"FFTx: Learnings from West European and Emerging Markets"

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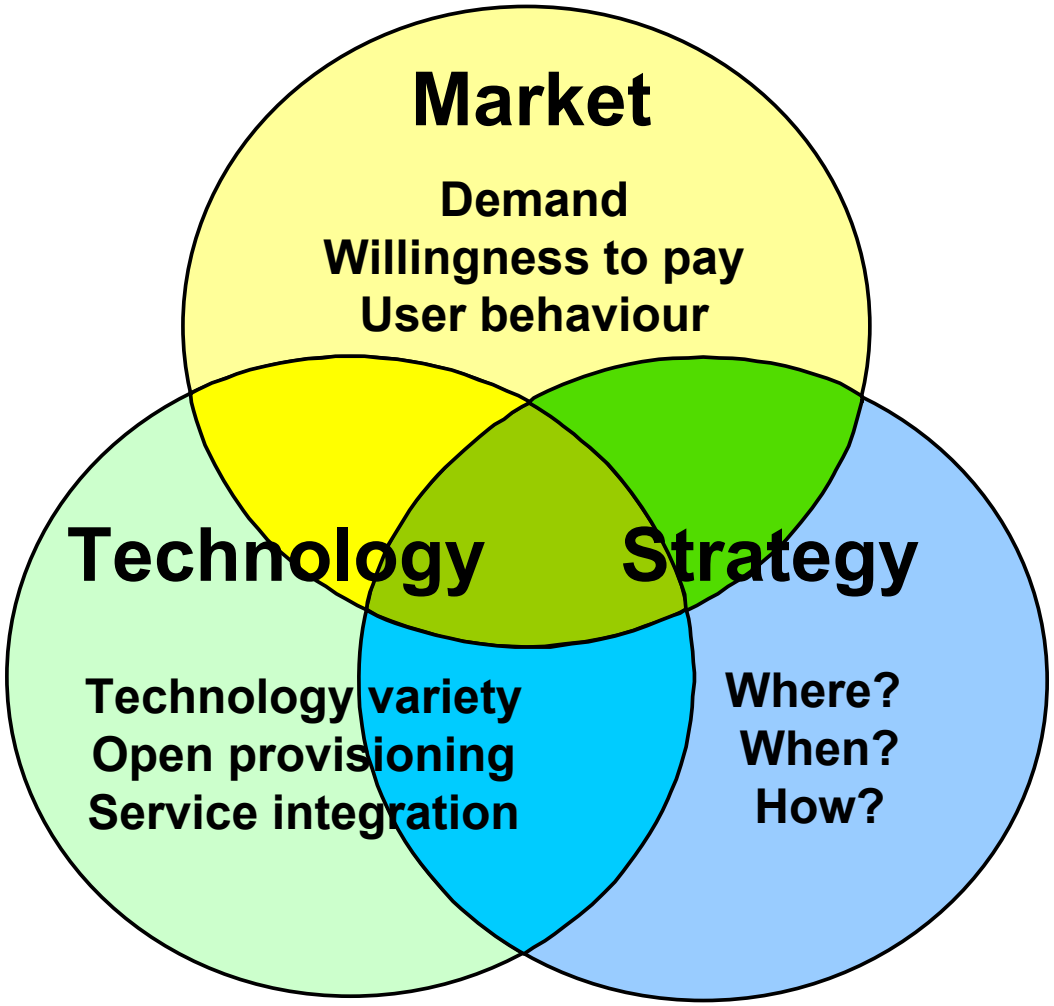
Abstract

In this presentation, a techno-economic evaluation of the business prospects of a wide scale deployment of FTTx as a last-mile solution is carried out. The evaluation is based on a Techno-Economic (TE) tool which, taking into account network topology, area characteristics, service demand and price evolution forecasting estimates key economic figure-of-merits.

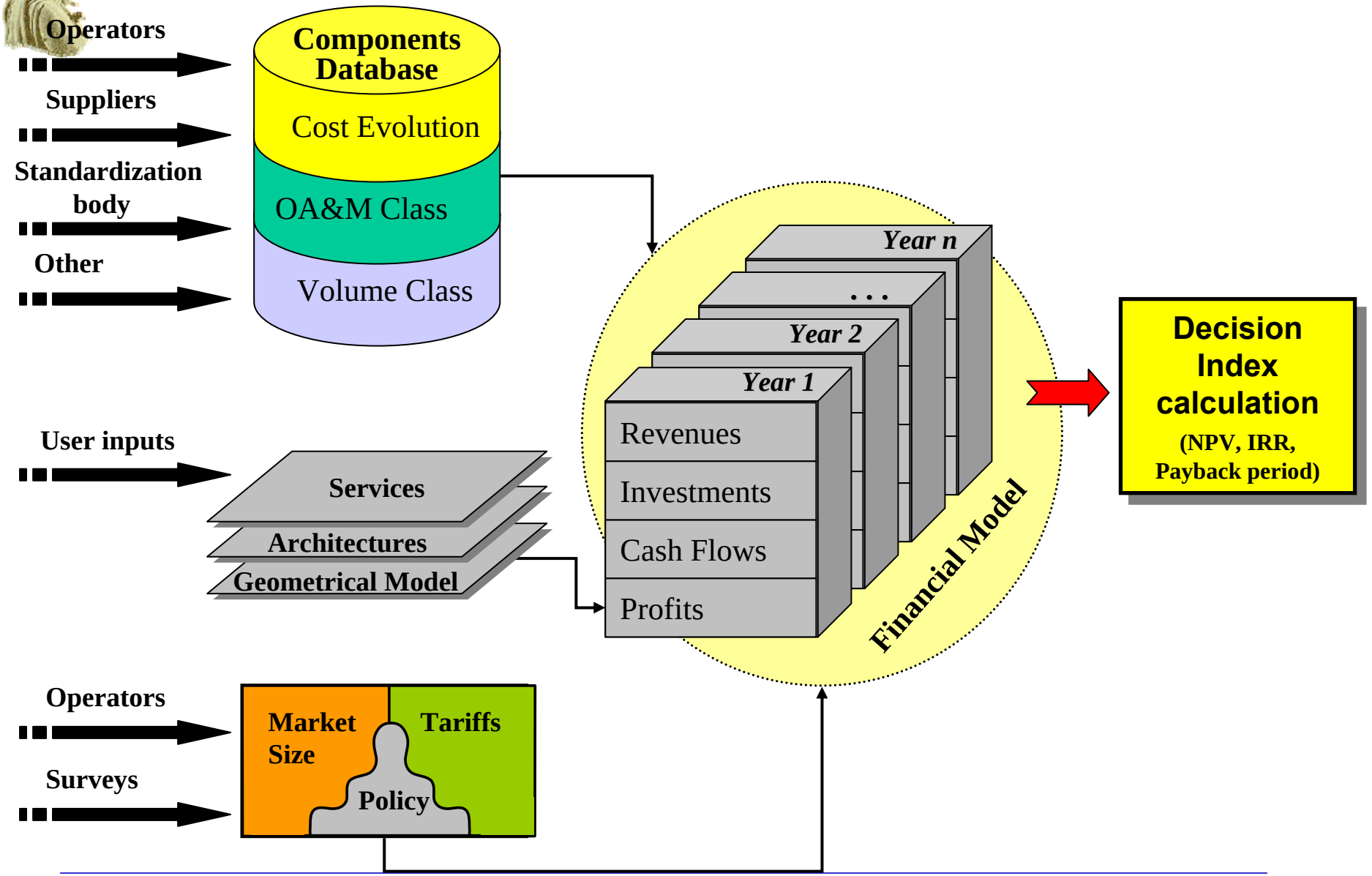
Part A. The analyzed scenarios (Fiber-to-the-Home/Office or Fiber-to-the-Cabinet) for the European market is driven from several parameters and have less favorable business prospects where the duct availability is limited.

Part B. In addition technical, business and economic aspects of the case Greece will be presented concerning the development of the municipal networks in order to arise some issues about the FTTH future development in emerging markets.

