

E-commerce impacts on service and network operations and management

Telecommunications B2B problem statement and requirements

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Abstract

This document gives the background and broad requirements for the anticipated adoption of e-commerce technologies in telecommunications network and service management.

Adopting such technologies is expected to help integrate communications supply chains, involving many forms of communications service providers and their partners, collaborating to deliver communications services over a variety of networks including fixed and mobile IP based networks.

The combination of e-commerce B2B frameworks such as ebXML together with e-enabled OSS processes, such as the eTOM, and component based OSS architectures, such as NGOSS, is expected to form the basis of the e^2 -OSS framework developed in this project.

EDIN 0212-1106

Project P1106

For full publication

December 2001

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Executive Summary

Telco OSS interconnection is evolving from a narrow regulated “electronic bonding” focus to wider B2B (business-to-business) initiatives aimed at improving the integration of processes between communications service providers and their trading partners.

OSS interconnection, once the subject of regulatory driven projects to meet equal access requirements for network products such as number portability, is now aimed at extending the global reach of providers; reaching new customers via other third party retailers, service and network providers in supply chains.

The trend toward e-commerce based B2B integration of trading partners is not unique to the telecoms industry and the opportunity presents itself to lower the cost of OSS interconnection technology by leveraging initiatives such as ebXML.

The unbundling and componentisation of service elements, including OSS, combined with the falling cost of OSS and e-commerce technology are lowering the entry costs for smaller trading partners (particularly niche service providers and resellers) to become members of these supply chains, thus widening the range of players involved and possible service propositions.

This document principally focuses on the requirements on communications service provider OSS architectures to meet these new e-business opportunities. However the requirements have relevance to all parties involved in such *communications supply chains*.

The intention of the project is to allow OSS/BSS architects and business managers to better understand how e-business technologies and products should be best applied to their OSS to serve their B2B and communications supply chain needs through the implementation of an e^2 -OSS framework.

The intention of this document is to provide the base business and technical requirements for the project.

Aspects addressed by this project report

This document makes the proposition that a combination of B2Bi technologies, next generation component OSS stacks and new e-business process frameworks will form the basis of new e^2 -OSS solutions.

These e^2 -OSS solutions will support the delivery of communications services through the integration of *communications supply chains*.

The document explores:

- The types supply chains required for communications service providers (network operators, virtual network operators, value added service providers and retailers plus others) and their partners to deliver communications services and multimedia applications to customers globally over a variety of networks including fixed and mobile IP based networks.
- The requirements on B2Bi technology, OSS architectures, telco enterprise & B2B processes and security combined as an e^2 -OSS framework to support these supply chains.

Conclusions

- Deregulation, globalisation and new service architectures will encourage the creation of new and more complex supply chains in the delivery of communications services.
- While some trading relationships within these supply chains will be long standing ones; others will be briefer and more dynamic in their formation.
- Trusted third parties will also be called upon to facilitate trading within these supply chains.
- The unbundling of service elements together with lowering entry costs of technology will encourage a wider ranger of smaller, specialised providers to join these supply chains.

- Opportunities for product bundling and affinity selling will encourage companies whose core business is not telecommunications to join such supply chains.
- Process integration between partners in these supply chains will be facilitated by the use of B2B integration frameworks.
- For B2B integration of such a wide range of players to be effective, B2Bi frameworks that have a much wider base than telecommunications, such as RosettaNet and ebXML, will be key.
- For such supply chains to work effectively, trading partners will need to closely integrate their data, systems and processes not just for fulfilment but for planning and other functions also.
- B2Bi platforms will be integrated with enterprise data and processes in OSS and BSS systems via EAI (enterprise application integration) and other middleware technology.
- Such integration of B2Bi and OSS/BSS would be facilitated by the adoption of component-based architectures.
- In addition to integration with B2Bi technology, BSS and OSS applications themselves to support a more collaborative approach to trading in supply chains together with new enterprise processes for the management of supply chains and partner relations.
- The combination of B2Bi frameworks, component OSS, new OSS applications and new enterprise and B2B e-business processes will form the basis of a new e²-OSS framework.
- In addition to new telecom e-business enterprise processes, B2B core processes will need to be extended to include telecom specific flavours of B2B collaborations.

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Abbreviations

3GPP	3 rd Generation Participating Partners
A2A	Application-to-Application
API	Application Programming Interface
B2B	Business-to-Business
B2C	Business-to-Consumer
B2Bi	Business-to-Business integration software
CA	Certificate Authority
COTS	Commercial Off The Shelf Software
CRM	Customer Relationship Management
CSP	Communications Service Provider
DUNS	Data Universal Numbering System
e ² -OSS	European e-commerce Operations Support Systems
EAI	Enterprise Application Integration
ebXML	Electronic Business XML
eTOM	e-Business Telecommunications Operations Map
EDI	Electronic Data Interchange
EDIFACT	Electronic Data Interchange for Administration Commerce and Transport
FTP	File Transfer Protocol
GSM	Global System for Mobiles
HTTP	Hypertext Transfer Protocol
HTTPS	Secure Hypertext Transfer Protocol
MeXE	Mobile execution Environment
MSF	Multi-switching Forum
NGOSS	New Generation Operations Systems and Software
OSA	Open Services Architecture
OSI	Open Services Infrastructure
PKI	Public-key Infrastructure
PKCS	Public-key cryptography system
QoS	Quality of Service
RFC	Request for comments
RFP	Request for Proposal
RFQ	Request for Quotation
RPC	Remote procedure call
SLA	Service Level Agreement
SLM	Service Level Management
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol

SOAP	Simple Object Access Protocol
TMF	TeleManagement Forum
TOM	Telecom Operations Map
eTOM	e-Business Telecom Operations Map
TPA	Trading Partner Agreement
TTP	Trusted Third Party
UDDI	Universal Description Discovery and Integration
UML	Unified Modelling Language
VHE	Virtual Home Environment
WSDL	Web Services Description Language
XML	eXtensible Markup Language

Definitions

Actor	Someone or something, outside the system or business that interacts with the system or business. (source Rational Unified Process and ebXML)
Business Collaboration	An activity conducted between two or more parties for the purpose of achieving a specified outcome. (source ebXML)
Business Operational View (BOV)	A perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organisations, which are needed for the description of a business transaction (source ebXML)
Business Service Interface	<p>An ebXML collaboration that is conducted by two or more parties each using a human or automated business service that interprets the documents and document envelopes transmitted and decides how to (or whether to) respond. (source ebXML)</p> <p>Describes a pattern of interaction among objects; it shows the objects participating in the interaction by their links to each other and the messages (Source Rational Unified Process)</p>
e-commerce	Electronic Commerce is doing business electronically. This includes the sharing of standardised unstructured or structured business information by any electronic means. (source UN/CEFACT)
Role	The named specific behaviour of an entity participating in a particular context. A role may be static (e.g., an association end) or dynamic (e.g., a collaboration role). (source UML v1.3)

Requirements Key

The requirements in this document are labelled in the form

[aaa-nn] where aaa is a mnemonic for the section where the requirement occurs and nn is a sequence number.

Table 1 Requirements mnemonics

Mnemonic	Section
bus	Business Viewpoint
chn	Communications Service Provider Supply Chains
tptr	Trading Partner Relationships
mod	e-Business Models and e-Markets
pro	The eTOM Business Process Framework
inf	Management of Information Flow in the Supply Chain
tec	Technical Viewpoint
arc	Service Architectures
asu	SLA & QoS in Communications Supply Chains
sec	Security

1 Introduction

Regulation, globalisation, the growth of the Internet, and the services supplied over it, are driving the disaggregation of traditional vertically integrated telecommunications operators and the creation of a wide range of new communications service providers and relationships. In order to deliver integrated communications services, supply chains will be established between and within these new organisations.

This trend coincides with B2B (business to business) e-commerce software evolving from web portals, for selling to businesses as “big customers”, to a more document centric collaborative form of service negotiation, fulfilment and service care.

The catalyst for this is enterprise-to-enterprise process integration over the Internet through B2Bi (B2B integration) technologies such as XML and SOAP and e-commerce frameworks such as Rosettanet, ebXML and BizTalk.

Communications service providers and their partners will increasingly look to this B2Bi software to integrate their enterprise OSS and processes with end-to-end supply chain processes.

1.1 Objectives of this document

The objective of this document is to define the broad requirements on an e-business enabled OSS (e^2 -OSS) framework supporting supply chain process integration of communications service providers and their partners [1].

This document makes the proposition that a combination of B2Bi technologies, next generation component OSS stacks and new e-business process frameworks will form the basis of the new e^2 -OSS framework.

The document explores:

- The types supply chains required for communications service providers (network operators, virtual network operators, value added service providers and retailers plus others) and their partners to deliver communications services and multimedia applications to customers globally over converged fixed and mobile IP networks.
- The requirements on B2Bi technology, OSS architectures, telecom enterprise & B2B processes and security combined as an e^2 -OSS framework to support these supply chains.

1.2 Requirements Areas

The requirements outlined in this document are segmented into 10 broad topics.

These topic areas, whilst not exhaustive, have been chosen to illuminate key drivers for any end-to-end e-commerce oriented OSS framework. These topics have also been arranged to tell a story of e-commerce oriented supplier chains will emerge in the market place driven by de-regulation, globalisation and the componentisation of services and technology.

1.2.1 Business Viewpoint

There is a trend toward inter-enterprise e-commerce integration. In particular it highlights the dual trends towards disaggregation of traditionally vertically integrated telecommunications providers and formation of alliances and trading relationships to provide global services.

1.2.2 Communications Service Provider Supply Chains

Within this evolving e-business arrangement, more complex communications supply chains will emerge than have hitherto been seen. These will include a wide range of types of companies. Furthermore, communications supply chains will not escape the general drive to make such supply chain integration more effective and efficient.

1.2.3 Trading Partner Relationships

To facilitate the formation of communications supply chains, trading partners will need to form and manage technical and commercial agreements based on their own and their partners' capabilities. Furthermore partners will need to publish information about their capabilities to discover each other.

1.2.4 e-Business Models and e-Markets

The formation of multiple bi-lateral agreements in supply chains will be inefficient. Also trading partners will find that they lack all the capabilities to effectively trade with each other bilaterally. Market makers will therefore emerge together with a variety of other third party facilitation services to broker and enhance trading relationships.

