



Fibre to the Home
Council Europe

FTTH Conference 2011
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CREATING A BRIGHTER FUTURE UNDER THE PATRONAGE OF MINISTERO DELLO SVILUPPO ECONOMICO, ISCTI, COMUNE DI MILANO & PROVINCIA DI MILANO

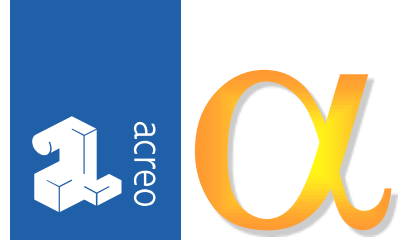
Next Generation Active Optical Access Networks (AON): Latest Results of the ALPHA Project

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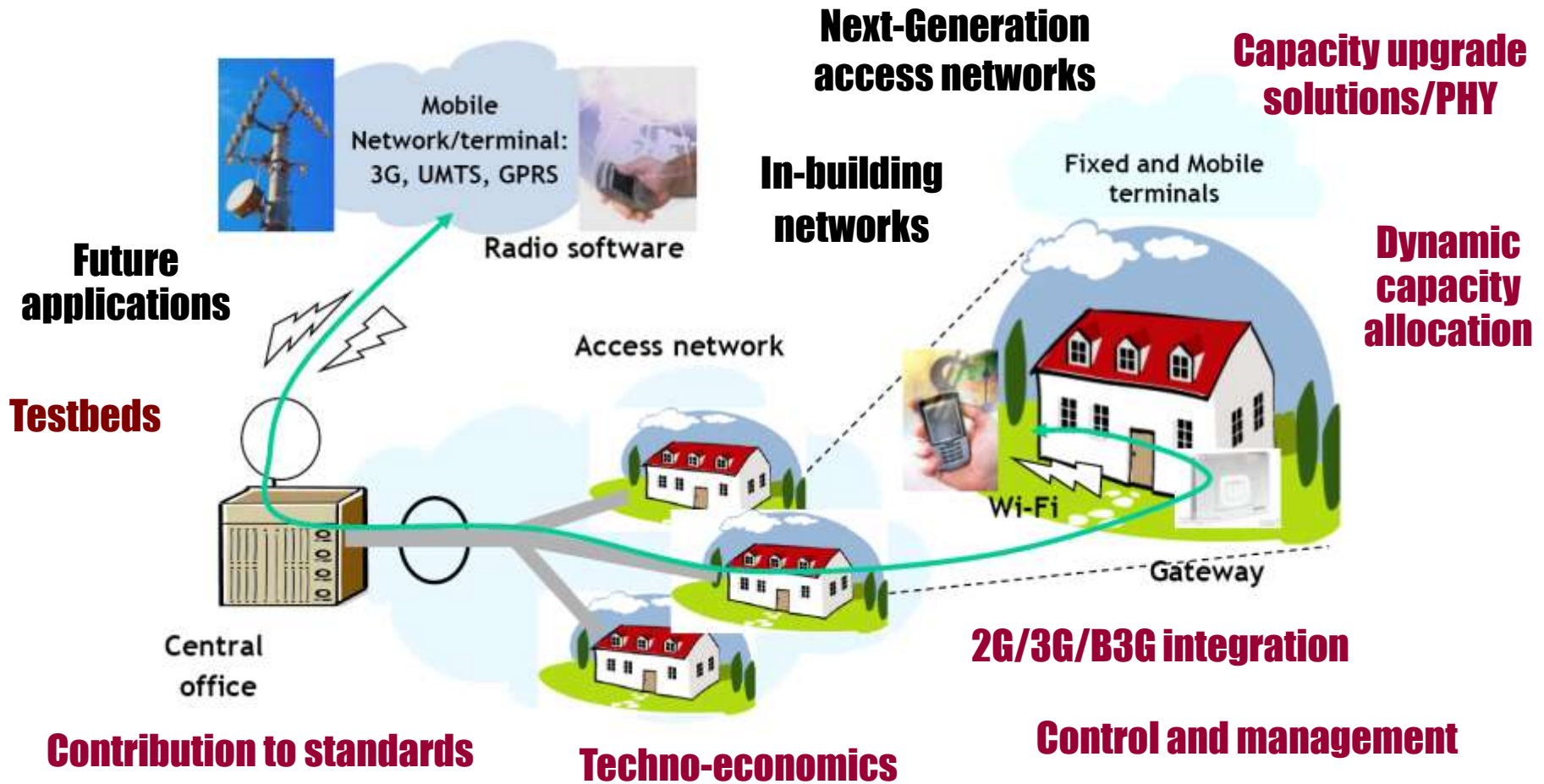
ALPHA Consortium: 3 system vendors, 3 operators, 3 SMEs
2 research institutes, 6 Universities



