ITU-T/ITU-D Seminar on Standardization and Development of NGN for the Arab region

Session 9

Use and Applications of NGN Network Planning Tools

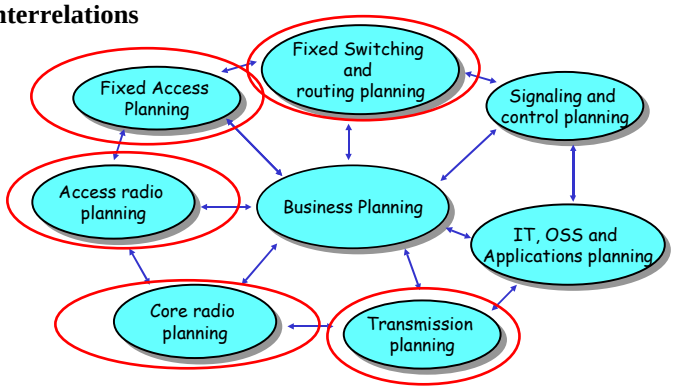
Ignat Stanev
ITC, Bulgaria

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**



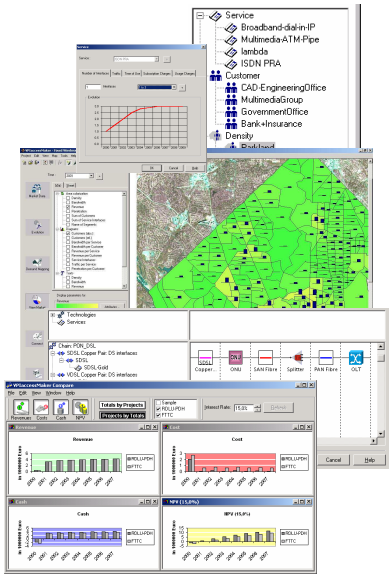
GNPT for Developing Countries and Countries with economies in transition, ITU, Geneva, 2005

Fixed Access Planning - *OnePlan Access™*

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

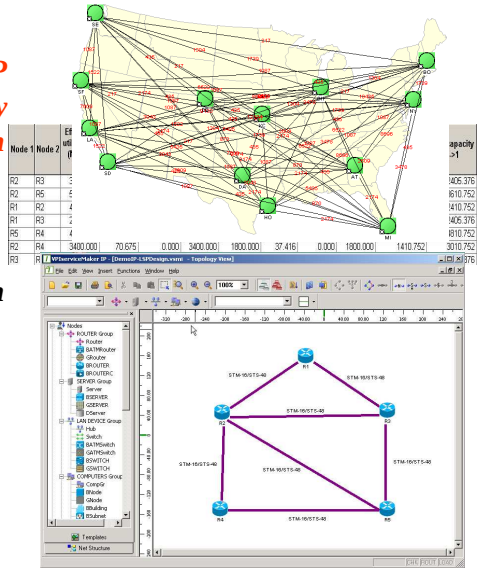
Requirements for NGN planning:

- *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

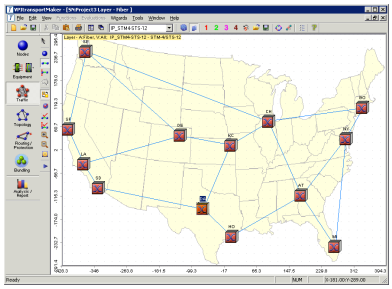


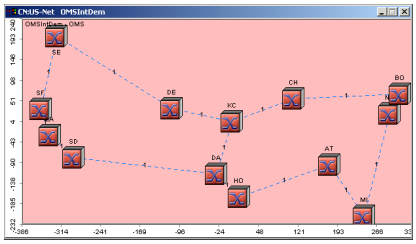
Requirements for NGN planning:

- *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



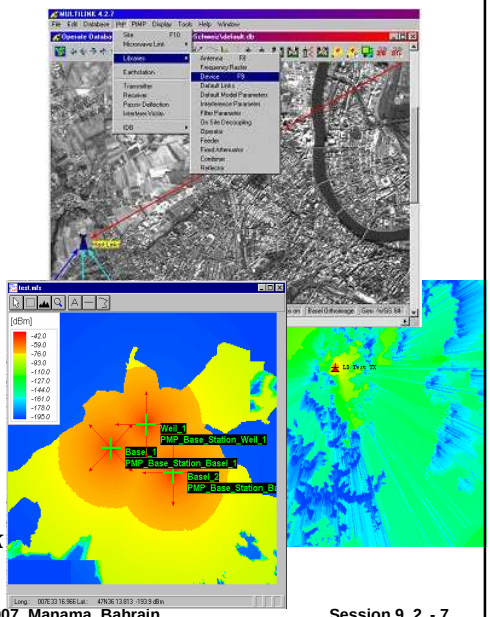


Requirements for NGN planning:

- *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

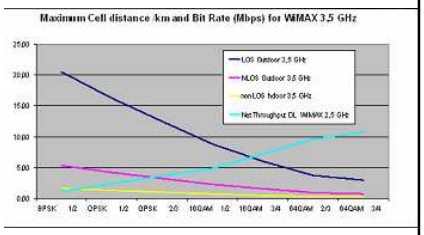
Purpose: Validation of Network Planning Tools for Developing Countries and Countries with economies in transition

- **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**
- **Crating 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"

Rural Area

Suburban Area

- 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”

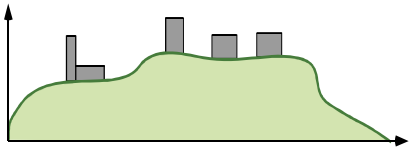
Urban Area

- 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

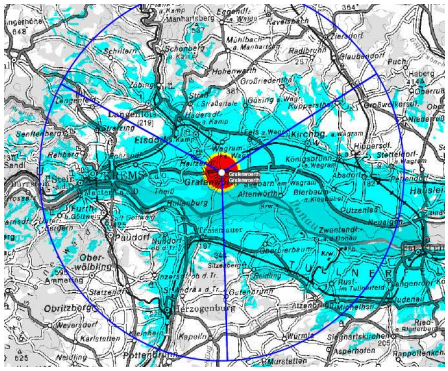


- **Medium Resolution Data** (25m / 50m)
- based on 2 different files:
- Digital Terrain Model, elevation of earth-surface
- Digital Clutter Model, describing land use above terrain
- Provide no building heights

Planning Fixed BWA - “Rural Area”