The motivation for technoeconomic evaluation



ECOSYS/TONIC Tool - Methodology



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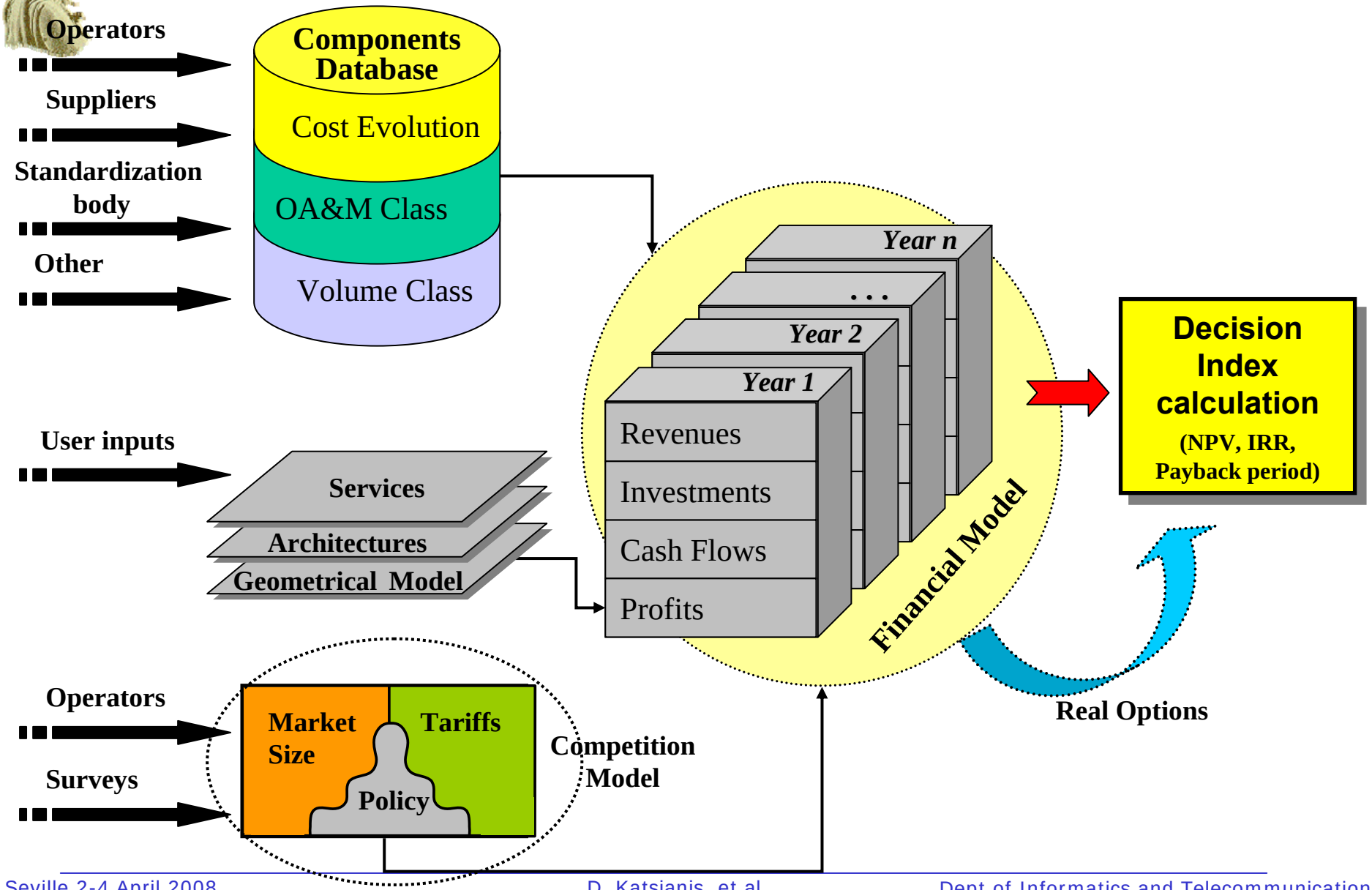
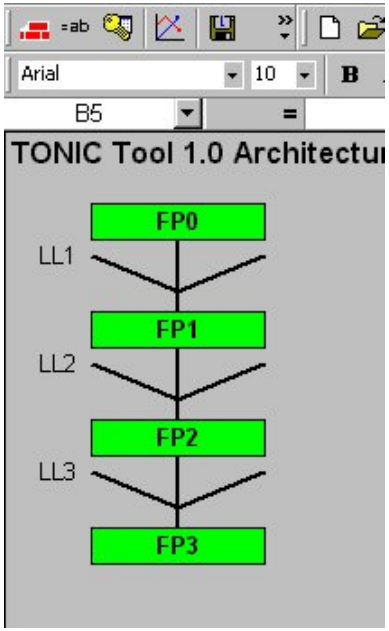


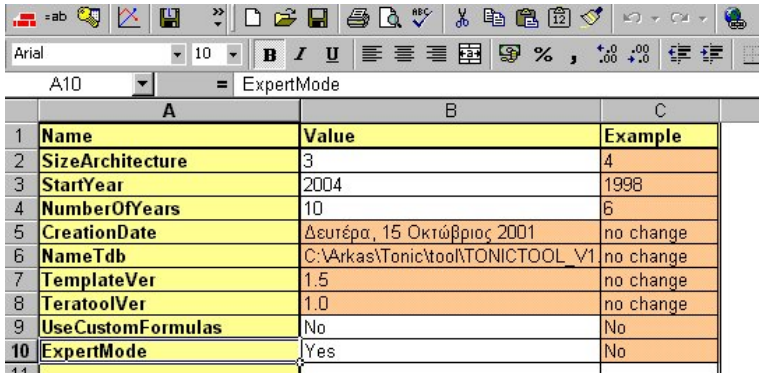
Steps in Network Evaluation

- Definition of service basket
- Network scenarios
- First Simulations – Main Financial results
- Sensitivity and Risk Analysis
- Evaluation Recommendation and Guidelines

The Tool



- Based on Office 2003 platform
  - Excel & Access
- Automatic sensitivity analysis
- Compatibility with Risk Analysis Tool(s)



Arial 10 | A10 = ExpertMode

	A	B	C
1	Name	Value	Example
2	SizeArchitecture	3	4
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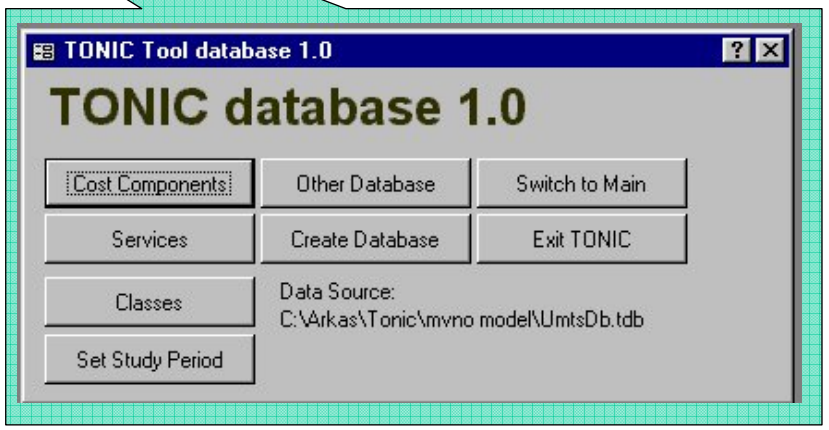
4	NumberOfYears	10	6
5	CreationDate	Δευτέρα, 15 Οκτώβριος 2001	no change
6	NameTdb	C:\Arkas\Tonic\tool\TONICTOOL_V1	no change
7	TemplateVer	1.5	no change
8	TeratoolVer	1.0	no change
9	UseCustomFormulas	No	No
10	ExpertMode	Yes	No

The tool & its database

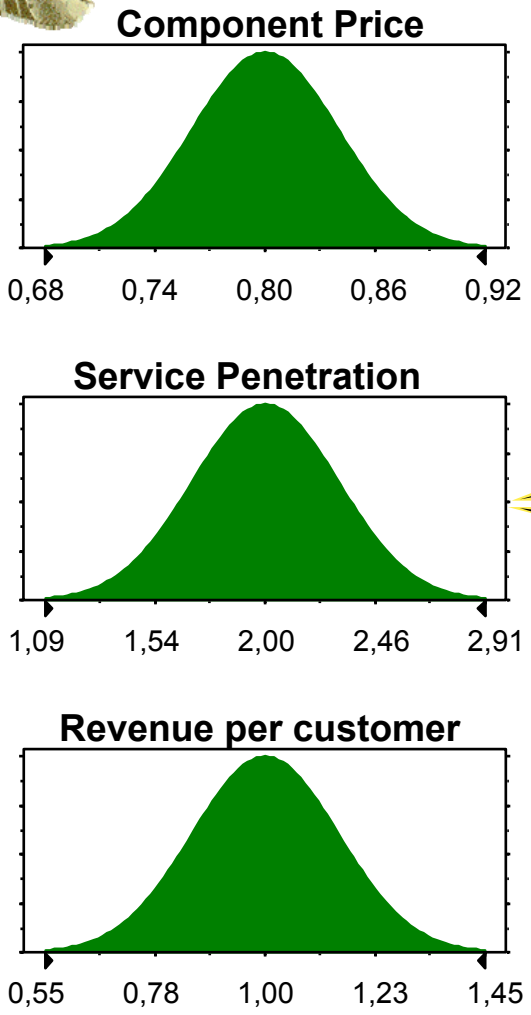
Component	Auto Update	Level	ItemType	M_Rate	M_Hours	WriteOff	ReferencePrice	Referer
GPRS_and_UMTS_DNS	1	FP1	Material/Electronics	0,08	0	5	15.000	
GPRS_and_UMTS_Firewall	1	FP1	Material/Electronics	0,08	0	5	70.000	
GPRS_Charging_gw	1	FP1	Material/Electronics	0,08	0	5	380.000	
Middleware	1	FP1	Material/Electronics	0,05	0	5	15	
UMTS_Billing_system	1	FP1	Material/Electronics	0,05	0	5	6.000.000	
UMTS_Call_Processing_Serv	1	FP1	Material/Electronics	0,05	0	5	2.000.000	
UMTS_HSS	1	FP1	Material/Electronics	0,05	0	5	2.000.000	
UMTS_MediaGateway_circuit	1	FP1	Material/Electronics	0,05	0	5	600.000	
UMTS_MediaGateway_ip_mu	1	FP1	Material/Electronics	0,05	0	5	2.100.000	
UMTS_MSC_Server	1	FP1	Material/Electronics	0,05	0	5	1.800.000	
UMTS_MSC_upgrade	1	FP1	Material/Electronics	0,05	0	10	200.000	
UMTS_OMC	1	FP1	Material/Electronics	0,08	0	10	7.000.000	
Authentication Server	1	FP0	Material/Electronics	0,05	0	5	500.000	
GPRS_and_UMTS_GGSN_S	1	FP0	Material/Electronics	0,08	0	5	1.300.000	
UMTS_CAMEL_Server	1	FP0	Material/Electronics	0,08	0	10	3.600.000	
UMTS_GMSC_Server	1	FP0	Material/Electronics	0,08	0	5	1.800.000	
UMTS_HLR/AuC	1	FP0	Material/Electronics	0,08	0	5	1.000.000	

