

Next generation optical access networks: the OASE view

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On behalf of the OASE project team
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Integrating project on access addressing technology, techno-economics, business regulation, standards

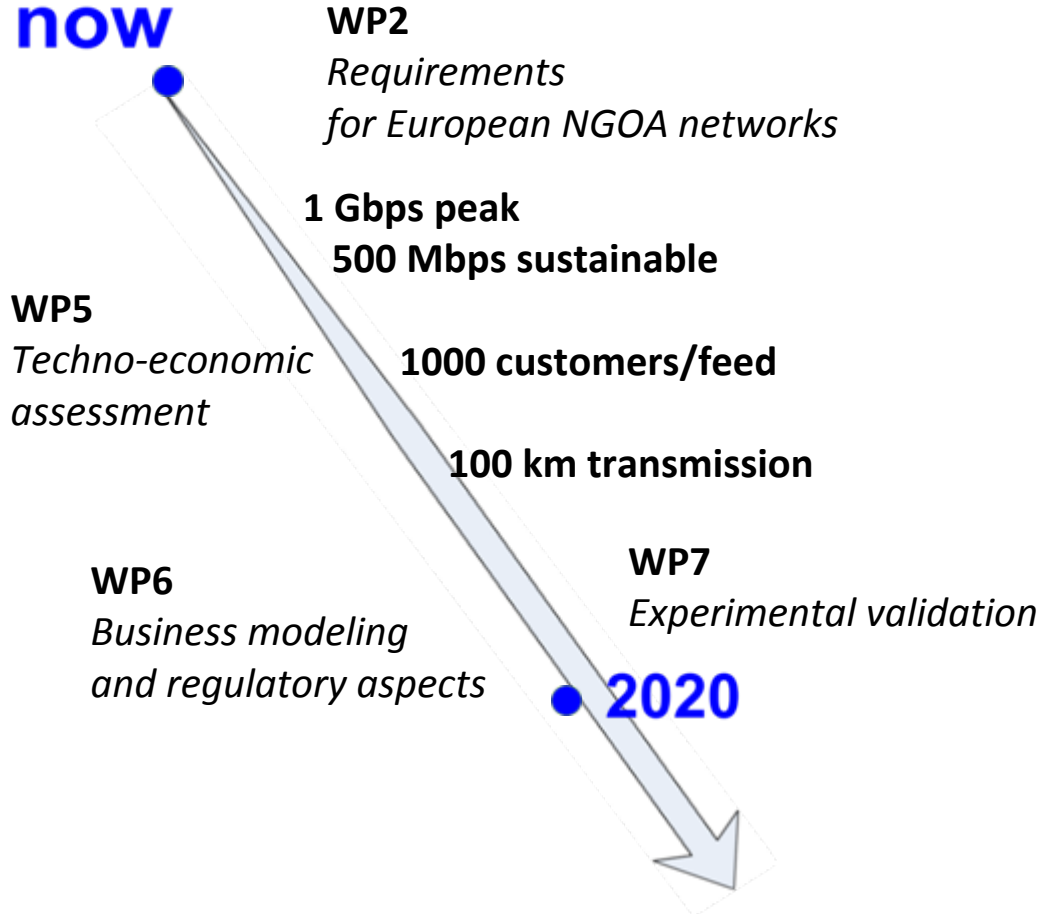
Objectives

Development and assessment of NGOA network architectures for the “2020” time horizon focused on European requirements.