1.2.5 The eTOM Business Process Framework

For communications service providers to operate effectively in these new supply chain arrangements, new e-business versions of "traditional" fulfilment, assurance and billing processes will be required together with new processes for partner and supplier relationship management and collaborative product development and marketing.

1.2.6 Management of Information Flow in the Supply Chain

With the "virtualisation" of many hitherto enterprise oriented functions across many companies in a supply chain, rights management on the ownership and use of information will be critical.

1.2.7 Technical Viewpoint

Previous attempts, driven by regulation, to integrate telecommunication operations have been limited by the capabilities of the technology of the day. The ubiquity of the Internet together with the emergence of cost effective technologies for inter and intra enterprise integration, make it possible for a wider range of companies to integrate their businesses using B2B technology.

1.2.8 Service Architectures

Component oriented architectures for networks and services are also facilitating the unbundling of services and a more open approach to service provision. As a result the range of service components available to be traded through a communications supply chain is growing.

1.2.9 SLA & QoS in Communications Supply Chains

Despite the integration and delivery of communications services becoming devolved across many companies in a supply chain, customers will still require services to perform effectively. End-to – end management of service levels and QoS across all the assembled service components will therefore be essential.

1.2.10 Security

Similar the integrity of services must still be maintained through end-to-end management of security.

2 Business Viewpoint

2.1 Overview

Deregulation, globalisation and increased competition is driving *network providers* to

- Increase global reach through acquisition and strategic partnerships
- Reach new customers through affinity resellers
- Add value to their network services through service partnerships
- Leverage network and licence investments through support of virtual network operators

Incumbent network providers are further regulated to support

- Service portability
- Unbundling of network elements
- Network interconnection
- Service resale

Providing the basic commodity services to extend the reach and capability of new entrant providers.

New entrant providers are seeking to use this open access to network providers as a platform to offer a wide range of value added applications.

Trusted third parties also see business opportunities to facilitate trading between these providers.

These drivers are accelerating the creation of complex extended supply chains and wholesale-style trading relationships between network and service providers.

Furthermore, downward pressure on wholesale pricing models and customer expectation of maintained service quality are driving

- Radical re-engineering of communications business processes to support these new trading relationships in a cost effective manner.
- OSS interconnection between providers in support of flow-through and perfect touch

The following sections provide examples of the commodity wholesale communications services available from network providers and range of supply and value chains emerging in the communications services market.

2.2 Network Provider Wholesale Services – The commodity

The principal commodity component of communications services supply chains is network transport offered by network providers [4].

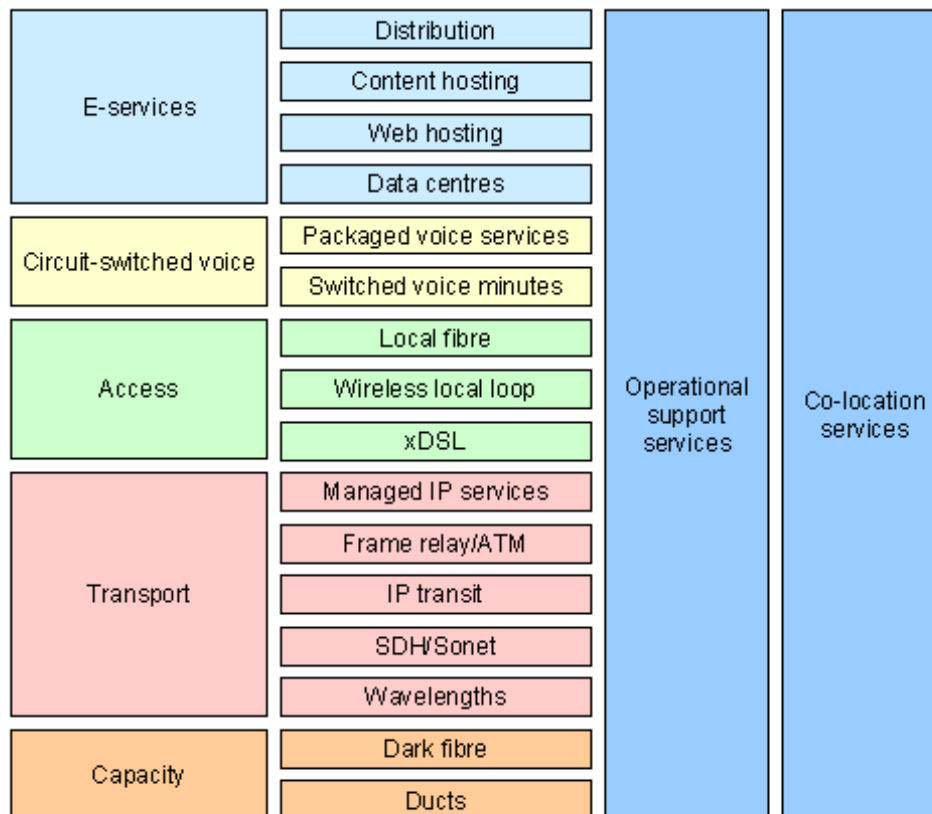
Major sources of these services are the various national and regional incumbent network providers.

As retail market share declines and the number of competing providers increases, revenue from wholesale services will be increasingly relevant for these incumbent providers.

Many of today's wholesale services are transport oriented unbundled elements of incumbent retail services offered as "intermediate" products to other competing providers and retailers. Intermediate products are designed to make it possible for these other parties to offer consumers equivalent retail services in competition to retail business units in the incumbent's organisation off its own network often adding their own service elements and management surround.

In addition incumbent providers will seek to use their market position and legacy infrastructure to offer a range of newer services.

The range of possible wholesale services is illustrated in Figure 1.



Source: Ovum (*Wholesale: New Markets for Communications Carriers and Service Providers/Chapter B*)

Figure 1 Telecommunications wholesale services Ovum (2000)

Generally, there is a downward pressure on the price of wholesale services sometimes driven by regulators to enhance competition.

Furthermore, there is an expectation that the prices for unbundled intermediate services should be lower than the prices for equivalent retail services (based on the expectation that operators have less to do when they are intermediated by third parties and do not bear the costs of marketing sales and service). Sometimes the regulators impose those prices for intermediate services must be 'cost plus' or 'retail minus' based.

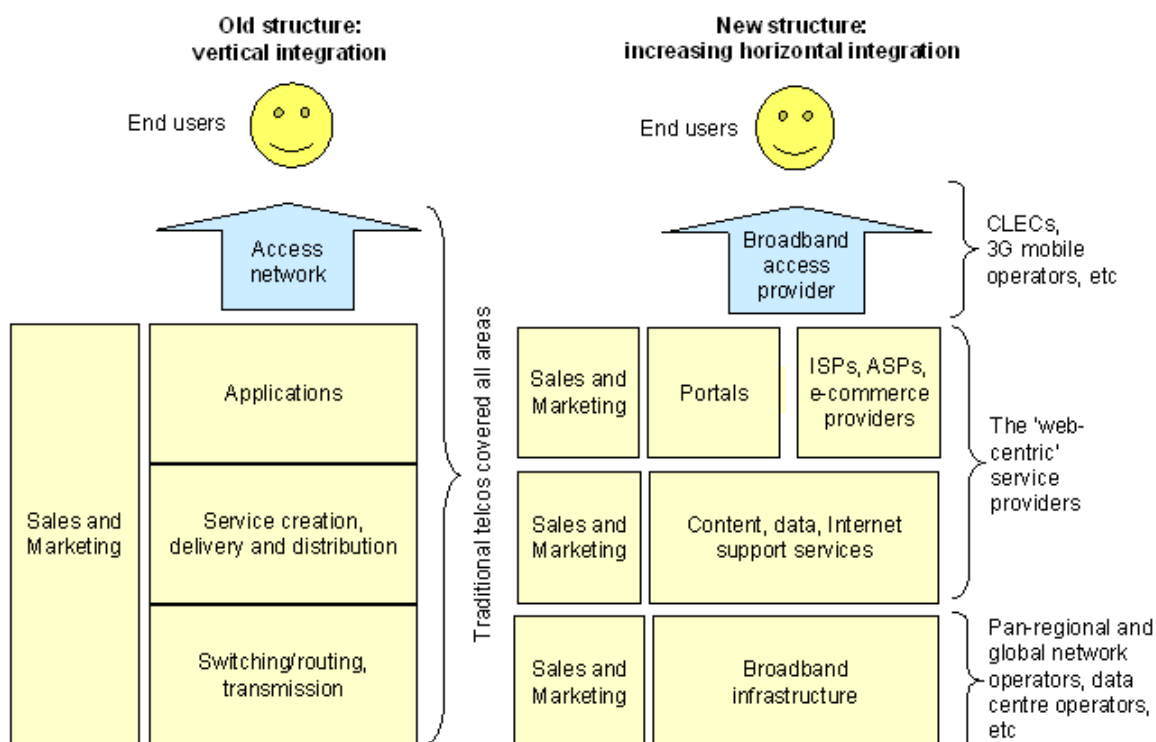
Therefore, there is a general need to improve the cost base of wholesale products through more efficient operations including the B2B trading of these services.

Also, telecom companies, in order to retain value for their services, will provide value added enhancements such as an enhanced service surround based on B2B access to OSS.

In creating intermediate services from within traditionally vertically integrated providers (see Figure 2), there is the burden of disengaging the retail elements of OSS from internally integrated OSS stack and adding wholesale service management elements instead.

For incumbents, this often presents a legacy OSS issue tactically dealt with by adding B2B components to their vertically integrated OSS, and making expensive modifications to legacy, to cope with intermediate services adding cost and complexity.

In the longer term, to overcome legacy issues, reduce integration costs and make space for OSS developments to suit their retail and wholesale propositions, incumbents will re-engineer their organisation and OSS to separate wholesale, value added and retail services.



Source: Ovum (Wholesale: New Markets for Communications Carriers and Service Providers/Chapter B)

Figure 2 Disaggregation of vertically integrated providers Ovum (2000)

In addition OSS interconnection solutions will evolve from those electronic bonding solutions designed to retrofit B2B to vertically integrated OSS for a narrow range of unbundling and service portability propositions to more e-business oriented solutions for a wider range of products and services.

