OPEX reduction through GMPLS/ASON
- a business case study

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Motivation

- ASON/GMPLS often promoted as a key technology to reduce OPEX and CAPEX
- Few studies on OPEX so far
- We quantify the cost reduction potential of ASON/GMPLS
Outline

- Defining OPEX
- Process-based OPEX modelling
  - Approach
  - Typical processes
  - ASON/GMPLS modified processes
- Quantitative results
  - Service provisioning
  - Overall OPEX
- Analysis and conclusions
Defining OPEX

Total expenditures of a company

- Capital expenditures: CAPEX
  - Contribute to fixed company infrastructure
  - Depreciated over time
  - Purchase of land and buildings
  - Network infrastructure
  - Software

- Operational expenditures: OPEX
  - Cost to keep company operational
  - Do not contribute to infrastructure itself, not subject to depreciation
  - Rented and leased infrastructure
  - Personnel wages

Network operator
OPEX subparts

q Network operation
   – For a network which is up and running
   – Maintenance, service provisioning, etc.

q Equipment installation
   – First time installation costs
   – Up-front planning

q General OPEX
   – Non-telco specific infrastructure and administration
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   – Service provisioning
   – Overall OPEX

q Analysis and conclusions
Approach

q Formal description of network operations
   – Identify generic processes
   – Modelling

q Changes expected with ASON/GMPLS
   – Qualitative and quantitative variation

q Relate to total OPEX
   – Network scenario
   – Relative weight of each OPEX category
Operational processes

- Continuous and recurring processes
  - Continuous cost of infrastructure
  - Routine operations, maintenance
  - Reparation
  - Operational network planning
  - Marketing

- Service management processes
  - Service offer
  - Service provisioning
  - Service cessation
  - Service move or change
Service management processes

q Service offer
   – The operator makes an offer at the customer’s request

q Service provisioning
   – According to the terms of the contract, physical delivery of the service is carried out

q Service cessation
   – Contract update, coordination between new service setup and release of the previous service.

q Service move or change
   – End of the contract, release of the connection and recovery of equipment
Service offer

Dr. Andreas Iselt (Siemens AG) – IST project NOBEL
Service provisioning
Service cessation

- Customer:
  - Request Cessation
  - Receive Cessation information

- Sales:
  - Assess Request
  - End of contract
  - Confirm Cessation

- Administration:
  - Generate Final Bill

- Project Management:
  - Create Work packages
  - Send Information of Cessation
  - Close Cease Order

- Network Operation Local Domain:
  - Deactivate Circuit / Switch Off
  - Physical Recovery of Equipment

- Network Operations Other Domains:
  - Deactivate Circuit / Switch Off
  - Physical Recovery of Equipment

- External Suppliers:
  - Deactivate Circuit / Switch Off
  - Physical Recovery of Equipment
Service move or change

q Combination of services
  – Prepare offer for “new“ service
  – provisioning of new service
  – Cessation of previous service

q Requires additionnal coordination
  – Common resources
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NMS: Current Limitations

q OTN currently operated by NMS
  – Administration & maintenance
  – Centralized provisioning

q NMS are widespread but
  – Manual configuration
  – Human communication
  – Limited to a domain
  – Lack of standardized interfaces
GMPLS/ASON: Expected improvements

- **Compatibility between different domains**
  - Standardized interfaces (UNI, NNI)

- **Automatic configuration of connections**
  - Call control, connection control

- **Service Level Agreement (SLA)**
  - Unified set of service classes
## Automated service provisioning

<table>
<thead>
<tr>
<th>Client</th>
<th>Signaling</th>
<th>Acknowledgement</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Sales</td>
<td>UNI</td>
<td></td>
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<tr>
<td>Administration (Databases)</td>
<td></td>
<td></td>
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<tr>
<td>Project Management</td>
<td>Call Control</td>
<td>Response OK?</td>
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<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
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<tr>
<td>Network Operation Local Domain</td>
<td>RSVP Signaling</td>
<td>Manual Intervention</td>
</tr>
<tr>
<td>Network Operation Other Domain</td>
<td>RSVP Signaling</td>
<td></td>
</tr>
<tr>
<td>External Supplier</td>
<td>RSVP Signaling</td>
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</tbody>
</table>
## Automated service cessation