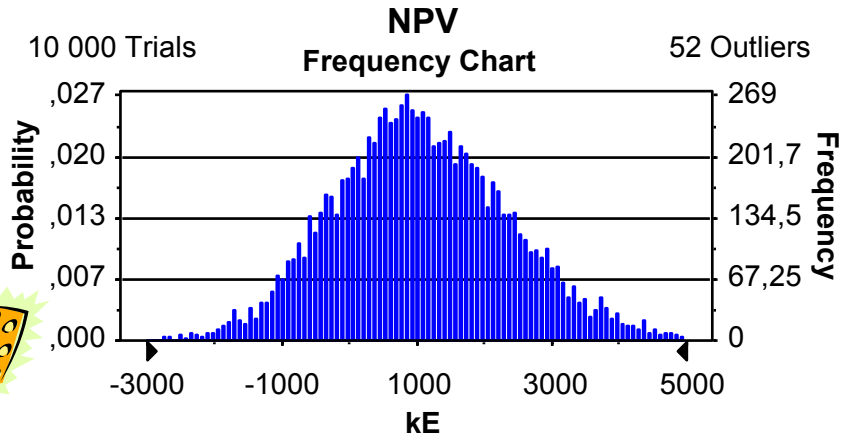


Main Financial Results

- Net Present Value, NPV
- Internal Rate of Return, IRR
- Payback Period
- Financial indicators
  - Investments
  - Running Costs
  - Revenues
  - Cash Flows
  - Depreciation
  - Profits
  - Taxes
  - Retained Cash Flows
  - Cash Balance
  - Rest Value

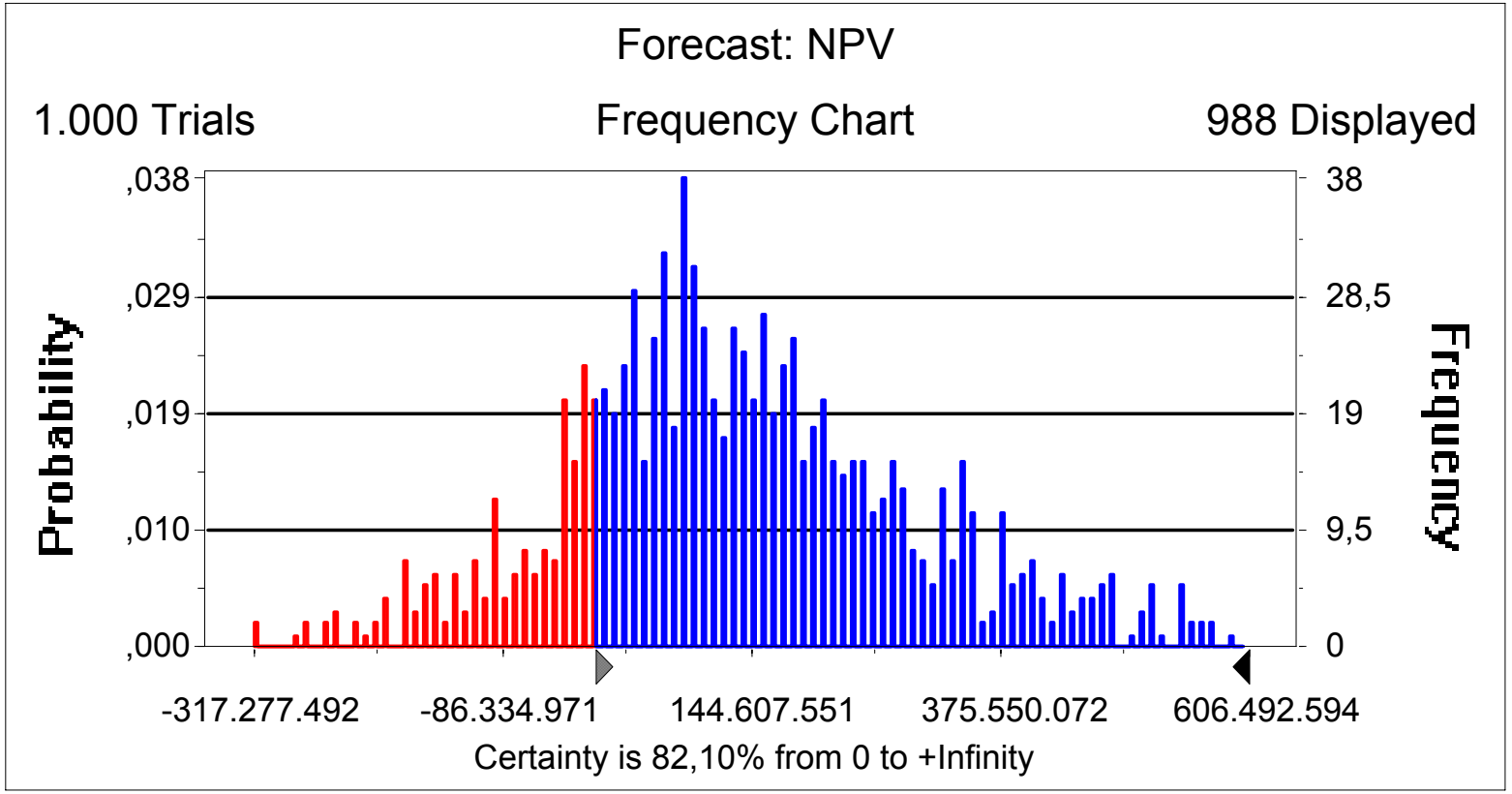
Risk Analysis





- Statistical Variation of the input parameters
- Using Monte Carlo Simulation
- Results: probability distribution, risk profile of the business case
- Extended basis for investment decisions

Risk Analysis - NPV



Requirements for T-E study BP

- Services Scenarios
  - Dimensioning
- Commercial Network Architectures .
  - For these services
  - Database
  - Serving areas
- T-E Model Constructions
  - Study period (5 years?)
- Potential market
- Market Shares (e.g operator)
- Pricing
- **Runs- Results**
- **Sensitivity and Risk Analysis**
- **Evaluation of the results – Recommendation and Guidelines - Commercial viability**

Example Models for European Cases

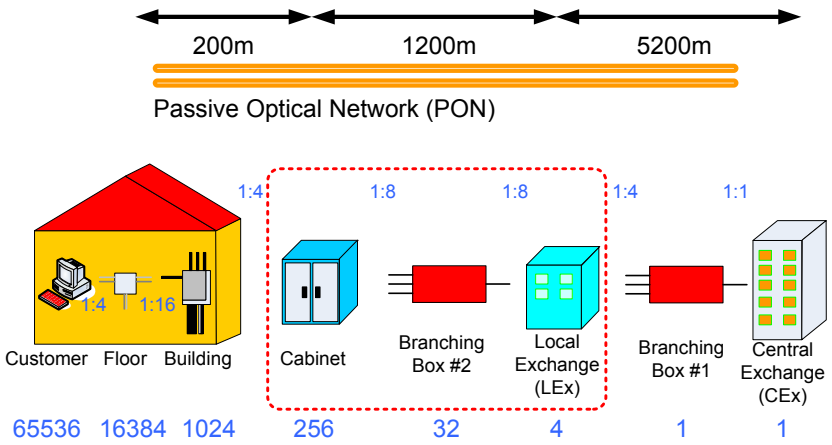
a) FTTx and duct availability

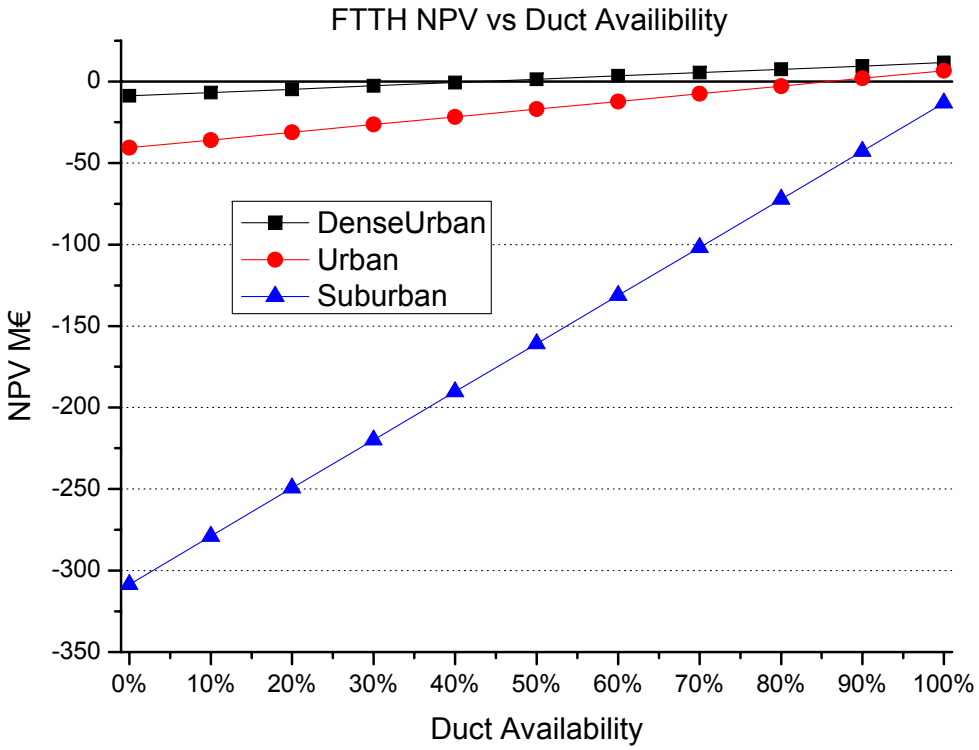
b) Application to TDM-PON and WDM-PON Access Networks