2.3 Requirements

- Req [bus-01] Telco OSS interconnection must evolve from “electronic bonding” for regulated services to a broader based B2B interconnection in support of wider wholesale services offered to other operators, service providers and resellers.
- Req [bus-02] Within telco enterprises retail and wholesale concerns both need to be met but in a separable fashion.
- Req [bus-03] Issues of equivalence between the treatment of a telco’s own retail and service provider business units and other trading partners need to be addressed throughout the OSS architecture.
- Req [bus-04] Incumbent telcos will be providing “management” services and not only infrastructure/transmission services, i.e. billing services, etc. Often, these services will be provided via B2B interfaces.

3 Communications Service Provider Supply Chains

As trading relationships form between communications service providers and their partners, *supply chains* will emerge that partners will wish to optimise and manage.

Automation and integration of these supply chains will require formalisation and management of electronic trading agreements.

The lifespan of these supply chains and individual relationships can vary from very static (lasting many years) to very dynamic (lasting a matter of days or hours).

3.1 What are Supply Chains?

A supply chain can generally be defined as the end-to-end process of creating and delivering products and services for customers.

Supply chains span process steps including:

- raw materials production,
- manufacturing of finished components & products,
- logistics comprising
 - distribution,
 - transportation,
- warehousing,
- sales

Supply chains span the globe involving numerous independent firms, customers and business models.

Supply chain management techniques ensure that this complex web of interactions deliver the right product to the right place, at the right price, at the right time, and in the right condition.

3.2 Managing Supply Chains

In coordinating these global interactions supply chain management aims to

- Reduce cost through tight integration
- Reduce inventory level through lean manufacturing and just in time delivery
- Reduce procurement costs and improve vendor management.
- Reduce design to development cycle times
- Reduce cycle time between order and delivery
- Increase revenues and improve profitability

3.3 Introducing the Supply Chain for Communications Service Providers

Specifically within the telecommunications market, four broad categories of communications service provider are involved in the supply chain (excluding equipment suppliers, and third parties)

Network Providers

Build and operate network infrastructure.

Unbundling regulation will require that network operators provide third parties and their own affiliates with equal access to network infrastructure.

Service Providers

Deliver content and network based applications, including messaging and transaction services.

Retailers

Sell services to consumers and businesses, marketing, billing and providing customer service to specific market segments.

Customers/Consumers

Pay for and use the services delivered by the supply chain.

Within these categories there are many specialist roles addressing particular technologies and market segments. A fuller more detailed list of potential communications supply chain roles is given below. It may well be that individual trading companies will fulfil more than one of these roles within their organisation.

Table 2 Basic Communications Supply Chain Roles

Core Network Provider: Principally network operators providing transport and connectivity.
Public Land Mobile Network Provider: specific organisation that performs the roles of Access Network Provider, Core Network Provider - e.g. a traditional mobile operator.
Service Provider: E.g. Content Provider, Internet Services Provider or Applications Service Provider.
Service Integrator: An organisation that takes a set of services from other providers and derives an end-to-end set of services. It has responsibility for the QoS to the Customer.
Manufacturer-Supplier: Company that procures telecom equipment
Retailer-Distributor: An organisation that sells user equipment and telecom services to retail customers.
Customer: The organization that orders and buys the integrated telecom end – product/service.
End user: The <u>person</u> that actually uses the integrated telecom end – product/service.
Trusted Third Party (TTP): An organisation that is commercially neutral with respect to telecom products and services and their provision. They include: <ul style="list-style-type: none"> • Financial clearing House, Banks, Brokers Institutions • Certification Authorities • Regulatory Authorities • Advertising-Marketing Companies • E-marketplace makers

In creating supply chains for communications services it should be noted that many businesses would discharge one or more of these responsibilities adopting different roles in different circumstances. In a particular role, a company will participate in B2B processes with trading partners; fulfilling complementary roles (see Figure 3).

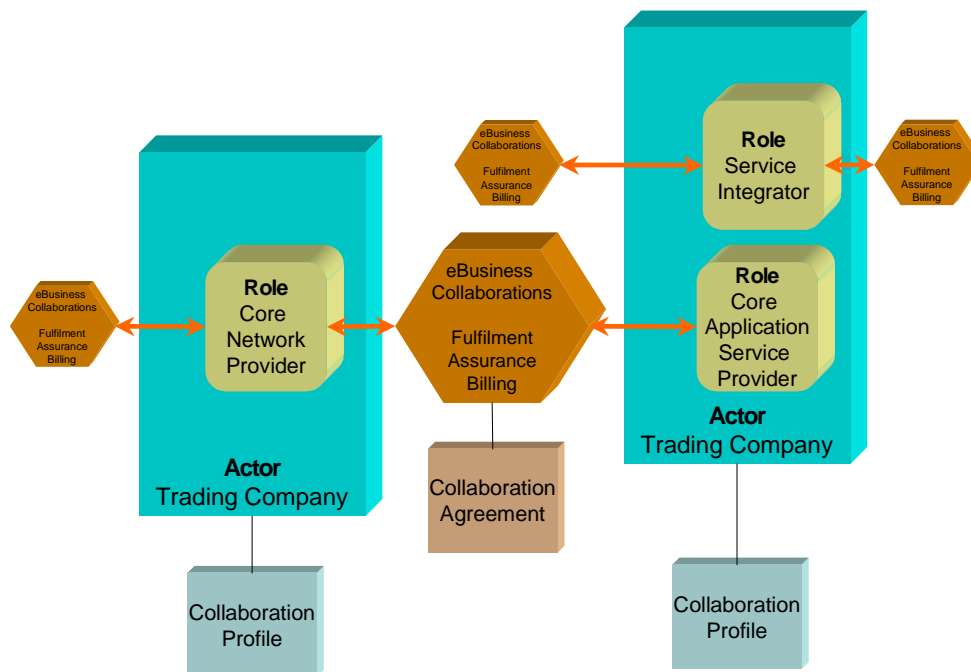


Figure 3 Supply Chain Roles and Collaborations

3.3.1 An Example Communications Supply Chain - Mobile Communications

Beyond the basic supply of wholesale network transport services, the roles in a communications supply chain can be many and varied (going well beyond the list given in Table 2) as illustrated in this example of mobile network enabled e-commerce for delivering content to customers [2] (see Figure 4).

As well as being diverse in nature, the scale of these providers can be very varied also ranging from multinational media companies to single individuals providing applications and content.

Also the relationship of any provider to any particular instance of a supply chain may vary from years for a strategic partnership to hours for a single transaction.

In some cases the relationship may be transactional in nature (providing a service on demand to paying customers) or more collaborative (planning a multimedia event or jointly running promotions and marketing).



Figure 4 Mobile e-commerce value chain Durlacher (2000)

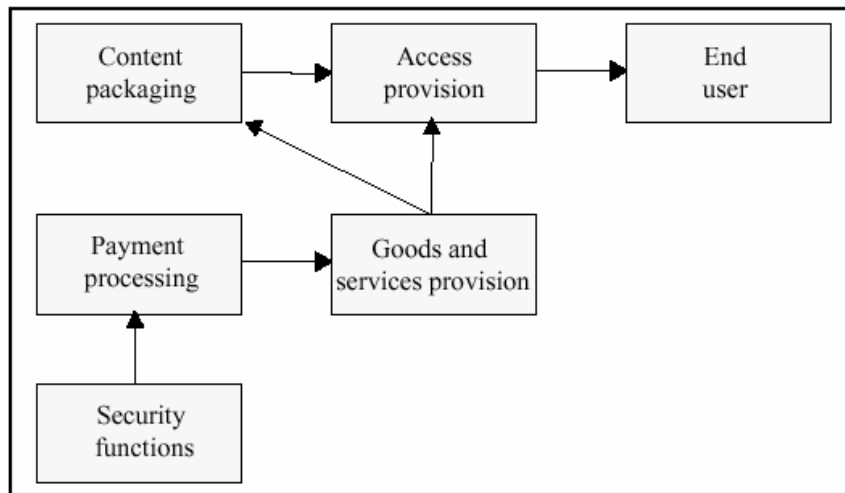


Figure 5 Supply chain for mobile e-commerce Analysis (2000)

When mobile networks are used as a secure means of ordering and paying for the provision services other third party players can also be involved, including those required providing security and trusting in the payment for and delivery of services (see Figure 5).

3.4 Requirements

- Req [chn-01] Integration of telco trading partners will require a broader more collaborative range of B2B business models than “traditional” electronic bonding order management style interfaces.
- Req [chn-02] e²-OSS solutions will need to support the integration of a wide variety of supply chains of partners and their services (varying in terms of size, complexity and duration).
- Req [chn-03] Integration of telco trading partners needs to support the additional integration of a variety of trusted third parties.
- Req [chn-04] e²-OSS solutions will need to support a wide range of partners from multinationals to small start-ups including third party partners not directly involved in the communications industry (minimising the cost of participation in B2B supply chains for all players)
- Req [chn-05] e²-OSS solutions will need to support the establishment of long term trusted business relationships and more dynamically managed single trades. Not all future services may be related to a long-term business relationship and might be far shorter period, flexible contract.
- Req [chn-06] e²-OSS enabled supply chains will need to meet the needs of a very diverse range of customer types (from single consumers to large multinational corporates).
- Req [chn-07] e²-OSS enabled supply chains will need to cope with rapidly changing organisational structures and business relationships (mergers, de-mergers, associations, partnering, collaborations, etc.).

4 Trading Partner Relationships

Unless managed carefully, the effectiveness of the end-to-end supply chain will only be effective as the poorest trading relationship in the chain.

In forming trading relationships, trading partners will need to define and enforce agreements related to e-commerce and how it is to be conducted.

At the moment, such rules are created statically and encoded in the current generation of B2Bi and enterprise solutions.

Current communications supply chains are characterised by long-term relationships and the traded products or services that are generally strategic for the whole supply chain. Therefore the static nature of the current generation of solutions is not currently an issue.

However, in future, trading partners will create and dissolve trading partner agreement dynamically according to business needs.

Therefore the next generation of B2Bi enabled OSS solutions will need to support managers within enterprises in the negotiation and creation of trading partner agreements based on the needs and capabilities of each of the trading parties concerned.

These agreements will then need to be executed and enforced by the relevant OSS and B2B platforms.

