NGOSS-based convergent OSS framework using BPM for converged e-business environment

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ABSTRACT

Recently, most wired telecom service carriers are faced to decreasing of the number of subscriber because of the expansion of wireless market and blocking of net earnings. To overcome that business environment, telecom service carriers try to change their service infrastructure from network-focused service to value-added and customer-focused one that can create new value. Such changes will ultimately bring forth a service and network convergence. This also entails paradigm shift in operational management and now most service carriers are rushing to build a new converged Operational Supporting System (OSS) to efficiently accommodate the network evolution. To cope with this new business environment, KT had driven NeOSS (New OSS) [1] project, which total expense is about 1.5 billion dollar, to build convergent OSS for past 3 years.

This paper proposes convergent OSS framework, NeOSS framework, complied with NGOSS (New Generation Operations Systems and Software) [2] and e-TOM (Enhanced Telecom Operation Map) [3]. After that, we describe three architectural core principles considered to build NeOSS, which are business process integration by using BPM [4] (Business Process Management) technology, distributed application integration by using EAI [5] technology and web service. Lastly, we make a conclusion.

Keywords: NeOSS, NGOSS, web service, BPM and EAI.

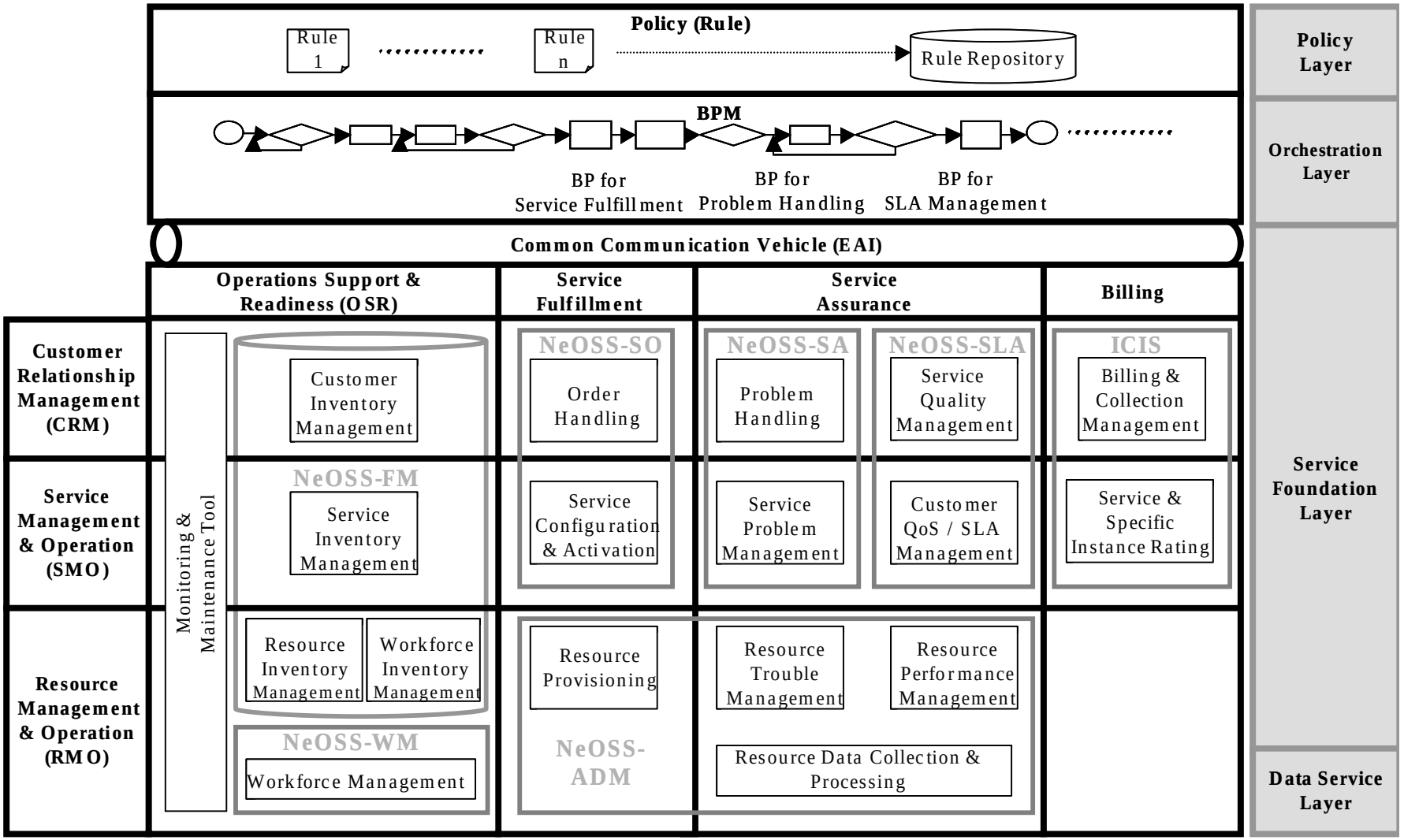
1. INTRODUCTION

The legacy OSS that most service carriers own has deficiencies in supporting converged service operation. Most siloed OSS constructed individually according to each domain technology raises problem due to lack of consolidated inventory DB. This problem may lead to make integrated service management impossible due to lack of cross-connection data, increased data inconsistency, and deteriorated data integrity, which will call for an ensuing rise in operating expenses and lower competitiveness of the service carrier. Another problem in siloed legacy OSS is lack of integrated service management. This problem may lead to make service carrier's fast business process changes according to market change impossible and deteriorates customer satisfaction. To solve these problems, some service carriers make an effort to build integrated OSS and most service carriers engaged in next-generation converged OSS projects are using NGOSS as a blueprint for their next-generation OSS. In NGOSS, some essential factors are defined for next generation OSS from an architectural point-of-view through its core principles to functional point-of-view through its e-TOM: the business process framework that a telecom service carrier should observe is defined by e-TOM and application architecture of next-generation OSS is provided through core principles in TNA (Technology Neutral Architecture) [6]. Meanwhile, a new IT trend to support this is beginning to be applied in OSS, and some of the leading technologies include BPM, EAI and web service. In NeOSS project, we had tried to build next generation OSS complied with NGOSS. To reach that, some new IT technologies had been used in NeOSS project.

