



## Solution Strategies of Service Fulfilment Operation Support Systems for Next Generation Networks

**Joonas Ojala, 13.11.2007**

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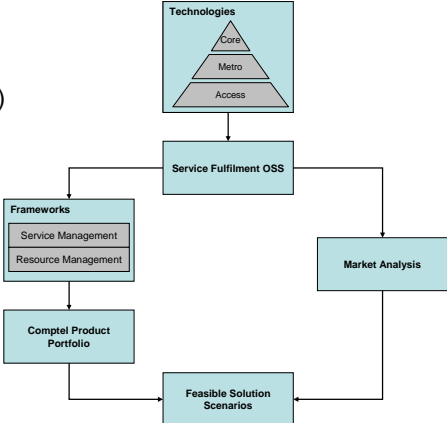
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## Content

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- Network Technologies
  - Access, metro, core
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graph TD; Technologies[Techologies: Core, Metro, Access] --> SFOSS[Service Fulfilment OSS]; Frameworks[Frameworks: Service Management, Resource Management] --> SFOSS; SFOSS --> MarketAnalysis[Market Analysis]; SFOSS --> FeasibleScenarios[Feasible Solution Scenarios]; ComptelPortfolio[Comptel Product Portfolio] --> FeasibleScenarios; FeasibleScenarios --> ComptelPortfolio;
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## Background

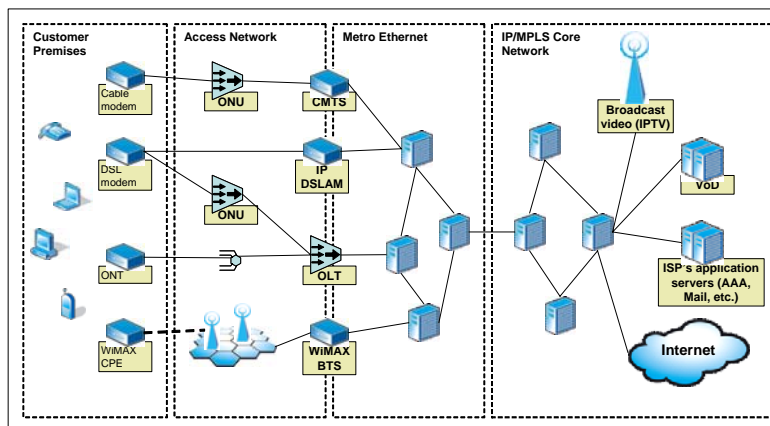
- **Problem**
  - Modern technologies will not come without a cost: ever-increasing network complexity makes for example the service fulfilment process more difficult
  - For Operation Support Systems (OSS) vendor that has a strong foothold in mobile network service activation, the shift to data networks is not trivial
- **Research questions**
  - Should Comptel strengthen its presence in NGN network service fulfilment OSS markets?
  - If yes, what are the most feasible solution scenarios from Comptel's point of view?
- **Scope**
  - Commercial Off-The-Shelf (COTS) service fulfilment OSS solutions
  - Service fulfilment in (wireline) access, metro and core networks
  - IP Multimedia Subsystem (IMS) is discussed only briefly
    - *There is not similar challenge in service fulfilment*
- **Methods**
  - Literature survey
  - Technology papers, industry reports, standardisation bodies etc.
  - Porter's Five Competitive Forces framework used in analysing the Service Fulfilment OSS industry

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## Network Technologies

- Access (FTTx, xDSL, Cable), metro (Metro Ethernet) and core (IP/MPLS) network technologies were covered

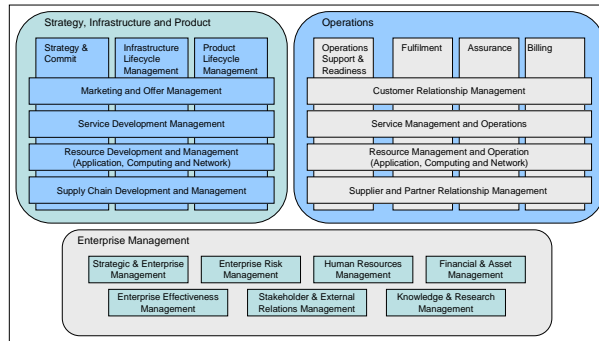


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## Operation Support Systems (OSS)

- TeleManagement Forum's (TMF) Enhanced Telecom Operations Map (eTOM) describes all enterprise processes required by a service provider
  - Also suggests potential boundaries of software components and describes the required functions, inputs and outputs for OSS products
- When service providers upgrade their operational environment, then main responsibility is usually given to system integrator (Accenture, IBM etc.), while OSS vendors provide software and expertise for some specific process/function

