Session 9

Use and Applications of NGN Network Planning Tools

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Presentation content

- NGN requirements to the planning domains
  (referenced in ITU GNPT document)
- Fixed Network Planning Tools
  (referenced in ITU NP Manual)
- Radio Planning Tools
  (referenced in ITU NP Manual)
- ITU validation process for planning tools
  ✓ Case study of Planning Broadband Access
  ✓ Study of Planning Fixed BWA
Planning Domains for top level Requirement Specifications

-requirements are organised by 8 planning domains derived from planner needs and networking problems

- minimise the number of tools to be applied and facilitate their interrelations

Fixed Access Planning - OnePlan Access™

Provides geo-market forecasting, access network design and some economic analysis

Requirements for NGN planning:

• Modeling of future NGN access network equipment, including equipment parameters, technological constraints, costs structures

• Extending of the forecasting models and methods due to NGN service/customer requirements

• Adapting of the calculation modules to the NGN access network requirements
Fixed Switching And Routing Planning - OnePlan Distribution™ & OnePlan IP™

Calculates traffic matrices, plans IP network capacity, provides topology checks and bottleneck identification.

Requirements for NGN planning:
- Service demands characterisation and traffics for VoIP and NGN multi-service flows
- Device catalogue covering most typical NGN technologies
- Modelling of most typical routing flows and implementing of corresponding routing methods

Transmission Planning - OnePlan Transport™

Performs analysis of Link/node failure, studies network survivability, models SDH/SONET/Ethernet/WDM.

Requirements for NGN planning:
- Device catalogue covering Next Generation SDH technologies
- Formation of optical networks
- Capability to model IP over SDH and IP over WDM
- Modelling architecture and capabilities of Ethernet mesh topology and Ethernet ring topology
Radio Access and Core Planning - LStelcom MULTILINK

Performs interactive microwave link engineering, designs radio access networks, plans wireless broadband networks

Requirements for NGN planning:
• Modeling of future NGN access network equipment, including equipment parameters, technological constraints, costs structures
• Adapting of the calculation modules to the NGN access network requirements

ITU validation process for planning tools

Purpose: Validation of Network Planning Tools for Developing Countries and Countries with economies in transition

- Compliance with the technical requirements specified in the ITU Guidelines for Network Planning Tools
- Performance of the planning tool in terms of size of the network and time to execute typical planning cases
- Creation of Set of real data reference networks
Study of Planning Fixed BWA

Project Description
- BWA Network to provide fast Internet
- 3.5 GHz band (WiMAX)
- Two different Scenarios
  - Scenario 1: *Rural Area*
  - Scenario 2: *Urban Area*

Presented on ITU-BDT Regional Network Planning Workshop with Tool Case Studies for the Arab Region Cairo, Egypt, 16 – 27 July 2006

Planning Fixed BWA - “Rural Area”
- Valley, villages
- Lower average income
- Lower penetration of home computers
- Fewer business
- No DSL via cable available, “no competition”
- Residential-dominated market
- Outdoor coverage (using outdoor antenna)
- Large cell sizes
- Existing core network / microwave link for backhaul
- Data Rate: >1.0 Mbit/s
Planning Fixed BWA - “Urban Area”

Urban Area

- Major city, high-rise buildings
- Many potential broadband customers
- High penetration of home computers
- Many business users
- Cable and/or DSL available, strong competition
- Residential & business market
- Indoor coverage dominant
- Small cell sizes
- Extension (more capacity) of existing or new core network necessary
- Data Rate: >2.5 Mbit/s, 1Mbit/s

Planning Guideline Parameters - “Rural Area”

- Based on existing sites
- Tx antenna height: 20m above ground
- Receiver height: 2.5 / 5.0 / 9.0 m
- Medium Resolution Data (25m / 50m)
  - based on 2 different files:
  - Digital Terrain Model, elevation of earth-surface
  - Digital Clutter Model, describing land use above terrain
  - Provide no building heights
Planning Fixed BWA - “Rural Area”

Rural Scenario

Coverage Plot

blue: outdoor 1Mbit/s
yellow: indoor 1Mbit/s
red: indoor 2.5Mbit/s

Suburban Scenario

Coverage Plot

blue: outdoor 1Mbit/s
yellow: indoor 1Mbit/s
red: indoor 2.5Mbit/s

Planning Guideline Parameters - ”Urban Area”

- “Greenfield” planning, fictive sites
- Tx antenna height: 3m above rooftop
- Receiver height: 2.5 / 5.0 / 9.0 m

- High Resolution Data (1m / 5m)
- Digital Elevation Model, elevation of earth surface + building heights
- Sat-Image, 1m resolution
- Provide details of buildings
**Planning Fixed BWA - ”Urban Area”**

Urban Scenario

*Sub-Scenario 1: Basic coverage*

*Sub-Scenario 2: Extended indoor coverage*

<table>
<thead>
<tr>
<th>Covered Households</th>
<th>Base-Stations</th>
<th>Indoor</th>
<th>Outdoor</th>
<th>Total</th>
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</thead>
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<tr>
<td>Scenario 1</td>
<td>16</td>
<td>34 %</td>
<td>36 %</td>
<td>70 %</td>
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<tr>
<td>Scenario 2</td>
<td>60</td>
<td>65 %</td>
<td>30 %</td>
<td>95 %</td>
</tr>
</tbody>
</table>

**Case study of Planning Broadband Access**

**Description**

- Broadband access
- Urban/suburban area
- Two different Scenarios
  - Scenario 1: xDSL
  - Scenario 2: BWA (WiMAX)

*Presented on the ITU/BDT Regional Seminar on Mobile and Fixed Wireless Access for Broadband Applications for the Arab Region, Algiers (Algeria) 19-22 June 2006*
Case study - Planning process

Case study – services and customers definition

- Permanent BB service – BB connection at 1 Mbit/s
Case study - Service Area definition

- Average BB penetration from 10% to 70% and strategy for 20% of the market

Case study - Technology Definition
Case study – planning of DSL access network

Optimization of access node number/locations and service areas

Case study – planning of wireless access network

Planning of market/technology and transfer of data to radio planning tool
Case study – planning of wireless access network

Max server coverage: calculation and improvement

Transfer of results from radio planning tool for costing of the network
Case study - Economic Analysis

Wireless access network

Comparison of DSL and Wireless access network