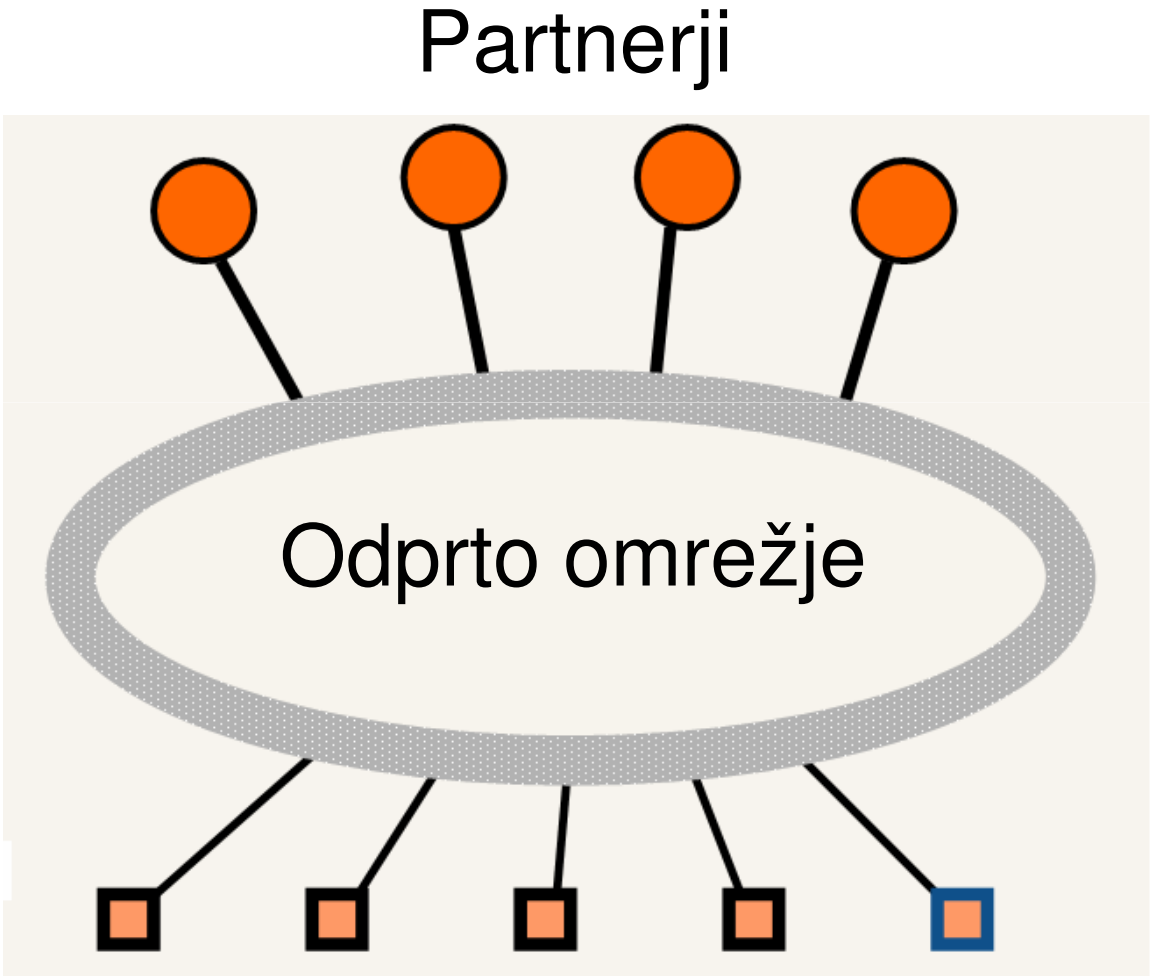
Vprašanja delovanja OAN

Regulacija, ekonomika, politika



Mobitel d.d., izobraževanje

21.1. 2011, predavanje 22

Prof. dr. Jožko Budin

Vsebina

1. Statistika
2. Regulacija
3. Razvezava
4. Ekonomika
5. Politika

Definicije za statistiko omrežja

Home Passed

- The number of "**Homes Passed**" is the potential number of premises to which an operator has capability to connect in a service area

Homes Connected

- The number of "**Homes Connected**" is the number of premises which are connected to an FTTH/FTTB-network.

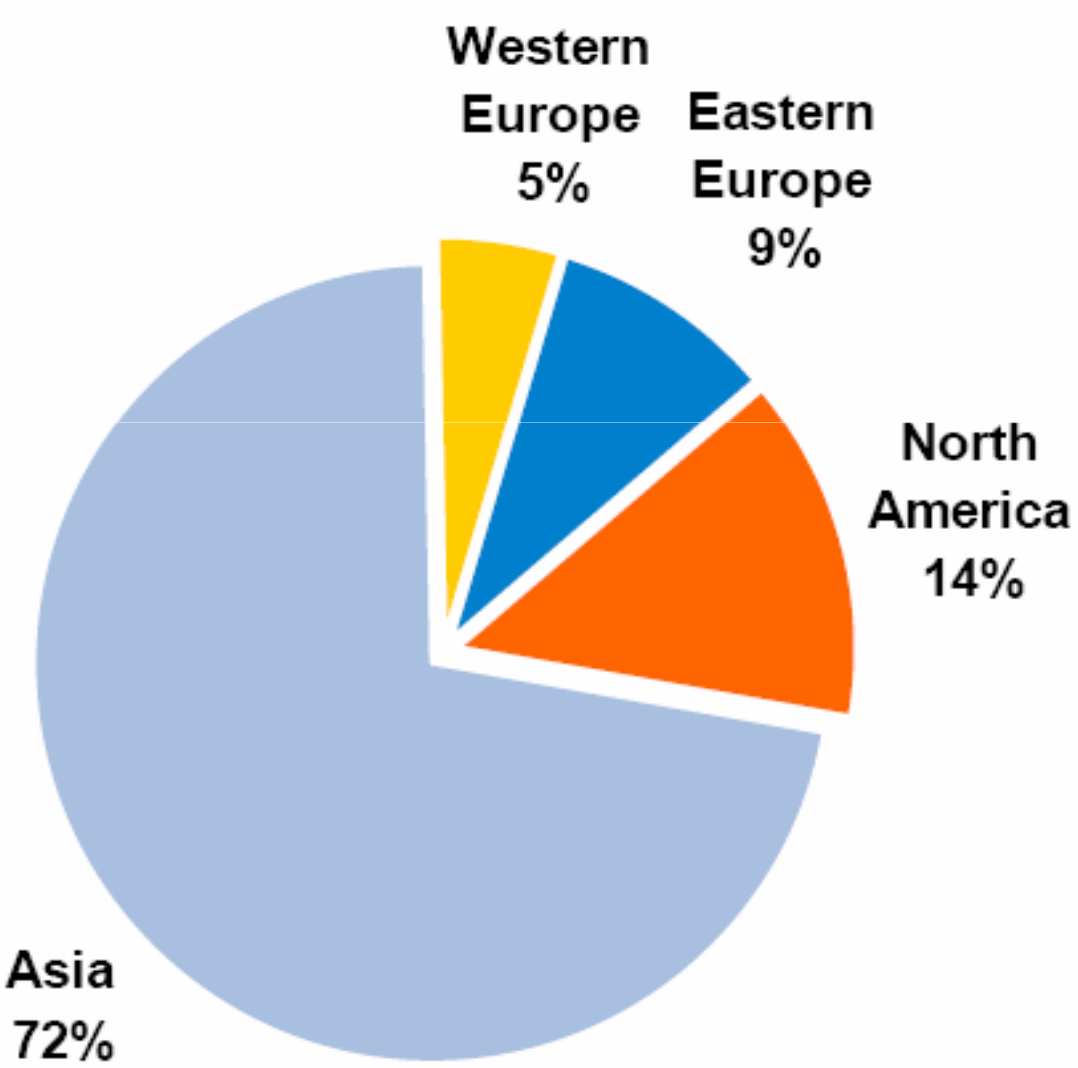
Premises

- The subscriber's home or place of business. In a multi dwelling unit each apartment is therefore counted as one **premises**.

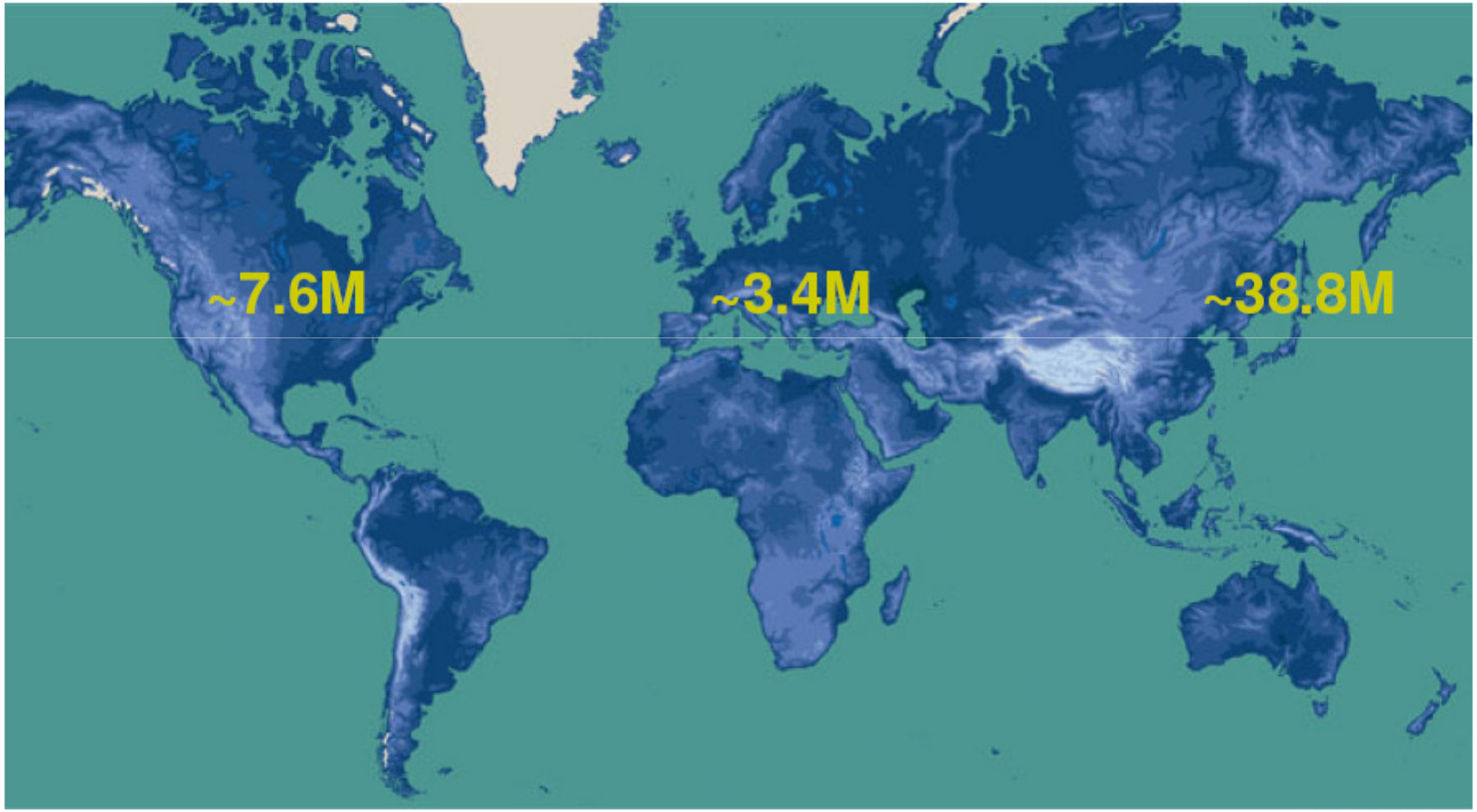
Subscriber

- A premises that is connected to a FTTH/B-network and uses at least one service on this connection under a commercial contract.

Stanje po svetu



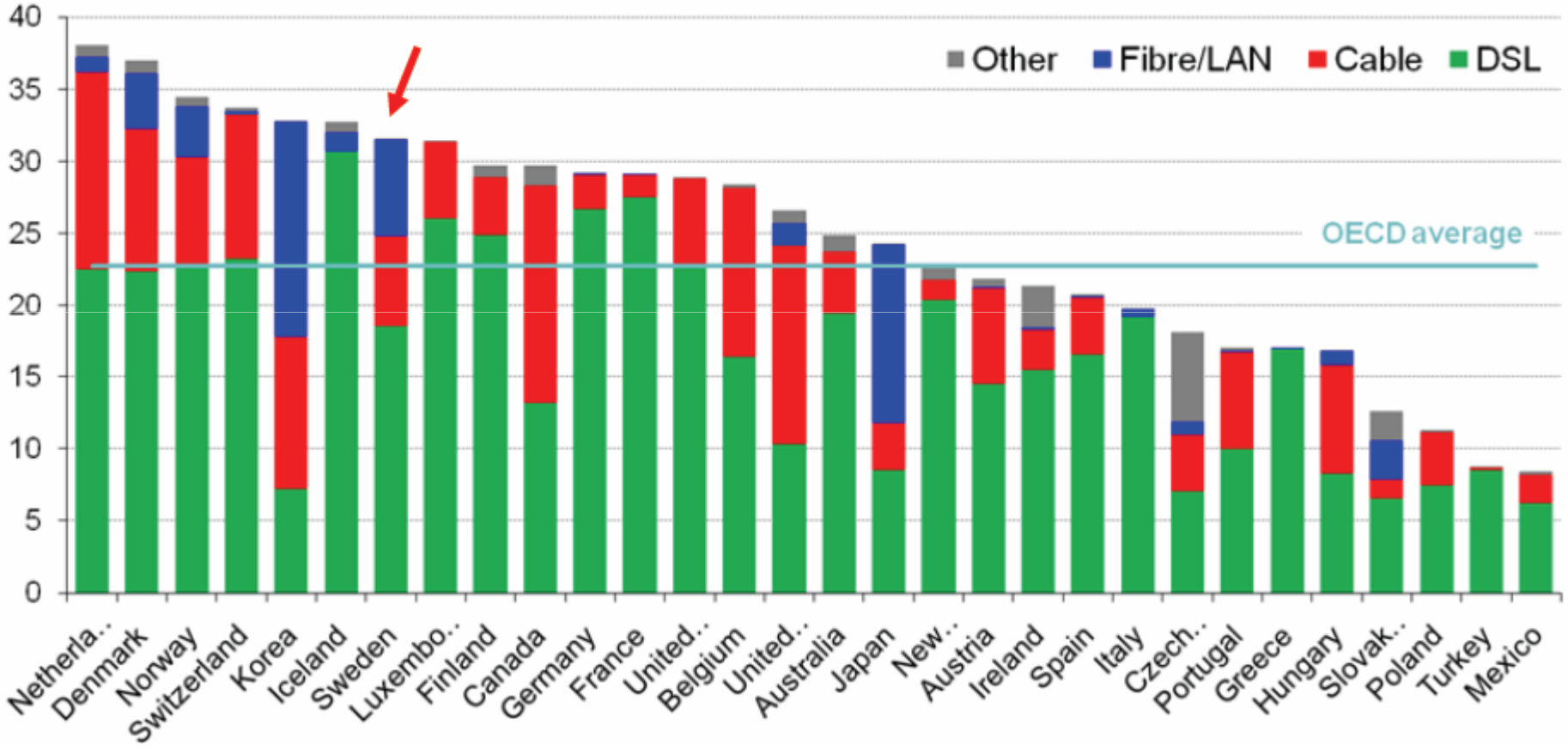
FTTH/B Subscribers Connected (Dec. 2009)



Source: International Advisory Group FTTH Council (march 2010)

Stanje po svetu, primerjava BB

- 2009 pregled po tehnologiji (OECD)



Število širokopasovnih (BB) naročnikov na 100 prebivalcev

OECD

Stanje v Sloveniji (FTTH Forum)

* *As of the end of June 2008*

Slovenia

KEY STATS*

- **Population**
  - ✓ **2 million**
- **HOUSEHOLDS**
  - ✓ **700,000**
- **AVG Pop/HH**
  - ✓ **2.8**
- **Dominant FTTx Architecture**
  - ✓ **FTTH**
- **Total FTTH/B Subscribers**
  - ✓ **31,974**
- **FTTH/B Penetration Rate**
  - ✓ **4.6%; 7 of 14**
- **# Broadband Subscribers**
  - ✓ **366,500** *(1Q08)*

Originalno besedilo

- **Deployment Trends**
  - Two operators involved
    - T2, which launched FTTH services in October 2006 and passes more than 100,000 homes (and counts more than 9,000 subscribers)
    - Telecom Slovenije, incumbent, with its "F2" project, had planned to spend €50 million in 2007 taking fiber to 50,000 homes in Slovenia's main cities, running new cables through its extant ducts for the initial phase of the rollout
  - No noteworthy involvement from municipalities and/or utilities
- **Technology Trends**
  - Telecom Slovenije is deploying FTTH/EP2P technology
- **Regulatory Trends**
  - No specific rules

STATUS (relative to positive FTTH/B deployment)