The world of Optics

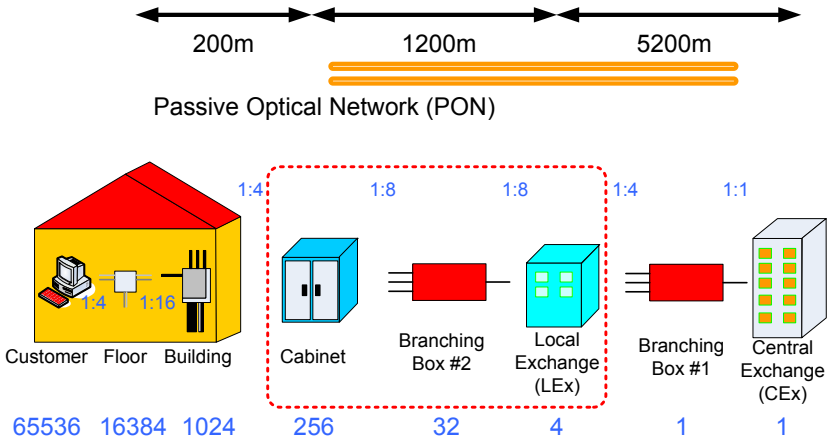
- ✓Optical technologies currently allow the transmission of Tb/s bit rates using Wavelength Division Multiplexing (WDM) on the metropolitan are and core network.
- ✓However, there is yet no technology of choice in the access network capable of delivering Gb/s access at an affordable price (This is the last mile problem).
- ✓Installing fiber up to the customer premises has questionable business prospects: Fiber installation may cost as much as €80,000/Km (!)
- ✓ADSL and RF technologies eventually run out of bandwidth

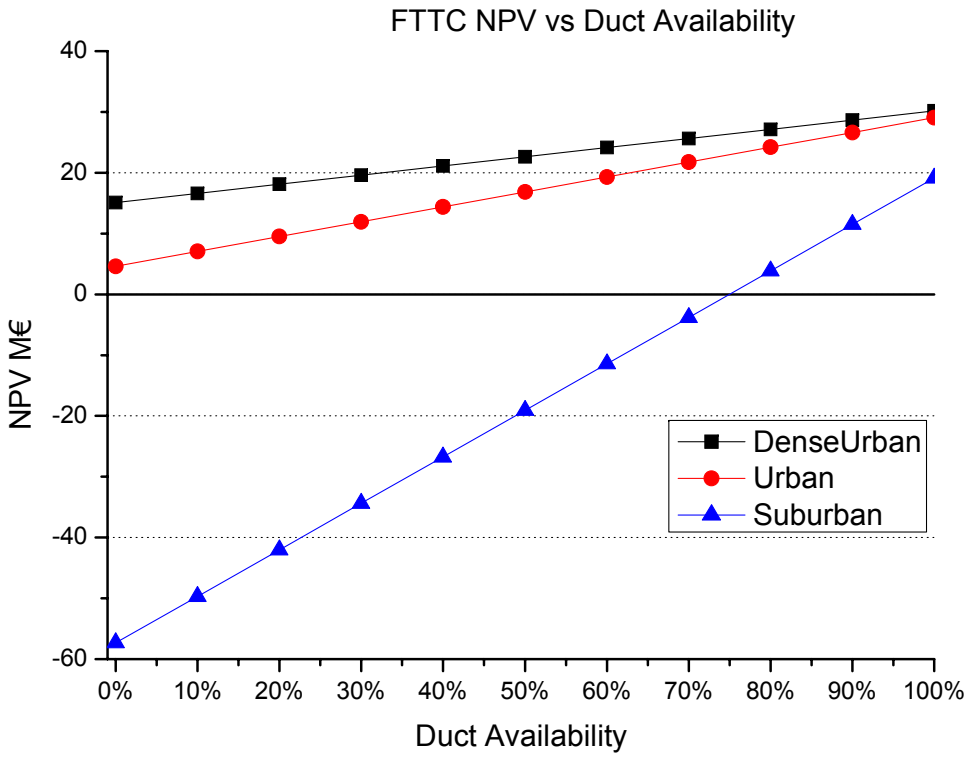
Can we put fiber everywhere (FTTH/O) ?





Can we put fiber nearly everywhere (FTTC) ?

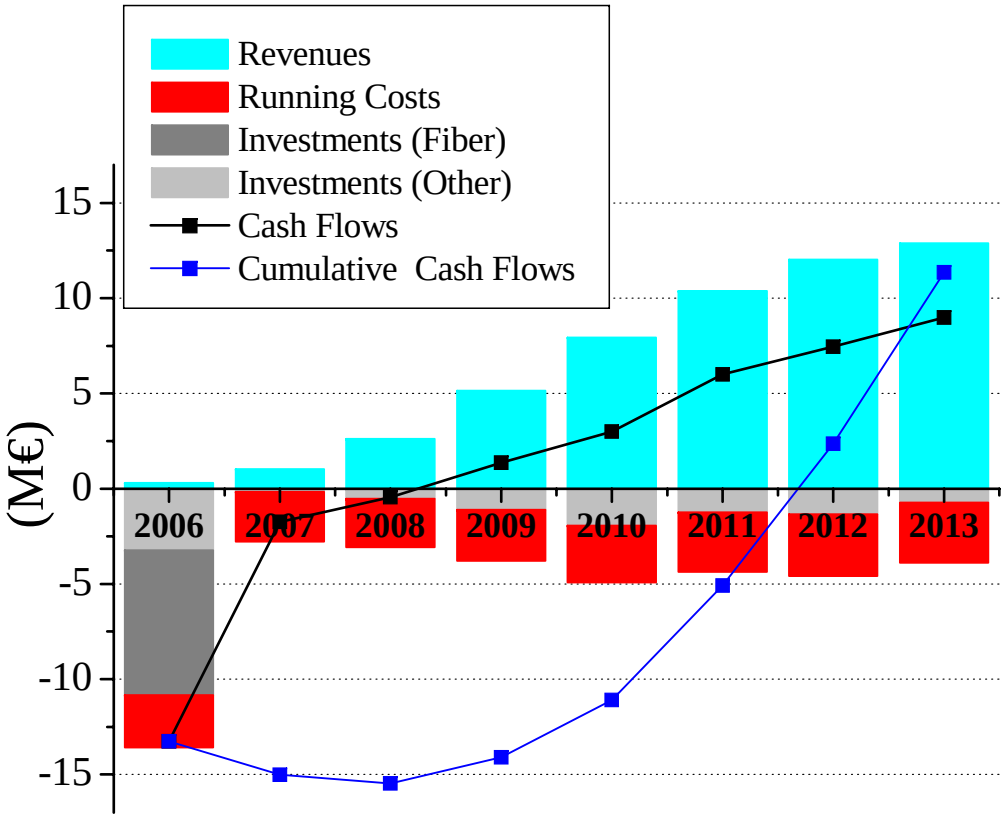


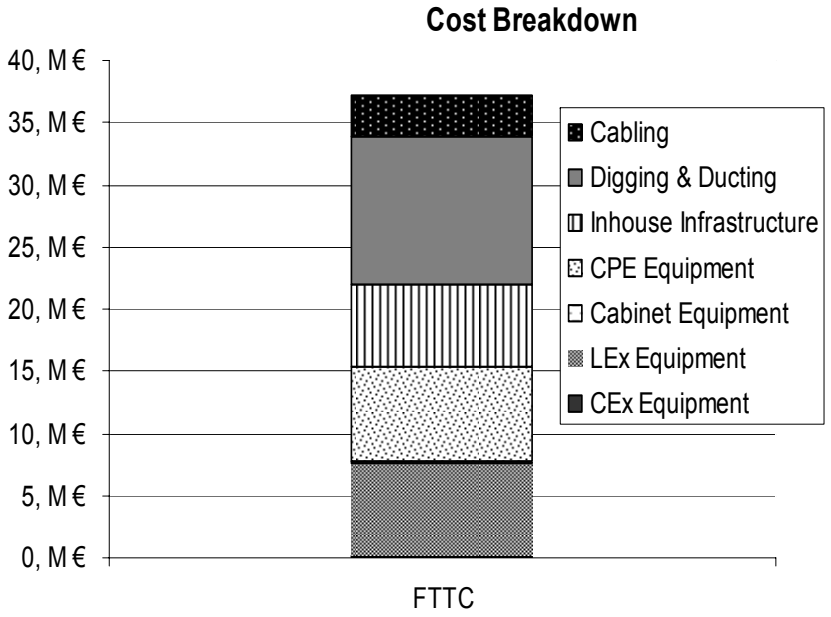


Why do we even bother?

- ✓Installing optical fibers involves digging up trenches and hence costly civil works!
- ✓The prospects of the investment largely depend on the duct availability (d_a).
- ✓In large Western European countries the duct availability is 70% so the prospects of FTTC are quite good in dense urban areas
- ✓FTTH/O and FTTC prospects severely degrade as the duct availability decreases!