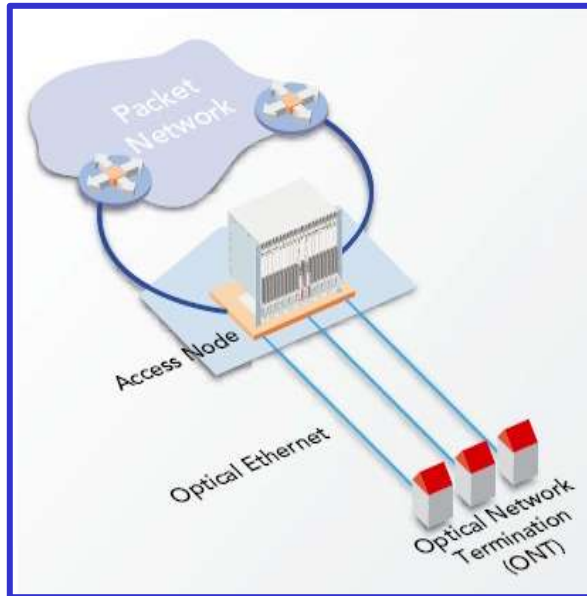
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ALPHA key issues: overview

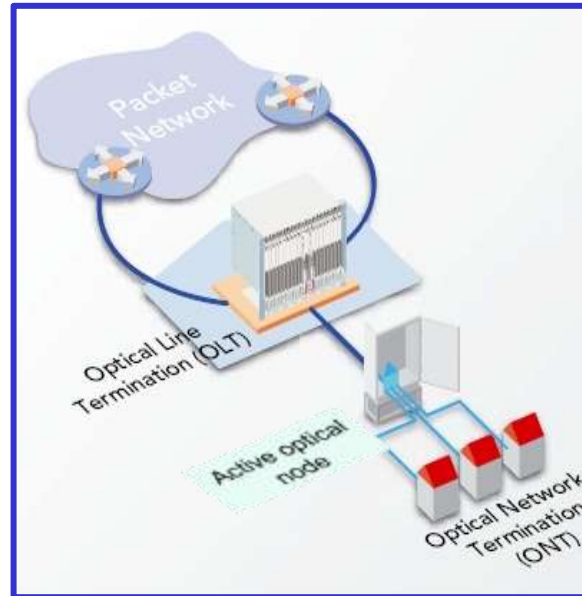


What is Active Optical Network (AON)?



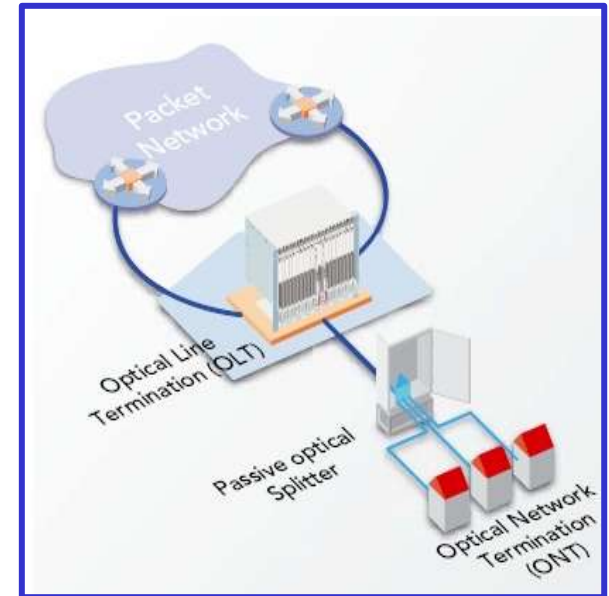
Home run (AON)

- Point to point
- Highest bandwidth
- High flexibility
- Most deployed in Europe



Active star (AON)

- High bandwidth
- High flexibility
- Active equipment in field
- Most deployed in Europe and Korea



Passive optical network (PON)

