Telecom Applications Map

The BSS/OSS Systems Landscape

Release 2.1

GB929

Version 2.4

August, 2007

Notice

No recipient of this document shall in any way interpret this document as representing a position or agreement of TM Forum or its members. This document is a draft working document of TM Forum and is provided solely for comments and evaluation. It is not a Forum Approved Document and is solely circulated for the purposes of assisting TM Forum in the preparation of a final document in furtherance of the aims and mission of TM Forum.

Although it is a copyrighted document of TM Forum:

Members of TM Forum are only granted the limited copyright waiver to distribute this document within their companies and may not make paper or electronic copies for distribution outside of their companies.

Non-members of the TM Forum are not permitted to make copies (paper or electronic) of this draft document other than for their internal use for the sole purpose of making comments thereon directly to TM Forum.

If this document forms part of a supply of information in support of an Industry Group Liaison relationship, the document may only be used as part of the work identified in the Liaison and may not be used or further distributed for any other purposes

Any use of this document by the recipient, other than as set forth specifically herein, is at its own risk, and under no circumstances will TM Forum be liable for direct or indirect damages or any costs or losses resulting from the use of this document by the recipient.

This document is governed by all of the terms and conditions of the Agreement on Intellectual Property Rights between TM Forum and its members, and may involve a claim of patent rights by one or more TM Forum members or by non-members of TM Forum.

Direct inquiries to the TM Forum office:
240 Headquarters Plaza,
East Tower – 10th Floor,
Morristown, NJ 07960 USA
Tel No. +1 973 944 5100
Fax No. +1 973 944 5110
TM Forum Web Page: www.tmforum.org

TABLE OF CONTENTS

List of Figures

Executive Summary

This document provides the global telecom software industry with a frame of reference to understand the relationship of the multitude of operational systems typically found within a service provider or network operator. It is intended to be a practical, everyday working guide for those organizations who buy or sell operational systems to help position and navigate a complex landscape. It is not intended to be prescriptive so that operators are required to implement this approach. However it does provide a 'lens' to use to compare their current implementations with an idealized approach. The document can also be used by suppliers to help position their products in relation to a common reference framework.

TM Forum's vision is "To lead the emergence of lean and agile operators, able to compete in 21st century markets". The Lean Operator Program is thus TM Forum's flagship program and the New Generation Operations Systems and Software (NGOSS) technical roadmap is a key technical and process enabler of that program. The Telecom Applications Map forms the 4th major framework that comprises NGOSS.

Granularity is an important factor in the design of this Telecom Applications Map. The authors have taken an approach at the systems level based on commercially available products. Clearly these products have options and feature sets that could be used to develop a more granular level of abstraction, but the criteria used has been to examine the market and find at least 2 suppliers of commercial technology in any area of the Map.

Care has also been taken to align this map, wherever possible with other TM Forum publications, particularly the enhanced Telecom Operations Map® (eTOM) and the Shared Information/Data (SID) Model. Thus terminology used in this Map mirrors, as far as possible, eTOM parlance. For completeness, the Applications Map includes infrastructural software components as well as applications components.

1. Introduction

Welcome to the Telecom Applications Map (TAM). This document is intended as a working guide to help operators and their suppliers use a common reference map and language to navigate a complex systems landscape that is typically found in fixed, mobile and cable operators. Where the enhanced Telecom Operations Map® (eTOM) provides a frame of reference for telecom *processes* and the NGOSS Shared Information Data model (SID) provides a frame of reference for standardized *information language*, the Telecom Applications Map provides a frame of reference for telecom *applications*.

Release 1.0 of this document concentrated on the Operations (Fulfillment, Assurance, and Billing) segments of the eTOM primarily in the Resource Management, Service Management, and Customer Management layers. This release provides further detail in these layers as well as the Market / Sales, Product, Supplier / Partner, and Enterprise Management layers. Grouping some of the level 1 categories into an Operational Support & Readiness (OSR) eTOM segment has been introduced, along with the addition of supporting contracts for some of the level 1 categories. Mapping between the Telecom Applications Map and eTOM / SID will be addressed in a future release.

The Telecom Applications Map provides the bridge between the NGOSS framework building blocks (eTOM and SID) and real, deployable, potentially procurable applications by grouping together process functions and information data into recognized OSS and BSS applications or services.

No document like this can ever be 'right' in the sense that it represents a perfect systems infrastructure for an operator. What this document intends to give the industry is a common frame of reference that allows the various players who specify, procure, design and sell operation and business support systems to understand each others viewpoints. It has been built up from observation of typical systems available in the industry today and will naturally evolve as these systems evolve.

Wherever possible, the Telecom Applications Map keeps to language already common in the industry or used in other TM Forum publications particularly the eTOM. It has been designed to be as generic as possible without losing touch with market reality and to be familiar as possible to industry users, thus it uses the familiar layering concepts of the TMN model, enhanced to cover the management of *resources* rather than simply the *network*. Thus in this context, resources could be a variety of items such as network elements, sub-networks or servers.

The document is laid out against this layering approach and describes the principal functions of each layer and each system. For completeness, the TAM includes infrastructural systems, such as bus technology and business process management technology that are not strictly applications.

There are a number of benefits to the industry in using a common Telecom Applications Map:

- Common Application Language

The common language for information exchange within the industry will result in reduced investment risks and costs through industry alignment. The procurement process will be made easier by using a common map and application definition, and component license costs will be reduced through higher reusability and lower custom development. As the TAM is adopted by the industry, the market for suppliers based on operators procuring from the standard applications model will grow.

- Standard Application Requirements

A key deliverable of the TAM is an industry set of standard application requirements that will enable the development of reusable components leading to a more modular approach to application development. This reuse will result in lower costs through economies of scale. Similarly the component approach will encourage the adoptions and development of standard interfaces between components which will again reduce development costs.

- Enable Automation

The standard, deployable components that result from the adoption of the TAM will enable a higher degree of automation within the service providers' businesses which will in turn reduce human errors and improve operational efficiency. With solutions based on a standard application map it will be easier for organizations to change they way in which they work by adding or changing components within their support systems. Similarly, mergers and acquisitions will be easier to manage through the common understanding of applications delivered by the TAM's common language and the business integration points easier to identify.

The TAM has been developed using a product deployment and product implementation point of view to identify typical systems available in fixed, mobile, and cable operators today and assist the various players who specify, procure, design and sell operation and business support systems to understand each others viewpoints.

Assumptions used in the development of the Telecom Applications Map were:

An application is a set of one or more software artifacts consisting of well-defined functions, data, business flows, rules and interfaces. These artifacts include:

- Data Model for data used to interface to and within application
- Policies for governing external and internal application resources
- Flow Model for functionality with application
- Contract Specifications for (externally visible) interfaces to functionality with application

Applications are implementable as a deployable package and procurable in the system market place.

It should be noted that this definition is from a Telecom Applications Map viewpoint.

The definition for an application from the technology neutral architecture viewpoint is "An NGOSS Application is a container artifact which provides an encapsulation of the requirements, specification and implementations of designed functionality, from the perspective of Service Providers, needed to support a specific business goal within their operating environment."

Additional information regarding NGOSS terminology can be found in the NGOSS Technology Neutral Architecture suite of TMF053 documents, and in GB927 NGOSS Lifecycle Methodology.

In order to be an application, there must be at least two commercially-off-the-shelf (COTS) products in the market. This was verified by at least two service providers

OSS/BSS terminology was used in the general text, but was not used to differentiate functionalities nor separate areas on the TAM.

If a feature had its own context (could stand alone), and its own features and contracts, it became a level 2 application

Level 1 applications contain core functionality that is shared with its level 2 applications. Level 2 applications only contain specific functionality.

Supported contracts are typical and important, but are not a complete list. They will serve as requirements input to the NGOSS Contracts Management program initiative.

The eTOM level 1 vertical segments, FAB and OSR, were used for the Customer, Service, Resource, and Supplier / Partner layers only.

The SID domain horizontals excluding the Common Business Entities (CBE) were used and the team “management” was added.

Used eTOM terminology when discussing business functions and SID terminology when discussing system data.

The following are open issues which will be addressed in the next release:

Terminology used is not always in alignment with eTOM, SID, or Lifecycle/TNA

Mapping TAM to eTOM and SID

Service Management and Resource Management sub-sections need to be rearranged to be in alignment with the TAM diagram (reading left to right)

Oracle contribution of Retail Customer Fulfillment Process diagram, Corporate Customer Fulfillment Process diagram, Customer Problem Resolution Process diagram, and Customer Billing Process diagram

Korea Telecom contribution for Order Management and Resource Management

2. The Telecom Applications Map

The Telecom Applications Map has been designed to be of use by the entire spectrum of players in the telecom software value chain. It may be used for a variety of functions and allows both the operator and supplier communities worldwide to have a common frame of reference in describing both their current and future needs and intentions. For example, an operator could use the Map to model their current (as-is) OSS applications in a structured format; as well as developing a (to-be) future model and deriving a clear gap analysis. By using this common layout and nomenclature, the current and future landscape would be much easier for consultants, suppliers or system integrators to understand the situation and requirement.

Alternatively, a supplier may wish to use the Map to highlight the systems that they supply and the systems that they partner with other companies to deliver. It may be used to show both current and future portfolios. Investors or financial analysts may find the Map useful to describe the OSS market in terms of its growth, value etc. Others may find the Map a useful starting point in assembling directories of suppliers active in each segment of the Map.

Thus the Telecom Applications Map can be used across the entire telecom value chain as shown in figure 1 below:

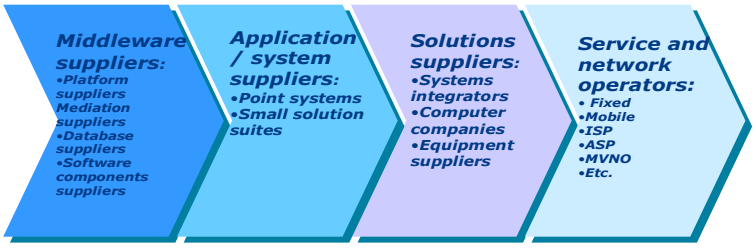

Figure 1: Telecom Value Chain

Wherever possible, TAM uses language already common in the industry and builds on the process and common information models key to the TM Forum's NGOSS program especially the eTOM and the SID. It has been designed to be generic without losing touch with market reality and to be familiar to industry users, thus it uses the familiar layering concepts as those specified in the eTOM and SID.

The document is laid out against this layering approach and describes the principal functions of each layer. The Telecom Applications Map, shown in figure 2, is segmented by the primary eTOM end-to-end level 1 vertical process areas: Fulfillment, Assurance, & Billing (FAB), and Operational Support Readiness (OSR) functions along with the layering SID domains of Market/Sales, Product, Customer, Service, Resource, Supplier / Partner, and Enterprise. Each box on the map represents a level 1 TAM category.

The TAM also recognizes managed resources including network based resources; content servers Intelligent network platforms and related network control technologies such as element management systems as well as the OSS infrastructure fabric e.g. bus technology, business process management engines etc. The term OSS is used to cover all the systems that are used by a telecom operator, sometimes referred to as OSS and BSS.

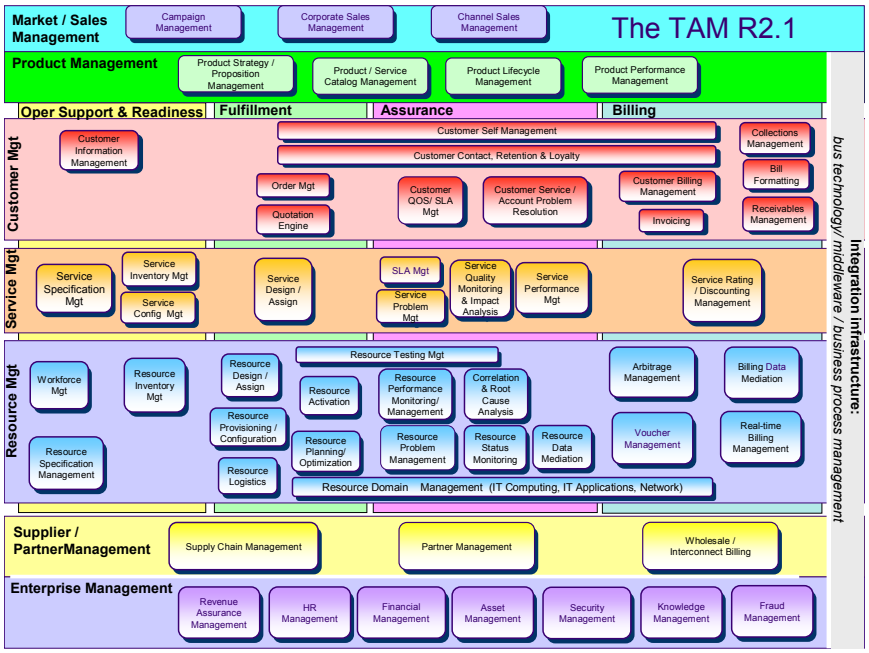

Figure 2: The Telecom Applications Map

The bulk of this document is used to describe the level 1 applications of each of the layers of the TAM. In some cases, level 1 applications are broken down into level 2 applications where additional clarity would help the reader. Each application includes an overview description, a functionality description, and supporting contracts.

3. Market / Sales Management

The primary application areas in the Market/Sales area of the Map are as follows:

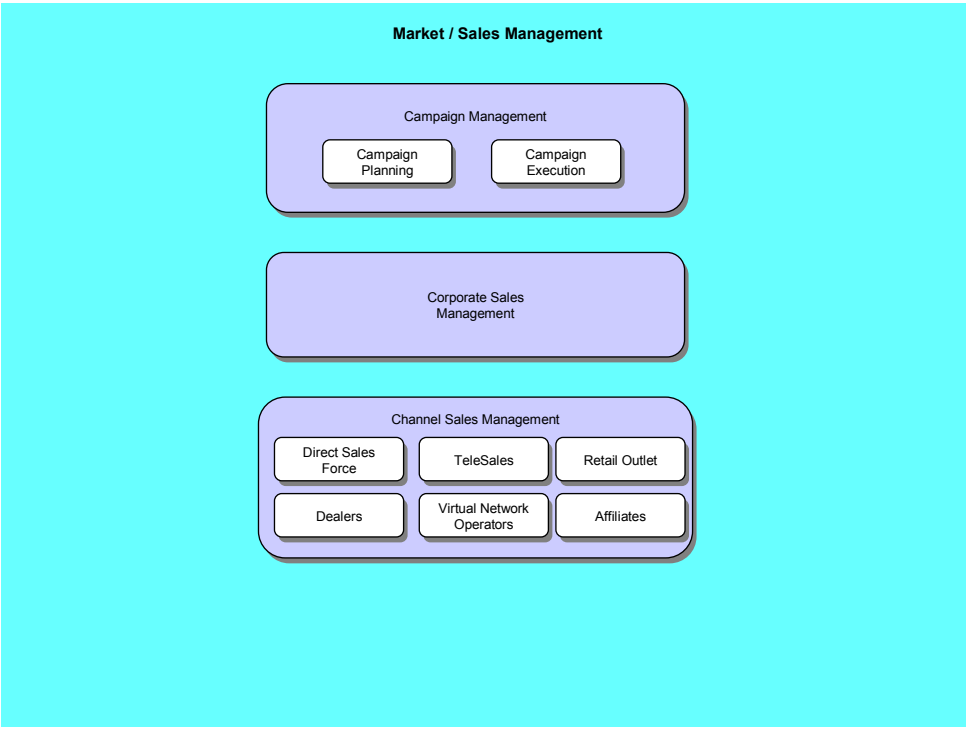

Figure 3: The Market / Sales Applications

3.1. Campaign Management

Overview

The campaign management applications are responsible for managing the lifecycle of marketing campaigns.

Service Provider marketers need to respond to changing market environments with marketing initiatives that push highly targeted messages to increasingly focused segments. Marketers need an adaptable and flexible campaign management application that can adjust to evolving customer lifecycles with corresponding targeted marketing strategies. Marketers need to deliver coordinated outbound and inbound campaigns across all points of interaction— focusing marketing resources where the greatest potential value exists. The campaign management application needs to:

- Leverage a single, consistent view of customer data.
- Be highly usable, which increases marketing productivity and effectiveness.
- Provide valuable insight into marketing performance through analytics that enable marketers to continually adjust and improve marketing investments.

Functionality

The campaign management applications ideally have the following features:

Campaign Analytics

Provides quantitative tools to analyze customers and prospects to help design the right recommendations. Next generation applications also provide statistical analysis and modeling to optimize target markets and assist in self learning and optimization of campaigns based on the empirical analysis of past campaign execution.

Marketers need to utilize a segment designer that allows quick identification of desired targets, as well as global profile management capabilities that allow new customer data attributes to be designed on the fly. The resulting profiles can be leveraged immediately for actions that include segmentation, personalization, and branching logic.

The campaign analytics feature benefits from the automation of essential campaign processes in the campaign management application and uses all the managed communications with customers across multiple channels, tracking responses and consolidates and reports campaign planning & execution performance.

The campaign analytics features should be able to gather and analyze data from past campaign planning success and performance in a continuous loop and feed this data back into the campaign planning feature.

Marketers need to construct meaningful market segments and base their campaign investments on valid assumptions and projections. Through Predictive Analytics, marketers need to build models to predict campaign response likelihood, determine customer retention risk or predict any user-defined customer behavior. Marketers can then leverage the model's predictions to determine which customers/prospects are most likely to display a particular behavior.

Campaign Design

Campaign Management Applications provide the ability to plan & design campaigns, as well as manage and monitor campaign delivery activities. A distributed marketing framework that simplifies marketing capability delivery.

By bringing marketing capability delivery closer to the different groups that make up the marketing and offer management groups, the service provider can support truly distributed campaign management capabilities. In this area, Campaign Management Applications should include the ability to assist:

- Marketing and sales managers explore install base and historical customer data, and to mine that data for cross-sell and up-sell opportunities.
- Users can quickly create campaigns to push opportunities out to pre-defined sales territories using a coordinated sales methodology.
- Templated campaign creation: Many frequently used campaigns, segments, content templates, and their tracking metrics are pre-defined to step through campaign setup and execution, and yet customizable.
- Pre-defined execution channels and fulfillment include direct mail, email, fax, web, events, telesales and sales.

Campaign Execution (& Refinement)

Campaign Management Applications provide a distributed marketing framework that simplifies marketing capability delivery. By bringing marketing capability delivery closer to the different groups that make up the marketing and offer management groups, the service provider can support truly distributed campaign management capabilities. In this area, Campaign Management Applications should include:

- Permission-based controls to ensure that customers are always treated according to their preferences, no matter which interaction point you use.
- Users can quickly execute campaigns in their own terms to push opportunities out to their territories, along with a coordinated sales methodology. Integration to Sales Management Applications and Channel Sales Management Applications is needed.
- Integrated Workflow notifications ensure that approvals are in place as needed.
- Event triggers ensure that campaigns and waves are executed at critical points in the customer lifecycle.

- Inbound and outbound campaign coordination for marketing control of the interactions that follow a campaign.

Inbound Marketing

Marketers need to take advantage of the moment each customer interaction takes place by timing the delivery of relevant messages to particular segments at the right time—across any channel. Providing marketers with the foundation to design a completely multichannel, coordinated inbound and outbound customer experience. Marketers need to utilize real time analytics that provide real time rules, scores, and decisioning logic that executes actions at the moment your organization is interacting with a customer.

Program Management

Marketers need to manage a whole marketing program. create budgets, track costs, develop task lists, and assign teams. In this area, Campaign Management Applications should include:

- A Searchable marketing calendar allows marketers to view program activity by any criteria, including date, campaign type, program owner, or segment.
- Dynamic alerts that send team members personalized messages designed to keep marketing program development on track.
- Built-in security that ensures that marketers are self sufficient within specified boundaries, as well as built-in workflow that enforces approval processes.
- Budget and Cost Management functionality supports a budget hierarchy to define unlimited sub-budgets, allocated via different mechanisms, including past sales history.
- Request and transfer funds from different budgets, approve budgets for different messages and product programs, and track approved, committed, and utilized budgets throughout.
- Offer Management functionality that enables marketers to plan and create offers with marketing initiatives. These are then tracked through to order fulfillment for enhanced marketing accountability. This requires integration with Sales Management and Order Management Applications as well as integration to an Enterprise Product Catalog.
- Built in content management functionality to provide marketers with an integrated framework that stores, categorizes, and manages collateral and communications materials.
- Content template definition and style sheet management, content workflow approvals, versioning, and access control. Translation management and support for multiple languages is needed.

Performance Tracking

Marketers need to monitor campaign performance in real time. Marketers need a combination of real-time reporting and what-if modeling capabilities to continuously optimize campaigns by taking corrective action—even when campaigns are already underway. In this area, Campaign Management Applications should include:

- Real-time view into customizable segmentation schemes and key metrics.
- Dashboard views, alerts, and notifications provide marketing organizations with the insight and agility needed to protect and optimize marketing investments.
- Prebuilt Marketing Insight reports.

Supported Contracts

- Manage Business Intelligence
- Manage Dashboard
- Manage Predictive Analytics
- *Send Recommendation(s)*
- *Consume Recommendation Success*

3.1.1. Campaign Planning

To Be Added

3.1.2. Campaign Execution

To Be Added

3.2. Channel Sales Management

The Channel Sales Management application area contains several level 2 applications, each supporting different channels. This application contains core functionality shared amongst level 2 applications, and functionality specific to each channel. This section is organized to reflect Common Functionality, then addresses the specificities of each channel:

Common Functionality

Although these different channels may require different user interface layers serving the specific needs for each channel, the core application logic and data store is common to all channels to enable the 360 degree view irrespective of the channel being used. The Common Functionality section describes those core functionalities and supported contracts.

Overview

The channel sales management application is responsible for internal sales channels, such as field sales, Telesales and Retail stores, as well as sales performed by channel partners, such as dealers, resellers and affiliates.

The channel sales management application is responsible for internal sales channels, such as field sales, Telesales and Retail stores, as well as sales performed by channel partners, such as dealers, resellers and affiliates.

Sales channels for communications service providers include:

- Direct sales force (also known as field sales) – most handling corporate and medium sized businesses
- Telesales / ordering department – selling over the phone to consumers and small businesses
- Retail outlets – the Telco's branded retail stores, (mostly common in Wireless communication provides and mostly serving consumers and small businesses)
- Dealers – 3rd party retailers that sell the communications service provider's services, mostly to consumers
- VNOs – Virtual Network Operators, that sell their own branded services over the communications service provider's network
- Self Service
- Affiliates

Functionality

- Create and promote leads.
- Create and promote contacts.
- Create and dispatch literature requests to customers.
- Lead Management: A lead is a person with an interest in the CSP's service offering(s). The lead, for example, may have requested information about the

CSP's services. The direct sales application should provide the support and functionality CSP's need to efficiently move the lead through the relevant stages in the lead qualification phase of the sales cycle.

- Sales quotation

Supported Contracts

- Product catalog (catalog browsing, selection of products/services, quoting)
- Resource management/Inventory Management (e.g., phone numbers, SIM cards, equipment)
- Credit check service (check credit history of the customer)
- Address validation/completion service
- Resource management/Inventory Management (e.g., phone numbers, SIM cards, equipment)
- Workforce Management (installation scheduling)
- Fulfillment management (shipping)
- Billing/Accounts Receivable (creation of billing profile, payment and deposit handling)

3.2.1. Direct Sales Force

Overview

The Direct Sales Force application is used by CSR's, Field Sales, Sales Administrators, Analysts and Managers to generate/qualify sales opportunities, generate revenue, maintain and optimize the sales process, territories, quotas, view forecasts.

As a Customer Service Representative (CSR), you have first contact with potential customers. Incoming telephone calls and emails enable you to capture customer information and qualify leads according to the guidelines set by your company (cf Customer Information Management). If the lead satisfies your criteria, you can promote that lead to the status of a contact, and an opportunity. Sales opportunities are dispatched to sales representatives in the field to pursue if the size of the sale has the potential to exceed agreed monetary thresholds. If not, you can respond directly to customer inquiries by creating and dispatching literature requests and/or sales quotations. Orders are submitted for processing when you receive acceptance for the contract that has been negotiated with the customer (cf. Order Management).

A user of the Direct Sales application can have one of the following roles:

Customer Service Representative (CSR). As a CSR or agent, you generate and qualify sales opportunities and dispatch leads to field sales representatives. Your primary method of communication with the customer is by phone and email.

Field Sales Representative. As a field sales representative, you create and manage customer accounts, develop sales opportunities, and generate revenue

Sales Administrator. As a Sales Administrator, you manage the design and maintenance of the overall sales process and stages in the sales cycle according to business requirements.

Sales Analyst. As a Sales Analyst, you manage sales territories and quotas and generate sales forecasts and pipeline analyses.

Sales Manager. As a Sales Manager, you define sales territories, and manage the sales process and forecasting.

Functionality

Create and dispatch opportunities to relevant employees/sales personnel.

Create and dispatch sales quotes to legal, finance, sales manager for approval.

Campaign execution: A campaign is a planned marketing effort to promote a single product or range of products. The direct sales application should enable the capture of details of the campaign promotion, such as the duration of it and the products, pricing strategy, and media channels you want to use.

Forecast Analysis: This feature should enable data analysis of your sales pipeline and predict the revenue that will result when opportunities are won and deals are finalized. Forecasts are either Sales forecasts, which one can apply to anticipate the consumer demand for and consumption of the CSP's product range, and the revenue the CSP expects to result. There are also Order forecasts, which enables CSP's to determine whether the supply required is available to meet expected consumption levels. This should integrate to logistics systems for auto-replenishment and order management applications.

