Next Generation Access Networks

A key factor of development

NGON Seminar – ISCTE

Alvaro Oliveira
14th of April 2009

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- **Main Drivers for the NGON deployment**
- **Market Status**
- **Network Solutions**
- **Possible Obstacles**
- **What to do in the Short/Medium Term**

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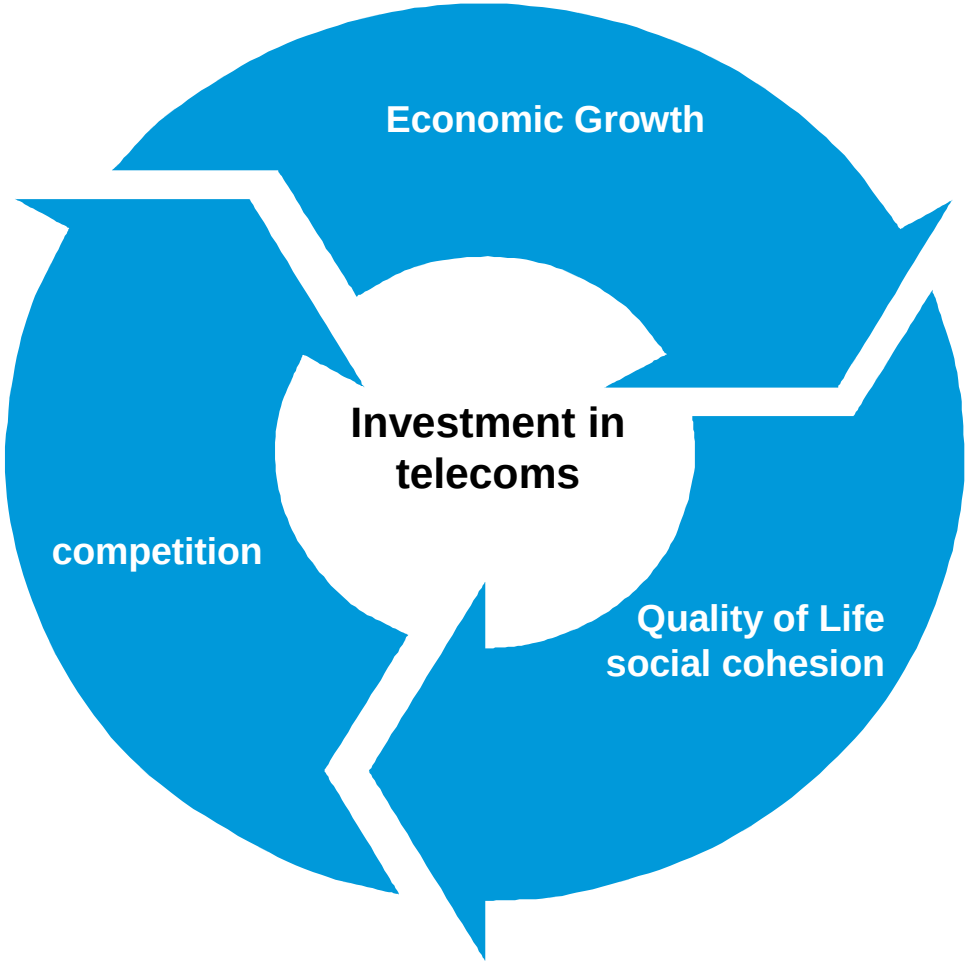
Telecoms have a crucial role in answering the main chalenges of the country for the coming years:



It is a structuring investiment with deep impacts on the competitiveness of the country

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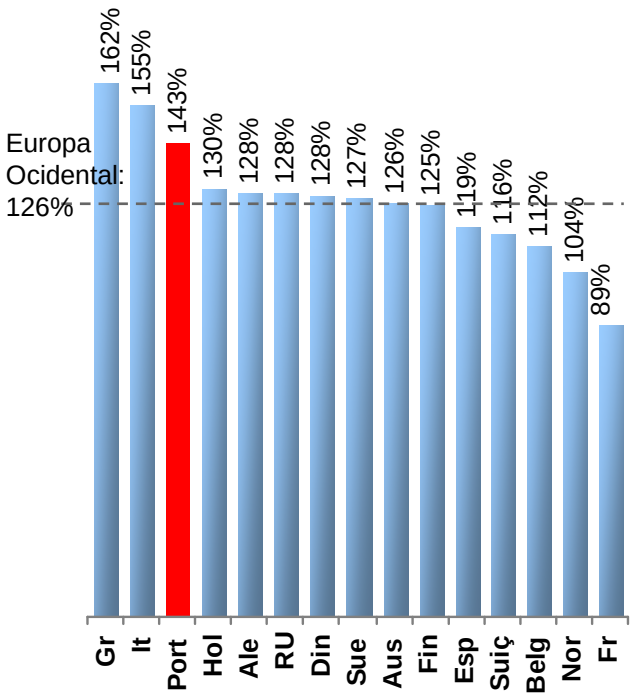
Competition in the mobile market is a good example to follow since it has been key to the development of the Telecoms market

Penetração entre as mais altas da Europa

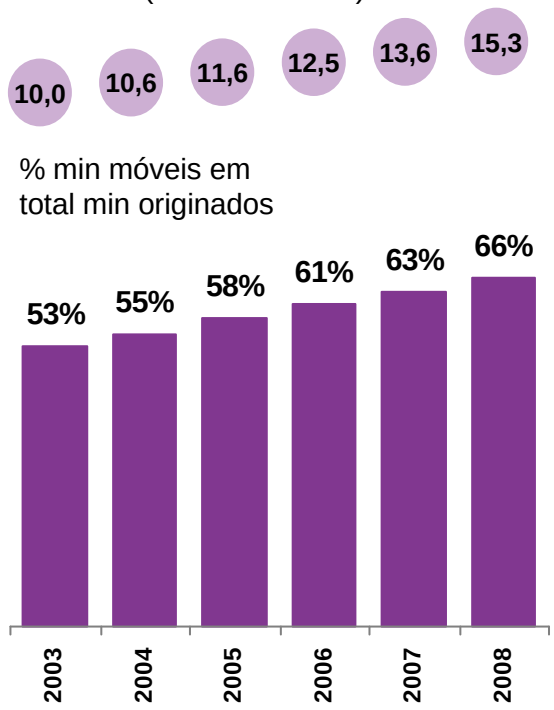
Penetração 3ºT '08 (%)



