

**ITU/ITC Regional Seminar on Network Evolution to NGN  
and Fixed Mobile Convergence**

**Session 2.1.4**

**Case study**

**Planning of different broadband  
solutions in the last mile for urban and  
suburban areas**



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ITU/ITC Regional Seminar

Moscow (Russia), 27-30 April 2004

Session 2.1.4 - 1

**Planning of different broadband solutions in  
the last mile for urban and suburban areas :**

- ❖ **The ongoing evolution of the present networks to NGN as well as the invasion of the market from new operators and service providers implementing the latest technological solutions makes the precise network planning and optimisation necessary task and important instrument**
- ❖ **There are different possible broadband solutions for the so-called last mile of the network, especially for urban and suburban areas**
- ❖ **Through careful planning of the different alternatives and comparison of the corresponding economical consequences the best long-term solution could be taken**

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Session 2.1.4 - 2

## **Case study objectives :**

- ❖ **This case study intends to present the planning process that needs to be performed for evaluation of different broadband solutions in the last mile for urban and suburban areas**
- ❖ **Special attention is drawn on the wireless technological solutions, which include additional network optimization with regard to evaluation and optimization of the terrain coverage**

## **Case study includes several phases :**

- ❖ **Geographical data processing (e.g. from raster maps), services definition, market segmentation and customer mapping**
- ❖ **Technology definition in terms of infrastructure, node and link elements, necessary interfaces, capacity limitations, maximum distances allowed, etc.**



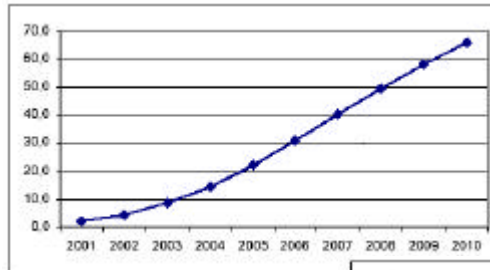
## Case study - area :

Name	Abr.	Capital	A (km2)	C 1987-05-25	E 1996-01-01	E 2002-01-01
< Freiburg	RB BW	Freiburg	9,357	1,869,032	2,087,042	2,156,851
< Karlsruhe	RB BW	Karlsruhe	6,919	2,395,523	2,644,430	2,701,376
< Stuttgart	RB BW	Stuttgart	10,558	3,491,787	3,862,311	3,964,162
< Tübingen	RB BW	Tübingen	8,918	1,530,045	1,725,584	1,778,517
< Baden-Württemberg	BW BL	Stuttgart	35,752	9,286,387	10,319,367	10,600,906
Germany	DEU	Berlin	357,022	77,718,000	81,817,499	82,440,137

## Case study - population data :

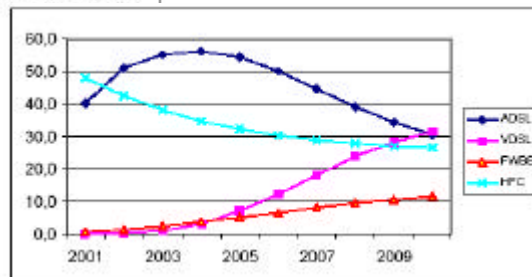
	Name	C E 2002-01-01
1	Stuttgart	567,452
2	Mannheim	308,385
3	Karlsruhe	279,578
4	Freiburg	208,294
5	Heidelberg	141,509
6	Heilbronn	120,163
7	Ulm	118,347
8	Pforzheim	118,002
9	Reutlingen	111,338
10	Esslingen	90,905
11	Ludwigsburg	87,502
12	Tübingen	82,444
13	Villingen-Schwenningen	81,691
14	Konstanz	79,240
15	Aalen	66,559
16	Schwäbisch Gmünd	61,873
17	Sindelfingen	60,878
18	Offenburg	58,280
19	Friedrichshafen	57,538
20	Göppingen	57,536
21	Baden-Baden	53,084
22	Waiblingen	52,536

## Case study - services :



*Broadband penetration forecasts for the residential market of West European countries*

*Market share evolution of ADSL, VDSL, FWBB (Fixed wireless broadband) and HFC/cable modem*



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Session 2.1.4 - 9

## Planning tools - VPIaccessMaker Markets

### Market definition

- ✓ Define services classes (service nature, bandwidth, SLA)
- ✓ Create customer classes (service mixes, tariffs, lines)
- ✓ Define density classes (as mixes of customer classes)
- ✓ Define planning period

### Evolution forecasting

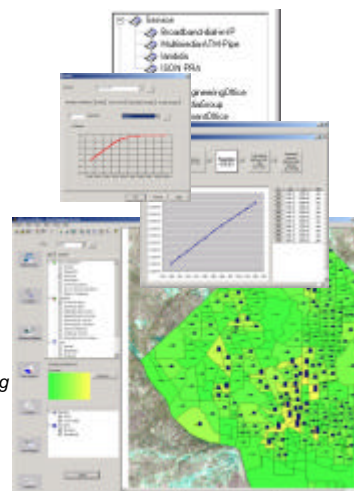
- ✓ Tariffs
- ✓ Market penetration and traffic prediction
- ✓ Component costs

