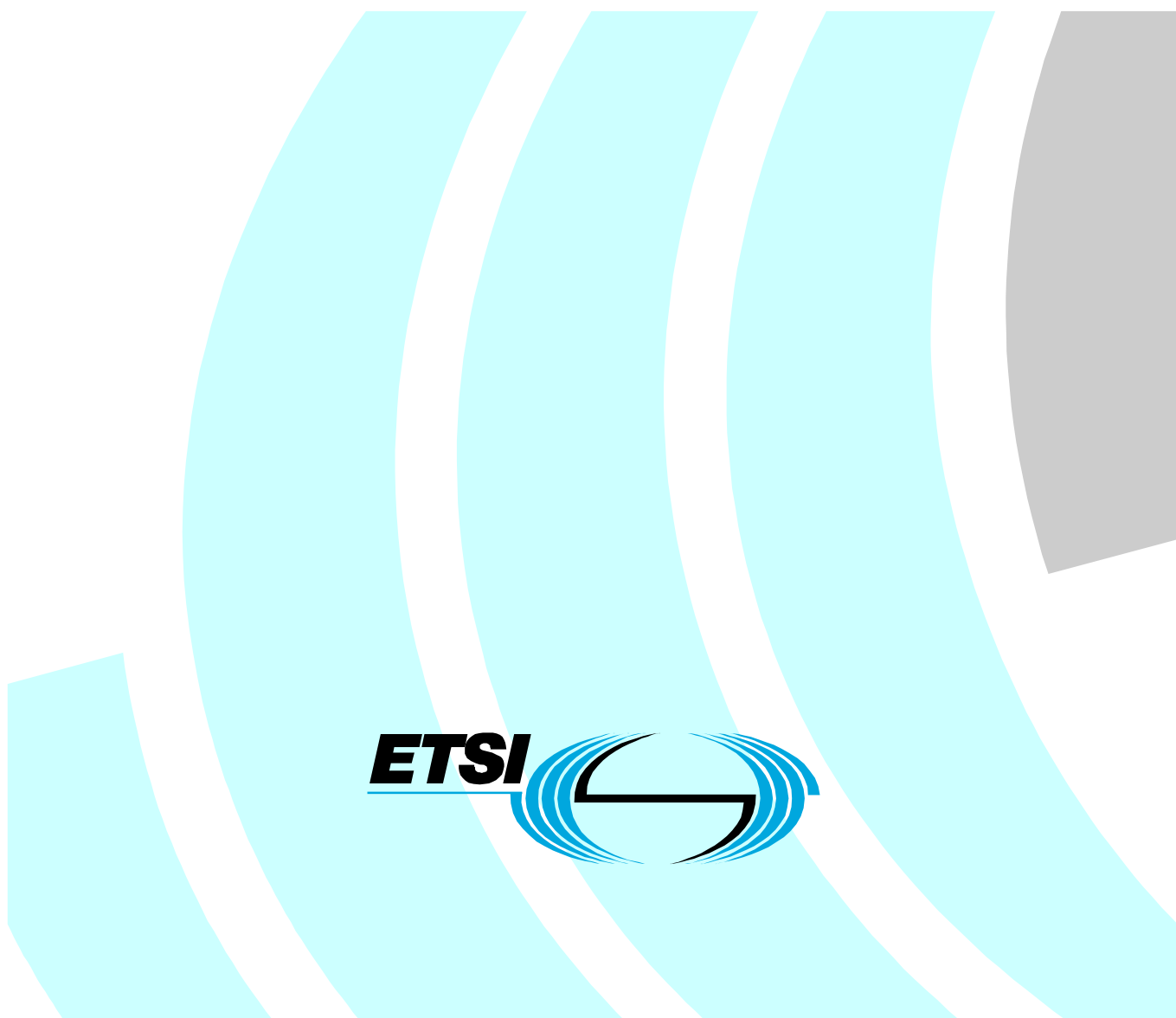


Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Telecommunication Equipment Life Cycle



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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

During various ETSI TISPAN discussions it has become obvious that standardization of equipment interactions among industry participants will be facilitated by clear life cycle descriptions. The present document addresses that issue.

1 Scope

The present document describes the complete telecommunications equipment life cycle, including relevant participants (e.g. suppliers, service providers, resellers) and relevant equipment states, processes and events. These states, processes and events are related to hardware, firmware and software. The present document addresses equipment lifecycle for all, telecommunication equipment that could be part of a telecommunication network (e.g. Transport, Switching, Access including CPE, Power) and for all technologies (e.g. IT, IP, Wi-Fi, Wireless, DWDM, SDH/SONET).

The purpose of the present document is to identify life cycle modelling requirements which will need to be met by equipment management specifications e.g. MIB, information data model, equipment identifiers.

The description of the lifecycle which takes place within the service providers environment is based on the concepts of TMF eTOM [3]. The lifecycle part which takes place within the equipment suppliers environment is described using the SCOR model [7] as the eTOM model does not currently address their environment.

The present document identifies areas for potential future activities to be carried out by either by ETSI or individual companies.

The present document extends the equipment information work i.e. TR 102 214 [9], TS 102 209 [1], TS 102 359 [2].

NOTE: The purpose of the present document is to describe the life cycle of an equipment item and related processes, but not to cover all possible business relationships.

2 References

For the purposes of this Technical Report (TR) the following references apply:

- [1] ETSI TS 102 209: "Telecommunications and Internet converged Services and Protocols for Advancing Networks (TISPAN); Telecommunication Equipment Identification".
- [2] ETSI TS 102 359: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Equipment Information in the Management Information Base (MIB)".
- [3] TeleManagement Forum Enhanced Telecommunications Operations Map® (eTOM) GB921 V4.01: "The Business Process Framework, Addendum B - B2B Integration: Using B2B Inter-enterprise integration with the eTOM".
- [4] ITU-T Recommendation M.3050 (Parts 2 and 3): "Enhanced Telecommunications Operation Map (eTOM)".
- [5] ETSI TS 132 611: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP): Requirements (3GPP TS 32.611 version 6.1.1 Release 6)".
- [6] ETSI EN 300 463: "Transmission and Multiplexing (TM); Requirements of passive Optical Access Networks (OANs) to provide services up to 2 Mbit/s bearer capacity".
- [7] Supply Chain Operations Reference Model Version 7 (SCOR).
- [8] ANSI T1.213: "Coded Identification of Equipment Entities of the North American Telecommunications System for Information Exchange (Revision of T1.213-1990 (R1996))".
- [9] ETSI TR 102 214: "Services and Protocols for Advanced Networks (SPAN); Result of the PNOs and Equipment Manufacturers questionnaires for identification of Equipment Unit".
- [10] ETSI TS 188 001: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); NGN management; OSS Architecture Release 1".

- [11] ISO/IEC 15459-1: "Information technology -Unique identification of transport units - Part 1: General".
- [12] ATIS-0300005: "Product Identification Coding Schemes".
- [13] TCIF-98-005: "Product Serialization Guidelines, Issue 2".
- [14] ATIS-0300038: "Product Marking Implementation Guidelines".
- [15] TCIF-99-010: "Product Change Administration Guideline".
- [16] ATIS-0300039: "Guideline for Identifying Downloadable Software for Plug-in Cards".
- [17] ATIS-0300040: "Guideline for Data Elements in the Management Information Base".
- [18] ATIS-0300006: "Implementation Guide to Package Labelling, Issue 6".
- [19] EDIFICE Guideline, Product Package Label Issue 3.
- [20] EDIFICE Guideline, Shipment Label Issue 5.
- [21] EDIFICE Guideline, License Plate Issue 4.
- [22] BCC-95-004-R1: "Guidelines for the Identification and Bar Code Labelling of Cable Reels".
- [23] TCIF-03-002: "Machine-readable Manifest Guidelines for Cable Reels".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

customer (TMF GB 917): party ordering and receiving services /products

Equipment Identity (EI): (as defined in TS 102 209 [1], clause 7.1) provides information in a uniform, concise and function-oriented format about each equipment unit within its particular network application or environment

Firmware: term used in contrast to software to identify the hard-coded program, which is not downloadable on the system

FRU: lowest level of maintenance spare and will typically be a plug-in card. The modules of an Optical Line Termination (OLT) and ONU should be FRUs

Management Information Base (MIB) [2]: database of configuration management information that is stored on a Network Agent for access by a Network Management Station or local user interface device. MIB consists of a repository of characteristics and parameters managed in a network device such as a NIC, hub, switch or router

Manufacturer Part Number: (as defined in TS 102 209 [1]) proprietary character string of information that is assigned to each equipment unit by its manufacturer

NOTE: For the present document the manufacturer has the supplier's role.

Request For Proposal (RFP): document that invites a supplier to submit a bid for hardware, software and/or services. It may provide a general or very detailed specification of the system. A service provider typically issues the RFP in order to assess competing bids

NOTE 1: The purposes of issuing an RFP may be:

- Ensure that vendors can deliver the product or service required by the customer.
- Standardize the vendor's proposal for ease of analysis and comparison.
- Notify vendors that the purchase is being competitively bid.

NOTE 2: An RFP may contains instructions to the supplier on:

- Specifications: RFP contains detailed information on the specifications of the product or service the buyer is seeking.
- Proposal Content: The RFP contains specific instructions on how the response (a proposal) should be prepared.
- Timing: When does the business expect the proposals? This allows the company issuing the RFP to plan their decision making process schedule.

NOTE 3: It may be that a RFI (Request For Information) is issued Prior to a RFP.

NOTE 4: It may be that a RFQ (Request for Quotation) is issued after RFP.

Service Level Agreement (SLA) (TMF GB 917): formal negotiated agreement between a Service Provider (SP) and a Supplier/several Suppliers. A Service Provider has the Customer role, buying equipments/software/services which are manufactured by one/several manufacturers

Service Provider (SP): as defined in ITU-T M.1400 (version 01/2004): A general reference to an operator that provides telecommunication services to Customers and other users either on a tariff or contract basis

NOTE 1: A Service Provider may or may not operate a network. A Service Provider may or may not be a Customer of another Service provider. 1.4.6/ITU-T M.3320.

NOTE 2: For the present document a network operator would have the role of a Service Provider.

supplier: suppliers interact with the enterprise in providing goods and services, which are assembled by the enterprise in order to deliver its products and services to the Customer

NOTE: For the present document a manufacturer would have the role of a Supplier.

trusted third party: this business role provides services (e.g. outside consulting and engineering) that facilitate the interaction between any actor

Unique Item Identification (UID): As defined in the ISO/IEC 15459-1 [11].