Up Close: Fiber up to the Cabinet

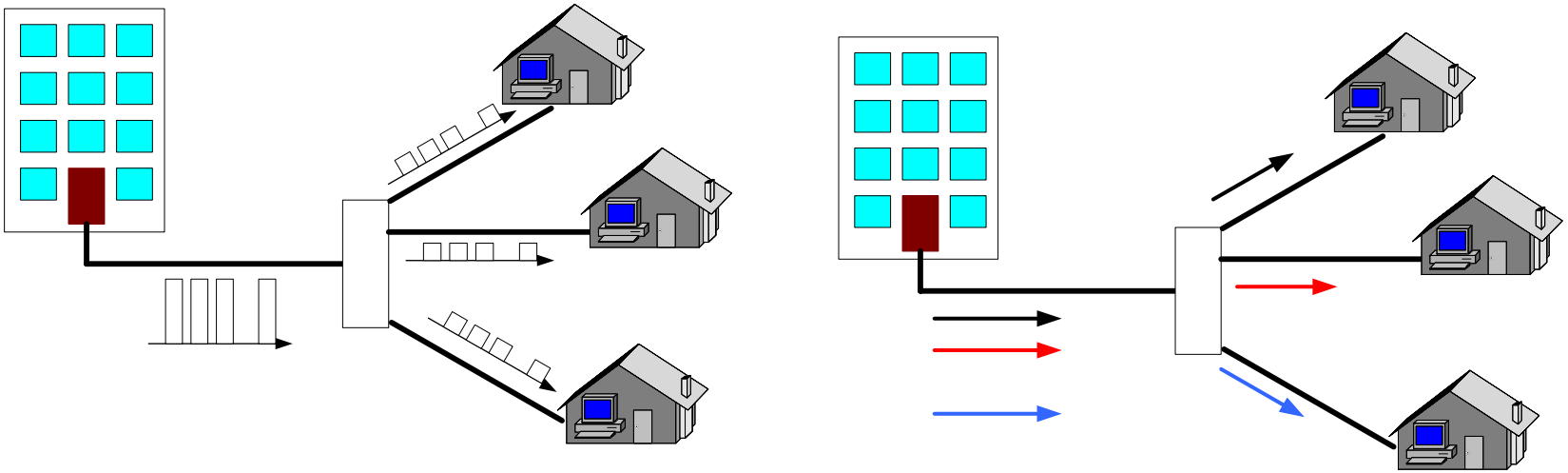




Conclusions (a)

- FTTC and FTTH/O are undermined when the duct availability is reduced!
- Other solutions could be investigated (next session)
- Public authorities could increase the duct availability

TDM vs PON cases - Architectures

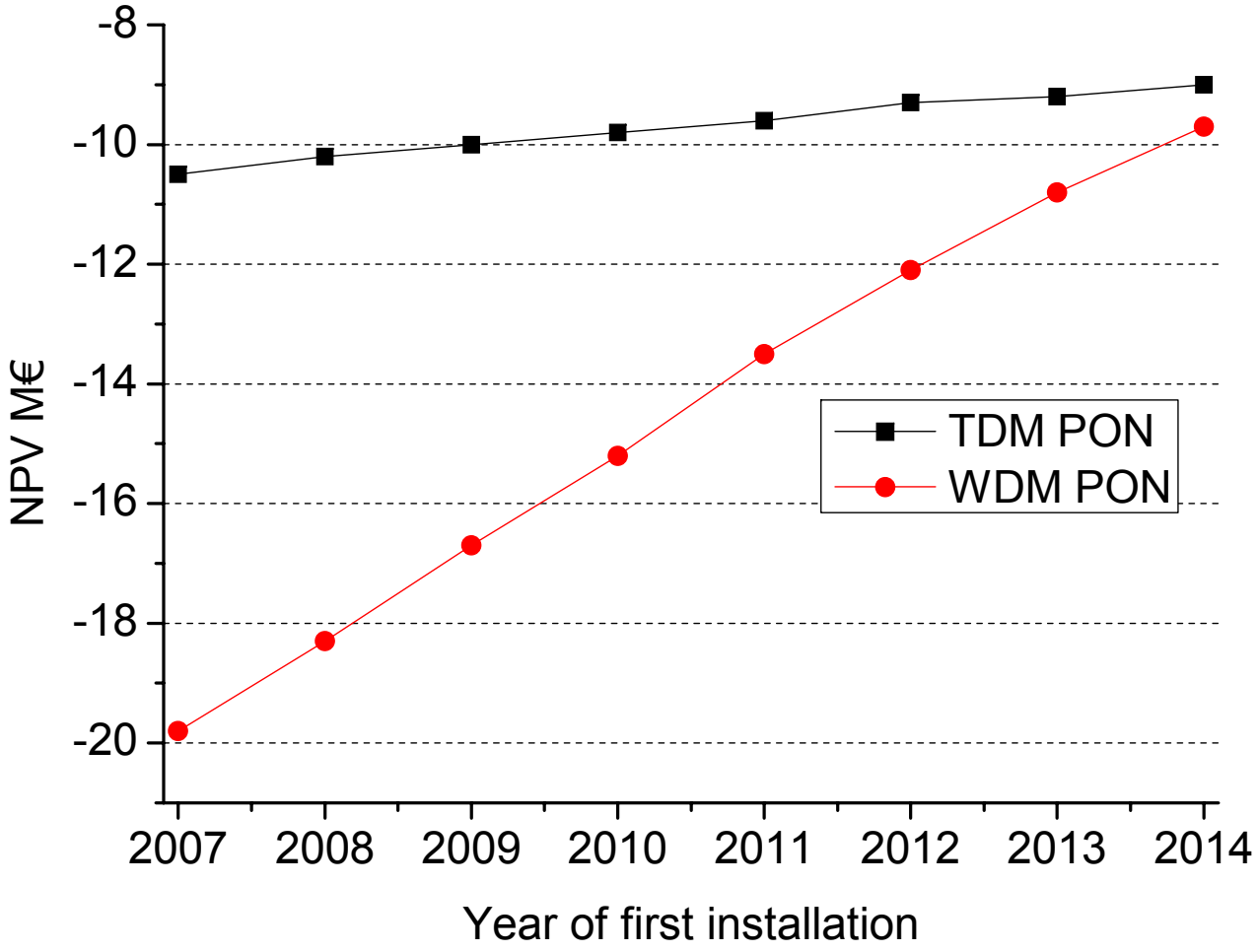


LEx

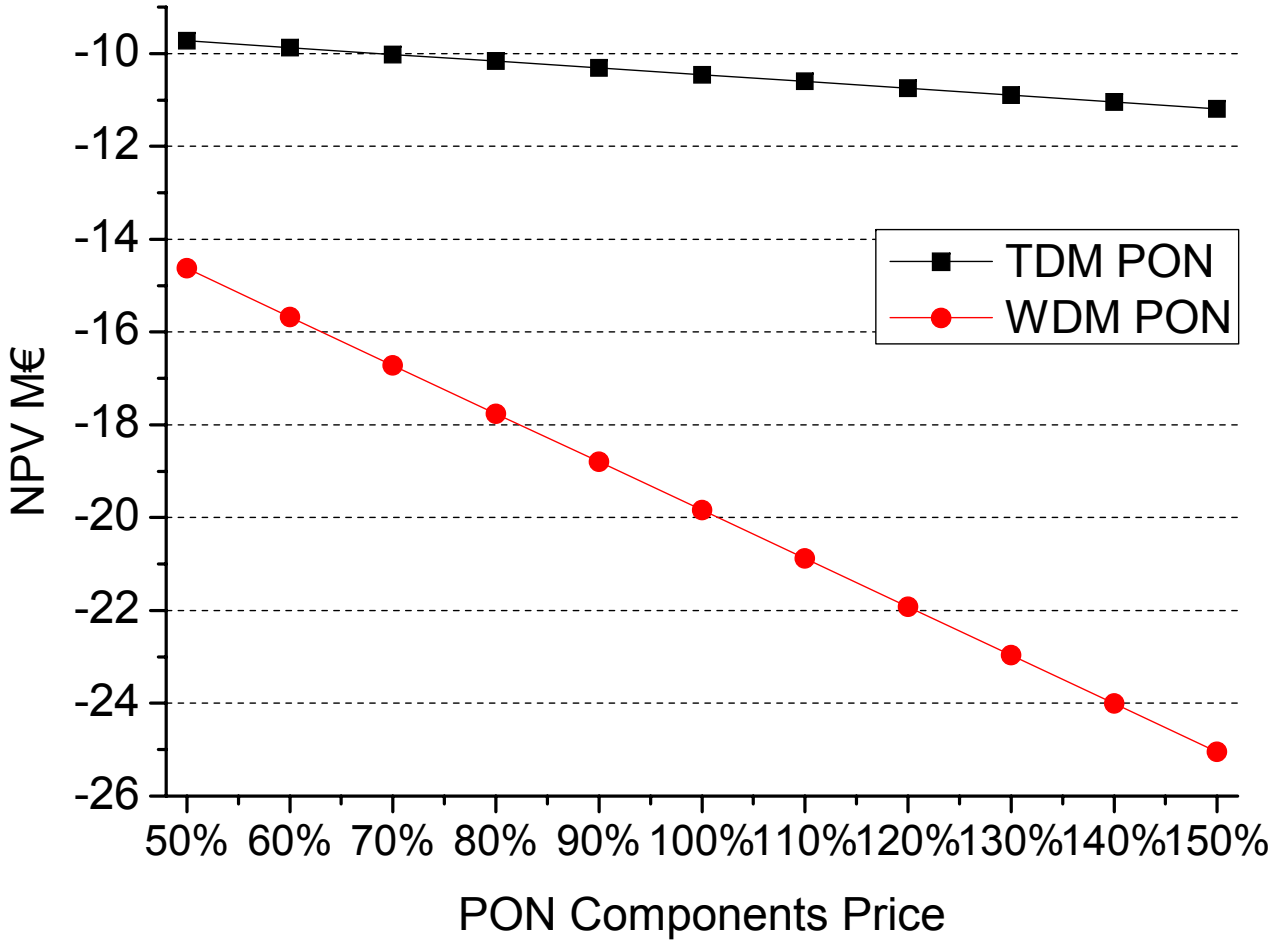
Services Classes and Traffic Assumptions

Area	D_{max} (Mb/s)	U_{max} (Mb/s)	C_t	*Example Interface*
Silver Residential	100	10	0.05	FastE / GbE
Gold Residential	300	30	0.05	GbE
Basic Business	500	50	0.05	GbE
Silver Business	1000	100	0.2	GbE
Gold Business	1500	150	0.2	10GbE

