Chapter VI

Towards a Framework for Managing the Business-to-Business e-Commerce Chain

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The rapid of growth in e-Commerce/e-Business provides new opportunities and challenges for next generation Internet and telecommunication service providers. The collective global e-Commerce activities is estimated to exceed $6 trillion dollars in 2004. However, a key element in successful e-Commerce/e-Business operation is the improved integration and management of the e-Business value chains (i.e., management of business-2-customer (B2C) and business-2-business (B2B) chains. Current e-Business managed solutions, where available, tend to concentrate on only single aspects of the e-Business integration e.g., outsourced accounting management or virtual private network (VPN) services. This is analogous to first generation telecommunication management systems which delivered stand alone management applications for specific management concerns e.g., perfomance management and configuration management. However, e-Business

organizations of the future will require a more holistic, integrated approach to e-Business management networks. Such e-Business services would support integrated management solutions (e.g., Quality of Service, accounting, service level agreement, negotiation and management, virtual private network mgt. etc.), across the B2C and B2B value chain.

This paper proposes a management component framework to support the rapid and flexible construction of an e-Commerce management infrastructure. This management solution is based on a holistic management approach supporting seamless integration of network and application management services (i.e., vertical), as well as integrating management across distinct functional areas (i.e., horizontal). The chapter also presents an analysis of the business model for a provider of such B2B and B2C management and examines the requirements for such management services. It also identifies best practice and state of the art research, upon which this framework is based and describes how this research is being developed as part of a large EU telecommunications research project.

DRIVERS FOR INTEGRATED MANAGEMENT OF E-BUSINESS VALUE CHAINS

In the business-to-business value chain, providing "e" services means much more than building Web-front interfaces with fancy features to end customers. An e-Business value chain can be defined as commerce conducted between businesses over an Internet, extranet or intranet (i.e., IP networks). The rapid growth in e-Business is enormous. While organizations in different countries move online at their own pace, their collective e-Commerce activities is estimated, by Forrester Research Inc. to reach $6.8 trillion dollars, or 8.6% of the global sales of goods and services, in 2004 (Sanders 2000).

A key aspect in successful e-Business operation is the integration and management of the e-Business value chains (i.e., management of business-to-business chains). Research has consistently identified that a crucial element of successful e-Business operation is the ease and flexibility of *integrating and managing* inter-business interaction. However, in ever increasing competitive markets, organizations are focusing on their own key market competencies and seeking *outsource managed solutions* for non-core competencies.

Such e-Business requirements provide new opportunities and challenges for next generation Internet and Telecommunication service providers. In order to support e-Businesses across their supply/value chains, these next generation Internet and Telecommunication providers must offer dynamic, managed communication as well as inter-organizational application service management.

Thus, in much the same way as organizations have become reliant on third party managed connectivity services, e-Businesses are beginning to seek managed e-Business networks where the e-Business value chain is managed and supported as an integrated service. Providers of such e-Business management services must

provide managed solutions across e-Business value chains (end to end management of B2B supply chains).

Current e-Business managed solutions, where available, tend to concentrate on only single aspects of the e-Business integration e.g., outsourced accounting management or traditional virtual private network services. This is analogous to first generation telecommunication management systems which delivered stand alone management applications for specific management concerns e.g., performance management, configuration management. However, the lessons learned from such "stand alone" management applications were that management function integration was vital to support increasing customer demands. Such integration was difficult if not impossible, if integration had not been considered from the outset. Thus, rather than developing piecemeal, isolated e-Business management applications, more functionally integrated solutions are required. Hence, e-Business management services must be constructed rapidly and dynamically across different management functional areas.