Opportunity & Quote Management

Territory Management: A direct sales application can structure sales territories to assist structuring of the CSP's sales organization. For example, CSP's should be able to organize territories by geography, industry, named accounts, service lines, or opportunities. One should also be able to compress many territories into a single territory. You can assign territory-specific roles to your sales employees as members of a team. A single employee can perform many roles within a territory, or one or more roles in other territories. If required, you can structure territories according to a parent-child hierarchy.

Supported Contracts

Typical contracts for a Direct Sales application are to Document Design or electronic document generation applications, and Enterprise Management applications for legal & regulatory approval.

3.2.2. Telesales

Overview

Some Communication Service Providers use the customer service call center agents as a sales channel and allow them to sell and order services for customers who are calling in (reactive sales). Other Communication Service Providers have a dedicated call center for taking orders that is separate from the customer service call center. The Telesales call center does both reactive and proactive sales efforts.

An application geared for Telesales should provide the following benefits:

Business Benefits

- Quick time-to-market for new and advanced services
- Improved quality of service and minimum faulty orders
- Increased customer satisfaction and loyalty
- Reduced churn

Benefits from the Telesales agent's perspective

- Simplified application flow
- Shorter training time
- Shorten calls
- Complete visibility to order status at all times

IT Benefits

- Open, standards-based integration capabilities leverages current investments
- Faster response time to business needs

Functionality

An application for telesales agents should provide the following capabilities:

- 360 view of the customer, including full customer details, recent interactions, pending activities, history
- Complete order capture, negotiation and activation capabilities (see section 6.2 for detailed functionality list)

- Order tracking capabilities
- Ability to create action items when follow up activities are required
- Multi media integration (CTI, Predictive dialer, Email)
- Scripting
- Cross sell/up sell recommendations

Supported Contracts

No specific contracts

3.2.3. Retail Outlets

Overview

One of the primary sales channels for Wireless Communication Service Providers is the provider's own retail stores. Other communications sectors rely less on this channel due to the fact that non-Wireless services typically need to be physically installed on the customer's premises, whereas in wireless communications the customer typically gets services instantly at the retail store/point of sale. Non-wireless services providers may use retail outlets as a means to complete an order (e.g., for customers that want to pick up a DSL modem from a retail outlet to complete their order in order to avoid payment of shipping costs).

Retail stores are considered an extension of the call center in the sense that existing customers may walk in and ask for assistance in customer service issues (e.g., billing, how to operate their handset, etc.). In other words, Retail Stores are not only used as Point of Sale but also used as Point of Service.

Functionality

Retail store agents require an application that exposes most of the functionality used by call center agents (Telesales and customer service), and also have additional processes that are unique to the retail environment (for example, handset loans and repairs). A retail application should therefore include the following functionality:

- Complete customer information management capabilities
- Customer contact and retention management capabilities
- Order capture and negotiation capabilities
    - Specific to retail stores, order management should be capable of supporting contract printing, integration with a locally installed cash management/cash register and a retail inventory system for order completion.
    - Billing management activities
    - Problem resolution

- Specific to retail stores, problem resolution should be capable of handling handset repairs, including reverse logistics and advance exchange.

In addition, retail stores may also require the following additional clients:

- A self service kiosk, located in the store, to allow customers that are in the store to lookup information about products, services, promotions, etc., access and pay their bills, or even start configuring a product while waiting in line.
- Handheld device used by sales agents in the store, to allow them to help customers with information about products and services, and to allow them to configure a quote for the customer. The quote/configured offer can, in turn, be transferred to the agent "behind the counter" for completion of the order.

Supported Contracts

Potential interface areas:

- Most of the CRM applications
- Cash management system
- Inventory management system / ERP
- Accounts Receivables/Billing
- Spares Management / Logistics / Reverse Logistics applications

3.2.4. Dealers

Overview

Dealers are 3rd party retailers that sell the services of the Communication Service Provider and get commission for those sales. Dealers vary in size and can range from a country wide retail chain to a local retail shop in a rural area. Some dealers sell the services of multiple Communication Service Providers and some are exclusive to one Communication Service Provider.

Dealers focus on acquiring new customers and upgrading existing customers. Most dealers are only a Point of Sale and not a Point of Service (as opposed to the Communication Service Provider's owned retail stores). The dealer's main focus is to acquire new customers or upgrade existing customers. The main need for a dealers online application is to make them self sufficient and avoid the need for them to call the call center on behalf of a customer to activate their handset.

Functionality

An application for dealers should include the following capabilities:

- Customer acquisition (customer creation and new order for products and services for the newly created customer)
- Lookup existing customer details by mobile number
- Upgrade customer's products/services
- View dealer commission statements
- View products, services and promotions data
- View other communications from the Communication Service Provider
- "Data fencing" – a security feature that will allow dealers to view only the customers that they sold to (in order to prevent solicitation of other customers to increase commission)

Supported Contracts

Potential interface areas:

- CRM
- Commissions management
- Knowledge management system
- Product catalog

3.2.5. Virtual Network Operators (VNOs)

Overview

Virtual network operators are typically service providers that do not own their own network but sell communications services under their own brand on top of another service provider's network. Some VNOs also do not own their own Business Support Systems (BSS) and "lease" these systems from the network provider that provides their network services. Such VNOs are the focus of this section.

The network provider that "leases" the business support systems to the VNO should therefore provide a separate online application for the VNO agents to be able to manage their customers, and handle fulfillment, assurance and billing issues for these customers.

Functionality

An online application that will allow VNOs to manage their customers' lifecycle should include the following capabilities:

Customer information management capabilities

Customer contact and retention management capabilities

Order capture and negotiation capabilities

Billing management activities

Receivables and Collection activities

Problem resolution

"Data fencing" – a security feature that will allow the VNO agents to view only the VNO's customers. In some cases, the network provider will use the same BSS environment to serve several VNOs (multi tenancy)

"VNO Personalization" – in cases where the network provider serves multiple VNOs under the same BSS environment (multi tenancy) the user interface of each VNO needs to be "personalized" to the VNO business (look and feel, business flow, etc.)

Supported Contracts

To Be Added

3.2.6. Affiliates

Overview

Some service providers have affiliate companies that may feed in orders. An example could be a *Wireless* Communication Service Provider that has an affiliate *Wireline* Communication Service Provider that wants to bundle its wireline services with the affiliate's wireless services. When the affiliate sells the bundle, it will need to notify the wireless service provider of the sale, and the wireless service provider may need to assist in completing the order.

Functionality

An application to support the above flow should include the following capabilities:

Mass service/product pre activation

Mass transaction feed of new orders

Activation of service/product sold by affiliate

Registration of pre activated service/product

Supported Contracts

Potential interface areas:

Partner Revenue Settlement System

Inventory/warehouse management/supply chain

3.3. Corporate Sales Management

Details to be added in the next release

4. Product Management Applications

The primary application areas in the Product Management area of the Map are as follows:

Comment: Product/Service Catalog should be changed to Product Catalog as there is a separate Service Catalog being developed in mTOP-SM and a separate Service Catalog referenced in the OSS/J Inventory API.

Additionally, this current name "Product/Service Catalog" is referencing two different domains.

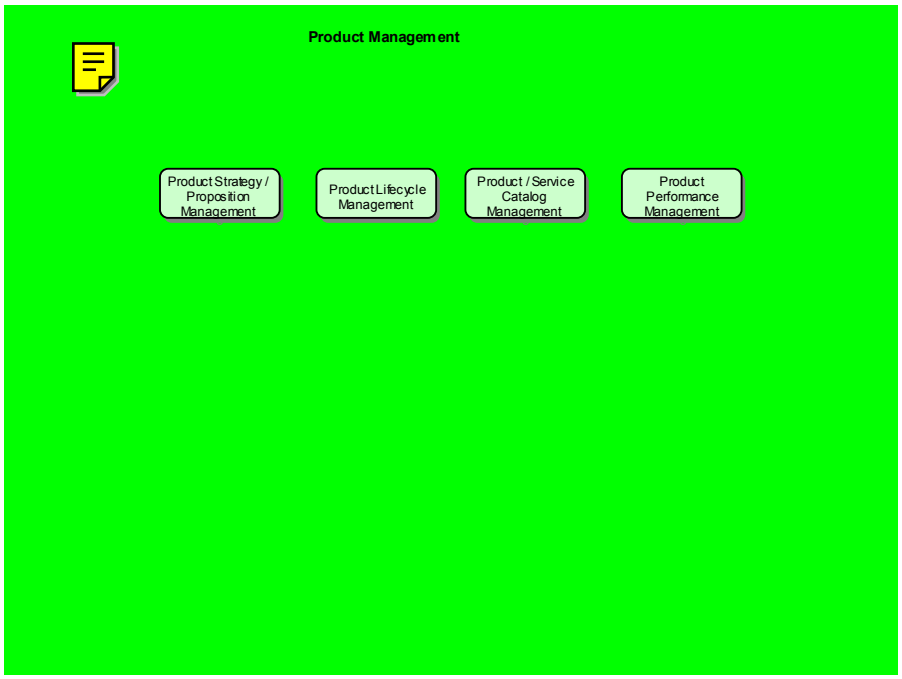

Figure 4: Product-centric Applications

Product Management is the organization's approach to the process of developing, managing and marketing its products offerings to the customer. Product Management is about identifying what products to sell, what they are comprised of, who they are sold to, how they are sold, supported and serviced, how they perform in the market and how they are managed through to retirement. Product Management contains four key facets:

- Product Strategy / Proposition Management
- Product Catalog Management
- Product Lifecycle Management

- Product Performance Management

4.1. Product Strategy / Proposition Management Applications

Overview

Product Strategy is an action plan for meeting the objectives of an operating strategy via the products sold to the marketplace. Product Propositions are ideas on how the strategy will be realized through products sold within specific target markets. Product Strategy / Proposition Management is therefore the ability to capture and manage the detail of a company's strategy and resulting propositions, that then drive what product offerings they will develop, deliver and sell. This capability allows the management of this information at the enterprise level, across the different operating groups and market units within which the enterprise operates. Finally, it provides the ability to link the product offering propositions to the actual sellable product offerings in order to track how the product offering strategy is actually be delivered into the marketplace.

The ability to hold this information enables downstream performance reporting to validate or negate a company's product offering strategy and underlying propositions.

Functionality

Key application functions include:

- Capture and manage details of the strategy
- Organize the propositions by operations (for example, which operating groups are delivering which propositions and where are the crossovers)
- Link strategy to propositions
- Link propositions to product offerings
- Project manage the delivery of strategy through propositions through product offerings
- Enable performance reporting of the strategy, driven by the performance of the underlying product offerings

Supported Contracts

To be added

4.2. Product Catalog Management Applications

Overview

A product offering is an item that satisfies a market's want or need that is based on a product specification. Product Catalog Management is the ability to create and maintain product offerings that can be sold to customers in the target market. More specifically, it is the ability to explicitly model the structure of a product offering, then create and centrally manage catalogs of product offerings. A product catalog is list of product offerings for sale, with prices and illustrations, for example in book form or on the web. Product catalogs can be used by customers during a self-care ordering process and may be used across one or more distribution channels..

Product offerings are not always discreet, single items. A product offering can be a number of components associated together and sold as a single purchasable entity. Therefore the product offering may be comprised of other offerings, tangible or intangible, such as features, devices, and so forth, that are "assembled" together to form a single sellable entity.

Some of the components within a product offering will be enabled by shared / common / reusable offerings , such as a location finder. Some of the components within a product offering will be enabled by shared / common / reusable resources , such as network exchange. These underlying types of services and resources may be managed by different parts of the organization. The types of services and resources are called service specifications and resource specifications in the SID. They represent how the offerings are realized within a provider's infrastructure.

Comment: These are called service specifications and resource specifications in the SID.

The Product Management organization is typically responsible for managing the Product Catalog through the assembly and update of product offerings utilizing available components.

Functionality

Key application functions of Product Catalog Management are :

- Contain the complete data model for the product offering structure and the relationships that govern the behavior of a product offering and its underlying components
- Create and maintain product catalogs based on the common product offering structure, to form the centralized product catalog
- Create and maintain the different components that can comprise a product offering
- Create and maintain the parent / child / peer relationships between components to formulate the complete product offering

- Reuse components in different product offerings
- Create and maintain the relationships between components and their underlying types of services and resources
- Provide the complete master view of the product offerings to external functions / applications / etc
- End-to-end Product Data Management, which includes the activities and tools to manage and retain data on all product specifications and product offerings for a given enterprise. While a data repository is key to supporting these activities, collaboration workspaces are also generally in use in this area as well. These tend to be highly configurable information repositories, and are also generally supported by role based workflow engines. Navigation and search capabilities are prevalent in this area as well. The functional groupings here may include (but will not be limited to):
    - Detailed product specifications
    - Product Bill of Materials (BOM)
    - Contractual information
    - Historical product specification, product offering, and product catalog information
    - Document management
    - Configuration management
    - Engineering change management
    - Interoperability and data integration with product catalog

The diagram below illustrates the key data categories that comprise the product model in a product / service catalog and the relationship that data has to other applications:

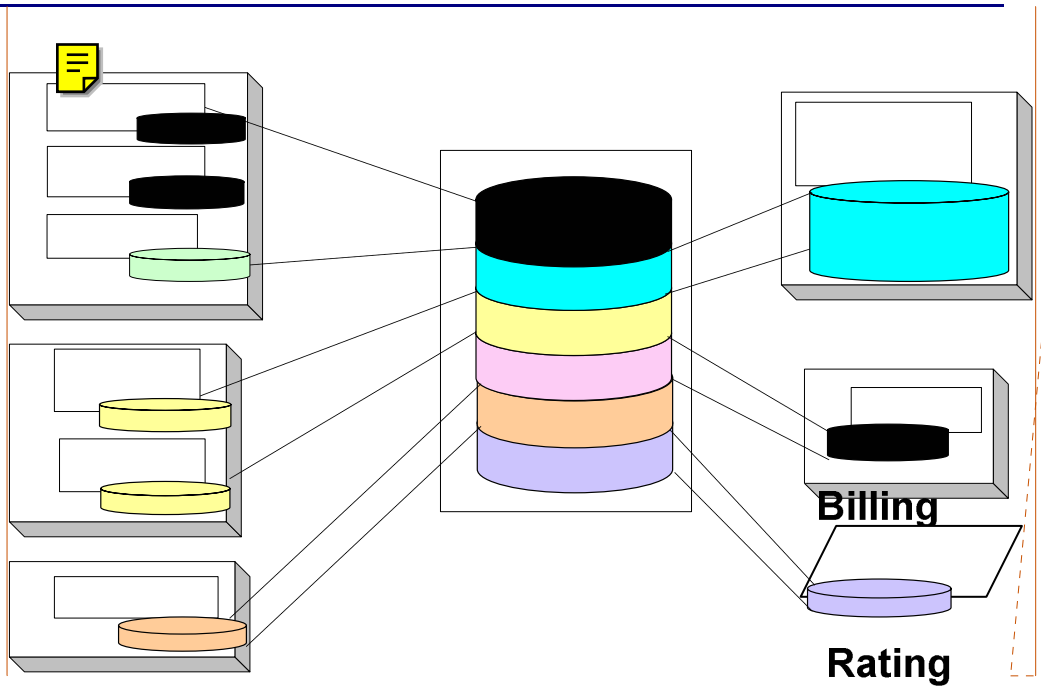

Figure 5: Product Catalog Applications

Typical Product Management applications may contain the following functions:

Products offerings made available to the market

Product specifications upon which the offerings are based

Product offering business hierarchy

Commercial product hierarchy

Rules relating to offers including pre-requisites and embellishment options, relationships with other offers and parameters

Product/customer profile mapping

Availability Rules

Product offering validity period

Lifecycle of a product offering/ including its projected replacement date

Service levels available.

The financial catalog typically contains:

Rating attributes

Tariff information

Settlement information

Comment: I don't have the source for this figure, but it should be updated based on whatever changes recommended in the text are accepted by the TAM team…at a minimum the "ue" should be removed from the names.

Comment: This seems to be a duplicate of number 2. I added a item for specifications

Comment: This is the Product Price ABE and Product Price Rule ABE in the SID.

Comment: A comment on the word information…the specifics of the information should be listed…the word information is a bit vague.

Rating Rules

Retail Billing & Content Settlement

Charging Rules

Carrier Interconnect Settlement

I,C Settlement Rules

Fulfillment

Service and Resource Provisioning

Provisioning Rules

Service Order Management

Workflow

Provisioning Products

Service level information

Billing and settlement attributes

Tax rules (not customer specific)

One time charges

Recurring charges

Settlement rules

Discount information

Contractual matters relating to offer (e.g. revenue sharing arrangements, service level agreements)

Product Cost

The Technical catalog typically contains: Provisioning Information necessary to build the workflow to provision the types services e.g. sequence in which types service should be provisioned.

Comment: This should be moved to the Service domain as it is not the responsibility of a Product Manager to know how an offering is provisioned.

The Physical catalog typically contains: Physical equipment to be provided as part of an offering

Comment: This would be part of a Resource Catalog.

The Product Offe entity catalogue typically defines the relationship of a product offering to anothe oduct offering for the purpose of locating the products across the distributed databases. For example,.it includes parent / child relationship of the hierarchy using a common reference ID for each of the product catalog locations.

Application services that should be available from the Product Catalog Management capability of Product Management include the following:

Supported Contracts

(Note: In this context the term Service is being used as an application service (i.e. API) and not the SID definition of Service as it pertains to telecommunications.)

- Get product offering/component effective duration: Retrieves product offering effective date information from the catalog based on input unique ID or other search criteria for product offering or product offering component.
- Get product offering/component sales availability duration: Retrieves product offering sales availability date information from the catalog based on input unique ID or other search criteria for product offering or product component.
- Get product offering/component characteristics: Retrieves product characteristic content information from the catalog based on input unique ID or other search criteria for product offering or product offering component, in addition to criteria to identify a characteristic.
- Get product offering/component characteristic duration: Retrieves product offering/component characteristic duration information from the catalog based on

input unique ID or other search criteria for product offering or product offering component, in addition to criteria to identify a characteristic.

- Get product offering/component characteristic version: Retrieves product offering/component characteristic version information based on input unique ID or other search criteria for product offering or product offering component. Can be applied against prior or future versions of product offering/component characteristics.

- Get product offering/component pricing: Retrieves product offering/component pricing information based on input unique ID or other search criteria for product offering or product offering component.

- Get product offering/component costing: Retrieves product offering/component cost information based on input unique ID or other search criteria for product offering or product offering component.

- Get product offering/component description: Retrieves product offering/component descriptive information based on input unique ID or other search criteria for product offering or product offering component.

- Get product offering/component structure: Retrieves product offering/component structural information (such as related/child product offering/components) based on input unique ID or other search criteria for product offering or product offering component.

- Get entities where product/component used: Retrieves other entities within the catalog (i.e. Tariffs, Discounts) based on input unique ID or other search criteria for product offering or product offering component.

- Get master product offering/component ID: Retrieves product catalog master ID based on input unique related ID or other search criteria for product offering or product offering component. This service is used to maintain product offering/component synchronization between other systems.

- Get campaigns which relate to product offering/component offering: Retrieves Campaigns within the catalog based on input unique ID or other search criteria for product offering or product offering component.

- Get discounts which relate to product offering/component offering: Retrieves Discounts within the catalog based on input unique ID or other search criteria for product offering or product offering component.

- Check operational compatibility (between product offering/component): Determines whether two product offering/components are compatible from an operational standpoint, based on input of multiple unique IDs or other search criteria for product offerings or product offering components.

- Check customer compatibility (between product offerings/components and customer): Determines whether a customer and a product offering/component are compatible based

on input of input unique ID or other search criteria for product offerings or product offering components and customer attributes.

- Get product offering/component SLA: Retrieves Service Level Agreement from the catalog based on input unique ID or other search criteria for product offering or product offering component.
- Get product offering/component BOM: Retrieves Bill of Materials list from the catalog based on input unique ID or other search criteria for product offering or product offering component.
- Get available product offering/component contracts: Retrieves associated Contracts from the catalog based on input unique ID or other search criteria for product offering or product offering component.

Comment: What type of contracts does this refer to?

Comment: This seems to overlap with the Product Catalog application area. Why isn't catalog just part of this application area?

4.3. Product Lifecycle Management

Overview

Product Lifecycle Management (PLM) is responsible for the managing the entire lifecycle of the product and its underlying components. This includes all of the processes required to design, build, deploy, maintain and ultimately retire the product offering.

Product Lifecycle Management includes those activities and tools used to define new product offerings and updates to existing products offerings. Generally these activities require a significant degree of collaboration, often across multiple geographic locations. This could even include the gathering of customer needs/preferences and mapping those to current and future product offering capabilities. There will also be a significant use of project and program management activities and tools to satisfy these functional areas.

Functionality

A PLM application should support the following major functions:

- Solicit product offering requirements
- Model product offerings
- Provide detailed product specifications
- Introduce new product offerings
- Manage existing product offering
- Obsolesce/retire product offerings
- Implement marketing & [illegible] strategies

Comment: There is no mention of contracts associated with this.

Comment: There are no mention of contracts associated with this.

Comment: There is no mention of contracts associated with this.

Comment: There are no mention of contracts associated with this.

Supported Contracts

Application services that should be available from the PLM capability of Product management include the following:
(Note: In this context the term Service is being used as an application service (i.e. API, Web Service) and not the SID definition of Service as it pertains to telecommunications.)

- Get product offering lifecycle state: Retrieves the current lifecycle state for the product offering or product offering component based on input unique ID or other search criteria for product offering or product component.
- Get prior lifecycle state: Retrieves the previous lifecycle state for the product offering or product offering component based on input unique ID or other search criteria for product offering or product offering component.
- Get next lifecycle state: Retrieves the next lifecycle state for the product offering or product offering component based on input unique ID or other search criteria for product offering or product offering component.
- Get lifecycle state owner/group: Retrieves information about the person or group responsible for the current lifecycle state of the product offering or product offering component based on input unique ID or other search criteria for product offering or product offering component.
- Get lifecycle state expiration: Retrieves the expiration of the current lifecycle state for the product offering or product offering component based on input unique ID or other search criteria for product offering or product offering component.
- Get lifecycle state jeopardy/SLA: Retrieves the jeopardy/timeout information for the current lifecycle state for the product offering or product offering component based on input unique ID or other search criteria for product offering or product offering component.

4.4. Product Performance Management

Overview

Product Performance Management includes the activities and tools that gather and analyze data regarding the efficacy of the product strategy, propositions and products offerings based upon their performance in the marketplace.

Functionality

Performance factors typically gathered as part of Product Performance Management include:

- Product key performance gathering and analysis

- Product offering campaign tracking
- Product revenue reporting
- Product cost reporting
- Product offering capacity analysis
- Product Cost Management includes the activities and tools used to
    - Optimize product inventory
    - Determine product/component sourcing

The information yielded from Product Performance Management will aid the organization in making Product Lifecycle Management and Product Data Management decisions, specifically what changes to make to the product offering definition and / or what to do with the product offering in its lifecycle.

Supported Contracts

To be added

5. Customer Management Applications

The primary application areas in the Customer Management area of the Map are as follows:

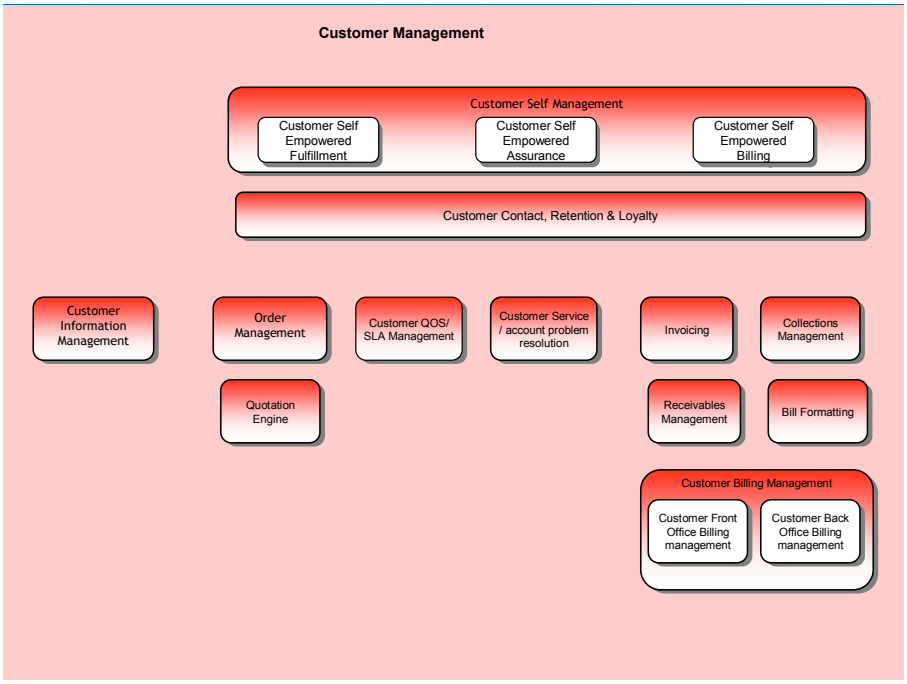

Figure 6: The Customer Management Applications

Customer Relationship Management (CRM) processes and functions are defined by the eTOM (TMF GB 921) as the process grouping that considers the fundamental knowledge of customers needs and includes all functionalities necessary for the acquisition, enhancement and retention of a relationship with a customer.