Competition — Regulation — Services

Razvrstitev v Evropi in število naročnikov

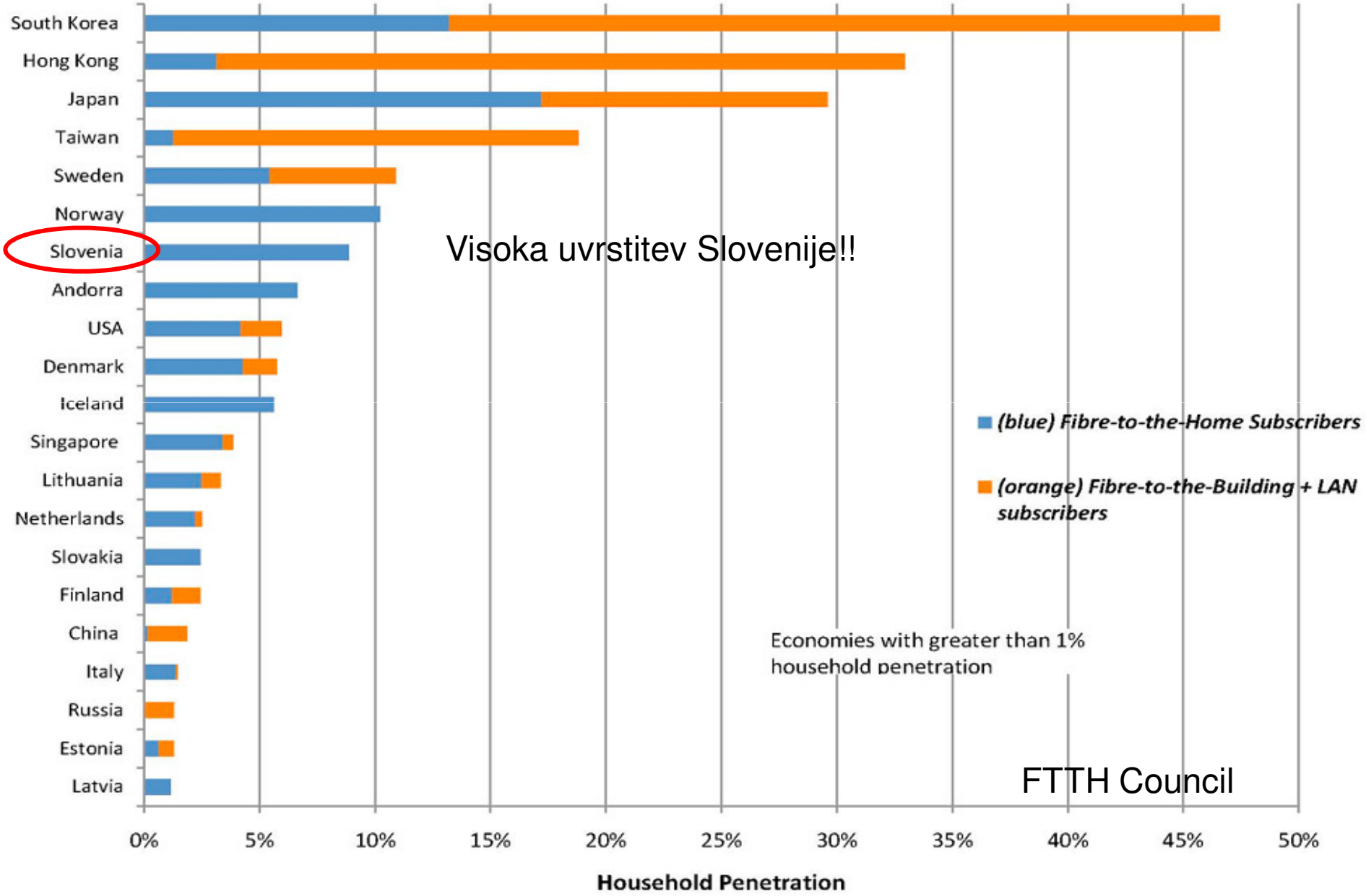
FTTH Council's full European rankings			
1.	Sweden	14.	Czech Republic
2.	Norway	15.	Ireland
3.	Slovenia	16.	Austria
4.	Iceland	17.	Switzerland
5.	Denmark	18.	Poland
6.	Finland	19.	Germany
7.	The Netherlands	20.	Portugal
8.	Italy	21.	Romania
9.	Estonia	22.	Cyprus
10.	Latvia	23.	Greece
11.	Lithuania	24.	Spain
12.	Slovakia	25.	Great Britain
13.	France		

FTTH Council Europe, 2009

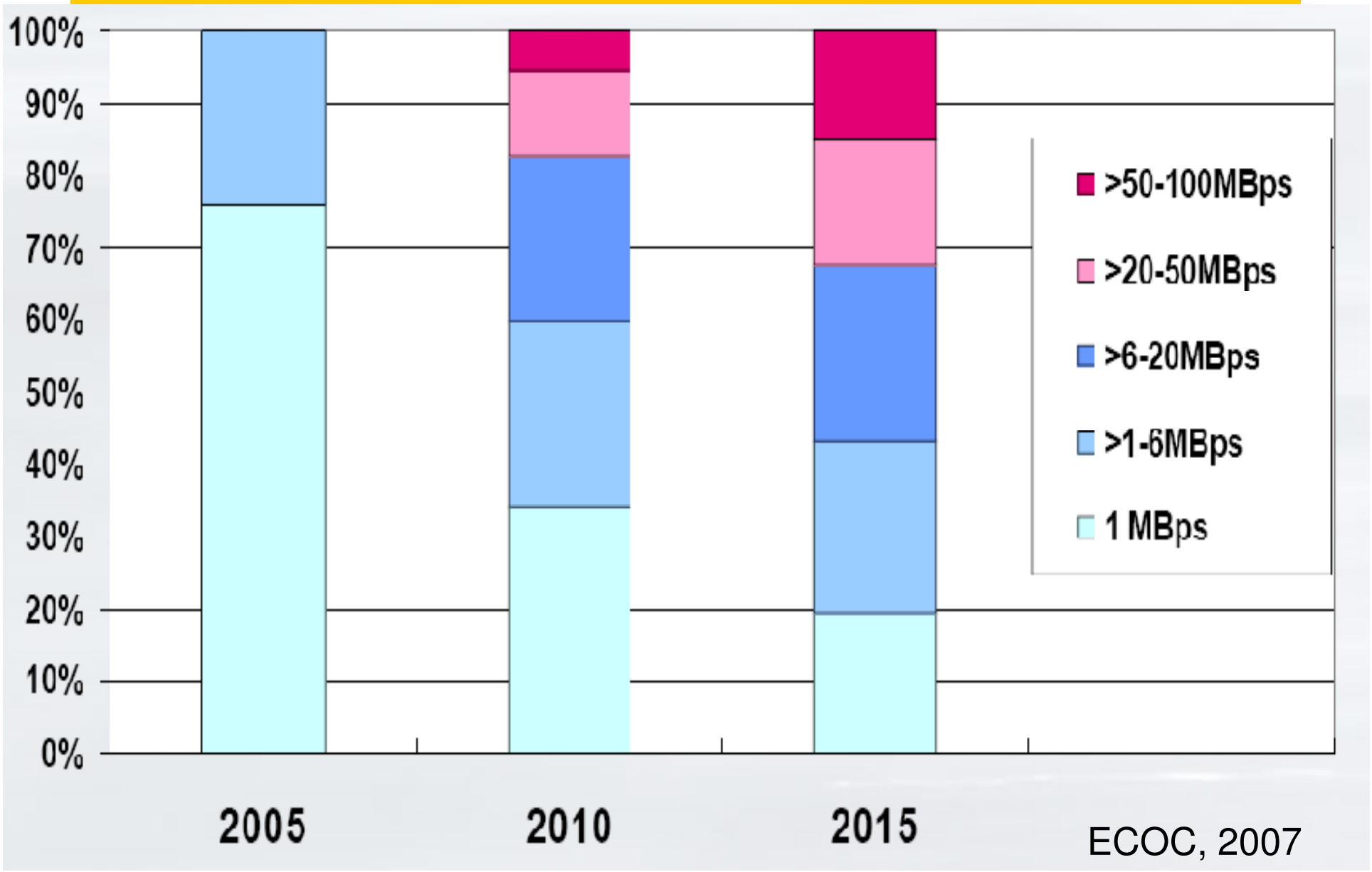
Country	Total no. of Subscribers
Sweden	367,540
Italy	291,500
Norway	141,600
France	137,790
Netherlands	98,500
Denmark	75,450
Germany	41,500
Finland	39,720
Slovenia	32,340
Poland	15,265

Večino (60%) vseh napeljav v Evropi so zgradile lokalne skupnosti in komunalna podjetja. Telekomi imajo nizek delež.

Penetracija FTTH/B v svetu, 2009



Širokopasovna evolucija, Nemčija



ECOC, 2007

Investitorji v omrežje po deležu EU2009

Tradicionalni operaterji (Telekomi)	11,5%
Mestne in komunalne skupnosti	55,7%
Alternativni operaterji	28,7%
Stanovanjska podjetja	4,1%

10 največjih telekomov v svetu

	Carrier	Employee	Market Cap	GPON	EPON
❶	NTT	205,000	$3,071B	■	
❷	AT&T	310,000	$152.57B	■	
❸	Verizon	224,000	$89.19B	■	
❹	Telefonica	250,000	$88.63B	■	
❺	France Telecom	185,000	$62.58B	■	
❻	Deutsche Telekom	230,000	$55.19B	■	
❼	China Telecom	285,000	$31.05B	■	■
❽	Telecom Italia	80,000	$18.94B	■	
❾	China Unicom	200,000	$13.83B	■	■
❿	British Telecom	112,000	$12.40B	■	

Telekomi se prednostno opredeljujejo za GPON in njegove prihodnje izpeljanke.

FTTH po svetu – dilema T-T in PON

- Graditelji omrežij PON in T-T

	Europe	Rest of the world
Točka-mnogo točk **PON**	Telefonica France Telecom Deutsche Telecom British Telecom/Open Reach Portugal Telecom Telenor SFR Eircom Soneacom	Verizon AT&T NTT KDDI Korea TELECOM LG Powercom China Telecom M-NET Lafayette Utilities System
Točka-točka **P2P**	I3 Free Lyse Telecom Reggefiber Swisscom Teliasonera	Openet Singapore

86%

14%

P. Solina ECOC 2010

Območja dostopovnega omrežja

1. Novo dostopovno območje (greenfield):

- območje stanovanjskih hiš, novogradnje (SFU, single flat unit)
- območje stanovanjskih blokov (MDU, multi-dwelling unit)

2. Obstoječe dostopovno omrežje (brownfield):

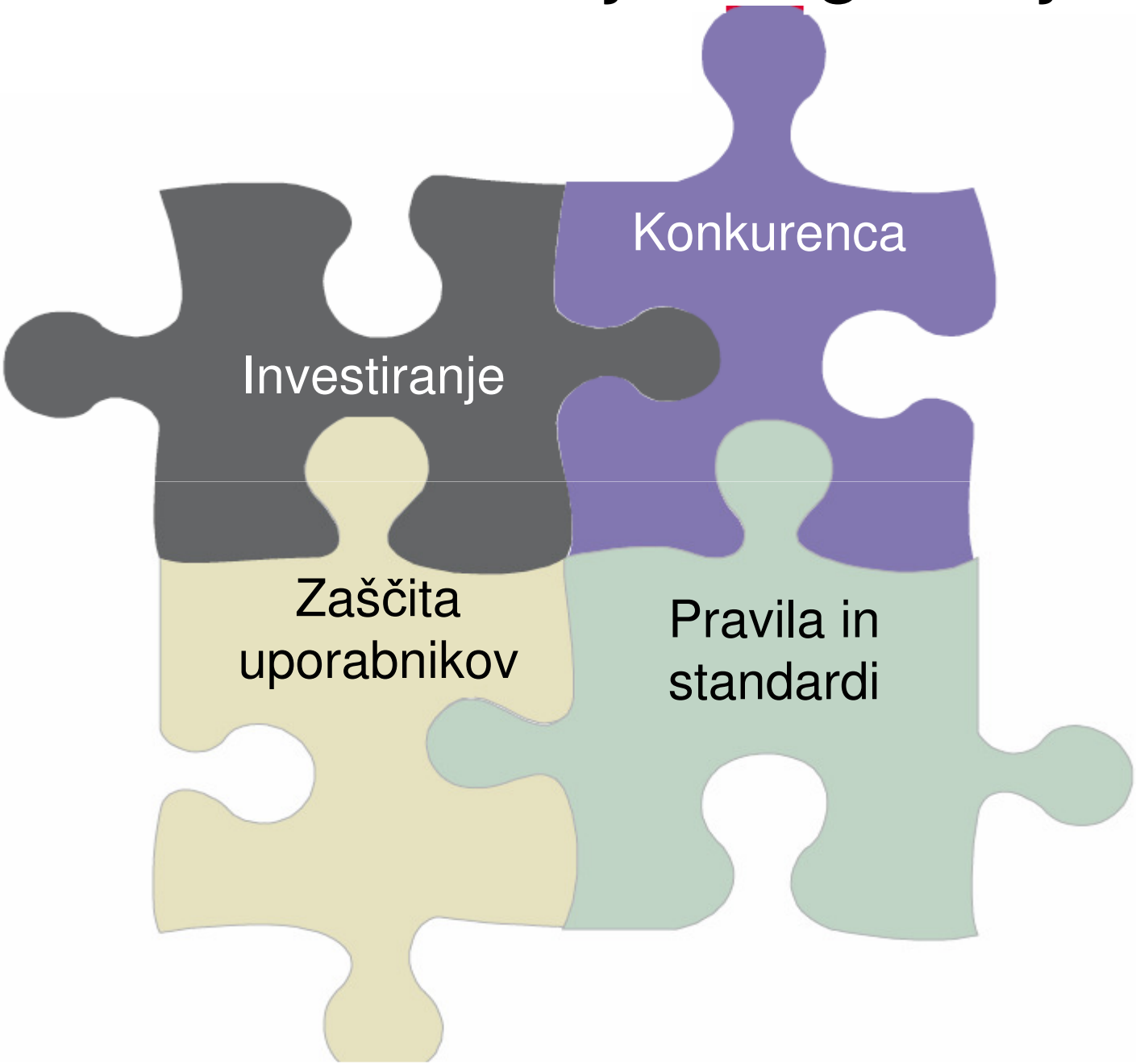
- Gosto pozidano urbano področje, mestna jedra, dostopnost telefonske in kanalske infrastrukture

3. Regulacija:

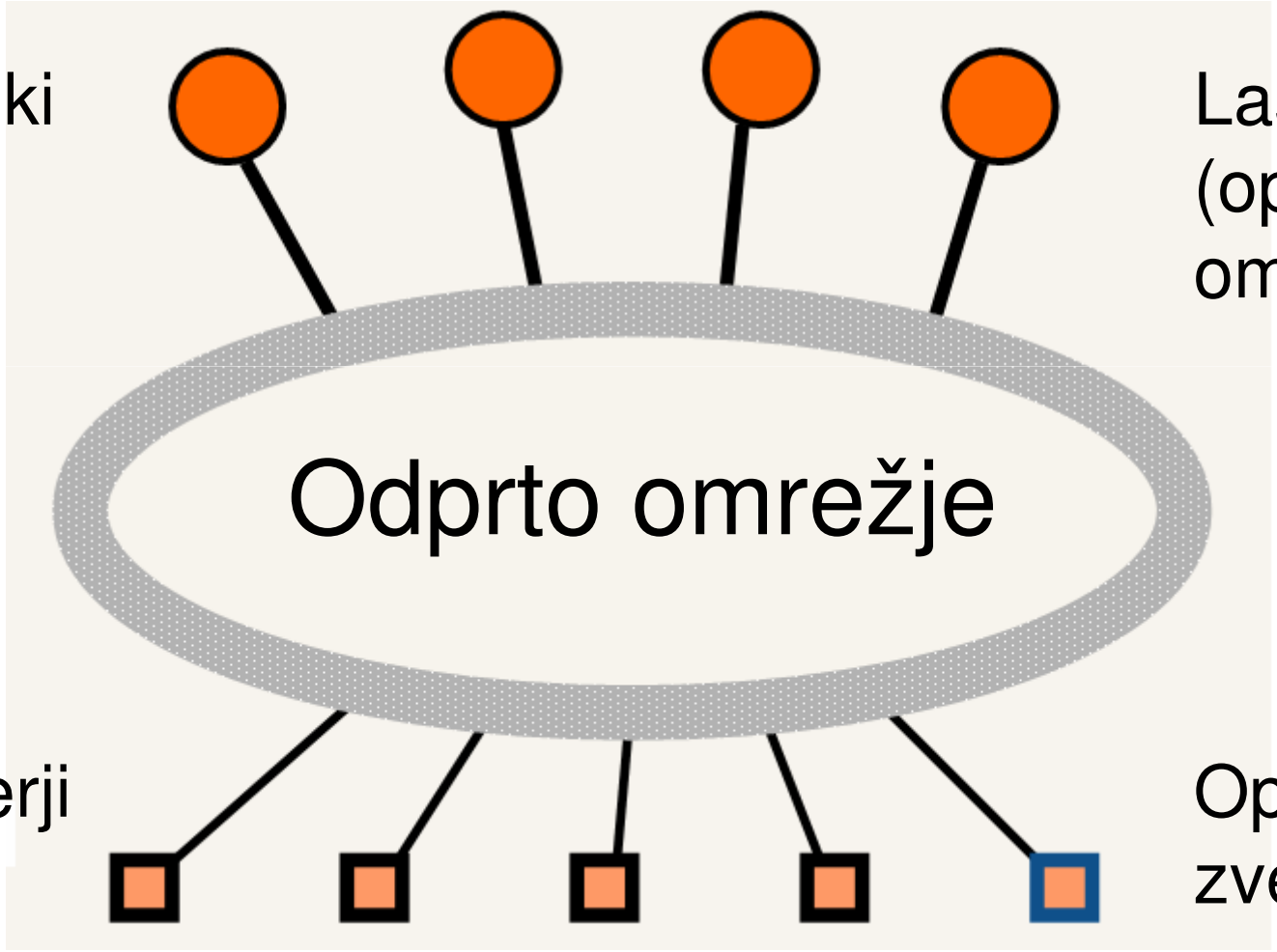
- Razvezava zanke (Japonska, Koreja, Eu, ZDA)
- Konkurenca ponudnikov storitev
- Vlaganje v omrežje, interes vlagateljev ?

Regulacija

Povezanost ciljev regulacije



Partnerji


Naročniki
Lastniki (operaterji) omrežja
Odprto omrežje
Operaterji storitev
Operaterji zveze

Kaj je odprto omrežje?

- A network that:
  - Network Operator and Service Operator are discrete entities
  - Reciprocal contracts between end users and service providers
  - Network Operator is not involved in any other operation except for the connectivity service
  - End users may select a service from any service provider over a shared infrastructure controlled by the network operator
- This is an **OPEN NETWORK**

Definicija in pravila odprtega omrežja

Definicija

- Allows open, transparent and non-discriminatory access of third parties to high speed telecom infrastructure

  http://www.bundesnetzagentur.de/media/archive/16268.pdf

- Open access is predominantly about a business model. A key issue is the establishment of a trusted actor, that owns, maintains and supervises a well designed set of access rules to a common shared infrastructure creating a market place for users and a wider spectrum of service providers.