An e-Business management provider would:

- Support the seamless extension of a customer organization's Internal business processes across existing or new e-Commerce value chains.
- Support an integrated Service Level Agreement for the end customer which should be dynamically negotiable thus allowing faster service subscription (to the e-Business management services).
- Support automated processes for creation, activation, delivery support, accounting and billing, of the end-to-end e-business chain, in order to allow real-time service provisioning

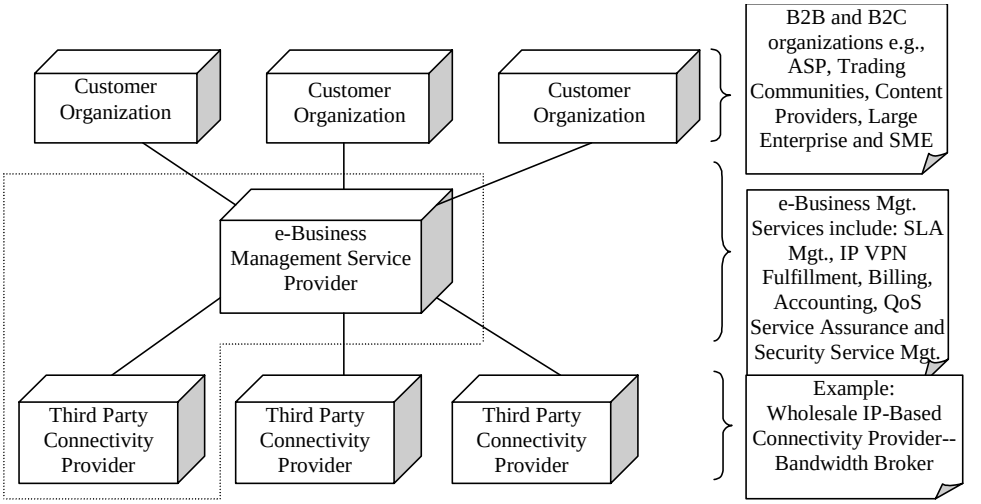
In this way an e-Business management provider may aim to offer a one-stop-shop for outsourced B2C and B2B management.

In this chapter we first present an analysis of the business model for a provider of such B2B and B2C management and examines the requirements for such management services. Then a component framework is proposed to support the rapid development of e-Business managed solutions. The chapter also illustrates the operation of such a framework in the flexible construction of an integrated VPN-based management service using Internet protocol (IP) Quality of Service guarantees. It identifies best practice and state of the art research, upon which this framework is based and describes how this research is being developed as part of a large EU telecommunications research project.

BUSINESS MODEL FOR E-BUSINESS MANAGEMENT PROVIDER

The e-Business management service (e-BMS) provider is a "managed solution provider" offering a range of services, including managed connectivity (advanced VPN), accounting, managed security, quality of service management of both connectivity service and application services. Figure 1 illustrates a generalized e-BMS provider and its relationship with potential customer(s).

Figure 1: Generalized business model for e-business management service provider



The business model supports several types of potential customer organizations types, namely

- Customer organization which uses the e-Business management provider to manage its B2B co-operation;
- Customer organization which is a consumer of a 3rd party service (the access to which is managed by the e-Business management service provider);
- Customer organization which is an application service provider, and which uses the e-Business management provider to manage certain parts of the application service (e.g., accounting, quality of service etc.). An example of such a customer is an ASP providing online IT solution to businesses, online trading community mediating any-to-any transactions amongst businesses (auctions, exchanges, aggregation), and SME and large enterprise in a selling-chain or supply-chain.

Figure 1 also illustrates that the e-Business management provider may utilize the communication services of an Internet provider/wholesaler or may be an Internet provider itself. It is also important to note that the e-Business management provider may have business relationships with one or many Internet providers, and that Customer organizations may exist in one or multiple Internet Provider domains.

The generalized business model also identifies two inter-organizational interface types, the customer interface (for the managed service) and the interface between the e-Business management provider and the Internet Provider.

The Value Added Aspect of E-Business Management

Customer Perspective

The value-added aspect of e-Business management service for Customer Organizations is that it offers a single service interface providing access to a well-

integrated set of customer management services. The provision and operation of these services can be defined within a single service level agreement. Thus enabling the customer, for example, to place management service orders, check the status of existing orders and check the performance of their services against the SLA. An important gain is the ability for Customer Organizations to speed up their business transactions and to have access to highly managed services at lower cost.