The customer as defined by the e-TOM e-business reference model is responsible for ordering, using and (usually) paying for service products. The customer may represent an end-customer, where the product provided by the value network is consumed, or a wholesale customer that resells the product provided, generally with

some added value. The customer may also be a corporate customer that potentially has many contact people, departments, sites, services and billing accounts with the service provider.

CRM encompasses the end to end lifecycle of the customer, from customer initiation/acquisition, sales, ordering and service activation, customer care and support, proactive campaigns, cross sell/up sell and retention/loyalty. CRM needs to involve all the touch points and channels to the customer, including contact center, retail stores, dealers, self service, and field service, as well as via any media (phone, face to face, web, mobile device, Chat, Email, SMS, mail, the customer's bill, etc.).

As an example, the following diagram describes the typical work flow of customer service representatives (CSRs) of Communication Service Providers:

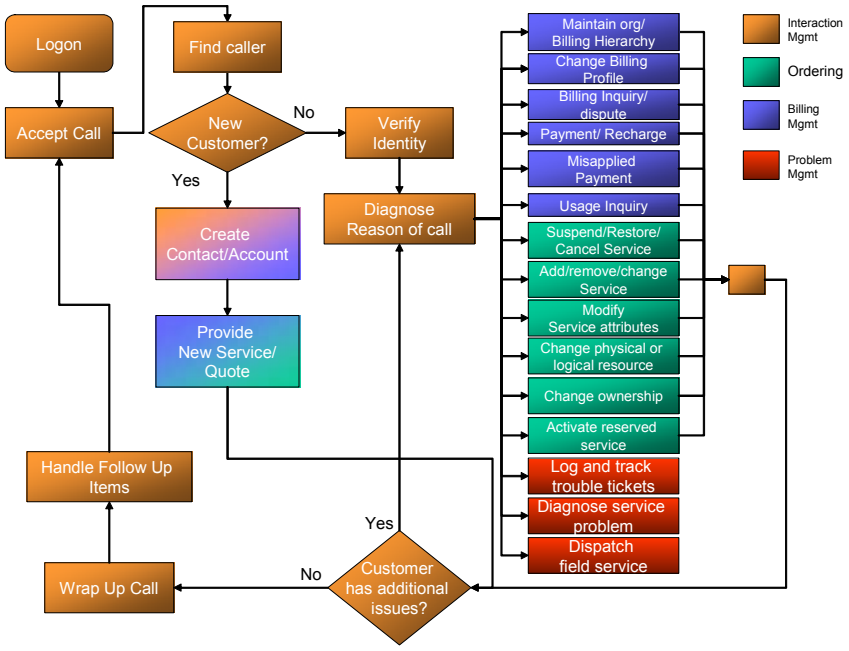

Figure 7: Typical work flow of Customer Service Representatives

Another significant component of CRM evolves around marketing activities. This includes retention management, cross-selling, up-selling and direct marketing for the purpose of selling to customers. CRM also includes the collection of customer information and its application to personalize, customize and integrate delivery of service to a customer, as well as to identify opportunities for increasing the value of the customer to the enterprise.

In the Telecom Applications Map, a number of systems and applications provide these functions. Typically an operator may have the following applications:

5.1. Customer Self Management Applications

Overview

Customer self empowered applications provide an internet technology driven interface to the customer to undertake a variety of business functions directly for themselves. These applications interact to provide fully automated service or assisted service over various customers touch points. Although customer self management applications primarily trigger functionality defined in the rest of the CRM, Service Management and Resource Management applications, they should also contain functionality specific to customer self empowerment.

As service providers shift to multidimensional services, new business realities require self service systems to support the following criteria:

- One-and-done fulfillment across service portfolio (cf. Order Management Applications)
- Multi-disciplinary customer service (cf. Customer Service / Account Problem resolution applications)
- Sync multi-channel interoperability
- Total convergent self directed billing (view/pay/dispute all) (cf. Front Office Customer Billing Management applications)
- Reconciliation interoperability
- Personalization and usability
- Visualization of SLAs across subscribed services (cf. Customer Service / Account Problem resolution applications)
- Portfolio driven guided selling (cf. Product Catalogue, Product Lifecycle Management applications)
- Leveraging the 360 degree customer view (cf. Customer Information Management Application)

Customer self management applications enable service providers to increase profitability across the organization by optimizing the customer experience and maximizing the efficiency of business operations through:

- Rapid order-to-activation mechanism across service portfolio
- Commodity like enablement for telecom services (rapid introduction; easy amendment; cross bundling)
- Universal platform supporting multiple users (consumers; business; dealers) and multiple LOBs (wire line; wireless; IPTV) though single point of contact
- Reducing costs through operating efficiencies

These operations expect to gain more customer loyalty, service stickiness and ARPU for the service provider.

A primordial factor for increasing ARPU through self empowered systems is high usability. High usability requires channel agnostic consistency and seamless customer experience leveraging functionality that is driven from sporadic backend systems. For that, self empowered systems should provide integration readiness through several vehicles:

- Pre-integrated self service system including stand-alone web framework or integration front end with a portal engine
- Self services layer exposing atomic Webservices/APIs for reuse by multiple systems across the architectural environment
- Portlets driven connectivity exposing data and services interoperability through a portal engine or web application.

Typically the portal to the customer is via a web-based interface. Customer self care is increasingly popular with both customers and operators as it usually provides access to information 24 hours a day, 7 days a week and does not have the frustration of waiting for a free call agent. Customer self-care systems can take a number of forms from a controlled 'secure window' application into the underlying OSS systems used internally by the operator for the customer to view and pay his invoices to a complete portal where the customer can manage his entire relationship with the operator. Customer Self Management applications need to provide a level of security to protect both the customer's data and the integrity of the underlying systems. They should also be capable of providing single sign on capabilities to access Business and Operational Support Systems.

In functional terms customer self-management generally provides a comprehensive collection of self-service functionality supporting all stages of the customer life cycle, Registration and fulfillment, Assurance and Billing Management activities. As the various features provided for customer lifecycle management are often portlet type applications that are integrated to a CSP's overall customer self management portal, the self management applications can be broken down into 3 major applications:

- Customer Self Empowered Fulfillment Applications
- Customer Self Empowered Assurance Applications
- Customer Self Empowered Billing Applications

These will be discussed in more detail in the following sections.

5.1.1. Customer self empowered fulfillment applications

Overview

Customer self empowered fulfillment applications provide an internet technology driven interface to the customer to undertake a variety of fulfillment functions directly for themselves. These applications interact to provide fully automated service or assisted service over all customer self management touch points.

These applications tend enable rapid order-to-activation while reducing operating costs through improved efficiency and integrated flow-through-fulfillment. Today's communications products and services carry commodity oriented attributes requiring easy activation, amendment and consumption, rapid and comprehensive introduction to customers while bringing together customer consumption interests and service provider's business interests in a seamless and consistent manner.

It is assumed that the user is not as savvy as the employee at the call center. The customer experience should support a simple flow that capitalizes from the advanced application flows defined by the order management applications (cf. Order Management Applications).

Functionality

In functional terms customer self-empowered fulfillment generally provides a comprehensive collection of self-service functionality supporting all stages of the customer facing fulfillment cycle, including:

- Product Catalogue and Offerings browsing (versioning driven)
- Guided selling driven view for offer eligibility
- Shopping cart driven order management:
    - Check Availability
    - Check Eligibility
    - Check Compatibility
    - Quote Price
    - Order Status
    - Payment capture
    - Installation preferences capture
    - SLA preferences capture
    - Account creation for anonymous user
- Assigned products maintenance
- Change Rate Plan Selection
- Alerts and notifications setting
- Access to Knowledge Management database & solutions to common problems
- Access to Call center agents
- Reports on fulfillment and SLA aspects

Corporate customers should benefit from additional features as required for their daily tasks:

- Bulk ordering
- Customer hierarchy driven ordering
- Mass changes (activation; configuration)
- Eligibility management for the business customer admin
- Organizational approval process
- Equipment management (allocation; activation)

Supported Contracts

- Order Management
- Billing Management
- Customer Service / Account Problem Resolution
- Service Problem Resolution for Order exception handling
- Customer Information Management
- Knowledge Management
- SLA Dashboard
- Activation and Provisioning
- Resource Management

5.1.2. Customer self empowered assurance applications

Overview

Customer self empowered assurance applications provide an internet technology driven interface to the customer to undertake a variety of assurance functions directly for themselves. These applications interact to provide fully automated service or assisted service over customers touch points. These applications create enablement for customers to assure the service level that they benefit from their service provider.

Functionality

Self empowered assurance applications include the following features:

- Account management (such as contact attributes)
- Self registration to online services
- Service requests management:
- Service request submission
- Service request amendment
- Service request closure
- Users management
- Alerts and notifications setting
- Address book management
- Access to Knowledge Management database & solutions to common problems
- Access to call center agents
- Reports on service requests and SLA across services

Corporate customers should benefit from additional features as required for their daily tasks:

- Users and roles management
- Mass changes

- Contacts management
- Customer hierarchy driven service requests
- Organizational approval flow

Supported Contracts

- Order Management
- Billing Management
- Customer Service / Account Problem Resolution
- Service Problem Resolution for trouble ticket handling
- Customer Information Management
- Knowledge Management
- SLA Dashboard (for incident and entitlement tracking)
- Activation and Provisioning
- Resource Management

5.1.3. Customer self empowered billing applications

Overview

Customer self empowered billing applications provide an internet technology driven interface to the customer to undertake a variety of billing functions directly for themselves. These applications interact to provide fully automated service or assisted service over customers touch points.

Customer self empowered billing applications enable the service providers cost reduction through the following operational efficiencies:

- Replacing paper bills with paperless bills
- Converging the multi- disciplinary billing operations
- Deflecting bill queries calls from the contact center to the web
- Automating the dispute resolution process
- Reducing days sales outstanding (DSO)
- Reducing requests for bill prints
- Reduction in professional personnel providing analytics for business customers
- Reduction in interest loss due to delayed payments

Functionality

Self empowered billing applications include the following web based features:

- Bill view
- Unbilled charges view
- Usage view
- Payment capture

- Dispute capture and resolution
- Usage and charges comparison
- Penalties view
  - Address book driven usage view
  - Split statement for demarcation between calls
  - Calls assignment for classification of usage
  - Reports on usage and charges

Corporate customers should benefit from additional features as required for their daily tasks:

- Cost center analysis
- Customer hierarchies driven billing operations
- Organizational reports on usage and charges
- Organizational approval process (such as for payments and disputes)

Supported Contracts

To Be Added

5.2. Order Management Applications

Overview

Order management applications manage the end to end lifecycle of a customer request for services. This includes capturing the order, configuring the products and services within the order, de-composing the order for provisioning activities, and orchestrating the activation and fulfillment and billing notification processes. Order management applications typically serve all the customer touch points / channels, including call center, retail, self service, dealers, affiliates, etc. The order may be initiated by any channel and visible to the other channels if needed.

Functionality

Order management applications would need to provide the following key functionality:

Order capture and negotiation

Search Customer base and Registration – The purpose of this function is to search the existing customer base using various criteria (name, address, subscriber number, equipment id, billing account number, etc.) and find the customer record to add the order to it or register the ordering customer if he is a new customer. This function leverages functionality in Customer Information Management.

Browse the catalog for products, services and service contracts, provide the customer information on those products and services, as well as projected one time, recurring costs and usage costs (if any). In addition, the user should have visibility to terms, commitments and minimum requirements associated with the services and/or products being requested.

Once products and service are selected, configure service-specific attributes as well as negotiate relevant resources (e.g., phone number for a voice service). Ultimately, the order capture and negotiation process should be product catalog-driven. This means that the order capture functionality will dynamically present to the user the specific attributes of each product/service that is negotiated. This relieves the business from dependency on IT for launching new services (faster time to market), and ensures the correctness of the order.

In addition to ordering new services for new/existing customers, the application should handle Move, Migrate, Suspend, Reconnect, Replace Offer, Change Ownership, Amend, Add, Change, Disconnect, Cancel and Terminate orders

Determine Pre-Order Feasibility - The purpose of this function is to check the availability and /or the feasibility of providing non-standard product(s) and / or special solutions on standard product(s) to a customer. At this stage, the function should be checking for an existing customer's eligibility and install based compatibility with the products being ordered.

Save the order/quote for future processing (in case the customer is not sure they want to go through with the order at this point)

Authorize Credit - The purpose of this application function is to assess a customer's credit worthiness in support of managing customer risk and company exposure to bad debt. This application function is responsible for initiating customer credit checks and for authorizing credit and credit terms in accordance with established enterprise risk and policy guidelines. In cases where the customer has insufficient credit based on this feature, the application should be able to direct the customer to prepaid services or capture a deposit if the customer is still interested in postpaid services.

Create the customer's billing profile

Capturing payment for immediate charges and/or deposits needed, and optionally payment method information for on going service charges

Receive Purchase Orders and Issue Orders - This function is responsible for validating the Purchase Order received and issuing correct and complete service orders to be completed.

Dispatch Engineer (optional) – This function is responsible for the scheduling, routing and assignment of work order to field engineering work force in order to proceed with customer premises equipment installation and on site procedures if required by the service being ordered. Field engineer should be able to access parts, scheduling and work order information and cross reference back to the customer order.

Capture shipping information (in cases where good to be sold need to be delivered)

Submit an order to be processed at a future date

Submit a retro-active order with a past effective date (e.g., retroactive price plan change)

Track Order & Manage Jeopardy (Service Delivery SLA tracking and management) - The purpose of this function is to track the status of the customer's purchase/service request order and ensure that the procedures associated with the order are being undertaken within the time required to meet the committed date agreed with the customer. This function is responsible for tracking the customer order after the order commitment has been agreed with a customer. It initiates mechanisms to check the progress of all components of the order and to update the status as changes occur. It is also responsible for initiating actions if the order completion plan is in danger of not being kept and/or if the agreed order completion date deviates from the date originally scheduled. It terminates tracking the order when the order has been completed or cancelled. Orders in jeopardy may require escalation management capabilities. In addition, the application may also need to be able to send Jeopardy notifications to Customer Contact Management or Customer Self Management applications.

- Task Assignment - Assign individual orders to specific employees and allow task management within a predefined ordering team. This function allows efficient task management minimizes order fallout. Each employee will have visibility to all assigned order related tasks. The employee would be then able to log status amendments, e.g. time and materials of installation and other manual tasks.

Decouples order lines into sequenced, actionable items for provisioning and monitor the completion of each action item.

Complete Order - The purpose of this function is to focus on customer information and interactions after the customer order has been finalized and during the Order Completion phase. The customer may want to initiate changes, even after committing. The customer may participate in commissioning or end-to-end testing and then satisfactory delivery. The customer is trained on the functionality and benefits of the solution. Validation of any changes occurring after Contact/Order commitment may be needed to ensure that post-sales Processes will start up correctly.

Finally, the completion of the order should include notification to the billing system once provisioning is successfully completed.

The application can optionally support Cancel for order completed by Service Provisioning (this capability is dependent on the provisioning system's ability to roll back service provisioning).

Support grouping of orders if appropriate so they can be executed simultaneously.

Supported Contracts

Customer Information Management

Product Catalog

Provisioning / Activation Management

Channels (Self Service, Retail, Dealers, etc.)

Billing / Collection / Receivables

Service Resource Management

Workforce management

Contracts & Service Level Management

Inventory Management / Network Discovery engine

Credit Bureau Service

Address Validation and Completion

Intelligent Network (for prepaid activation)

General Ledger

GIS

Document Management (search scanned contracts and product literature)

5.3. Customer Information Management

Overview

Customer Information Management is a core piece of any CRM solution. This is an application that is used by all users across all channels, to allow creation, update, lookup/search and view of customer information. Customer Information includes, but is not limited to, the following:

Functionality

- Customer name
- Contact persons for this customer
- Account managers for this customer
- Customer Addresses (residence, billing, etc.)
- Customer contact phone numbers (landline, mobile, fax, etc.)
- Customer organizational hierarchy (relevant for household, business and corporate customers)
- The customer's existing products/services (linked to order management – see section 5.2)
- The customer's billing accounts (linked to Billing management – see section 5.8). The CRM application should be capable of linking multiple Billing Accounts that may be managed by different billing systems (e.g., for different lines of business).
- The customer's current and past orders (linked to order management – see section 5.2)
- The customer's current and past trouble tickets (linked to service/account problem resolution – see section 5.7)
- The customer's interactions with the Service Provider via all channels (This is related to the Customer Contact Management Applications – see next section)

Supported Contracts

To Be Added

5.4. Customer Contact Management, Retention & Loyalty Applications

Overview

Customer contact management, retention and loyalty applications are a varied group of functions that are generally sold as part of a Customer Relationship Management (CRM) suite of applications. These applications allow an operator create, update and view the customer's information (names, addresses, phone numbers, organizational hierarchy), record and view all customer interactions across different communication channels and department, so that whoever is speaking to a customer can see the history of issues that have concerned that customer, be they order issues, billing enquiries or service problems. More sophisticated systems allow capabilities to highlight customers as risk of switching to an alternative carrier (churn indicator) and provide comparisons with other operator's service packages to allow customer care agents to try to persuade a customer that their current operator can provide the best value for money. These indicators can be provided via integration to business intelligence platforms.

Functionality

In general, the functions provided by this application suite are:

Verify Customer Relationship - The purpose of this function is to verify that the customer is who they claim they are. The application verifies the identity of the customer and issues a unique Identifier and Authentication information. This function may also be used to 'clean-up' duplicates of customer identifying information that may exist within the organization.

Interaction Management - Provide single point of user access to end to end business processes for Customer Acquisition and Management, Order Capture, Customer Service, Customer and Account Management, Trouble ticketing, Billing and Collections, Billing, Disputes, rate plan analysis. This function is used by customers directly (via self service) or by people dealing with customers (assisted service)

Build Customer Insight - The purpose of this function is to ensure that Service Provider and the customer feel confident that the relationship is founded on up-to-date, accurate and legally compliant information. The Service Provider will incorporate into the customer profile, all relevant information gathered through all contacts with the customer (usage pattern, demographics, life stage, household, community of interest, business direction). Customer and market information from other sources may be gathered, which will build a better understanding of the customer. Customer Information must be made available to any process that needs to access it. This customer information will be used to continually refine the means and style of interaction, and the solution sets and customer experience offered. This functionality can usually be offered via script management tools.

Analyze and Manage Customer Risk - The purpose of this function is to ensure that Risk analysis is based on information collected from all processes and that consistent risk assessment is used across the Enterprise. Its purpose is also to track and improve Operations, target and win the right customers, improves Sales Conversion rate. It determines the credit risk, fraud risk, influence risk, and churn risk. It identifies treatments

to manage these risks and focuses on using customer information. This function is usually best served through integration with Business Intelligence platforms, with feeds provided by Charging, Collections, Accounts Receivable, and Prepaid Balance Management applications.

Personalize Customer Profile for Retention & Loyalty - The purpose of this function is to provide the personalization opportunities for customers that will encourage them not to switch to another Service Provider. Personalization allows delivery of services that more closely match the customer's need. Collection of Personalization Information also discourages switching since the customer would have to build up the same personalized experience with the next Service Provider. Typical Personalization would be enforcing customer communications through the customer preferred communication channel, provide cross-selling and up-selling recommendations based on customer interests and leveraging the information gathered to help the operator build a more intimate relationship with the customer.

Validate Customer Satisfaction - The purpose of this function is to validate that predicted/expected value is delivered by the product/service and that the after-sales processes (billing and assurance) are initialized. It validates that the customer is capable of realizing maximum value from the operation or use of the solution and that intense Provider involvement is no longer needed to manage the product/service. This process ensures that the customer is satisfied and that the product/service that was actually delivered meets original or updated expectations and agreements and that the product/service is operable by the customer.

Supported Contracts

- Application should support integration to Media Management: Voice (CTI), Email, Chat, Collaboration Tools
- Application should support integration to Knowledge Management
- Application should support integration to Quality Monitoring (ensure that the customer experience is being met)
- Application should support integration to Workforce Management & Scheduling

5.5. Quotation Engine

Overview

The quotation engine supports the order management process by interfacing between the Order Management and Billing applications.

Functionality

The quotation calculation of the recurring and one-time charges that are associated with orders for services and equipment (S&E) is based on the following features:

- Order components – services and equipment and the relevant associated parameters

- Customer information – Customer's agreements with the CSP, and customer parameters
- CSP's policy and Product Catalog – Maintaining the CSP's rating schemas
- General market rating rules (such as tax)

Supported Contracts

Order Management

Customer Information Management

Billing

5.6. Customer Quality of Service & Service Level Agreement Management applications

Overview

Customer Quality of Service (QoS) and / Service Level Agreement (SLA) Management(Contract and SLA Management) is a set of functions, possibly residing in more than one application, that assist operators in ensuring that their customers get the level of service for which they are paying. This area is specifically implemented to enable the operator to 'see' the service through the eyes of the customer, i.e. customer perceived quality. This is not to be confused with the related set of functions and applications that exist at the service management and resource management layers to help operational managers understand the performance of services and network resources respectively.

Customer QOS functions aim to measure the *customer perceived* quality of service. An example of this is the approach taken to measure voice or video service quality as perceived by a human being. This is known as Mean Opinion Scoring and makes an objective measure of customer perceived quality using technologies that simulate the human ear and human perception. Such measures may be required by legislators or be published in league tables. Certainly operators who believe that good quality services enable them to retain and delight customers take this area of QOS management seriously. QOS measurements may be applied either on a per customer basis; against a group of customers (e.g. a corporate account) or across an entire service. It may be applied where one operator is retailing another operator's wholesale service (e.g. Mobile Virtual Network Operators)

If QOS applications measure the actual level of service being offered, SLA management applications (Contract Management) provide the ability to compare actual QOS with the pre-agreed level of service promised and flag any jeopardizes encountered. This is particularly important where service level guarantees (SLG's) have been contractually offered – the primary purpose of the SLA management application(s) is to ensure that the operator knows at any time which services to which customers may potentially or actually be in breach of a service level guarantee.

Functionality

Specific functions of this application area are:

Document Contractual SLA obligations – the purpose of this function is to document contracts and contract terms (entitlments) signed with the customer and provide automated monitoring of the potential or actual breaches to the terms of the SLA. Escalation hierarchy should be defined for automatic notifications of the potential or actual breaches.

- Measure perceived QoS – the purpose of this function is to measure or estimate the actual quality of service being received by the customer against pre-set thresholds.
- Manage QoS/SLA Violation - the purpose of this function is to ensure that the customer and the relevant internal processes are informed of service quality degradations and violations and that action is undertaken to resolve the degradation or violation. Analyzes all the information related to a QoS/SLA degradation or violation and takes the appropriate actions when a soft threshold is crossed or the agreed QoS is violated. Follows up the actions to ensure that the customer is satisfied with the resolution of the problem. Ensures that the customer is informed of any planned maintenance or other scheduled events likely to impact delivery of the customer's service.
- Manage Reporting – the purpose of this function is to report on the customer's QoS performance, to manage the production and presentation of reports to the customer on service levels in the form and at the times agreed with the customer, to prepare reports for internal processes and respond to specific inquiries on the performance of the customer service.

Supported Contracts

E.g., Network Performance Management

5.7. Customer Service / Account Problem Resolution Applications

Overview

Customer Problem Resolution applications (trouble ticketing) handle the processes of dealing with customers affected by a service related or billing related problem. These functions are closely related to Service Problem Resolution, Customer Billing Management, and Resource Problem Resolution. These can be seen as a distributed set of related applications, ideally built around common data and functions. Each layer has a different perspective and takes a different view of the same data using the same information model (see TMF GB922 – the Shared Information and Data Model). Customer Problem Resolution applications are mainly concerned with how the problem would affect the operator's relationship with the customer with the goal of minimizing any adverse effect on this relationship.

The current trend is to integrate trouble ticketing with both service level and network level problem-reporting systems. Trouble ticketing applications would act as an initiation source for Service Problem Resolution applications or Resource Problem Resolution applications based on specific business rules.

Functionality

Typical application functions supported are:

Verify Customer Relationship - verify that the customer is who they claim they are and they own the products that they are reporting the problem with.

Problem Reception - receive and acknowledge the problem report. Accurately timestamp the problem. Raise appropriate Trouble Ticket and record problem symptoms.

Specifically for billing problems (e.g., dispute of a charge on a bill), the application needs to also capture the details of the bill (e.g., bill id, charge code, amount in dispute, etc.). This "context" of the complaint will be "carried" with the trouble ticket through its resolution, thereby relieving the second tier support from looking up that information. Also, once the second tier support approves the dispute, the application should automate the billing notification.

Verify the customer's SLA's for support (support hours, maintenance agreements, frequency, for example). Activate any incident related SLA's.

Evaluate & Qualify Problem – determine the nature of a problem that has been reported by a customer and whether the customer is using the service properly. There will be testing to fit or translate customer information into service information for diagnosis. If there is a problem notification, a resource problem notification or a service-affecting event report (alarms, etc.) the Evaluate & Quality Problem functions may analyze this information and translate these problems into their impact on customers. These processes will make the necessary reports to inform the Problem Handling processes about the estimated time to restore service. Also the Customer QoS/SLA Management applications will be informed about the problem's impact on the service performance.

Plan & Assign Resolution - identify the necessary steps in order to activate the different units that will be involved to fix the problem.

Track & Manage Resolution - ensure that the whole resolution is completed according to the established plan. Automated notifications and escalation procedures are established to effectively monitor any deviation to the resolution plan.