Rural Scenario

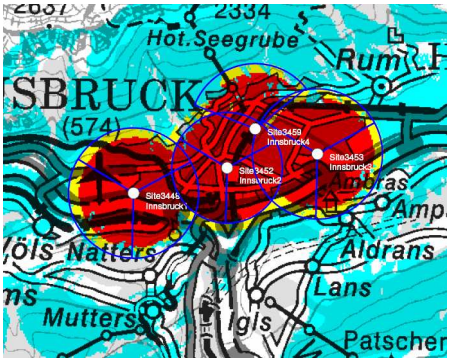
Coverage Plot



blue: outdoor 1Mbit/s
yellow: indoor 1Mbit/s
red: indoor 2,5Mbit/s

Suburban Scenario

Coverage Plot

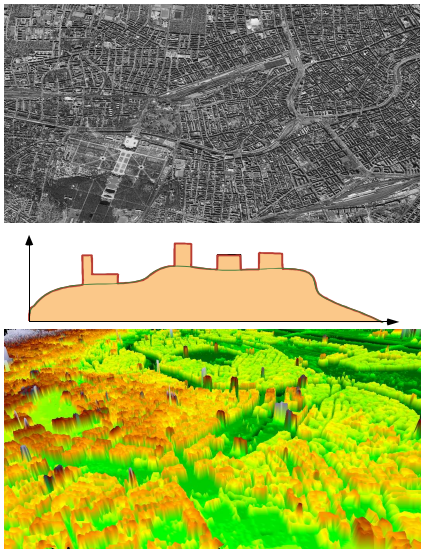


blue: outdoor 1Mbit/s
yellow: indoor 1Mbit/s
red: indoor 2,5Mbit/s

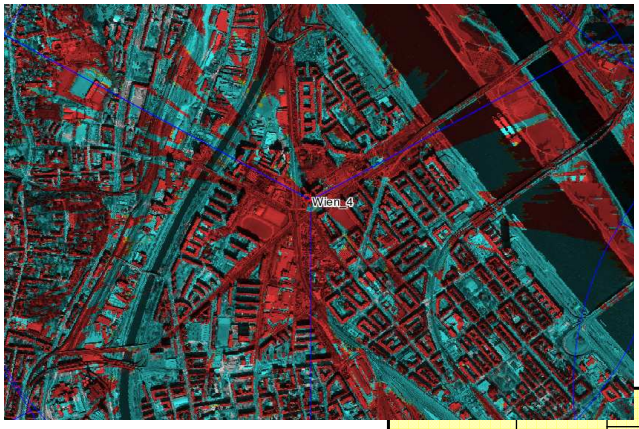
Planning Guideline Parameters - ” Urban Area”

- “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

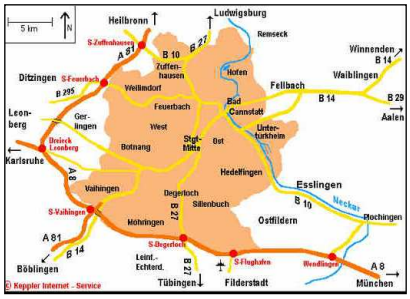
Sub-Scenario 2:
Extended indoor coverage

		Covered Households		
	Base-Stations	Indoor	Outdoor	Total
Scenario 1	16	34 %	36 %	70 %
Scenario 2	60	65 %	30 %	95 %

Case study of Planning Broadband Access

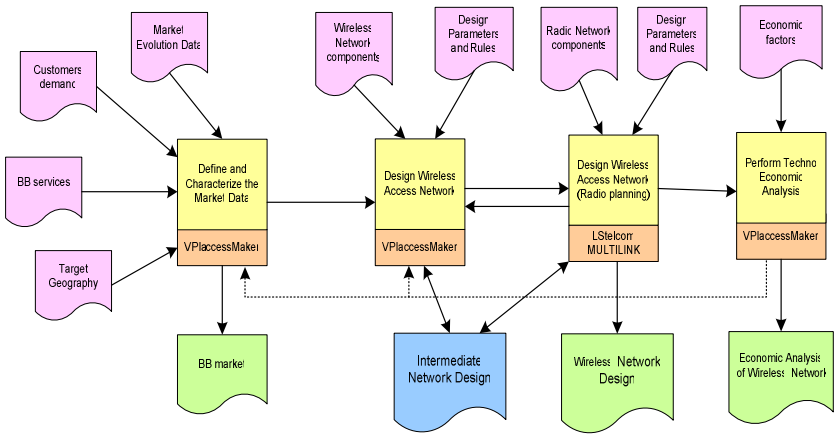
Description

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

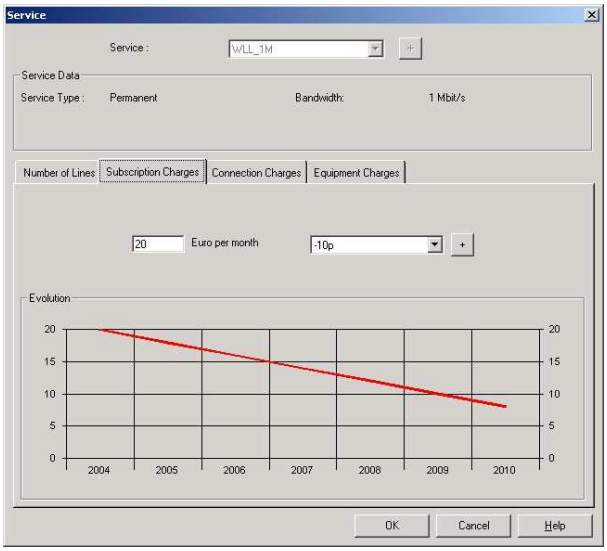


Presented on the ITU/BDT Regional Seminar on Mobile and Fixed Wireless Access for Broadband Applications for the Arab Region, Algiers (Algeria) 19-22 June 2006