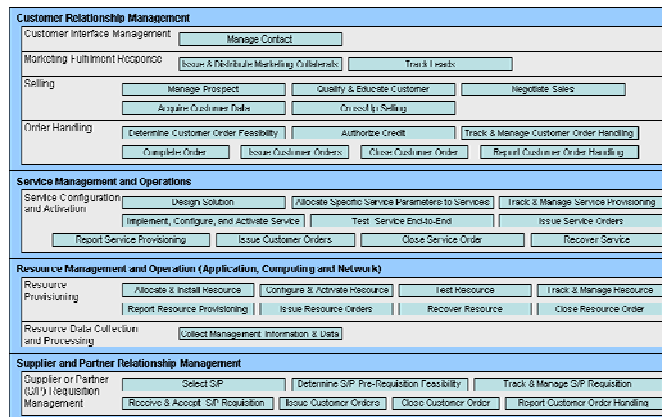


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## Service Fulfilment

- Service fulfilment refers to the complete process from receiving customer order (e.g. for broadband or business VPN) to activating and testing the service in network
- Service and resource management layers were analysed in this study



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## Resource Management

- Network provisioning: modifying network and infrastructure to create, modify or remove a subscriber's service
  - DSL activation consists of configuring routing information and selecting ports to a DSLAM and possibly to BAS (provisioning) and setting a subscriber account in an email server (activation)
- Service activation: modifying subscriber account records to create, modify or remove a subscriber's service
  - Mobile activation consists of configuring subscriber information, for example, into Home Location Register (HLR) and Voice Mail System (VMS) (activation)
- Service Fulfilment in NGN networks requires network provisioning, which means that network resources must be stored into resource management (network inventory) system
  - Modelling both NGN and legacy technologies into network inventory system can be very complex process and requires high level of flexibility from the system

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## Network Provisioning

- Requirements for Network Provisioning
  1. Allocated resources must exist
  2. Resources must not be allocated to other services
  3. Physical location of resources must be known
  4. Physical and logical connections between resources must be known
- Requires that network elements are modelled into network inventory system
- Requires extensive Network Element Interface (NEI) library from service fulfilment platform
  - NEI implementations vary a lot, because there are no commonly accepted standards
  - Many network elements are managed through Command Line Interface (CLI), which is easy for humans, but problematic to machine-to-machine communication

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## Service Management

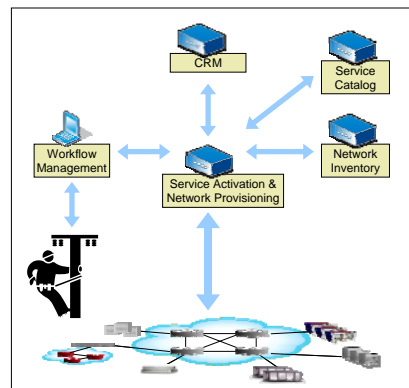
- Industry is experiencing shift from voice to data services, providing access to application and content
  - The number of services is constantly increasing, leading into need for mass customisation, better market segmentation and more complex tariff logic
- Creation of new services has been much simpler in paper than actually in the network
  - Extracting technical details from a service and activating the service in network is usually a cumbersome process to define
- Quality of Service aspects are also important, because there are some service specific requirements for bandwidth, jitter etc.
  - Service Level Agreement (SLA) vs. Service Level Specification (SLS)
- TeleManagement Forum's (TMF) Shared Information/Data (SID) and Distributed Management Task Force's (DMTF) Common Information Model (CIM) frameworks can be utilised in the process of mapping services to technical details
  - However, they neither are standards nor can be simply directly used when modelling the services in the network level

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## Comptel's Product Portfolio

- Comptel Inventory, can be used for modeling and recording the network resources.
  - Resource management
- Service Catalog, allows service providers to efficiently manage their services and create product bundles.
  - Service Management
- Comptel InstantLink (and Business Service Tool), provides the activation workflow and activation interfaces.
  - Manages the whole service fulfilment process

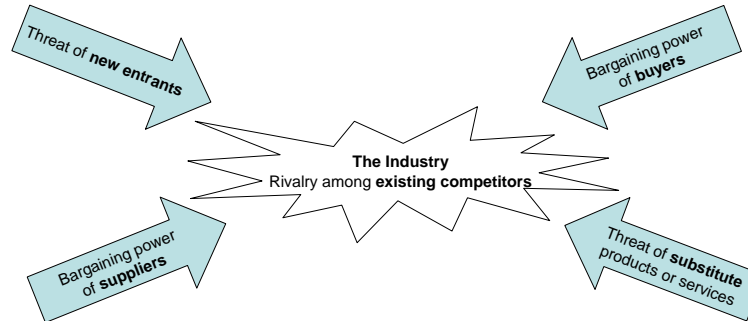


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## Service Fulfilment OSS Market Analysis