- Technology and architecture evolution focusing on minimized total cost of ownership
- Supporting new business models

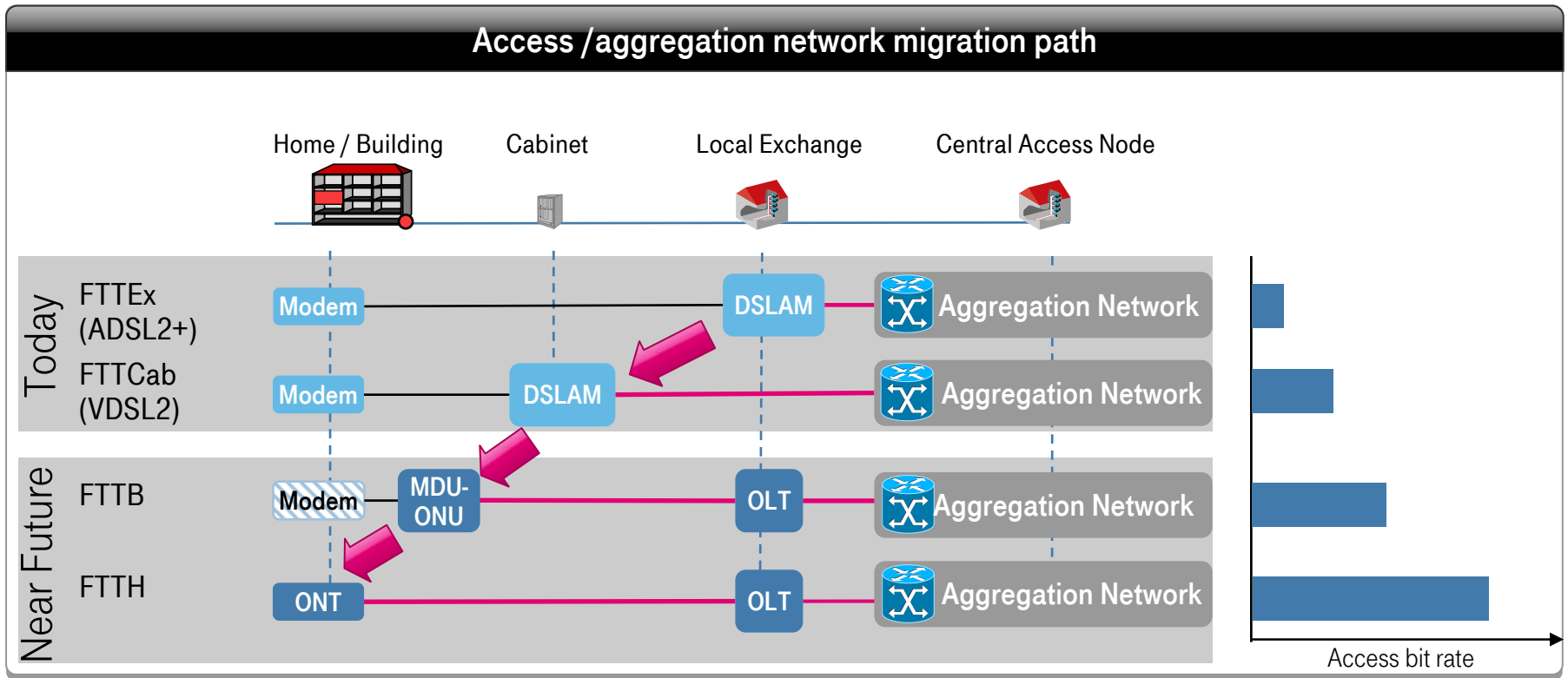
Target:

- 1 Gbit/s per customer
- > 1000 customers per fiber feed
- > 100 km transmission distance



Migration towards FTTH

FTTH will remove the access bottleneck.