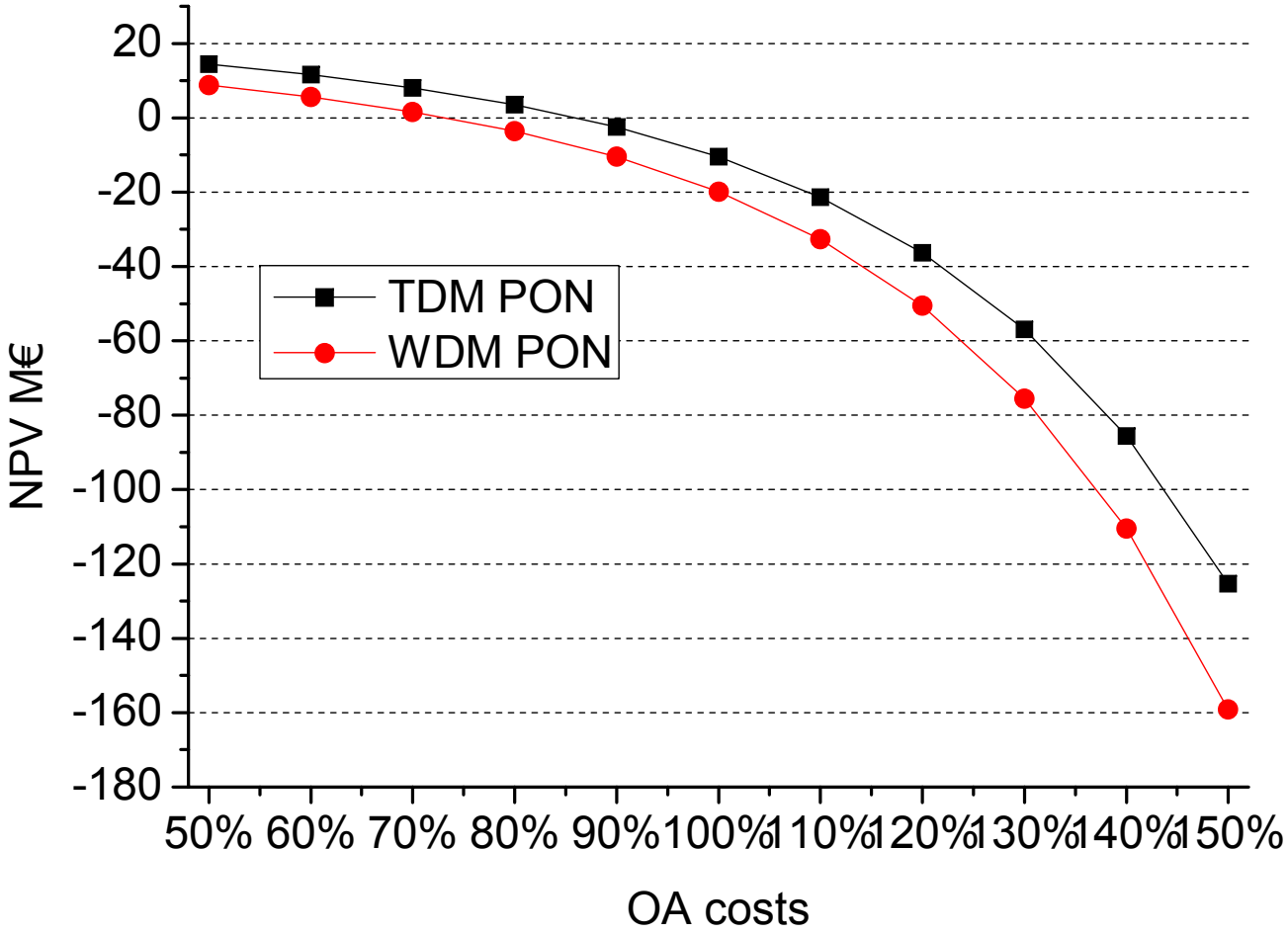
NPV of the TDM/PON and WDM/PON solution depending on the initial year of installation



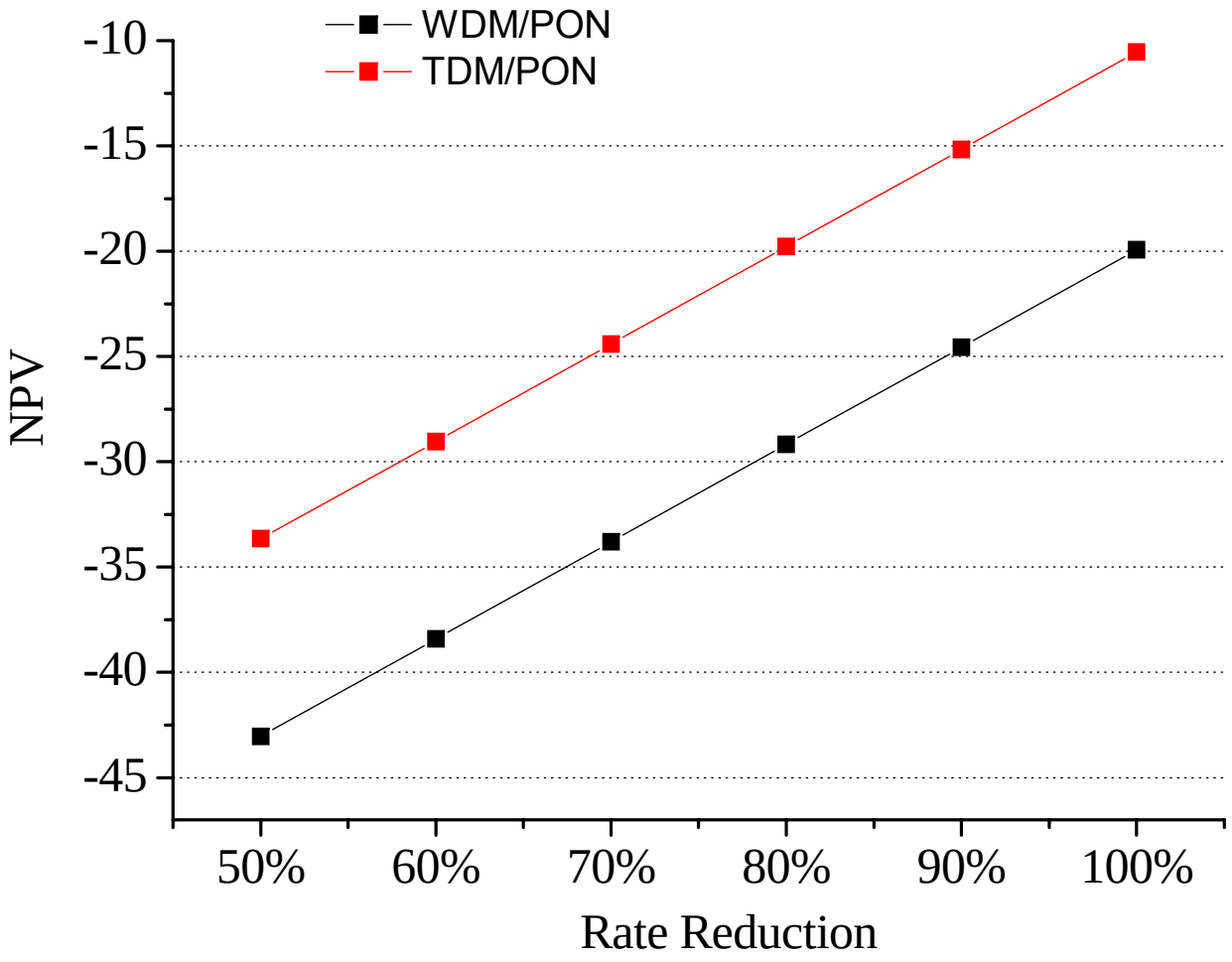
Sensitivity analysis of the NPV of the TDM/PON and WDM/PON with respect to the initial price of the optolectronic components



Sensitivity analysis on the NPV of the TDM/PON and WDM/PON with respect to O&A costs



Impact of Tariff Reductions in the NPV of the WDM/PON and TDM/PON solutions.