4.1 Requirements

- Req [tpr-01] e²-OSS solutions must support management of the business relationships of trading partners in the supply chain.
- Req [tpr-02] e²-OSS solutions need to support trading partners in creating and dissolving a wide range of trading partner agreements dynamically according to business needs.
- Req [tpr-03] Telco B2B processes will be governed by such trading partner agreements, contracts and SLAs.
- Req [tpr-04] e²-OSS solutions will need to support the storage and exchange of partner profile information upon which trading agreements may be formed.

5 e-Business Models and e-Markets

In hosting B2B transactions between trading partners and enabling supply chains various forms of B2B hosts, are required [3].

The exact form and location of host depends on the business model and the nature of the transactions involved.

The following figure explains the types of e-business models.

			RELATIONSHIP
Governed by Buyers	E-PROCUREMENT	E-PROCUREMENT	<ul style="list-style-type: none"> •One/few buyers •Many sellers
Governed by Community	E-MARKETPLACE		<ul style="list-style-type: none"> •Many buyers •Many sellers
Governed by Sellers		E-DISTRIBUTION E-SELLING	<ul style="list-style-type: none"> •Many buyers •One/few sellers
SOURCE: IDC 2000	Horizontal	Vertical	

Figure 6 B2B e-Business models – IDC (2000)

The most important factor distinguishing an e-marketplace from its siblings, e-procurement and e-selling, are who controls the structure and whose commercial interest the system is designed to serve.

e-Marketplaces are usually independent and managed by third parties without interests in any particular company.

Currently the communications supply market is served by relatively few network providers distributing their products to a much larger number of partners. In this scenario, privately hosted solutions oriented to *e-distribution* and *e-selling* by network operators are the norm.

With time, as markets globalise and the range and volume of “buyers” and “sellers” increases, public *e-marketplaces* will arise.

Initially these e-marketplaces will exist to facilitate the technical issues of forming trading relationships and provide supply chain process visibility and global reach to trading partners.

Later public e-marketplaces will provide a variety of other horizontal services such as financial settlement.

Later, still, as competition increases and the telecommunications services become ubiquitous and standardised commodities, such e-marketplaces will also host brokering, auctioning and other forms of financial dealings in communications services.

The revenues for e-marketplaces are derived from transaction fees, membership fees or value added services (like logistics, financial management or consultancy). The strength of e-marketplaces is their neutrality as a trusted third party plus the ability to connect large numbers of buyers and sellers in one arrangement.

Many consultancy and research agencies predict, in general terms, that by 2005 the independent e-marketplace model will be the most used model of e-commerce. Due to the non-standard nature of communications services, and the lack of liquidity that would follow, publicly hosted communications services marketplaces in their fullest form will be toward the back end of this prediction if not further out.

Trading partners will participate simultaneously to several e-marketplace or e-procurement and e-selling systems to serve a variety of supply chains and markets.

Another important classification of trading hosts can be made relating to how supply chains are hosted and the types of interaction supported as described in Figure 7.

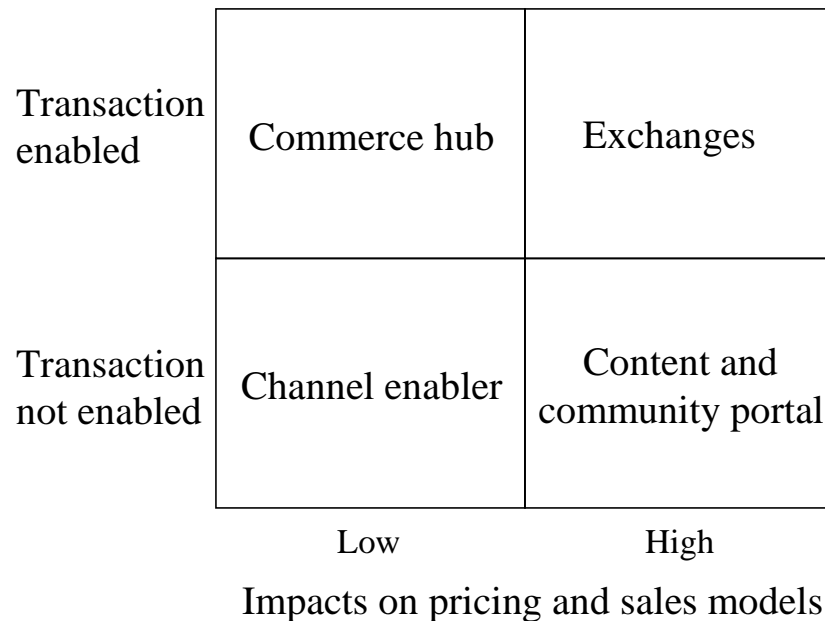


Figure 7 Impacts on pricing and sales models - Gartner (2000)

Portals are designed to inform people in trading organisations; providing value added content, such as specifications and buyer' guides and even hosted software. They may also provide bulletin board functionality for sellers and buyers to post information about products or services for sale or sought. Portals are often hosted by suppliers to inform potential customers about products. Such portals can also be used to inform trading partners about the status of services already purchased.

Commerce hubs manage a trading network that generally maintains existing supply chain relationships and pricing models but attack industry inefficiencies, such as error-prone manual processes. Commerce hubs are often hosted by the dominant players in a trading relationship (either the buyers or the sellers).

Channel enablers are common in industries in which suppliers have ceded so much supply chain power to channels of distributors, brokers and agents that suppliers may now be hesitant to initiate direct sales in competition. Channel enablers provide commerce software and hosting solution to help the channel partners and thus a wholesaler to participate in e-commerce.

Exchanges employ a commerce model to publicly host trades; whereby product pricing is negotiated within the marketplace through auctions, reverse auctions, RFP/RFQ processes or bid-ask matching exchanges.

For current incumbent network operators; portals, hubs and channel enablers have obvious roles to play in supporting trades with channel partners, customers and suppliers.

However, selling wholesale services in public e-marketplaces might accelerate the loss of account control and pricing pressure.

5.1 Requirements

Req [mod-01] e²-OSS solutions must support the various forms of communications services supply chain hosting and interaction models including

- private telco commerce hubs for e-selling and distribution.
- private telco commerce hubs for e-procurement.

- channel enablers for network provider retailers.
- portals for personnel in trading partners to access information from other partner systems.

Req [mod-02] e²-OSS solutions must ease integration between the various styles of hosting arrangement including integration between trading partners and third party hosted exchanges and hubs.

Req [mod-03] e²-OSS solutions must support such integrations not just for buying, selling and billing services, but also, where appropriate provide integration for service assurance and partner relationship management.

6 The eTOM Business Process Framework

The creation of communications supply chains will place additional requirements on the enterprise processes for communications service providers both in terms of new process groupings and end-to-end processes. This has been the work of the TeleManagement Forum in the creation of the eTOM (eBusiness Telecoms Operation Map) [6].

The eTOM not only provides a process map identifying potential B2B processes but also defines end-to-end processes for the creation and management of communications supply chains.

6.1 The eTOM “Level 0”

“Level 0” is the highest-level view and encompasses all of eTOM. As depicted in Figure 8, the eTOM business process framework is considered as a depiction of all business functional areas important to a communications service provider’s (CSP) enterprise in six functional process groupings.

Although only enterprise business processes are modelled, many of these processes also involve interaction with entities outside the enterprise. The eTOM diagram only shows one principal external entity - the Customer.

The six functional process groups of the eTOM within the Level 0 were defined on the basis of the different typologies of knowledge existing in a communications service provider enterprise.

The eTOM was defined as totally generic so that it is organisation, technology and service independent.

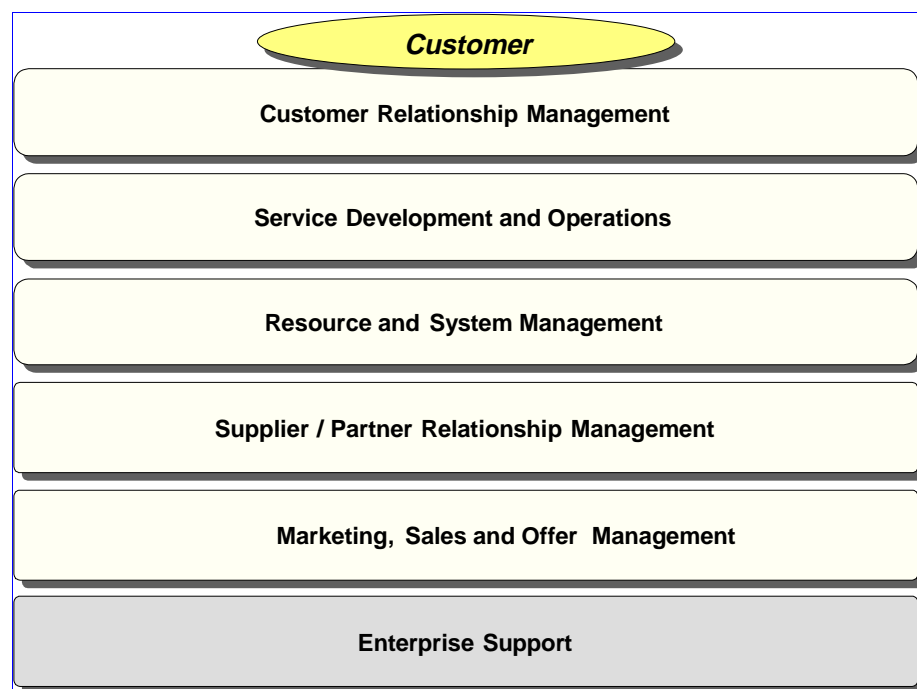


Figure 8 The overall eTOM Business Process Framework (Level 0 View)

6.2 The eTOM “Level 1”

The six Level 1 functional process groupings of the eTOM Business Process Framework are the following:

- **Customer Relationship Management:** this grouping considers the knowledge of customers needs and includes all functionality necessary for the acquisition, enhancement and retention of a relationship with a customer. It is about customer service and support, storefront and field service, retention management, cross selling and up-selling, and direct marketing for the

purpose of selling to customers. Development of CRM infrastructure and business capability is also included. CRM applies both to conventional retail customer interactions, as well as to wholesale interactions, such as when an enterprise is acting as a third party or complementary provider to another enterprise.