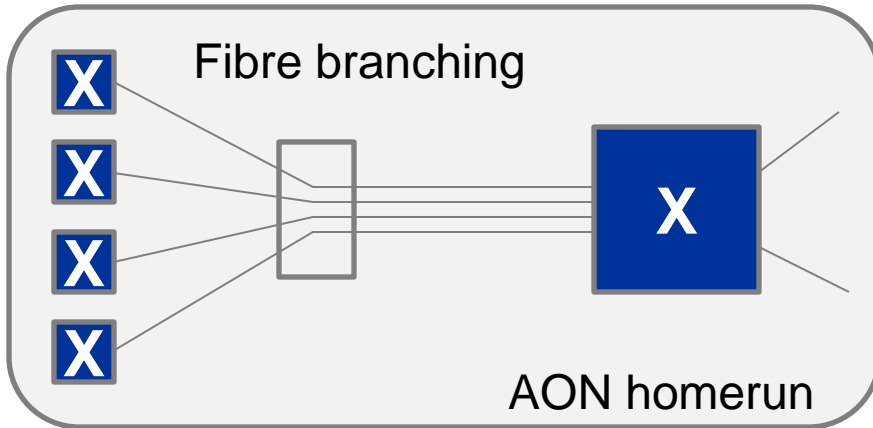
- Passive network with tree topology
- Average bandwidth
- Most deployed in Asia and USA

- Comparison of four different architectures
- Which factors determine choice of NGOA?
- Traffic patterns
- Multilayer integration of access and distribution
- Summary

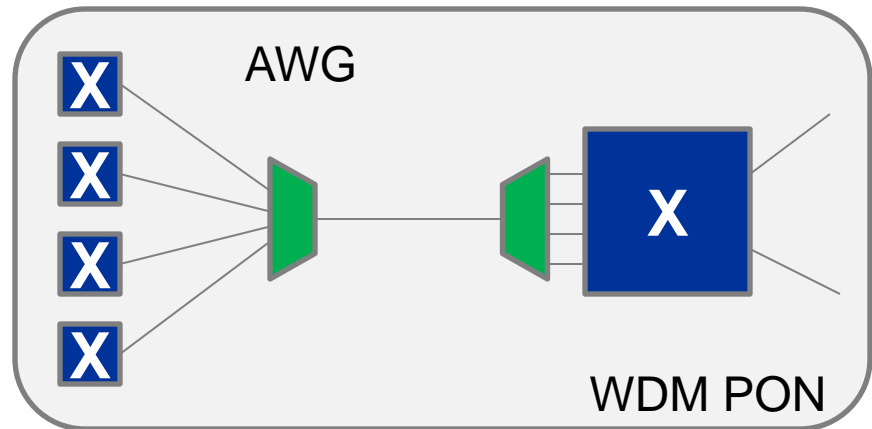
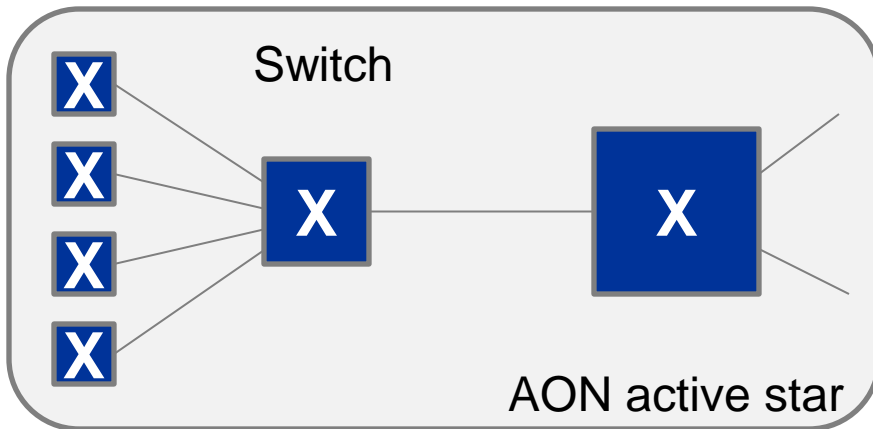
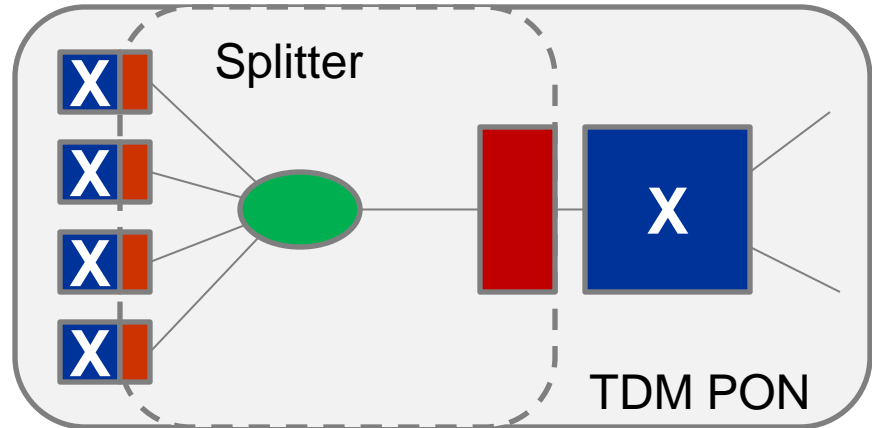
FTTx comparative model