Case study - Planning process

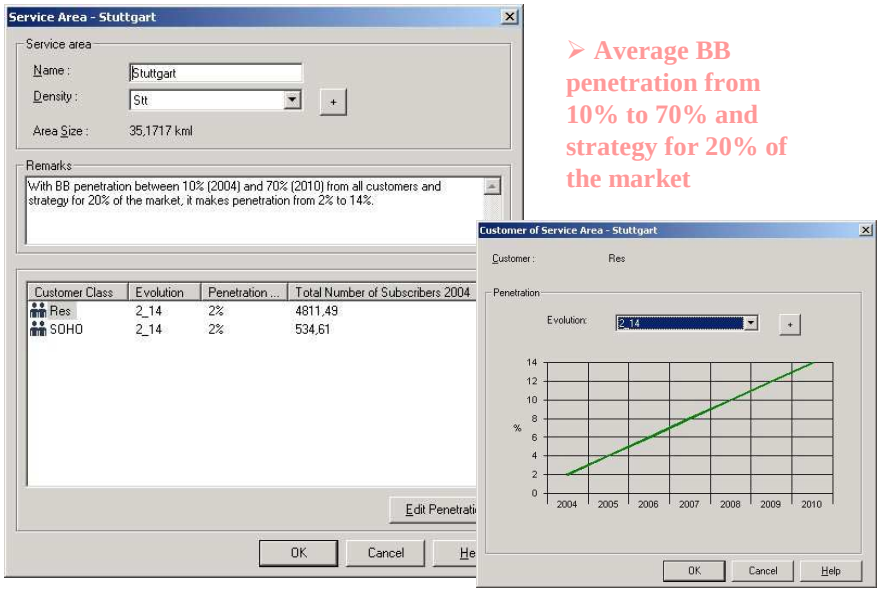


Case study – services and customers definition



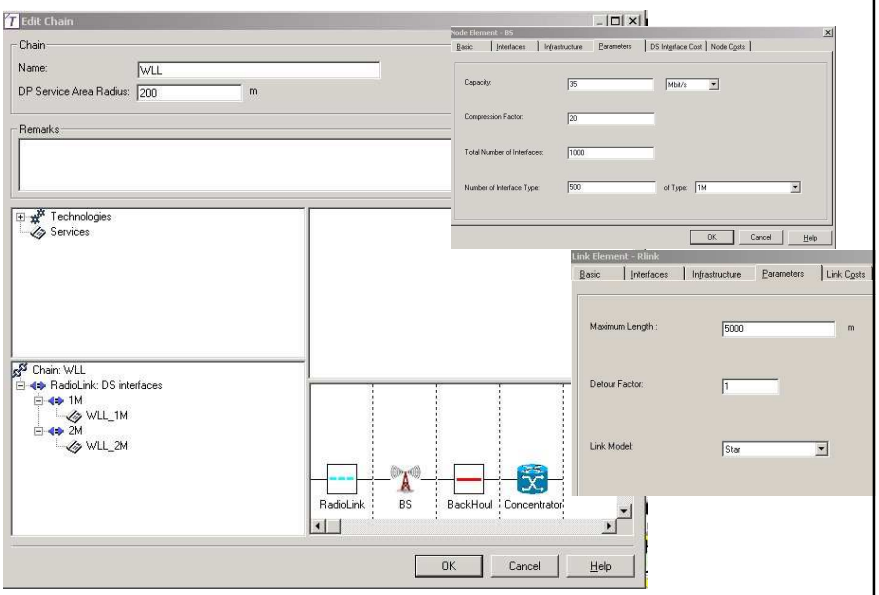
- **Permanent BB service – BB connection at 1 Mbit/s**

