - Trouble and other event ticket management for performance management
  - **Analyze and Control Functions for Performance Degradation Resolution**
    - Evaluation for performance degradation and threshold (KPI/KQI) cross
    - RCA for performance degradation

- **Intelligent NMS**
  - **Supporting End-to-end Business Process Automation**
    - BPM approach in network operation and management area
    - Business process management and automation
  - **Policy-based Management System**
    - Auto-handling process based on pre-defined rule model
    - Building Rule set and management for business process automation
    - Building Rule set by extracting best practice from field experts

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RPDR (Resource Performance Degradation Report) Creation and Management

This is a type of trouble ticket in performance management. A performance ticket is also required to trace and resolve a performance degradation event and manage it continuously. In the future, more sophisticated quality management architecture for the various personalized and individual service quality will require this capability.

Analysis and Control Functions for Resource Performance Degradation Resolution

This function conducts the RCA for the performance degradation or crossing threshold event utilizing cause analysis and evaluation. This also includes resource control functions (e.g. QoS parameter and bandwidth control) for the resource performance degradation resolution.

This paper previously described advanced capabilities for NMS from the gap analysis and the following paragraph describes improved ways in higher view.

End-to-End Process Automation

Until now OSS concentrated on automation of individual parts from the entire business process, but henceforward OSS trends must go to an end-to-end business process management and automation, minimizing the operator’s manual job and intervention. Especially in operation, centralizing, and unmanned network management and operation trend for cost reduction, automation area must be extended for fulfillment and network trouble management works in respect to network management. Therefore, if the current network management system stayed in a gathering network events and alerting to operator, it should evolve to the system that manage, support, automate the after business process i.e. localize the trouble in topology, diagnose the root cause of network trouble and control for recovery.

Network Management based on Policy

The policy of defining each condition and reactive actions regarding best practices is built up on a knowledgebase from the continuous operation and management[7]. As discussed earlier, in order to realize the more extended process automation operator’s know-how must be reflected to OSS functions done by manual processes and for this goal the policy based management architecture is required. Therefore, operator’s trouble shooting know-how and procedures must be built based on a knowledgebase of policy or rule. In other words, through the investigation of the standardized policy (rule set) for actual operation examples and definition, a turn over to policy-based system is required.
3.5 Advanced OSS Architecture for Integrated Network Management

As described in section 2 about OSS situation in KT that has many distributed systems and function duplication, therefore core advanced functions and future directions from gap analysis made a to-be integrated network management model.

In lower end of the picture IP NMS, TN NMS stands for a integrated management system for IP domain and transmission network each, these systems manages the backbone and access network without division.

The system in the middle of the picture is a total network fault management system and provides an integrated view of total network. It not only unifies and provides alarms and fault events from each the individual domain network management system, but also provides the analyzed the root cause through the inter-domain correlation and notifies the results to the network management system. In addition, these integrated fault information and RCA results are delivered to the systems of CRM and SM&O layer in eTOM and also delivered to workforce management system when needed and let the field worker can be dispatched to the trouble spot. Total fault management system inter-works with H/W server monitoring systems and electronic power monitoring systems as well, therefore it enables a integrated fault management for entire resources.

4. Conclusion

As diverse network facilities and services are introduced, various OSS/BSS systems for supporting this environment are also developed and in operation, but now the enterprise dimension management architecture is needed about entire OSSs in respect to OPEX reduction and effective operations.

This paper diagnosed overall OSS’s current operating situation and their problems and to solve this matter conducted an approach based on the standard business process framework i.e. TMF eTOM. That is, it looked into the entire OSS architecture in KT and analyzed the current status and problems based on eTOM and derived the standard functions for the eTOM process and functional architecture for NMS. Also, presented core advanced functions and future directions which must be considered in OSS/NMS development by the gap analysis with the reference architecture and draw a to-be integrated network management system model.

References

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