Fonte: Strategy Analytics "Wireless Operator Performance Benchmarking 3Q '08" (Dezembro 2008)

Tráfego móvel a substituir tráfego fixo

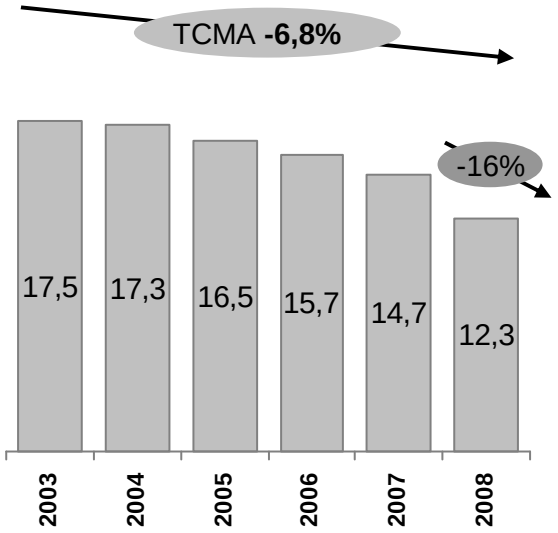
Min móveis (mil milhões min)



Fonte: ANACOM

Preços cada vez mais competitivos (saída)(1)

PPM
€ cent



Fonte: Relatório e Contas dos Operadores, estimativas VF-PT
(1): Valores nominais

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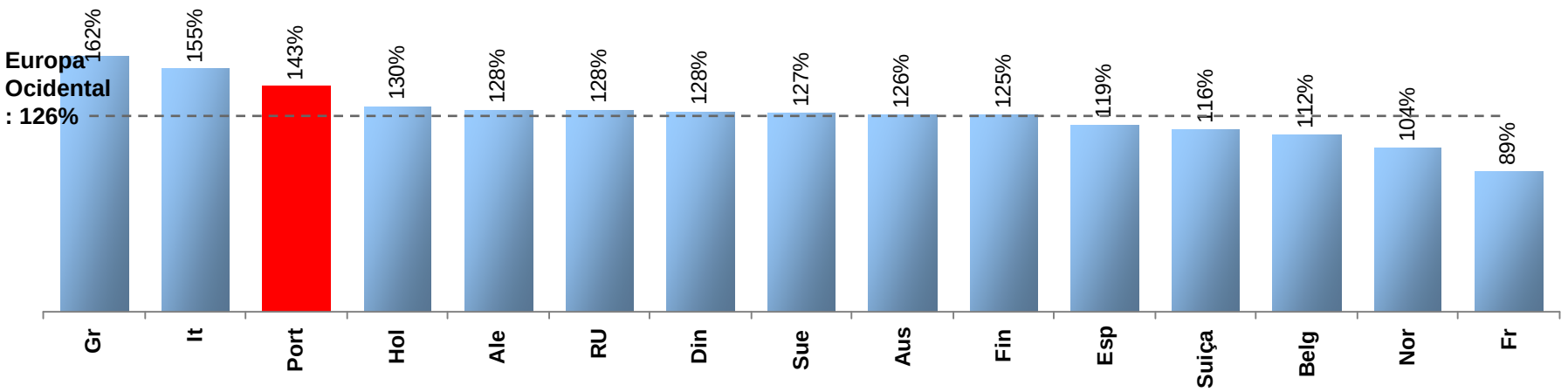
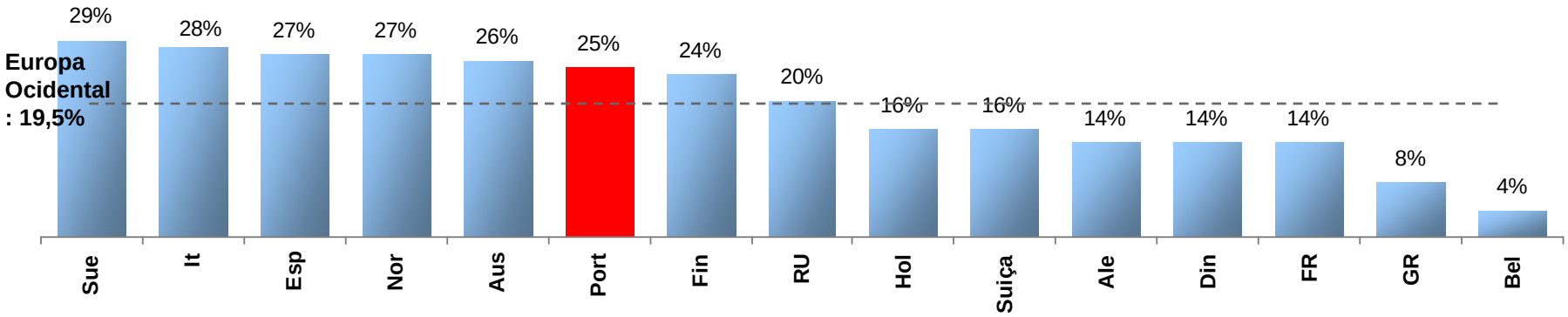
… That produced good results when benchmarking with the other countries in Europe…

Mobile Penetration 3Q ‘08 - Portugal entre as mais altas da Europa



Fonte: Strategy Analytics “Wireless Operator Performance Benchmarking 3Q ‘08” (Dezembro 2008)

3G penetration on the client base of 2Q ‘08 – Portugal mantém-se no grupo da frente



Source: Merrill Lynch Wireless Predictions for 2009 (Dezembro 2008)