  R. Battiti et al: Global growth of open access networks, 2003

Pravila

- Any user must be free to select any service provider on the Open Access network (OAN)
- Any service provider must be free to deliver services over the OAN
- Service providers should be offered transport services at different architectural levels and refinements
- All services providers must be offered the same conditions
- The owner of the OAN is not allowed to offer services to end users

SBR
Juconomy Consulting AG

Cilji regulacije

Cilj regulacije je ureditev razmerij med različnimi akterji v telekomunikacijskem omrežju (tradicionalni operaterji – telekomi (incumbments), alternativnimi operaterji - altneti, operaterji storitev, operaterji zveze, operaterji omrežja)

- Cilja delujeta nasprotno, obeh ni mogoče doseči hkrati

Operaterji

1. Pasivni operater, operater (lastnik) omrežja

investitor v infrastrukturo omrežja, lastnik pasivnega omrežja

- oddaja omrežje v najem aktivnim operaterjem

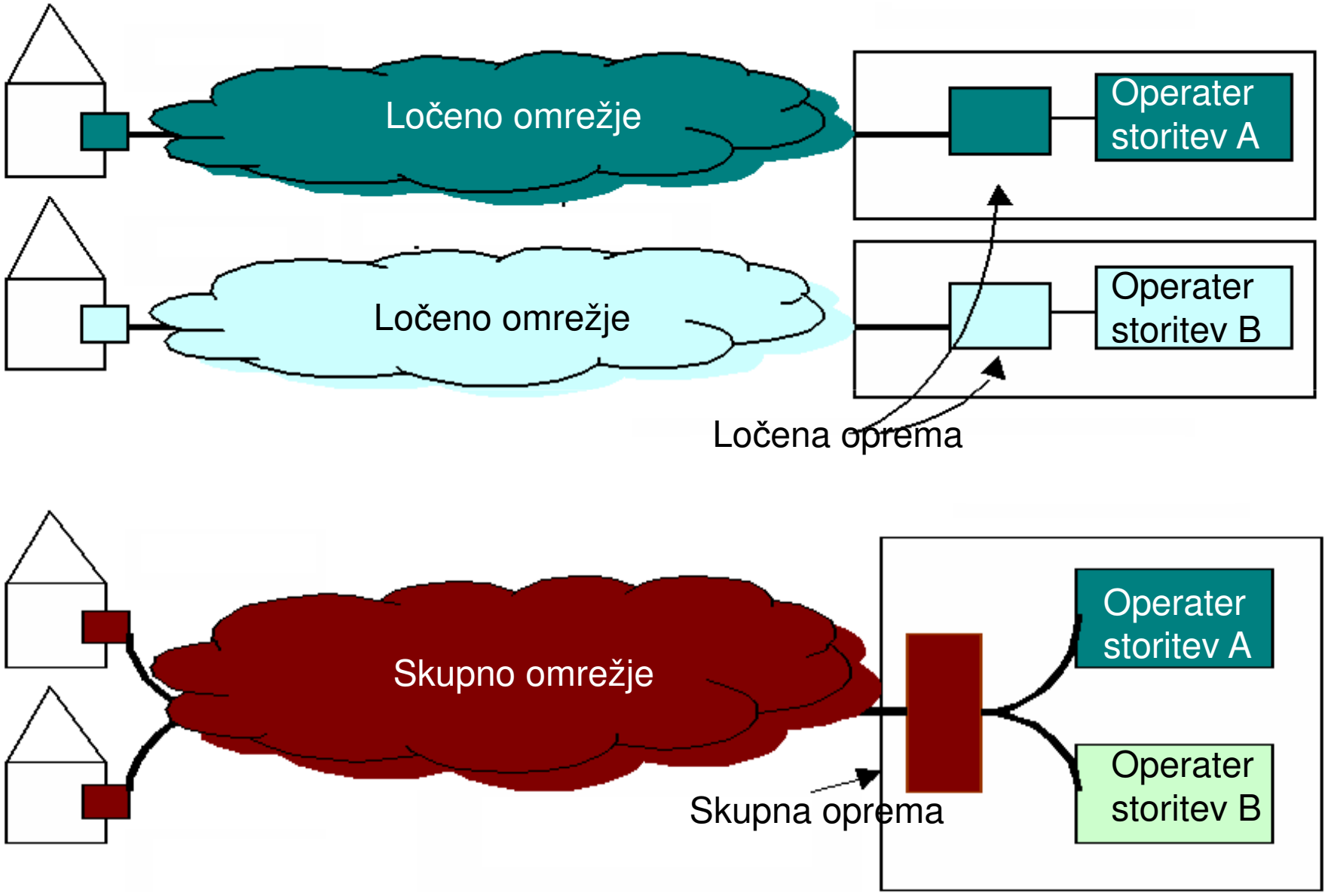
2. Aktivni operater, komunikacijski operater, operater zveze

- investira v opremo in končni del omrežja
- oddaja omrežje v najem opraterjem storitev

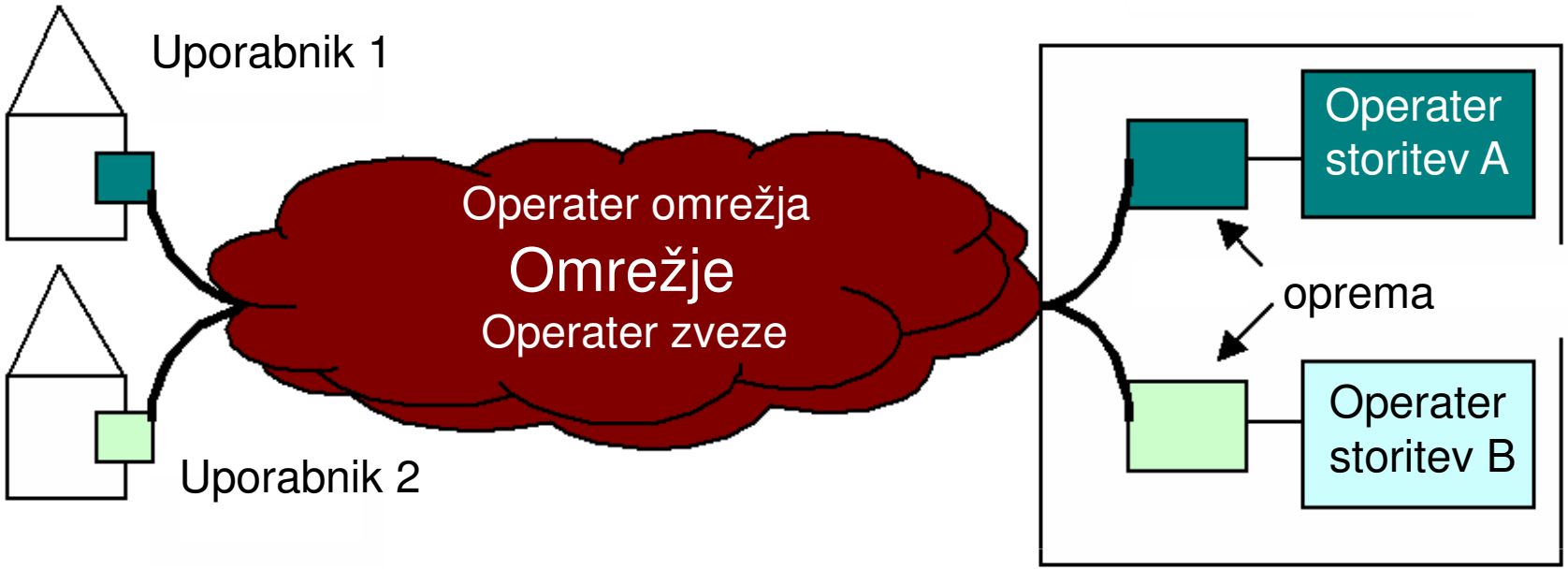
3. Operater (ponudnik) storitev

- sklepa razmerje s končnim uporabnikom

Ločeno in skupno omrežje



Razvezava



Zveza T-T:

- Razvezava na fizičnem nivoju je možna
  Operater storitev najame vlakno

Zveza PON:

- Razvezava na fizičnem nivoju ni možna
  Razvezava na logičnem nivoju je možna

Zveza WDM PON

- Razvezava na optičnem nivoju je možna
  Operater storitev najame valovno dolžino pri operaterju omrežja.

Cilji in načini regulacije

Cilji regulacije

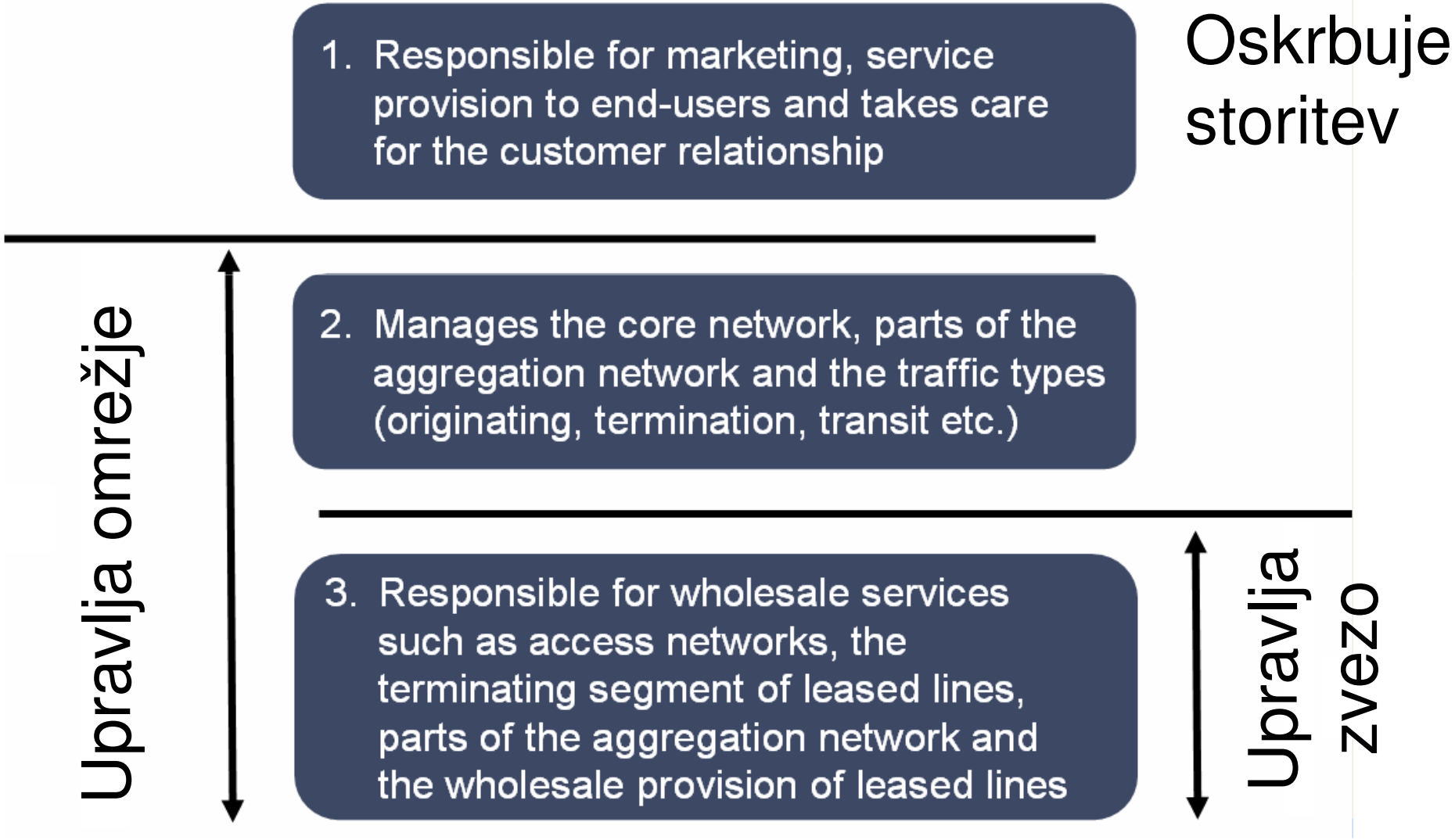
- Spodbujati investiranje
- Spodbujati konkurenco
- ...

Načini regulacije

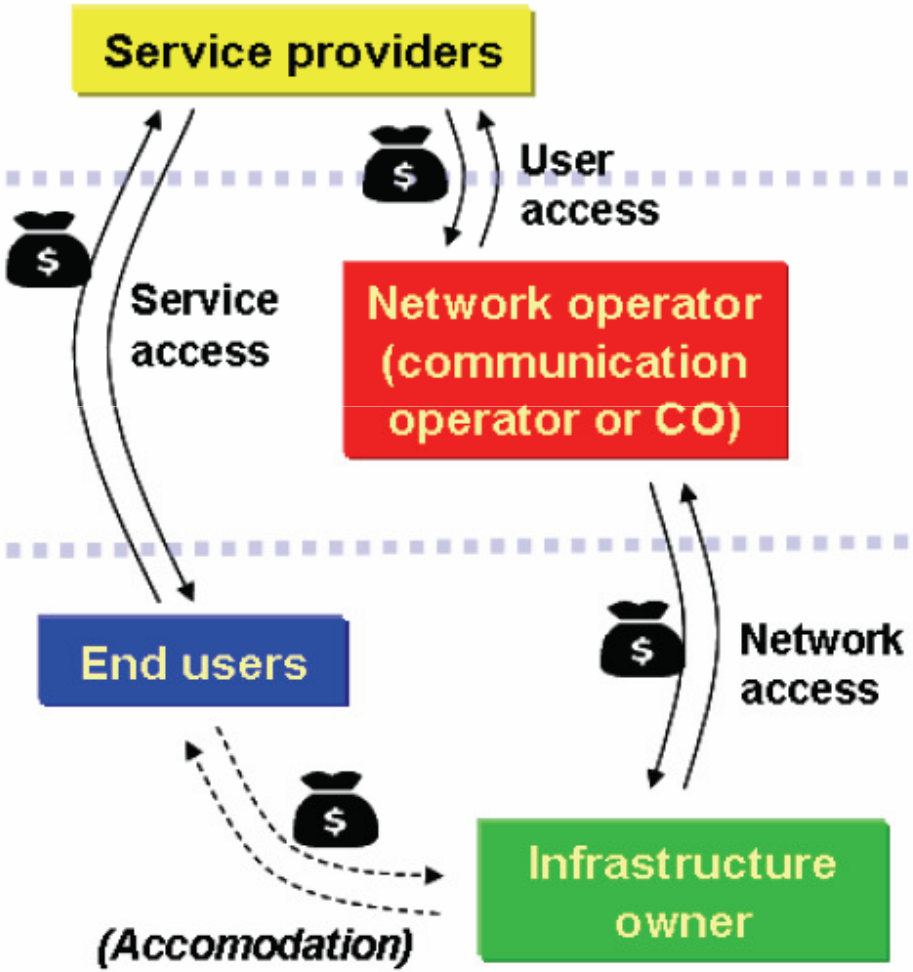
- Pravila, obveznosti, cene
- Funkcionalna ločitev
- Odprt dostop

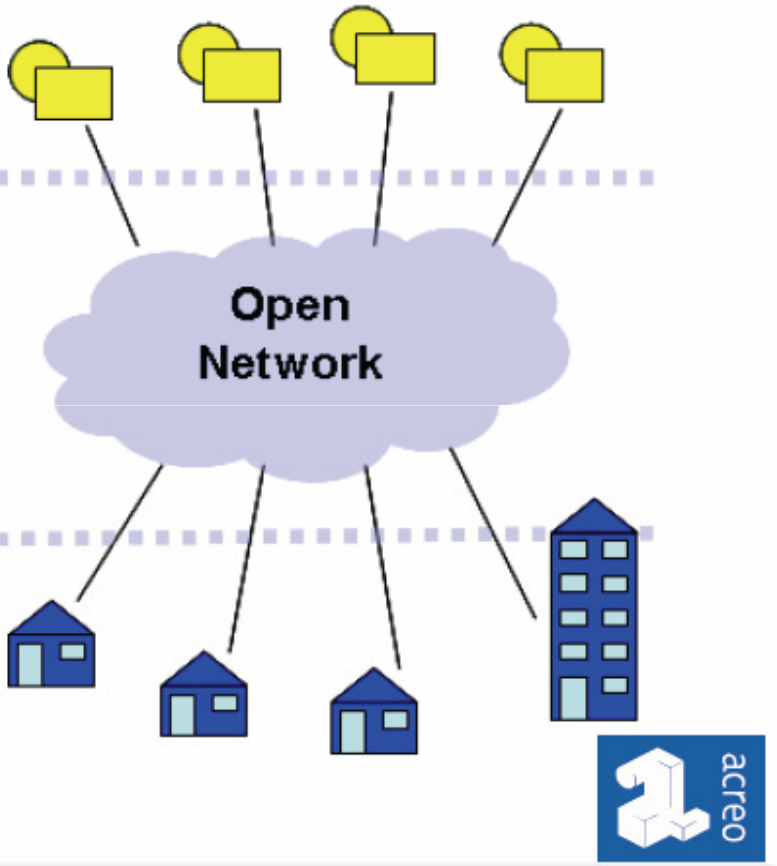
Vertikalno integriran operater

- Združuje v svoji organizaciji vse tri funkcije delovanja
- Ne ustreza ciljem regulacije