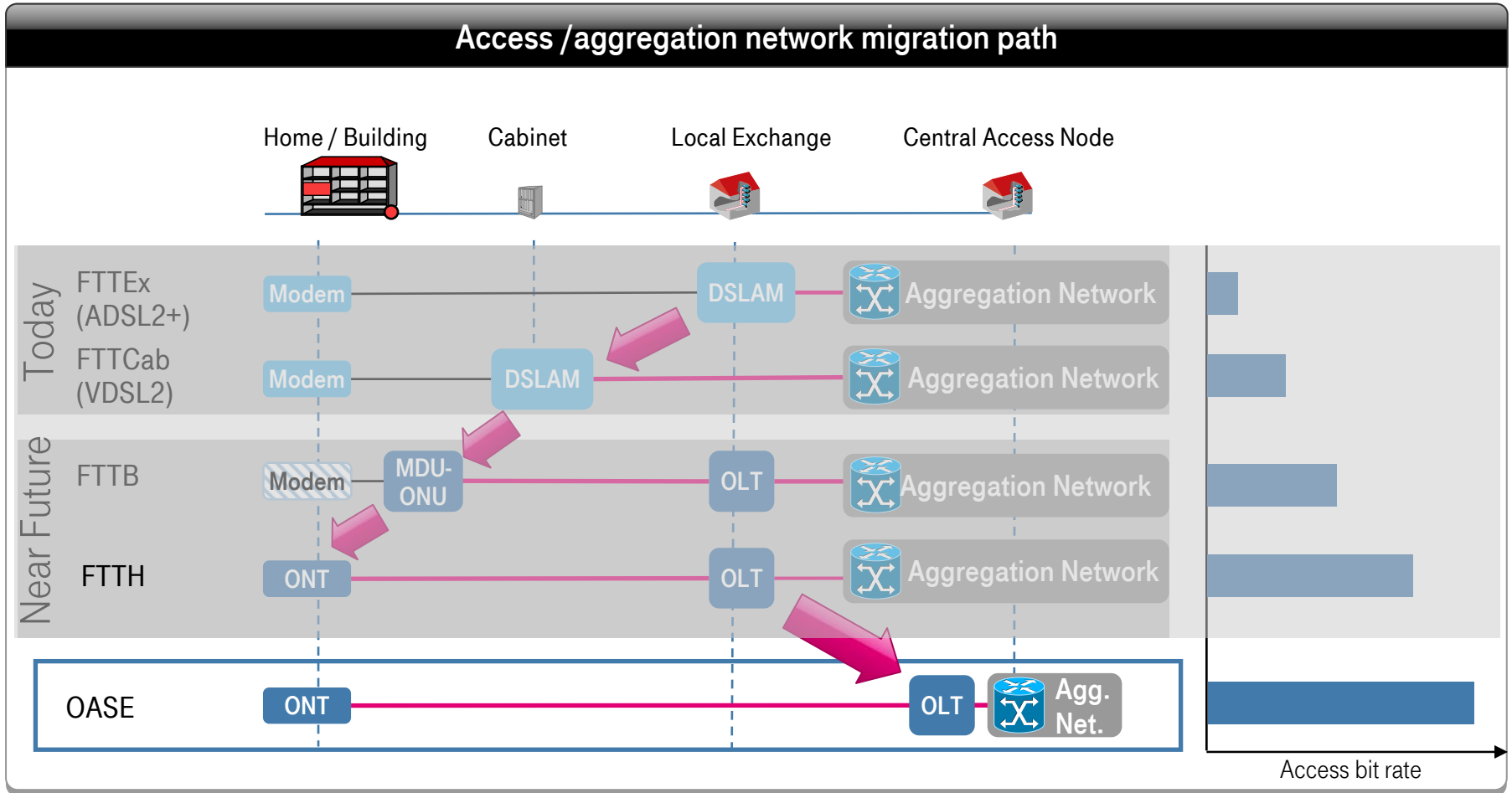


FTTH – Optical fiber access: No (practical) limitation in the access bandwidth.



NGOA – Reducing Total Cost of Ownership.