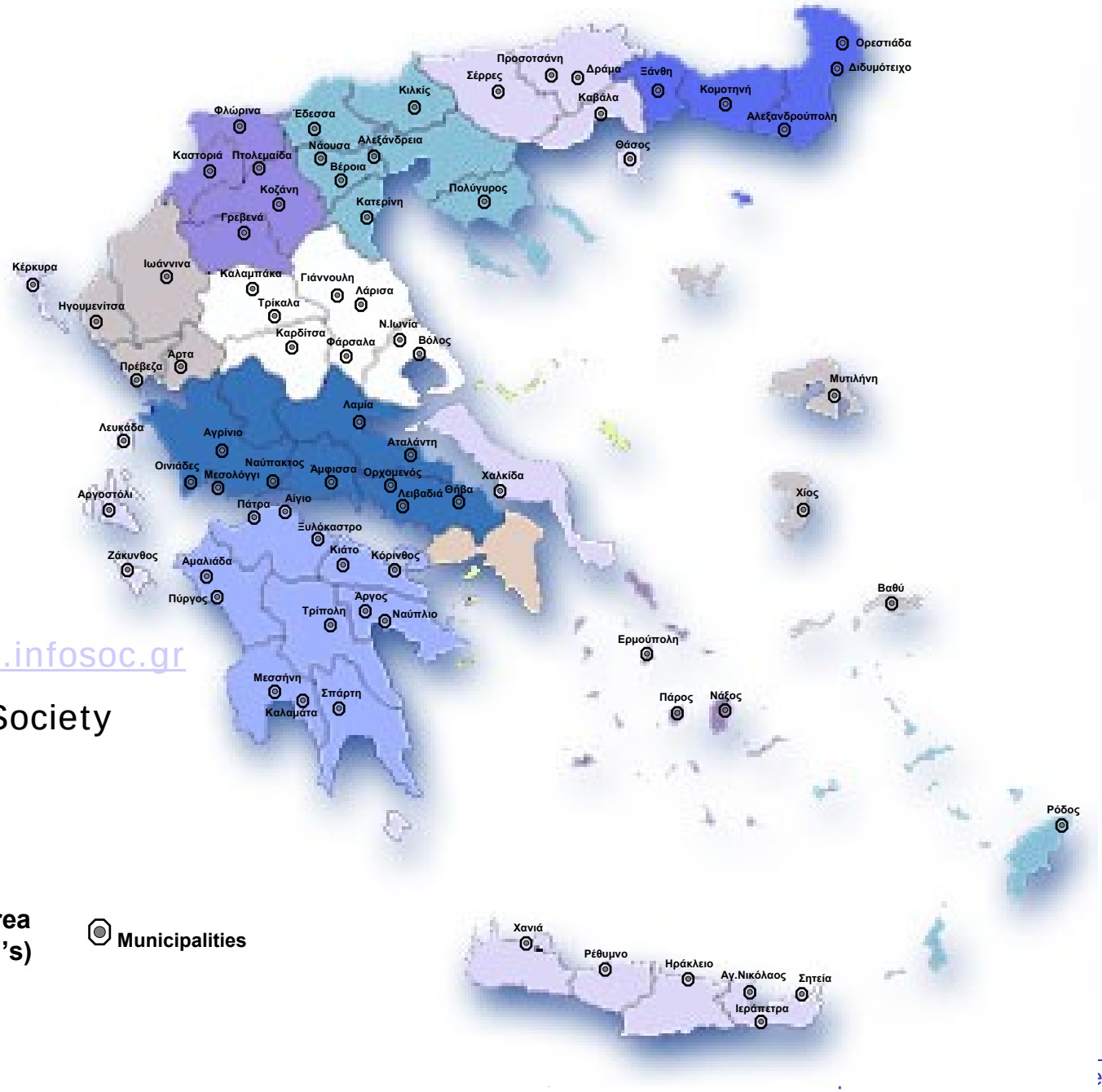


Conclusions (b)

- TDM/PON and WDM/PON are attractive especially for mature markets
- WDM/PON Technology is crucial affected by the price of the optoelectronic components
- WDM could be the driver for Europe (for high demand regions)

Municipalities Networks

In Greece



Source: www.infosoc.gr

Information Society

Metropolitan Area Networks (MAN's)

Municipalities

MAN's Details

- Constriction of MANs in 75 Cities (12 main regions)
- Total Budget > €62 M
- 750 Km
- 2800 points of Public Interest

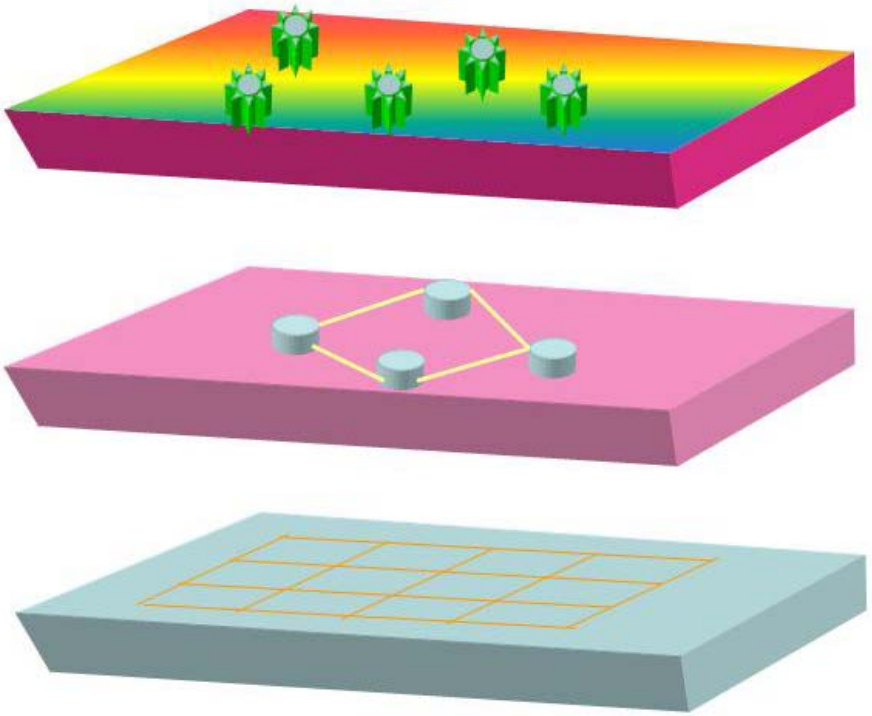
Current Citation (Nov 2007)

- 72 RFP have been assigned
- 60 municipalities have a contract
- More than 30 municipalities have ongoing construction projects

Main Additional Actions

- Wireless Networks to the rest of the public interest points (smallest Municipalities)
- Broadband (mainly xDSL) access to the 90% (geographical coverage) of Greece (€ 210 M) including 3500 KM of optical Network

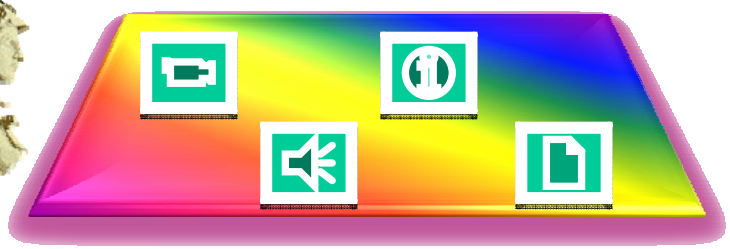
Layers in an Optical Network



Services and Content Providers

Operation Active Infrastructure

Owner -Passive (Dark Fiber)



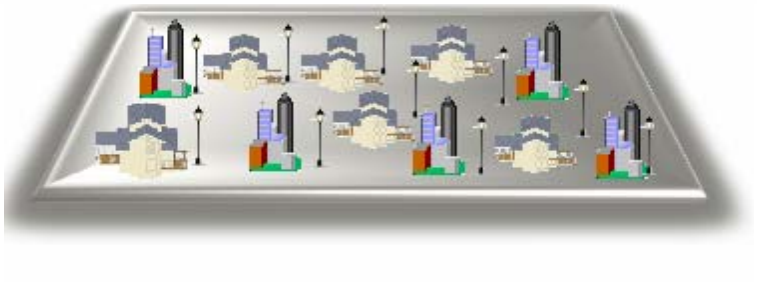
Service & Content Providers

Active Net B

Maintenance and Administration of Access

Active Net A

Routers, Switches, Access Points



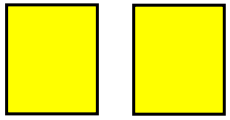
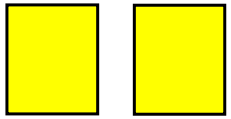
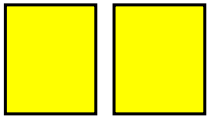
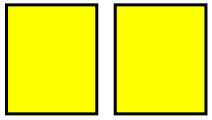
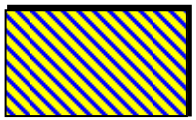
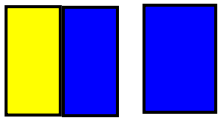
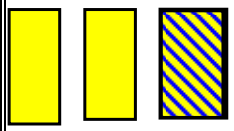
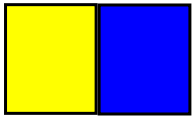
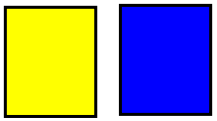
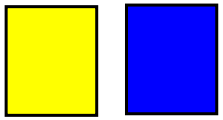
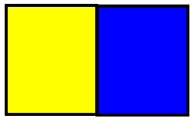
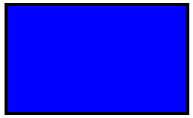
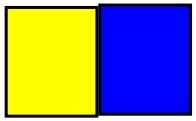
Physical Infrastructure

Buildings etc.