- Porter's Five Competitive Forces framework was used in analysing the risks related to entering the Service Fulfilment OSS markets



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## Risks Evaluated

- Largest obstacles are the difficulty to enter the market and rivalry among current competitors
  - Best alleviated by gaining good references from first projects and thereby strengthening partner relationships with system integrators
- Due the importance of good initial references and complexity of environment, the product scope should be set to attainable

| Threat of New Entrants                     | Risk   |
|--|--------|
| Economics of scale                         | High   |
| Product differentiation                    | High   |
| Capital requirements                       | High   |
| Switching costs                            | High   |
| Access to distribution channels            | High   |
| Cost disadvantages independent of scale    | High   |
| Government policy                          | Low    |
| Existing Competitors                       | Risk   |
| Numerous or equally balanced competitors   | Medium |
| Slow industry growth                       | Medium |
| High fixed or storage costs                | Medium |
| Lack of differentiation or switching costs | Medium |
| Capacity augmented in large increments     | High   |
| Diverse competitors                        | Medium |
| High strategic stakes                      | High   |
| High exit barriers                         | High   |

| Pressure from Substitute Products   | Risk   |
|---|--------|
| In general  | Low    |
| Bargaining Power of Buyers  | Risk   |
| Large or concentrated buyers  | High   |
| Purchased products represent a significant fraction of buyer's costs      | Low    |
| Standard or undifferentiated products                                     | Low    |
| Low switching costs   | Low    |
| Low profit buyer  | Medium |
| Buyers pose a credible threat of backward integration                     | Low    |
| Product is unimportant to the quality of the buyer's products or services | Medium |
| Buyer has full information  | Medium |
| Bargaining Power of Suppliers   | Risk   |
| In general  | Low    |

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## Solution Strategies

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- Residential broadband with Triple Play focusing on access network service fulfilment
- Metro and core network management solution for managing e.g. MPLS networks
- General network management solution for more advanced network management, including e.g. service assurance functionality

## Residential Broadband

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- Network provisioning is largely associated with broadband services because there is a direct allocation of network resource to a customer
  1. Account setup with the Internet Service Provider, Softswitches (for VoIP), interactive TV broadcast servers etc.
  2. Setup of the IP connectivity, requiring provisioning of Provider Edge (PE) routers
  3. Setup of e.g. DSL connectivity, always requiring allocation of a DSL port, but often requiring IP and Ethernet/ATM configuration
  4. In extreme cases, exchange and access network re-wiring is also required
- The offered services will vary widely depending on service provider's network environment, which makes each delivery case very different
  - High-speed Internet connectivity, VoIP, IPTV, VoD, other value-added services etc.
- Broadband access network provisioning requires rather complex workflow, which can be effectively defined using Comptel InstantLink and Business Service Tool
  - Also network inventory, containing the existing network and its available capacity for allocation to services is vital
- The main responsibility in reconstruction of service fulfilment process is usually given to system integrator
  - The partnering alternative, where the main focus would be on delivering COTS software and not that much on services, should be also evaluated

## Metro and Core Network Resource Management

- The most apparent metro or core network service that requires network provisioning is enterprise VPN
- The main focus is not only in the service activation, but also the traffic monitoring and measuring functions are very important
  - Service activation occurs quite rarely, because it is not necessary to establish VPNs as often as activate new broadband subscribers
- In order to make service fulfilment solution more applicable for metro and core network management, the general system architecture must be revised
- Implementing MPLS and Metro Ethernet specific management functions, such as establishing new LSP for traffic engineering, must be evaluated as well
  - LSPs for example are changed quite rarely. → Is there need for automatic activation and is it necessary to record such information into network inventory?
  - Most likely LSPs are only allocated per group of VLANs (etc.), so modelling and automating such process into service fulfilment system is not necessary effective

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## General Network Management

- NGN service fulfilment solution should contain features that are traditionally connected service assurance and general network management solutions
- These functions include such as ability to monitor the network, use auto-discovery to find new network elements and their configurations automatically, traffic engineering, and execute only occasional management tasks, such as setting up the routing protocols, to network elements
- While adding such functionality should be beneficial in the long run, in the first phase it would be recommended to concentrate on automating the broadband service fulfilment process
  - Both software architecture and the company expertise suites better for that
- Management of large enterprise networks and Managed Services (hosted IT services) could be also possible application areas

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## Summary of Solution Strategies