Service Provider Perspective

Competition is driving the customer need for faster service access at lower cost. However Service providers need to differentiate themselves by providing more than just basic connectivity services in order to create new revenue streams and increase their overall return. The advantage of e-Business management service in such a context is that it allows the e-BMS provider to provide dedicated solutions to customers, which speed up the provisioning of services and reduces the cost of the integration of different management components. Furthermore e-BMS will enable service providers, in the role of e-BMS provider, to generate new revenue streams by widening the range of customers.

Requirements for e-Business Management Provider

In order to realize such management services, the e-Business management provider must apply flexible software architectures and components to respond rapidly to customer needs. Three important technology requirements can be identified as:

- A flexible software architecture for rapid management system construction;
- Use of off-the-shelf management components to reduce cost and increase reliability; and
- Use of open interfaces and relation to standards needed for inter-domain management interactions.

Requirements for e-Business Management Services

The e-Business management service could comprise management services supporting the e-business needs of dynamic federated organizations that conduct business across intranets, extranets or Internet. Customer organizations of such E-BMS would be Small-to-Medium sized Enterprises (SMEs) participating in business-to-business e-commerce or Application Service Providers (ASPs) and their customers. The dynamic nature of the customer organizations places stringent service requirements on the design and implementation of the e-Business management service. The main customer requirements are:

- A consistent view of e-business communication/information services (operating across the e-Business value chain).
- A single customizable interface for services operation (across the e-Business value chain).
- Low cost of adding new e-business services (i.e., based on low overhead new service integration).

- Support for dynamic restructuring of the e-commerce value chain by allowing the rapid introduction and removal of services from the value.
- Capability to dynamically introduce and customize new e-business services.
- Flexibility in choice of service provider.
- Ability to customize service feature from the desktop.
- An integrated service accounting and billing service irrespective of the origin of the service (operating across the e-Business value chain).
- A clear audit trail for service monitoring and performance management.
- The e-business services should be capable of integrating with traditional communications services.

In effect the customers view services not as standalone services requiring separate customer service parameters, but rather as service applications of a integrated e-business service. The additional value provided by the e-BMS provider is that the e-BMS system acts as a mediator between the customer and the individual application and value added service providers systems.

A COMPONENT BASED E-BUSINESS MANAGEMENT FRAMEWORK

The pressure to rapidly develop new services to operate over Internet based networks has left little time for the development of an open architectural framework for management systems in this domain. However, without some common architectural principles to guide the analysis and design of systems that manage these IP-based services, the industry runs the risk of finding it increasingly difficult to provide high-quality (and thus high value) services capable of interoperating with peer services and provide open customer management facilities. More importantly, the cost of developing such services and the lack of an agreed standardized management architecture will deter software vendors from investing in developing low-cost off-the-shelf component for this market.

Thus, a key aim of this work is to try and establish an Open Development Framework to assist in the development of new services and to promote the development of commercial off-the-shelf software component for management systems. The proposed framework consists primarily of the concepts listed below.

Business Roles

Business roles are abstract roles that may be taken by a business organization and which can be used to describe its participation in a business relationship. A business organization can take up any number of business roles at any one time, depending on the business relationships in which it is currently involved. Business roles can also be used for relationships between reconfigurable organizational units within the same enterprise. The framework contains a predefined set of abstract roles to aid analysts to define their particular set of business relationships.

Reference Points

These are used to establish the open interoperable specifications to which the interfaces of management systems may conform either completely, in part or not at all.

The framework proposes the business roles and references points shown in Figure 2. The model is focussed on an e-BMS provided by an e-BMS provider to a group of e-BMS customers via an e-BMS-Customer Management reference point. The e-BMS customers may be a group of cooperating peer organizations or an ASP supplying multiple customers utilizing the e-BMS (the AS-CP reference point support the direct application service provision interactions). The model also identifies a guaranteed Quality of Service Internet Protocol service (GQIPS) provider role. This may receive DiffServ traffic from a customer (via reference point DS-CP) and forward it to peer role in adjacent ISPs (via DS-PP). The GUIPS-PP reference point allows QoS management provision and charging settlement between ISPs performing the GQIPS role. The e-BMS may be provided either directly using the GQIPS, in which case the two roles interact via the GQIPS-PM reference point. Alternatively the e-BMS service may be layered over a VPN service (VPNS) which in turn uses the GQIPS. In this case the e-BMS provider role interacts with the VPNS via the VPNS-PM. The VPNS provides end-to-end management of guaranteed QoS communications and security over multiple domains including the customer's CPE (via VPNS-CM), adjoining ISPs (via VPN-GQIP-PP) and the GQIPS Provider role in its own domain if present (via GQIPS-PM).