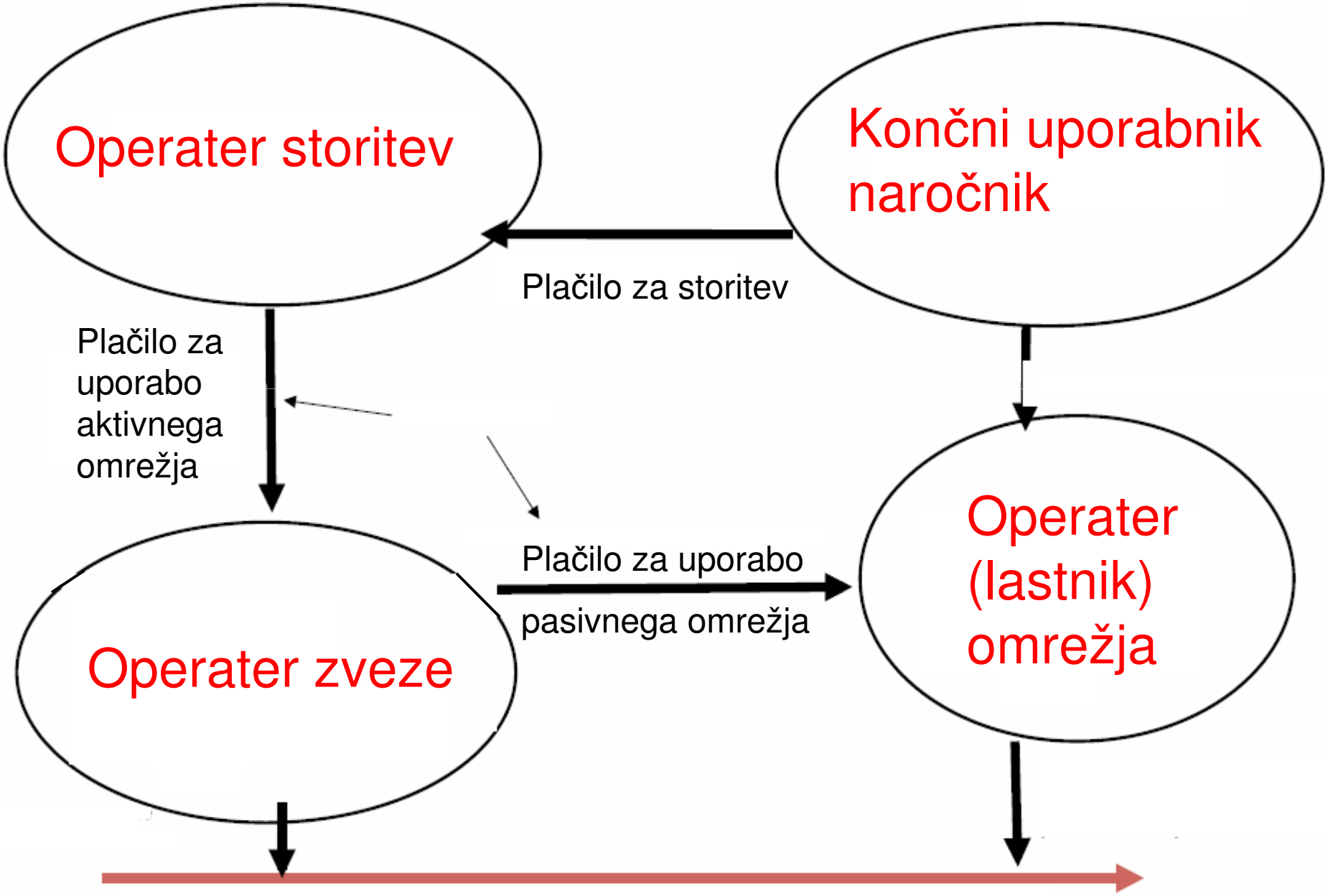
Odprt dostop – poslovni model



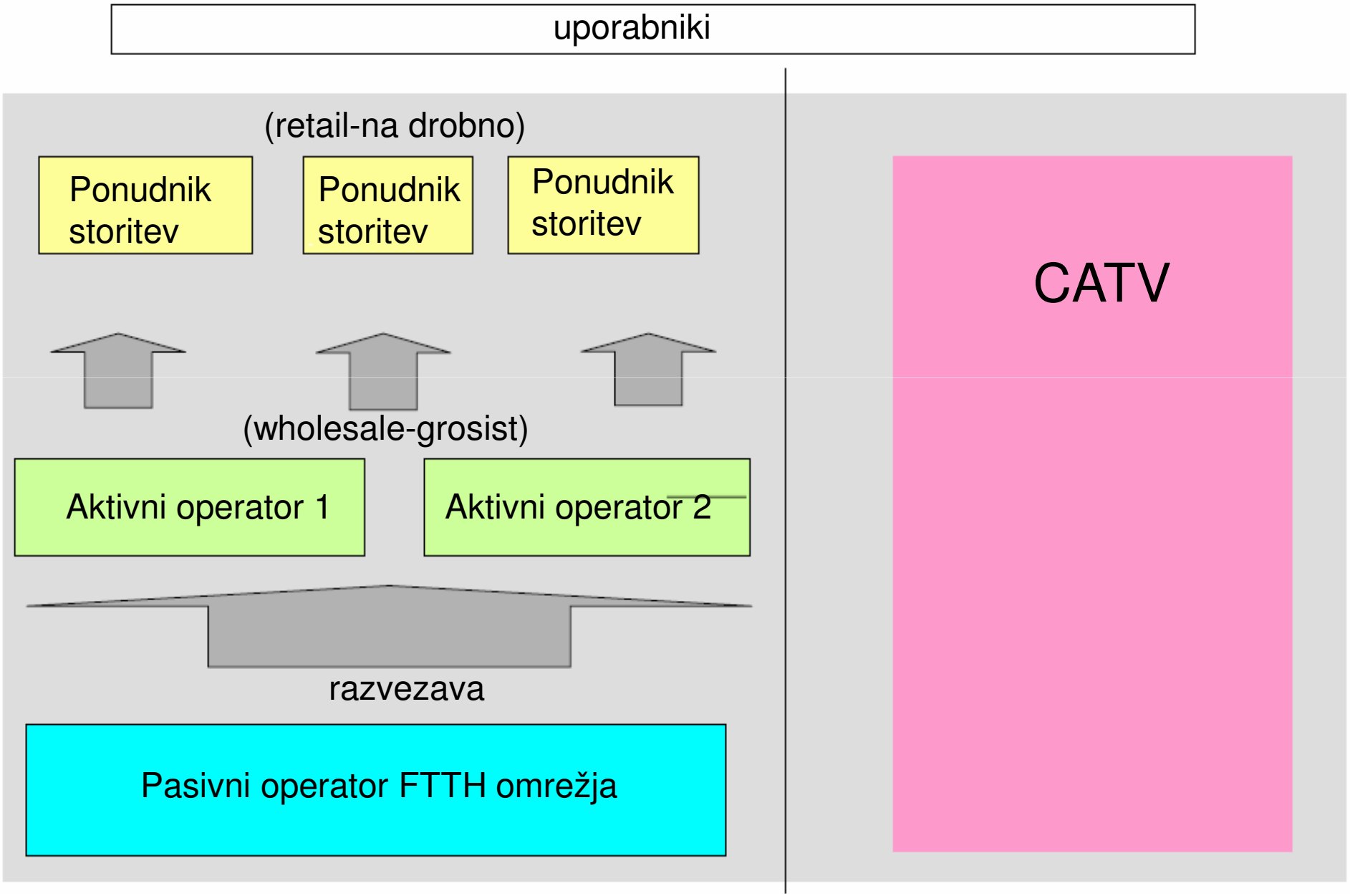


All service providers should have access to end users on equal terms

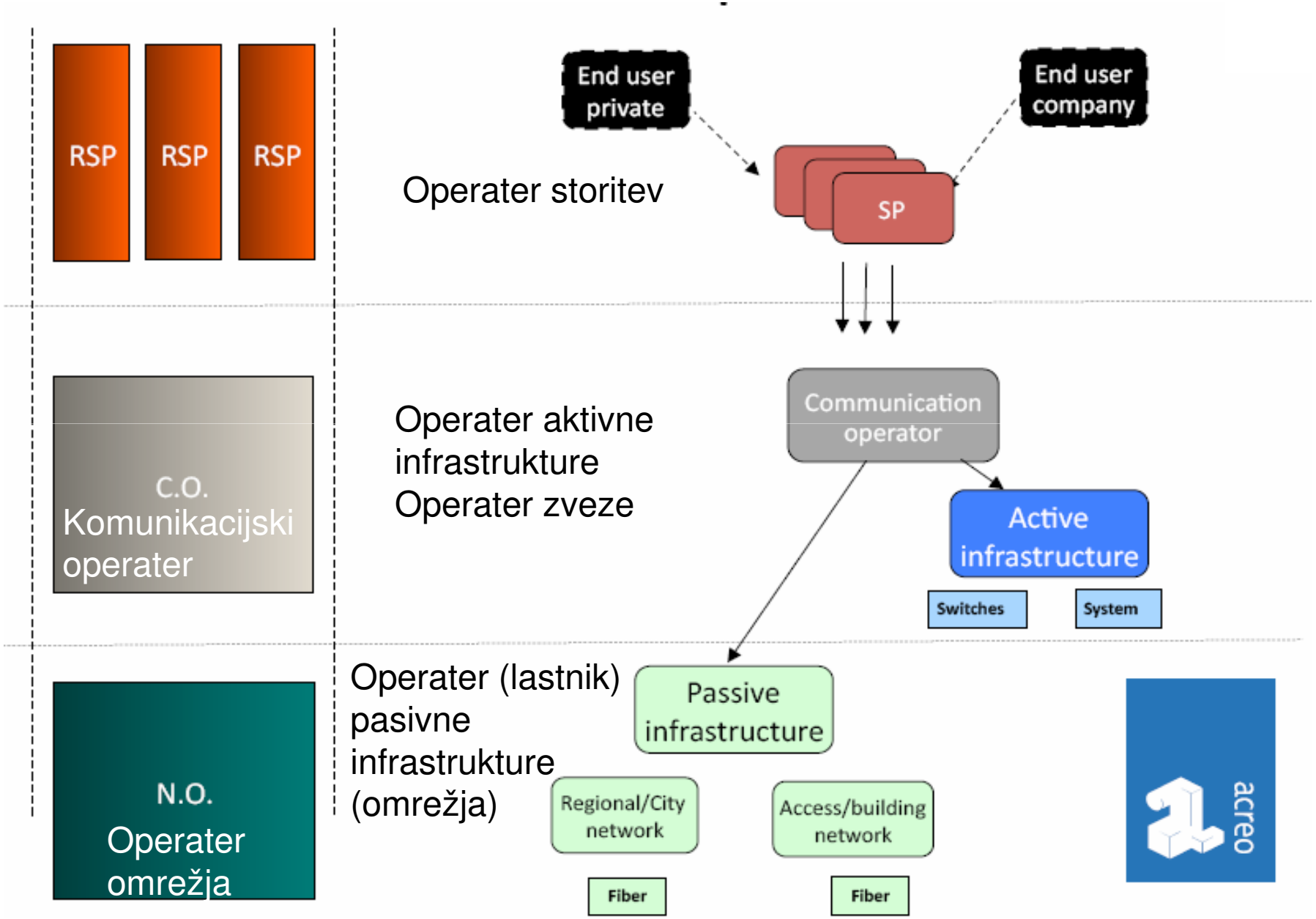
Odprto omrežje – poslovni model



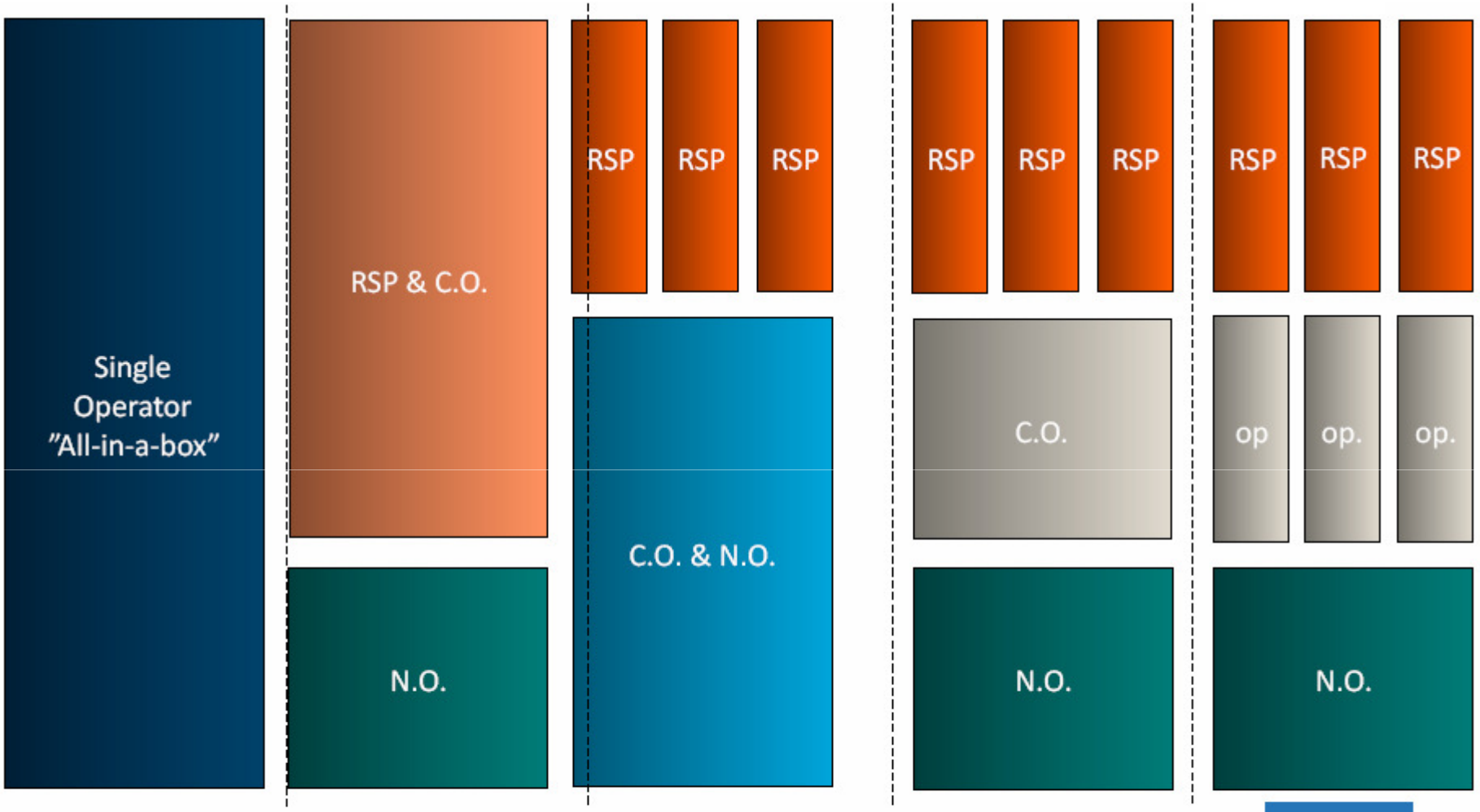
Poslovna modela v OAN in CATV



Komunikacijski operaterji



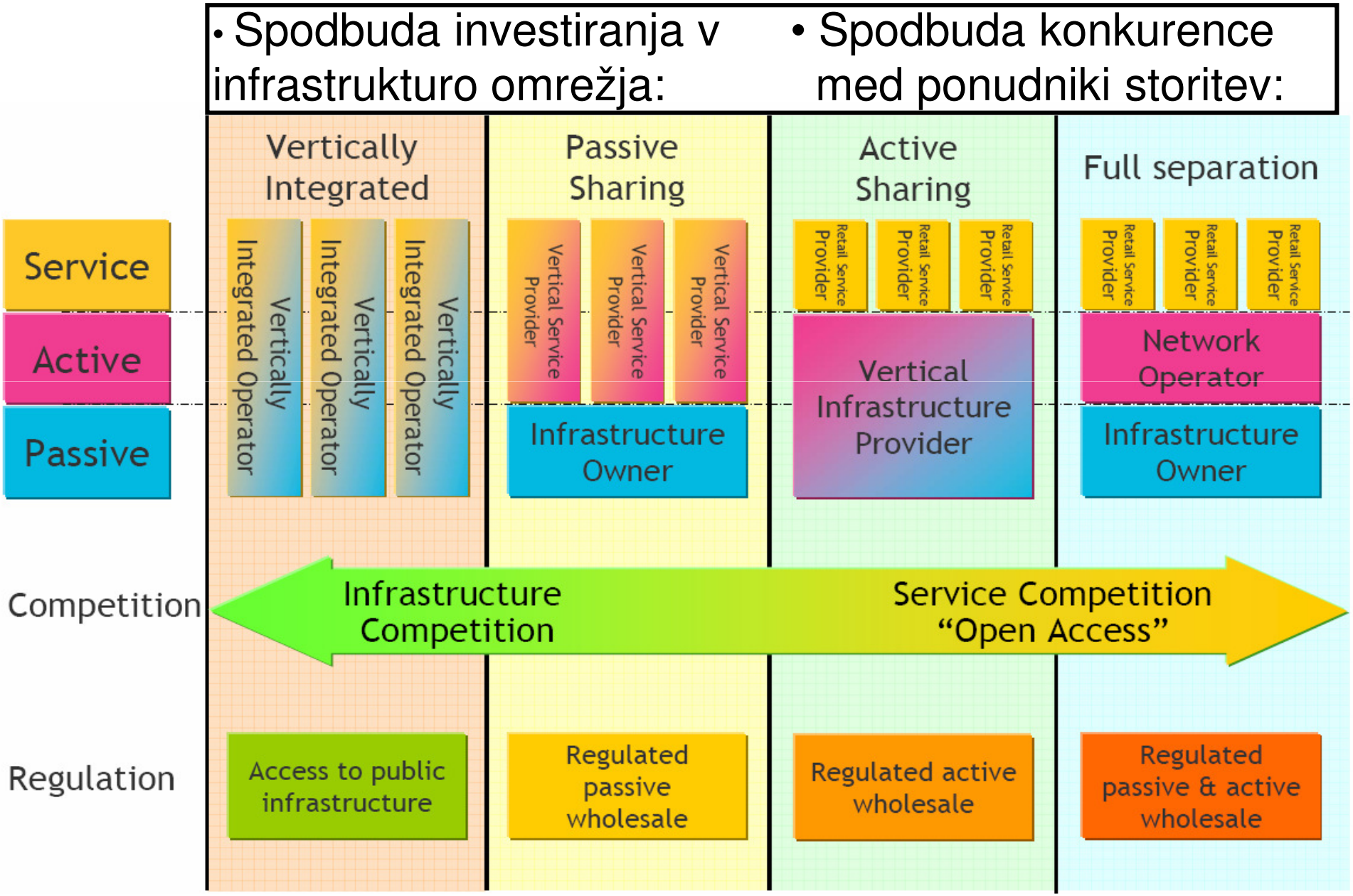
Poslovni modeli



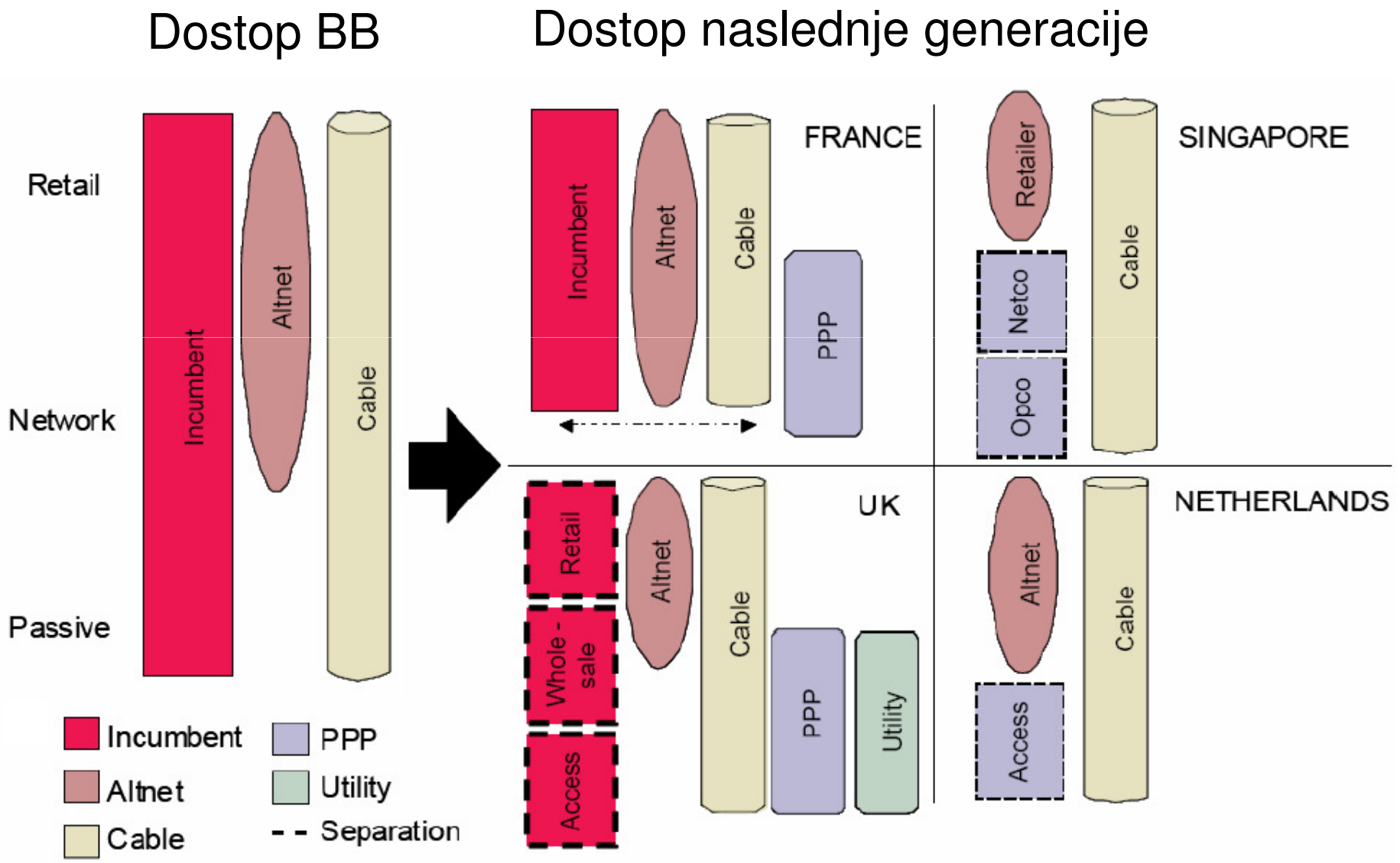
- RSP = Retail Service Provider, providing the services
- C.O. = Communication Operator, investing in and operating the active layer
- N.O. = Network Operator, investing in and operating the passive layer

acreo

Stopnje regulacije



Sedanja in prihodnja ureditev nekaterih držav



Funkcionalna ločitev

Common position adopted by the Council

SBR
Juconomy Consulting AG

(46) The purpose of functional separation, whereby the vertically integrated operator is required to establish operationally separate business entities, is to ensure the provision of fully equivalent access products to allow downstream operators, including the operator's own vertically integrated downstream divisions. Functional separation has the capacity to improve competition in several relevant markets by significantly reducing the incentive for discrimination and by making it easier to verify and enforce compliance with non-discrimination obligations

- FS may be justified in exceptional cases (ultima ratio)
  - where there is no prospect of infrastructure competition
  - after recourse to one or more remedies

Agreement in third reading expected autumn 2009; 18 months timeframe for transposition into national law

- Incentives to invest need to be preserved
- NRAs should pay particular attention to products, network roll-out, degree of technological progress, which may affect substitutability of fixed and wireless services
- FS should be approved in advance by the Commission

competitor pressure

Funkcionalna ločitev, Openreach, UK

- Openreach provides full functional and operational separation within the same legal entity.
- Whilst it is owned by BT, BT Group only has one member on its board.
- Openreach sets its own objectives and is self governing.
- Breaches can lead to:
  - Directions from Ofcom &/or court enforcement
  - Reference to the Competition Commission
  - Third party actions for damages
- Openreach's real purpose is to guarantee a fully competitive downstream environment for incumbent and CPs alike.