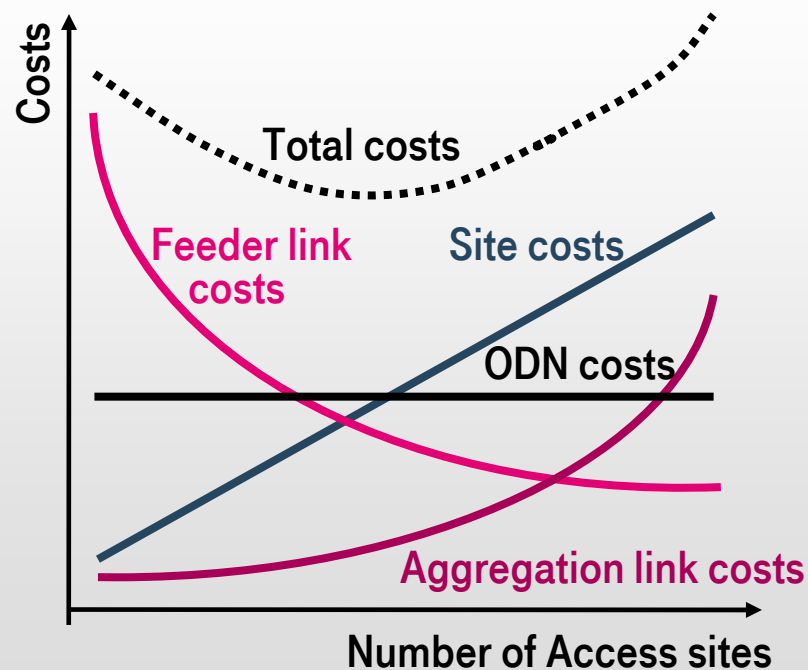
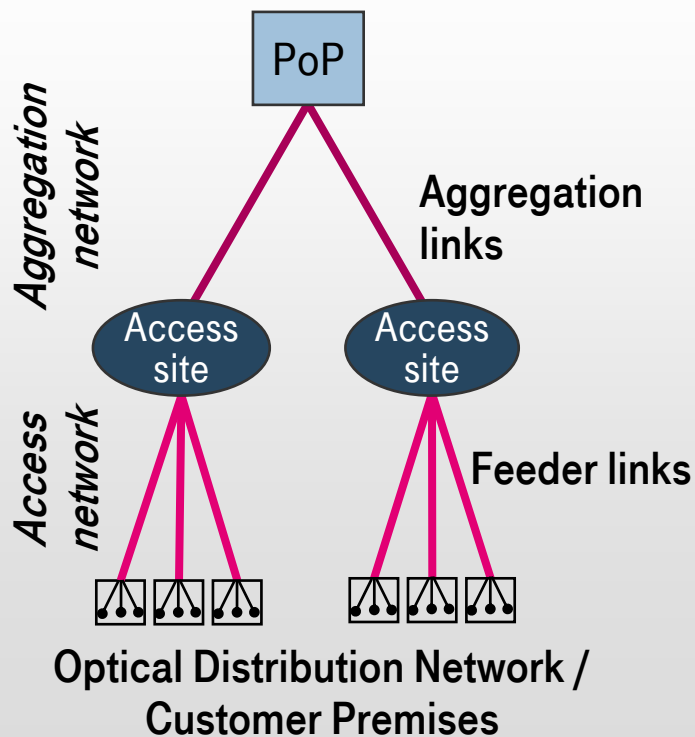
Minimal TCO at still growing bandwidth.



Principal interrelationship between network structure and costs in access/aggregation networks.