### Demand mapping

- ✓ Import maps
- ✓ Define service areas (sub urban, down town, etc)
- ✓ Geometrical modeling of service areas & site locations
- ✓ Model in-building networks
- ✓ Define outside plant cost regions for accurate cost modeling
- ✓ Import/ export market demands

### Geomarketing results

- ✓ Extensive and flexible user defined query system
- ✓ Results are displayed on the GIS (selected year)
- ✓ Results are displayed on annual tables & charts



*Market capture for a service provider*

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Moscow (Russia), 27-30 April 2004

Session 2.1.4 - 10

## Planning tools - VPIaccessMaker Technologies

### Technology modeling

- ✓ Specification of network infrastructure
- ✓ Specification of network elements
- ✓ Specification of interfaces (upstream, downstream)
- ✓ Planning rules (bandwidth, distances, topology)
- ✓ Chains of nodes and links for topology modeling



### Network design optimization

- ✓ Optimize clustering to satisfy bandwidth requirement
- ✓ Support of multiple technologies and constraints
- ✓ Cost regions
- ✓ Support of star and tree network topologies
- ✓ Considers legacy infrastructure



Modeling a PON network deployment in a city center

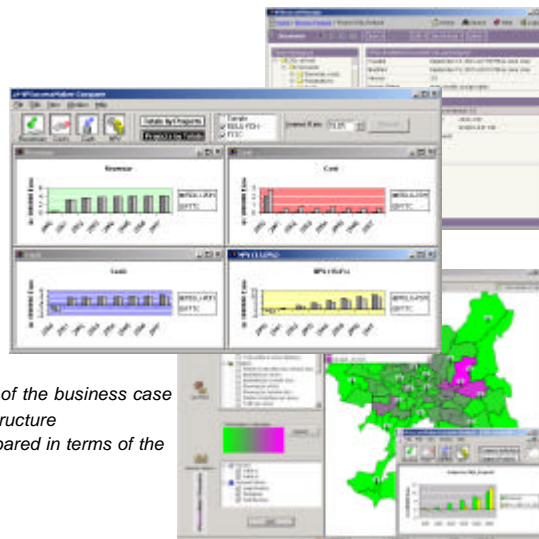
### Roll-out results

- ✓ Calculate automatically all network costs
- ✓ Each element has its own set of results
- ✓ Multiple roll-out with different technologies
- ✓ Bill of materials
- ✓ Results are displayed on the GIS and tables / charts

## Planning tools - VPIaccessMaker Economics

### Financial calculations

- ✓ Project revenues
- ✓ Project cost structure
- ✓ Project cash-flows
- ✓ Project net present value



### Scenario analysis

- ✓ Full geographical visualization of the business case
- ✓ Specification of network infrastructure
- ✓ Various scenarios can be compared in terms of the main economics indexes
- ✓ All data exportable to Excel

Return on investment from a deployment in a metro area

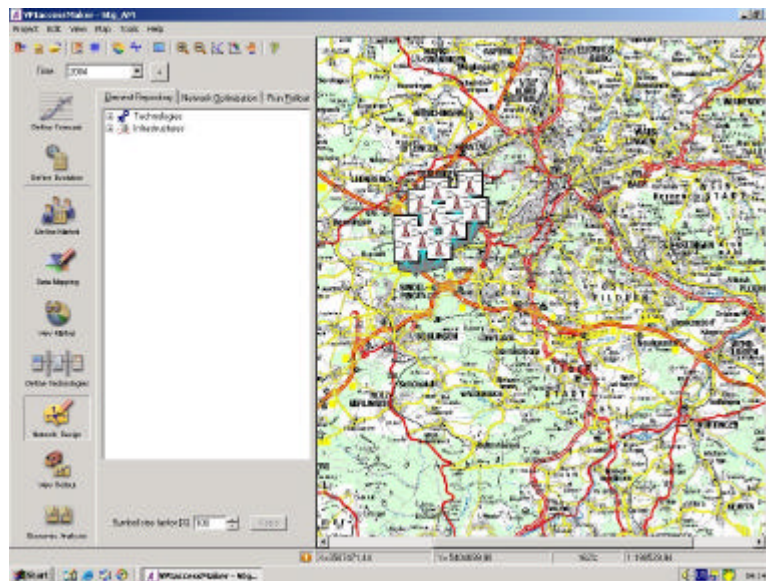
## Planning tools - LStelcom MULTlink

*MULTlink is a complete solution for fast microwave link engineering and designing of PMP/WLL/LMDS networks.*



*It can be used for planning and optimizing single links (e.g. path loss, coverage and availability calculations) as well as for doing network-wide analysis (e.g. interference calculation, channel assignment).*

## Planning process - VPIaccessMaker



## Summary

- **This case study presents the planning process that needs to be performed for evaluation of different broadband solutions in the last mile for urban and suburban areas**
- **Through careful planning of the different alternatives and comparison of the corresponding economical consequences the best long-term solution is taken.**
- **The whole case study is performed with NP tools operating on real data. The highly professional NP tools are provided by companies, partners of ITU in the network planning programs and activities.**