NOTE: The UID may only contain uppercase English alphabet characters A through Z, numeric characters 0 through 9, and the special characters "-" and "/".

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CCC	Card Control Centre
CRM	Customer Relationship Management
E2E	End-to-End
EI	Equipment Identity
EM	Equipment Manager
FRU	Field Replaceable Unit
MIB	Management Information Base
PUP	Pick Up Point
RFI	Request For Information
RFP	Request For Proposal
RFQ	Request For Quotation
RSR	Repair Service Request
SCOR	Supply-Chain Operation Reference-model
SLA	Service Level Agreement
SP	Service Provider
UID	Unique Item iDentification

4 Telecommunication equipment life cycle introduction

4.1 Overview

This clause provides an introduction to the equipment life cycle.

The sequence of events during the equipment life cycle is represented in figure 1.

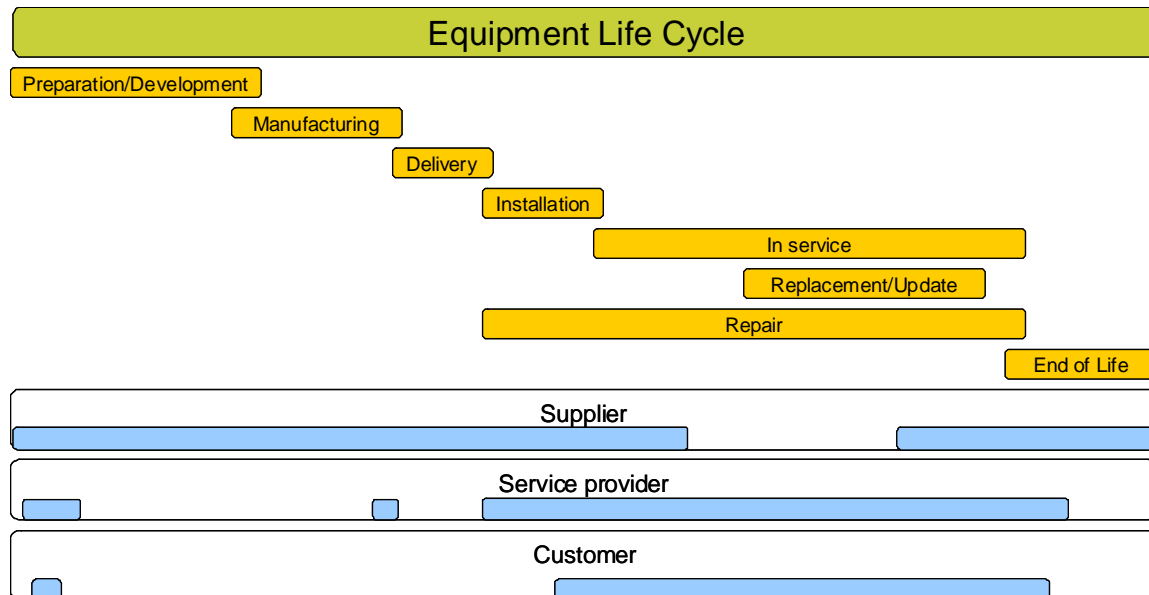


Figure 1: Equipment life cycle Overview of events

The upper part of the figure shows the events, the lower part shows the actors involved at this time of the event.

The life cycle is divided in to eight major parts which will be detailed in the next clauses of the present document:

- 1) Preparation/Development.
 - a) Define opportunity and define solution.
 - b) Specify, make, test and verify product.
- 2) Manufacturing: Production of products.
- 3) Delivery of products: Shipment of products.
- 4) Installation: Implementation and integration of products.
- 5) In service: Products delivering defined solutions.
- 6) Replacement/Update: Implementation of extended/changed solutions.
- 7) Repair: Fault handling of products.
- 8) End of life: Products taken out of service by the service provider it can then be resold, scrapped or returned to the supplier for recycling.

The purpose of the lower portion of figure 1 is to represent the primary areas of responsibility with three actors:

- Supplier.
- Service Provider.
- Customer.

NOTE 1: There are many business relationships that are not covered in this description of the equipment life cycle. For example, a network operator may outsource the operation of its network to a supplier, equipment repair may be performed by the network operator, and equipment items may be purchased from a supplier or reseller other than the original supplier. A trusted third party can be related to a supplier.

NOTE 2: In many cases the service provider keeps in service the equipment even after the equipment has been declared "not supported" by the supplier.

NOTE 3: The equipment can be owned by the customer e.g. for Residential equipment.

The purpose of the present document is to describe the life cycle of an equipment item and related processes, but not to cover all possible business relationships.

4.2 Concepts used

4.2.1 SCOR model to describe the suppliers processes involved in the equipment life cycle

The present document uses among others the Supply-Chain Operations Reference-model (SCOR) model to describe some of the equipment life cycle events that are taking place within the supplier environment.

SCOR is a process reference model that has been developed and endorsed by the Supply-Chain Council [7] as the cross-industry standard diagnostic tool for supply-chain management.

SCOR is a management tool. It is a process reference model may be used for supply-chain management, spanning from the supplier's supplier to the customer's customer.

NOTE 1: SCOR model does not deal with the repair loop and return processes.



Figure 2: SCOR Model [7]

NOTE 2: The modelling and vocabulary used in the present document to describe the Supplier processes are provided as examples.

4.2.2 TMF eTOM to describe the service providers processes involved in the equipment life cycle

The present document uses the eTOM concept to describe the equipment life cycle events that are taking place within the service providers environment.

eTOM is a business process model or framework that has the objective of describing and classifying the business processes required for a Service Provider; it analyzes the processes to different levels of detail according to their significance and priority for the business.

eTOM uses hierarchical decomposition to structure the business processes according to which all of the processes of the enterprise are successively decomposed. Process elements are formalized by means of a name, a description, inputs/outputs, etc.

The eTOM supports two different perspectives on the grouping of the detailed process elements:

- horizontal process groupings, in which process elements are grouped according to reference accomplished functionalities (e.g. Market and Product and Customer management, Service management, etc.);
- vertical process groupings, in which process elements are grouped within End-To-End processes (e.g. Fulfilment, Assurance, etc.) accomplished by the Service Provider enterprise.

The eTOM Business Process Framework is defined as generically as possible, so that it is independent of organization, technology and service. However it is not a Service Provider business model.

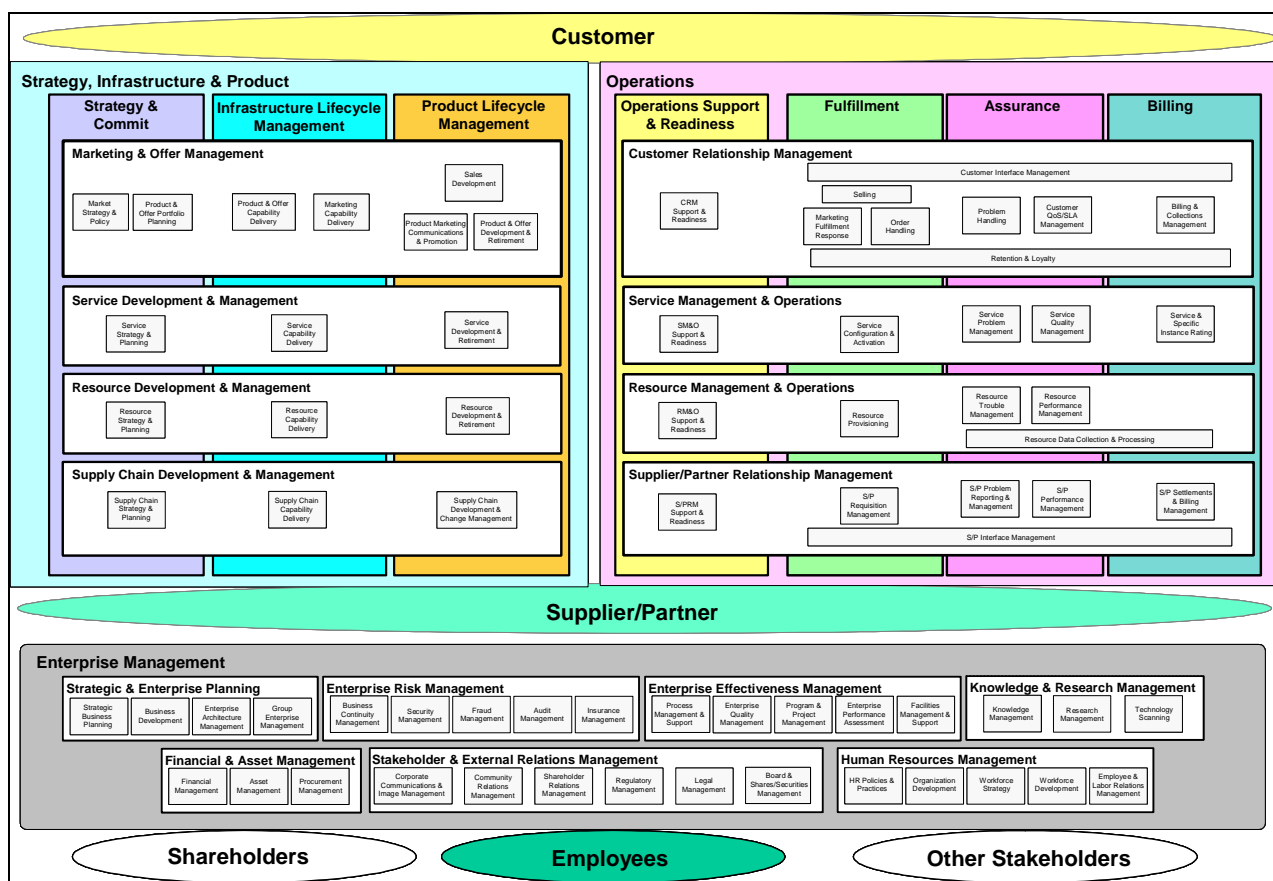


Figure 3: eTOM Business Process Framework (ITU-T Recommendation M.3050.1 [4])

5 Preparation and development

The main purpose of the Preparation/Development phase is to collect and define criteria and determine requirements when to develop new or upgrade existing products to meet market and customer needs.

In addition, during this Preparation/Development process, marking and traceability requirement on products are set according to level of complexity, market and customer needs, etc.