- Openreach's regulatory remedies are in addition to those Ofcom have mandated following market reviews.

BT

BT – razlogi za razvezavo in pogoji

- **Competition for provision of services will reduce prices and drive up quality**
- **The solution needs to be forward looking**
  - monopolists will not innovate as there is no incentive to take risk
  - fibre to cabinet or premises should not be used as an excuse for re-monopolisation
  - BT is rolling out 21CN (NGN) knowing it will be regulated
  - reward for this investment is the key issue
- **On what terms should Access be made available?**
  - Non discriminatory
  - Transparent
  - Cost orientated
  - NRAs need to consider all markets as business needs are not the same as residential

BT

BT Openreach

- BT infrastructure operations in separate unit called Openreach
- Openreach will own infrastructure of future Optical Access/ Metro Network
- Openreach provides equal access for all Communications Providers (CPs) - *Equivalence of Input (EOI)*
- FTTP viable in Greenfield sites with ~>20 premises
  - (actual number depends on detailed economics)
- GPON preferred FTTP solution
- No commitment at this point to mass market roll out of FTTP.

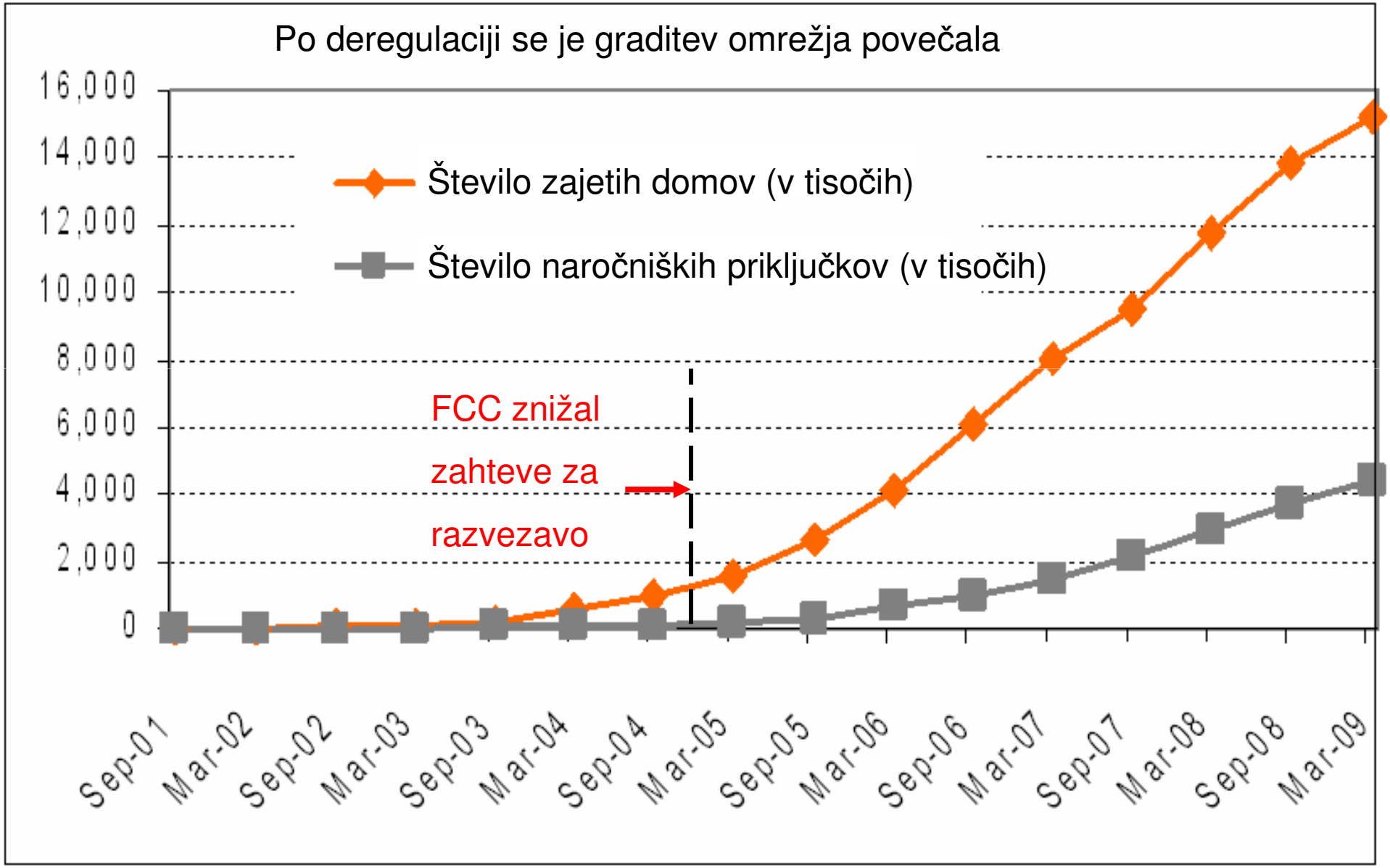
Kritično mnenje

- No evidence that network-sharing accelerates broadband penetration
- Preliminary evidence suggests that such regulation reduces network investment
- Network-sharing mandates will create disputes over network architecture – who decides on the technology to be deployed?
- Once regulators begin these mandates, they are induced to extend greater and greater support to failing entrants who cannot build their own facilities

Kritično mnenje: zakaj UK zaostaja

- Partly because of higher penetration of satellite broadcasting in UK compared to other OECD countries
  - Reduces multi-channel revenues available to FTTH installers
- Partly because of incumbent network operators fear that if they were to invest, OFCOM would require them to give uneconomic access to competitors to the new network whilst at the same time bearing high costs maintaining the legacy copper network.
- In a sense OFCOM is perceived to be holding back progress
- But BT announced last month a £1.5Bn plan for some FTTC (with VDSL)

Primer ZDA – pred deregulacijo in po njej

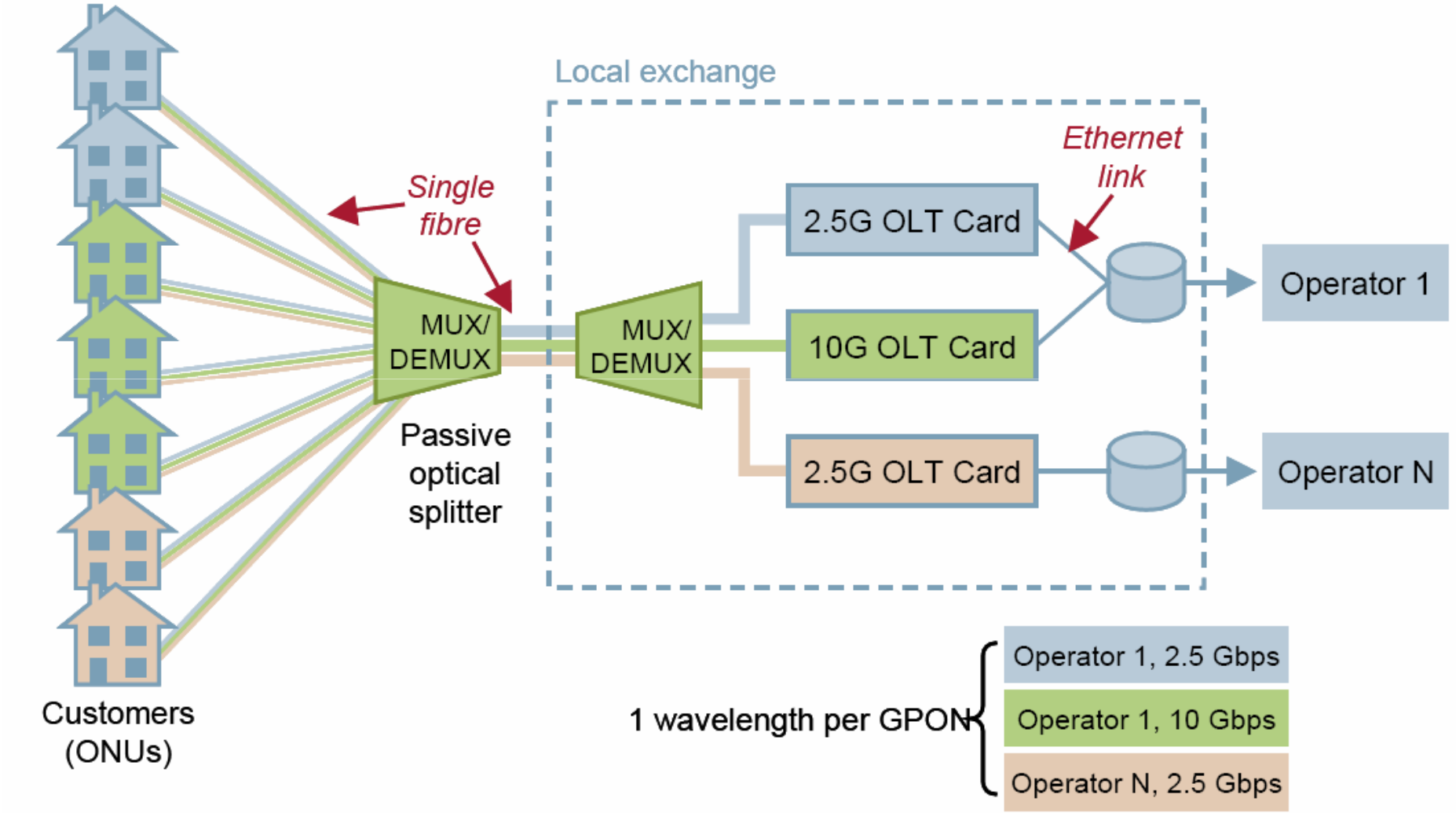


Razvezava

Vrste razvezave

1. Razvezava na fizičnem nivoju
   Zveza T-T, zveza PON (delno)
2. Razvezava na optičnem nivoju
   WDM PON
3. Razvezava na logičnem nivoju
   TDM PON