Key Points for Operations

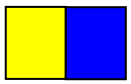
- Concrete Business Plan for all players involved

BPlans proposed

Network Layers	Proposed Models			
	S1	S2	S3	S4
Content & Services				
Administration (Access & Maintenance)				
Active Network				
Passive Network				

 Municipality

 Private

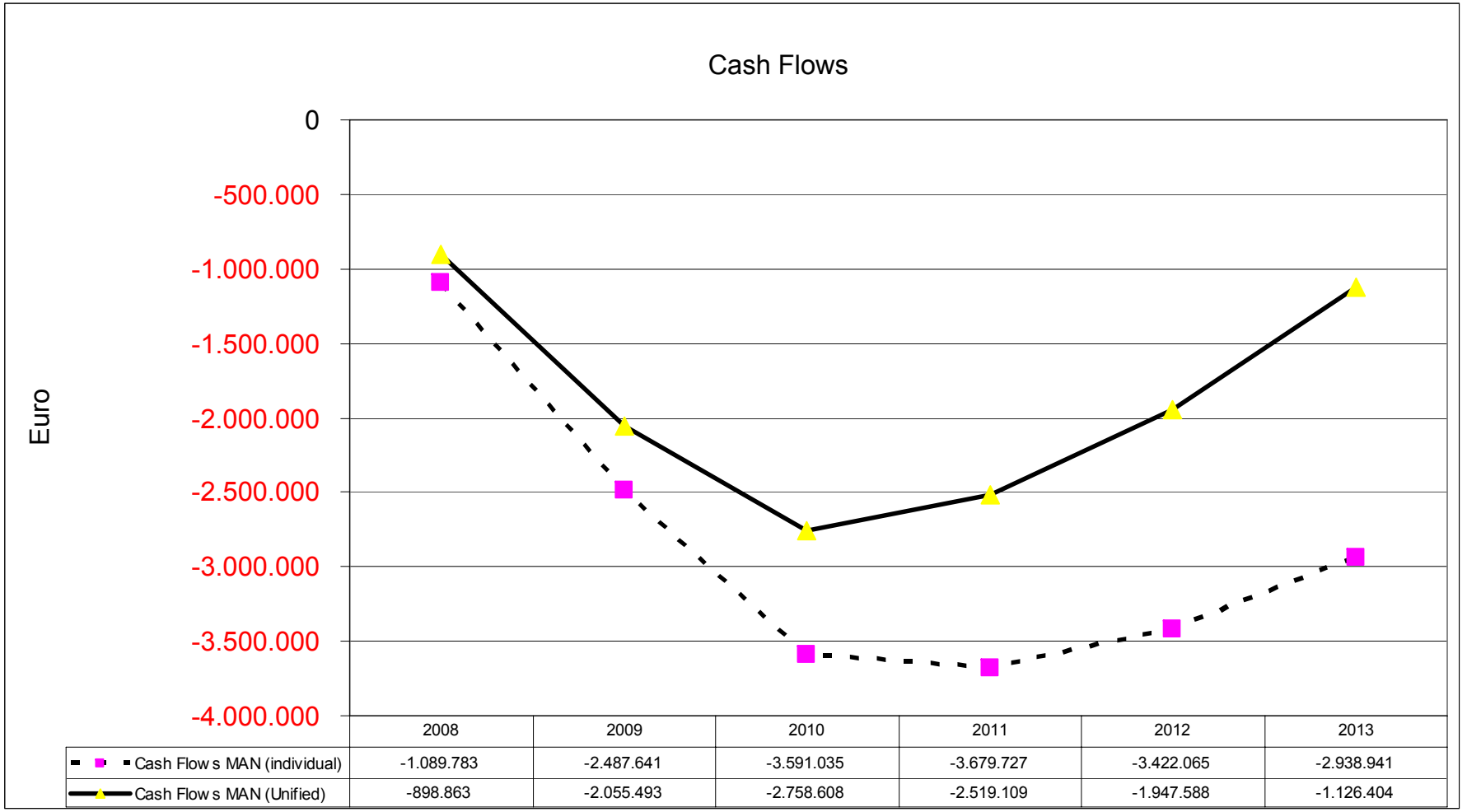
 Public Private Partnership (PPP)

 Neutral Operator

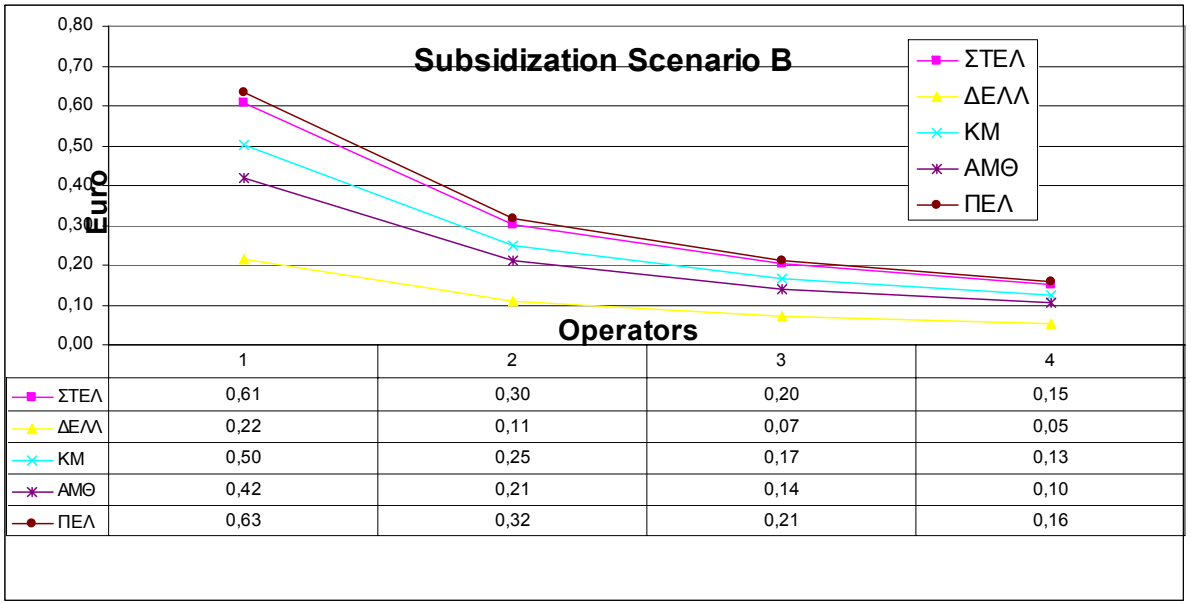
Qualitative Evaluation

	Public Ownership-Outsource Administration (S1)	PPP in Active Layer (S2)	Private initiative in Active Layer (S3)	PPP in Infra Structure (S4)
Easy Decision Making	+++	+	++	++
Complexity	-	--	-	-
Transparency	+	+++	+++	++
Total Value of Networks	+++	++	+++	++
Risk & Required Investments	--	--	-	--
Time Scaling	+++	+	++	++
Expected Performance	+++	+	++	++
Competition	+++	+	+++	++
Functionality	+++	+	++	++
Break-through Participation	+	+++	+++	++
TOTAL	**20+, 3-**	**13+, 4-**	**20+, 2-**	**16+, 3-**

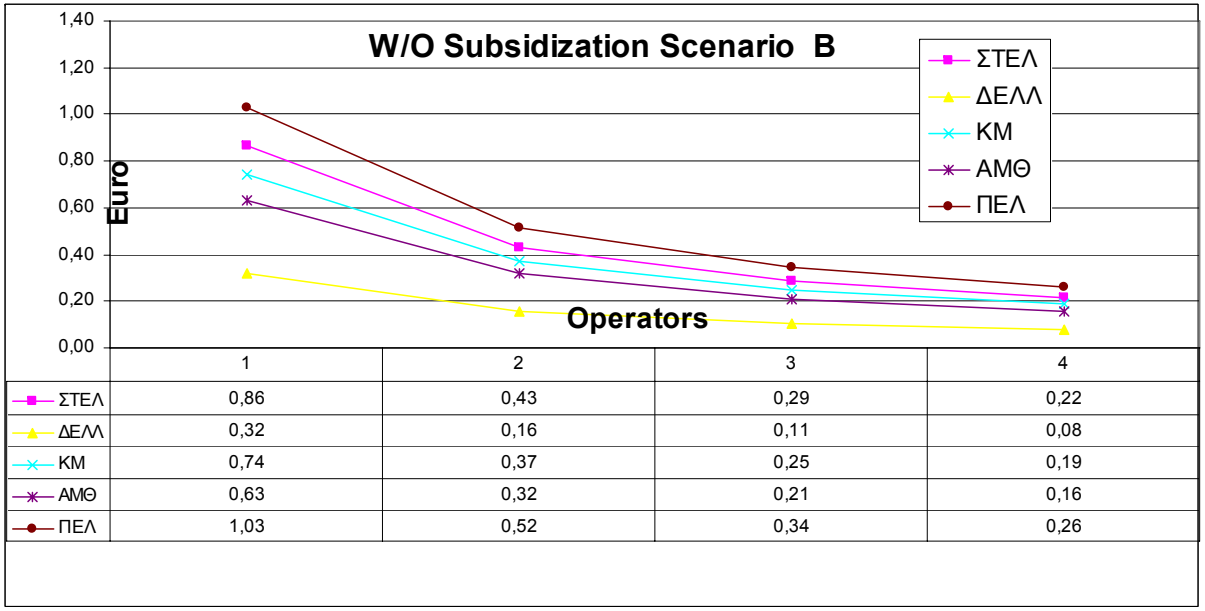
Technoeconomic Results



	2008	2009	2010	2011	2012	2013
Cash Flows MAN (individual)	-1.089.783	-2.487.641	-3.591.035	-3.679.727	-3.422.065	-2.938.941
Cash Flows MAN (Unified)	-898.863	-2.055.493	-2.758.608	-2.519.109	-1.947.588	-1.126.404



	1	2	3	4
ΣΤΕΛ	0,61	0,30	0,20	0,15
ΔΕΛΛ	0,22	0,11	0,07	0,05
ΚΜ	0,50	0,25	0,17	0,13
ΑΜΘ	0,42	0,21	0,14	0,10
ΠΕΛ	0,63	0,32	0,21	0,16



	1	2	3	4
ΣΤΕΛ	0,86	0,43	0,29	0,22
ΔΕΛΛ	0,32	0,16	0,11	0,08
ΚΜ	0,74	0,37	0,25	0,19
ΑΜΘ	0,63	0,32	0,21	0,16
ΠΕΛ	1,03	0,52	0,34	0,26

Integration of Tariff Policy

- MAN administrations in regions (8-10 MANs) could:
  - Reduce rental cost for the Operators per KM per duct or fiber
  - Reduce administrations complexity
  - Increase the negotiation ability of Passive network owners

Conclusions (Public MANs)

- Private initiative in Active Layer (S3) is the most attractive scenario following by the Public Ownership-Outsource Administration (S1)
- Integration of MAN administration could reduce the yearly costs in collaboration with private schemes

Time for Questions & Answers

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