5.1 Preparation

This preparation phase encompasses the following tasks:

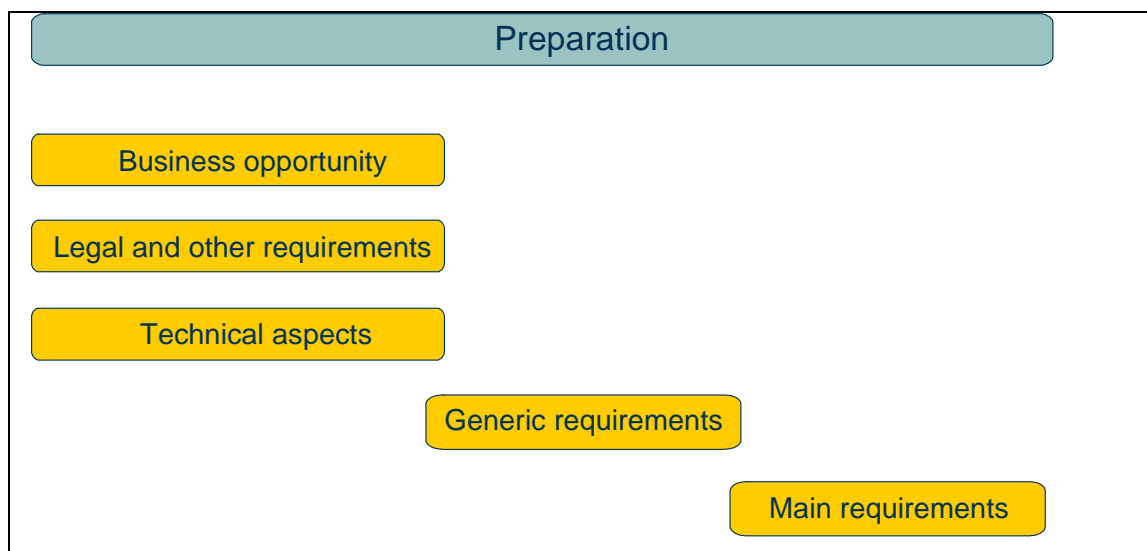


Figure 4: Preparation Phase

The preparation phase flows as follows:

Input to this phase:

- Business opportunity: e.g. what market should the product serve, customer expectations and needs.
- Legal requirements: e.g. CE and R&TTE requirements, ETL/UL-requirements, RoHS (Restriction of the use of certain Hazardous Substances).
- Customer and market requirements e.g. RFP/RFQ/RFI.
- Technical Aspects: e.g. power limitations, frequencies that can be used.
- Other requirements e.g. supplier's own requirements.
- Output from this phase.
- Generic requirements: e.g. company defined general requirements that are valid for all products.
- Main requirements: e.g. product specific requirements that includes the generic requirements and other requirements related to the product, i.e. the legal, technical and other requirements.

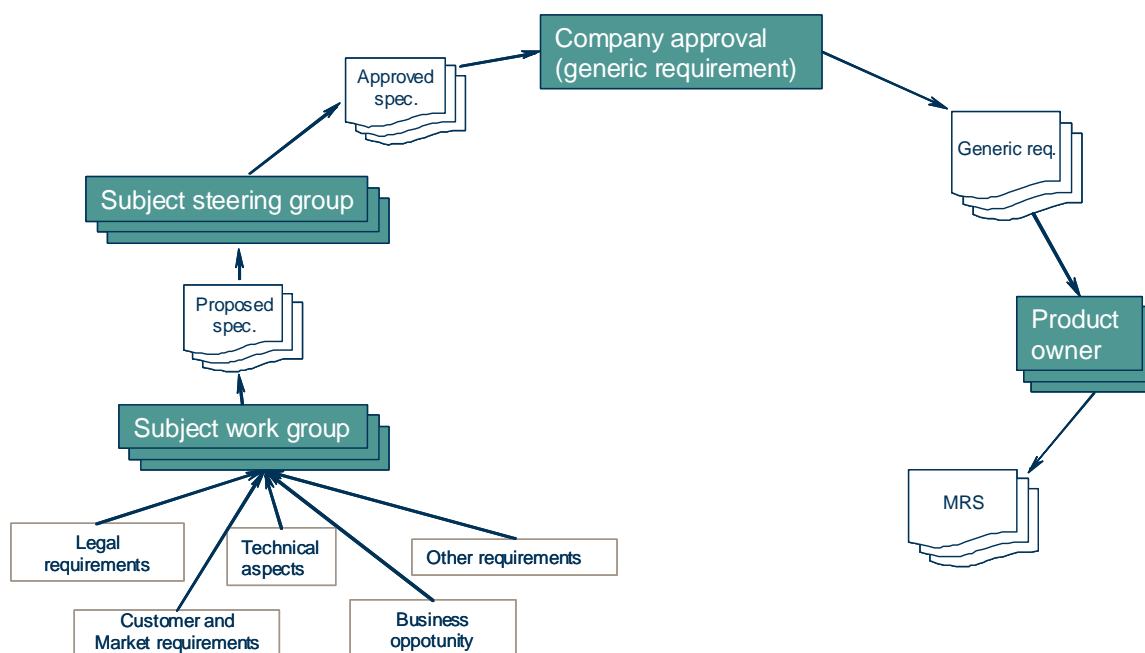


Figure 5: Preparation Process Flow

The result of this process preparation phase is the generic requirement and main requirement specifications. Generic requirement specifications are product neutral and are to be evaluated when to create/update main requirement specifications (product specific) when developing/changing a product.

5.2 Development

The base for development of products is the main requirement specification defined during the Preparation phase.

This Development phase encompasses the following tasks:

- Requirement Analysis e.g. evaluation of outcome from the preparation phase.
- Implementation e.g. how should requirements be included in the product.
- HW design e.g. developing of hardware to meet requirements.
- SW design e.g. developing of software to meet requirements.
- Integration and Verification e.g. merging HW and SW together and validation of expected functions.
- Product Release e.g. product is ready for manufacturing.

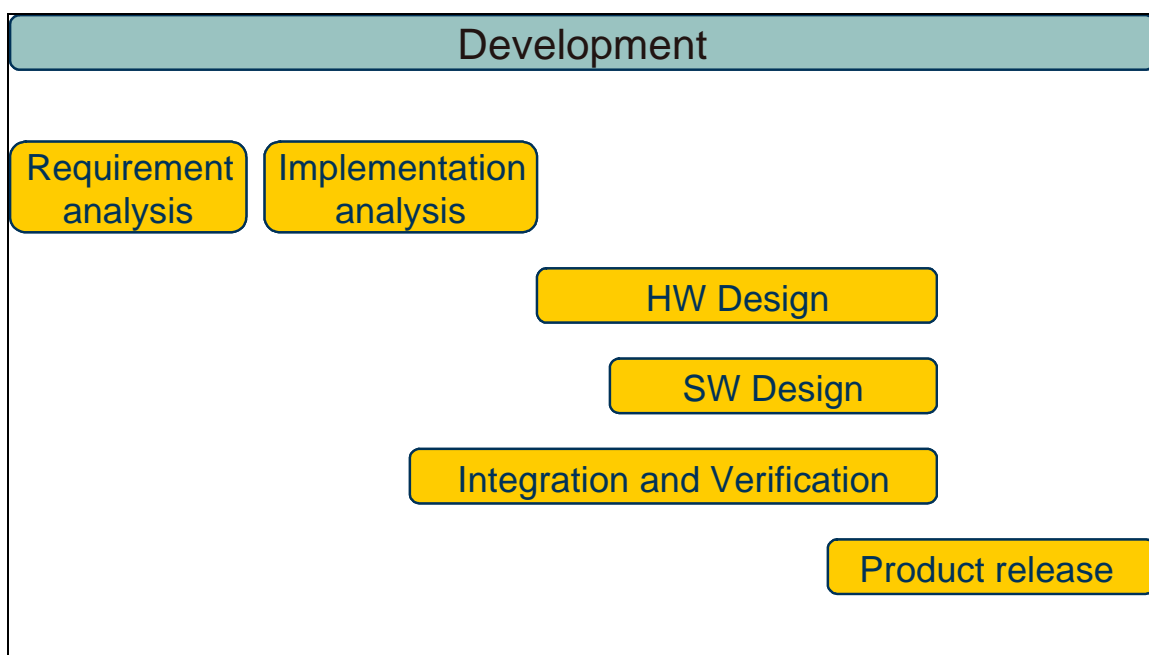


Figure 6: Development

In this development phase the supplier allocates the part number to the equipment that is developed or changed.

The result of the development phase is product specifications and verified products ready for manufacturing (released products).

6 Manufacturing

The main purpose of the manufacturing process is to convert "raw" material to products ready for delivery, and perform all associated material handling, manufacturing, testing and preparation of products for delivery. The same basic process is applicable to both internal and external manufacturing. Typical example of manufacturing decomposition can be found in informative annex A.

Figure 7 describes the manufacturing process. The following clauses provide explanations for figure 7.

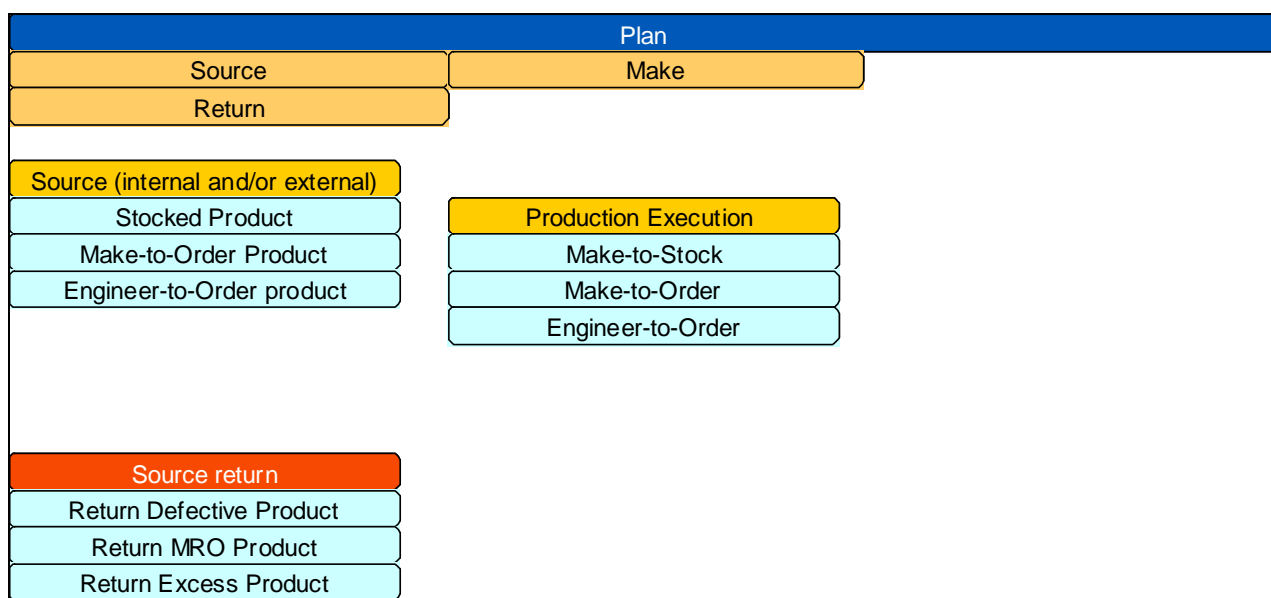


Figure 7: Equipment Life Cycle – Manufacturing Phase

6.1 Plan

Plan of manufacturing encompasses the demand/supply planning and management tasks as follows:

- Balance resources with requirements and establish/communicate plans for the whole supply chain, including return, and the execution processes of source and make.
- Management of business rules, supply chain performance, data collection, inventory, capital assets, transportation, planning configuration, and regulatory requirements and compliance.
- Align the supply chain unit plan with the financial plan.