Find the optimal network structure enabled by optical technology

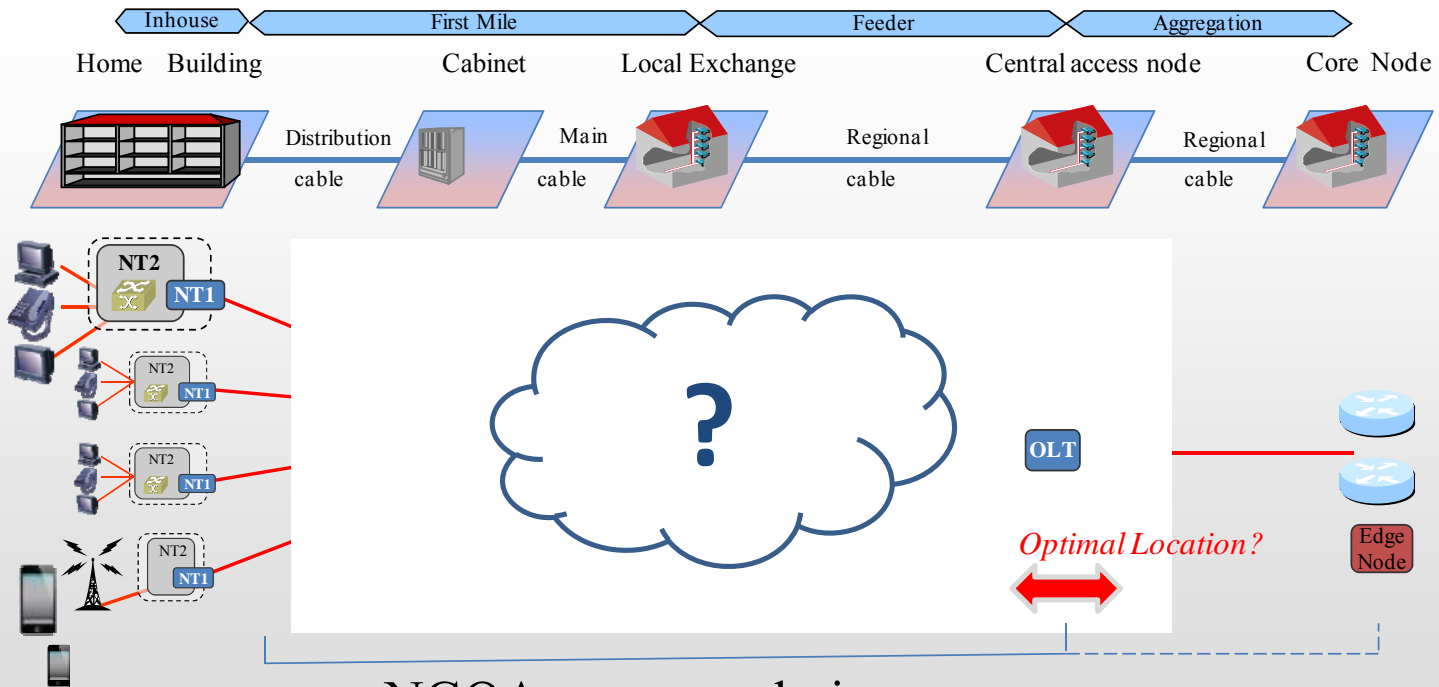


NGOA architectures

Identifying the optimal structure



Identify architectures with potential for lowest total cost of ownership

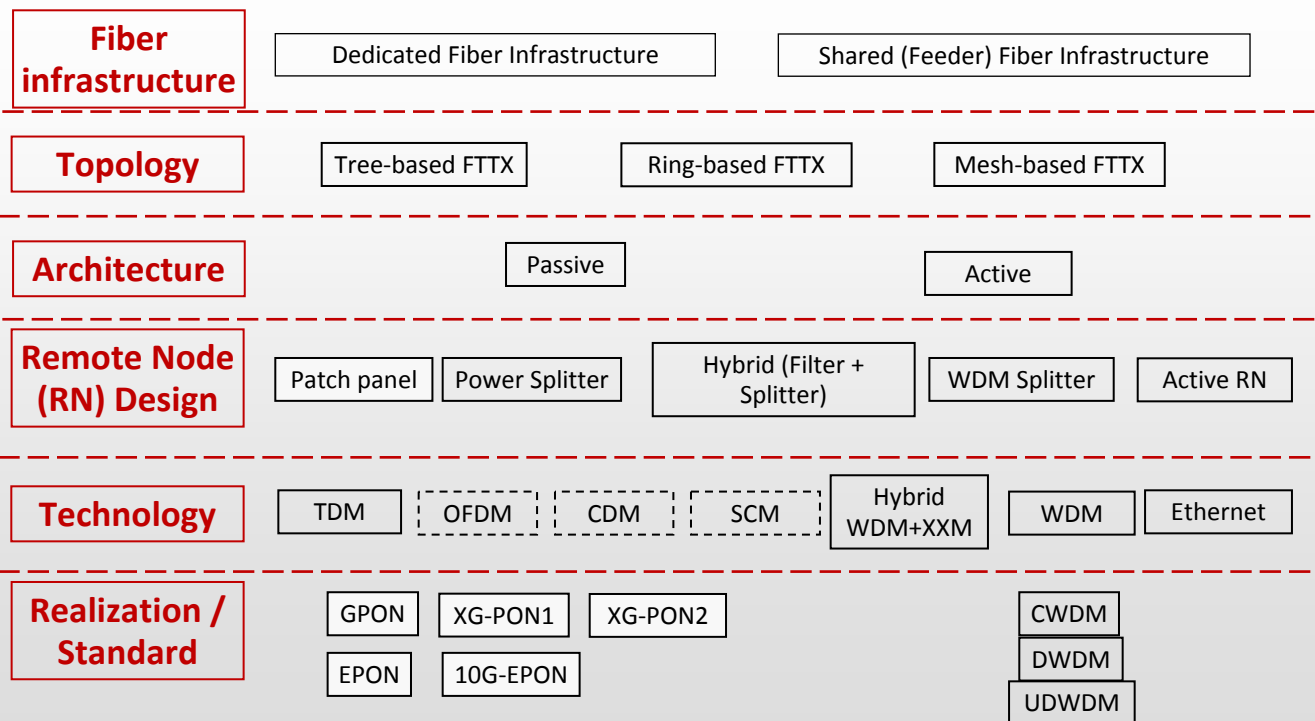


NGOA coverage design

PON, WDM, AON, PtP, hybrid solution