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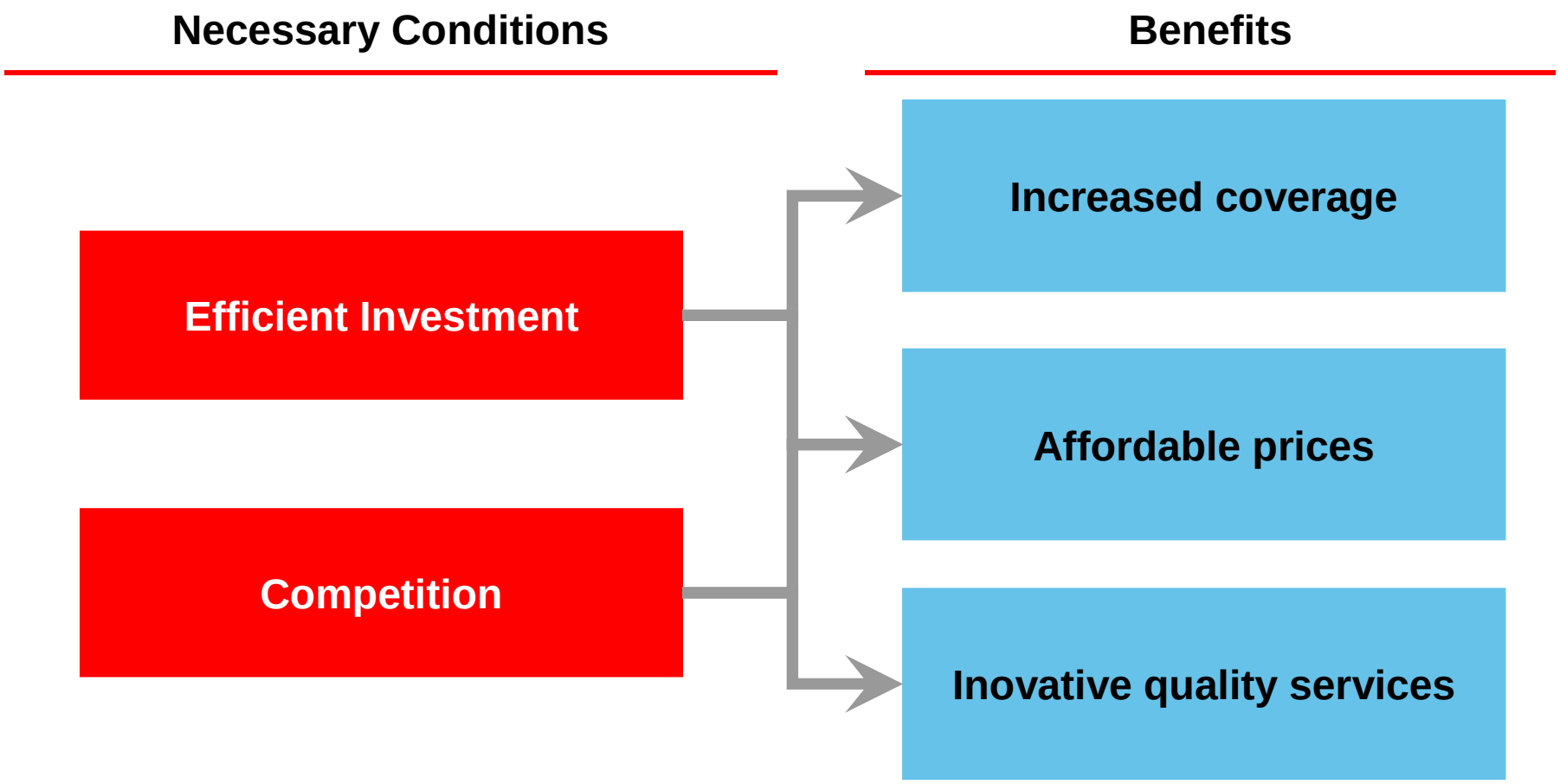
Public policies should promote an efficient investment and competition in all markets…



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The market is continuously evolving to more convergent offers

2001 | 2005 | 2006 | 2007 | 2008 | 2009

3play Offers

TV

Phone

PC

CABOVISÃO

1º 3play offer

bragatel

TELECOM

SONAECOM

pluricanal

ZON MULTIMEDIA

PT

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4play Offers

TV

Mobile

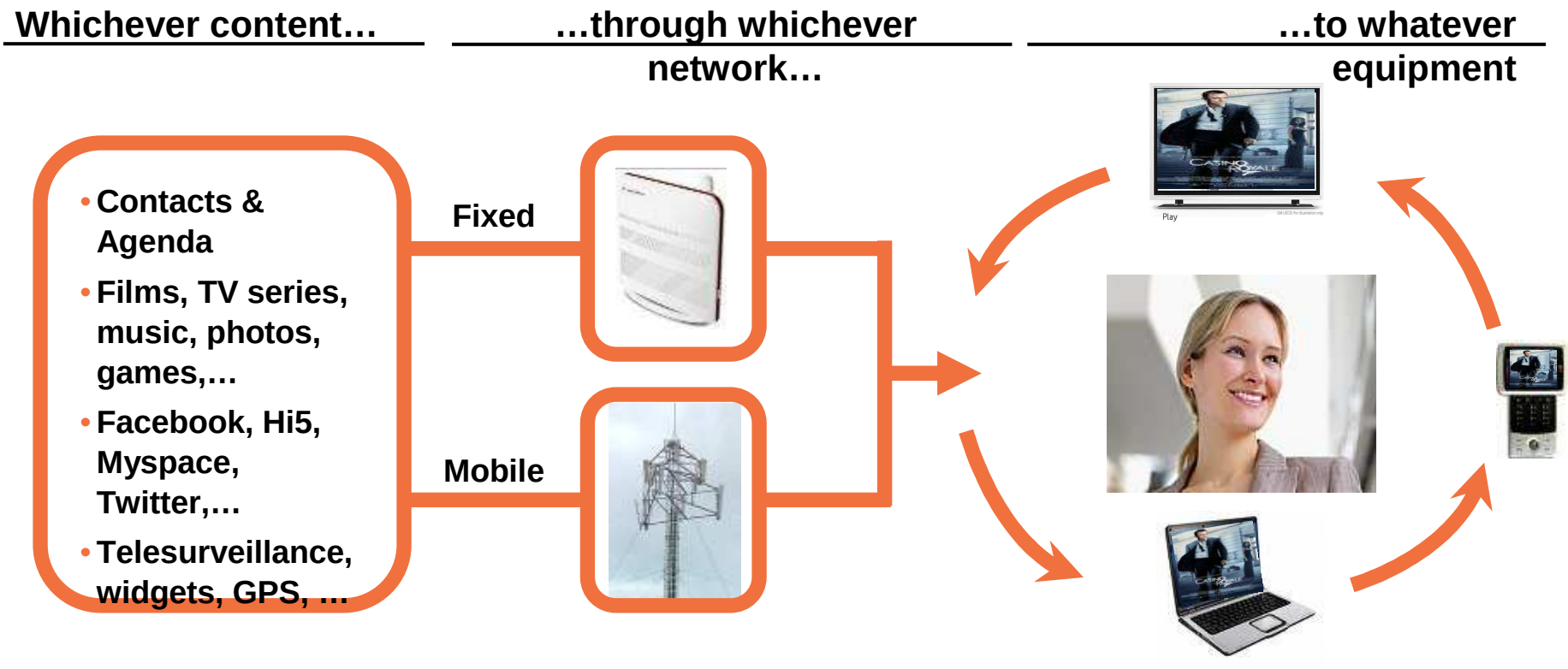
Phone

PC

ZON MULTIMEDIA

1º 4play offer (Nov 2008)