6.2 Source

Source of products (e.g. components) is important to be able to execute the own manufacturing. The sourced products could be from both internal and external suppliers, depending on a companies supply chain.

The source phase (Stocked, Make-to-Order, and Engineer-to-Order Product) encompasses the following tasks:

- Schedule deliveries; receive, verify, and transfer product; and authorize supplier payments.
- Identify and select supply sources when not predetermined, as for engineer-to-order product.
- Manage business rules, assess supplier performance, and maintain data.
- Manage inventory, capital assets, incoming product, supplier network, import/export requirements, and supplier agreements.

6.3 Make

The make phase is when production of a product is executed to finalize what have been achieved during earlier steps in the equipment life cycle (i.e. preparation/development).

The make phase (Make-to-Stock, Make-to-Order, and Engineer-to-Order) encompasses the following tasks:

- Schedule production activities, issue product, produce and test, package, stage product, and release product to deliver.
- Service Providers may also test the equipment. The results of the test can be an input for the product requirements enhancements.
- Finalize engineering for engineer-to-order product.
- Manage rules, performance, data, in-process products (WIP), equipment and facilities, transportation, production network, and regulatory compliance for production.

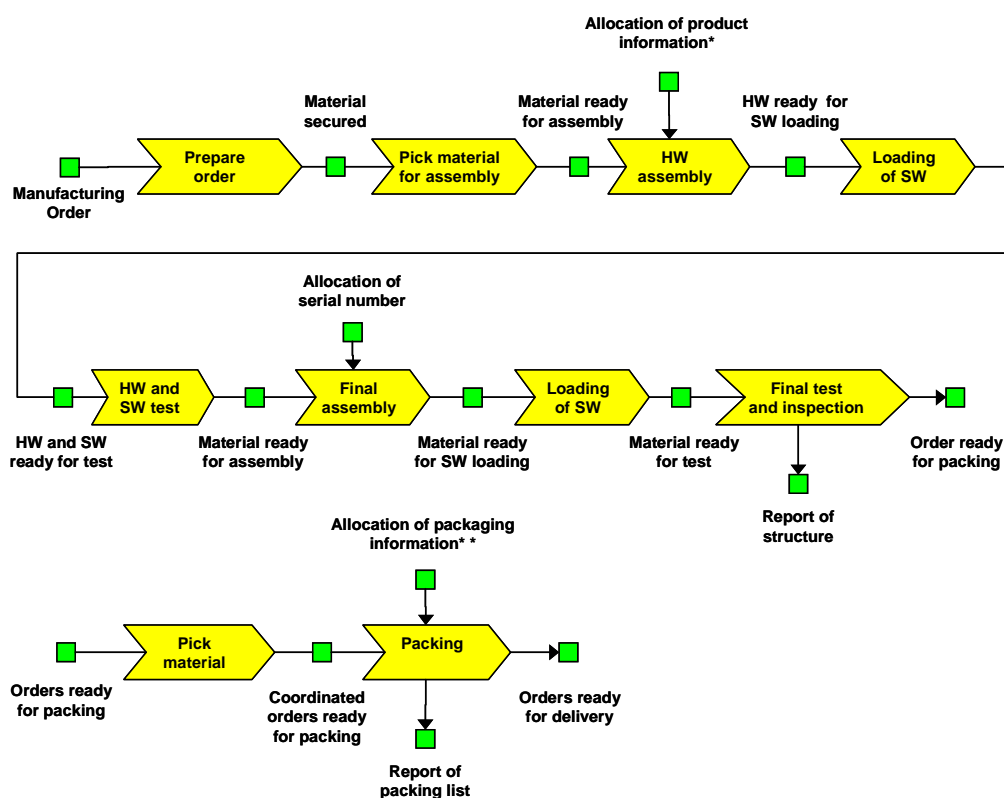
NOTE 1: Prior to delivery the supplier realizes the following tasks:

- Equipment Identification: assign part number and version and an equipment identifier if needed as referred to in TS 102 209 [1].

NOTE 2: Service Providers may request suppliers to identify their equipment with ANSI T1.213 [8]:

- Physical marking: label placement as needed.

The processes flow of the Source and Make Phase can be as follows:



* product information could be product number, version, manufacturing date, serial number etc.

** packaging information could be package id, shipment number, dispatch advise number, address information etc.

Figure 8: Example of a production process description

6.4 Source return

The Source Return Phase is the Return of Raw Materials (to Supplier) and Receipt of Returns of Finished Goods (from Customer), including Defective Products, MRO Products, and Excess Products.

The Source Return Phase encompasses the following tasks:

- All return defective product steps from authorizing return, scheduling product return, receiving, verifying, and disposition of defective product, and return replacement or credit.
- Return MRO product steps from authorizing and scheduling return, determining product.
- Condition, transferring product, verifying product condition, disposition, and request return authorization.
- Return excess product steps including identifying excess inventory, scheduling shipment, receiving returns, approving request authorization, receiving excess product return in Source, verifying excess, and recover and disposition of excess product.
- Manage Return business rules, performance, data collection, return inventory, capital assets, transportation, network configuration, and regulatory requirements and compliance.

7 Delivery

The main purpose of the delivery phase is to move goods from one physical location to another, and to perform all associated goods handling, administration and documentation. The same basic process is applicable to both domestic and international distribution, and to both backline and frontline flows.

Figure 9 describes the delivery phase processes.

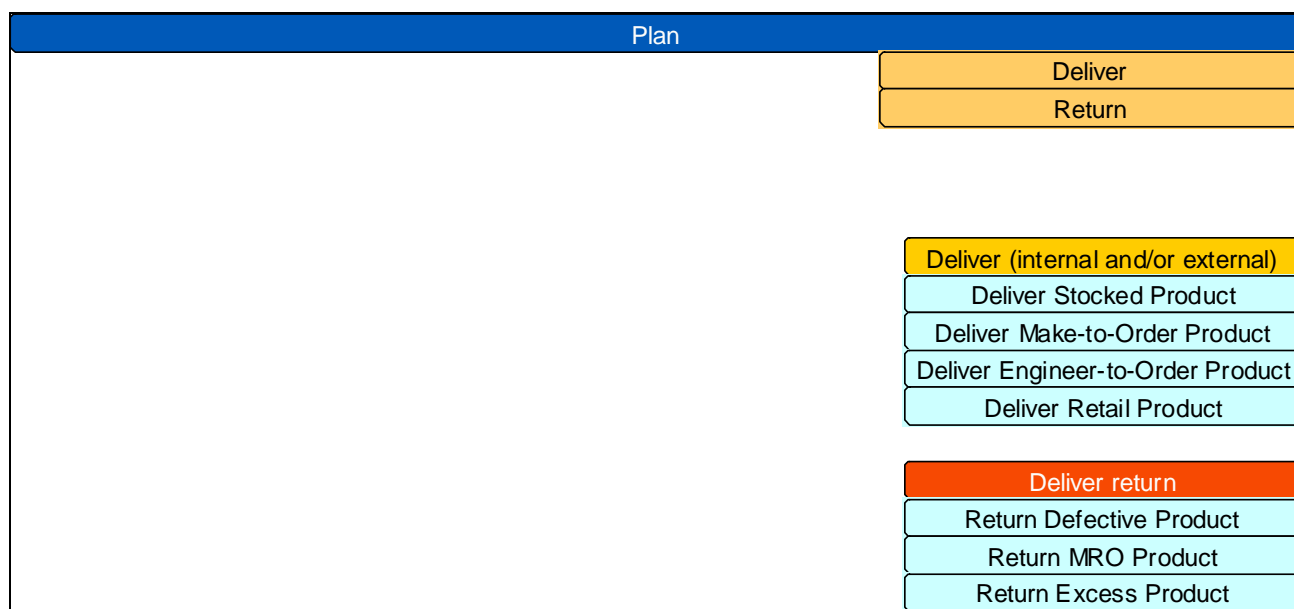


Figure 9: Delivery Phase

A Service Level Agreement (SLA) between the Service Provider and the Supplier may be established Prior to Delivery. SLA is contract designed to create common understanding about equipment quality, priorities and responsibilities.

7.1 Plan of delivery

Plan of delivery encompasses the demand/supply planning and management tasks as follows:

- Balance resources with requirements and establish/communicate plans for the whole supply chain, the execution processes of Source, Make, and Deliver.
- Management of business rules, supply chain performance, data collection, inventory, capital assets, transportation, planning configuration, and regulatory requirements and compliance.
- Align the supply chain unit plan with the financial plan.

7.2 Deliver

The Deliver Phase (Stocked, Make-to-Order, Engineer-to-Order, and Retail Product) could be handled differently deepening on what to deliver and from where.

The Deliver Phase (Order, Warehouse, Transportation, and Installation Management) encompasses the following tasks:

- All order management steps from processing customer inquiries and quotes to routing shipments and selecting carriers.
- Warehouse management from receiving and picking product to load and ship product. Receive and verify product at customer site and install, if necessary.

- Invoicing customer.
- Manage Deliver business rules, performance, information, finished product inventories, capital assets, transportation, product life cycle, and import/export requirements.