Close & Report - certify the recovery of the normal service performance. These processes will perform the necessary testing to achieve this purpose and make the necessary reports about the problem that occurred, the root cause and the activities carried out for restoration. It also will issue the trouble clearance report to inform other CRM applications.

Updating Billing systems if appropriate- reimburse the affected customer for the service problems they have endured.

Advising other OSS systems if appropriate.

Supported Contracts

Service Problem Resolution Applications

Correlation & Root Cause Analysis

Resource Problem Management

Service Performance Management

Service Quality monitoring

Resource performance management

. Billing

5.8. Customer Billing Management Applications

5.8.1. Customer Front Office Billing Management Applications

Overview

Over 60% of the calls in a Communication Service Provider's call center involve questions and complaints on the customer's bill. Therefore, the customer touch points (call center, retail store, self service) need access to billing management processes and quick access to real time billing data.

The primary purpose of this application is two fold:

- Setup and maintenance of the customer's billing profile (account, payment method, bill cycle, billing address, etc.)
- One-and-done Billing Inquiries and dispute Resolution (and possible escalation via problem resolution in cases where the agent is not authorized to resolve these issues)

The billing management application is used by customer service representatives (CSRs) to handle customer billing and usage inquiries on voice, data and content, process payments and recharges for both prepaid and postpaid customers, resolve disputes and manage the collection process.

Functionality

This application includes the following features:

- **Flexible Account Relationships and Comprehensive Profiles**
  The application should be capable of maintaining multi-level account hierarchies and billing relationships for the individual customer, the residential household, as well as,

the complex corporate organization. Each account can be linked to subscriptions, contacts, billing and financial profiles, including billing arrangements, billing cycle, charges distribution, usage events distribution, financial accounts, pay means, and prepaid buckets. Any updates performed via the front office billing management application are also reflected in the respective back-end billing systems.

- **Real-time Visibility into Financial, Billing and Rating Events of Voice, Data and Content**
  As mentioned above, billing and payment inquiries are the most common reasons customers call into the contact center of a communications service provider. To resolve such inquiries effectively, the application should provide the user with real-time visibility of all financial, billing and usage events, during and after the consumption of any service. The contact center agent should be able to drill-down on the current balance, financial statement, invoice, billed charges and usage events, as well as have access to the actual bill image of the paper bill that the customer received. Besides accepting recurring and multi-level payments in any currency, agents must be able to make multi-level credits and adjustments in line with the policy of the company. These payments and adjustments can be applied on either billed or unbilled events, ensuring an up-to-date available balance in both prepaid and postpaid accounts.
- **Dispute Escalation and Resolution**
  In many cases, contact center agents are empowered to resolve most billing disputes on the first call. For issues that required more investigation or a higher level of approval, escalation and follow-up processes are kicked off via problem resolution processes (see previous chapter).
- **Billing integration**
  Many Communication Service Providers still use legacy billing systems, and in several cases, multiple disparate billing systems concurrently. This is typically due to historical separation of IT systems for different lines of business (a.k.a. “stovepipes”) or due to to mergers and acquisitions. An effective billing management application should be able to integrate with multiple and disparate billing systems simultaneously and provide a single agent a seamless work flow regardless of the complexity of the back end system.
- **Presentation of bills**
  Formatting of invoices in different styles and to achieve different publishing possibilities and supports the creation of different invoice formats for different publication media – should support presentation to customer s and third parties

Supported Contracts

Legacy billing systems

Bill document archive

5.8.2. Customer Back Office Billing Management Applications

Overview

The application provides aggregation of all rated billable events and charges for products and services delivered to the customer by the Service Provider and respective trading partners and the production of a timely and accurate invoice. The invoice may be delivered in a variety of formats: paper, online, CD etc. Billing applications leverages a print office that is a large system, capable of producing very significant numbers of bills and distributing them to many millions of customers. In addition to bill production, these applications provide capabilities for the formatting of invoices in different ways and to achieve different publishing possibilities and supports the creation of different invoice formats for different publication media. Customer Billing Management applications manages customer balances regarding products requiring Balance Management such as prepaid services. These applications also manages changes to the customer's billing account (such as change of address, etc.) as well as managing the customer's service portfolio, such as ensuring that the correct products are assigned to the customer's account for accurate billing.

Convergent billing is currently the trend in Customer billing applications where the customer would receive one bill for all of the products and service he has subscribed to, such as a combined Internet and phone bill that includes mobile and wireline services. The move towards Convergent Billing requires Customer Billing applications to move towards a customer-centric model rather than product-centric billing. They may combine data from multiple billing systems to create complete files for printing or posting to the Web. In addition, applications may offer multi-language bills, data-driven graphics and hierarchy-based bills for corporate customers plus capabilities for promotions and targeted marketing for up-selling and cross-selling.

Beyond the features listed below, Billing Management is also enhanced by 3 supplementary applications:

Bill Formatting

Invoicing

Quotation

Functionality

Distributions of charges between bills - Billing documents are generated according to the billing arrangement agreed upon with each customer during the customer's initiation. A customer can request one or more billing documents generated for the relevant services, wherein each billing document is represented by a billing arrangement. A single billing document can accumulate charges for multiple subscribers and lines of business. Conversely, services related to a single subscriber can be charged on several billing documents. This mechanism enables cross-billing among accounts and customers

Hierarchy based Aggregation & Balance Management - All incoming transactions are stored and aggregated on the aggregated account structure. Transactions are always

booked on the lowest possible level and aggregated upwards. A transaction that cannot be booked on a lower level is always booked on the top level.

Transaction Booking - The transactions are booked on the current period and when the totals for the current period are sent to invoicing the period is closed and a new period is opened for new incoming charges.

Billing Runs - A bill run process starts with a request to the Balance Manager to send the aggregated balances & detailed CDRs corresponding to the account IDs included in the current bill run. The Balance Manager responds with the accumulated & detailed usage for the current period. Applicable recurring & one-time charges are then applied to each account ID. Invoice discounts are applied and applicable taxes.

Invoicing – The outcome of the bill run along with the invoice number assigned and language forms the customer invoice.

Availability of billed and unbilled information for analysis and leakage control

Bill reversals and rebilling

Generating pseudo bills and estimate bills for revenue analysis and forecasting

Pre-paid and post-paid billing

Credit and debit adjustments to settle bill disputes

Conventional discounts and cross product discounting

Loyalty discounts and reward schemes

Supported Contracts

Integration with Collections & Receivables Management - Forwarding of billed customer invoices to Receivables for Revenue recognition processes & collection processes.

- Customer Information Management
- Bill Formatting
- Invoicing

5.9. Bill Formatting

Overview

Bill Formatting applications can be used in the telecommunications vertical that requires bills, invoices, letters and statements to be created for subscribers on a regular basis. It can be deployed by any organization that provides billable services.

Bill Formatting can process pre-defined numeric, text and image content into print-ready and web-ready streams that can be reproduced on a variety of media. For instance, telecommunications companies can process data from a billing system into standard industry print streams to produce paper bills.

Functionality

A Bill Formatting system has the following features:

Designer Environment: used to develop the bill or letter format, and which allows one to create the data dictionary, create run-time definitions.

Bill production engine - processes extract files provided by the Billing module to produce an intermediate data format.

Output Device Interface – This is the final runtime executable that creates the desired print, web, or ASCII print files from the Bill Formatting system.

Supported Contracts

- . Document printers
- . Content systems
- . Billing application
- . CRM
- . Customer Information Management
- . Marketing Automation Bill Formatting system has two major features:

5.10. Invoicing

Overview

Invoicing is one of the main communications channel between the Communications Service Provider (CSP) and the customer via the issuance of a periodic billing document.

Functionality

Providing a convergent bill for next-generation voice, data, content, and commerce services - Including prepaid and postpaid services in a single convergent bill

Performing charge and event distribution to support a split bill

Enabling flexible definition and application of recurring (RC) and onetime charge (OC) rates and discounts

Supporting flexible cycle definition

Supporting multi-currency

Billing Discounts – Invoicing should enable the definition of discount plans at any level of the customer structure. Support these discounts by aggregating the relevant performance to each level and by applying the correct credit to the billing arrangements and subscribers eligible for these discounts.

Supported Contracts

To Be Added

5.11. Collection Management Applications

Overview

The purpose of this application is to automate and manage the process of collecting payments made by the customer. Furthermore this process is meant to match these payments with the services/invoices delivered to this customer. This is a legal requirement in some countries, e.g. as required by the Sarbanes-Oxley Act in the USA. This application also usually manages the amount due from the customer, i.e. check whether the payments are made in time. If not so, this might result in putting the customer having services temporarily suspended.

Typical applications in this segment allow for handling each customer individually, based on customer value and financial history. They identify customers with overdue balances; target them accordingly and ensure delinquent payment cases are not lost. In addition, they improve operational efficiency by automating collection, while also supporting manual account handling. They may generate late notice letters or emails, including suspension notices, and can refer delinquent accounts to collection representatives or agencies. By integration with other OSS systems, they may automatically suspend, cancel and reconnect services and provide reports on collection activities and results.

In the context of NGN services, payments are classified to high value and low value payments. Hence the ability to process conventional large value payment vehicles and low value online payment vehicles like e-wallet and micro-payments is a legitimate requirement. Flexibility to the customer in choosing any payment mode is a desired feature to support self-care applications.

Functionality

Application functions may include:

Support for multiple payment methods, prepaid, post-paid, loyalty and 3rd party

Balance Management (including prepaid Balance)

Replenishment management (top up prepaid account)

Dispute

Policy definition for overdue accounts

Policy definition for overdue accounts

Full visibility to the customer's collection status and history

Collection settlement (e.g., payment arrangement/installments program, write off, service suspension/cancellation, etc.)

Process-driven collection treatment management (letter generation, outbound calls, service suspension, deferral to external collection agency).

Outbound multi-channel contact center collection activities

Decision Engine - Evaluates each arriving account and decides whether the account needs the Collection treatment.

Step Management using the Business Process automation Engine (cf. Application Integration Infrastructure)- Defines and initiates the Collection activities according to the appropriate treatment policy.

Real Time Collection Treatment - Provides real time monitoring of the Collection treatment, and allows the following activities to be performed:

Stop real time treatment due to payment

Resume real time treatment due to back-out or credit reversal

Re-evaluate real time treatment due to customer attributes change

Supported Contracts

Billing

Customer Information Management

Order Management

Service Management / Activation / Provisioning

External Credit Bureau Databases

Accounts Receivable

Predictive Dialers

5.12. Receivables Management Applications

Overview

The purpose of this application is to automate and manage the process of managing payments made by the customer. Furthermore this process is meant to match these payments with the services/invoices delivered to this customer. This is a legal requirement in some countries e.g. as required by the Sarbanes-Oxley Act in the USA. This application typically comprises invoice receipt generation, payment handling, account management, and financial reporting.

Functionality

Invoice Receipt

Invoice Receipt manages the connection between Accounts Receivable and Billing. The Invoice Receipt module posts invoices in Accounts Receivable based on billed charges. It can be invoked by any billing system. Invoice Receipt accepts information on new charges and credits billed to customers, and updates their account balance accordingly.

Payment Management

Payment Management receives customer payments and applies them to customer accounts. It also performs payment-related activities, such as back-outs of payments, refunds of overpayments, and transfers of funds between accounts. Payment Management accepts payments from various sources. It posts them to customer accounts and applies the funds to unpaid invoices.

Account Management

Account Management supports the financial activities that relate to customer accounts. These activities include handling charges, credits, refunds, deposits, disputes, and write-offs.

Financial Reporting and Audit

Financial Reporting and Audit comprises a set of reports presenting summaries of the financial activities of customer accounts. It includes a set of Debt Ageing reports and Proof & Balance reports.

Journaling

The Journaling feature is responsible for analyzing and translating each financial activity into journal records. The Journaling module receives extract files with financial activity records.

GL Mapping

The GL mapping feature is responsible for accumulating journal entries and mapping them to the GL transaction, e.g. The accumulation process accumulates all journal transactions with the same breakdown parameters on a daily basis; The mapping process maps journal-accumulated transactions to GL physical transactions based on the specific Communication Service Provider (CSP) mapping rules.

GL Financial Reporting

The GL financial reporting module comprises the set of reports which present the GL analysis and extract information.

Support for multiple payment methods, prepaid, post-paid, loyalty and 3rd party

Support for multiple pay means, including check, credit card, direct debit/bank, prepaid vouchers, ATM cards, etc.

Balance Management (including prepaid Balance)

Replenishment management (top up prepaid account)

Dispute

Refunds

Transfers between accounts (e.g., in events where a payment was posted to the wrong account)

Multi-mode payment support

Credit and debit payments

Advance payments and managing receivables in installments

Supported Contracts

- Billing
- Customer Information Management
- Order Management
- Service Management / Activation / Provisioning
- External Credit Bureau Databases
- Accounts Receivable
- Predictive Dialers

6. Service Management Applications

The primary application areas in the Service Management and Operations area of the Telecom Applications Map are as follows:

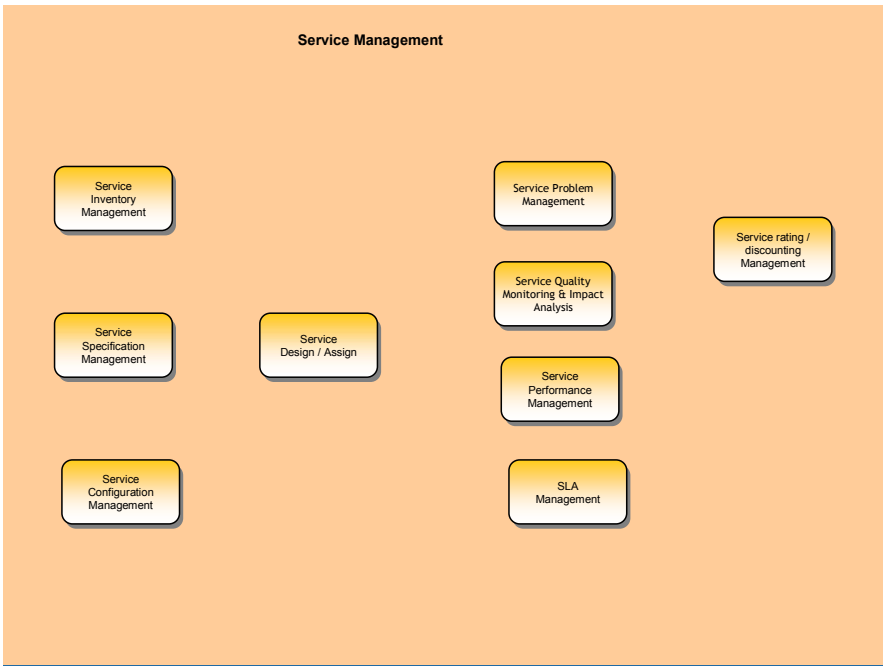

Figure 8: The Service Management & Operations Applications

This group of applications supports and enables the processes that focus on the knowledge of *services* (e.g. voice; data, content services, etc.) and includes all functionality necessary for the management and operations of communications and information services required by or proposed to customers. The focus is on service delivery and management as opposed to the management of the underlying network and information technology. Some of the functions involve short-term service capacity planning; the application of a service design to specific customers or managing service improvement initiatives. These functions are closely connected with the day-to-day customer experience.

These processes are accountable to meet, at a minimum, targets set for service quality, including process performance and customer satisfaction at a service level, as well as service cost. The applications that an operator may have in the Service Management and Operations area are:

6.1. Service Design / Assign Applications

Overview

This application area is deployed as part of the fulfillment process on those services that require specific custom design or topology changes. These are typically complex business services which can include service to multiple users and locations, and possibly multiple service elements. As a simple example, imagine a typical business requirement for one or more T1/ E1 services from between 2 or more locations. The physical routing of these services may involve local line plant at the 'tails' of these services and transit across several SONET / SDH rings. Historically the design of these paths to enable the service was planned by engineering planning departments and the service assigned / enabled manually.

Service design / assign applications automate most or all of these functions.

Functionality

The functionality processes the Product/Service specification in order to achieve three distinct tasks in this application

1. Design of service components which are purely in the service level and do not depend on the resource inventory, such as billing options, time to provide and so on.

2. Domain level design of service within the resource, which determines which domain managers will be tasked to deliver the required service. If this design decision is based on the network inventory model, then this function must be carried out in the service & resource layer. An example would be where the service can be implemented using more than one network technology, each technology being managed by a different domain manager, and the technology choice being dependent on the technology available at a given location in the network.

3. Detailed design of service within the resource domains. This is a 'service & resource layer' operation as it is dependent on a resource inventory model which is found in the service & resource layer

Note that all three functions make use of the product/service specification.

Supported Contracts

To Be Added

6.2. Service Inventory Management Applications

Overview

The Service Inventory holds two types of information

1. The mapping of Product Specifications to Service Specifications and of Product Instances to Service Instances.
2. The mapping of service to service components. The components being either pure Service Layer features, or the resource features and the resource domain managers used to implement these features.
3. The domain level service implementation in the resource. This is the service, the domain manager that delivers the service and the inter-domain Access Point to Access Point relationships. Note that if the domain manager design decision is based on the network inventory model, then this aspect of the inventory is in the service & resource layer.

Functionality

Service Inventory Retrieval

This feature allows for client OSS to retrieve part or all of the service inventory known to the target OSS.

This feature may allow the following selection criteria:

- retrieval based on attribute matching
- retrieval of only the object instances that have been modified after a provided date and time.

For the selected objects, this feature may allow the client OSS to specify what specific attributes and relationships shall be returned.

Service Inventory Update Notifications

This feature entails the generation of inventory update notifications based on changes to the inventory known to a given OSS. The notifications concerning object creation, object deletion and attribute value changes.

Single Entity Notifications – in this variation of the feature, each notification pertains to only one entity, e.g., an IP VPN service instance

Multi-entity Notifications – in this variation of the feature, a single notification may report on inventory changes for multiple entities.

Service Inventory Update

This feature entails an OSS requesting that another OSS (referred to as the target OSS) update its inventory based on a provided collection of updates. The expectation is that the target OS update its inventory as requested, but no other side-effects are expected (e.g., creating a service in the network). This is a key point concerning this capability. The inventory update request can involve addition (new object), modification (change to an existing object) or deletion (removal of an object).

Service Inventory Reconciliation

This feature entails an OSS reconciling its own inventory with inventory discovered from another source. When new service inventory information is discovered, the OSS will try to match the newly discovered information with an entity or entities already known to the OSS.

If no match is found, the OSS will typically assume that a new entity has been discovered and add this to its inventory. Alternately, as decided by the service provider as part of their procedures, the OSS may record this event as an exception. For example, this may happen if the service provider always expects to have the planned service inventory in their inventory OSS before the actual services are activated.

If a match is found and there are no unexpected discrepancies, the OSS will update its inventory as needed.

If a match is found and there are unexpected discrepancies, the OSS will typically raise an exception so that service provider personnel can correct the problem.

Service Inventory Information Model

This feature is the information model for the services to be managed. Typically, the service provider would need to add a lot of detail concerning the services to be managed. The suggested approach for the service provider is to start with the TM Forum SID service model and then specialize the model for the specific services to be managed. The service model should indicate or point to the supporting resources for each services (the SID model, in fact, does do this).

Supported Contracts

To Be Added

6.3. Service Specification Management Applications

Overview

This application involves the storage and retrieval of service specifications. The service specifications represent the common and invariant aspects of various types of services. These specifications are used in the creation of new service instances.

Functionality

To Be Added

Supported Contracts

To Be Added

6.4. Service Configuration Management Applications

Overview

These application areas are close bedfellows to the service design/ assign functions outlined above. This area is fast evolving and new applications are becoming available all the time.

To explain this area in general, it is necessary to see a clear difference between services and networks /resources. Services can be viewed as being comprised of a number of building blocks – e.g. bandwidth, security, billing options, maintenance packages, SLA's, specific functions e.g. voicemail. Service design / assign would be an example of configuring a specific customer instance of the components. Service Configuration management might be either the set up of network / resource components for a customer, or a class of customers of a generic service build.

Functionality

To Be Added

Supported Contracts

To Be Added

6.5. Service Quality Monitoring & Impact Analysis Applications

Overview

Service Quality Monitoring (SQM) and impact analysis applications are designed to allow operators to determine what levels of service they are delivering to their customers. Ideally these take a customer centric view, i.e. the quality of service ***perceived by customers*** but may measure additional service metrics to allow the operator to be aware of approaching problems or degradations to service. Impact analysis applications extend this capability to predict the likely impact of service degradations or network problems on specific customers.

SQM applications generally support the 4 sub-processes defined by eTOM:

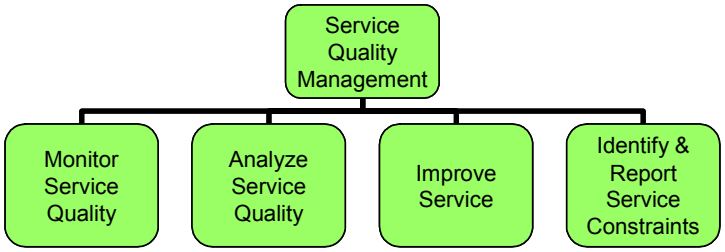

Figure 9: Service Quality Management Applications

Functionality

SQM applications are a major feed to service level agreement management applications. Key features are:

Monitor Service Quality

Extracts service related key performance indicators (KPIs) from various management systems.

Receives alarm information

Receives test information

Analyze Service Quality

Collates the KPIs and converts to Key Quality Indicators (KQIs) against which the service quality can be measured.

Improve Service

Recommends improvements as a result of the Service Quality Analysis

Identify & Report Service Constraints

Identifies areas within the network where service deterioration is being caused by constraints such as demand surges

Reports these to the resource layer

Supported Contracts

To Be Added

6.6. Service Level Agreement Management Applications

Overview

Successful SLA management is a growing factor in maintaining customer satisfaction and winning new business. These can be applied to both business and consumer customers. Satisfied customers are less likely to churn to competitors.

SLA Management applications use the output of the SQM applications to provide a comprehensive view of the level of service provided to customers compared to pre-agreed, often contractually binding, agreements. Typically SLA agreements will be agreed between operator and customer to measure a variety of service oriented issues and impacts. These may be either stated in terms of service characteristics, or in terms of the business impacts on the customer. An example of service oriented characteristics could include:

Availability

Security

Latency

Transmission speed

Time to respond to the initial fault report

The escalation process

The time to repair

Spares holding

The algorithm for calculating rebates

Contact details

Time to deliver from order confirmation

Additional services

Capacity

Increasingly, business customers are demanding SLA's measured in terms of business impacts. For example, Qantas, the Australian state airline measures its communications service levels in terms of impact of any disruptions on flights.

SLA's are also becoming an important characteristic between various players in the communications value chain. Service Level Agreements between network suppliers and service operators (for example a mobile virtual network operator MVNO) are common and are likely to grow between service providers and content suppliers.

Functionality

Collection of Service KPIs and Key Quality Indicators (KQIs) from:

Element management systems,

Directly from certain resource elements

Other OSS and applications

Apply appropriate algorithms to calculate the SLA metrics

Compare the calculated metric to the agreed SLA / Operational Level Agreements (OLA) metric

Raise SLA alarms and pass to alarm management system

Collate historical SLA information

Analyze that information

Publish the information in the form of reports etc.

Notification of charge / settlement adjustment information to other architecture functions (including Product Interface Management, Billing & Settlement, Business Intelligence, Legal)

Update Data warehouse with SLA statistics

Key Data

SLA created in SLA Management system from SLA contract

KPIs & KQIs from the network and other sources

Business rules for comparing

Supported Contracts

To be Added

6.7. Service Problem Management Applications

Overview

Service problem Management applications act as the bridge between resource problems (e.g. network problems) and customer affecting issues. Customer problem resolution, service problem resolution and resource problem resolution can be seen as one distributed set of related applications, ideally built around common data and functions. Each takes a different view of the same data. Thus related applications and functions are:

Customer Problem Resolution

Correlation & Root Cause Analysis

Resource Problem Ticketing

Service Performance Management

Service Quality monitoring

Resource performance management

Functionality

Typical application functions supported are:

Problem Reception

Trouble Ticketing

Problem Consolidation

Closure

Reporting

Allocating priority

Advising the Customer Resource Management systems (CRM)

Advising the Network Operations Center

Allocating the tasks to the appropriate people / roles

Tracking progress

Confirming when impact has been removed

Updating Configuration Management systems

Updating Inventory Management systems

Tracking progress

Confirming when fix has been completed

Updating Billing systems

Advising any other OSS/ systems as needed

Supported Contracts

To Be Added

6.8. Service Rating / Discounting Management Applications

Overview

Rating applications are the traditional 'heart' of any billing systems. The purpose of these applications is to ensure that the customer receives an invoice that is reflective of all the billable events delivered by the Service Provider dictated by their business relationship. In addition, it ensures that the appropriate taxes, rebates (i.e. missed customer commitments) and credits are applied to the customer's invoice(s).

Rating and discounting applications manage the customer's account and customer specific pricing, charges, discounting, credits and taxation for services delivered. They accept events that have been collected, translated, correlated, assembled, guided and service rated. It takes these events and determines the account or customer specific pricing, charges, discounts, and taxation that should be delivered to the invoice(s) for the customer.

In traditional circuit switched voice networks, rating systems take the output of circuit switches as a call detail record and, based on pre-loaded algorithms, produce an appropriate charge for the call based on factors such as time, distance, customer tariff plans etc. Historically, rating applications worked on a batch basis as calls were traditionally billed on a post paid, after the event basis.