Additional concepts related to the analysis and design of management systems within the Framework are as follows.

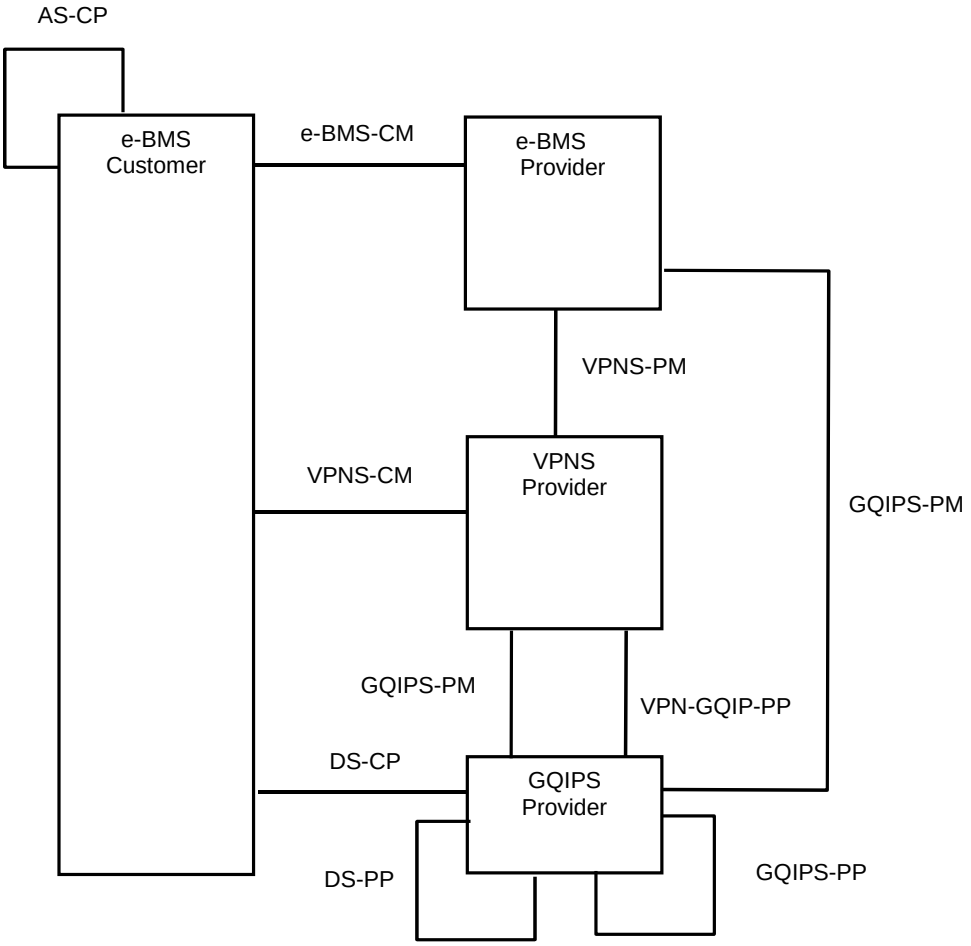
Business Processes

Business processes describe areas of activity in the operation of an organization, and the interactions that take place between those activities. The TM forum telecoms operations map (TMF 1998) represents a commonly used model of management business processes and has been adopted for this part of the framework. This model is being gradually refined by the TM Forum and thus may need to be modified in future version of the Framework.