… And a friendlier eco-system, where all contacts, contents and applications are available on all environments and equipments



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The success of fiber deployments is also related with the business model adopted in each country, being the public initiative the main driver for Fiber expansion

Business models followed by deployments worldwide

Private Initiative	**Europe** (e.g. France, Italy, Netherlands) driven by Altnets / incumbents having preference for vertical integrated models (closed networks)
Public Initiative	**Asia** (driven by incumbents which are controlled by Government) & **Sweden** (driven by municipalities with open networks)
Utilities Expanding	**Nordics** (e.g. Denmark, Iceland, utilities owned by municipalities develop open networks)
Private with Public Aid	**France** (municipalities co-financing network deployments, awarding a build and operate contract to telecom operators mandating wholesale access)
Partnership Public-Private	**Netherlands** (Amsterdam municipality to endeavor in a private partnerhsip to build and manage a new FTTH network)

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But… It is not an easy decision

- NGA fibre roll-out (FTTH as well as FTTC) needs substantial investment
  - FTTC in Germany for 37% of population: 4,8 billion €
  - FTTH in France for 7% of population: 3,4 billion €
  - Nationwide NGA roll-out not profitable in most countries

- Incumbents are better placed than entrants to make these investments on a large scale
  - Lower costs on infra-structure usage
  - Investment savings by dismantling MDF's and better use of passive infrastructure
  - Larger subscriber base

	DSL market share	Retail market share incumbent	Incumbent Retail + Resale + Bitstream
Germany	94%	46%	64%
France	95%	47%	62%
Italy	97%	64%	75%
Portugal	64%	67%	46%
Spain	79%	56%	62%
Sweden	62%	38%	40%

Source: The economics of NGNA - WIK Consult

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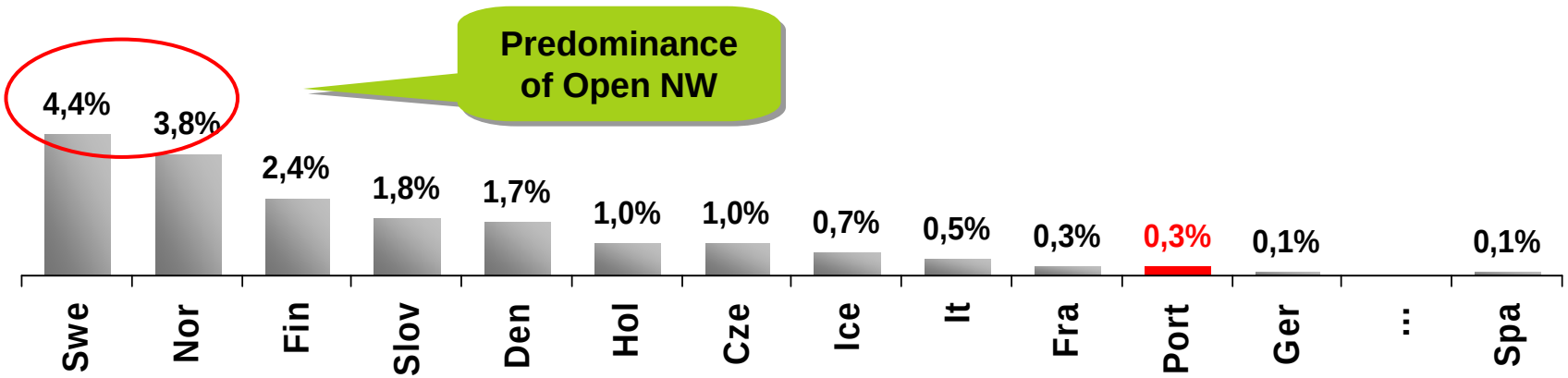
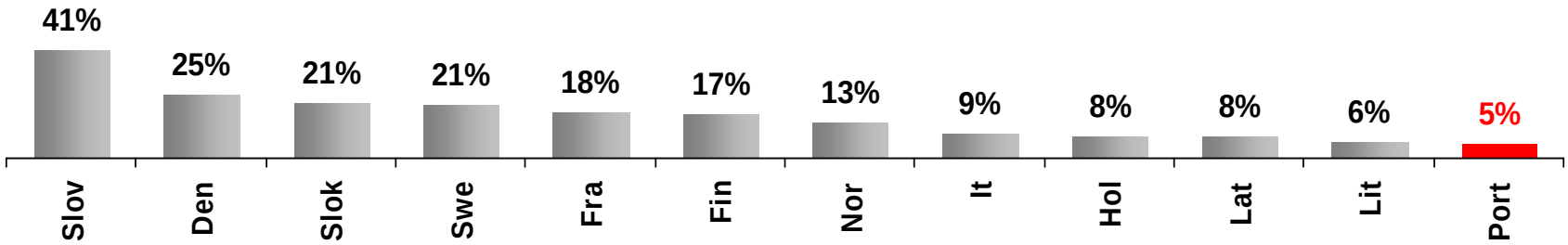
Although without big pushes by incumbents, Nordic & some Eastern Europe countries lead deployment in Europe

Penetration of Active FTTx clients in Population (Dec 2008)



Source: IDATE "FTTH European Panorama" (Dezembro 2008) para Suécia, Noruega, Dinamarca, Holanda, Itália, França e Alemanha
Analysis Mason "western European Fixed Telecoms: Market Sizings and forecasts for 2008-2014" (Novembro 08) para Finlândia, Eslováquia, Islândia, Portugal, Espanha - OCDE "Population by country" (4º trimestre 2008)

Penetration of Homes passed by FTTx / Households (Dec 2008)



Source: IDATE "FTTH European Panorama" (Dec 2008)
UNECE "Private Households by country" (2006/2005)

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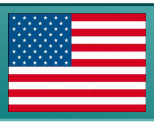
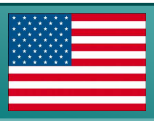
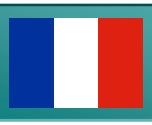
But it's Asia and USA that have the most ambitious coverage targets in the next years

	Operator	Technology	Target Homes
	NTT	FTTH G-PON	47 M.
	Verizon	FTTH G-PON	18 M.
	AT&T	FTTC VDSL	18 M.
	Korea Telecom	FTTH	12 M.
	Deutsche Telekom	FTTC VDSL	10,5 M.
	BT	FTTC VDSL	10 M.
	Iliad (Free)	FTTH P2P	4M.
	Belgacom	FTTC VDSL	3,6 M.