2. NeOSS overall system architecture

KT 'NeOSS' system architecture is based on NGOSS e-TOM. The detail is as follows.

According to NGOSS e-TOM, service carrier's enterprise management field can be categorized largely into Strategy, Infrastructure & Product (SIP) [7], Operations (OPS) [8], and Enterprise Management (EM) [9]. Among the above three fields, the scope of proposed NeOSS is limited to OPS. The area of OPS is sub-divided into vertical and parallel process groups as shown in figure 1.



<Figure 1. NeOSS Overall System Architecture>

From the perspective of the vertical OPS process group, the scope of the proposed NeOSS system is limited to 'Service Fulfillment', 'Service Assurance', and 'Operations Support & Readiness' excluding 'billing' which can be categorized into the BSS (Business Supporting System) fields. From the perspective of the parallel OPS process group, NeOSS aims to build a part of CRM (Customer Relationship Management) [10], SM&O (Service Management & Operation) [11], and RM&O (Resource Management & Operation) [12] excluding S/PRM (Supplier & Partner Relationship Management) [13]. For reference, BSS is not covered in the NeOSS coverage and KT already had integrated BSS named as ICIS before NeOSS. Based on process group suggested by NGOSS e-TOM, the NeOSS system is categorized into five areas as following Table 1.

As shown as Figure 1, applications to be implemented on the NeOSS will be based on Layered Application Architecture, and are classified into three layers of policy (rule), orchestration (workflow), service foundation layer, and data service layer. This architecture is developed based on the NGOSS TNA core principles, that is, 'Policy-enabled Architecture', 'Externalized Process Control' and 'Contract-defined Interface' as well as SOA (Service Oriented Architecture). The more details of each layer are as follows.

- ***Policy-Layer:*** Policy-layer is on he topmost layer of the layered application architecture where flexible adjustment and control of orchestration (business process), modeling through policy (rule) editor, and storing to the policy (rule) repository take place. It functions as the core tool for achieving business agility that can control corporate business processes in real-time.
- ***Orchestration-Layer:*** Orchestration refers to workflow or a composite service that is formed by combining fine-grained atomic operations implemented in the service foundation layer.
- ***Service foundation-Layer:*** This refers to the smallest unit of reusable operations and it also is the smallest unit that forms orchestration. It processes business logic and may call DSL when needed.
- ***Data service-Layer:*** This refers to a data processing service that acts as common API for DB access in data processing.