Functionality

The main functions of traditional rating applications are:

Rating & pricing of events for retail billing (real time and offline)

Discounts, including cross product discounting

Flexibility of rating algorithms to accommodate new tariff plans

Throughput & accuracy

Pro rating of charges

Execution of adjustments based on information received from the Service Level Agreement function

The explosion in customer calling plans, and the wide variety of services offered, especially on mobile networks has changed the world of rating applications considerably, particularly in the area of pre-paid billing. Today, post paid billing and pre-paid billing are often implemented as separate applications using different data capture and processing

approaches. The current trend is to move towards *convergent* billing approaches which can handle either a pre-paid or post paid billing methodology. In convergent billing applications, the rating application moves closer to the point of data collection. Modern billing approaches are also much more flexible in their support of complex rating algorithms, handling multiple service bundles and managing non voice services like messaging, data and content.

Supported Contracts

To Be Added

6.9. Service Performance Management Applications

Overview

Service Performance Management Applications help monitor the end-end services, including the customer's experience. This can include a real-time, end-to-end view to ensure that each service is functioning correctly and a historical view.

These applications build on the Resource Performance data and active end-end service performance test data to provide a view of a service.

These applications provide a key input to determine the Quality of Service.

Functionality

The main functions of the Service Performance Management Applications are:

- Collection of Resource Performance Data from the Resource Management Applications (or directly in the absence of Resource Performance Management application)
- Collection of Service Performance data through end-end tests done internally through the application or external Service Test applications.
- Map the Performance data to Service Topology
- Calculate Service realted KPIs, KQIs
- Long-term performance archive
- Short-term performance repository
- Input to Service planning and forecasting applications

- Identification of Service related problems
- Historical trending
- Service triage / testing
- Service Performance “dashboard”

Supported Contracts

To Be Added

7. Resource Management Applications

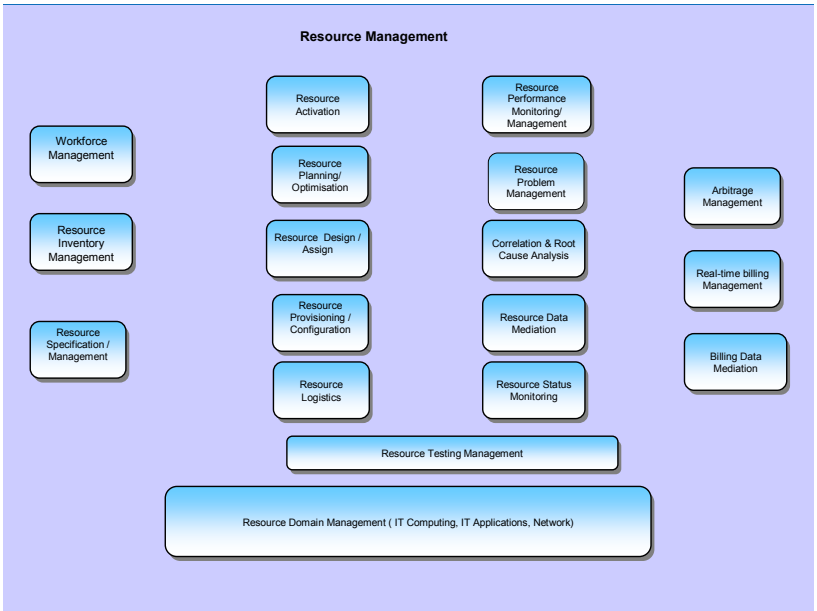

Figure 10: Resource Management & Operations Applications

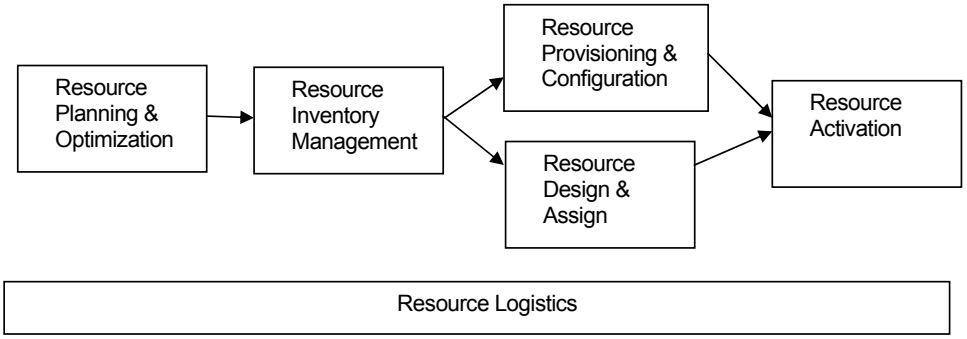

Figure 11: Resource Fulfillment Process

7.1. Resource Domain Management Applications

Overview

Resource Domain Management is the application area that provides the exposed resource services that are available to all other application areas, including those others in the Resource Management layer.

Domain Management's role in Next Generation Network re-engineering is to hide the idiosyncrasies and shortcomings of the Network, IT Computing, and IT applications equipment from the rest of the OSS estate, freeing it to be agile.

This is particularly important as operators install lots of new, untried equipment with early release Element Management software.

Resource Domain Managers should be expert activators, alarm handlers, and billing mediators for their domain, but should not operate in any cross-domain capacity. It is the responsibility of the other Resource Management layer applications to perform any cross-domain functions such as forecasting, capacity planning and design, and or for co-coordinating activation, root cause analysis and performance monitoring.

The basic model is shown below and is related to the examples shown in section 4.2 TMF 516.

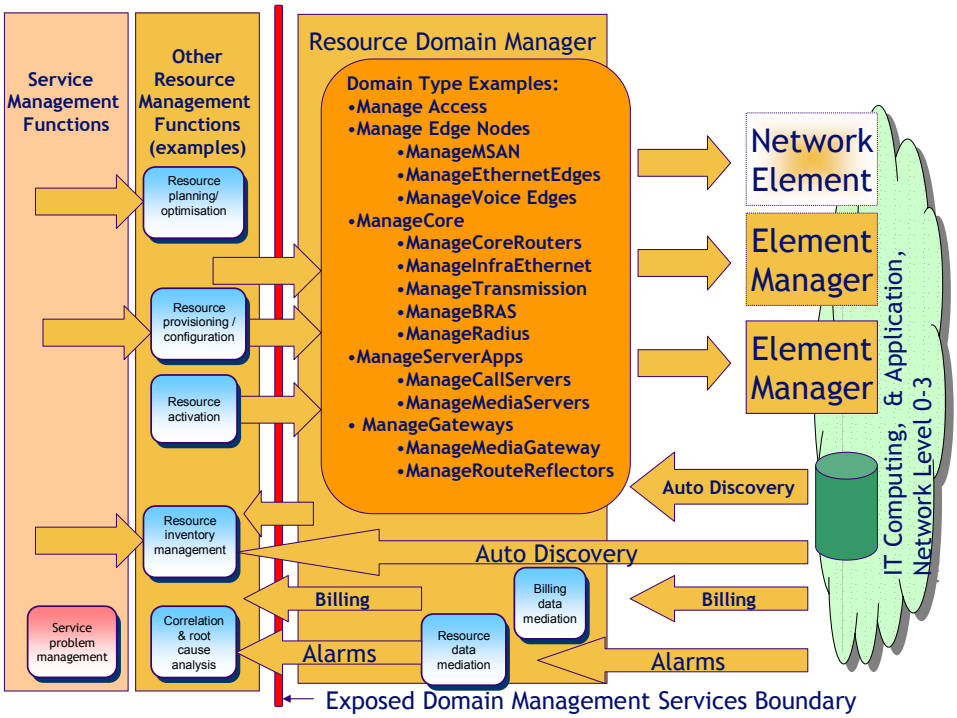

Figure 12: Relationship of Resource Domain Management to other TAM application areas

Why Domain Management?

Domains are defined as a set of entities, in this case resources, which have a common set of policies applied to them by a manager (M. Sloman, "Policy Driven Management for Distributed Systems," *J. Net. Sys. Mgmt.*, vol. 2, no. 4, 1994, pp. 333–60). Note that the general concept of a Domain allows for overlapping Domains, provided there are no policy conflicts. However it is likely that the TAM will need to mandate non-overlapping Resource Domains.

The resources that need to be managed include: IT computing, IT application, and networks.

Historically Networks have been managed as a service technology specific stove pipe such as SDH and ATM i.e. the service providers have commonly imposed a policy that all SDH services will be managed by one management systems stack. In next generation networks there is a need to move away from stovepipe E2E service management stacks towards a shared resource infrastructure model for services.

TMF 516 SoIP Resource Management Business Agreement suggests that NGN will need to introduce a set of patterns for managing resources. It identified in section 2.6 three dimensions for patterns namely, Protocol, Functional and Network and covered the general requirements for IT computing, IT application, networks resources.

A specific example in TMF516 for Networks was the proposal to use Resource Management Domains that separately manage the logical and physical aspects of:

Access Networks

Access Nodes

Intelligence Nodes

Core Network

Gateway Nodes

Applications and Content Servers

Functionality

The basic concept is to define resource domains that expose consistent services (NGOSS Implementation Contracts) to other TAM applications. Because Domains are based on the operator's policies the scope of the resource information model that they expose is based on the SP's individual policy decisions. However the basic services exposed are those necessary to support, at least, but not limited to, the other Resource Management Application Areas.

The Resource Domain Management applications are responsible for providing a completely encapsulated interface to network technology domains by:

- hiding vendor specific idiosyncrasies e.g for network s through the use of mTOP/MTNM/MTOSI template mechanisms.
- presenting a standards based interfaces e.g for networks mTOP/MTOSI/MTNM specifications using a standard data model.
- providing in-domain activation.
- providing in-domain alarm collection, filtering (and non data based correlation) to supplement that done by ***Correlation & Root Cause Analysis***.
- providing in-domain QoS activation .
- providing in-domain inventory discovery to supplement that done by ***Resource Inventory Management.***
- containing limited distributed copies of logical network inventory sufficient to support atomic operation rollback, element manager selection and network auto-discovery. Domain Managers are **not** the masters of this data. Where keys need to be assigned (e.g. IP addresses, VLAN IDs, PortIDs, telephone numbers) this will be undertaken by other applications in the Resource Management Layer.

The Resource Domain Management applications are **NOT** responsible for:

- cross-domain anything (activation, fault correlation and RCA, QoS, testing, orchestration – all done in ***Resource Configuration / Provisioning***, ***Correlation & Root Cause analysis***, ***Resource Performance Monitoring***, ***Resource Testing Management***).
- planning (done in ***Resource Planning/Optimization***)
- design (done in ***Resource Design/Assign***)
- assignment/ allocation of anything (e.g. ports, IP addresses) (done in ***Resource Design/Assign***)
- managing the engineering work for physical network equipment (outside plant), fiber or copper (done in ***Resource Logistics*** and ***Workforce Management***).
- providing in-domain performance monitoring – this is generally conducted by specialist tools and probes in ***Resource Testing Management***.
- being the database of record (Network inventory database of record is in ***Resource Inventory Management***)
- naming network resources (done in ***Resource Planning/Optimization and Resource Design/Assign)***
- workflow (done in ***Resource Configuration / Provisioning***,)
- B2B ordering (done in the ***Partner/Supplier Management Applications***)

Replication of Resource Domains

Resource Domain Management may be replicated by Service Providers to cover any specific policies that they have for organizing resource domains e.g. e2E technologies such as SDH and ATM, Legacy PDH networks, narrow band voice networks, Application Servers containing IT Application and Content - IPTV, and Next Generation Networks where domains need to be formed based on network roles.

Domains may also be replicated to cover different vendors and different equipment types at the choice of the Service Provider.

Impact on Element Management

With Next Generation Networks there will be an evolution away from complex and expensive Element Management Systems towards Resource Domain Managers that have common features that directly connect to the network or Application Server elements themselves. This evolution is also needed to compress the number of systems in any stack to reduce complexity, increase agility and improve end to end process performance.

The use of a Resource Domain Manager means that this can happen whilst shielding all the other TAM applications areas from these detailed implementation changes.

Relationship to mTOP/ MTNM/MTOSI

In this analysis it is assumed that that the services exposed by the Domain Managers for Networks will be based on the MTOSI Specifications. This is shown as a red vertical bar in the figure. This sets a critical SP expectation on the position of the procurement boundary for basic Resources Management Functionality (Service interfaces).

It also shows a clear relationship between the TAM as an Application Architecture and actual conformance testable interfaces that have been developed by the TMF.

Note that MTOSI is not limited to just this boundary and may be used by other application areas in the Resource Management and Service Management layers.

Resource Domain Management for IT computing and applications will be defined in a future version.

Supported Contracts

To Be Added

7.2. Resource Planning / Optimization Applications

Overview

This application area is used to manage the functions of planning resource installation, managing changes, and providing optimization capabilities of the resources in use.

These applications typically cover the Inside Plant Engineering, Outside Plant Engineering and RF Engineering processes

Functionality

There are three major planning applications in this area

- Resource Design Automation
- Resource Planning
- Physical Planning

Resource Design Automation

Resource Design Automation deals with the *networked resource* not individual resource items. It is the complex functionality based on analysis of network capacity, topology and utilisation trends in order to determine optimum deployment of network resources. It typically will make use of complex algorithms, but uses a simplified model of the service and resource inventory.

Key functions of these applications include:

What-if configurations and modeling

Real world modeling

End-to-end resource design and architecture to support service deployments

Optimisation of resource for a number of factors, including

Resilience

New capacity

Existing capacity

Makes use of

Usage and Performance Analytics

Utilization Trend Analytics

Resource Planning

Resource Planning implements resource design decisions either generated manually or from Design Automation. This application is capacity-based and requires a Service and Resource Inventory model. Its main function is to ensure there is sufficient capacity in the network to support service demand, but it also supports planned engineering, repair and capacity required for individual services.

Key functions of these applications include:

Architecture/Structure modifications to networked resource

Production of resource deployment, configuration, and maintenance plans (which form part of the Infrastructure Lifecycle Management process)

Optimizes the resource usage and triggers changes to configurations (Resource or Service)

New technology and new resource designs

Planning of resource installation and changes e.g. :

- Logical resource planning including all equipment configurations, interconnectivity etc.
- Applies at all technology layers
- Applies to the capacity management of physical resource
- Inter-resource dependencies
- Provides optimal resource configurations

Interaction with Financial systems for CAPEX plans and approvals

Controls manual installation tasks via Workforce Management process or applications

Resource Capacity, Optimization

Resource Coverage Planning

A major role for Resource Planning is to generate Resource Inventory Data

Physical Planning

Physical Planning implements Resource Planning decisions, but also supports Resource Planning with physical detail and constraints. This application requires CAD/GIS support and covers both inside and outside plant.

Key functions of these applications include:

Planning of resource installation and changes e.g. :

- Physical resource planning including all equipment configurations, cabling etc.
- Space, power and cooling
- Inside plant ducting

Planning and management of external plant configurations (duct, cables / fibers, routing etc.)

Graphical presentation of physical plant, equipment and cable / fiber routing

Graphical representation of street layout and external plant locations

Controls manual installation tasks via Workforce Management process or applications

Interaction with Financial systems for CAPEX plans and approvals

Geospatial Analytics

Supported Contracts

To Be Added

7.3. Resource Design / Assign Applications

Overview

This application area includes both the design of new resources to be included in a network as well as the design of resource configurations which are needed to support new service activations. Assignment is the function which conveys the new designs to those systems which initiate and support the implementation.

Functionality

Key functions of these applications include:

Physical, logical, and software design of resources including definition of configuration variables and initial parameters.

Graphical presentation and visualization of resources, interconnections, or topology

End-to-end resource design and architecture to support service deployments

Architecture modifications to include resources or changes.

New technology and new resource designs

What-if configurations and modeling

Real world modeling

Controls manual installation tasks via Workforce Management process or applications

Interface with Configuration or Inventory applications

Multi-layer modeling and design (physical, data, transport, ...)

Supported Contracts

To Be Added

7.4. Resource Logistics Applications

Overview

Resource logistics applications coordinate the availability and deployment of resources to their in-service locations. These often have a close-coupling with supply chain applications but serve complementary roles. Whereas supply chain applications identify vendors and alternate sources, and manage order fulfillment while seeking to minimize stocking levels; resource logistics applications identify and distribute resource stock where needed as quickly as possible.

Functionality

Key functions of resource logistics applications are:

resource or kit distribution

people + part + event coordination

stock balancing or distribution in reaction to special events or disasters

warehouse stock level projections

Engineering Work Order Management

Engineering Project Management

Network Asset Deployment Workflow

Resource Supply Chain Management

Resource logistics applications take input from several functions to determine the need for resource distribution including

resource planning (capacity)

workforce management (preventative maintenance, change management)

resource problem management (fault management)

And resource logistics applications output to supply chain management applications to identify resource needs and order placement.

Supported Contracts

To Be Added

7.5. Resource Provisioning / Configuration Applications

Overview

Applications in this area manage the provisioning and configuration of resources required for services. Often Resource Provisioning / Configuration applications and Resource Activation applications may be part of one combined application package.

Functionality

Typical functions include:

Configuration of the physical and logical resource (network element or component, IT system, application or other entities defined within systems)

Management of the resource activation or deactivation

Interface with NE or EMS or other provisioning or activation application

Management of resource properties, including changes in characteristics

Maintaining up-to-date status of resources in Resource Inventory applications

Maintain resource state and topology

Interface to Workforce or Workflow applications

Control of the manual provisioning tasks possibly via Workforce Management application

Supported Contracts

To Be Added

7.6. Resource Activation Applications

Overview

Resource activation applications interpret the needs of a fulfillment request into specific control commands for a network or sub-network often handling proprietary messaging with individual resource elements.

Functionality

Typical functions include:

Update the resource instance to perform the activation or deactivation.

Update the resource to activate Billing data collection

Notify Resource Provision / Control of the activation status

Update Resource Inventory with the resource status information

Queued / scheduled activation requests

Configuration validation and rollback

Manage dependencies within, and across network elements through rules

Multi-vendor and multi-technology activation

Multiple NE activation coordination

Confirm / identify available resources

Supported Contracts

To Be Added

7.7. Workforce Management Applications

Overview

Workforce Management applications manage field forces to make optimum use of manpower and other resources such as vehicles. They are used to schedule resources, provide a map of field skill sets and provide forecasting and load balancing capabilities. Workforce Management can be used to manage both internal and external (customer) resources in both service assurance and provisioning areas.

Functionality

Typical functions include:

Scheduling: Applications are usually designed to build schedules for groups and individuals taking into account shift patterns, daily duties, multiple skill sets, resource availability, schedule preferences and fluctuating nature of the workload.

Forecasting: Application usually calculate optimal staffing requirements with input of historic statistics, service level goals, call centre costs, change parameters and expected workload. They may include resources that are required by date, time, queue, resource pool etc.

Dynamic management: provides for immediate and unexpected changes in resource status, such as sick leave, or unforeseen changes in the workload dictate that conditions be constantly monitored, and spontaneous adjustments made

Operational Support: This function typically tracks and reports Work Force Management data such as actuals to forecasts and gathering individual and group statistics

Supported Contracts

To Be Added

7.8. Resource Inventory Management Applications

Overview

Resource Inventory applications manage information of all resources used to implement services and products. This application area is typically linked to various element management systems (i.e. building inventory for actual network and resource assets) and resource inventory database systems which may or may not be combined with Service Inventory Application(s) or database(s). In addition, Resource management applications have a major role to play managing spare parts; 'dumb' resources such as cable pairs and external plant and customer premises equipment.

In addition, Resource Inventory applications are used to discover and manage underutilized or 'stranded' resources.

Functionality

Resource Inventory Information Model – the assumption is that this feature implements the standardized information model for the resources to be managed. Typically, the service provider would need to add a lot of detail concerning the resource attributes that are to be managed. The specific details will depend on the particular resources (e.g., particular types of managed elements and equipment) and associated

technologies (e.g., SONET/SDH, ATM and Ethernet) to be managed. The suggested approach for the service provider is to start with the TM Forum SID model and then define or make use of an existing model that specializes the SID model for the specific technologies that need to be managed.

Key Functions:

Accurately describes the state of resources (network elements and their components, IT systems and applications, resources defined within systems etc.)

Track status all resources

Database of all spares (Capacity Management and optionally interface to Asset Tracking)

Barcode/RFID tracking of all resources including spares

Resource Site Information

- Resource History tracking for all problems and returns
- Interacts with Resource Activation and Resource Provisioning
- Manages under-utilized or 'stranded' assets

Resource Inventory Retrieval – this feature allows for client operations support (service assurance and billing systems) to retrieve part or all of the resource inventory known to the target OSS.

This feature may allow the following selection criteria:

- retrieval of a specified set of one or more sub-trees
- exclusion or inclusion of specified object types from the selected sub-tree
- further filtering based on attribute matching
- retrieval of only the object instances that have been modified after a provided date and time.
- For the selected objects, this feature may allow the client client operations support (service assurance and billing systems) to specify what specific attributes and relationships shall be returned. This (the attributes and relationships to be returned) would be the same for all objects of the same type.

Resource Inventory Update Notifications – this feature entails the generation of inventory update notifications based on changes to the inventory known to a given OSS. The notifications concerning object creation, object deletion and attribute value changes to other systems.

- Single Entity Notifications – in this variation of the feature, each notification pertains to only one entity, e.g., an equipment instance
- Multi-entity Notifications – in this variation of the feature, a single notification may report on inventory changes for multiple entities.

- Notification Suppression – in this variation of the feature, each notification pertains to only one entity. However, in cases where a container object is created (e.g., a managed element) that has many contained objects, the sending OSS may only report on the container object creation. The expectation is that the receiving OSS will use a retrieval operation to obtain the contained object. This concept is explained further in TM Forum document SD2-1, MTOSI Implementation Statement (see Section 2.5.1, Publisher Notification Suppression).

Resource Inventory Update – this feature entails an OSS requesting that another OSS (referred to as the target OSS) update its inventory based on a provided collection of updates. The expectation is that the target OS update its inventory as requested, but no other side-effects are expected (e.g., creating an SNC in the network). This is a key point concerning this capability. The inventory update request can involve addition (new object), modification (change to an existing object) or deletion (removal of an object).

Resource Inventory Reconciliation – this feature entails an OSS reconciling its own inventory with inventory discovered from another source (typically, the network). When new inventory information is discovered, the OSS will try to match the newly discovered information with an entity or entities already known to the OSS

- If no match is found, the OSS will typically assume that a new entity has been discovered and add this to its inventory. Alternately, as decided by the service provider as part of their procedures, the OSS may record this event as an exception. For example, this may happen if the service provider always expects to have the planned inventory in their inventory OSS before actual resources are installed.
- If a match is found and there are no unexpected discrepancies, the OSS will update its inventory as needed.
- If a match is found and there are unexpected discrepancies, the OSS will typically raise an exception so that service provider personnel can correct the problem.

Supported Contracts

To Be Added

7.9. Resource Specification Management Applications

Overview

This application involves the storage and retrieval of resource specifications. The resource specifications represent the common and invariant aspects of various types of resources. These specifications are used in the creation of new resource instances.

Functionality

To Be Added

Supported Contracts

To Be Added

7.10. Correlation & Root Cause Analysis Applications

Overview

Correlation is the ability to collect various events in the network and through a transformation process reduce the number of raw events to a manageable amount to enable a user to move into the area of Root Cause Analysis (RCA), RCA enables the end user to quickly determine the root cause of a problem in the network. Correlation & Root Cause applications are often part of an overall resource problem management solution, but have a unique role in mediating network alarms with topology and configuration data.

Functionality

Capabilities of these applications can be divided into several areas:

Alarm Correlation:

Ability of the application to collect all relevant network events (alarms, performance measures, customer information, events, test results, etc.). The application will have the capability to collect, parse and normalize disparate alarm streams from various sources, including, but not limited to NMS, EMS, NE's, etc.

Reduction of alarms either presented to the user or for use by additional correlations. The more correlation methodologies the application is capable of delivering, the greater the overall reduction of alarms that should be accomplished.

There are several alarm correlation mechanisms which could be employed by the application:

Alarm de-duplication – first level of alarm reduction based on pre-defined user criteria. Alarm de-duplication is designed to eliminate repeated events to reduce the amount of "noise" from the network. The application should provide end user with capability to define rules for de-duplication.

Alarm auto-clearing – ability of the application to correlate a previous alarm with a clear-alarm received from the source (NE, NMS, and EMS). The application should deliver "out-of-the-box" auto-clearing capabilities for each device type/EMS/NMS supported, as well as capabilities for end users to define their own auto-clearing rules.

Alarm thresholding – ability of the application to handle various thresholding scenarios such as alarm flapping and integration with performance management systems to receive threshold crossing alarms, as well as generate synthetic threshold alarms based on pre-defined user conditions. The application should provide end user the ability to maintain "out-of-the box" rules, as well as develop their own rules for threshold management.

Correlating alarms with supporting data (topology, configuration).

Rules-based correlation (intra- or like-element driven)

The application should have the ability to perform topology-based correlation:

- intra-element
- inter-element (including up/down the various network layers)
- service-based; In order for the application to do topology based correlation, the application must be "topology aware". Topology awareness can be achieved through autodiscovery or integration with an inventory management application. Inter-element and service based correlation can only be achieved if the inventory data is valid and is available for integration with the correlation application.
- Alarm enrichment (external database connectivity)
- Ability to associate services to the physical aspects of the network.
- Filter, summarize, and reduce displayed alarms
- Consolidation of alarms
  - Consolidating alarms across technology
  - Consolidating alarms across elements

Present to alarm console

Graphical display of fault / topology overlay

Root Cause Analysis – (RCA) ability to pinpoint the root cause of the problem or in some instances probable cause of the problem. The application should have the ability to:

Root Cause isolation based on correlation analysis described above.