Source: Reviving the Fixe Line", Exane BNP Paribas (February 2009)

And Europe still with limited coverage

	Operator	Technology	Target Homes
	Telefónica	FTTH	3,6 M.
	SwissCom	FTTH (already concluded VDSL)	2,5 M.
	France Telecom	FTTH G-PON	1 M.
	SonaeCom	FTTH G-PON	1 M.
	KPN	FTTC VDSL	0,8 M.

Source: Reviving the Fixe Line", Exane BNP Paribas (February 2009)

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Several Municipalities are taking on the chalenge of promoting an NGAN in their geographycal areas (though in different stages of development)

	Drivers	Entities involved	Level of roll-out
Minhocom Valicom	Municipalities Development Initiative	11 municipalities+DSTelecom,	Backbone: Deployed Capilarity: Being deployed
Porto Digital	Municipality Development Initiative	1 municipality+DSTelecom,	Backbone: Being deployed Capilarity: Being deployed
Quadrilátero Digital	Municipalities Development Initiative	4 municipalities	Backbone: built Capilarity: Under development
LusoCapital	Private entity Proposal	LusoCapital, x municipalities	Backbone: Under analysis Capilarity: Under analysis
Évora Digital	Municipality Development Initiative	1 municipality that will concession NW operation to an operator	Backbone: built Capilarity: Under development
GlobAlgarve	Regional Development Agency initiative	14 municipalities and private entities	Backbone: built Capilarity: Under development

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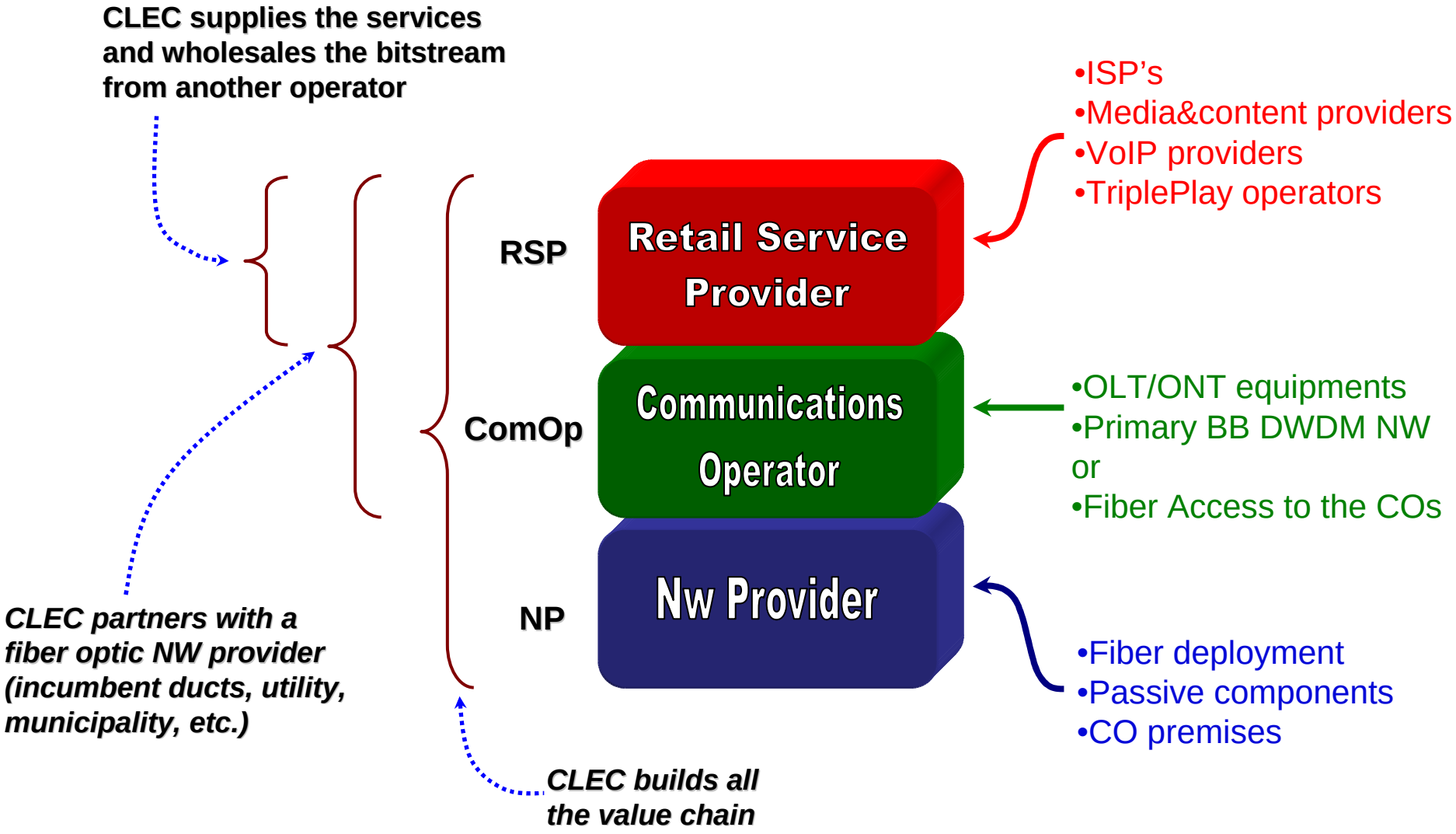
A layered analysis to the NGAN architectures:



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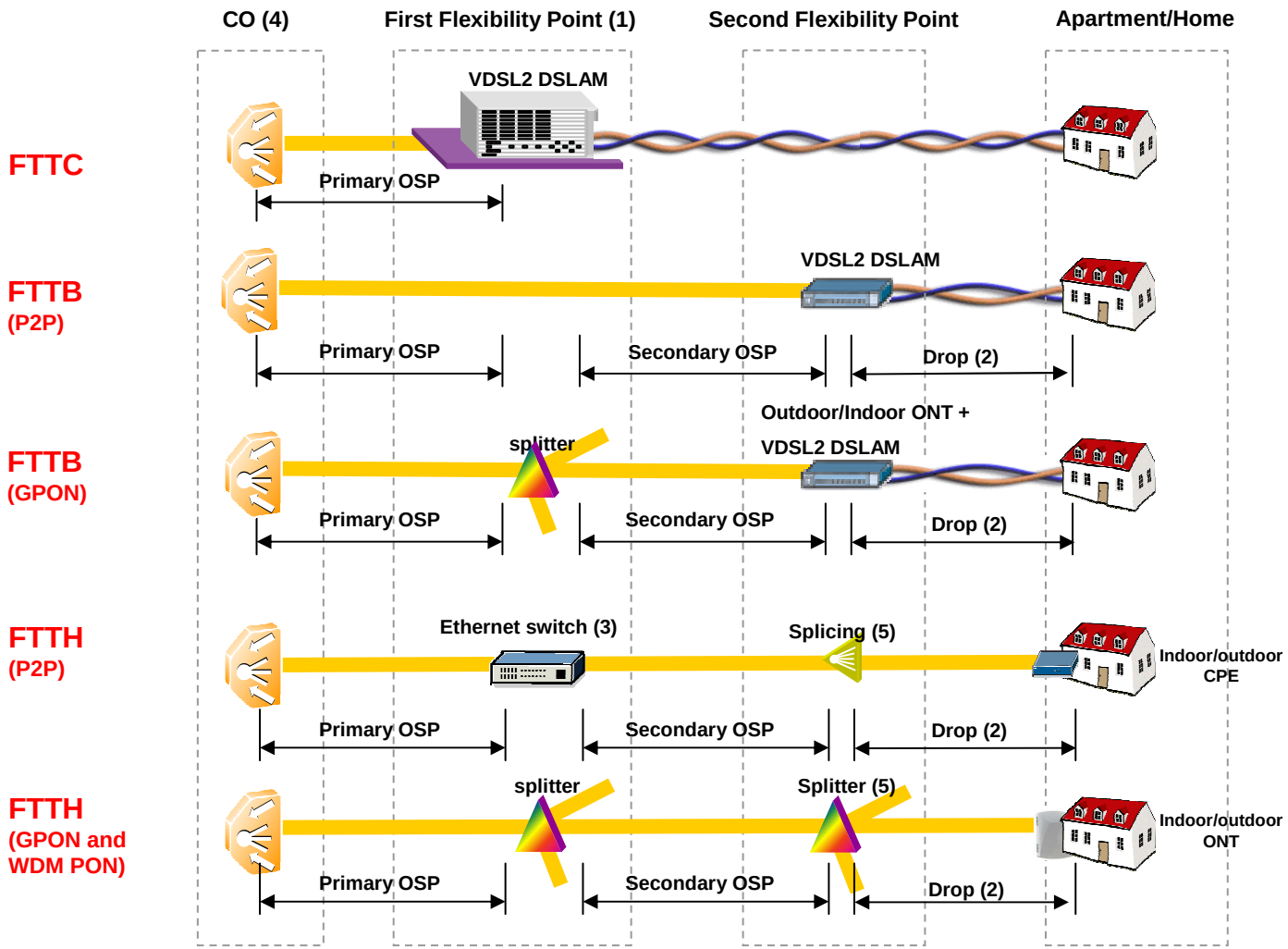
Main FTTx Technologies available are the following:



Notes:

(1) In case of FTTC it represents the Street Cabinet

(2) In case of MDU it represents the Inside Plant

(3) Optional depending on business case

(4) CO may not coincide with ILEC's COs

(5) Optional

Initials:

OSP Out Side Plant

CO Central Office

FTTC Fiber to the Curb

FTTH Fiber to the Home

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PON vs Point-to-point – Pros & Cons

GPON

- ☺ One fiber can support up to 64 clients today and 128 clients in the future
- ☺ Less fibers to manage in the outside Plant and in the ODFs of the CO -> Much smaller ODF's are required
- ☺ CO location requires Less equipment and therefore much less space
- ☺ Cheaper and easier RF overlay deployment
- ☺ Easier equipment upgrade

- ☹ Heavier network preparation/planning
- ☹ Passive devices on the OSP
- ☹ OSP and ISP Networks => More complex FO network

Point-to-Point

- ☺ Higher Bandwidth (>1Gb/s) per customer
- ☺ Less planning required
- ☺ Easier FO fault detection
- ☺ Simpler record keeping

- ☹ Higher CapEx intensity
- ☹ Much larger cables => Higher duct usage costs and more difficult to manage joints
- ☹ No bandwidth efficiency
- ☹ Client provisioning requires more work

In terms of network topology for FTTH, the trends seams that P2P is mainly used by utilities or municipalities whereas G-PON is mainly used by telecom operators, both incumbents and CLECs

Main solutions with several key advantages/disadvantages:

FTTC/VDSL 2+ is the lowest Capex upgrade solution:

- ☺ Lower Capex, faster do deploy
- ☹ Higher Opex, Less future proof technology and strongly dependant on street cabinets and willingness of the incumbent

FTTH GPON is the most scalable solution:

- ☺ Higher speeds, OpEx strongly reduced
- ☹ More time to deploy and unbundling less viable