Building Blocks

Building blocks are the main reusable structural element in the Framework. The most comprehensive definition of management-related building blocks currently available is being worked on in the TM Forum's Application Component Team (ACT). This is based on the requirements established by Telcordia (formerly Bellcore) in their extensive OSCA/INA analysis. This has already seen some application in the use of INA principles in the work of TINA-C (Telecommunication Information Network Architecture Consortium). The ACT however, has, further refined and condensed the OSCA/INA work in (NMF TIM, 1998). The concept of building blocks used here has been adopted for the framework. The ACT work forms

Figure 2: Logical business roles and reference points



the basis of the next generation OSS initiative currently being conducted in the TMF. It is anticipated that the implementation work associated with the framework defined here will provide valuable input to the TMF NGOSS work.

The ACT work identifies a "building block" as a deployable unit of interoperating software. In line with contemporary software architectures, building blocks are described as being in one of three computing tiers:

- **Enterprise Information Tier (EIT):** This tier is concerned with the storage and maintenance of enterprise data, i.e., data used by multiple business processes;
- **Process Automation Tier (PAT):** This tier is concerned with business operations and management and
- **Human Interaction Tier (HIT):** This tier is concerned with issues related to human/computer interaction.

Building blocks are an abstract concept used in the analysis and design of systems. Their actual implementation as software, involves the mapping of building blocks to technology specific concepts such as component assemblies from the OMG's CORBA component model, or jar files from Sun Microsystem's enterprise java beans.

Building Block Contracts

The interfaces of a Building Block are termed contracts, and a building block may have multiple contracts. Contracts may be designed to conform to specifications of reference points. Management system interfaces may therefore be defined in terms of aggregation of contract specifications.

CASE STUDY: AN INTEGRATED, MANAGED E-BUSINESS NETWORK BASED ON THE COMPONENT FRAMEWORK

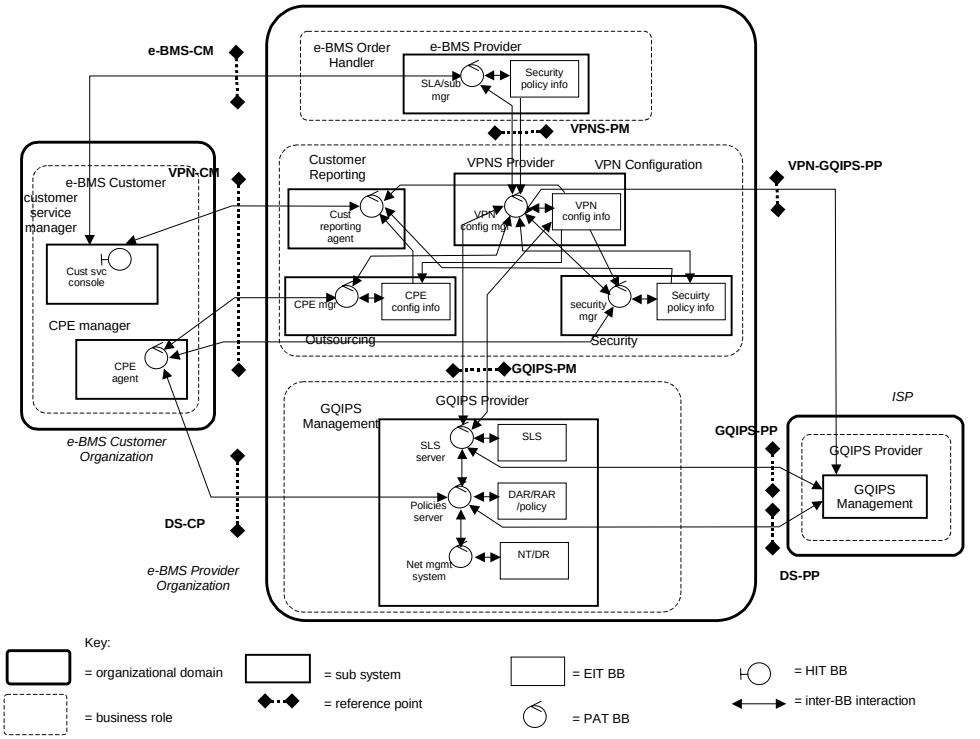
Figure 3 provides an example of how the concepts may be applied for an organization playing the roles of e-BMS provider (e-Business Management Service Provider), VPNS provider (Virtual Private Network Service Provider) and GQIPS provider (Guaranteed Quality of IP Service Provider). The figure focuses on business processes related to the fulfilment of the e-BMS service. This involves order handling within the e-BMS provider Role, VPN configuration, outsourcing, and security management and customer reporting within the GQIPS provider role. Customer service management and Customer Premises management processes are also identified in the e-BMS customer domain. Within each of these business processes initial identification of building blocks within the different computing tiers have been identified, their binding via contracts and the mapping of those bindings to reference points.