- Equipment, topology, architecture

CPE Remote site CO



CPE Remote site CO



Ethernet equipment

TDM equipment

Optical equipment

FTTx status in Europe (June 2010)



Main technology deployed (subscribers segmentation)	June 2010	Dec 09	June 2009
PON	18%	16%	19%
Ethernet	82%	84%	81%

Dwellings deployed (subscribers segmentation)	June 2010	Dec 2009	June 2009
MDU	75%	73%	71%
SDU	25%	27%	29%

- Types of player, homes passed
 - ▶ Incumbent: 17,4% (high in PT and FI)
 - ▶ Municipality/Utility: 9,3% (high in DK and SE)
 - ▶ Alternative operators/ISPs: 72% (high in RU and FR)
 - ▶ Housing companies and others: 1,4% (high in NL and SE)

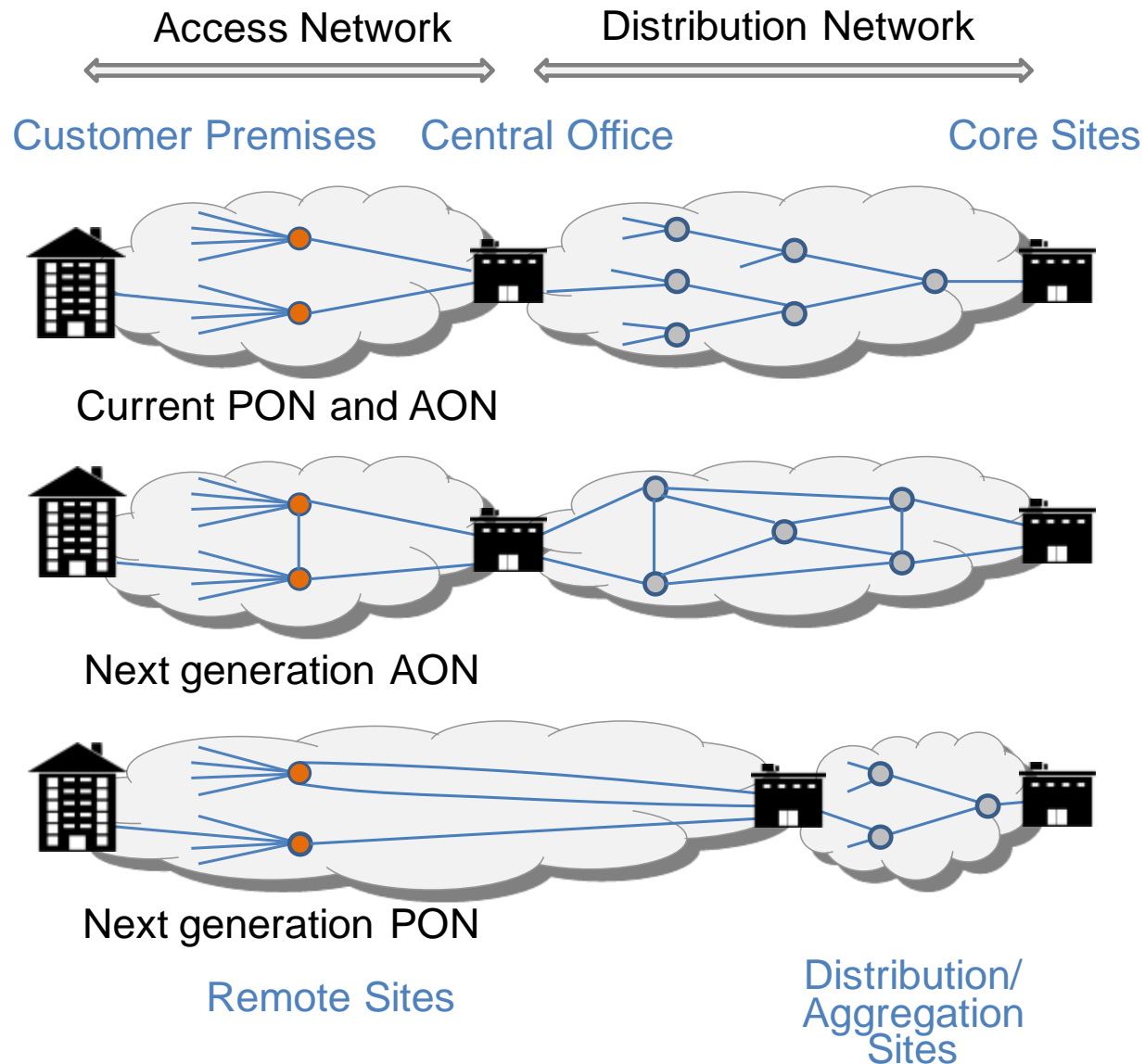
What determines NGOA?