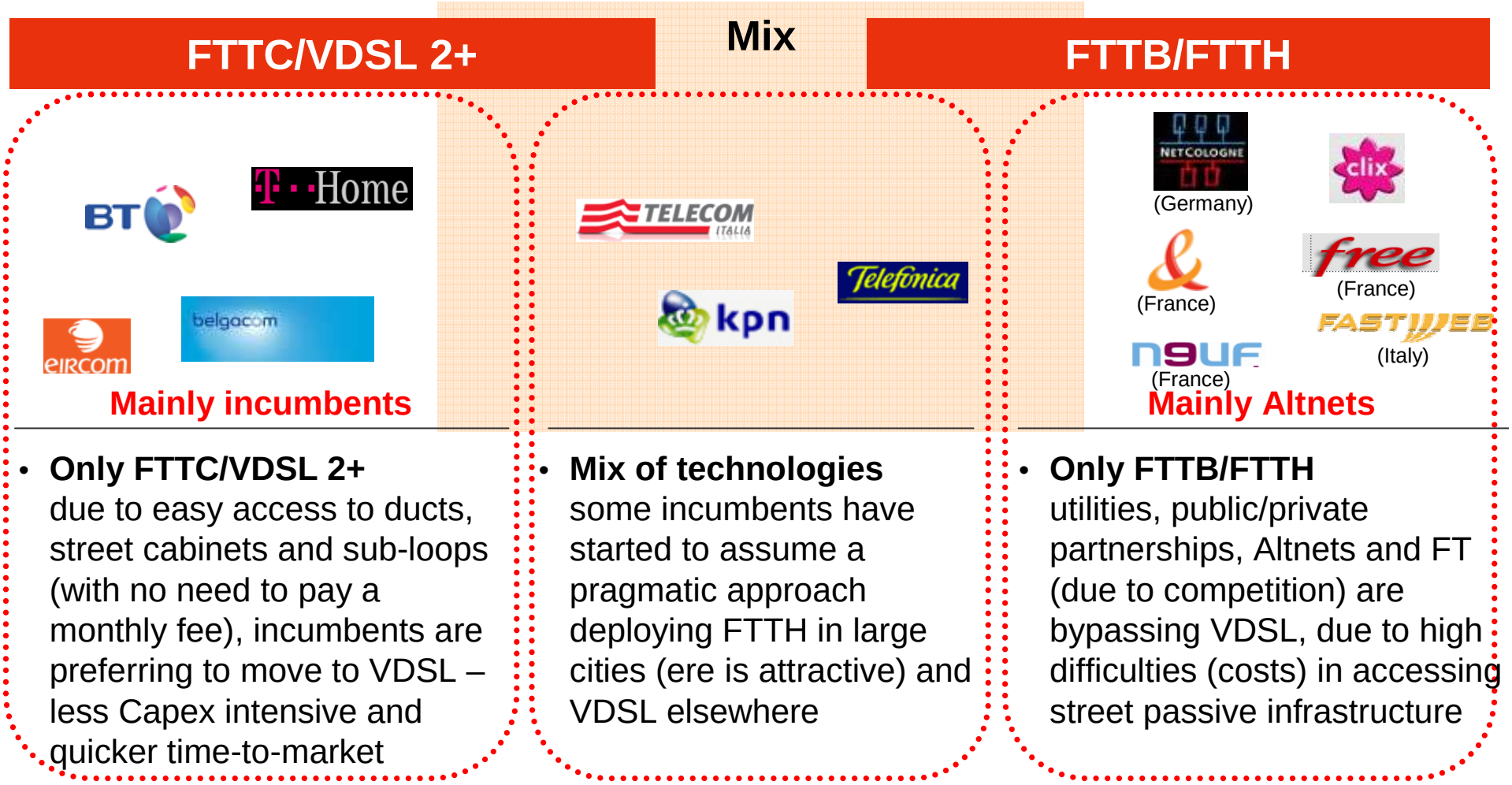
FTTH P2P is the "premium" costly solution:

- ☺ Very high capacity and simple unbundling proccess
- ☹ Highly CapEx intensive and difficult fiber management

FTTB GPON/P2P is probably a "no-man's land":

- ☺ Re-uses the buildings copper infra-structure
- ☹ Less bandwidth, higher Opex costs and requires building power

In terms of fiber investment options, FTTC is being drive due to easy access to street cabinets & sub-loops by the incumbents whereas FTTB/H is being pushed by the Altnets



- **Only FTTC/VDSL 2+** due to easy access to ducts, street cabinets and sub-loops (with no need to pay a monthly fee), incumbents are preferring to move to VDSL – less Capex intensive and quicker time-to-market
- **Mix of technologies** some incumbents have started to assume a pragmatic approach deploying FTTH in large cities (ere is attractive) and VDSL elsewhere
- **Only FTTB/FTTH** utilities, public/private partnerships, Altnets and FT (due to competition) are bypassing VDSL, due to high difficulties (costs) in accessing street passive infrastructure

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Passive Network Solutions – Pros & Cons

- ☺ **Higher degree of freedom for all the operators to use the NW**
- ☺ **Part of the NW which has a Long life is the one which is shared**
- ☺ **Equipment, which is the part that defines the services to develop is deployed by the operators**

- ☹ **Less investiment sharing => Higher cost**
- ☹ **Requires a common approach from all the entities (public entities mainly)**

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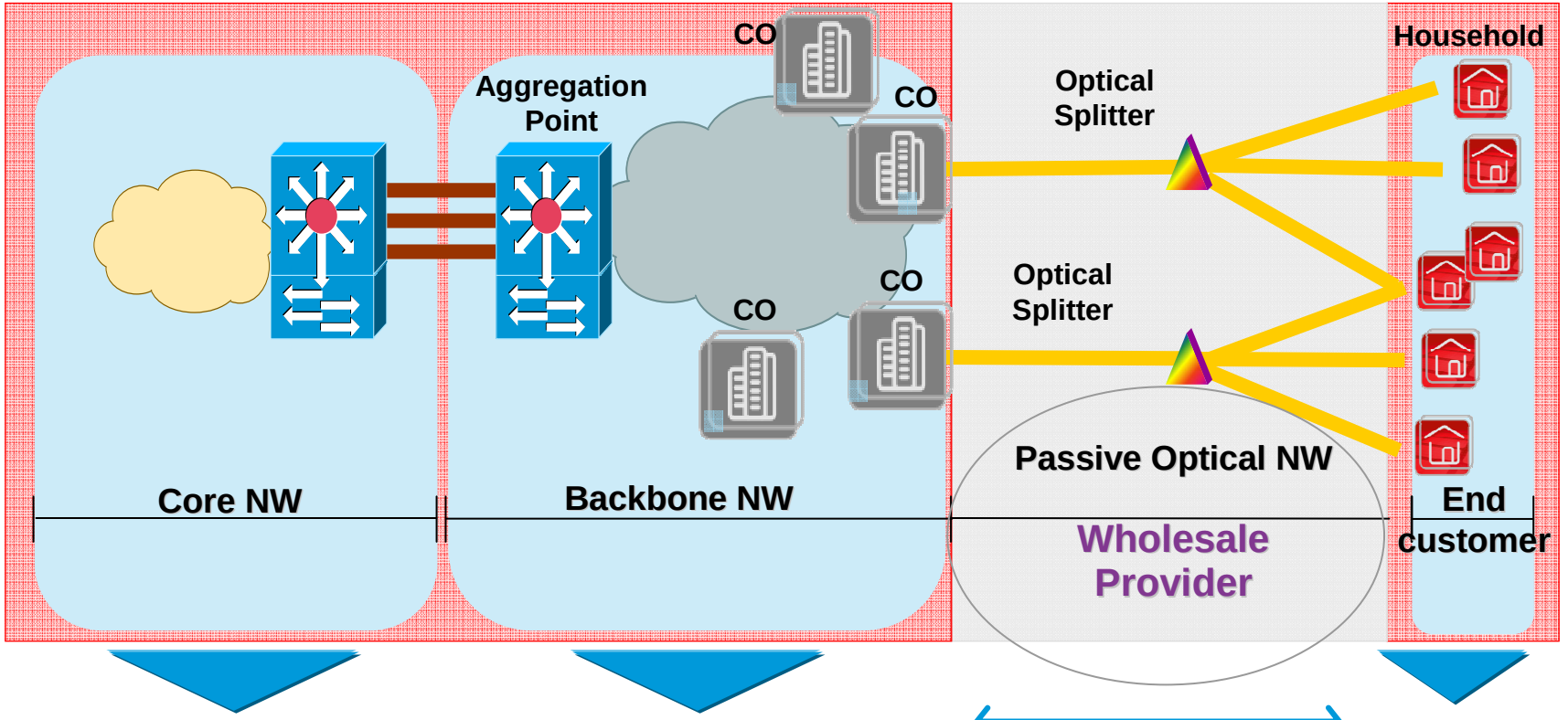
The Wholesale Provider would be responsible to build and manage the passive NGN that would be shared equally by its potential partners