- **Service Development and Operations:** this grouping focuses on the knowledge of services and products and includes all functionality necessary for the planning, development and management of telecommunications and information services required by or proposed to customers.
- **Resource and System Management:** this grouping considers the knowledge of resources and is responsible for managing all resources utilised to deliver and support services required by or proposed to customers. It also includes all functionalities responsible for the direct management of all such resources utilised within the enterprise.
- **Supplier/Partner Relationship Management:** this grouping considers the knowledge of partners' and suppliers' capabilities and needs to ensure that the enterprise can buy all appropriate services or goods. It deals with managing supplier/partner's orders and problems, as well planning, measuring, improving or rescinding business relationships with suppliers or providers.
- **Marketing, Sales and Offer Management:** this grouping focuses on the knowledge of running and developing the core business for an enterprise, and includes functionalities necessary for defining strategies, developing new products & services, managing existing products & services and implementing marketing, sales and offer strategies especially suitable for telecommunications products and services.
- **Enterprise Support:** this grouping involves the knowledge of enterprise-level actions and needs, and encompasses all business management functionalities necessary to support the operational processes that are critical to run a business in the competitive market. Some functions such as regulatory management are telecommunications-specific, but most (financial management, employee relations) are not significantly different for the communications industry.

6.3 The Enterprise End-to-End Process Flows view

The horizontal process groupings present a static view of the enterprise, in which the enterprise's major process functionalities can be described and formalised with greater detail as the level of decomposition increases.

At right angles to the static view, a dynamic view of the enterprise can be defined and formalized. This view enables the definition of the enterprise's end-to-end processes, which are typical, generic sequences of activities, which must occur in the enterprise to achieve desired results.

The dynamic view includes the "FAB" (Fulfilment, Assurance and Billing) view defined in the TOM process model (document GB910), but is more complete because it covers additional processes that are executed within the enterprise.

At the highest management level of an enterprise, six end-to-end processes can be identified:

- **Infrastructure Lifecycle:** this process is responsible for the definition, planning and implementation of all necessary infrastructures (telecommunications networks, computer networks, etc.) as well as all other support infrastructure and business capability (operations centers, architectures, processes, etc) required to provide information and communications services to the customer.
- **Product Lifecycle:** this process is responsible for the definition, planning, design and implementation of all products and services in the enterprise's portfolio.
- **Fulfilment:** this process is responsible for providing customers with their requested products or services in a timely and correct manner; it translates the customer's business or personal

need into a solution which can be delivered using the specific products or services in the enterprise's portfolio; it informs the customers on the status of their purchase order.

- **Assurance:** this process is responsible for the execution of proactive and reactive maintenance activities to ensure that services provided to customers are continuously available with the agreed SLAs; it also performs continuous network status and performance monitoring to proactively detect possible failures; it supports a direct contact with customers to receive problem notifications and to inform them of the status of actions towards resolution.
- **Billing:** this process is responsible for the production of timely and accurate bills, for sending bills to customers, for processing their payments and performing payment collections; in addition it handles customer inquiries about bills, provides billing inquiry status and is responsible for resolving billing problems to the customer's satisfaction.
- **Supply Lifecycle:** this process is responsible for the definition, planning, design and implementation of the enterprise's supply chains

6.4 The overlaid static Process Framework (horizontal) view and dynamic End-to-End Process (vertical) views

Having defined both the static and dynamic views of the eTOM Business Process Framework, an overlaid view can be depicted in which the six end-to-end processes cross the six functional process groupings. Figure 9 illustrates the overlaid view.

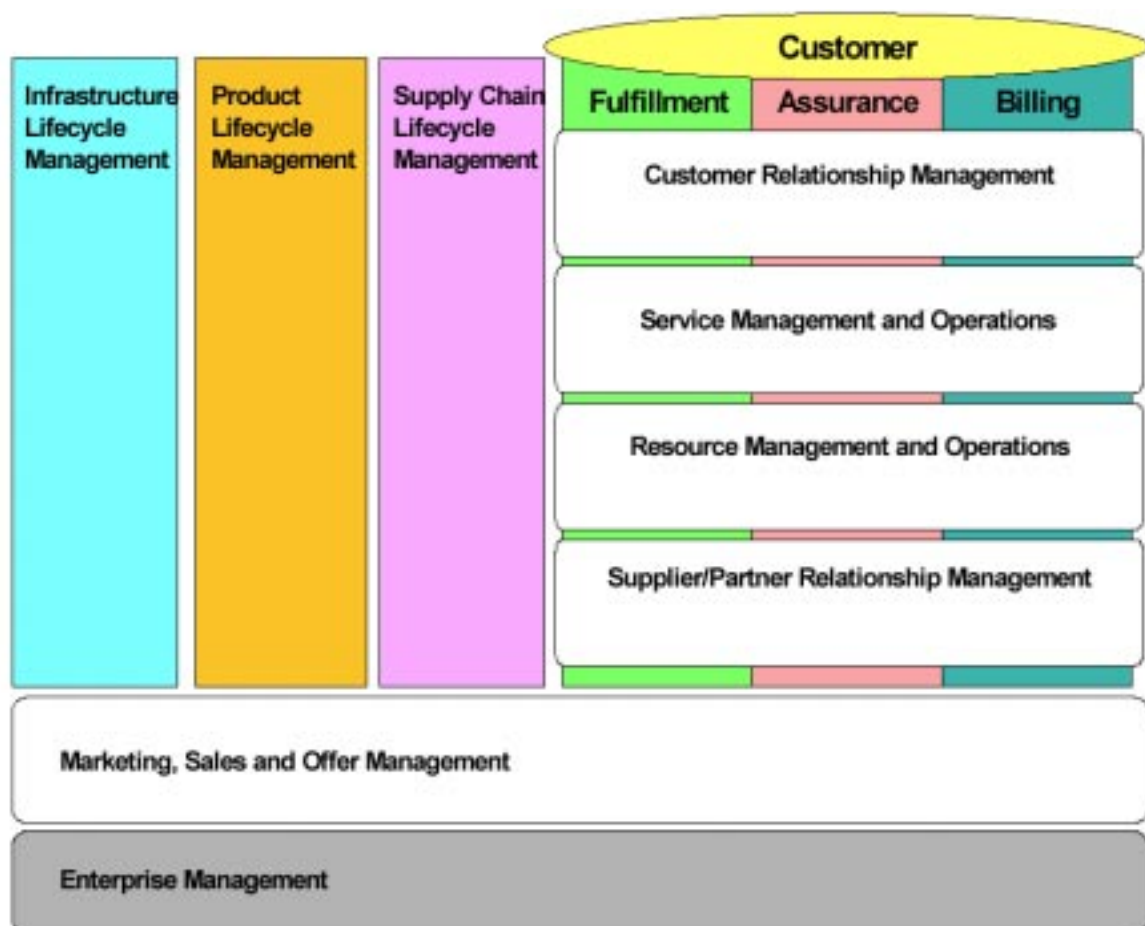


Figure 9 The static and dynamic views of the eTOM

As depicted in the picture, the six end-to-end processes cross only four of the six Level 1 functional process groupings: the Enterprise Support and the Marketing, Sales and Offer Management process groupings are considered as general and supporting to the other functional process groupings.

The Customer Relationship Management (CRM) process grouping, as well as other three main process groupings (the SD&O, RSM, S/PRM) cross the Fulfilment, Assurance and Billing end-to-end processes because some functionalities in the horizontal groupings are directly associable to a specific vertical end-to-end process. The CRM process grouping (as well as the SD&O, RSM, S/PRM) though is involved also in the three vertical lifecycle processes, but this involvement is evident at a lower level of detail.

6.5 Requirements

- Req [pro-01] e²-OSS solutions must support eTOM end-to-end processes for the range of products and services traded by communications service providers across the communications supply chain.
- Req [pro-02] OSS components in e²-OSS solutions must support the new process groupings for partner and supplier relationship management.

7 Management of Information Flow in the Supply Chain

The ultimate goal of any supply chain is to effectively deliver goods and services to consumers.

In order to plan, develop and market propositions to consumers, trading partners need to gather and exchange a wide variety of market and proposition information through the supply chain in addition to the usual orders, faults and invoices.

Trading partners will also want to collect and exchange relevant information about each other to effectively manage partner relationships.

In some market models, there will be conflicts of interest in the information requirements of trading partners that will need to be resolved. Long-term trading relationships will be needed to achieve sufficient trust to exchange valuable commercial information and sustain competitive advantages.

Long-term business partners will be able to create strong co-operative links between them. Only in such a case, a win-win strategy could be established, ensuring short and long-term benefits for both parties.

For more dynamic and short lived trading relationships, less trust may exist, limiting the degree to which valuable commercial information will be exchanged.

Agreements about what information to gather, and how it will be exchanged and used, will need to be the subject of trading agreements.

Where trusted third parties are involved they will need to respect the trading agreements of their clients and possibly resolve any conflicts.

7.1 Information Likely to be Traded in the Supply Chain

As an illustration, the following are examples of the range of information likely to be traded in supply chains.

- Product and Services Specifications
- Marketing Promotion Information (e.g. products training and promotion information)
- Marketing and promotion plans
- Capacity forecasts
- Consumer behaviour data (appropriate both for B2B and B2C)
- Personalization data (customer profile management, customer identification information, products/purchasing/transaction/payments preferences)
- Metadata (e.g. about products, customers, in order to enhance intelligent search)
- Order and related information (e.g. invoicing, shipping, order auditing)
- Fault and service information.
- Asset, inventory and stores information
- Security control data (customer identification information, public keys, payment tokens, digital signatures, etc.)
- RFQ and RFP requests and responses

In Figure 10, a rough view of the data collections related to sales and marketing is presented. The arrows correspond to interactions between the several areas of data (in a high-level approach)