Customer impact analysis– accurate customer impact analysis depends on service correlation as well as the ability of the application to integrate inventory management and CRM databases to identify impacted customers.

Fault isolation

Network Element / network layer attribution

Alarm consolidation / substitution as well as alarm suppression of the sympathetic alarms.

Problem identification / initiation (ticket creation). Once Root Cause/Probable cause is determined, the application should have the ability to integrate with trouble management application for manual/automated ticket creation.

Resolution initiation (testing, solution identification/ownership, knowledge base index). The application should have capability to integrate with various testing applications. Integration with testing should be rules bases.

Knowledge of topology

Present to alarm console

Drill down from root cause into details

Supported Contracts

To Be Added

7.11. Resource Status Monitoring Applications

Overview

These applications ensure that any changes to the network topology (configuration), is reflected into the dependent systems – performance management, service management etc.

Also changes in load on resources are reflected. This means that the setting of relevant thresholds and observing the passing of these is within the capabilities supported by such applications.

Add text for this section to be a general overview for L1 and its respective L2s

Functionality

Application principles in this area are typically:

Distributed meta model of the configurable resources

- Meta-data capability to consolidate multiple databases
- Rules for access control and validation

- New and legacy information

Distributed meta model of expected resource load

- Meta-data capability to consolidate threshold modelling
- Rules for access control and validation
- New and legacy information

Process-driven workflow coordination

- Assigned tasking
- Process templates define work-flow

Mediation layer to support interaction of diverse applications

- Point to point and publish / subscribe modes
- Application Map to support load balancing, resilience

Directory-based profiles

- Users
- Data entities
- Applications

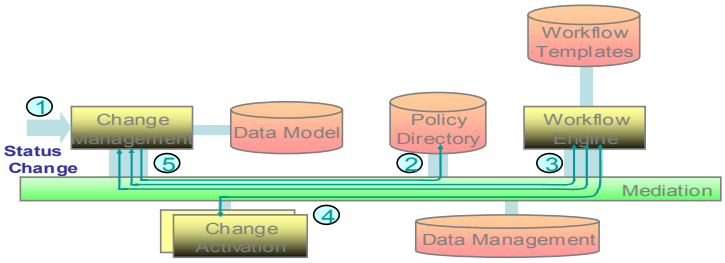

Figure 13: Status Monitoring Data Flow

The flow is:

1. A change in topology status or resource load is received from a manual or automatic source
2. The policy directory (could be a person) decides on the appropriate action
   - User Profiles
   - Data Profiles
   - Application Profiles
3. The action is then passed to the workforce control (system or person)
   - Process Templates
   - Workflow Tracking

- Historical Archive
- Fast Invocation / Results

4. The change is then activated
   - Automated decomposition of change impact
   - Automated activation via the network element / network managers
5. The change is then updated into the management system data model
   - Meta-data schema
   - Configurable network and server model
   - Concurrent lifecycle views

Supported Contracts

To Be Added

7.11.1. Resource Status Monitoring Level 2 Capabilities

The level 2 capabilities envisaged are:

Network topology monitoring

Network topology modeling

Protection/rerouting policy

Resource load monitoring

CPU load

Memory utilization

Storage (disc) utilization

Bandwidth utilization

Application keep-alive monitoring

Threshold policy modeling

Automatic workforce control

Resource status alarm handling

Resource status alarm logging

7.12. Resource Performance Monitoring / Management Applications

Overview

Applications in this area of the Applications Map can be sub-divided into four main functions.

Resource Performance management

Resource Topology Status Monitoring

Resource Testing Management

Resource Data Mediation

The data flow is illustrated and each application area described below:

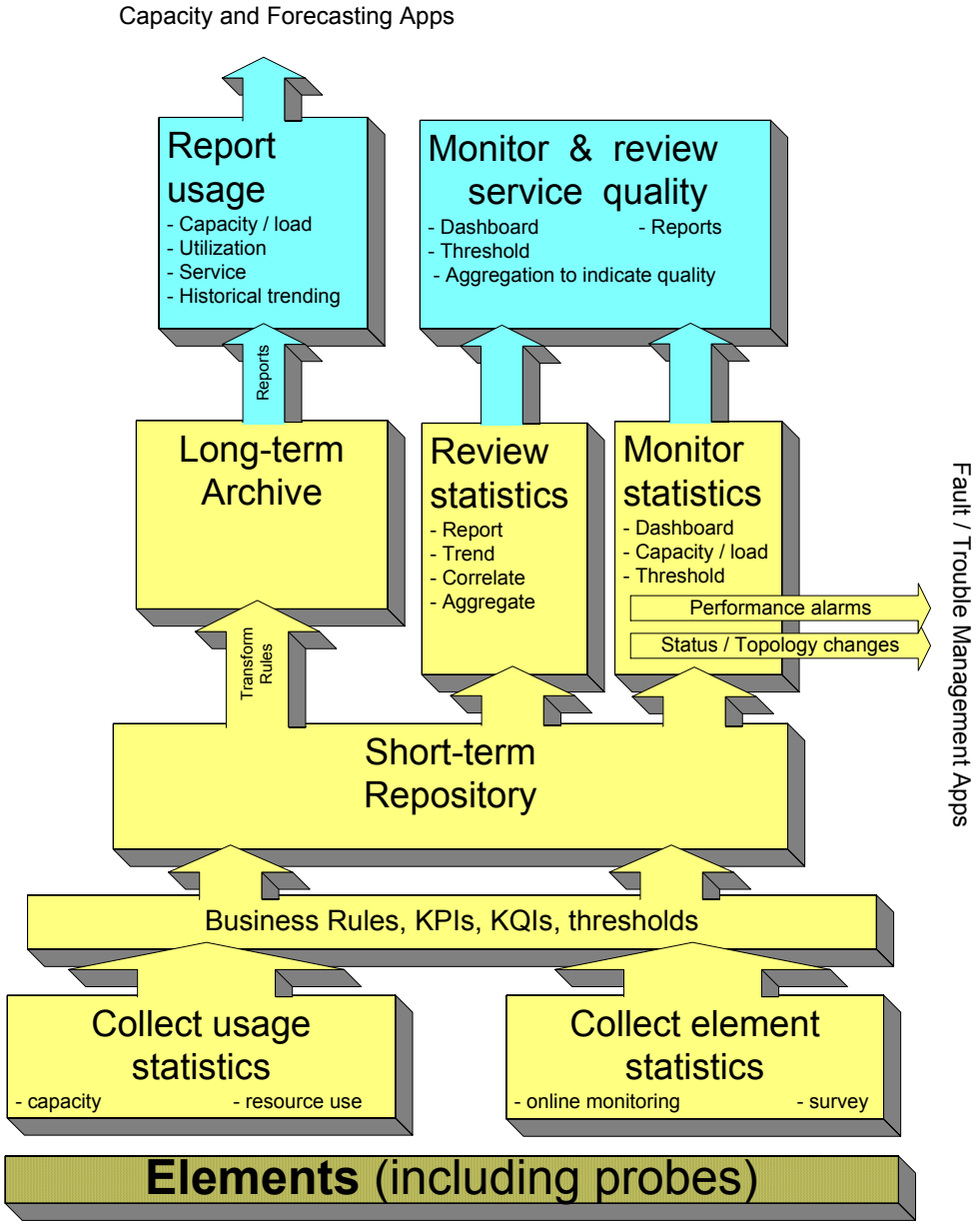

Figure 14: Resource Performance Management Data Flows

Traditionally, the management of network resources has been geared to managing the technology that supports the network - monitoring events. With multi-service networks it will be managed according to the services being delivered across the network - monitored on service levels.

As the services and the network infrastructure that supports them become more complex, automation of the data analysis is required.

Functionality

Applications that support Performance Management will have one or more of the following capabilities:

Resource Performance data collection

Resource Topology Status data collection

Business rules / formulae / KPIs, KQIs

Cross NE and Layer data mediation

- Intra- and inter-NE rules
- Intra- and inter-layer rules

Long-term performance archive

Short-term performance repository

Input to capacity planning and forecasting applications

Input to resource problem management applications

Historical trending

Problem identification: Capacity, Configuration problem identification

Problem triage / testing

Utilization trending

Capacity/load management

Performance “dashboard”

Supported Contracts

To Be Added

7.13. Resource Testing Management Applications

Overview

Resource testing applications are focused on ensuring that the various resources are working properly. The resource testing applications are part of both the fulfillment and the assurance process. In the fulfillment process, the resource testing is responsible for ensuring that the assigned service works as designed, while on the assurance side the resource testing applications are responsible for fault isolation and correction. As part of

the testing process, these applications also interface with the trouble process, which can trigger an automatic test.

Following is an example application flow:

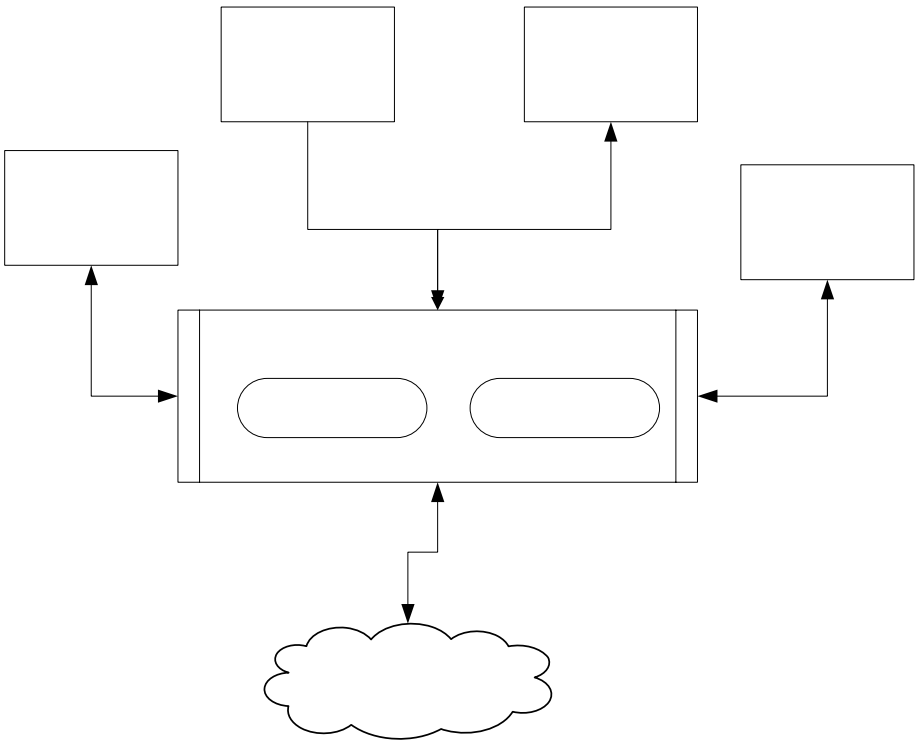

Figure 15: Testing Management

Functionality

Following are some of the capabilities of the testing process:

Test Work flow and Rules Engine

Auto and Manual Test Initiation

Test Life Cycle Management

Problem Management Process

Test Head Management

Manage Test Head Resources Capacity

Manage Test Head Availability

Element and Test Head Command and Control

Test Results Management

Interpret Test Results

Supported Contracts

To Be Added

7.14. Resource Problem Management Applications

Overview

Problem or trouble ticketing applications provide comprehensive capabilities for recording problems, providing escalation of the problem based on a number of criteria. Systems are able to associate the effects of problems to root causes (based on root cause analysis systems or human deduction).

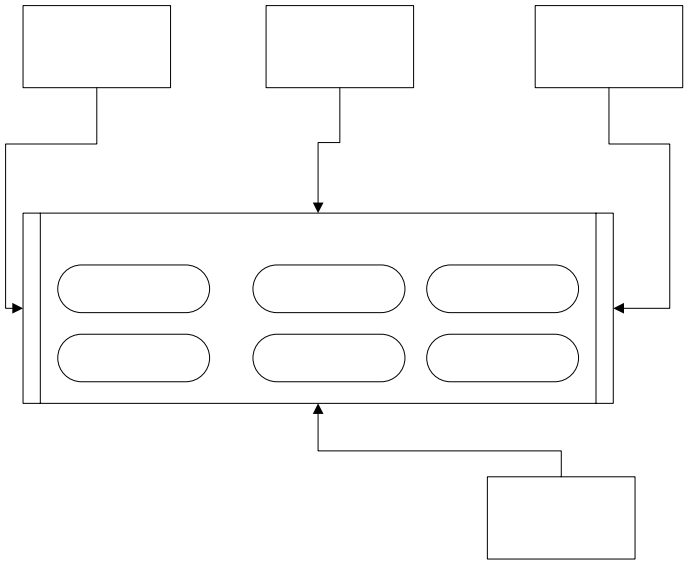

Figure 16: Resource Problem Management

Resource Management

Functionality

Typical functions include:

Event Management

Trouble ticket creation

Auto and manual ticket initiation

Outage classification and prioritization

Problem tracking / history

Ticket Workflow and notification

Problem workflow

Personnel utilization and interface to Work Force Management

Knowledge Management

Resolution identification, tracking and confirmation

MTTR and Uptime measurements

Problem trending and identification of design flaws or hot spots

T

Work Flow & Notification

Event Management

Feedback to customer: service status, trouble status, network bulletins

Business Rules Management

- Managing Methods and Procedures
- Manage Interfaces to external functions
- Consolidating trouble tickets across technology & elements
- Change control

Supported Contracts

To Be Added

7.15. Resource Data Mediation Applications

Overview

These applications take the output from the various resources and re-format the data into a form usable by an application such as a status monitoring application. Mediation capabilities have historically been built for almost every OSS system that faces a variety of network elements or element management systems and the development and maintenance of these functions is a significant overhead since many interfaces often need to be changed when the element being monitored changes.

In recent years, specialist mediation tools, toolkits and applications have become commercially available along with libraries of interfaces to popular network level resources. As network resources deploy standardized interfaces, mediation becomes less of a requirement but for the foreseeable future, this capability is likely to be required.

Functionality

Typical functions include:

Parsing of data from one format to another

Correlation

Pattern recognition

Tools to set up and maintain parsing rules

Supported Contracts

To Be Added

7.16. Billing Data Mediation Applications

Overview

These applications are very similar in function to resource mediation but especially concerned with billing functions (for voice, data, or content). Typically they are optimized to handle very large volumes of data but do not need to be as flexible as general purpose mediation as they typically parse call detail records (CDR's).

Functionality

Typical functions include:

CDR Formatting, mediation & correlation

IP & IPCDR formatting / mediation/ correlation

Wholesale Partner Gateways

CDR/IPCDR pre-processing / rating

Supported Contracts

To Be Added

7.17. Arbitrage Management Applications

Overview

Arbitrage is the buying and selling of bulk services.

Functionality

Applications may support the following functions:

Bandwidth brokering

Bit parity management

Supported Contracts

To Be Added

7.18. Real-time Billing Mediation Applications

Overview

Real time billing mediation applications are significantly different from post paid mediation systems. The source of data is usually different (post paid billing systems usually collect call detail records after the call event), pre-paid systems take usage information from signaling networks and monitor in-call usage. Services like Advice of charge, even for post paid usage, require real time mediation systems.

Functionality

Capabilities required for real time mediation include:

Acquisition and validation of events received from Network element.

Formatting the event into a common-formatted event record.

Identifying and routing the customer/customer population group associated with an event and routes the event to the relevant rating function

Communication with the session control device

Communication with the rating engine

Supported Contracts

To Be Added

7.19. Voucher Management Applications

Overview

Voucher management application handles all aspects of prepaid recharge vouchers. Generally, a voucher has a unique serial number and a PIN code by which it is identified. The PIN code is covered, and the cover must be scratched off in order to use the voucher. Scratch-vouchers can be purchased from vending machines, at kiosks and other points of sale.

Customers can use vouchers to recharge their balances via an IVR system or by contacting the call center and providing the CSR with the voucher.

Functionality

Voucher Management Applications generally provide the following functionality:

Voucher Ordering

Definition and creation of packages and tentative vouchers

PIN generation and encryption

Pairing of serial numbers with PINs

Sending of the order file to the manufacturer

Voucher Distribution to dealers

Supported Contracts

To Be Added

8. Supplier/Partner Applications

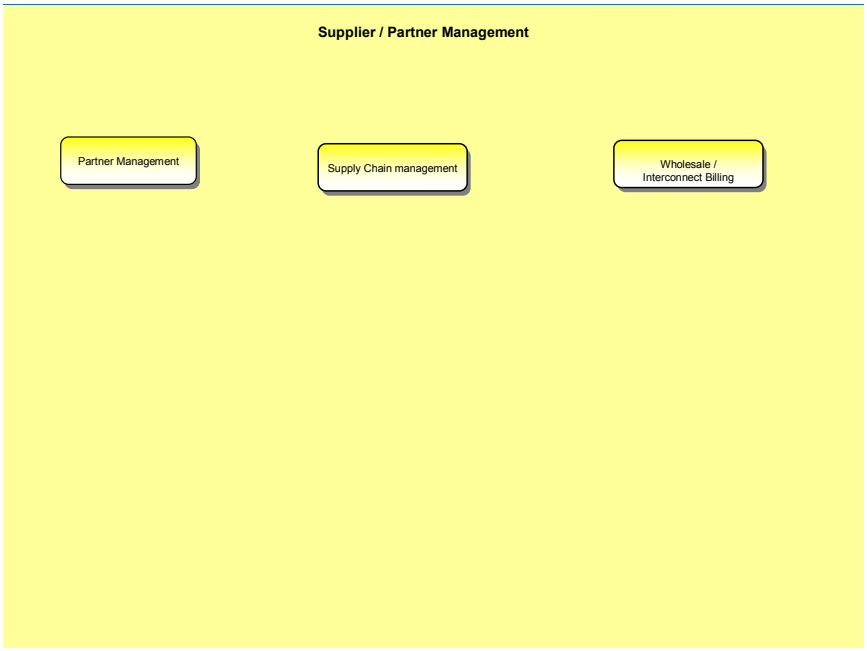

Figure 17: Supplier / Partner Applications

8.1. Partner Management Applications

Overview

In the next generation telecom scenario, collaboration is the key to successful delivery of value added services and retention of customers. The telecom operators form horizontal and vertical revenue sharing relationships with players like other telecom operators, content providers, and regulatory bodies.

Most of the service providers now bring in a lot of products from partners to add to their service portfolio, so that customers can choose from a wide array to their preference and

benefit. The service providers can also form channel partners through which they can offer their products to other markets where they don't have any direct access. As the market is getting polarized to service providers and customer owners, partnerships are going to be the key. Virtual world is opening up with increasing operations of players like MVNO's, extending services or products from other parties to their customers leveraging their brand power and customer access. Hence horizontal and vertical value chain integration is going to be a vital part of the consolidation and convergence strategy of any service provider. In the online content and commerce world, the length of value chain could go on to include content providers, brokers, intermediaries, network operators, payment processing entities, banks and so on. Revenue from the end customer needs to be shared among these value chain entities based on pre-defined agreements. Sometimes the revenue settlement process has to be done in real-time so that final transaction can be validated and output delivered to the end customer.

Functionality

A partner management application mainly does functions like

- Partner definition and hierarchy management
- Pre-defined revenue sharing agreements and variation rules
- Agreement definition for each service, product, channel or location
- Direct and indirect settlement
- Real-time settlement
- Drill down reconciliation at summary and detailed levels
- Partner event processing and revenue share accounting
- Partner payment handling

Supported Contracts

To Be Added

8.2. Supply Chain Management Applications

Will be defined in the next release.

8.3. Wholesale / Interconnect Billing Applications

Overview

Wholesale billing applications include a variety of capabilities. Traditionally this area included inter-carrier settlements capabilities and this was later extended to interconnect billing applications. In today's competitive markets and complex value chains, it has

expanded further to include among others Roaming, wholesale operators, resellers, Mobile Virtual Network Operators, Content Providers and E-Commerce.

There is now an array of applications in the area providing charging, billing, and settlement capabilities on a raw data basis, individual transaction basis and bulk basis across a variety of services and platforms. These applications work across a variety of platforms and support a wide range of services, preferably in one single system. Wholesale applications need to adhere to international standards such as TAP and RAP files, which are processed in Roaming solutions.

Functionality

Reference Data Creation and Management

Definition of products and services, pricing schemes, partner entities and contracts into the system. Easy uploading of reference data from external sources such as XML files.

Partners' accounting activities (Partner event processing)

Processing the events generated by the partners' business activities for invoicing and payment purposes.

Error Management

Automatic and manual handling of records found in error, mass correction and re-rating of events.

Partner Invoice management

Accurate, flexible bi-directional invoicing for various settlement periods.

Settlement management

Oversee the Partners' accounting activities. Provide monitoring tools.

Handling of payments

Logging and tracking of full or partial payments.

Disputes management

Automated tools to ease and expedite dispute management.

Supported Contracts

Interface with other financial management systems such as the general ledger.

Report and Statements

Tools for the analysis of the information available within the system such as accumulated charges, rated usage, etc.

9. Enterprise Management Applications

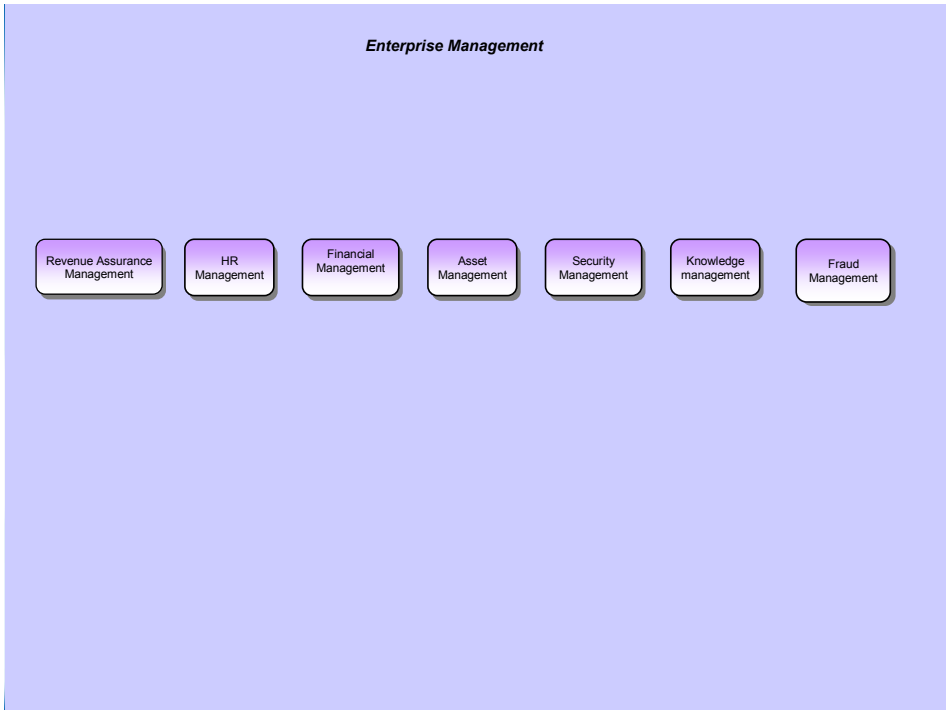

Figure 18: Enterprise Management Applications

Introduction

Enterprises need to manage themselves and the TAM has identified the following application areas:

Revenue Assurance Management

HR Management

Financial Management

Asset Management

Security management

Knowledge Management

Fraud Management

Mostly these functions are quite generic across many industry sectors and are not peculiar to the Communication industry.

Within Knowledge Management the communications industry has some very specific needs around the general title of 'Enterprise Information Applications or 'Business intelligence'.

9.1. Revenue Assurance Management Applications

Overview

Revenue assurance is the identification and prevention of "leaking" revenues. Applications to solve this problem vary considerably and while they predominantly relate to the billing area of applications, this is not always the case. The revenue assurance applications area is thus shown at this part of the TMF Applications Map for convenience.

The three main sources of loss (see Figure 19: Main Sources of Revenue Leakage below) are fraud, rating failures and incorrect or incomplete Call Detail Records (CDRs).

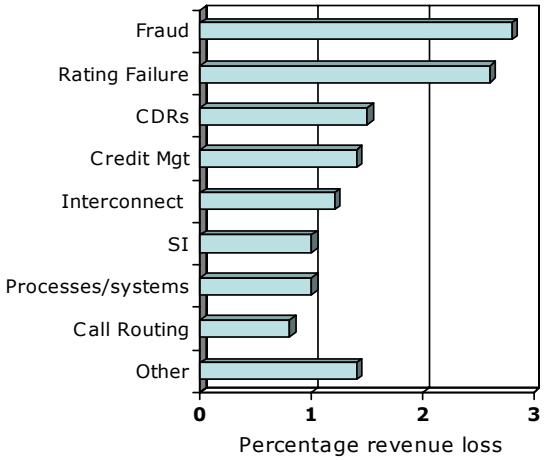

Figure 19: Main Sources of Revenue Leakage[1]

[1] Analysys Ltd - Revenue Leakage Survey October 2003 available via Azure Solutions Ltd.

Functionality

The main revenue assurance application areas are;

Interconnect billing and settlement applications – to reduce CDR loss, interconnect billing disputes

Optimized Call Routing applications – to find the best quality, lowest price route for international traffic

Network Integrity processes – to check that calls or data events that enter the network are accurately captured by the billing engine (this system is also used to demonstrate billing accuracy to national regulators)

- The benefit of reducing revenue leakage is it can be added to the top line which increases revenue growth (without the need to launch a new service). At the same time, there is relatively little additional cost to collecting the revenue so most of it goes to the bottom line increasing profitability.