Investment Sharing Network Structure Model



- Communications Provider:
  - Core network (equipment)

- Communications Provider:
  - Backbone network
  - Space and OLT in CO

- Wholesale fee for passive Access infra-structure

- Communications Provider:
  - End user equip

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Investment Sharing may contribute to decrease the level of investment but also presents risks

Investment Sharing Opportunities

✓ **Investment level and risk is mitigated**

- Total investment decreases
- Competitors become network partners, diminishing incentive to "destroy value" through very aggressive commercial practices

Investment Sharing Risks

× **Negotiation process:**

- Complexity of negotiations will impact time to market (opportunity for PTC)
- Agreement with competitors may prove unviable as alignment of priorities between all partners could be impossible

× **Network Roll-out:**

- Splitting coverage areas or creating a single entity to manage the whole process present a higher risk and complexity

× **Commercial success:**

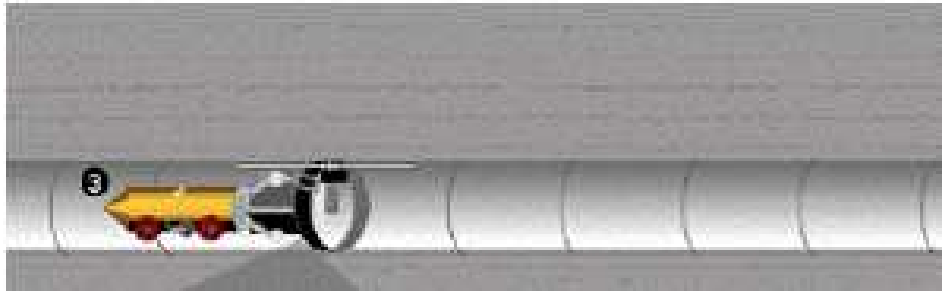
- Competitors which have larger customer bases to leverage on and migrate to fiber will be better positioned

New solutions will bring a strong cost reduction to the passive NW part

Microtrenching

Microducts

Sewer/Water Infrastructure usage



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BitStream Network solutions – Pros & Cons:

- ☺ **Lower cost on the passive part of the network - several service providers use the same passive/active network**
- ☺ **Less risk for each of the players by not competing on the infra-structure level which is the biggest part of the CapEx needed**

- ☹ **Less freedom to develop new services and features – OLT is the same for all operators**
- ☹ **RF Overlay (for video distribution) is not viable**
- ☹ **Retail service providers sharing an FTTH access network will also need to share at the metro/regional level.**

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BitStream Key issues

- Service types
  - Unlimited pricing versus per gigabyte pricing
  - Time of day tariff gradients
  - QoS pricing for services such as voice and real-time video

- Regulatory remedies
  - Where to mandate available interconnection?
  - Pricing control remedy alternatives:
    - Retail minus
    - Benchmarking
    - Cost Orientation
    - Margin Squeeze
  - Service-Based or Element Based?
  - Should regulators mandate additional regional backhaul products?

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Access to ducts can be both a booster or an obstacle. Therefore It has to…

- **Be deterministic…**
  Clear and reasonably defined SLA's that the incumbent has to follow

- **Be based on a simple procedure…**
  The procedure has to be a non-stop type in which the incumbent operator has x weeks to answer requests otherwise the request is accepted

- **Have a fast resolution of problems**
  The proccess has force the incumbent to a swift duct obstruction resolution whenever that is encountered in the field
- **Have a good Geografic DataBase…**
  The national database on existing infra-structures has to be quickly put in place so that operators can benefit from it

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Next steps are crucial

- **It is critical to make a decision now, and not later, to:**
  - Ensure benefit of growth momentum in Internet, Data and TV Markets;
  - Benefit from a 1st mover advantage (experience demonstrates that first movers can grab disproportionate market share);
  - Maximization of bargaining power to signal the market and public authorities the intention to maintain its current position in the total telecom market and "fostering" potential investment sharing models.

- Regulatory intervention and proper access products needed for a competitive NGA market
  - Duct and dark fibre access increase replicability, but not sufficient for viable competition
  - Fibre full local loop unbundling (at Metro Core Locations) and sub-loop unbundling (at OSDF) increase scope for competition significantly
  - Fibre LLU and SLU generate replicability wherever a first mover rolls out FTTH
  - Bitstream access remains relevant for rural areas and provision of services to businesses

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Alternative solutions to duct access should be regulated both for “C” areas and “NC” areas

Access to incumbents ducts

Ducts from other entities

Access to Dark Fiber with equivalent path, compatible with Market 4 definition

Virtual bitstream access

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Next Generation Access Networks

A key factor of development

NGON Seminar – ISCTE

Alvaro Oliveira
14th of April 2009