The processes flow of the Deliver Phase can be as follows:

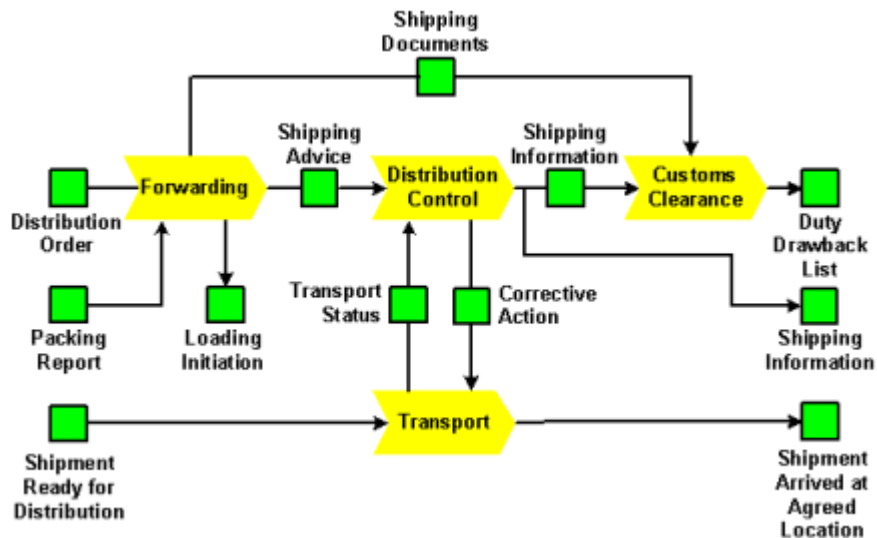


Figure 10: Example of a Deliver process description

7.3 Deliver return

The deliver return phase is the return of raw materials (to supplier) and receipt of returns of finished goods (from customer), including defective products, MRO products, and excess products.

The deliver return phase encompasses the following tasks:

- All return defective product steps from authorizing return, scheduling product return, receiving, verifying, and disposition of defective product, and return replacement or credit.
- Return MRO product steps from authorizing and scheduling return, determining product.
- Condition, transferring product, verifying product condition, disposition, and request return authorization.
- Return excess product steps including identifying excess inventory, scheduling shipment, receiving returns, approving request authorization, receiving excess product return in Source, verifying excess, and recover and disposition of excess product.
- Manage return business rules, performance, data collection, return inventory, capital assets, transportation, network configuration, and regulatory requirements and compliance.

8 Installation

The installation phase consists of a preparation, installation and verification phase.

Hardware and software are installed to prepare for using that equipment to provide services. This installation is performed according to pre-engineered designs and includes testing to determine installation success. Installation also involves integrating various components.

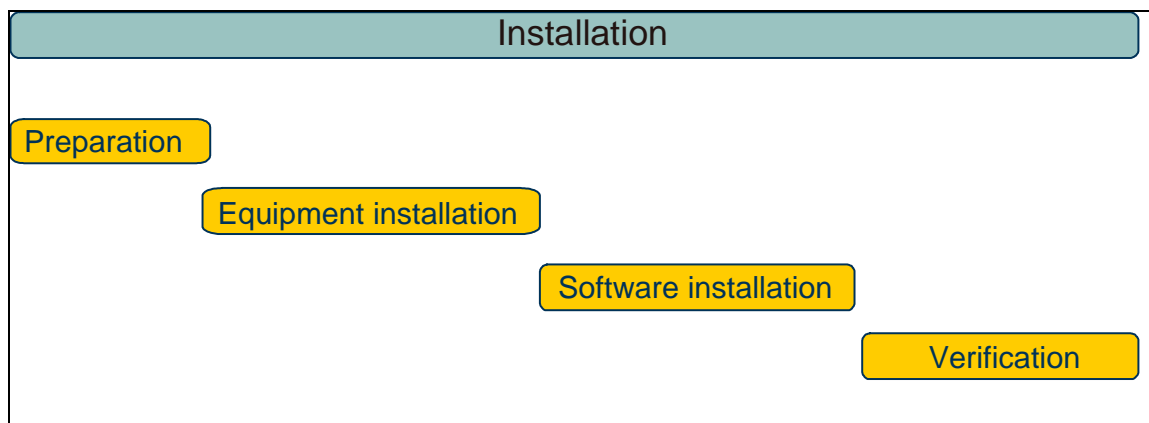


Figure 11: Installation phase

8.1 Preparation

Verification and inspection that all delivered equipment and documents match the ordered materials to ensure that the sites are ready for installation.

8.2 Equipment installation

The hardware is installed in accordance with proven procedures. Upon completion of each step in the process, the work is inspected and the results are documented. Installation includes the mounting of equipment, installation of software, the connection of cables to the power supply and distributing frames.

8.3 Software installation

Equipment that requires node-specific software is pre-loaded and configured at the factory. This software is included in the delivery.

8.4 Verification

After all equipment has been installed, the site is verified. Some onsite tests are necessary although the equipment has already been tested at the factory before delivery. The installation is complete and the equipment is ready for integration into the network when the tests have been performed and accepted (with or without additional conditions) by the Service Provider. If needed, site documentation is updated to reflect the actual installation.

9 In service operations

The In service operations phase is best describe by using eTOM processes [3]. This clause describes the eTOM processes (level 2) involved in the equipment life cycle during the in services operations phase.

NOTE: Management of the equipment in operations phase is described in TS 188 001 NGN OSS Architecture specification [10].

9.1 In service operations eTOM process interaction

The first step in documenting the end-to-end (E2E) flows is positioning the In service operations flows in its context within the overall eTOM model.

Figure 12 shows this context for In Service Operations.

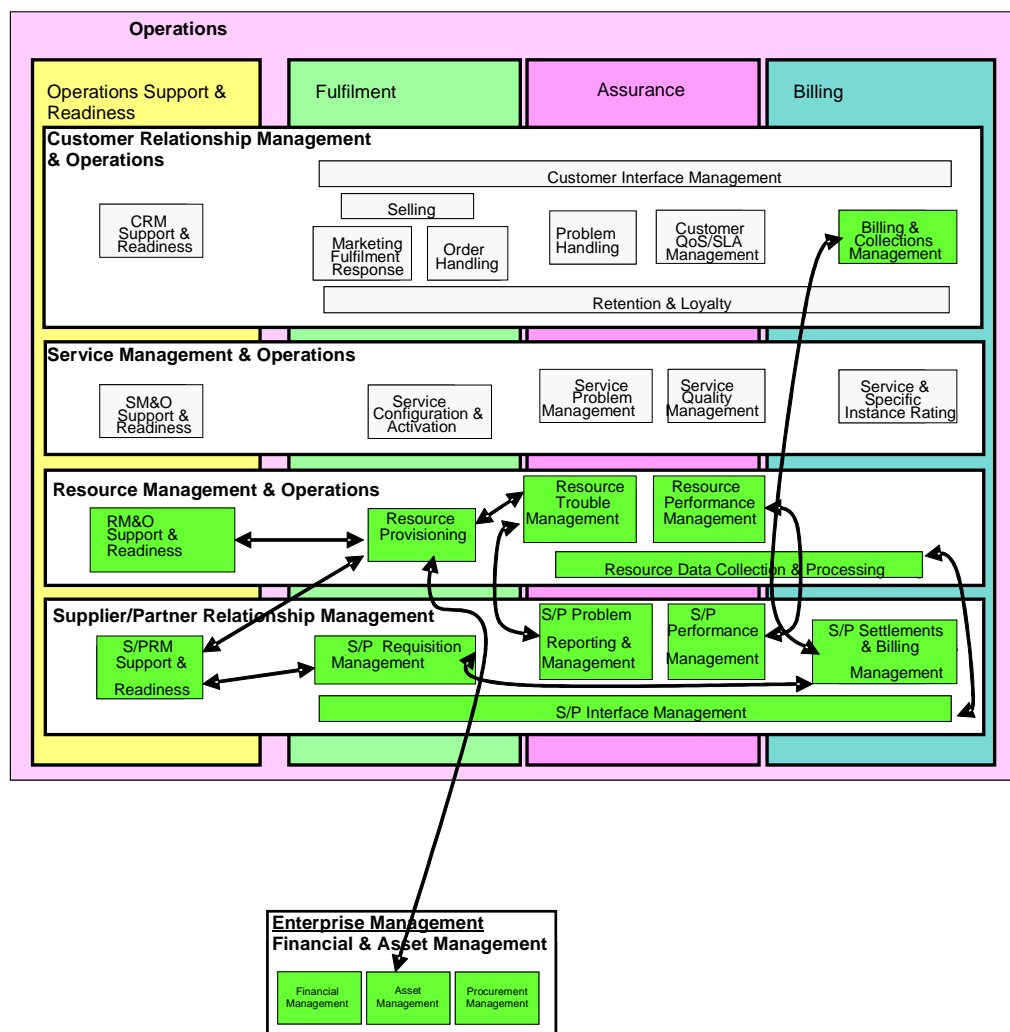
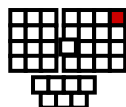


Figure 12: In Service Operations Process Interaction

9.1.1 Customer Relationship Management (CRM)

Billing & Collections Management (CRM – B) (Level 2)



eTOM Process Identifier: 1.B.1.8 eTOM definition: "Ensure that enterprise revenue is billed and collected" link to equipment in this process:

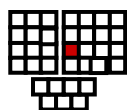
- The purpose of this process is to ensure the timely and effective fulfilment of all customer bill inquiries and the resolution of customer/Service Provider billing issues. This process is responsible for managing customer interaction as it relates to a customer's billing relationship to a Service Provider. This includes fulfilling inquiries against the customer's billing account (s), handling disputes from the customer with regards to its billing records and resolving billing disputes between the customer and Service Provider. This process can be viewed via traditional means, with a service representative managing the customer or via e-business means. In the latter case, inquiries, issues and communication of resolution would be handled via electronic media without the intervention of a representative. (eTOM level 3: Manage Customer Bill Inquiries, CRM – B).
- The purpose of this process is to ensure that the customer receives an invoice that is reflective of all the billable events delivered by the Service Provider as per the business relationship between the customer and the Service Provider. (eTOM level 3: Apply Pricing, Discounting & Rebate, CRM – B).

- The primary purpose of this process is the production of a timely and accurate invoice reflective of the charges for services delivered to the customer by the Service Provider and respective trading partners. This process contains the invoicing components of the Service Provider's business. This includes the design and development of the Service Provider's invoicing process, the rendering of an invoice, the delivery of an invoice to customers and the processes that verify invoice quality Prior to customer distribution. The flow of this process can be viewed as an extension of the company's e-business strategy. In this case, the Service Provider would render an invoice electronically, via the Internet for example, and potentially trigger a payment from the customer's credit card electronically. (eTOM level 3: Create & Deliver Bill, CRM – B).
- The primary purpose of this process pertains to effective management of the customer's billing account as it relates to the products purchased and consumed throughout the appropriate billing cycle. This process focuses on managing 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. (eTOM level 3: Manage Customer Billing, CRM – B).
- The purpose of this process is to collect payments made by the customer. Furthermore this process is meant to match these payments with the services/invoices delivered to this customer. This process is also meant to manage 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 on hold. (eTOM level 3: Manage Collection, CRM – B).