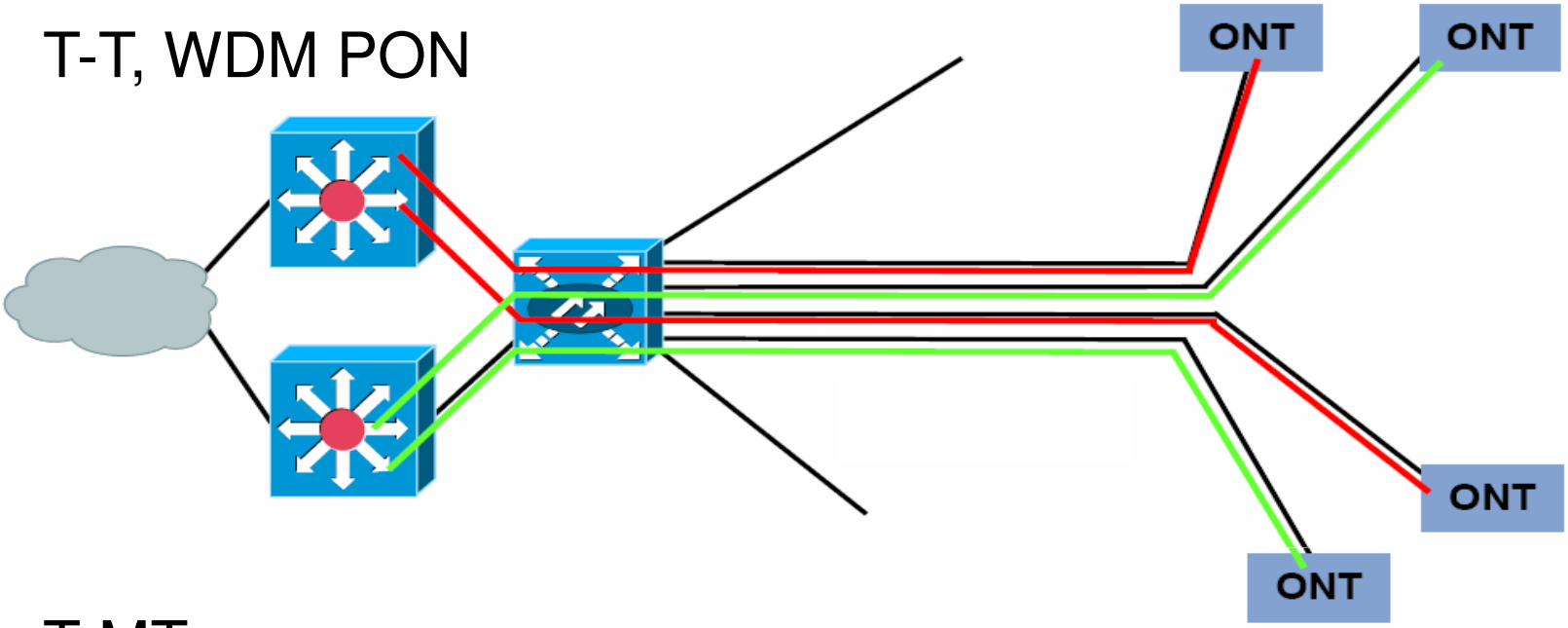
Razvezava WDM PONa na optičnem nivoju



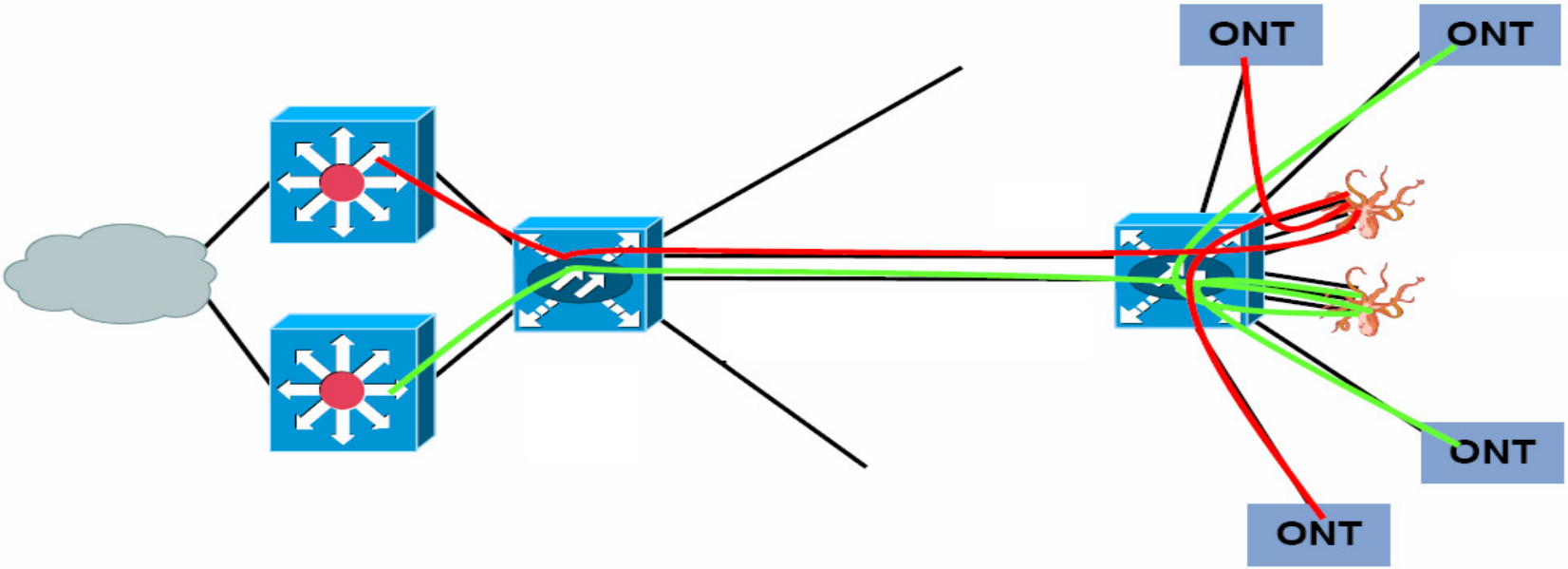
Ofcom, Analysys Mason 2010

Razvezava na fizičnem nivoju

T-T, WDM PON



T-MT:



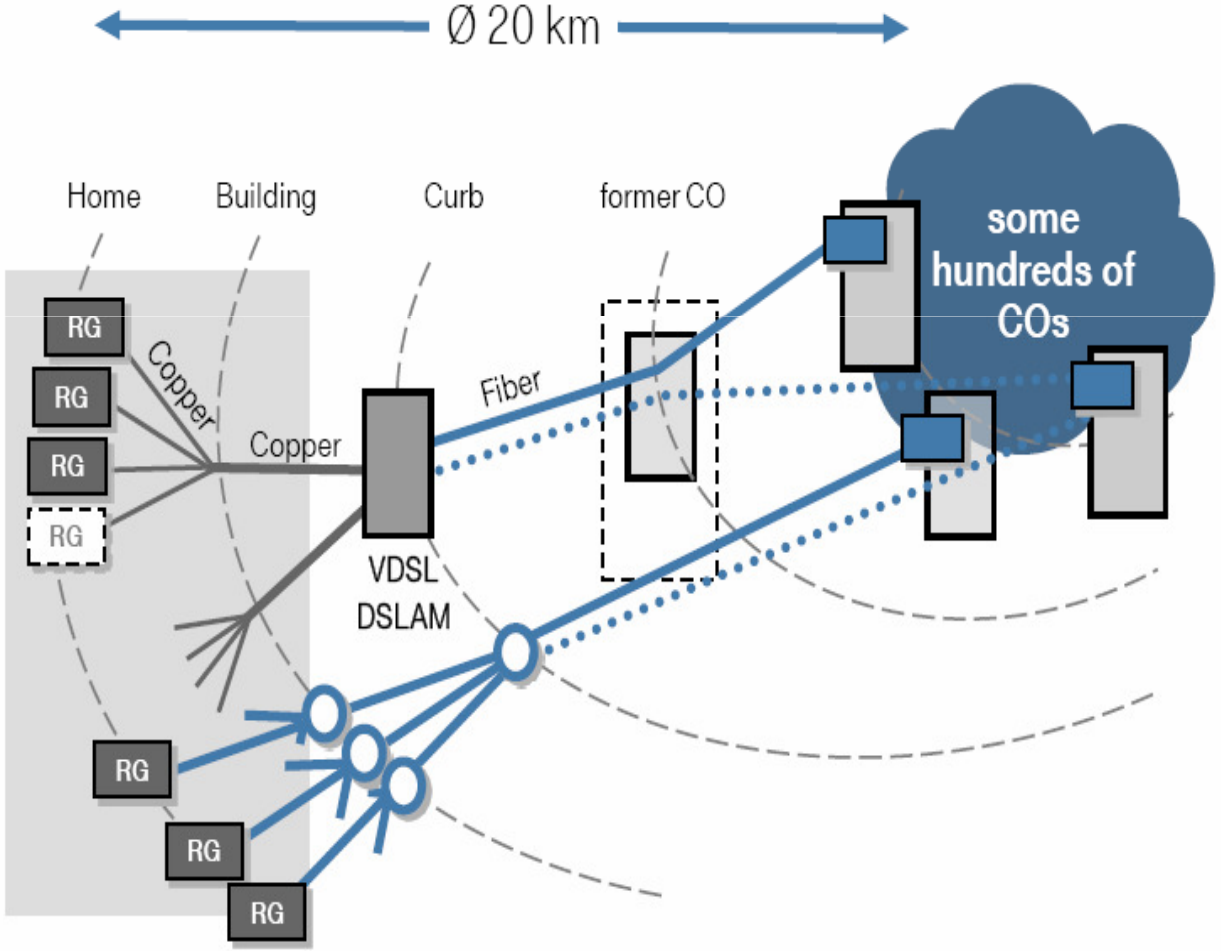
Ekonomika

Mnenje BT o možnih načinih pocenitve

- There is no economic case for large scale FTTP roll out in the UK based on existing solutions
- Research team investigating a radical "Long Reach PON" solution that changes the economic structure of networks:
  - Longer reach access to eliminate metro networks
  - Higher capacity – 10GBit/s symmetrical
  - Greater split/sharing to improve economics
  - Network simplification and node consolidation to reduce opex
  - Optical NTE and Self-install ONU to reduce capital cost of the infrastructure provider and simplify upgrades
- An intermediate step could be extended reach GPON
- There is an on-going need for infrastructure research that addresses more efficient fibre deployment

BT

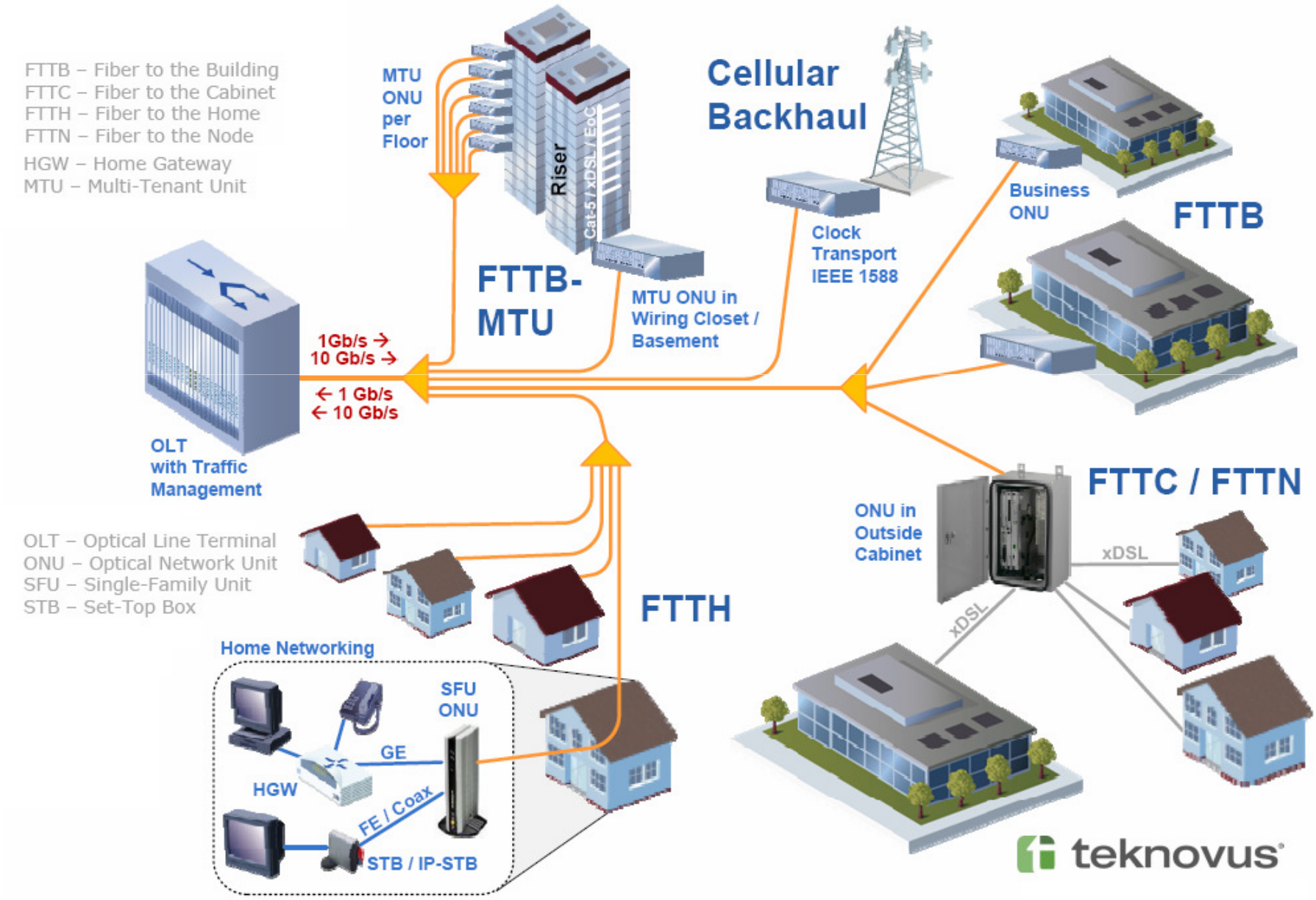
Značilnosti prihodnje arhitekture



Reduced number of COs

- promises significant OPEX savings
- means an average distance of 20 km between customer premise and CO
- must support on average tens of thousands of customers per CO
- requires efficient fiber utilization resources between former and remaining COs

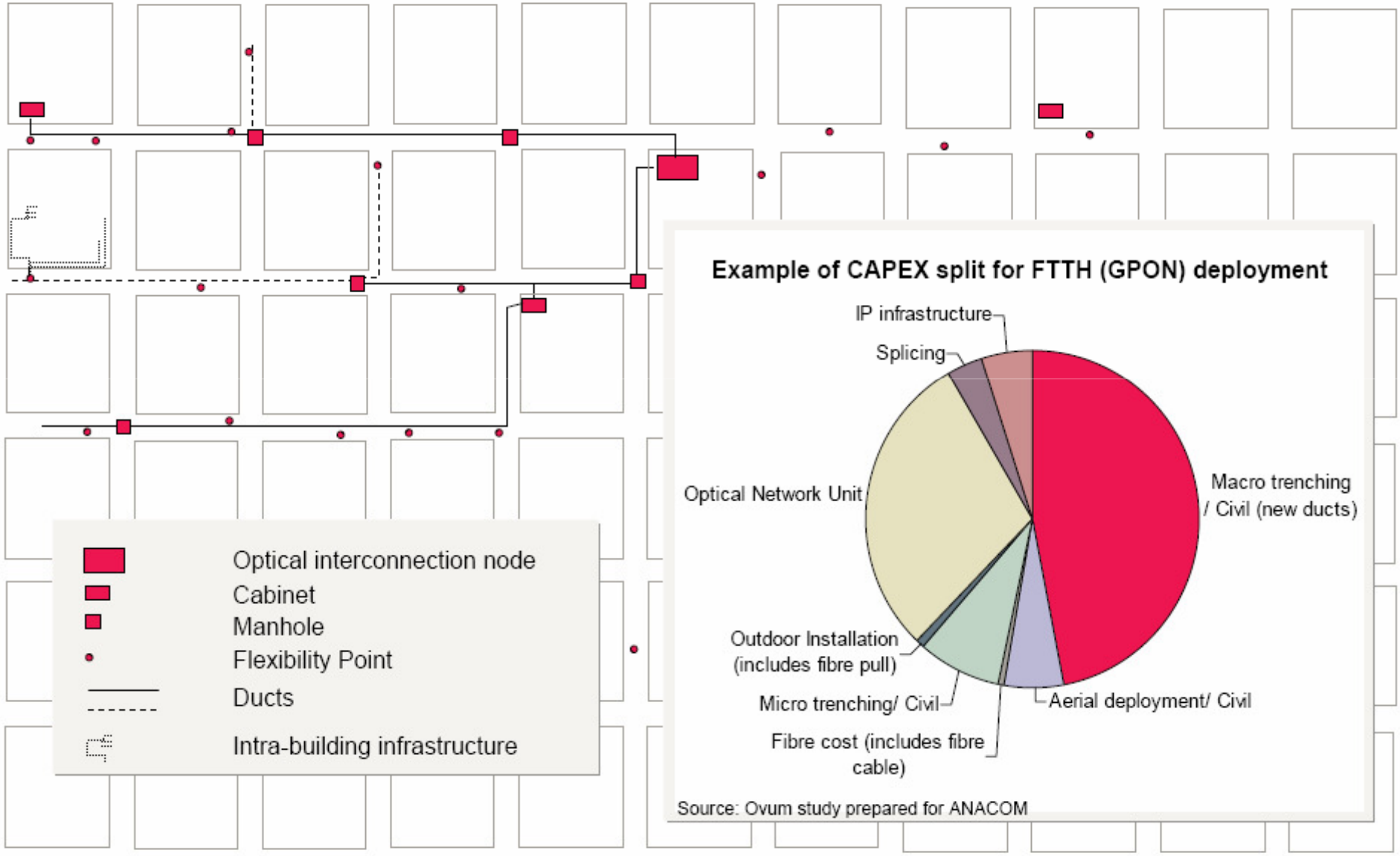
Uporabniki v optičnem dostopu



Tipizacija gostote naseljenosti

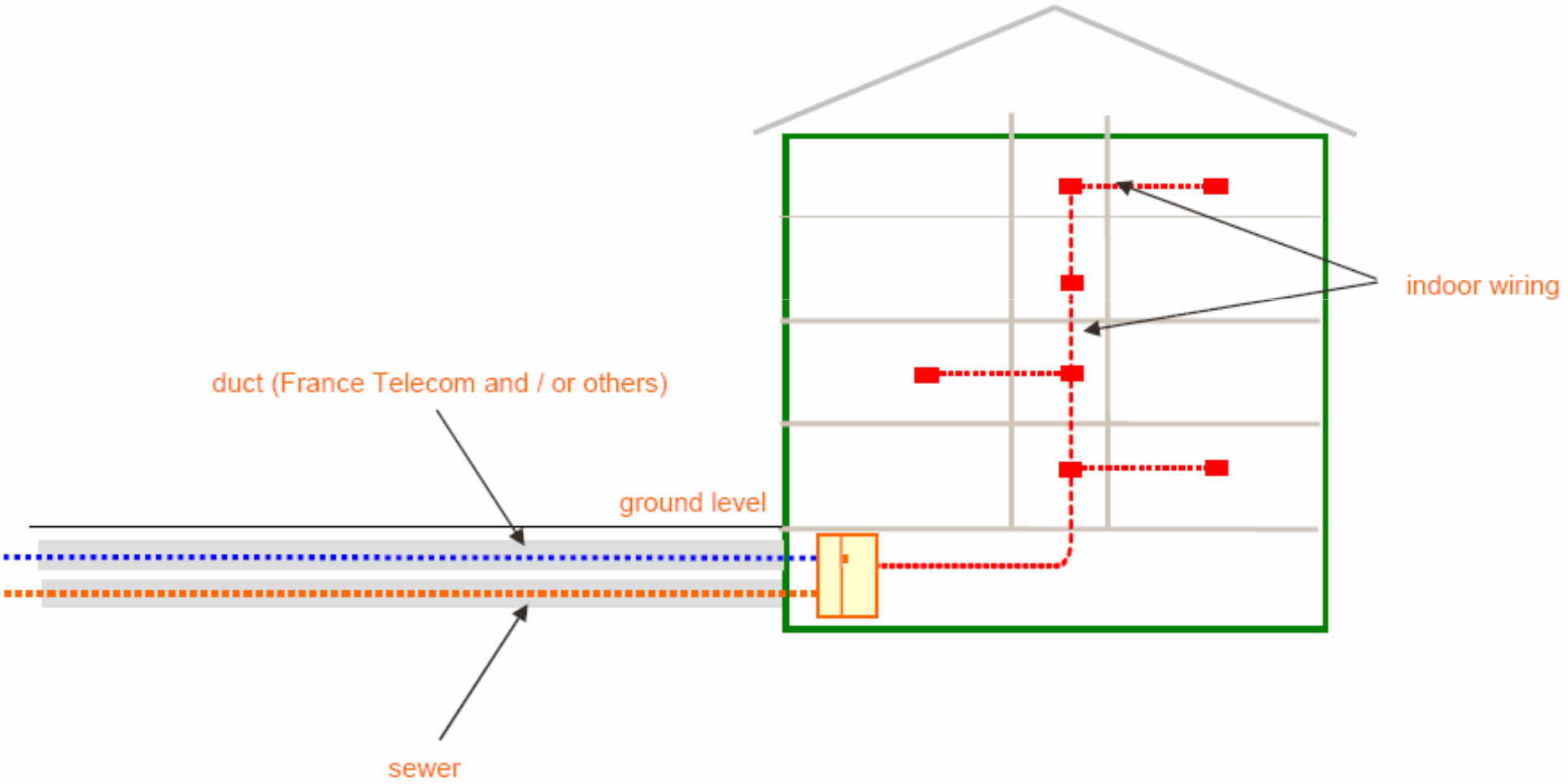
Geotype		Cluster	Subscriber density per km^2
Urban	(1)	Dense Urban	> 10.000
	(2)	Urban	> 6.000
	(3)	Less Urban	> 2.000
Suburban	(4)	Dense Urban	> 1.500
	(5)	Suburban	> 1.000
	(6)	Less Suburban	> 500
Rural	(7)	Dense Rural	> 100
	(8)	Rural	≤ 100