Case study - Service Area definition

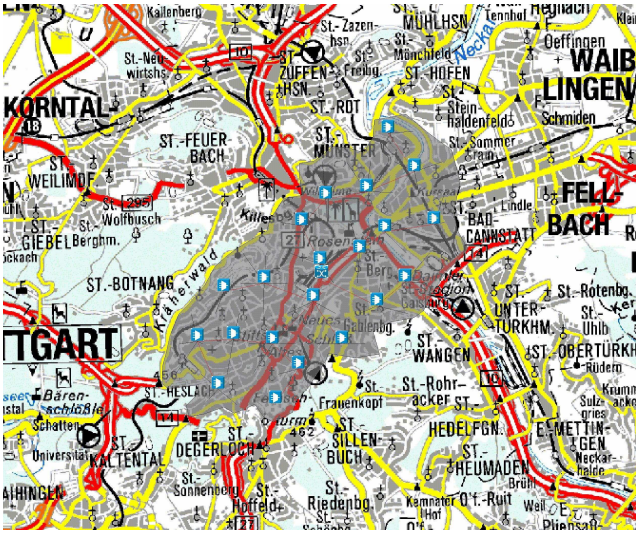


- Average BB penetration from 10% to 70% and strategy for 20% of the market

Case study - Technology Definition

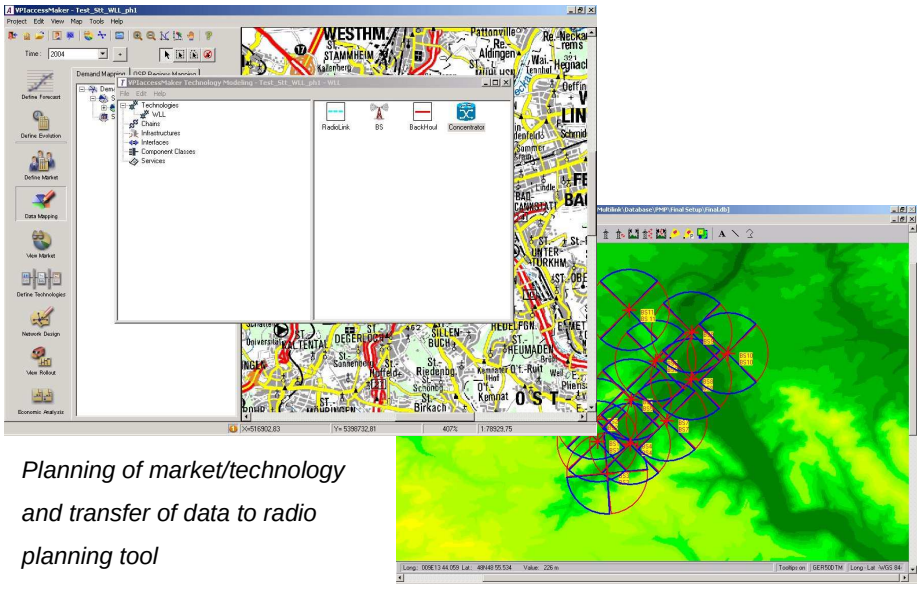


Case study – planning of DSL access network



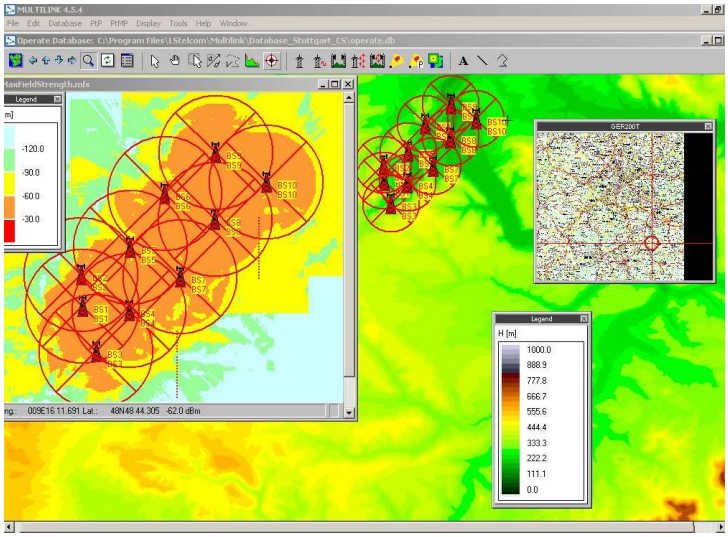
Optimization of access node number/locations and service areas

Case study – planning of wireless access network



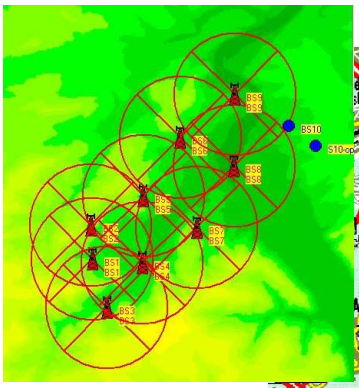
Planning of market/technology and transfer of data to radio planning tool