9.1.2 Resource management & operations

9.1.2.1 Support & readiness (RM&O – OSR) (Level 2)

eTOM Process Identifier: 1.O.3.1



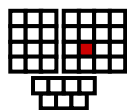
eTOM Brief description: "Manage classes of resources, ensuring that appropriate application, computing and network resources are available and ready to instantiate and manage resource instances."

Link to Equipment in this process:

- The new equipment is made ready for use. This process also involves the assurance that repaired equipment is also ready for use. (eTOM level 3: Enable Resource Provisioning, RM&O – OSR).
- The equipment being monitored for performance data. (eTOM level 3: Enable Resource Performance Management, RM&O – OSR).
- Maintenance is being performed on faulty equipment. (eTOM level 3: Support Resource Trouble Management, RM&O – OSR).
- The inventory of equipment is being reviewed along with forecasts of future needs. This is to insure that enough spare equipment will be available to meet future demands. (eTOM level 3: Enable Resource Data Collection & Processing, RM&O – OSR).
- The inventory on hand is synchronized to what is in the inventory database. (eTOM level 3: Manage Resource Inventory, RM&O – OSR).
- The maintenance personnel are managed. (eTOM level 3: Manage Workforce, RM&O – OSR).
- The management and control of equipment transportation from supplier to site, or storage at warehouse. This process manages and controls the logistics of equipment between PNO locations (central office, remote location, warehouse, customer location). This process would also control the level of spare equipment to insure it will meet planned forecasts. (eTOM level 3: Manage Logistics RM&O-OSR).

9.1.2.2 Resource provisioning (RM&O – F) (Level 2)

eTOM Process Identifier: 1.F.3.2



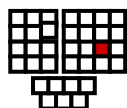
eTOM Description: "Allocate and configure resources to individual customer service instances in order to meet service requirements."

Link to Equipment:in this process:

- Equipment is allocated to provide a specific service. this process also handles the ordering of equipment from supplier/supplier. (eTOM level 3: Allocate & Deliver Resource, RM&O – F).
- Equipment that was initially installed, and spare, will be updated to a working status to support a specific service request. (eTOM level 3: Configure & Activate Resource (RM&O – F).
- Equipment is tested to insure it meets appropriate performance levels. (eTOM level 3: Test Resource, RM&O -F).
- Working equipment is verified against the database to reflect the correct customer assignment. (eTOM level 3: Collect, Update & Report Resource Configuration Data, RM&O – F).

9.1.2.3 Resource Trouble Management (RM&O – A) (Level 2)

Process Identifier: 1.A.3.3



Brief description: "Responsible for the management of troubles with allocated resources."

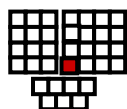
Link to Equipment in this process:

- The equipment is monitored in real time to determine failure and alarm indications. (eTOM level 3: Survey & Analyze Resource Trouble RM&O – A).
- The root cause of equipment failure is determined. Routine tests are also performed. (eTOM level 3: Localize Resource Trouble RM&O – A).
- The equipment is restored to normal service and faulty equipment is replaced. (eTOM level 3: Correct & Recover Resource Trouble RM&O – A).
- Faulty equipment is tracked from beginning to end for the repair process. (eTOM level 3: Track & Manage Resource Trouble RM&O – A).
- To report on new or changed source problems. (eTOM level 3: Report Resource Trouble RM&O – A).
- To close the trouble report once it has been completed. (eTOM level 3: Close Resource Trouble RM&O – A).

9.1.3 Supplier / partner relationship management (S/PRM)

9.1.3.1 S/PRM Support & Readiness (S/PRM – OSR) (Level 2)

Process Identifier: 1.O.4.1



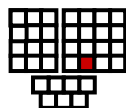
Brief description: "S/PRM Support & Readiness processes are responsible for ensuring that all necessary facilities related to the interaction with suppliers and partners are ready and functioning. Moreover, these processes are responsible for the resolution of problems related to these facilities."

Link to Equipment in this process:

- Verify that communications channels between customers and suppliers are ready and functioning, e.g. contracts. (eTOM level 3: Support S/P Requisition Management, S/PRM – OSR).
- Verify that communications channels for processing trouble reports are functioning between customers and suppliers. (eTOM level 3: Support S/P Problem Reporting & Management, S/PRM – OSR).
- Verify that all necessary facilities related to S/P Performance Management are ready and functioning. It insures that there is capability (for example, information, materials, systems and resources) so that the S/P Performance Management processes can operate effectively. (eTOM level 3: Support S/P Performance Management, S/PRM – OSR).
- Insures that there capability to process invoices and billing issues between suppliers and customers effectively. (eTOM level 3: Support S/P Settlements & Billing Management, S/PRM – OSR).

9.1.3.2 S/P Requisition Management (S/PRM – F) (Level 2)

Process Identifier: 1.F.4.2



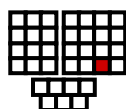
Brief description: "S/P Requisition Management processes manage requisitions with partners/suppliers to ensure on-time and correct delivery of the product or service requested by the enterprise. According to the appropriate policy and practices of the enterprise, supply chain processes in SIP may be involved as well as, or instead of, S/P Requisition Management to achieve this. This process interfaces with the supplier's CRM process for order handling."

Link to Equipment in this process:

- Determine which supplier/supplier/partner will be selected. Once the supplier has been selected there needs to be assurance that the needed equipment is available and able to be delivered as agreed. (eTOM level 3: Select Supplier/Partner, S/PRM – F).
- Manage the requisitions to the chosen supplier will be managed thru the delivery of the equipment. (eTOM level 3: Place S/P Requisition, S/PRM – F).
- After delivery, arrange for acceptance testing or if commissioning is required. Changes to the equipment specification, or delivery, will also be managed. This process will accept delivered equipment and insure that it is tested to be ready for service. It may also require negotiations with the supplier for equipment that is found to be faulty or missing from delivery. (eTOM level 3: Receive & Accept, S/P Product S/PRM – F).

9.1.3.3 S/P Problem Reporting & Management (S/PRM – A) (Level 2)

Process Identifier: 1.A.4.3



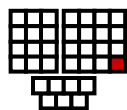
Brief description: "S/P Problem Reporting & Management processes manage problems, associated with supplier/partner interactions, whether identified within the enterprise or notified by the supplier/partner."

Link to Equipment in this process:

- Reports equipment problems to the supplier. (eTOM level 3: Report Problem to S/P, S/PRM – A).
- Receive notification of problems detected by the supplier/ partner, and notifies other processes of this. (eTOM Level 3: Receive & Notify Problem from S/P, S/PRM – A).
- Monitors the problem until it is resolved and the performance requirements are being met, it ensures follow up within internal processes (e.g. SLA management) and customers, and maintains records of the problems. (eTOM level 3 "Manage S/P problem resolution", S/PRM – A).

9.1.3.4 S/P Settlements & Billing management (S/PRM – B) (Level 2)

Process Identifier: 1.B.4.5



Brief description: "Manage all settlements and billing for the enterprise, including bill validation and verification and payment authorization."

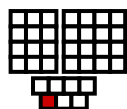
Link to Equipment in this process:

- Supports invoice reconciliation. (eTOM level 3: Manage Account, S/PRM – B).
- Receives and reviews the invoice from the supplier. (eTOM level 3: Receive & Assess Invoice, S/PRM – B).
- Negotiates, disputes, and provides approval of the invoice. (eTOM level 3: Negotiate & Approve Invoice, S/PRM – B).
- Issues the settlement notice and payment of the purchased equipment. (eTOM level 3: Issue Settlement Notice & Payment, S/PRM – B).

9.1.4 Enterprise management - financial and asset management

9.1.4.1 Financial Management (F& AM –EM) (Level 2)

eTOM Process Identifier: 1.E.5.1



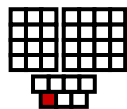
eTOM Brief Description: "Manage the financial management aspects of the enterprise."

eTOM definition: "Financial Management processes manage the financial aspects of the enterprise such as treasury, banking, payroll, financial planning, auditing and accounting operations functions, e.g. accounts receivable and payable. These processes are accountable for the financial health of the enterprise, managing cash flow, auditing for compliance to financial and expense policies, etc."

Link to equipment: this process manages and records the supplier invoices. It also manages and records the payment to the supplier. (eTOM level 3: Financial Management, F& AM –EM).

9.1.4.2 Asset Management (F&AM – EM) (Level 2)

Process Identifier: 1.E.5.2



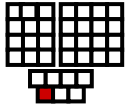
eTOM Brief Description: "Manage all financial and policy aspects of the physical assets of the enterprise."

eTOM Definition: "Asset Management processes manage all financial and policy aspects of the physical assets of the enterprise (corporate real-estate, fleets, infrastructure, stocks, consumables, etc.); they set asset management policies, track assets using physical asset recording systems and manage the overall corporate balance sheet. For each managed corporate asset, these processes plan for future needs and coordinate with the Supply Chain Development & Management processes for all aspects related to purchasing."

Link to Equipment: In this process is responsible for tracking the cost of the equipment for the corporate balance sheet. It also plans for future expenditures of equipment. (eTOM level 3: Asset Management, F&AM – EM).

9.1.4.3 Procurement Management (F&AM – EM) (Level 2)

eTOM Process Identifier: 1.E.5.3



eTOM Brief Description: "Define corporate procurement and logistics policies and rules, for all purchases, warehousing, transport, stock level management and physical resource distribution, and supervise their application."

eTOM Definition: "Procurement Management processes defines corporate procurement and logistics policies and rules, for all purchases, warehousing, transport and physical resource distribution, and supervises their application. These processes manage and control the acceptance of goods from suppliers and any transport arrangements to deliver the goods to either warehouses or site. They define the warehousing structure (centralized and/or distributed) and the associated management policies to be applied to purchased goods. The logistics/transport processes develop policies related to transport of purchased material to warehousing, to site, etc. The stock/inventory management processes, in conjunction with Asset Management processes which provide the inventory information resource, develop corporate policies relating to locations of, and levels of, stock/inventory holdings. These processes also manage the processes associated with the return of faulty goods for repair."

Link to Equipment: In this process manages the logistics of equipment for all purchases or distributions from warehouses to sites. It makes all the transport arrangements for delivery of equipment at needed location. It also determines the warehousing structure with specific stock levels. This process also insures that the Asset Management processes are notified as equipment is moved between locations. (eTOM level 3: Procurement Management, F&AM-EM).

9.2 In service operations process flow

The repair process flows of the Service Operations phase can be as follows.