Relationship With Other Work

This framework presented above is based on best practice in component based system design and construction as well as incorporating state of the art technology. A framework can be thought of as a reusable design of part of a system that may be extended or customized by an application developer (Johnson, 1997) and thus is a generic semi-complete solution designed to solve a set of similar problems in a number of customizable or configurable ways (Johnson, 1988). Based on Fayad and Schmidt's classification of frameworks (Fayad, 1997), the framework presented in this paper represents an enterprise application framework aimed at enabling the rapid development and deployment of management services.

The description of the framework components is specified using UML v1.3, employing use case, object and class models and collaboration diagrams (Rumbaugh, 1999). The components also use several well-established design patterns (Gamma, 1994) e.g., factory, façade, etc.

Figure 3: Application of framework focusing on VPNs and GQIPs management processes



As described in section 3, the most comprehensive definition of management-related building blocks currently available is being worked on in the TM Forum's ACT. One of the primary motivations for the proposed framework endorsing the TMF building block approach is the need for service providers to seamlessly integrate their service with the minimum of overhead. With the presented framework a building block is considered an atomic unit for the purpose of deployment, management, distribution security and interoperability.

In addition to the separation of concerns according to the three tiered architecture as described in section 3, the issue of the relationship between building blocks and business processes also need to be addressed. An important consideration is the mapping between the specification of building blocks and its relationship to the business processes as defined in the TMF Business Process Model (BPM). An important aspect of the work is to provide guidance on the construction of sets of building blocks to support fulfillment, assurance and billing business processes. The level of granularity of the building block in relation to the service management business processes as defined by the TMF BPM is a key framework consideration.

The VPN technology considered for this framework is the IP VPN based on Multi Protocol Label Switching (MLPS) that is an emerging IETF standard. The advantage of MPLS comparing to other VPN technologies (IP tunneling based on IPSec for example) is that it allows a large-scale VPN provisioning with simpler configuration and management for both provider and CPE sites. It provides a high degree of flexibility, enabling any-to-any IP VPN connectivity across switched or routed networks. In combination with Diffserv, MPLS allows fined-grained QoS for different traffic types (data, voice, video) over the same network infrastructure. Security is supported through a combination of border gateway protocol (BGP), IP address resolution and optional IPSec encryption.

Furthermore, various VPN access scenarios are considered, enabling end users to access quickly and easily corporate VPN sites independently from their locations, through access services integrating different existing access technologies, Dial (analogue or ISDN), Cable, ADSL and Wireless (Mobile IP).

CONCLUSIONS AND FURTHER PLANS

This paper has presented an analysis of the business model for a provider of e-Business management services and examined the requirements for such management services. Further, a management component framework to support the rapid and flexible construction of e-Commerce management infrastructure has been presented. The framework is based on a holistic management approach supporting seamless integration of network and application management services (i.e., vertical) as well as integrating management across distinct functional areas (i.e., horizontal). Such a framework concept for e-Business management is very important as it is one of the very few ways in which flexible, rapid development and one-stop-shopping e-business management can be achieved.

Future work consists of further elaboration of the framework which is an ongoing activity as part of a large European telecommunication project called FORM (http://www.uhc.dk/form). This project will also trail the implementation of an e-Business management system, supporting the features of the management component framework presented in this paper. Also, close liaison with industry standards bodies will be considered as well as contribution to the development of an integrated management framework for the management of a dynamic e-business environment.

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