- OPEX
- CAPEX
- Digging costs
- Business model
- Regulation
- Traffic pattern
- Technical performance
- Political & societal factors

- Mutually more or less contradictory
- Different for AON and PON

There will not be one size fits all, but we need to understand the differences and similarities for the various solutions

Topology Trends in NGOA



Today PON and AON topologies very similar

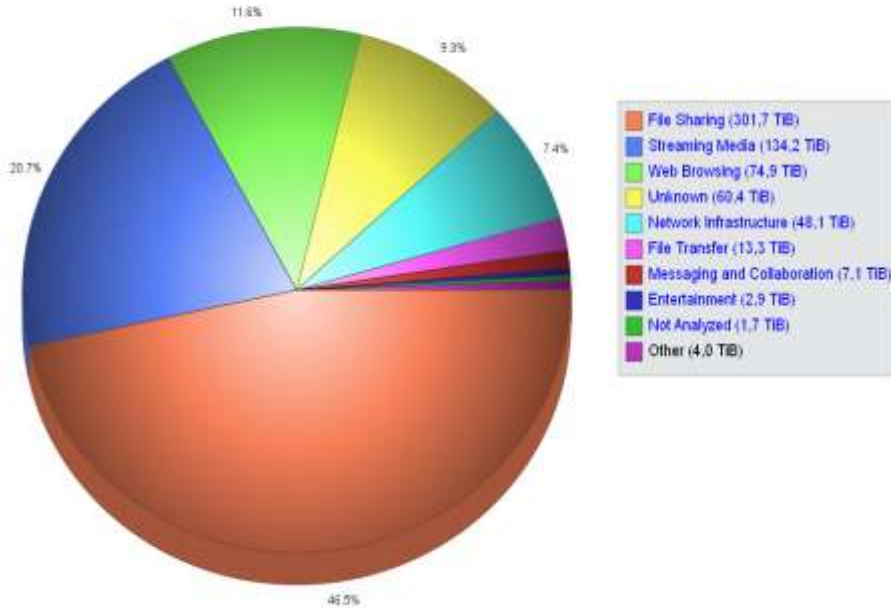
NG AON approach:
Contents become local ->
Dynamics in distribution network