System	Objective
NeOSS-SO (Service Ordering)	The objective of NeOSS-SO is to issue customer order, automatically configure and activate customer services and related network element in a flow-through manner. NeOSS-xNMS, NeOSS-WM and NeOSS-FM can be interoperated if needed in achieving the objective. Meanwhile, upon completion of all the processes, related information will be updated up-to-date on NeOSS-FM if needed. After internal process, NeOSS-SO sends a billing request to KT BSS named as ICIS.
NeOSS-SA (Service Assurance)	The objective of NeOSS-SA is to troubleshoot customer's service automatically in a flow-through and end-to-end manner. If necessary in achieving the objective, it will also interoperate with NeOSS-xNMS, NeOSS-SO, NeOSS-WM and NeOSS-FM. Meanwhile, upon completion of all the processes, related information will be updated up-to-date on NeOSS-FM if needed. After internal process, NeOSS-SA sends a billing adjustment request to KT BSS named as ICIS.
NeOSS-SLA (Service Level Agreement)	The objective of NeOSS-SLA is to guarantee SLA for customer service automatically in a flow-through and end-to-end manner. If necessary in achieving the objective, NeOSS-xNMS, NeOSS-SA and NeOSS-FM will be interoperated. Meanwhile, upon completion of all the processes, related information will be updated up-to-date on NeOSS-FM if needed.
NeOSS-FM (Facility Management)	The NeOSS-FM is a consolidated database and is implemented as a single database by integrating service and resource inventory that make up the KT network and service as a single platform. This allows management of each service and detailed network parts while providing a method to monitor the facility in an integrated view and to manage end-to-end service configuration information. If necessary in achieving the objective, it will also interoperate with NeOSS-xNMS, NeOSS-SO, NeOSS-SA, NeOSS-SLA and NeOSS-WM.
NeOSS-WM	The objective of NeOSS-WM is to automatically provide automatically field

(Workforce Management)	operation in processing service management in a flow-through and end-to-end manner. It provides functions such as field 'job scheduling', 'issuance of field work order', and 'mobile order dispatch,' required for each system through interoperation with other systems such as NeOSS-SO and NeOSS-SA.
NeOSS-xNMS (Network Management System)	The objective of NeOSS-xNMS is to manage all the networks of KT in an integrated manner. The xNMS applications are composed of management blocks for fault, performance, and configuration, which are required for integrated network management. KT NMS is largely categorized into NeOSS-ADM (Access Domain Manager) and Core NMS. During NeOSS project, NeOSS-ADM was newly designed and implemented but Core NMS was reused the legacy NMS.
Monitoring & Maintenance Tool	The objective of monitoring & maintenance tool is to monitor status of all applications and business processes in an integrated manner. Monitoring & maintenance view can be classified by the types of user group, which one is application view for monitoring system reliability the other is business process view for monitoring process efficiency.

<Table 1. Management blocks and objectives in NeOSS>

3. Process management by using BPM

The NGOSS recommends that all business processes should be managed by process controller externalized from application and policy business rules which can be changed frequently by business enabler also externalizes from business process layer. According to the recommendation of NGOSS, all business processes (or workflows) in NeOSS had been implemented, executed and monitored integrally through BPM. Also, all business policies or rules in NeOSS had been implemented with rule-engine for easy change. At the NeOSS design step, we had defined KT's standard business processes for service fulfillment, problem handling, and SLA management activity by means of decomposing e-TOM level 2 or 3 processes into more lower level such as level 4 or 5. The following Figure2 shows business rules and end-to-end business process flow for service fulfillment in NeOSS, in case of requesting for new service provisioning request of DSL service. More detailed description of each process step is as follows:

(1) ***RCR (Receive Customer Request)***: In first, call center's operator or CCO receives customer service request by telephone or on web site.

(2) ***CCO (Create Customer Order)***: Based-on received information, CCO issues customer order.

(3) ***COF (Check Order Feasibility***): On receiving customer order, COF determines customer order can be supported now or not. To determine order feasibility, COF checks availability of service, network, and human resource for supporting requested product.

(4) ***CCR (Check Credit Rating)***: If COF process successes, CCR checks customer credit rating.

(5) ***ACC (Authorizing Customer Credit)***: According to KT risk management policy, ACC ensures that customer's credit grade is eligible for product offering. This process decides credit risk based on action enabling rule stored in rule repository.