- Technologies with high utilisation rate and demand for automation, low difficulty of interface implementations and technology modelling, and low impact on system scope should be preferred
- Residential broadband solution with xDSL access, including support for Triple Play services, suites best for Comptel's current capability set and current product architecture, and therefore offers the best alternative for competitive market entry
- Strong experience with service activation encourages concentrating on commonly occurring service fulfilment actions that require high level of automation

|                                   | Technology Utilisation Rate | Demand for Automation | Difficulty of Interface Modelling | Difficulty of Technology Modelling | Impact on System Scope |
|-----------------------------------|-----------------------------|-----------------------|-----------------------------------|------------------------------------|------------------------|
| <b>Residential Broadband</b>      |                             |                       |                                   |                                    |                        |
| xDSL                              | High                        | High                  | Low                               | Medium/High                        | Low                    |
| FTTx                              | Low                         | High                  | Low                               | Medium/High                        | Medium                 |
| Cable                             | Medium                      | High                  | Low                               | Medium/High                        | Medium                 |
| Internet Subscription             | High                        | High                  | Low                               | Medium                             | Low                    |
| VoIP                              | Low                         | High                  | Low                               | Low                                | Low                    |
| IPTV                              | Low                         | High                  | Low                               | Medium                             | Low                    |
| VoD                               | Low                         | High                  | Low                               | Medium                             | Low                    |
| <b>Metro and Core Network</b>     |                             |                       |                                   |                                    |                        |
| Metro Ethernet (VLAN etc.)        | Medium                      | Medium                | Medium                            | Medium                             | Medium                 |
| MPLS (LSP etc.)                   | Medium                      | Low                   | Medium                            | Medium                             | Medium                 |
| ATM                               | Medium                      | Low                   | Medium                            | Medium                             | Medium                 |
| Frame Relay                       | Medium                      | Low                   | Medium                            | Medium                             | Medium                 |
| SDH/SONET                         | Medium                      | Low                   | Medium                            | Medium                             | Medium                 |
| VPN (VPLS, MPLS etc.)             | Medium                      | Medium                | Medium                            | High                               | Medium                 |
| <b>General Network Management</b> |                             |                       |                                   |                                    |                        |
| Traffic Engineering               | Medium                      | High                  | High                              | High                               | High                   |
| Network Monitoring                | High                        | High                  | High                              | High                               | High                   |
| SLA                               | Medium                      | High                  | Medium                            | High                               | High                   |
| Auto-Discovery                    | Medium                      | High                  | High                              | High                               | High                   |

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## Conclusions

- Service fulfilment OSS sector will grow
- It is an interesting investment opportunity with present conditions
- Comptel can reduce market risks through
  - product differentiation
  - building up a very good reputation among first customers
- Scope of the service fulfilment solution should be extended in the following order:
  1. residential broadband, including IP services
  2. metro and core network management
  3. general network management

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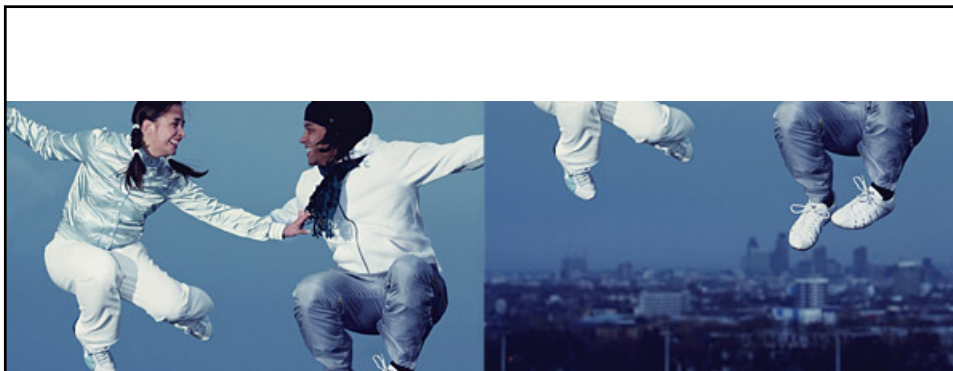
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## Criticism and Future Research

- Study offers a good overview to the technologies and frameworks that are required for constructing NGN service fulfilment solution
- Also the current state of service fulfilment OSS industry is quite well covered
- However, the study is quite theoretical and contains many assumptions
  - Studied OSS industry is currently in the state of flux and therefore the literature is either non-existent or disorganised
  - Concentrating on more domain specific topic, such as service fulfilment for residential broadband, could have been beneficial
    - Including a case study and interviews covering service providers' requirements for service fulfilment OSS
    - Would have dramatically extended the scope
- It is recommended to implement the mentioned case study in order to increase the domain specific knowledge and expertise

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# THANK YOU

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