<table>
<thead>
<tr>
<th>Customer</th>
<th>Request Cessation</th>
<th>Receive Cessation information</th>
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</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td></td>
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<tr>
<td>Assess Request</td>
<td>End of contract</td>
<td>Confirm Cessation</td>
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<tr>
<td><strong>Administration</strong></td>
<td></td>
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<tr>
<td>UNI</td>
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<td>Generate Final Bill</td>
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<tr>
<td><strong>Project Management</strong></td>
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<tr>
<td>Call Control</td>
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<tr>
<td><strong>Network Operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INI</td>
<td>Deactivate Circuit / RSVP signaling</td>
<td>ENNI</td>
</tr>
<tr>
<td><strong>Network Operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Domains</td>
<td>Deactivate Circuit / RSVP signaling</td>
<td>ENNI</td>
</tr>
<tr>
<td><strong>External Suppliers</strong></td>
<td>Deactivate Circuit / RSVP signaling</td>
<td>ENNI</td>
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## SLA Negotiations

<table>
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<tr>
<th>Client</th>
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<td>Inquiry</td>
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<table>
<thead>
<tr>
<th>Sales</th>
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<tbody>
<tr>
<td>Evaluate Inquiry</td>
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<tr>
<td>Price Calculation in Coverage Map</td>
</tr>
<tr>
<td>Prepare Offer</td>
</tr>
<tr>
<td>Yes</td>
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<tr>
<td>Price Calculation</td>
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<tr>
<td>Negotiations</td>
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<tr>
<td>No</td>
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<tr>
<td>Negotiations</td>
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<table>
<thead>
<tr>
<th>Administration (Databases)</th>
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<tbody>
<tr>
<td>Generate Requests</td>
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<tr>
<td>Projecting Results Cost Calculation</td>
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<tr>
<td>Project coordination</td>
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<tr>
<td>Customer Care</td>
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<td>Billing</td>
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<td>Generate Requests</td>
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<td>Project coordination</td>
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<tr>
<th>Network Operation Local Domain</th>
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<tbody>
<tr>
<td>Availability Check (Plan)</td>
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<tr>
<td>Install</td>
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<table>
<thead>
<tr>
<th>Network Operation Other Domain</th>
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<tbody>
<tr>
<td>Provide offer for service segment</td>
</tr>
<tr>
<td>Install</td>
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<th>External Supplier</th>
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<td>Install</td>
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Quantitative Results

- Focus on labour costs
- Assign duration (hours) to the activities, and probabilities to the decisions
- Estimate hourly wages for each employee category
- Sum up costs for all steps
  - Gives an upper bound estimate of a given process
- Figures obtained by means of surveys and interviews
First analysis

q Reveals two types of operators

- „Incumbent“
  - More hours for sales, administration and management
- And so called „new entrant“
  - Lower figures for these, the rest remaining in the same range
  - Due to
    - smaller network to maintain
    - Fewer types of services offered
Incumbent

- Nearly as expensive as service delivery
- Less management and operations
- SLA negotiations more expensive
- Consider offer+delivery
New Entrant

Processes are cheaper
- Less administration and management (smaller network)
- But less types of services
- Need for external supplier
  - Rental costs
  - Tests at interconnection point

ASON processes
- Cheaper
- In the same proportion
Overall OPEX

q Significant impact on OPEX related to service management

q How does it relate to other OPEX subparts?
Estimating yearly OPEX – input data

- Reference network
  - WDM network
  - 2.5 Gbps leased lines

- Traffic
  - Figures of reference network for 2004
  - Leads to a total of 1214 services in one year
  - 80% of services are standard

- Equipment
  - MTBF, life time

- Failure probabilities
  - Alarm types: preventive alarms, failure alarms
  - Failure types: external, hardware, misconfiguration/software, etc.
Estimated number of failures

- Architecture
- Topology
- Traffic

→ Dimensioning

- Failure probabilities
- Equipment MTBF

Repair process

1171 failures
749 preventive alarms

Routine operation process
Yearly OPEX

![Bar chart showing yearly OPEX categories: routine operation, repair process, service offer, service provisioning. The chart compares traditional and GMPLS methods. The y-axis represents costs in €10^6.]
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Conclusion

q Most network operator‘s processes are similar and can be modelled quite generically

q When looking at typical effort
   – Major differences between incumbent and „new entrants“
   – Lighter business processes, but interactions with external suppliers

q OPEX effort and cost reduction in the order of 50% for both types
Thanks for your attention

Questions?

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