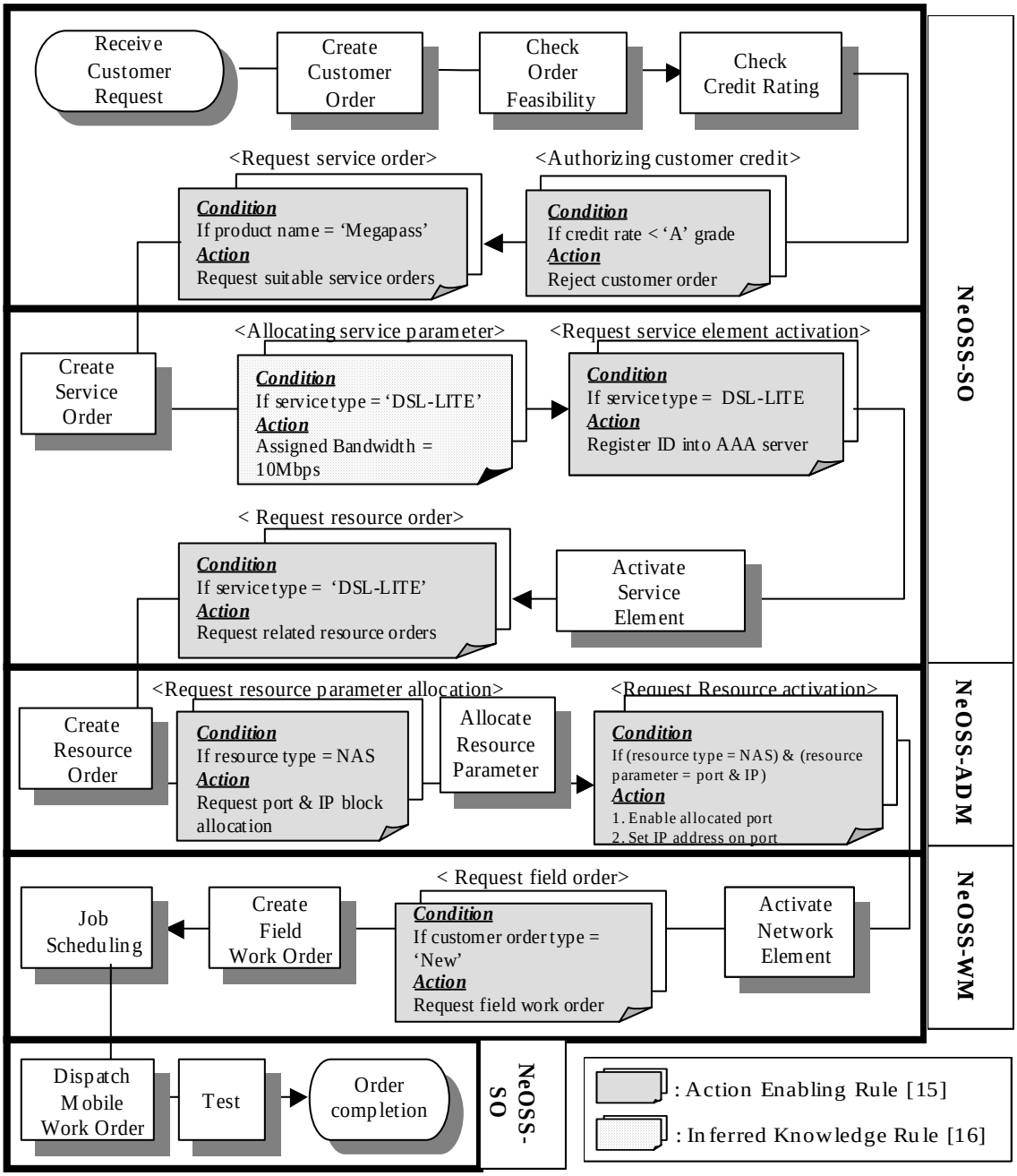
(6) ***RSO (Request Service Order)***: If customer credit is successfully authorized by ACC, RSO request CSO to issue service orders that need to deal with service configuration & activation. At this time, multiple service order can be issue for each customer order. To determine what kinds of service orders are needed for each customer order, RSO refers to pre-defined action enabling rules [14].

(7) ***CSO (Create Service Order)***: On receiving the request of service order, CSO issues service orders.

(8) ***ASP (Allocating Service Parameter)***: KT DSL service, brand name is 'Megapass', has some service specific parameter of each service type, such as bandwidth, disk volume assigned for free e-mail service, etc. To allocate service parameter, ASP refers to pre-defined inferred knowledge rules [15]. This rule can be frequently changed in accordance with enterprise policy change.

(9) ***RSA (Request Service element Activation)***: If ASP process is successfully completed, RSA request ASE to activate service element. To determine rule for service activation, RSO refers to action enabling rules. After finishing, RSA sends an activation request to ASE with service parameter.

(10) ***ASE (Activate Service Element)***: On receiving the request of service activation, ASE configures and activates service element.



<Figure 2. Service fulfillment orchestration by using BPM & Rule-engine>

(11) ***RRO (Request Resource Order)***: After activating service elements, RRO requests CRO to issue service orders that needs to deal with resource provisioning. At this time, multiple resource order can be issue for each service order. To determine what kinds of resource orders are needed for each service order, RRO refers to pre-defined action enabling rules.