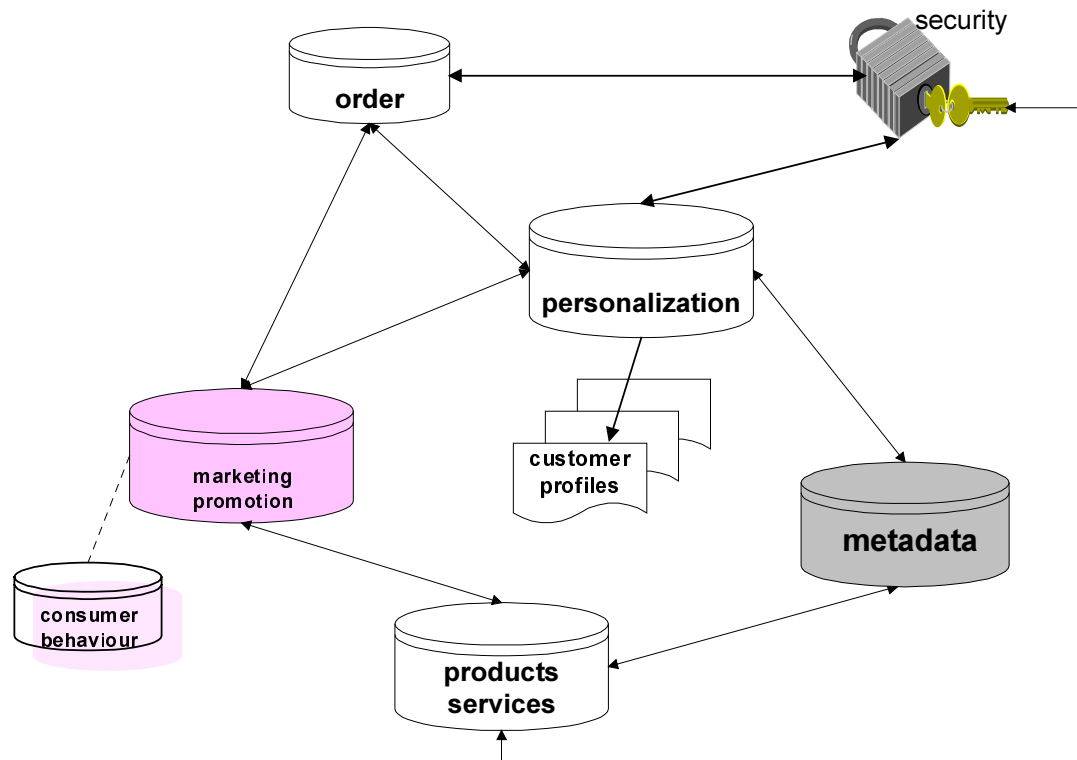


Figure 10 Types of information trading in the supply chain

7.2 Information Management Issues

In managing the exchange of information in supply chains, trading partners will need to establish information management strategies.

In determining the information management strategy for a supply chain several questions will need to be answered.

- **Content:** What information is to be traded? How should this information be recorded, in order to be used effectively?
- **Reasoning:** Why should this information be exchanged and how will it facilitate the supply chain?
- **Timing:** When should this information be collected, processed and exchanged (at which stage of interaction process between the two companies) in such a way that: (a) business partners are not disturbed (b) quality information is collected? How long should such information be retained?
- **Method:** Which is the best method to collect this information effectively?
- **Rights:** What rights are conferred in the exchange of this information?

7.3 Requirements

Req [inf-01] e²-OSS solutions must support information management of all the resources associated with products that a trading party produces

Req [inf-02] e²-OSS solutions must support the management and exchange of information in communications supply chains according to agreements made by trading parties.

8 Technical Viewpoint

8.1 Technology Overview

The principal technical drivers for telco B2B e-commerce are

- The componentisation of service and OSS architectures allowing the creation of tradable service elements and new service architectures.
- Enterprise and Internet integration technology supporting the integration of processes within and between enterprises across these components.

Early attempts at telco B2B were OSS interconnection initiatives originating from regulation of incumbent network providers and involved many in house developments leading to industry initiatives such as electronic bonding and the TMFs Common Interconnect Gateway Platform.

More recently, general B2B integration technologies (B2Bi) have emerged which bear some similarity to these earlier telco specific initiatives but have wider applicability and industry acceptance.

As with the earlier generation of OSS interconnection Gateways in the US, these B2Bi technologies will initially be retrofitted to legacy and COTS OSS with little impact on enterprise processes and architectures.

However, OSS componentisation and increased use of EAI technology, accelerated by internal reorganisations, de-mergers and company acquisitions, will allow the affects of B2Bi technology to drive deep into enterprise application architectures.

Initial B2B integration of communications supply chains will support simple binary collaborations between buyer and seller for “simple” order models. Later, more creative and complex collaborations will emerge to support project based provisions, collaborative planning and bid support. Also the collaborations will evolve from sales and order management to include service assurance, billing, and other service and network management processes. The range and diversity of B2B interactions between enterprises over the Internet will parallel the range collaborations supported by extranets.

This increasing richness of collaborations and increasing complexity of supply chains will drive changes to traditional CRM applications in support of new analytical and marketing models together with tools for the creation and management new e-business trading relationships supporting the eTOM partner and supplier relationship process grouping.

To support the widening of process collaborations, a wider range of OSS applications will also be integrated behind B2Bi platforms alongside CRM.

Furthermore, the e-business style of telco processes, initially supported on B2Bi platforms, will migrate into enhanced versions of OSS.

The complexity of B2B integration of service providers’ differing enterprise processes and legacy OSS means that even the simplest B2B will have 80% failure rates in end-to-end automation (not accounting for the tasks of field personnel).

The e-enablement and componentisation of OSS applications, together with EAI integration, will address some of the fall-out issues. However, very high degrees of flow through will require industry co-operation to simplify portfolios and devise common standards for document definitions & supply chain processes that cross all trading partners with their differing roles and enterprise infrastructure.

The emergence of these standards, and their initial immaturity, will give also rise to the emergence of “market-maker” style facilitators. Initially, the goal of these facilitators will be to ease the transition to B2B e-commerce. As the standards and technologies mature, these intermediaries will evolve to support other value added services such market based process and information sharing.

During this time, B2Bi integration technology will also evolve; from a collection of self-built web server applications to more robust products based on ebXML and other frameworks.

Besides being more robust and performant, these products will improve developer productivity by introducing repository, authoring and publishing tools. Also, integration with the wider sell side e-business capability, will allow the creation, management and enforcement of e-trading agreements that will embody B2B commercial and technical trading arrangements between partners.

8.2 B2B e-commerce Products and Technologies

Functionally, e2-OSS solutions need to achieve integration of processes within and between each trading partner.

In some cases this involves the integration of OSS; in others the requirement will be for manual access to data and functionality within one trading partner by personnel of another.

As the majority of communications services (excluding CPE and other communications hardware provision and maintenance) are soft in nature, the e-commerce processes supported in this integration go beyond the conventional e-commerce support for sales and marketing to include fulfilment of services. Also, as trading partners often remain responsible for the maintenance and assurance of services for their whole life, e-commerce processes also include life long assurance and billing beyond initial delivery.

As a result, telco variants of B2B e-commerce technologies

- need to support a wider range of processes beyond those of standard supply chain integration
- potentially have stricter performance requirements in supporting online rather than batch processes
- include secure portal and shared web space for manual access as well as OSS/process integration features

8.3 Requirements

Req [tec-01] Besides ebXML style integration of enterprises in a communications supply chain, e²-OSS will need to support a variety of styles of B2B interaction including near realtime exchange of data and publish and subscribe mechanisms.

Req [tec-02] Integration of trading partners will need to support one-to-one, one-to-many and many-to-many integrations.

Req [tec-03] Where B2Bi integration is not possible for semi automated processes secure portals must be provided for remote access of selected processes and information by trading partner personnel.

Req [tec-04] e²-OSS will also need to incorporate the integration of B2B technologies to a variety of legacy enterprise architectures as well as deeper integration to EAI/component architectures as typified by NGOSS.

9 Service Architectures

There is a trend away from standardising and agreeing end to end customer services, and a move towards defining service capabilities that may be traded and combined to form a tailored customer service.

This unbundling process is supported by a variety of service architecture initiatives.

Examples include:

- Services such as a network based call answering service. This might be provided as a supplementary service by the incumbent operator or by a specialised supplier integrating their call answering service with the networking features of the incumbent.
- 3G Open Services Architecture (OSA) is a concept where a customer can define a Virtual Home Environment (VHE) comprising service capabilities or components that are combined to provide the VHE. As the customer roams so the components used may change - such as the access network operator. The inclusion of network operator programmable features into mobile terminals (MeXE) makes this concept technically feasible and relies on building and delivering complex service supply and support chains.

Similarly at the network level there is a trend to modularising or componentisation of the switching fabric: examples include Parlay and the MSF.

9.1 Parlay (www.parlay.org)

Parlay has come from a concept of a 'network API' that allows third party service providers to effectively access and utilise the Intelligent networking infrastructure of a network operator. It has evolved into a set of APIs.

The Parlay API describes two sets of interfaces: Framework Interfaces, which provide for the common functions that are required to enable services to work together in a coherent fashion, and Service Interfaces, which provide for the common functions that deliver whole complex services or sub-components of services (micro services.)

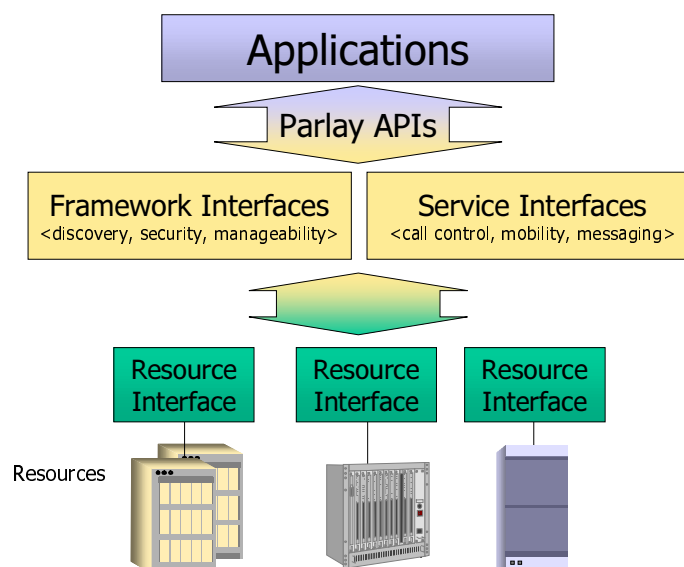


Figure 11 Parlay APIs

9.2 Multi-switching Forum MSF (www.msforum.org)

The MSF mission is to accelerate the deployment of open communications systems that realise economic benefits, which result from separating applications from the infrastructure over which they are delivered.

The focus is on development of architectures and industry agreements that enable interoperability and innovation in a rapidly evolving environment.