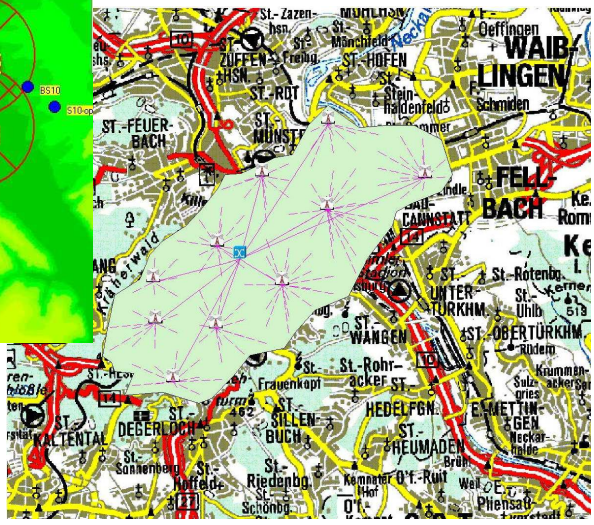
Case study – planning of wireless access network



Max server coverage : calculation and improvement

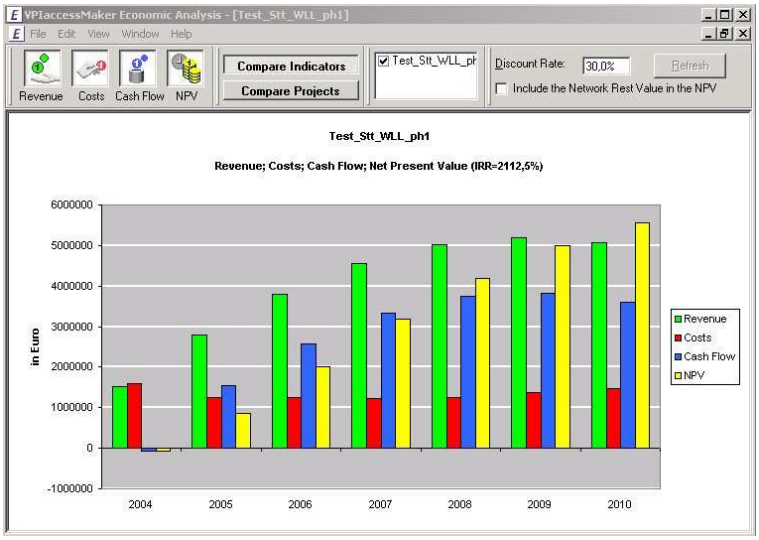
Case study – planning of wireless access network





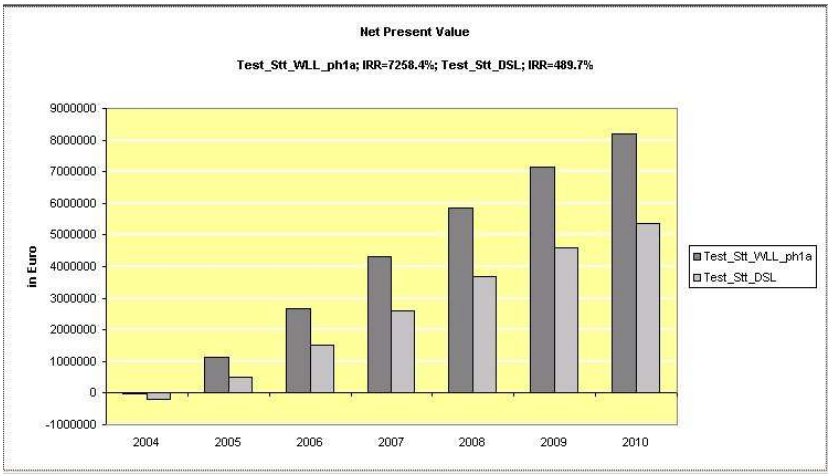
Transfer of results from radio planning tool for costing of the network

Case study - Economic Analysis



Wireless access network

Case study - Economic Analysis



Comparison of DSL and Wireless access network