NG PON approach:
Many COs are costly in OPEX ->
Consolidation of COs

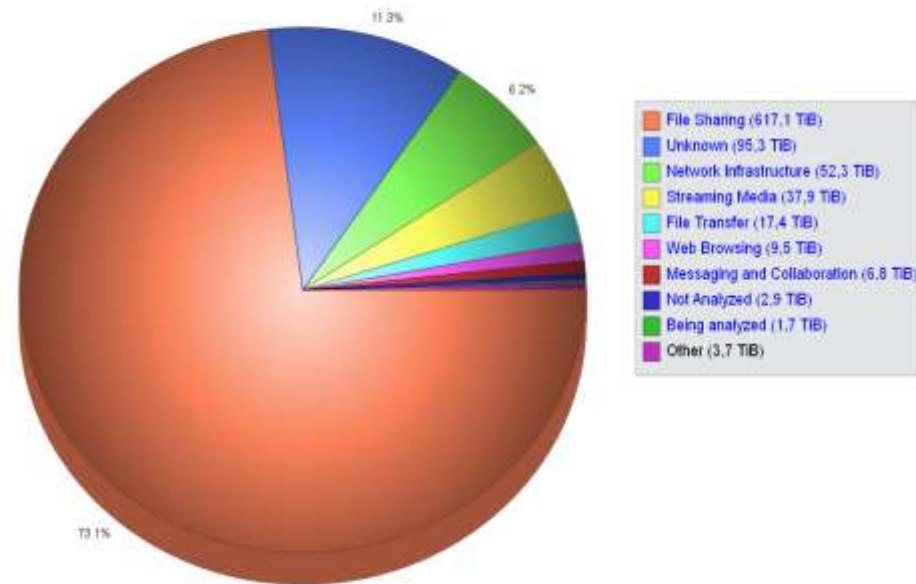
Measurements on a Swedish FTTH network (Jan–June 2010, 2500 users), symmetric



Procera Networks Categories (Inbound)



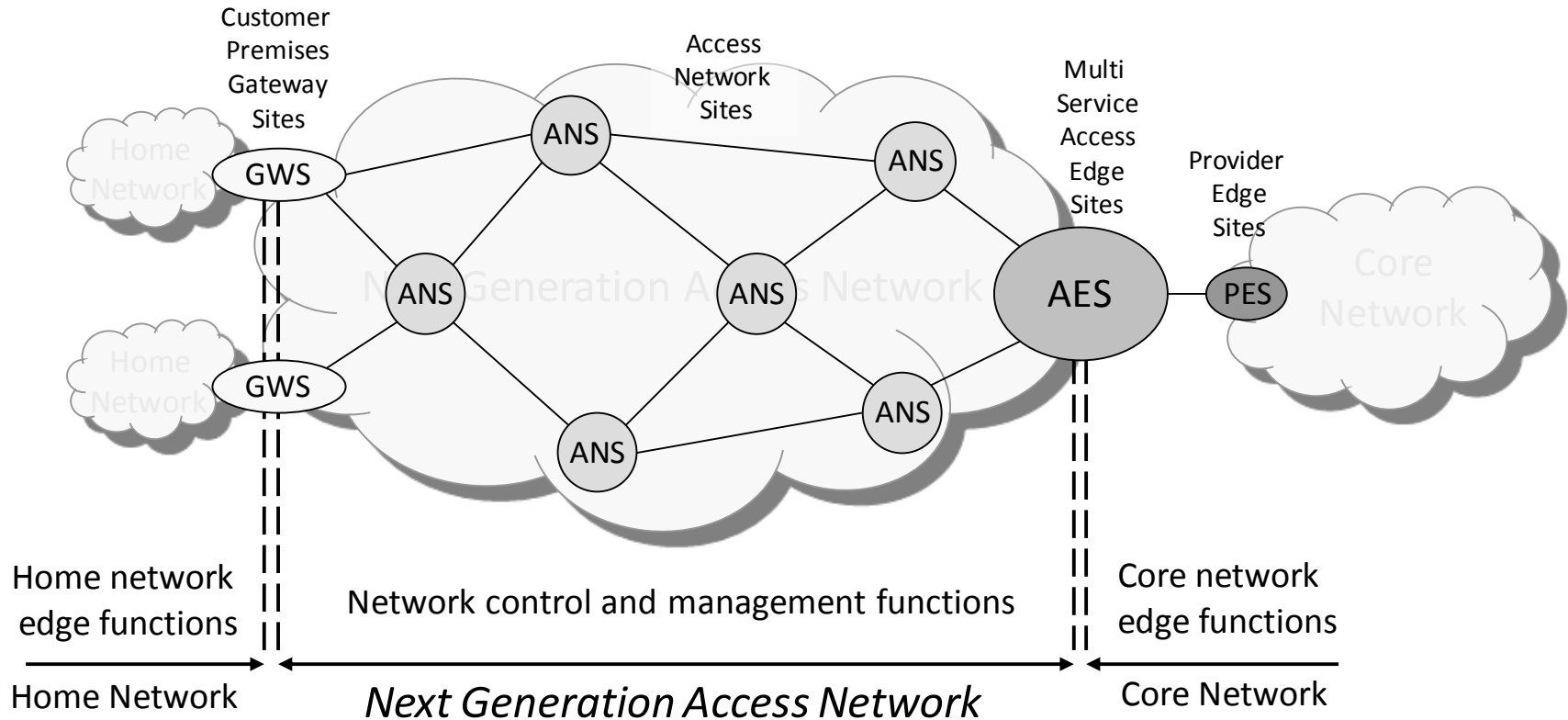
Procera Networks Categories (Outbound)