(12) ***CRO (Create Resource Order)***: On receiving resource order request, CRO process issues resource orders.

(13) ***RRPA (Request Resource Parameter Allocation)***: Network resource can be categorized into logical and physical resource. Also, logical and physical resource parameters are essential for resource provisioning. RRPA decides what resource is needed for resource provisioning and which resource parameters must be allocated into each resource, and then RRPA requests ARP to allocate resource parameter.

To determine what resource and which parameter must be allocated, RRPA refers to pre-defined inferred knowledge rules.

(14) ***ARP (Allocate Resource Parameter)***: On receiving RRPA's request, allocate resource parameters.

(15) ***RRA (Request Resource Activation)***: If ARP process is successfully completed, RRA requests ANE to activate network element. To determine rule for resource activation, RRA refers to action enabling rules. After finishing, RRA sends an activation request to ASE with service parameter.

(16) ***ANE (Activate Network Element)***: On receiving resource activation request, ANE configures and activates network element.

(17) ***RFO (Request Field Order)***: After activating network elements, RFO requests CFWO to issue field orders that needs to deal with field operation. To determine the necessity of field operation, RFO refers to pre-defined action enabling rules.

(18) ***CFWO (Create Field Work Order)***: On receiving field order request, CRO process issues field order.

(19) ***JS (Job Scheduling)***: After creating field order, JS is used to optimise & refine field engineer assignment to ensure the b est fit for the task.

(20) ***DMWO (Dispatch Mobile Work Order)***: After finishing JS process, DMWO issues mobile order. When field engineers connect to the system via their mobile devices, they automatically receive comprehensive on-screen instructions on the work are assigned.

(21) ***Testing***: When a field operation is finished, field technicians must notify back office system. Prior to the final notice of the requested customer order, this process make a final test to ensure that service is running without problem.

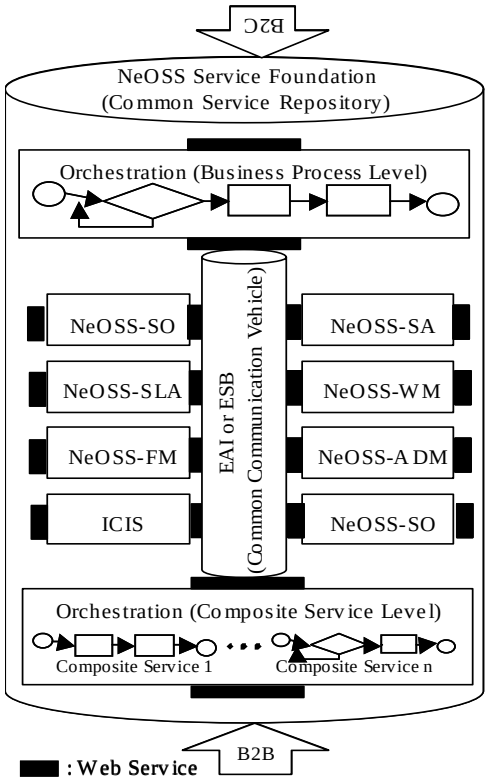
(22) ***OC (Order Completion)***: If testing completes successfully, OC makes a customer, service and resource profile into consolidated inventory DB, that is NeOSS-FM, and reports the result of customer order to the BSS in order to initiate the billing process.

4. Enabling e-business by using EAI and web service

In the NeOSS, EAI and web service technology provide a basis for integration of distributed applications (or service) and core mechanism for asynchronous message communication between applications (or service). Also all applications that be implemented in NeOSS system used standard interface, web service, which is independent on any kind of Operating System (OS).

However, in an exceptional case where it may have adverse effects on system functionalities (e.g., periodic batch processing or large bulk message sending), it will be allowed to use any other interface (e.g., FTP). Meanwhile, the standard message format among applications is XML. For platform used to implement BPM & EAI, commercial products had been used, which is MS (Microsoft) Biztalk 2004.

The following figure 3 shows how NeOSS interoperates between applications (or service) and how NeOSS is improving to success in new e-business environment.



<Figure 3.Aplication integration in NeOSS>

5. Concluding Remark

The next generation OSS must support not only to launch in a more prompt way new converged services but also to change business processes in a more flexible fashion according to ever-changing market trend and new business strategy. In addition, telecom service careers must easily coordinate and control distributed networks and services for prompt service delivery without any significant delay time. But till now, most service

carriers have had static business process control mechanisms in their OSS architecture.

The proposed BPM-centric OSS framework provides the way for building flexible management architecture required in order to rapidly develop, deploy, and change core business processes according to market changes. Also, service carriers will easily collaborate for making new e-business between carriers by using web service.

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