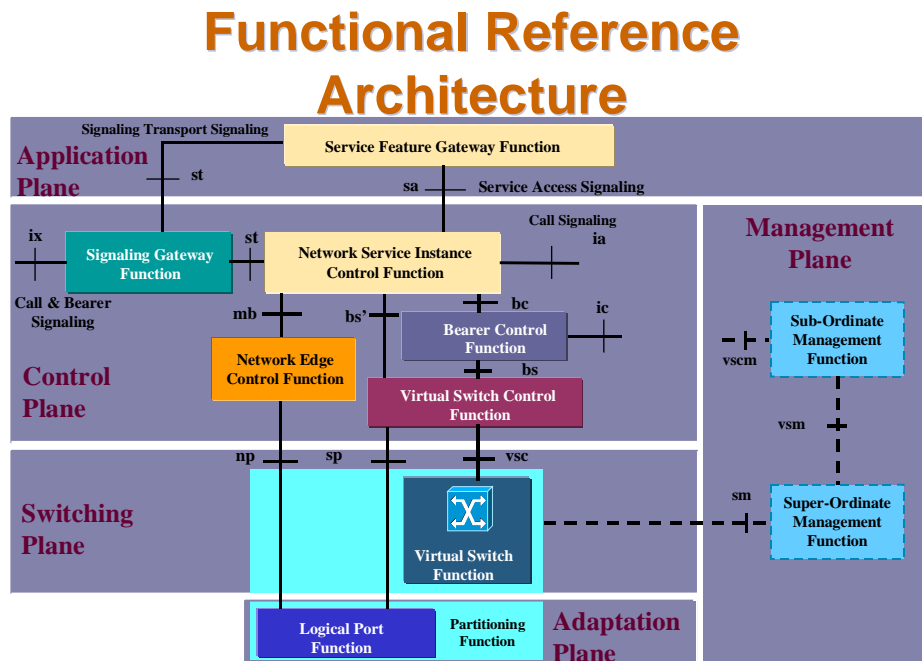


Figure 12 MSF Functional Reference Architecture

The key aspects of the architecture are the separation of control and signalling into components, and the definition of management functions / components to manage those Signalling and Switching functions.

9.3 Open Service Architecture OSA (www.3GPP.org)

The proposal for the network and service architecture of 3G releases 4/5 is to move towards an Open Services Architecture. This follows similar thinking for wireline service in the Parlay consortium (www.parlay.org).

An Open Service Architecture opens up the switching and signalling services of a network to allow other organisations to add innovative services and intelligence to basic network capabilities. The implications of this are:

- Operators do not have the concept of a fixed set of end user services that they are co-operating to deliver. For example, in GSM all GSM terminals have an agreed set of network features that they can implement such as call divert classes, SMS messaging, etc.
- End user services are constructed from element services offered amongst organisations, such as: call control, mobility, connectivity and messaging.
- The management and delivery of the end user service more complex as the organisation delivering the service to the end user has to have the ability to dynamically add and configure, and bill these services into the user profile.
- Any Service Level guarantees offer to the end user have to be backed up by (dynamically selected) QoS agreements for each element service, supported by real time SLA reporting and monitoring between organisations. These have significant impacts on OSSs as the SLA

monitoring is intimately tied to network performance tools, network configuration and inventory, repair systems, and billing systems.

9.4 Requirements

- Req [arc-01] e²-OSS solutions must support the B2B trading of new services and service components based on the service architectures of the MSF, Parlay and OSA organisations plus others.
- Req [arc-02] e²-OSS solutions must also include enterprise OSS applications that support the management of new component based service architectures.
- Req [arc-03] In supporting the trading and management of these service components, e²-OSS solutions must support the integration of end-to-end management.

10 SLA & QoS in Communications Supply Chains

Besides end-to-end service delivery, a key objective in integrating the activities of communications service providers in supply chains is to assure end-to-end quality of service to the consumer.

Key to this assurance is the creation and management of agreed service levels and quality of service measures.

A Service Level Agreement (SLA) is an agreed contract between two parties used to define a common understanding about Service Quality, Priorities, Responsibilities, etc.

Although SLAs can cover many aspects of the relationship between trading partners, of most concern is Quality of Service (QoS) of the delivered products and services.

An example is given in Figure 13 below where OSS B2B services are used to provision a service on an already connected network and applications. In addition to the ordering the service to be fulfilled over the connected network, QoS and SLA requirements are stated and monitored.

Most likely these SLA and QoS Parameters would be exchanged as information in e-business collaborations as part of fulfilment and managed as part of the assurance process.

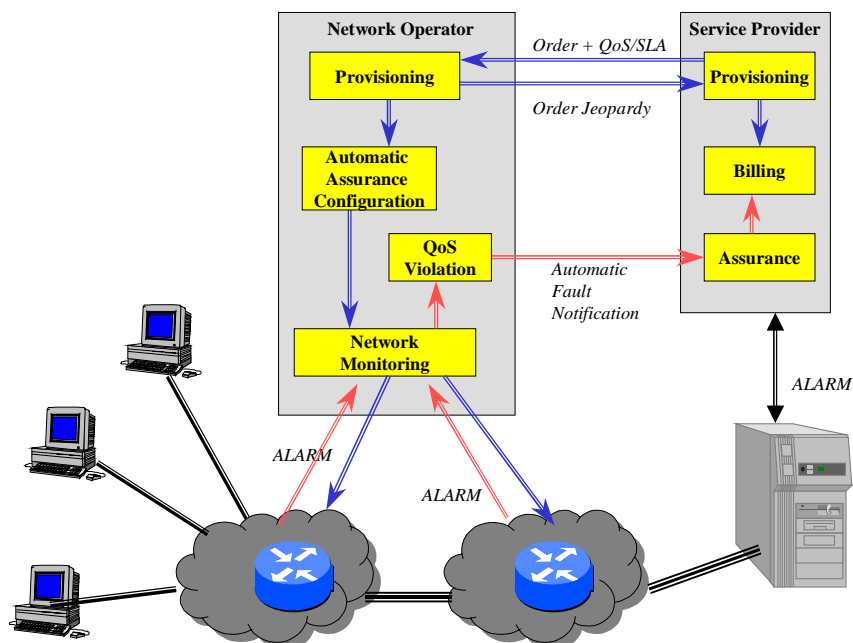


Figure 13 Networks and OSS Scenario for Service Assurance

10.1 Service Level Management and eTOM

Service Level Management (SLM) is all the actions performed by two parties in order to manage such a service once provided to agreed SLAs [5].

All the issues related to SLM are covered by TMF-eTOM (Telecom Operations Map) model according to Figure 14 as part of the assurance end-to-end process.

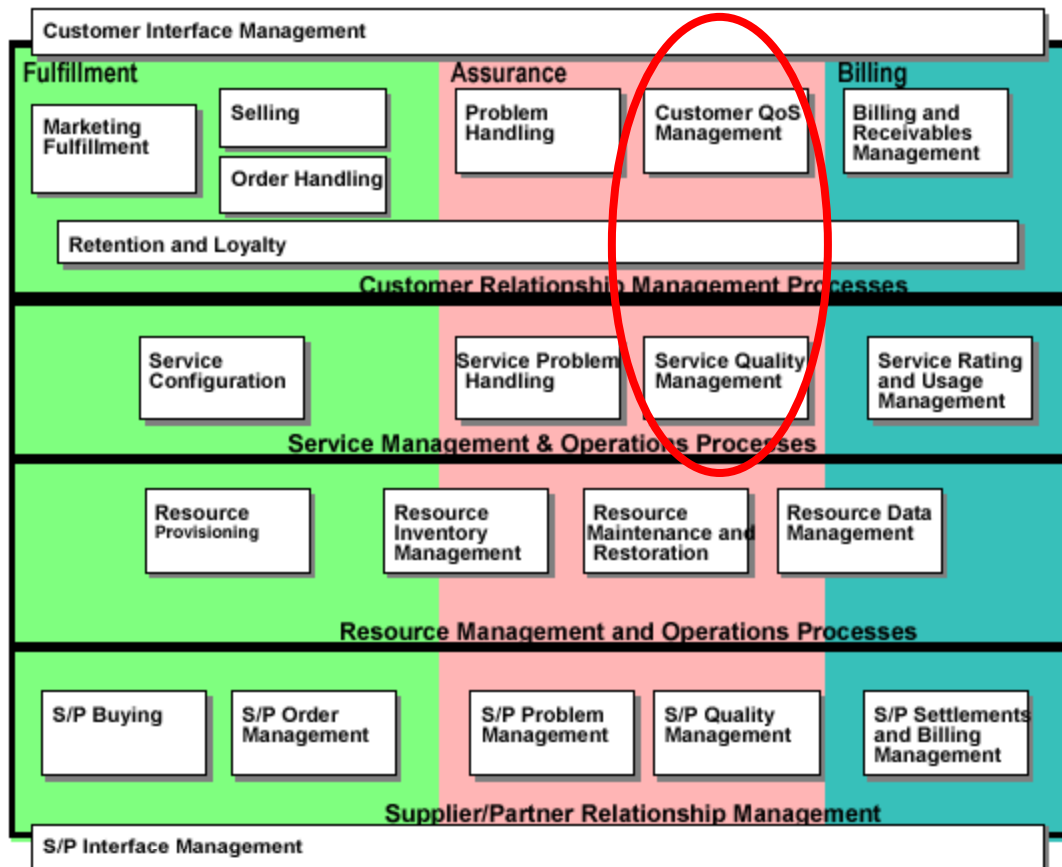


Figure 14 Zoom on TMF-TOM (Telecom Operations Map)

The SLA Management Handbook of the TeleManagement Forum (ref. 7) gives the requirements for the service level management of communications services during the fulfilment and assurance process. What follows is an overview of the requirements given by the SLA management handbook that would need to be supported by an entire supply chains, in delivering services to customers, in terms of processes, information and technical facilities.

10.2 Fulfilment

The requirements in this section are concerned with the SLA negotiation and engineering processes that take place during the fulfilment phase of the business process model.

The SLA is an integral part of the overall service contract and should include clear and unambiguous definitions of the following:

- The measurable QoS metrics and parameters that can be guaranteed by the SP for a specific service in terms that the Customer can understand and agree to.
- Service performance measurement method, measurement period, reporting period and reporting frequency. Customer and SP responsibilities, e.g. maintaining relevant hardware and software.
- SP procedures to be invoked on violation of SLA guarantees.
- Any conditions that affect operability/commitment to support.
- Selection of the type of reports associated with the service, specifying each report's contents, format, destination, conditions and delivery media.
- Service definitions for each service covered by the SLA.
- Process for handling the defined boundary conditions.