In addition, operators with strong interconnect systems can reduce the time lost collecting these revenues. At any given time 1-10% of interconnect revenues are being disputed. By having an interconnect system, operators have saved records which could be audited and agreed with other operators more quickly. This is important for former PTTs in deregulated markets. It is estimated that interconnect traffic accounts for15% of total revenue. Delays caused by disputes reduce cash flow and can attract interest charges.

Operator's networks and portfolios are never static. This means that new technologies and new services are being constantly added and removed. It is forecast [2] that revenue leakage will increase as the next generation of networks are introduced. In some operators, key people/departments have already been made responsible for revenue assurance end-to-end. Giving end-to-end responsibility for revenue assurance to one senior person in the company makes systematic measurement and prevention possible. This reduces losses now and increases the profitability that can be expected from the next generation of network services. Importantly, it sends a clear business message from the top of the company.

Supported Contracts

To Be Added

9.2. HR Management Applications

Details to be added in the next release

[3] Analysys Ltd - Revenue Leakage Survey October 2003 available via Azure Solutions Ltd.

9.3. Financial Management Applications

Details to be added in the next release

9.4. Asset Management Applications

Details to be added in the next release

9.5. Security Management Applications

Details to be added in the next release

9.6. Knowledge Management Applications

9.6.1. Enterprise Information Applications

Overview

These applications are usually associated with Data Warehousing technologies and provide the enterprise with a range of filtered information and events to present to enterprise managers, often through a dashboard, to allow them recognize, respond and manage business events.

Functionality

The Enterprise Information Application is responsible for:

The acquisition and management of data for use within Business Intelligence functions. This includes both internal corporate data, but also external data used to augment and enhance the organization's understanding of its customers and services.

The transformation and remodeling of data to an agreed model for each managed business domain within the enterprise e.g. Retail, Wholesale.

The cleansing and management of data quality to ensure an appropriate level of integrity and quality is maintained within the information. This also includes reporting to identify and initiate resolution of root cause issues pertaining to the data quality.

Data Integration services to manage the distribution and synchronization of information to other platforms.

The creation and management of an Enterprise Wide Data Warehouse for centralization and rationalization of business information containing all publishable quality data of a permanent nature for the enterprise. This information will be stored along the lines of common dimensions and over time to be used for analysis and prediction purposes.

The creation of a business intelligence application layer to utilise the information within the warehouse. This will take the form of the following basic capabilities:

- Dashboarding
- Query and Reporting
- User Guided Knowledge Discovery
- Predictive Analytics / Data Modeling

The generation of business data-driven event triggers for delivery to decision making platforms to assist in business intelligence

The support infrastructure for Marketing functions (Batch and Real Time), and Campaign Management.

The creation and management of an end to end Meta Data Repository for enhanced data identification and process understanding to further assist in Business Intelligence.

The Enterprise Information platform is NOT responsible for: The applications provided to customers, employees or agents of the enterprise which manage the customer relationship and capture of customer related data. These are proper to the Supplier Partner and Customer Relationship Management Applications described earlier.

The management of in-flight event status updates relating to complex order processing.

The Enterprise Information application platform SHARES responsibility for:

Business Intelligence reporting. This function is supplied directly from tools that sit within the Enterprise Information Application and thorough a Business Intelligence layer from within the Customer Relationship Management application. This ensures that ALL relevant business communities have access and correct use of the information required for business intelligence. This also supports niche areas that require specific tools/techniques for prediction and data mining analysis. Marketing and Campaign Management. A combination of Enterprise Information application and Customer Relationship Management Applications will be used to support Campaign Management.

Supported Contracts

Manage Dashboard

Manage Data Cleanse

Manage Data Profiling

Manage Data Synchronization

Manage Event Enhancement

Manage Extract

Manage Party

Manage Place

Manage Predictive Analytics

Manage Query & Reporting

Manage User Defined Knowledge Discovery

9.7. Fraud Management

Will be defined in the next release.

10. Application Integration Infrastructure

Figure 20: Application Integration Infrastructure

10.1. Introduction

As described in section 12 - NGOSS and the TAM, the Telecom Applications Map is an integral part of NGOSS. Integrating applications into a cohesive, automated and flexible infrastructure to enable 'lean' operations is as important as the application's functionality itself. The full NGOSS recommendations for integration are available in the NGOSS Technology Neutral Architecture GB053. Thus this section of the Telecom Applications Map is designed as an overview for companies either building or deploying applications. Key to the success of a highly integrated 'lean operator' is that such an approach should enhance, not diminish the business flexibility that the enterprise can achieve. Previous approaches of tightly coupling applications with

specific functional interfaces (i.e. 'hard-wired' integration) are not only expensive to build and maintain such one-one interfaces, they are extremely inflexible because they reflect the needs of the enterprise and its business processes at the time of development. Today, the telecom industry is very dynamic and such 'hard-wired' approaches badly serve the business.

- It is critical to separate business process control from the individual OSS applications.
- The key is for the individual OSS applications to offer open interfaces that allow for business process control.

TM Forum's approach to integration is based on 3 key principles:

- the use of a common communications bus,
- the use of business process management (process workflow);
- the use of contract interfaces between applications and a common information model shared between the applications.

Clearly the applications described in this document need not adhere to these core principles but unless applications migrate in this direction, the level of process automation achieved will be low, the amount of business flexibility will be low and the level of customer service will be low.

Achieving lean and agile business processes places a very significant reliance on integration between applications that deliver the various work functions of an operator's main processes. Full flow-through integration of applications at an enterprise level is a very significant task and one that many industry sectors have been trying to perfect over many years. In the telecom industry, some degree of application integration has been achieved over the past decade, but this typically has consisted on system-system point integration to achieve a specific, high volume flow-through result. The reality of this approach is that it can work but it is very expensive and very inflexible, requiring programmatic changes every time a minor process change is needed. The enterprise integration framework described in this document seeks to provide an effective, generic and flexible approach to such integration where changes can be made by operations people rather than software engineers.

It is critical to the success of any 'lean operator' program that integration between processes, data and applications can be achieved progressively, accommodating both legacy applications as well as new systems sourced from commercial suppliers or built in-house. Some approaches to integration are really only applicable to 'clean-build situations and for most operators with legacy systems, it is most unlikely that they can deploy anything other than step-by-step progressive integration approach. This progressive approach assumes that an increasing number of steps in a lean operator's processes will be automated via applications, either by replacement of current manual process steps, replacement of existing applications with ones offering greater functionality or upgrades to existing systems. Thus the task of providing end-to-end, flexible process automation is essentially one of providing integration between "islands" of automation.

There are 3 primary building blocks to achieving a generic and flexible approach to integration such process and application "islands". These are:

A common communications infrastructure between each application. Several leading middleware products are now well established to provide a common communications vehicle. The most common of these is currently enterprise application integration (EAI) bus technology that supports numerous interface types to cater for a variety of legacy operating systems, databases, data formats, standards etc. EAI is concerned foremost with application-to-application exchange of data, not user activity or interaction. Other common communications vehicles such as web based approaches can also be used.

A business process management (BPM) environment. BPM is an emerging class of technologies that work hand-in–hand with EAI technology to provide a range of facilities to manage process and information flows between applications. The real value of BPM is the ability to define and execute business processes independent of applications and infrastructure. While EAI and integration capabilities offer an important resource to BPM environments, EAI software alone typically lacks the ability to address the user-facing side of business processes.

Contract-defined interfaces between applications. In NGOSS parlance, these are defined as contract interfaces. NGOSS Contracts define the interfaces to Services made available by the OSS application. The data and metadata in Contract specifications use information defined in the Shared Information and Data model (SID).

10.2. Common Communications - Enterprise Application Integration

Enterprise Application Integration (EAI) is a business computing term for the plans, methods, and tools aimed at modernizing, consolidating, and coordinating the applications in an enterprise. EAI technology allows this integration to be done using techniques that leverage the architecture. Using these concepts, applications send or receive events / messages to or from other components or send or receive notifications. Such architecture provides greater degrees of freedom. For example, components can be replaced by new ones more easily as they have the same interface. It is also easier to plug-in a new component that will use the services already available. EAI includes:

transport of data between applications

data format translations

implementation, at EAI level, of enhanced enterprise level objects

In the following sections, we start with a description of the analysis methodology and guidelines that are used in this section for the EA Integration of the focused applications. Use of this analysis methodology should reduce making inappropriate decisions based on expected capabilities associated with such architectures.

It must also be noted that Enterprise Integration is generally implemented in a number of successive phases. This is particularly true when few existing applications are already efficiently integrated together. It is recommended that the first phases usually

consist in the integration of new features and new applications and that in further phases it can be envisaged to enhance the integration of the existing applications.

10.3. Business Process Management & Workflow

Business Process Management (BPM) is the evolution of earlier concepts called workflow management (also know as Process Flow Management). As operators understand the need to introduce much greater flexibility and day-day change into their business processes, BPM and workflow management techniques, pioneered in manufacturing industry, are becoming more and more visible in the telecommunications industry.

Business flexibility is crucial for an operator as well as high levels of automation of its processes, not just of basic process flows but of complex and exception handling areas. One of the cardinal principles of NGOSS is to allow this by abstraction of business processes from application logic. The emergence of N-tier computing and component-oriented environments (such as COM and J2EE) allow for this principle in the same manner that the emergence of SQL and the two-tier client/server architecture enabled the abstraction of data management from application code. By separating business process management as an independent function, applications can be designed around existing processes, and thus to take advantage of shared business logic rather than reinventing and recoding it for each application.

There are considerable benefits to an operator in adopting this type of approach and would include:

Reduced costs

Staff savings

Cash flow improvement

Better customer perception

Faster and more flexible response to implement new processes or amend existing ones to accommodate new products / services

To understand how BPM fits with an operator and its infrastructure, it is helpful to examine the individual components of BPM. While commercial implementations vary in their specific definitions and software composition, most fit within the basic framework described below. Note that although some systems offer the ability to automate activities and define business rules, those that lack the fundamental components below cannot realistically be used as a BPM system.

A BPM system is defined by the components of:

Execution Engine

Process Designer,

Process Definitions

Activity Monitor

User interface which may be a combination of a Windows client application, HTML based Work Portal, or an exposed API or Web service

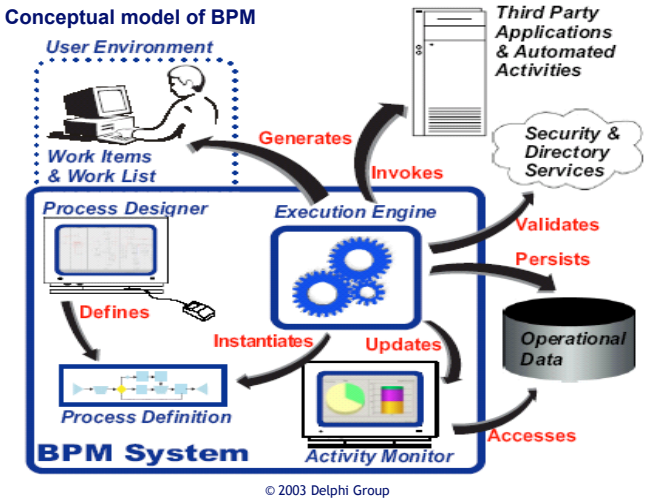

Figure 21: Conceptual model of Business Process Management

The majority of BPM systems on the market today are component-oriented and allow each of the individual pieces listed above to be deployed independently on individual servers. Individual business processes are defined by the process owner in a Process Definition, (increasingly expressed in a standard language such as UML or some variation of XML). Each Process Definition may be composed of both manual activities and automated activities. Once defined and validated within the Process Designer, processes are instantiated by an Execution Engine. The Activity Monitor provides access to status and performance metrics on the execution of processes.

End-to-end process 'orchestration'

It is unlikely that the implementation of an NGOSS based 'lean' migration program will be a 'big bang' type of approach implementing all new systems. Therefore, the Enterprise Integration Framework will need to integrate end-to-end processes across various 'islands of automation' ranging from existing legacy systems to new commercial-off-the-shelf technology. This approach is sometimes called 'orchestration' in process. An orchestration-based approach offers the ability to manage processes of greater complexity, (such as complex business service provisioning etc.) with far more efficiency than is otherwise possible with alternative approaches. The key to this is a modular approach to managing business rules, relationships, and activities.

Within a simple workflow automation paradigm, processes are defined "end-to-end" with all possible paths (or more commonly a single path) pre-determined. Thus 'Step 5' always follows 'Step 4' and precedes 'Step 6' even if different instances of an otherwise standard process may require a different sequence.

Orchestration allows for the sequencing of steps to be determined during the "run-time" instance of a process, with paths determined by evolving context resulting from each new step. Thus the potential number of paths and outcomes may otherwise be too complex to define in terms of pre-determined "If-Then-Else" rules, but may be easily resolved through human interaction and decision-making. This highlights the key architectural difference between automation and orchestration. Given the inherent complexity and constant changes within an operator's business environment, effectively managing processes requires the agility to shift with changes in context, rather than always being bound to the same scripted flow. This requires the unique ability to define processes as a set of atomic, goal-based activities with the enforcement of basic parameters (e.g., time limits, data variables), while separating the execution logic activities from the higher-level process definition. Process orchestration is not limited to invoking software, but rather represents a shift from task-based to goal-oriented process definition. Web services and other forms of software automation are utilized through process orchestration, yet not to the exclusion of manual, human-driven activities.

10.4. Contract defined interfaces

Contract defined interfaces are a key concept within the NGOSS architecture. This approach allows applications to locate each other and discover what services they offer through a repository of contracts. A contract is a well-formed interface by which the functionality of a component is made available to a client. Components advertise their contract instances by their class and the values of their service attributes, via a trading service. The remainder of the contract comprises the operations by which it provides the system services for which it was designed.

Contracts comprise a technology-neutral portion and a technology-specific portion. The technology neutral portion is independent of the protocols used between components, whereas this needs to be specified in the technology-specific portion that will be used at the systems level. Thus the interface specification is independent of the communications infrastructure.

It is possible that the technology-specific portion will not be completed until runtime. The reason for this is that the introduction of a new component can trigger the reconfiguration of the NGOSS adapters of existing components and consequently alter the communications between components. This enables a new component to enhance an existing business process dynamically.

NGOSS has defined a number of areas of contract interfaces and this work is continuing. For example, there has been much discussion about whether the technology-neutral portion of contracts should contain pre- and post-conditions and what the implications would be.

11. Appendix 1 TAM Short Description

TAM Level 0	Section	TAM Level 1	TAM Level 2	Functionality
Market / Sales Management				
	3.1	Campaign Management	Campaign Management	
				Campaign Analytics
				Campaign Design
				Campaign Execution (& Refinement)
				Inbound Marketing
				Program Management
				Performance Tracking
			Campaign Plan	TBD
			Campaign Execution	TBD
	3.2	Channel Sales Management	Common Functionality	
	3.2.1		Direct Sales Force	
				Create and promote leads.
				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Opportunities dispatching
				Sales quotes dispatching
				Campaign execution
				Forecast Analysis
				Opportunity & Quote Management
				Territory Management
	3.2.2		Telesales	
				Create and promote leads.

				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Holistic customer view
				"Order capture, negotiation and activation"
				Order tracking capabilities
				Action items and follow ups
				Multi media integration
				Scripting
				Cross sell/up sell recommendations
	3.2.3		Retail Outlet	
				Create and promote leads.
				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Customer information management
				Contact and retention management
				Order capture and negotiation
				Additional Responsibilities
	3.2.4		Dealers	
				Create and promote leads.
				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Customer acquisition
	3.2.5		Virtual Network Operators	
				Create and promote

				leads.
				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Customer information management
				Contact and retention management
				Order capture and negotiation
				Billing Management Activities
				Receivables and Collection activities
				Problem resolution
				Data fencing
				VNO Personalization
	3.2.6		Affiliates	
				Create and promote leads.
				Create and promote contacts.
				Literature dispatching.
				Lead Management
				Sales quotation
				Mass Service/product activation
				Mass transaction feed of new orders
				Activation of service/product sold by affiliate
				Registration of pre activated service/product
	3.3	Corporate Sales Management		
Product Management				
	4.1	Product Strategy / Proposition Management		
				Strategy capturing and management
				Propositions

				organization
				Link strategy to propositions
				Link propositions to products
				Strategy delivery project management
				Strategy performance reporting
	4.2	Product / Service Catalog Management		
				Product offering structure data model
				Product instantiation
				Product components maintenance
				Components relations management
				Components reuse
				Service logical representation management
				Components to services and resources relationship management
				Product to external functions view management
				End-to-end Product Data Management
	4.3	Product Lifecycle Management		
				Solicit product requirements
				Model products
				Provide detailed product specifications
				Introduce new products
				Manage existing products
				Obsolesce/retire products
				Implement marketing & offer strategies

	4.4	Product Performance Management		
				Product campaign tracking
				Product revenue reporting
				Product cost reporting
				Product capacity analysis
				Product Cost Management
Customer Management				
	5.1	Customer Self Management Applications		
	5.1.1		Customer Self empowered Assurance	
				Product Catalogue and Offerings browsing
				Guided selling driven view for offer eligibility
				Shopping cart driven order management
				Assigned products maintenance
				Change rate plans selection
				Alerts and notifications setting
				Knowledge management access
				Access to Call center agents
				Reports on fulfillment and SLA aspects
				Corporate customers support
	5.1.2		Customer Self empowered Fulfillment	
				Account management
				Self registration to online services
				Service requests

				management
				Service request submission
				Service request amendment
				Service request closure
				Users management
				Alerts and notifications setting
				Address book management
				Knowledge management access
				Access to call center agents
				Service requests and SLA reporting
				Corporate customers support
	5.1.3		Customer Self empowered Billing	
				Bill view
				Unbilled charges view
				Usage View
				Payment capture
				Dispute capture and resolution
				Usage and charges comparison
				Penalties view
				Address book driven usage view
				Split statement for demarcation between calls
				Calls assignment for classification of usage
				Reports on usage and charges
				Corporate customers support
	5.2	Order Management		
				Order capture and negotiation
				Search Customer base and Registration
				Catalogue browsing

				Service attribute configuration
				Order service management
				Determine Pre-Order Feasibility
				Order / quote persistence
				Authorize Credit
				Create the customer's billing profile
				Payment capture
				Purchase orders validation and execution
				Dispatch Engineer (optional)
				Shipping information capture
				Futuristic order submission
				Retro-active order submission
				Track Order & Manage Jeopardy
				Task Assignment
				Order decoupling
				Complete Order
				Notification to billing system
				Order cancellation
				Order grouping
	5.3	Customer Information Management		
				Customer name
				Contact persons for this customer
				Account managers for this customer
				"Customer Addresses"
				"Customer contact phone numbers"
				Customer organizational hierarchy
				The customer's products/services
				The customer's billing accounts
				The customer's orders history

				The customer's trouble tickets history
				The customer's interactions history
	5.4	"Customer Contact, Retention & Loyalty"		
				Verify Customer Relationship
				Interaction Management
				Build Customer Insight
				Analyze and Manage Customer Risk
				Personalize Customer Profile for Retention & Loyalty
				Validate Customer Satisfaction
	5.5	Quotation Engine		
				Order components
				Customer information
				CSP's policy and Product Catalog
				General market rating rules (such as tax)
	5.6	Customer QOS/ SLA Management		
				Measure perceived QoS
				Manage QoS/SLA Violation
				Manage Reporting
	5.7	Customer Service / Account Problem Resolution		
				Verify Customer Relationship
				Problem Reception
				Bill capture and notification
				Customer's SLA's verification
				Evaluate & Qualify Problem
				Plan & Assign

				Resolution
				Track & Manage Resolution
				Close & Report
				Billing systems update
				Advising other OSS systems
	5.8	Customer Billing Management		
	5.8.1		Customer Front Office Billing Management	
				Presentation of bills
				Flexible Account Relationships and Comprehensive Profiles
				Real-time Visibility
				Dispute Escalation and Resolution
				Billing Integration
	5.8.2		Customer Back Office Billing Management	
				Hierarchy based Aggregation & Balance Management
				Transaction Billing
				Billing Runs
				Invoicing
				Information availability for revenue assurance
				Bill reversals and rebilling
				Pseudo bills generation
				Pre-paid and post-paid billing
				Credit and debit adjustments
				Discounts
				Loyalty discounts and reward schemes
	5.9	Bill Formatting		
				Designer Environment

				Bill production engine
				Output Device Interface
	5.10	Invoicing		
				Supporting converged bill for NGN services
				Split bill support
				Recurring and onetime charges support
				Supporting flexible cycle definition
				Supporting multi-currency
				Billing Discounts
	5.11	Collection Management Applications		
				Balance Management
				Replenishment management
				Dispute
				Policy definition for overdue accounts
				Customer's collection status and history
				Collection settlement
				Process-driven collection treatment management
				Outbound multi-channel contact center collection activities
				Decision Engine
				Step Management using the Business Process automation Engine
				Real Time Collection Treatment
				Credit and debit payments
	5.12	Receivables Management		
				Invoice Receipt
				Payment Management

				A/c Management
				Financial Reporting and Audit
				Journaling
				GL Mapping
				GL Financial Reporting
				Support for multiple payment methods
				Support for multiple pay means
				Balance Management
				Replenishment management
				Dispute
				Refunds
				Transfers between accounts
				Advance payments and managing receivables in installments
Service Management				
	6.1	Service Design/Assign		
				Resource independent services design
				Cross resource domain service design
				Detailed services design within resource domain
	6.2	Service Inventory Management		
				Service Inventory Retrieval
			:	Service Inventory Update Notifications
				Service Inventory Update
				Service Inventory Reconciliation
				Service Inventory Information Model
	6.3	Service Specification Management		
				TBD

	6.4	Service Config Management		
				TBD
	6.5	Service Quality Monitoring & Impact Analysis		
				Monitor Service Quality
				Analyze Service Quality
				Improve Service
				Identify & Report Service Constraints
	6.6	SLA Management		
				KPIs and KQIs collection
				SLA metrics calculation
				Operational Level to SLA metric comparison
				SLA alarms handling
				Collate historical SLA information
				Analyze historical SLA information
				SLA alarms reporting
				Charge / settlement adjustment notification
				Update Data warehouse with SLA statistics
	6.7	Service Problem Management		
				Problem Reception
				Trouble Ticketing
				Problem Consolidation
				Closure
				Reporting
				Allocating priority
				Advising the Customer Resource Management systems (CRM)
				Advising the Network Operations Center
				Tasks allocation

				Tracking progress
				Confirming when impact has been removed
				Updating Configuration Management systems
				Updating Inventory Management systems
				Tracking progress
				Confirming when fix has been completed
				Updating Billing systems
				Advising any other OSS/ systems as needed
	6.8	Service Rating / Discounting Management		
				Events rating & pricing
				Discounts
				Rating plans flexibility
				Throughput & accuracy
				Pro rating of charges
				SLA based adjustments
	6.9	Service Performance Management		
				Resource performance data collection
				Service performance data collection
				Performance to service mapping
				KPI & KQI calculation
				Performance data repository & archiving
				Input to service planning & forecasting
				Service problem identification
				Historical trending

				Service triage / testing
				Service performance dashboard
Resource Management				
	7.1	"Resource Domain Management (IT Computing, IT Applications, Network)"		
				Hiding vendor specific idiosyncrasies
				Presenting a standards based interfaces
				Providing in-domain activation
				"Providing in-domain alarm collection, filtering"
				Providing in-domain QoS activation
				Providing in-domain inventory discovery
				Logical network inventory caching
	7.2	Resource Planning/Optimization		
				"Production of resource deployment, configuration, and maintenance plans"
				Planning of resource installation and changes
				"Graphical presentation of physical plant, equipment and cable / fiber routing"
				Resource usage optimization
				Controls manual installation tasks

				Financial systems interaction
	7.3	Resource Design / Assign Applications		
				"Physical, logical, and software resources design"
				Graphical resource presentation
				End-to-end resource design
				Architecture modifications to include resources or changes
				New technology and new resource designs
				What-if configurations and modeling
				Real world modeling
				Controls manual installation tasks
				Interface with Configuration or Inventory applications
				Multi-layer modeling and design
	7.4	Resource Logistics Applications		
				Resource or kit distribution
				People + part + event coordination
				Stock balancing or distribution
				Warehouse stock level projections
				Engineering Work Order Management
				Engineering Project Management
				Network Asset Deployment Workflow
				Resource Supply Chain Management
				Resource planning

				(capacity)
				Workforce management
				Resource problem management (fault management)
	7.5	Resource Provisioning / Configuration		
				Physical and logical resource configuration
				Management of the resource activation or deactivation
				Interface with other provisioning or activation application
				Management of resource properties
				Maintain status of resources in Resource Inventory applications
				Maintain resource state and topology
				Interface to Workforce or Workflow applications
				Control of the manual provisioning tasks
	7.6	Resource Activation Applications		
				Update the resource instance to perform the activation or deactivation.
				Update the resource to activate Billing data collection
				Notify Resource Provision / Control of the activation status
				Update Resource Inventory with the resource status

				information
				Queued / scheduled activation requests
				Configuration validation and rollback
				"Manage dependencies within, and across network elements through rules"
				Multi-vendor and multi-technology activation
				Multiple NE activation coordination
				Confirm / identify available resources
	7.7	Workforce Management Applications		
				Scheduling
				Forecasting
				Dynamic management
				Operational Support
	7.8	Resource Inventory Management		
				Resource Inventory Information Model
				Track status all resources
				Database of all spares
				Barcode/RFID tracking of all resources including spares
				Resource Site Information
				Resource Inventory Retrieval
				Resource Inventory Update Notifications
				Resource Inventory Update
				Resource Inventory Reconciliation
	7.9	Resource Specification		