Identify system concepts that meet the requirements for next generation optical access



Which concept offers lowest Total Cost of Ownership?

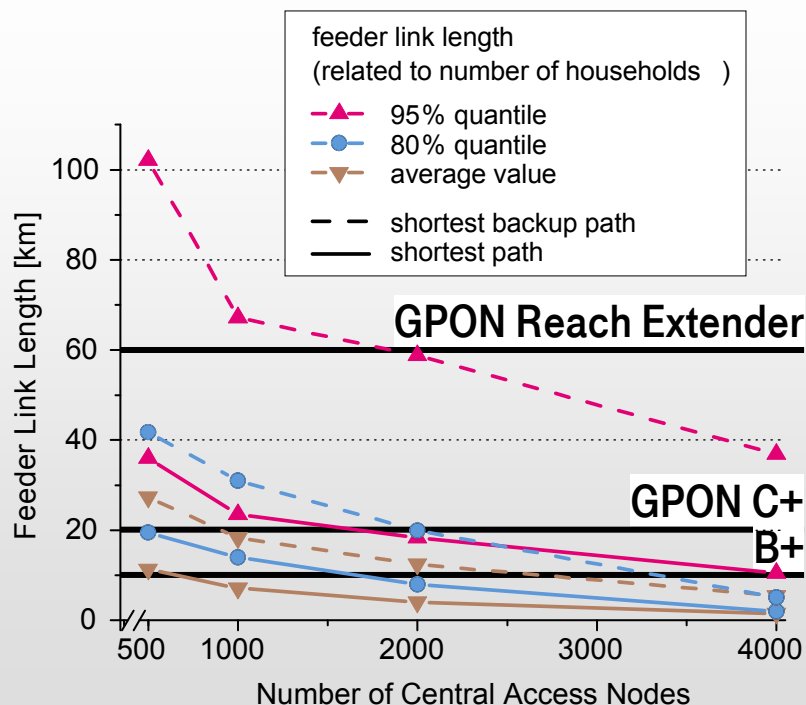


Feeder link length.

Which reach should be provided by NGOA systems?



Feeder link length = f(# metro access nodes)



Reach is not the challenge?