9.2.1 Operations Support and Readiness – Manage Resource Inventory (RM&O-OSR) process flow

The process flow of Manage Resource Inventory (RM&O-OSR) can be as follows:

- Install new type of equipment:
 - Add to new type to equipment catalogue.
 - Determine if equipment is critical to service.
 - If critical arrange for spares to be held locally (e.g. HOT SPARE).
 - If not critical arrange for spares to be held at Card Control centre (CCC).

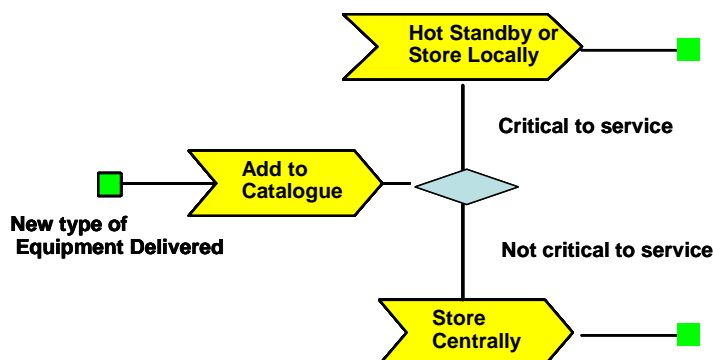


Figure 13: Operations Support and Readiness Process Flow

9.2.2 Resource Trouble Management – (RM&O-A) Process flow

The process flow of Resource Trouble Management (RM&O-A) can be as follows:

- Alarm or routine test identifies problem.
- The Field Technician:
 - Arrives at site.
 - Identifies faulty equipment item.
 - Identifies the availability of a suitable spare item.
 - Takes ownership of the spare.

Either:

- Installs the spare item (if on site).

Or:

- Requests delivery of spare item (if stored remotely at a Card Control Centre (CCC)).
- Receives the spare item.
- Installs the spare item.

9.2.3 Repair Process

The process flow of Repair can be as follows:

- Following the removal of faulty equipment the field technician:
 - Creates a Repair Service Request (RSR).
 - Drops the faulty item off at the Pick Up Point.
 - Updates the RSR at the same time as physically leaving the item in the Pick Up Point (PUP).
- The Card Control Centre (CCC):
 - Arrange for the faulty item to be transported into the CCC.
 - Check the faulty item into the CCC.
 - Request advance replenishment (if spares stored locally).
 - Arrange for the faulty item to be transported to the repairer.
 - Updates the RSR.
- The Repairer:
 - Repairs the faulty item.
 - Returns the repaired/replacement to CCC.
- The Card Control Centre (CCC):
 - Checks in the repaired/replacement item.
 - Arranges for the repaired/replacement item to be transported to the "home" pick up point of the spare.
 - Updates the RSR.
 - The repaired/replacement item is transported to the PUP.

- The Field Technician:
 - Collects the repaired/replacement item from the PUP at next visit.
 - Returns the repaired/replacement item to its appropriate location in the spares cabinet or HOTSPARE slot (i.e. installed in equipment).
- The CCC has the responsibility for tracking the faulty item throughout the repair process.

9.2.4 Repair activities

The entities identified in clause 9.2.3 can perform the following activities:

- Field technician facilities: Field Technicians can:
 - Find the nearest spare card.
 - Take possession of the card.
 - Leave an item on monitor or reserve.
 - Replace the failed unit with the spare item.
 - Raise a repair service request for the faulty item.
 - Drop failed units off at a pick up point for collection.
 - Pick up repaired items at a Pick up Point.
 - Return unused spare items.
- Card control centre facilities: card control centres can:
 - Check in failed items.
 - Organize advance replenishments.
 - Ship failed items to the repairer.
 - Receive repaired items from the repairer.
 - Dispatch items to the field technicians/sites.
 - Prepare replenishments.
- Main Admin functions:
 - Move spares.
 - Create and maintain the inventory.
 - Create and maintain stock levels at specified sites for particular equipment items and manage replenishment.
 - Create and maintain kits.
 - Manage/Overview repair loop.

- Administration facilities:
 - Create and maintain users.
 - Create and maintain catalogue.
 - Create and maintain sites.
 - Create and maintain suppliers.
 - Create and maintain compatibility.

Full eTOM level 3 processes are needed to describe the operation process flow of the in Operation Equipment life cycle. At the present time, eTOM does not provide all necessary Level 3 to fully describe the Operation processes flow therefore draft processes have been inserted with eTOM actual processes.

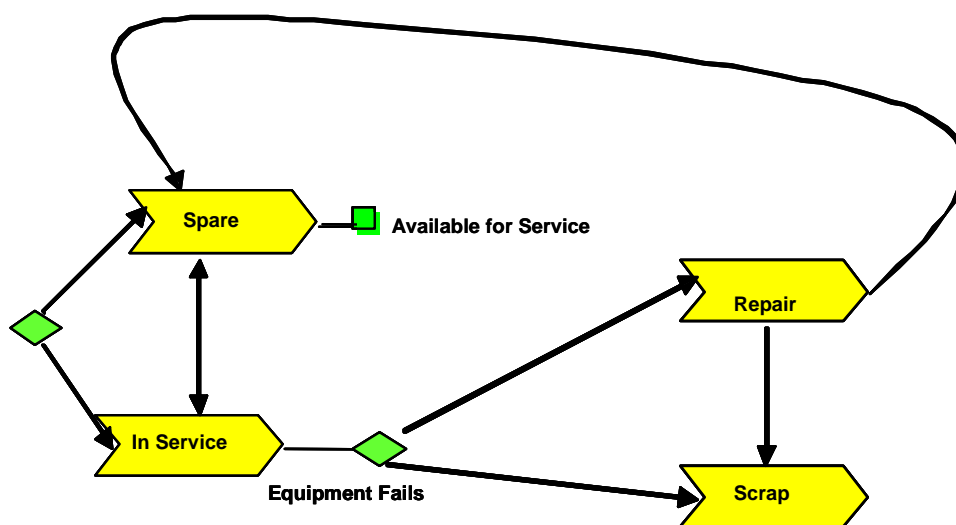


Figure 14: In Service Operations Process Flow

10 Replacement/update

Replacement of physical equipment (e.g. shelves, cards) entails removal of the current working equipment items and installation of new items to replace them. However, replacement of non-physical items (e.g. software) would be accomplished by "overwriting" the existing software or simply pointing processes to the new software.

Correct & Recover Resource Trouble (RM&O – A) (eTOM clause 10.3.3.3)

Process Name	Correct & Recover Resource Trouble
Process Identifier	1.A.3.3.3
Brief Description	Restore or replace resources that have failed and to ensure that the services depending on those resources are restored as efficiently as possible

11 Maintenance and repair

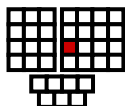
The repair occurs when equipment is determined to be fault. The role of "repairer" can be taken on by the service provider, the supplier, or a third party. In the process of repair the intended functions of the equipment will not change, however problems (e.g. overheating) may be fixed.

Further discussion is needed to identify the possible states that equipment can return to at the end of being repaired.

NOTE 1: There used to be situations where the equipment is "refurbished".

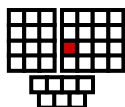
NOTE 2: TL 9000 may be used for maintenance and repair management.

Support Resource Trouble Management (RM&O – OSR) (eTOM clause 10.3.1.3)



Process Name	Support Resource Trouble Management
Process Identifier	1.O.3.1.3
Brief Description	Manage statistically driven preventative and scheduled maintenance activities, and repair activities

Manage Logistics (eTOM 10.3.1.7)



Process Name	Manage Logistics
Process Identifier	1.O.3.1.7
Brief Description	Manage and control warehousing, logistics, stock level management, physical distribution and transport of purchased materials/goods

12 End of life or phased out

End of life for hardware items can occur while those items are owned by a supplier, service provider, or customer. The first step is to "write off" the equipment from that company's accounting records. Then the equipment can be discarded per local laws or resold.

NOTE: Recycling depends on local laws.

End of life for software items is remarkably similar to that for hardware items. The license can be "written off" the company's accounting records. The software can then be discarded or resold, possibly with the hardware it depends on.

Annex A: Individual MIB status changes through the equipment life cycle

This annex describes an example of how the information to be held in the MIB could be created/read/updated by different roles (Supplier/Service Provider) capture the life cycle steps of an equipment.

NOTE 1: This clause and the tables refer to TS 102 359 [2].

NOTE 2: In TS 102 359 [2] the terms Operator and Manufacturers are used. In the present document the terms Service Provider and Supplier are used.

NOTE 3: Legend:

- "M" = Mandatory
- "O" = Optional
- "X" = no action required

Step #1: Preparation/Development:

MIB not relevant in this process.

Step #2: Manufacturing: Production of products:

- Produce the card, including product labelling.
- If the card has a MIB, update the card's MIB with static information.

	O/M	Service Provider	Supplier
Equipment Identity (EI);	M	X	Create
Unique item Identification (UID);	M	X	Create
Manufacturer software part number and version	M	X	Create
Manufacturer product name	M	X	Create
Manufacture date	M	X	Create
Operator equipment name	O	X	X
Geographic location	O	X	X
Physical location	O	X	X
Manufacturer name	O	X	Create
Manufacturer part number and version	O	X	Create

Step #3: Delivery of products: Shipment of products:

- No action on the MIB.

Step #4: Installation: Implementation and integration of products:

- Install the card.
- Update the MIB in the card/shelf, if applicable, with location-dependent information.

	O/M	Service Provider	Supplier
Equipment Identity (EI);	M	Read	X
Unique item IDentification (UID);	M	Read	X
Manufacturer software part number and version	M	Read	X
Manufacturer product name	M	Read	X
Manufacture date	M	Read	X
Operator equipment name	O	Create (see note)	X
Geographic location	O	Create (see note)	X
Physical location	O	Create (see note)	X
Manufacturer name	O	Read	X
Manufacturer part number and version	O	Read	X
NOTE: Suppliers, or third party vendors, could be subcontracted for installation of equipment and thus perform these tasks.			

- Integrate with other components, as necessary.
- Test.
- Bring into service.

Step #5: In service: Products delivering defined solutions.

	O/M	Service Provider	Supplier
Equipment Identity (EI);	M	Read	X
Unique item IDentification (UID);	M	Read	X
Manufacturer software part number and version	M	Read	X
Manufacturer product name	M	Read	X
Manufacture date	M	Read	X
Operator equipment name	O	Read	X
Geographic location	O	Read	X
Physical location	O	Read	X
Manufacturer name	O	Read	X
Manufacturer part number and version	O	Read	X

- Provision/activate use of the card.
- On-going fault monitoring.