Razrez stroškov za CAPEX



Ovum Consulting 2009

Dostop do hiše

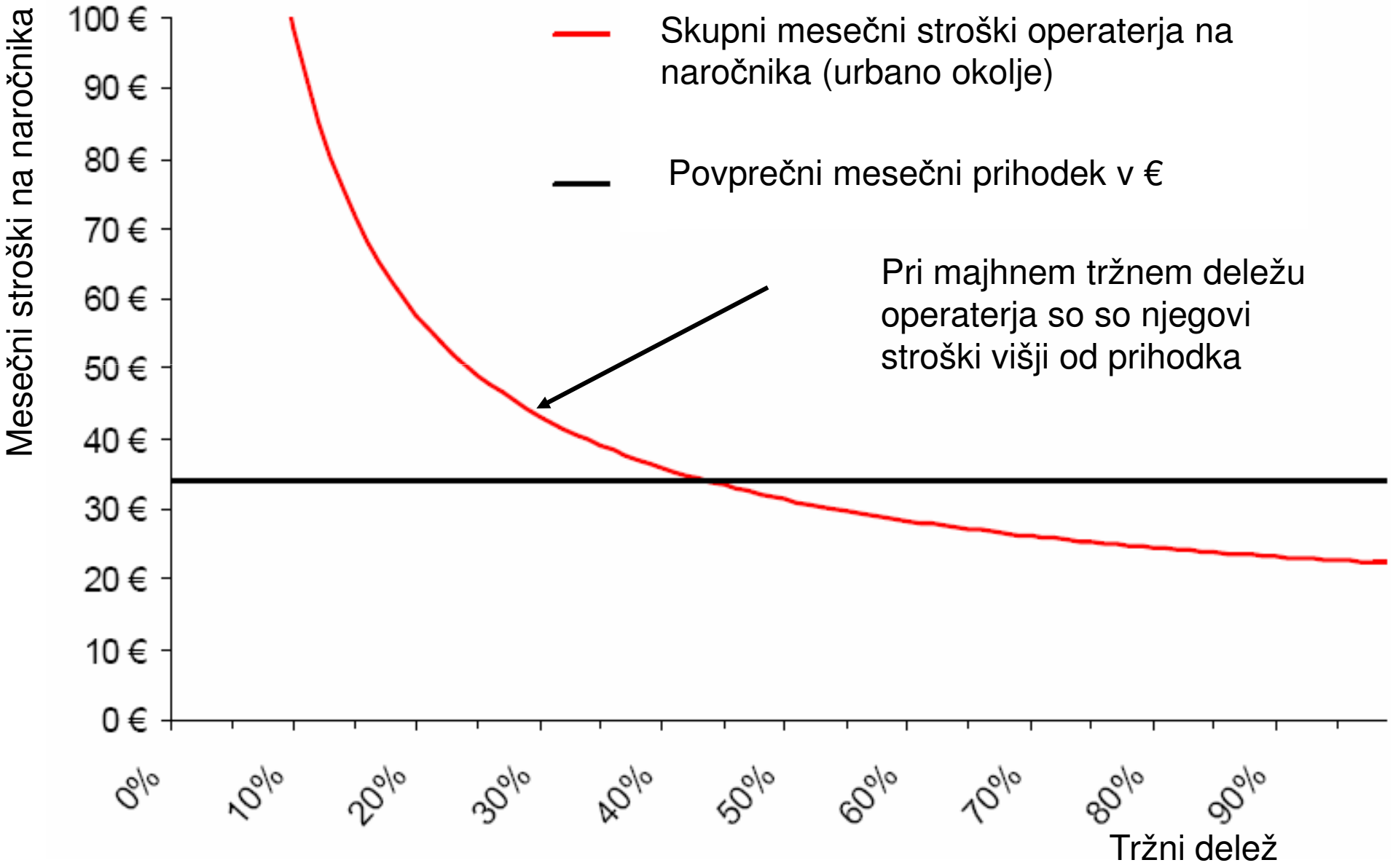


Primerjava med T-T in T-MT (PON)

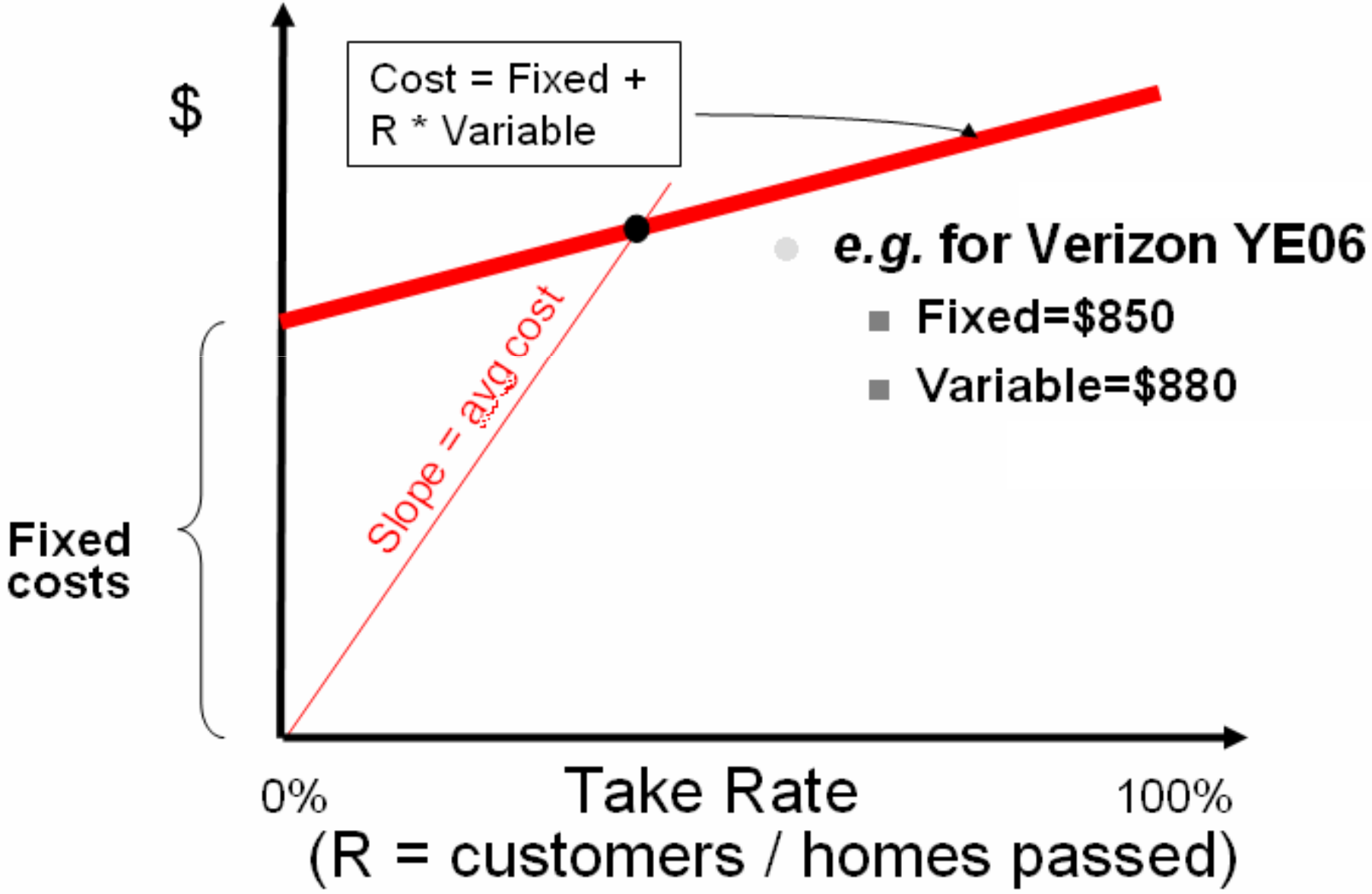
	point-to-point	GPON	on balance
duct occupancy for 20,000 customers	28 cables of 25 mm diameter, with 720 optical fibers each	3 cables of 13.5 mm diameter, with 144 optical fibers each	duct occupancy divided by 32 with GPON
central office requirements for 16,000 customers	32,000 fibers, 24 fiber racks and 24 HW racks, covering 180 m2 and requiring 67K Watts	508 fibers, 1 fiber rack and 2 HW racks, covering 11.25 m2 and requiring 4.8K Watts	64 less fibers to manage, floor space divided by 16 and power usage divided by 14 with GPON
bandwitdth per subscriber	no foreseeable limit	no foreseeable limit	same
potential for wholesale	both active and passive offers are possible	both active and passive offers are possible	same

source : Alcatel

Kritični tržni delež operaterja



Omrežje FTTH, fiksni in variabilni stroški

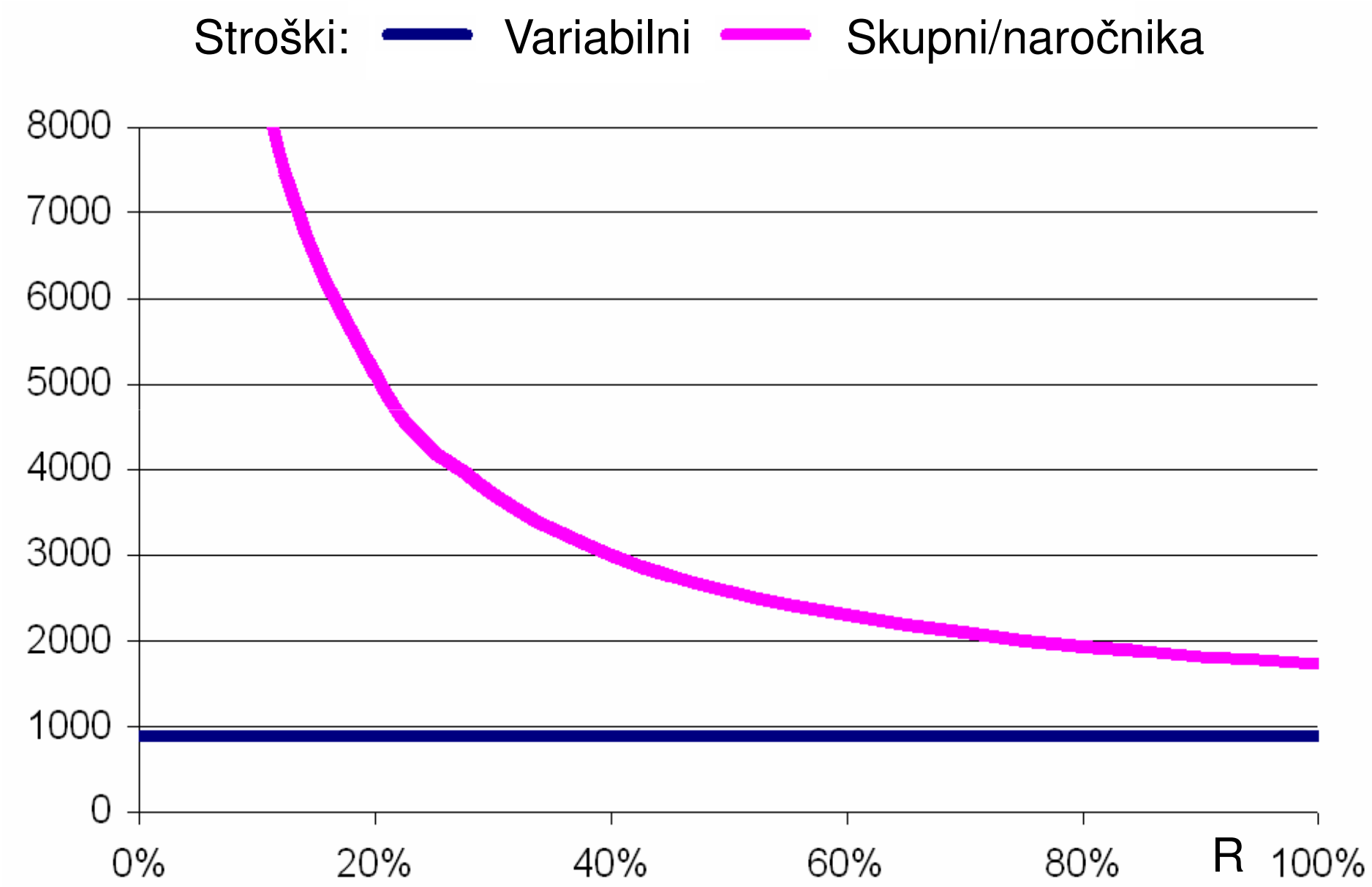


Razmerje penetracije v EU

R = število naročnikov / število zajetih domov (Dec. 2008)

Countries	Subscribers vs Homes Passed
Sweden	44,1%
Italy	14,5%
France	4,1%
Norway	65,6%
Netherland	29,0%
Denmark	14,5%
Germany	21,5%

Skupni stroški na naročnika



Evropa – razlike v ceni priključka

- 1,000 – 2,000 Euro per household in densely populated areas
- FTTH five times higher than VDSL
- P-2-P architecture less than 10 % more than PON

Investment per home connected (in Euro), market share 50%, urban cluster, stand alone first mover **

Network Type	Country [in €]					
	DE	FR	SE	PT	ES	IT
VDSL	457	n.v.	352	218	254	433
PON	2,039	1,580	1,238	1,411	1,771	1,110
P2P	2,111 (54%)	2,025	1,333	1,548	1,882	1,160

** Based on the investment of the urban cluster and a market share of 50%. If other marekt shares are used, it is mentiond in brackets.

n.v. – not viable

wik

Ekonomsko uspešna graditev

- In no country is FTTC/FTTH roll-out profitable for all homes
  - 25 % FTTH viable in France
  - 72 % VDSL viable in Germany
- Profitable investments in NGA require substantial market shares

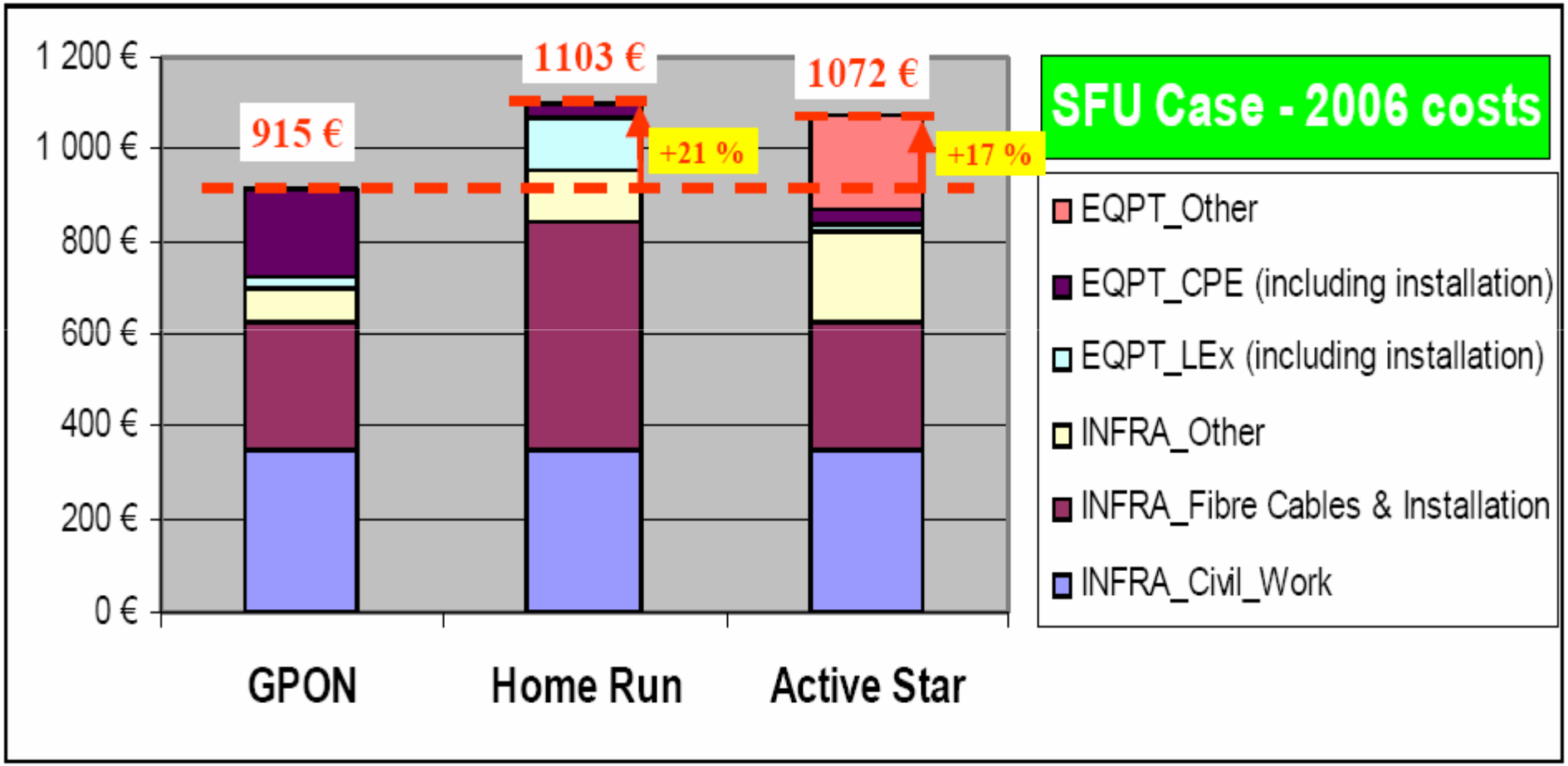
Viability of NGA roll-out for incumbents across countries and technologies