The success of peer-to-peer technologies:

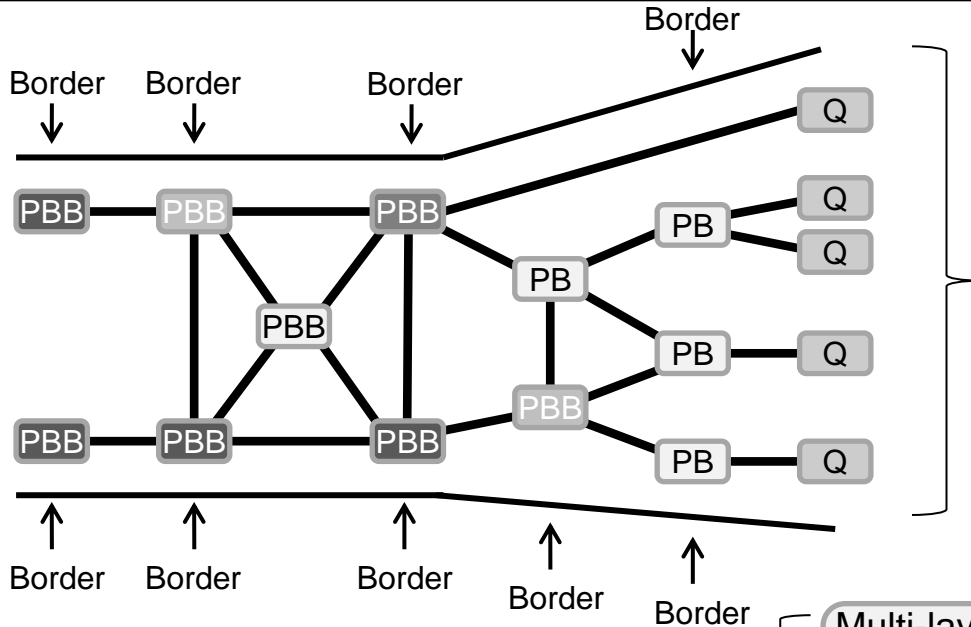
- Illegal file sharing: Pirate Bay, etc
- Commercial content distribution: Spotify, Voddler, NRK, etc
- File sharing reduces server costs and optimises content distribution
- Key question: How much traffic is local?

Future options for AON



- Mesh-like AON/Ethernet for higher dynamics and flexibility
 - ➔ the access and distribution networks can be merged
- Inherently higher resilience without adding cost to network elements (NE)
- The possibility of keeping local traffic local e.g. for P2P based content distribution

GMPLS control of multi-layer Ethernet networks

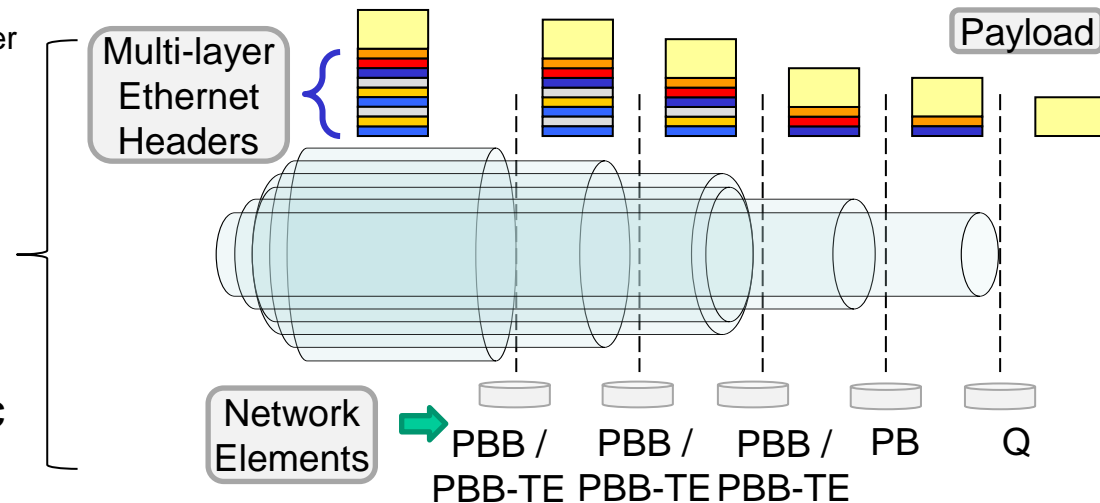


■ Demonstrated target network:

- ▶ 802.1Q + Amendments (.1Q, .1ad, .1ah, .1Qay)
- ▶ Allows for all resource reservation scenarios

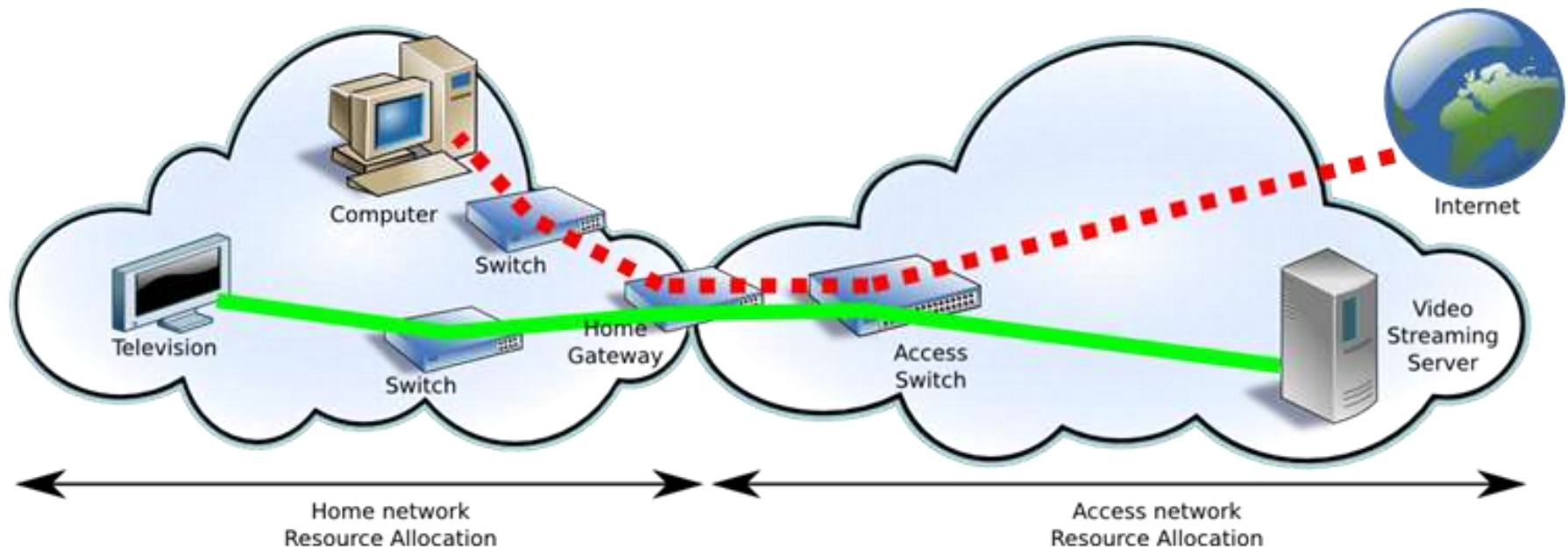
■ Multi-layer reservation

- ▶ Principle: Ethernet tunnels in Ethernet tunnels
- ▶ Signalling, routing and path computation allows for automatic setup



Provisioning in interconnected home/access network

- UPnP QoS (home network) + GMPLS (access)
 - Provisioned "pipe" (LSP) reservation in access from home demonstrated at ECOC 2010 in ALPHA booth



Conclusions



- Many factors determine the shaping of NGOA – the are often mutually contradictory
- Two topology trends today: Dynamics in distribution network vs consolidation of central offices
- Traffic in high capacity access networks dominated by peer-to-peer traffic
- NG AON merges access and distribution into one multi-layer network
- Provisioning across home gateway demonstrated in interconnected home/access network

There will not be one size fits all, but we need to understand the differences and similarities for the various solutions

Fiber-in-the-home (FITH)



POF installation in the home of Mikhail Popov

Thanks to



- ALPHA colleagues
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