Step #6: Replacement/Update: Implementation of extended/changed solutions.

- Replace the card – remove the original and replace with new card, including installation procedures (ref Step # 4).

	O/M	Service Provider	Supplier
Equipment identity (EI);	M	Read	X
Unique item IDentification (UID);	M	Read	X
Manufacturer software part number and version	M	Read or update (See note)	X
Manufacturer product name	M	Read	X
Manufacture date	M	Read	X
Operator equipment name	O	Create	X
Geographic location	O	Create	X
Physical location	O	Create	X
Manufacturer name	O	Read	X
Manufacturer part number and version	O	Read	X
NOTE: When a card is placed into service, for maintenance or for expansion of service, the manufacturer software part number and version may require an update to be in agreement with the other cards on that shelf.			

Step #7: Repair: Fault handling of products:

- Assumption – card has been removed.
- Send to repair.
- During repair, card functionality may be changed/updated:
 - a) Update product labelling on outside of card, if applicable.
 - b) Update static MIB contents in card, if applicable.

	O/M	Service Provider	Supplier
Equipment Identity (EI);	M	X	Read or Update (See note)
Unique item IDentification (uid);	M	X	Read
Manufacturer software part number and version	M	X	Read or Update (See note)
Manufacturer product name	O	X	Read
Manufacture date	O	X	Read
Operator equipment name	O	X	Read
Geographic location	O	X	Read
Physical location	O	X	Read
Manufacturer name	O	X	Read
Manufacturer part number and version	O	X	Read or Update
NOTE: The information is updated when the supplier changes the manufacturer part number and version. For example when there is a recall or an upgrade of the equipment.			

NOTE 4: Repair can be a Supplier or a third party vendor.

Repair sends card back to service provider's warehouse.

	O/M	Service Provider	Supplier
Equipment identity (EI);	M	X	X
Unique item IDentification (UID);	M	X	X
Manufacturer software part number and version	M	X	X
Manufacturer product name	M	X	X
Manufacture date	M	X	X
Operator equipment name	O	X	X
Geographic location	O	X	X
Physical location	O	X	X
Manufacturer name	O	X	X
Manufacturer part number and version	O	X	X

NOTE 5: Repair vendor can be a Supplier or a third party vendor.

NOTE 6: When this card goes back to service refer to Step 4.

Step #8: End of life: Products taken out of service:

- Remove the card from accounting books.
- Resell or send the card to waste disposal.

Annex B: Field Replaceable Unit (FRU) Life Cycle –Example

This clause describes the specific life cycle for a card.

B.1 Process overview

- 1) Preparation/Development.
- 2) Manufacturing: Production of products.
 - Produce the card, including product labelling.
 - If the card has a MIB, update the card's MIB with static information.
- 3) Delivery of products: Shipment of products.
 - Take the order for the card.
 - Ship the card.
 - Produce and send invoice for the card.
- 4) Installation: Implementation and integration of products.
 - Install the card.
 - Update the MIB in the card/shelf, if applicable, with location-dependent information.
 - Integrate with other components, as necessary.
 - Test.
 - Bring into service.
- 5) In service: Products delivering defined solutions.
 - Provision/activate use of the card.
 - On-going fault monitoring.
- 6) Replacement/Update: implementation of extended/changed solutions:
 - Replace the card – remove the original and replace with new card, including installation procedures (4).
- 7) Repair: fault handling of products
 - Assumption – card has been removed.
 - Send to repair.
 - During repair, card functionality may be changed/updated:
 - a) Update product labelling on outside of card.
 - b) Update static MIB contents in card, if applicable.
 - Repair sends card back to carrier's stock.

- 8) End of life: Products taken out of service:
- Remove the card from accounting books.
 - Resell or send the card to waste disposal.

B.2 Process details

Supplier – Service Provider Interactions for a Card

Between the supplier and the service provider, there are four major pairs of interactions:

- Order/acknowledge – the service provider orders an equipment item (or many) and receives an acknowledgement of that order and its acceptance back from the supplier.
- Send/receive – the supplier sends the item to the service provider and the service provider receives the item.
- Invoice/bill payment – the supplier sends an invoice to the service provider and the service provider pays the bill.
- Equipment complaint/supplier response – the service provider issues a complaint about an item or class of items and the supplier responds.

These interactions are depicted in figure B.1. All of these actions can apply to shelves, cards, firmware, and software.

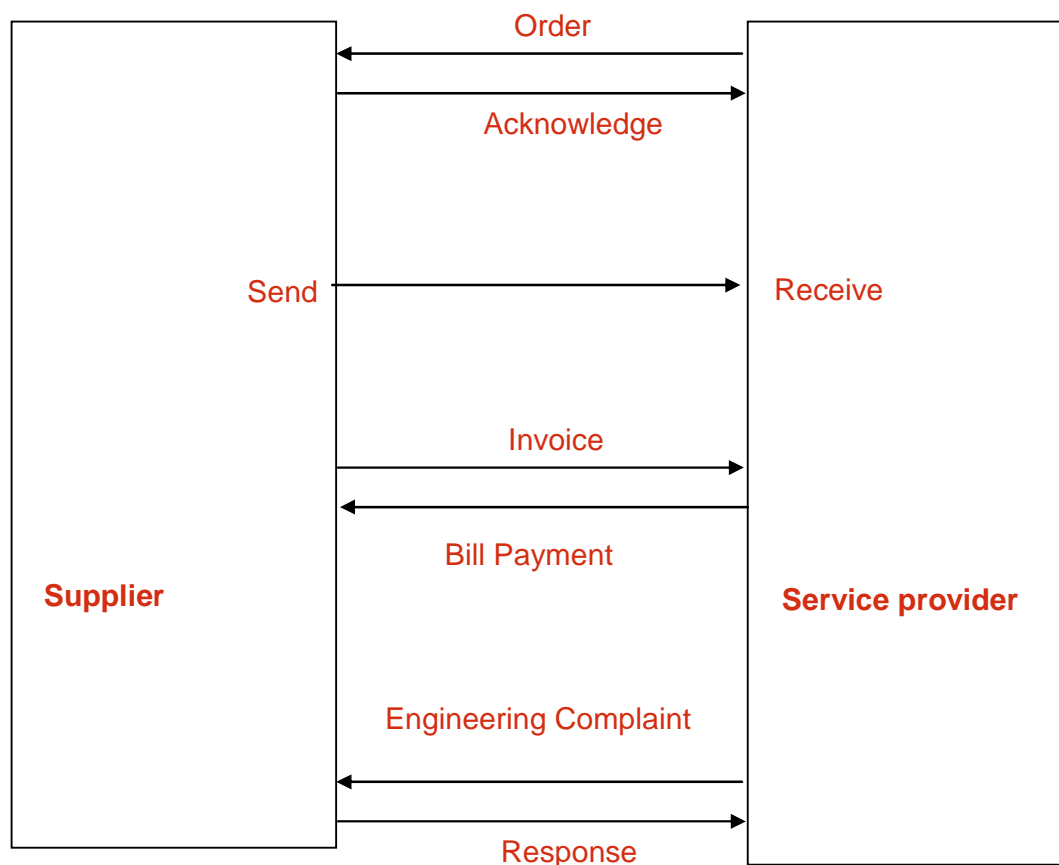


Figure B.1

Life cycle of a card within the network Service provider

Once a card is received by a network service provider, it can take on any of the following primary states:

- Spare – item is held in stock for use as needed. The item can either be:
 - Attached to and recognizable by the network.
 - Unattached to the network.
- Working – being used as part of the telecommunications network.

During the equipment life cycle any of the following actions can occur:

- Move – transport the equipment item between service provider sites.
- Inventory – perform an inventory count that includes the item.
- Install – the item of equipment (e.g., shelf, card, software) can be installed. This action connects the item (e.g., a card) to the network. This should also update the MIB automatically with location information.
- Activate – this action puts the card into use.
- Disconnect – take the card out of use.
- Remove – separate the card from the network. This action changes the item from working to spare.
- Update software - either manually or via download. The MIB should be updated as a result of this action.
- Retire the item – this is an accounting action, which removes a spare item from the service provider's accounting record of inventory.

Repair/Refurbish the equipment with a vendor

The equipment item can be sent to a vendor for repair. In this process, the following actions occur:

- Service provider sends the item to the vendor.
- Vendor repairs the item or determines that it is not repairable.
- Vendor returns the item or junks it.
- Vendor bills the service provider for item repair.

Resell the equipment item to another service provider or sell the equipment to a salvage vendor

This set of interactions is depicted in figure B.2.

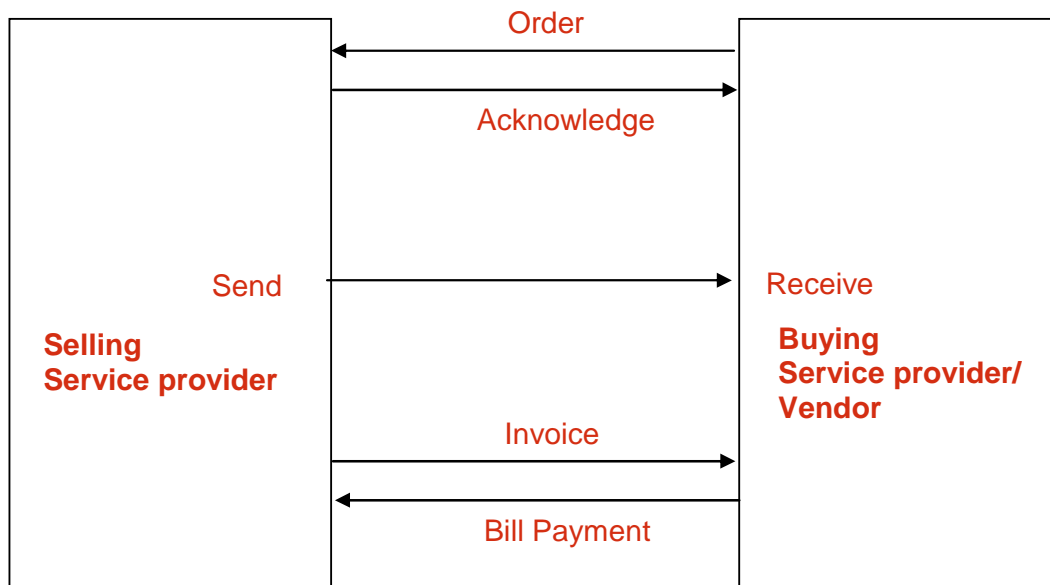


Figure B.2

History

Document history		
V1.1.1	January 2006	Publication