- Service cover time, i.e. the limits of SP support for different times of the day/week/month/year, etc.

For any service the Customer should be able to select:

- Parameters to guarantee.
- Value ranges for the parameters.

When defining the service reliability and performance metrics for the SLA, the following criteria should be considered:

- Provide concrete repeatable measurements in a well-defined unit of measurement without subjective interpretation.
- Be useful to users and SPs in understanding the performance they experience or provide.
- Be measurable by SPs, their Customers and outside testing agencies.
- Be useful as specification in the formal documents to help high performance users purchase the capacity that they need and to verify that it is actually met.
- Be useful for publication in data sheets.
- Be possible to provide measurements separately from each SP in a value chain.
- Be useful for diagnostics, including a diagnostic mode that can be used to sectionalise or identify the weak link in a long multi-hop, multi-provider path.

Standards and targets must be set with a periodic (e.g. annual) service performance review, which should include procedures to update the SLA according to changing Customer needs.

The SP needs to create the following:

- Thresholds for preventative activities to be initiated before a SLA violation occurs.
- A capability to store several values per parameter to support the need for different values. For example different values may need to be stored depending on time of day or week.
- The ability to collect information from underlying element and network management systems, such as performance management systems and traffic management systems.

10.3 Assurance

The requirements in this section are concerned with the assurance processes after the service has been provisioned and is being delivered to the Customer. They affect mainly the monitoring of service quality levels and the reporting of information to the Customer according to the SLA.

- The SP must be able to monitor and measure the delivered service quality against SLA commitments at a level acceptable to the Customer and/or the regulatory authorities.
- Accurate Customer-oriented information about all SLA parameters must be made available to Customers on a real-time and/or periodic basis as agreed in the SLA.
- Strong access control and authentication must be provided so that Customers are able to see only their own data.
- The SP should provide a capability to detect degradation in service performance, alert the Customer and respond to performance events affecting the Customer.
- The SP should provide a fault monitoring and tracking capability to ensure that faults are identified, tracked and resolved within time scales defined by SLAs, and should notify Customers when these critical milestones are not met.
- Customers should be kept informed of potential deviations from SLA coverage, including both scheduled and unscheduled maintenance. In the case of failure, Customers should be notified

of the approximate time that the service will be resumed and should be kept informed about the progress of problem resolution.

- The SP should have soft thresholds for every parameter to be warned of impending trouble and if a Customer wishes, it should be kept informed of any service degradation that could lead to possible SLA violations.

10.4 Customer Care

These requirements are concerned with the interface between the Customer and the SP and with how the Customer and SP interact in supporting a SLA.

- Customers should be able to report faults, request changes and make inquiries about their services by telephone, fax or electronically, and receive notifications in the same variety of ways.
- The SP should provide a rapid response to Customer helpdesk inquiries concerning service quality levels.
- The SP's Customer Contact Points should have information available on the current status of any service that the Customer could inquire about.
- When service is restored, the SP's Customer Contact Point should notify the Customer so that the Customer can test the service and confirm that the problem has in fact been resolved

10.5 Requirements

Req [asu-01] In order to assure end-to-end service e²-OSS will support collaborative service level management between partners in the supply chain. This would include negotiation of QoS and SLA requirements and their monitoring and enforcement as described in the TMF SLA management handbook.

Req [asu-02] B2B trading agreements will need to include agreement on the exchange of QoS and SLA information.

Req [asu-03] e²-OSS solutions must also support the use of trusted third parties to manage end-to-end service level issues such as budgeting of QoS elements and end-to-end monitoring.

11 Security

Security in e-Commerce is needed to prevent the corruption of data or processes, or the disclosure of confidential information by the misbehaviour of people. Where value is handled in some way, as is usual in e-Commerce, there is also the potential for fraud. It is therefore essential for the development of B2B e-Commerce, where high value transactions could be enacted, that security risks are controlled. Security covers a wide range of themes and possible technologies. There are some critical aspects however, which need to be developed, so that B2B e-Commerce can grow without encountering problems such as: low performance, high cost, unavailability, high fraud levels etc.

11.1 Threats to an Information System's security

The threats to information systems include the following categories:

- **System Penetration:** where unauthorized persons enter a system.
- **Authority violation:** a user authorized to use a specific part of the system abuses their rights.
- **Covert channel:** Code that allows access to a system or data by an unauthorized person. This code could be built in at the design stage, planted by a user or intruder or delivered by 'Trojan Horse' code.
- **Network Eavesdropping:** a third party could intercept data in transit.
- **Intervention in the communications:** a hacker acts in a trusted role, unknown to other network users.(e.g. spoofing, man in the middle etc.)
- **Denial of service:** the case where the access to a service or to a system resource is deliberately hindered by others (e.g smurfing).
- **Repudiation:** one of the participants in a transaction denies his participation in it.
- **Viruses:** software components that are introduced to a system to undermine its integrity.

11.2 Requirements Definition

The Security services, as defined in OSI model for the interconnection of open systems are described below in detail:

Table 3 Fundamental e-Commerce Security Requirements

Requirement	Description
Confidentiality	Ensures that information is not disclosed to unauthorised parties. Confidentiality services guarantee that the information is neither available nor readable to a unauthorised user and provides mechanisms that protect the transferred data from eavesdroppers. Confidentiality can be achieved with the use of <i>cryptography</i> .
User Authentication	Ensures that the parties involved in the transaction are who they say they are. Authentication is used to prove the identity of an entity, so that impersonation is prohibited. The simplest authentication form is based on password techniques.
Access Control	Ensures that only authorised persons can access certain electronic information. Access control contains some sort of user authentication (simple or strong), which is chosen according to the desirable security level.

Requirement	Description
Data Integrity	Integrity assures that data have not been changed or destroyed from non-authorized users. More specifically, authentication and integrity are essential in the context of the network security and use the same mechanisms, which are based on cryptographic techniques.
Availability	Systems need to be resistant to denial of service attacks to ensure that supply chains can operate in short time frames.
Non-Repudiation	Ensures that neither party can revoke or deny their role in a transaction or make false claims about posing or accepting an offer.

Req [sec-01] Accepted codes of practice for the management of information security shall be used by inter-operating parties (ISO17799)

Every security policy needs to be based on the business benefit it brings. Not all security is mandated by some higher authority or needed for the organisation's own protection. Much is demanded by customers and peers in the way of requirements and mutual agreements. It would be useful to take the principles of information security management as given in BS7799 (ISO17799) and refine them to reflect the real needs of e-business sectors.

Req [sec-02] Automated risk analysis tools based on ISO17799 shall be used where appropriate to reach common understandings of trust and security levels.

Use of a suitable tool to be used in this environment with a well defined: user interface, technical basis, and output. The output could be a prioritised list of threats, security policy document, network policies etc.

Req [sec-03] There shall be means of implementing policies across networks and between organisations.

Where policies need to be uniform or to correspond, the means to implement such policies need to be developed. This could be for instance to enable the fair exchange of data or in some key management processes.

Req [sec-04] The use of different B2B solutions and commensurate security properties shall be accommodated by appropriate risk analysis tools and security services.

The strengths and weaknesses of e-commerce solutions with respect to their security attributes need to be reflected in the risk analysis tools used. The differences between B2B and B2C security requirements need to be recognised.

Req [sec-05] There shall be common policy for choosing CAs and other TTPs between organisations

A single root CA for a specific business sector could be a simple solution but is undesirable. It is better to be equipped for handling multiple-PKI hierarchies, cross certified CA, uni-literal cross-certified CA's etc. The role of TTP services needs to be defined in this environment.

Req [sec-06] Authentication levels shall correspond between operators.

These vary from anonymous, low value transactions to high trust and high value transactions.

Req [sec-07] There shall be an agreed system for registration of users, to match authentication levels.

The assumptions made about the binding between private keys and unique individuals or entities need to be understood and normalised. Registration processes and other PKI elements must be treated as having risk associated with them. One example would be the provision of unique identities across a mixed CA environment.

Req [sec-08] There shall be agreed processes to identify levels of privilege against credentials offered.

This is for the provision of Role Based Access Control. This may involve the issue of consistent Certificate Policy (CP) and Certificate Practice Statement (CPS) which define the procedures for issuing a certificate and the intended purposes.

Req [sec-09] There shall be commonality between audit authorities

Auditors of e-commerce systems must have appropriate qualifications and credentials. It should not be the case that every inter-operating party must audit each other.

Req [sec-10] Site audit accreditation classes shall be used to show compliance with standard security practices.

Audit requirements need to be associated with ISO17799. Where risk is highest for inter-operating parties, there must be clear guidance on how to achieve appropriate levels of trust.

Req [sec-11] There shall be agreed use of distributed business continuity methods

In e-commerce, if a business fails or changes in some way, how does that affect inter-operating parties? If we determine that business state changes can be detrimental, then it would be useful to know how to minimise the impact of such events.

Req [sec-12] There shall be unified data retention policies

Data retention policy is partly a legal requirement area (e.g. for tax purposes) partly a organisational efficiency issue and partly an information theory topic. It is useful to have a policy devised and enforced for all data generated by an organisation regarding its whole life management. Interoperation needs appropriate attention to data retention.

Req [sec-13] There shall be a standardised directory schema

Directory enabled services such as Directory Enabled Networks (DENs) need very well designed directory schema, and network elements to comply with appropriate standards. The extent of the role directories have in end to end, networked e-commerce activities needs to be determined.

Req [sec-14] Directory information including authentication data shall be stored in secure entities

New uses of directories mean that data contained in them can be 'public domain', 'secure' or even 'business critical', each with a range of security attributes. Hence the business requirements and risks for applications involving directories need to be assessed and the role of other databases factored in as appropriate.

References

- [1] Impact of e-commerce on Service and Network Management Evolution EDIN 0211-1106
<http://www.EURESCOM.de>
- [2] Durlacher 2000 Mobile Commerce Report (<http://www.durlacher.com>)
- [3] IDC 2000 European B2B and eMarketplaces 1999-2005
- [4] Ovum 2000 New Markets for Communications Carriers and Service Providers
- [5] TMF GB917 SLA Management Handbook (<http://www.tmforum.org/>)
- [6] TMF GB921 eTOM The Business Process Framework (<http://www.tmforum.org/>)