		Management		
				TBD
	7.10	Correlation & Root Cause Analysis		
				Alarm Correlation:
				Root Cause Analysis
	7.11	Resource Status Monitoring Applications		
				Distributed meta model of the configurable resources
				Distributed meta model of expected resource load
				Process driven Workforce coordination
				Mediation layer to support interaction of diverse applications
				Directory-based profiles
	7.11.1		Resource Status Monitoring Level 2 Capabilities	
				Control of the manual provisioning tasks
				Network topology modeling
				Protection/rerouting policy
				Resource load monitoring
				CPU load
				Memory utilization
				Storage (disc) utilization
				Bandwidth utilization
				Application keep-alive monitoring
				Threshold policy modeling
				Automatic workforce control
				Resource status

				alarm handling
				Resource status alarm logging
	7.12	Resource Performance Monitoring/Management		
				Resource Performance data collection
				Resource Topology Status data collection
				"Business rules / formulae / KPIs, KQIs"
				Cross NE and Layer data mediation
				Long-term performance archive
				Short-term performance repository
				Input to capacity planning and forecasting applications
				Input to resource problem management applications
				Historical trending
				"Problem identification: Capacity, Configuration problem identification"
				"Problem identification: Capacity, Configuration problem identification"
				Problem triage / testing
				Utilization trending
				Capacity/load management
				Performance "dashboard"
	7.13	Resource Testing		

		Management		
				Test Work flow and Rules Engine
				Auto and Manual Test Initiation
				Test Life Cycle Management
				Test Head Management
				Manage Test Head Resources Capacity
				Manage Test Head Availability
				Element and Test Head Command and Control
				Test Results Management
				Interpret Test Results
	7.14	Resource Problem Management Applications		
				Event Management
				Trouble ticket creation
				Auto and manual ticket initiation
				Outage classification and prioritization
				Problem tracking / history
				Ticket Workflow and notification
				Problem workflow
				Personnel utilization and interface to Work Force Management
				Knowledge Management
				"Resolution identification, tracking and confirmation"
				MTTR and Uptime measurements
				Problem trending and identification of design flaws or hot spots
				"Feedback to customer: service

				status, trouble status, network bulletins"
				Business Rules Management
	7.15	Resource Data Mediation Application		
				Parsing of data from one format to another
				Correlation
				Pattern recognition
				Tools to set up and maintain parsing rules
	7.16	Billing Data Mediation Application		
				"CDR Formatting, mediation & correlation"
				IP & IPCDR formatting / mediation/ correlation
				Wholesale Partner Gateways
				CDR/IPCDR pre-processing / rating
	7.17	Arbitrage Management Applications		
				Bandwidth brokering
				Bit parity management
	7.18	Real-time Billing Mediation Applications		
				Acquisition and validation of events
				Common event record formatting
				Customer identification and event routing
				Communication with the session control device
				Communication with

				the rating engine
	7.19	Voucher Management Applications		
				Voucher Ordering
				Definition and creation of packages and tentative vouchers
				PIN generation and encryption
				Pairing of serial numbers with PINs
				Sending of the order file to the manufacturer
				Voucher Distribution to dealers
Supplier/Partner Management Applications				
	8.1	Partner Management		
				Partner definition and hierarchy management
				Pre-defined revenue sharing agreements and variation rules
				Agreement definition
				Direct and indirect settlement
				Real-time settlement
				Drill down reconciliation
				Partner event processing and revenue share accounting
				Partner payment handling
	8.2	Supply Chain Management Applications		TBD
	8.3	Wholesale / Interconnect Billing Applications		
				"Reference Data

				Creation and Management"
				Products and services definition
				Partners' accounting
				Partners' business event processing
				Error Management
				Partner Invoice management
				Settlement management
				Handling of payments
				Disputes management
Enterprise Management				
	9.1	Revenue Assurance Management Applications		
				Interconnect billing and settlement
				Optimized Call Routing
				Network Integrity processes
	9.2	HR Management		TBD
	9.3	Financial Management		TBD
	9.4	Asset Management		TBD
	9.5	Security Management		TBD
	9.6	Knowledge Management		TBD
	9.6.1		Entreprise Information Applications	
				Data acquisition and management
				Data modeling
				Data cleansing
				Data integration and synchronization
				Enterprise Wide Data Warehouse creation.
				Business intelligence

				Triggering events generation
				Marketing support
				Meta Data Repository
				Event status updates
				Business Intelligence reporting
	9.7	Fraud Management		TBD
Application Integration Infrastructure				
	10.2	Common Communications - Enterprise Application Integration		
	10.3	Business Process Management & Workflow		

12. Appendix 2 Mapping of TAM V2.0 to TAM V1.0

TAM V2.0 Name	TAM V1.0 Name	Changes
Campaign Management	Campaign Management	Change in description
Channel Sales Management	Channel Sales Management	Change in description
Corporate Sales Management		New in V2
Product Strategy / Proposition Management		New in V2
Product / Service Catalog Management	Product / Service Catalog	Change in description
Product Lifecycle Management	Product Lifecycle Management	Change in description
Product Performance Management		New in V2
Customer Information Management		New in V2
Customer Self Management	Customer Self Management	Change in description
"Customer Contact Management, Retention & Loyalty"	"Customer Contact Management, Retention & Loyalty"	Change in description
Order Management	Order Management	Change in description
Quotation Engine		New in V2
Customer Quality of Service & Service Level Agreement Management	Customer Quality of Service & Service Level Agreement Management	Change in description
Customer Service / Account Problem Resolution	Customer Service / Account Problem Resolution	Change in description
Customer Billing Management	Customer Billing Management	Change in description
Invoicing	Invoicing and Receivables Management	Application split into two
Collection Management		New in V2
Bill Formatting		New in V2
Receivables Management	Invoicing and Receivables Management	Application split into two
Service Specification Management		New in V2
Service Inventory Management		New in V2
Service Configuration Management	Service Configuration Management	Change in description
Service Design / Assign	Service Design / Assign	Change in description
Service Level Agreement		Change in description

Management		
Service Problem Management	Service Problem Management	Change in description
Service Quality Monitoring & Impact Analysis	Service Quality Monitoring & Impact Analysis	None
Service Performance Management	Service Performance Management	Change in description
Service Rating / Discounting Management	Service Rating / Discounting Management	No change
Workforce Management	Workforce Management	No change
Resource Specification Management		New in V2
Resource Inventory Management	Resource Inventory Management	No change
Resource Design / Assign	Resource Design / Assign	No change
Resource Provisioning / Configuration	Resource Provisioning / Configuration	No change
Resource Logistics	Resource Logistics	No change
Resource Activation	Resource Activation	No change
Resource Planning / Optimization	Resource Planning / Optimization	Change in description
Resource Testing Management	Resource Testing Management	No change
Resource Performance Monitoring / Management	Resource Performance Monitoring / Management	No change
Resource Problem Management	Resource Problem Management	Change in description
Correlation & Root Cause Analysis	Correlation & Root Cause Analysis	No change
Resource Status Monitoring	Resource Status Monitoring	No change
Resource Data Mediation	Resource Data Mediation	No change
Arbitrage Management Applications	Arbitrage Management Applications	No change
Voucher Management		New in V2
Billing Data Mediation		New in V2
Real-time Billing Management	Real-time Billing Management	No change
Resource Domain Management		New in V2
Partner Management	Partner Management	Change in description
Supply Chain Management	Supply Chain Management	Change in description
Wholesale / Interconnect Billing Applications		Moved as a new Level 1 from Billing Management Level 2
Revenue Assurance Management	Revenue Assurance Management	Moved From Service To Enterprise
HR Management	HR Management	No change
Financial Management	Financial Management	
Asset Management Applications	Asset Management Applications	No change

Security Management	Security Management	No change
Knowledge Management	Knowledge Management	No change
Fraud Management	Fraud Management	Moved from Customer to Enterprise layer
Enterprise Information Applications	Enterprise Information Applications	No change
	Wholesale Interconnect Billing	Moved to Level 2 Under Customer billing Management

13. Appendix 3 - NGOSS and the TAM

This Telecom Applications Map is designed to provide the industry with a frame of reference in order to evolve the set of applications that enable and automate operational processes within a telecom operator. It is a fundamental part of the overall TM Forum Lean Operator program and TM Forum's core technical roadmap: New Generation Operations Systems and Software (NGOSS) that the telecom industry worldwide is using as a guide to help the evolution of its processes and systems.

The core aim behind NGOSS is to provide a technology and process roadmap for the industry worldwide that allows the simplified implementation of business process automation coupled with significantly improved business flexibility and agility. These operational aims directly link to the key objectives of TM Forum's Lean Operator program:

- to transform operating costs
- to transform business agility
- to transform levels of customer service
- to transform innovation levels

13.1. What is NGOSS?

NGOSS is a comprehensive, integrated set of tools for defining, developing, procuring and deploying operational and business support systems and software. It is available as a packaged set of industry-agreed guidelines; maps; models; methodologies and specifications that cover key business and technical areas. These NGOSS tools, and the clearly defined methodology for using them, assist the user to define, design and build NGOSS compliant solutions that can easily integrate into any NGOSS compliant environment. As such, NGOSS delivers measurable improvements in development and software integration environments through use of standards processes, reuse of components, and repeatable cycles.

NGOSS is a sound technical solution developed by industry leaders with hundreds of combined years of operations and software experience from some of the world's major service provider and supplier companies. Recognizing the need to create a common integration environment for software systems, TM Forum member companies have contributed significant resources from their senior architecture and engineering resources to make NGOSS a success. This is being coupled with a major industry communications program driven by the TM Forum.

Automating telecom business processes requires a multi-step approach, from understanding existing processes through to designing how systems will integrate and operate. Typical activities would include:

Defining and engineering/re-engineering business processes

Defining systems to implement processes

Defining data using a common information model

Defining integration architecture

Defining integration interfaces

The elements of NGOSS align directly with the steps in this process automation approach. As a result, NGOSS gives service providers the tools they need to undertake automation projects with confidence. NGOSS-based solutions use industry-accepted IT concepts and technologies to deliver a more productive development environment and efficient management infrastructure. NGOSS is prescriptive for only those few 'cardinal points' where interoperability is of over-riding importance. NGOSS also provides for customization across a wide range of functionality, thus allowing applications to be tailored to provide a competitive advantage while also working with legacy systems.

The elements of NGOSS fit together to provide an end-to-end system for OSS development, integration and operations. The elements of NGOSS may be used as an end-to-end system to undertake large-scale development and integration projects, or may be used separately to solve specific problems.

NGOSS is based on 4 key frameworks:

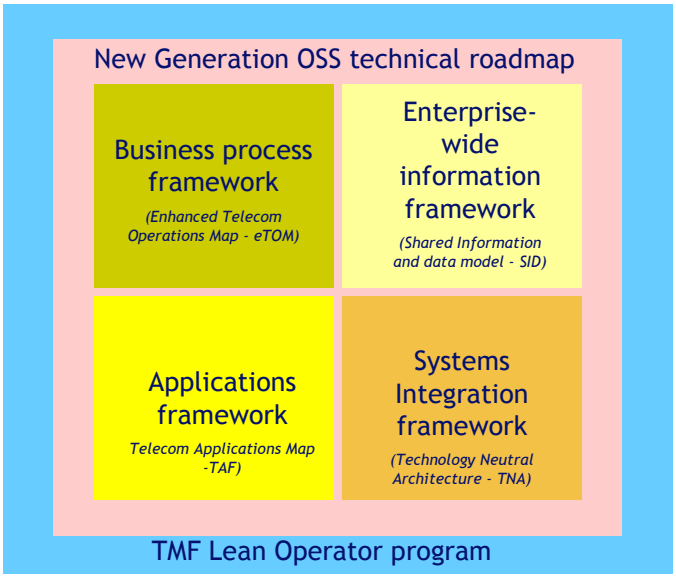

Figure 22: Major NGOSS Frameworks

Business Process Framework

The business process framework (TMF GB 921, the enhanced Telecom Operations Map®) is fundamental to ensuring that all of the key business activities of an operator are understood and captured in a single model. It defines all of the major flows of information within and external to the operator and provides a reference framework to migrate from current processes where such migration makes business sense. It provides a widely supported common language of business processes that are used in Telecom Operations. In addition, process flows are being developed for an ever-expanding list of key activities. It can be used to document existing processes of a Service or Network Provider, act as a framework for defining scope of a software-based solution, or simply enable clearer lines of communication between a service provider and their system integrator.

An operator needs to ensure that its business processes are as normalized as possible before it can truly unlock the value of commercial-off-the-shelf technology. Many will also benefit considerably from adopting industry best practice processes. The eTOM was developed from the best practices of some of the world's leading operators and provides a comprehensive business process framework for the information and communications services industry and serves as the blueprint for process direction and the starting point for development and integration of Operations Systems. It also includes work on converging telecom operational processes and IT operational processes.

As with other NGOSS frameworks, the business process framework is not necessarily 'better' than an operator's own internal process definitions. While this may be a side

benefit, the major value comes from bringing processes broadly into line with other operators, using the same naming conventions, broadly the same process steps and having a ready built body of work (several hundred man-years of effort) that define detailed process flows between sub-processes and systems. This allows a methodology for gap analysis between operators. It also facilitates successful discussions and implementations with OSS vendors by providing a detailed reference document from which to migrate current processes, many of which may be duplicated but implemented in different ways. The eTOM business process framework provides an external, neutral point of resolution of internal process differences.

Enterprise-wide Information Framework

This framework (TMF GB922 – the Shared Information and Data Model) provides a common approach to defining and using information within an operator and is essential to achieve the highest levels of process automation and 'right-first-time' accuracy in assist in meeting ever rising customer service levels. The shared information and data model provides a "common language" for software providers and integrators to use in describing management information, which in turn allows easier and more effective integration across OSS software applications provided by multiple vendors. For example, if all OSS/BSS applications in a given operating environment defined "customer" the same way – last name, first name, title, address, phone number (country code/number), account ID – then no translation of information needs to occur when sharing "customer" details to serve multiple purposes.

The SID provides the concepts and principles needed to defined a shared information model, the elements or entities of the model, the business oriented UML class models, as well as design oriented UML class models and sequence diagrams to provide a system view of the information and data. In essence the SID is a reference library for defining information in an OSS.

Systems Integration Framework

This framework (TMF GB053 – the Technology Neutral Architecture and Contract Interface definitions) defines how the applications, data and process flows within an OSS environment will communicate and interact. This framework covers issues such as common communications, inter-process workflow, core software engineering principles such as the separation of process and data etc. In order to successfully integrate applications provided by multiple software vendors, the "plumbing" of the solution must be common. This framework defines architectural principles to guide OSS developers to create components that operate successfully in a distributed environment as prescribed by NGOSS. The Contract Interfaces define the "API" for interfacing those elements to each other across the architecture. This architecture is intentionally called "Technology Neutral" as it does not define how to implement the architecture, rather the principles that must be applied for any particular technology specific architecture to be NGOSS compliant. TM Forum further defines technology specific interfaces for actual implementation in current software technologies such as J2EE.

Telecom Applications Map

This document (TMF GB 923 – The Telecom Applications Map) defines a clear target application set from which operators can either build a migration plan or create a greenfield structure. It also allows suppliers to clearly position their products and provides a common language and reference model for the industry world-wide.

13.2. What are the Business Benefits of Using NGOSS?

NGOSS offers service providers tangible business benefits that positively impact the bottom line:

Having a well-defined long-term direction for business processes and OSS implementation reduces investment risk. When new systems and services are purchased, if they fit in with a well-defined strategy and detailed set of requirements, their longevity is more assured than in an environment with looser definition.

Moving to an environment where process definitions, information models, interfaces and architecture are all standard allows for a true competitive bidding environment.

NGOSS delivers measurable improvements in development and software integration environments.

With NGOSS, large chunks of process language, requirements, data models, interfaces and tests are already defined, significantly reducing development costs

Integration of software with standard interfaces is significantly faster, reducing cost of bringing a new software system into an existing environment. In addition, integrating using NGOSS interfaces becomes a repeatable process, saving time and money on each project and improving success rates.

Definition of Use Cases and requirements becomes easier across service providers/supplier and supplier/supplier partnership relationships when the common language provided the various NGOSS frameworks are used.

Automation enables lower operational expenditure. With NGOSS, tackling the task of introducing additional automation to an operational environment comes with a blueprint to follow and guidelines to step through the changes. The task may still be large, but much of the work has been done within the NGOSS elements.

When automated systems are in place, making changes in a well designed, well-understood environment is straightforward. Reacting to a need to change a service offering, a billing option or a quality of service requirement becomes an easy to follow process rather than significant changes that require lengthy testing.

13.3. Core NGOSS principles

The TM Forum recommends that new generation OSS systems should be based on the 10 key business and technical principles of NGOSS described in the following sub paragraphs:

Enable an operator's business transformation.

The core aim behind NGOSS is to allow simplified implementation of business process automation coupled with significantly improved business flexibility and agility. These operational aims directly link to the key objectives of TM Forum's Lean Operator Program:

To transform operating costs

To transform business agility

To transform levels of customer service

To transform innovation levels

Reduce IT costs and timescales by utilizing widely available, commercial-off-the-shelf (COTS) software components.

NGOSS based applications should allow solutions to be rapidly implemented through the integration of off-the-shelf software components.

Allow a clear migration path by integrating with and evolving from legacy systems.

NGOSS has been specified to maximize the opportunities for re-use of business process components and integration with legacy systems. NGOSS takes into account existing legacy systems and considers migration of processes and software in its approach. Core to this is the specification of an integration framework and contract interfaces for each component.

Reduce software development costs and risks by building on industry best practices and existing standards work.

NGOSS draws widely from the work of other standards bodies and industry best practices. NGOSS brings together the best from each of these and applies them specifically into the telecom IT environment.

Provide comprehensive, enterprise-wide operational solutions for fixed, mobile, cable and converged industry segments

NGOSS is aimed at the telecommunications market in general and is not restricted to any one sector in particular. NGOSS provides tools to guide the user through a full-lifecycle of business process automation improvements from the analysis and requirements phases at the start of a project through to development and testing of systems and software. The NGOSS tools may be used as an integrated system or individually to focus on a specific area.

Allow corporate data to be widely shared across the enterprise and where appropriate with trading partners

NGOSS solutions adopt the principle of logically centralized data, providing more integrated views of customer and operational data via a common data model. This has significant bearing on operations, allows much improved levels of customer service (e.g. customer service agents can see all aspects of the services provided to a customer) and facilitates much higher levels of process automation.

Allow operator's organization to evolve without systems lock-in by using loosely coupled distributed systems

NGOSS based applications represent a move away from stand alone OSS stovepipes, toward a common distributed infrastructure for management process interaction.

Allow business processes to be easily changed without software change by separating control of business process flow from application operation.

NGOSS solutions separate control of business processes from the operation of business applications to provide flexibility to rapidly produce new business solutions and allow more re-use of business components across multiple business scenarios. This may be accomplished by using business process management (BPM/ workflow) techniques or policy based management.

Allow simplified systems integration ('Plug & Play') through clearly defined contract Interfaces between applications.

NGOSS has been specified to maximize the opportunities for re-use of business process components. Core to this is the specification of contract interfaces for each application component.

Allow simplified systems integration by utilizing a common communications bus between applications.

NGOSS specifies the implementation of a common bus based architecture for communications between application components.

14. Administrative Appendix

This Appendix provides additional background material about the TeleManagement Forum and this document.

14.1. About this document

This is a TM Forum Guidebook. The guidebook format is used when:

The document lays out a 'core' part of TM Forum's approach to automating business processes.

14.2. Document Life Cycle

The TMF Applications Map is being issued as Team Draft Version. It can be considered valid until released for Member Evaluation. The purpose of an Evaluation Version is to encourage input based on experience of members and the public as they begin to use the document. Following the Evaluation Period, documents that are seen to deliver value are candidates for formal approval by the TM Forum. All documents approved by the TM Forum undergo a formal review and approval process.

This document will continue under formal change control. Supporting work will be issued as companions to this document. A document of this type is a "living document," capturing and communicating current knowledge and practices. Further inputs will be made because of detailed work ongoing in the TM Forum and the industry.

14.3. Document History

Version Number	Date Modified	Modified by:	Description of changes
0.1	31 October 2004	Keith Willetts	Initial Version
0.2	10 November 2004	TMF Staff	Formatting of Document
0.3	12 November 2004	Keith Willetts	Final revisions before first circulation
0.4	22nd November	Keith Willetts	Changes following review

			by TDC
0.5.3	14th February 2005	Piyush Sarwal	Incorporated contributions
0.5.4	7th April 2005	Libbey Scheible	Incorporated contributions
0.5.5	17 April 2005	Piyush Sarwal	Incorporated Comments from the team
0.5.6	18 April 2005	Libbey Scheible	Added team members to list of contributors.
0.5.7	Not recorded		
0.5.8	Not recorded		
0.5.9	05-May-05	Tina O'Sullivan	Minor corrections and additions prior to Member Evaluation.
1.6.11 & 1.7.12	May & June 2006	Libbey Scheible	versions were not used
1.8.13	8 August 2006	Shayan Sanyal	incorporated contributions and revised sections on Market / Sales and Customer Management
1.9.14	9 August 2006	Libbey Scheible	incorporated contributions on Product Mgmt, Domain Mgmt, Service Mgmt, & Resource Mgmt.
1.10.15 – 1.17.12	Aug. & Sept. 2006	Piyush Sarwal & Libbey Scheible	revised TAM diagram & incorporated additional changes such as moving the NGOSS overview to an appendix. Detailed change control log provided with Release 2.0 Change Request
1.18.13	12 October 2006	Libbey Scheible	revised the Assumptions list in the Introduction section to add the TNA definition of an application and to make requested word changes to TAM version.
2.0	21 November 2006	Tina O'Sullivan	Major tidy up of document prior to submission into Member Evaluation.
2.1	10 April 2007	Piyush Sarwal	Updated document to include short description and other minor changes
2.2	15 April 2007	Piyush Sarwal	Incorporated AMDOCS contribution, updated Servie PM functionality
2.3	25-April 2007	Piyush Sarwal	Updated the document based on Feedback and Moved the Whole Sale billing section
2.4	9th August 2007	Tina O'Sullivan	Processed BA_2007-0007 and template changes.

14.4. Acknowledgments

This document draws liberally from the Enhanced Telecom Operations Map® – TMF GB921. Thanks are given to the many authors and contributors of this document.

In addition, TM Forum acknowledges the contributions to this document of:

Keith Willetts, TMF Chairman

Logan-Orviss International

TDC Solutions

Azure Solutions

Application Map Team

Chuck Baldi, Nextel Communications

Viviane Cohen, Amdocs

Martin Creaner, TM Forum

Roger Cutts, Vodafone

Wayne Floyd, Sprint

Stephen Fratini, Telcordia

Chris Glode, Tribold

Troy Henson, EDS

Phil Holmes, BT

Jenny Huang, AT&T

Martin Huddleston, QinetiQ

Dave Milham, BT

Erica Moradi, Microcuse

Mohamed Okasha, Oracle

Andrew Ponticelli, Nextel

Rakesh Radhakrishnan, Sun Microsystems

Dave Raymer, Motorola

John Reilly, Metasolv

Shayan Sanyal, Amdocs

Piyush Sarwal, IBM

Kevin Scaggs, AT&T

Libbey Scheible, TM Forum

Paul Short, TeliaSonera

Carolyn Smithson, O2

Ole Thomsen, TDC

Pravin Vijay, SunTec

14.5. About TeleManagement Forum

TeleManagement Forum is an international consortium of communications service providers and their suppliers. Its mission is to help service providers and network operators automate their business processes in a cost- and time-effective way. Specifically, the work of the TM Forum includes:

Establishing operational guidance on the shape of business processes.

Agreeing on information that needs to flow from one process activity to another.

Identifying a realistic systems environment to support the interconnection of operational support systems.

Enabling the development of a market and real products for integrating and automating telecom operations processes.

The members of TM Forum include service providers, network operators and suppliers of equipment and software to the communications industry. With that combination of buyers and suppliers of operational support systems, TM Forum is able to achieve results in a pragmatic way that leads to product offerings (from member companies) as well as paper specifications.

14.6. Time Stamp

This version of the Application Map document, GB 929 Release2.0, can be considered valid until further notice from TM Forum.

14.7. How can we obtain a copy?

An electronic copy of the IIS can be downloaded at the TM Forum Web Site (www.tmforum.org), Publications or through a link to Publications from a specific team's public project area.

Depending upon the document, it could be accessible from New Items, Evaluation Versions, or a team's Members Only project area.

If you would like a paper version of this document, please order via the TM Forum Web Site or contact the TM Forum office. If you are not a member, please contact the TM Forum office on +1 973-425-1900.

14.8. How can we comment on the documents?

Comments must be in written form and addressed to the team editor for review with the project team. Please send your comments to the editor using the editor's e-mail shown in the section below.

Application Map Team Leader
Piyush Sarwal, IBM
Phone : +1-913-762-8461
Fax :
email : Piyush.Sarwal@mail.sprint.com

TMF Senior Technical Manager
Libbey Scheible, TM Forum
Phone : +1-512 264-1551
Fax :
email : lscheible@tmforum.org