Network Type	Country					
	DE	FR	SE	PT	ES	IT
VDSL	71.5%	n.r.	18.3%	39.0%	67.4%	100.0%
PON	25.1%	25.2%	18.3%	19.2%	12.2%	17.6%
P2P	13.7%	18.6%	18.3%	19.2%	12.2%	12.6%

n.r. – not realisable

Primerjava cene med različicami

- FTTH – vlakno do hiše (stanovanja), SFU - single flat unit



GPON je najbolj ekonomična različica

Razrez cen za FTTH

Greenfield coverage - SFU case						
Solution	**GPON**		**Home Run**		**Active Star**	
INFRA_Civil_Work	350 €	38%	350 €	32%	350 €	33%
INFRA_Fibre Cables & Installation	276 €	30%	492 €	45%	276 €	26%
INFRA_Other	74 €	8%	115 €	10%	200 €	19%
EQPT_LEx (including installation)	24 €	3%	112 €	10%	8 €	1%
EQPT_CPE (including installation)	190 €	21%	35 €	3%	35 €	3%
EQPT_Other	**0 €**	**0%**	**0 €**	**0%**	203 €	19%
Total costs	**915 €**	**100%**	**1 103 €**	**100%**	**1 072 €**	**100%**
Overcost estimation	*Ref.*		21%		17%	

EURESCOM, 2007

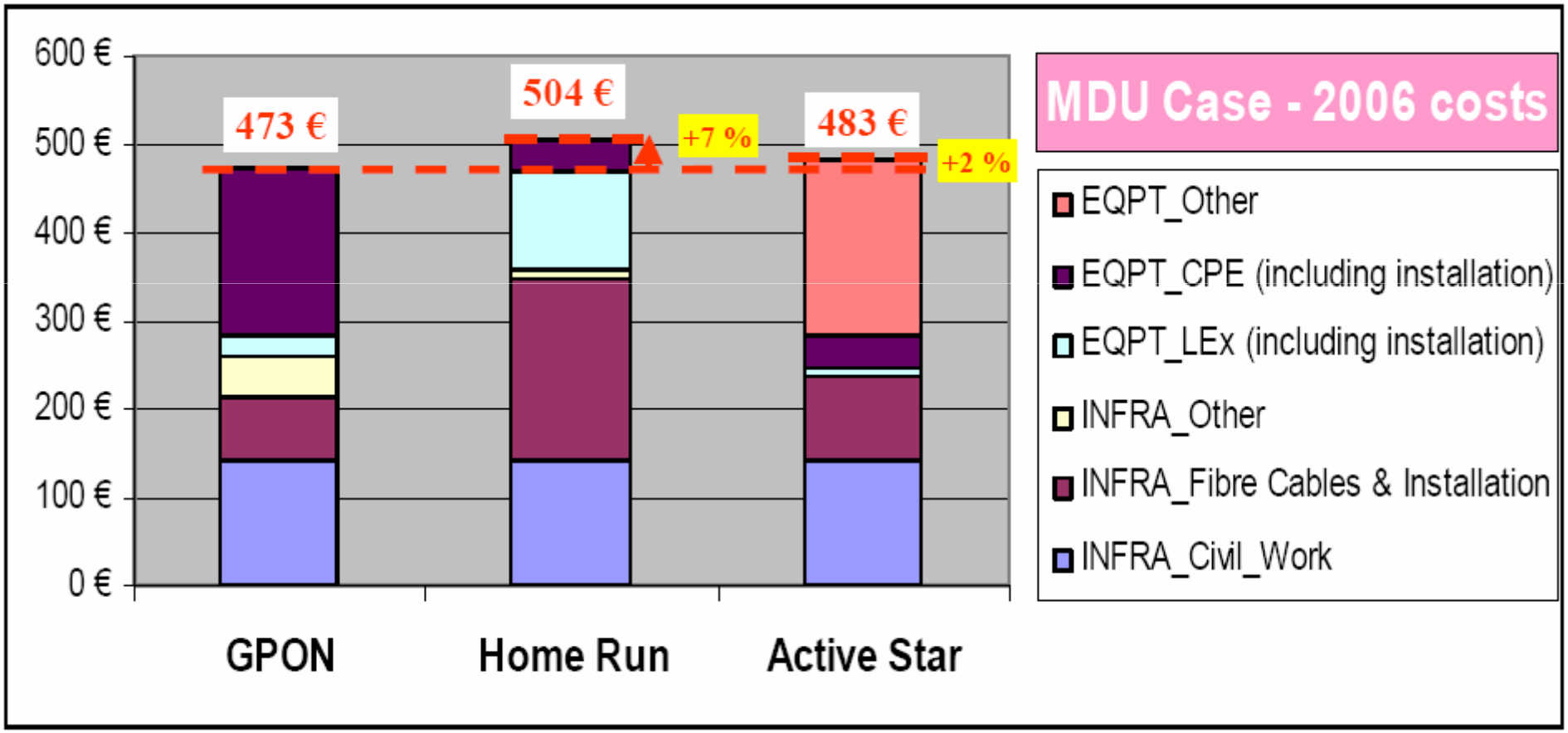
Možnost pocenitve opreme

- GPON je novejša tehnologija v primerjavi z EPONom. Zato pričakujejo 30% padec cen opreme v prihodnjem času. Zaradi tega se razmerja celotnih stroškov nekoliko spremenijo v primeru hiš in v primeru blokov.

Area / Technology	Reference Scenario		-30% on GPON Eqpts	
	Euro	Delta	Euro	Delta
SFU PON	915 €	Ref.	866 €	Ref.
SFU Home Run	1 103 €	21%	1 103 €	27%
SFU Active Star	1 072 €	17%	1 072 €	24%
MDU PON	473 €	Ref.	425 €	Ref.
MDU Home Run	504 €	7%	504 €	19%
MDU Active Star	483 €	2%	483 €	14%

Primerjava cene med različicami

- FTTB – vlakno do stavbe (MDU – multi-dwelling unit)



GPON je najbolj ekonomična različica

Razrez cen za FTTB

Greenfield coverage - MDU case						
Solution	**GPON**		**Home Run**		**Active Star**	
INFRA_Civil_Work	140 €	30%	140 €	28%	140 €	29%
INFRA_Fibre Cables & Installation	72 €	15%	209 €	41%	98 €	20%
INFRA_Other	46 €	10%	9 €	2%	**0 €**	**0%**
EQPT_LEx (including installation)	24 €	5%	112 €	22%	8 €	2%
EQPT_CPE (including installation)	190 €	40%	35 €	7%	35 €	7%
EQPT_Other	**0 €**	**0%**	**0 €**	**0%**	203 €	42%
Total costs	**473 €**	**100%**	**504 €**	**100%**	**483 €**	**100%**
Overcost estimation	*Ref.*		7%		2%	

INFRA_Other:

GPON: Splitters and Splicing boxes

Home Run: MDU termination box

Active Star: N.A.

EQPT_Other:

GPON: N.A.

Home Run: N.A

Active Star: Ethernet switches & Installation (in MDU basement)

Referenčni primer

Transport length assumptions	Sensitivity analysis		
	Case "A"	Case "B"	Case "C"
SFU areas	3 km	10 km	20 km
MDU areas	1,5 km	6 km	12 km

Primerjave primerov A, B in C

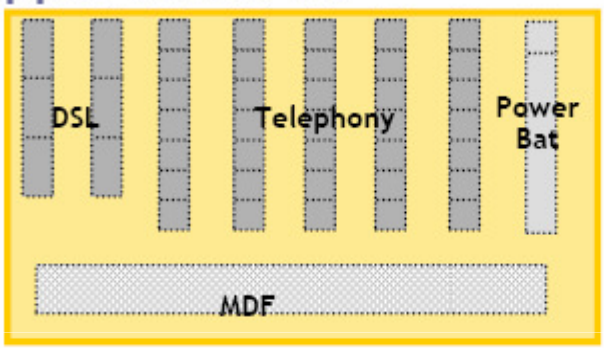
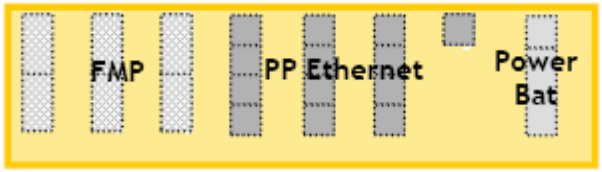
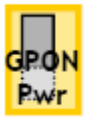
Primerjava cene pri različnih dolžinah omrežja FTTH (FTTB)

A...3 (1,5) km B...10 (6) km C...20 (12) km

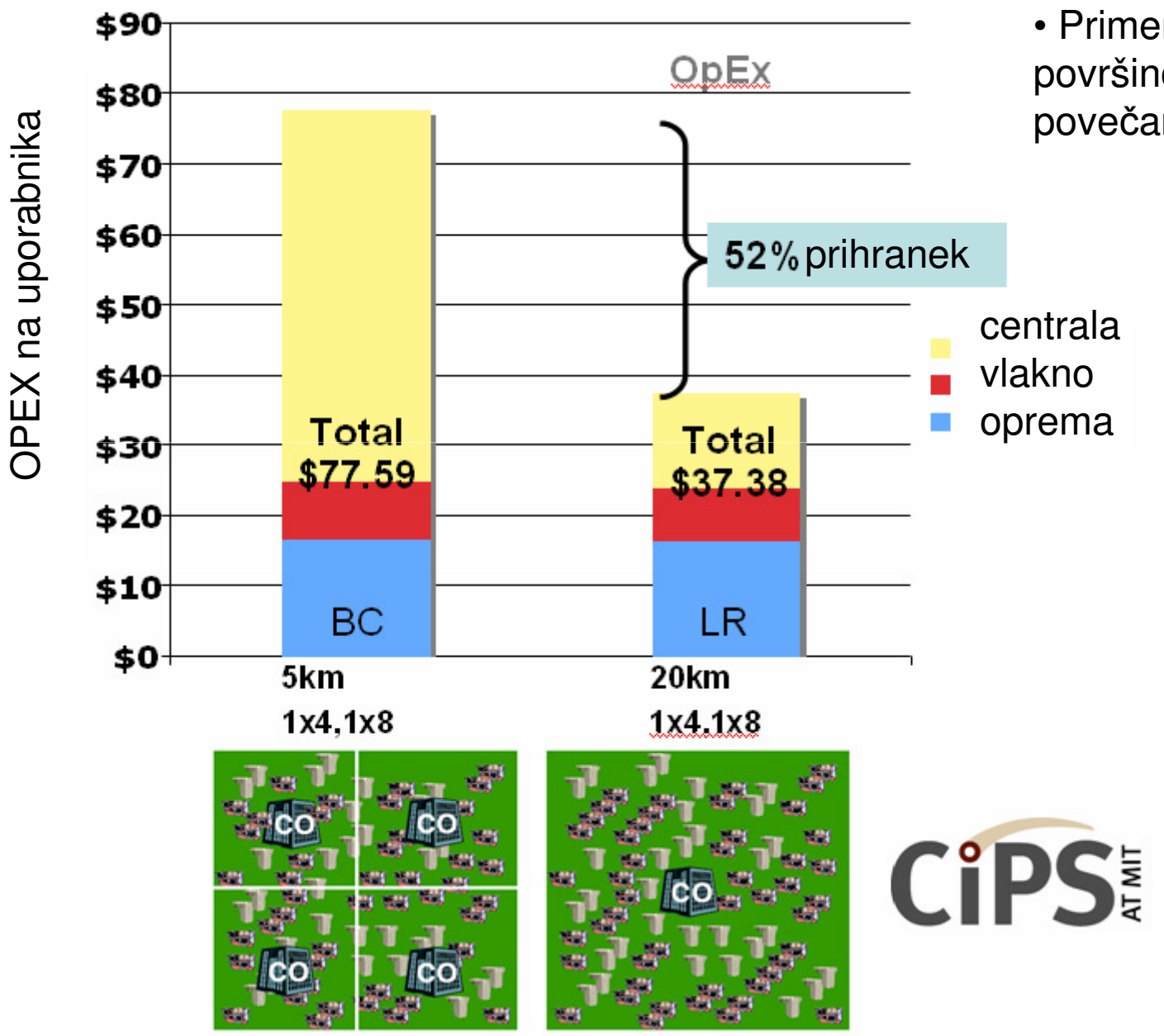
Area / Technology	"Case A" Scenario		"Case B" Scenario		"Case C" Scenario	
	Euro	Delta	Euro	Delta	Euro	Delta
SFU PON FTTH	915 €	Ref.	1 454 €	Ref.	2 225 €	Ref.
SFU Home Run	1 103 €	21%	2 145 €	48%	3 633 €	63%
SFU Active Star	1 072 €	17%	1 612 €	11%	2 383 €	7%
MDU PON FTTB	473 €	Ref.	792 €	Ref.	1 217 €	Ref.
MDU Home Run	504 €	7%	1 219 €	54%	2 172 €	78%
MDU Active Star	483 €	2%	875 €	10%	1 398 €	15%

Area / Technology	"Case A" Scenario		"Case B" Scenario		"Case C" Scenario	
	Euro	Delta	Euro	Delta	Euro	Delta
SFU PON FTTH	915 €	Ref.	1 454 €	Ref.	2 225 €	Ref.
SFU Home Run	1 103 €	21%	2 145 €	48%	3 633 €	63%
SFU Active Star	1 072 €	17%	1 612 €	11%	2 383 €	7%
MDU PON FTTB	473 €	Ref.	792 €	Ref.	1 217 €	Ref.
MDU Home Run	504 €	7%	1 219 €	54%	2 172 €	78%
MDU Active Star	483 €	2%	875 €	10%	1 398 €	15%

Operativni stroški za prostor in energijo

Floor plans	Space	Power (excl ONT)	Reach
Copper-Based CO 	~250 m^2	20-40 kw	5 km
Point to Point Ethernet CO 	~120 m^2	21 kw	3 km economically
GPON CO 	~5 m^2	2 kw	20 km
Extended Reach Solutions 	~3+5+5 m^2	2.5+2.5 kw	20 km +40km

Operativni stroški na uporabnika



- Primer, ko površino pokrivanja povečamo 4X

CiPS AT MIT

Politika

Stanje v Evropi

- DSL dominant broadband access technology in Europe (80%)
- 1.5% FTTH/B subscribers
- FTTH/B 11 mio. homes passed, but only 1.7 mio. subscribers
- Physical reach of NGA (including cable/DOCSIS 3.0 and VDSL): 40% of broadband subscribers
- FTTH/B investment mainly driven by altnets (only 15.1% of homes passed by incumbents)
- Cumulative investment in FTTH/B will only in 2013 exceed cumulative investment in VDSL

WIK

Digitalna agenda za Evropo

Evropska strategija, marec 2010:

(1) Basic broadband for all by 2013: basic broadband coverage of 100% of EU citizens. (Baseline: Total DSL coverage (as % of the total EU population) was at 93% in December 2008).

(2) Fast broadband by 2020: broadband coverage at 30 Mbps or more for 100% of EU citizens. (Baseline: 23% of broadband subscriptions with at least 10 Mbps in January 2010).

(3) Ultra-fast broadband by 2020: 50% of European households should have subscriptions above 100 Mbps. (No baseline)

Stanje na Švedskem

- Bit stream and local loop unbundling (LLUB) on cupper (owned by TeliaSonera)
- TeliaSoneras dark fibre infrastructure being deregulated
  - Fibre infrastructure recently separated from TeliaSonera in an “independent” subsidiary company Skanova
  - Not working satisfactorily according to the regulator (PTS)
- Cable not deregulated
- Municipality fibre not deregulated, but municipalities are not allowed to compete with service providers on unfair conditions

- Political goal that 90% of population should have 100 Mbit/s in 2020 and 40% should have it in 2015.
- No government money allocated, but the government will make sure that the “*market works efficiently*”

EU – priporočila članicam

- NRA – National Regulatory Agency

- Member States and NRAs have to take utmost account of Recommendation
- Access remedies for various NGA architectures
  - (1) Access to civil engineering infrastructure of the SMP operator
  - (2) Access to the terminating segment in the case of FTTH
  - (3) Unbundled access to the fibre loop in the case of FTTH
  - (4) Access obligations in the case of FTTN
  - (5) Wholesale broadband access
  - (6) Migration

Sklep

- Razvezava ne spodbuja (ali celo zavira) investiranje v omrežje
- Vključevanje novih ponudnikov storitev in upoštevanje ustreznih pravil pospešujeta penetracijo in povečujeta b/s
- EU in države OECD zaostrujejo zahteve za razvezavo
- ZDA 2003 opustile strogo razvezavo novo zgrajenega omrežja.

AT&T in Verizon povečala investicije v optično omrežje.

KONEC