- Feeder links length ≤ 40 km for majority of households in all scenarios
- Very long feeder links for a minority of households only
- For total transmission distance subscriber line length in ODN has to be added (typically < 5 km)
- Typically about ($<$) 40 km reach are sufficient
- Protection will require longer reach (2x)

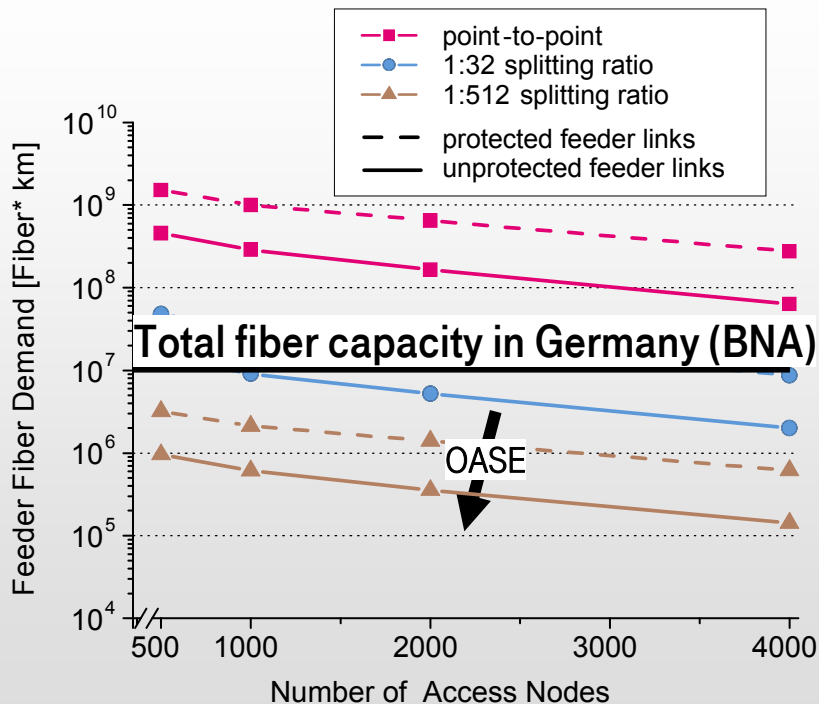


Feeder link fiber demand.

The dark side of site darkening - Additional cable required.



Feeder fiber demand = $f(\# \text{ metro access nodes})$



High splitting is required!

- Feeder cables are an important additional cost factor
- Feeder fiber demand depends on
 - Number of Central Access Nodes / Feeder link length
 - Feeder fiber multiplexing (splitting)
 - Resilience requirements
- High splitting ratio is key to reduce additional feeder costs
- Resilience has to be optimized



Key requirements on NGOA network architecture.



Peak data rate

- FTTH residential peak data rates ≥ 1 Gbit/s
- Business, backhaul (fixed, mobile) peak data rate: ≥ 10 Gbit/s

Sustainable data rate

- Average sustainable downstream based on service usage during peak hour 500 Mbit/s per Optical Network Units (ONUs)/customers
- Support of traffic symmetry, at least a ratio of 1:2 between up- and downstream

Feeder capacity

- Support of 128 Gbit/s up to 500 Gbit/s aggregate capacity per feeder fiber

Universal access

- Mobile and fixed backhaul, residential and business access (SME) on one platform
- Mobile Backhaul: Low delay and high synchronization requirements

Green network operation

- Low power consumption



Key requirements on NGOA network architecture.



Split

- Support of 256 up to 1024 ONUs per feeder fiber

Reach

- Support of 20 to 40 km passive reach option for the working path
- Support of 60 to 90 km extended reach option for the protection path (preferably passive)

Resilience

- Support of redundancy and protection mechanism for service availability and reduced failure impact (e.g. limited number of affected customers)

Migration

- NGOA system has to work on existing first mile infrastructure (single fiber solution)
- NGOA system does not affect deployed systems and the existing used spectra

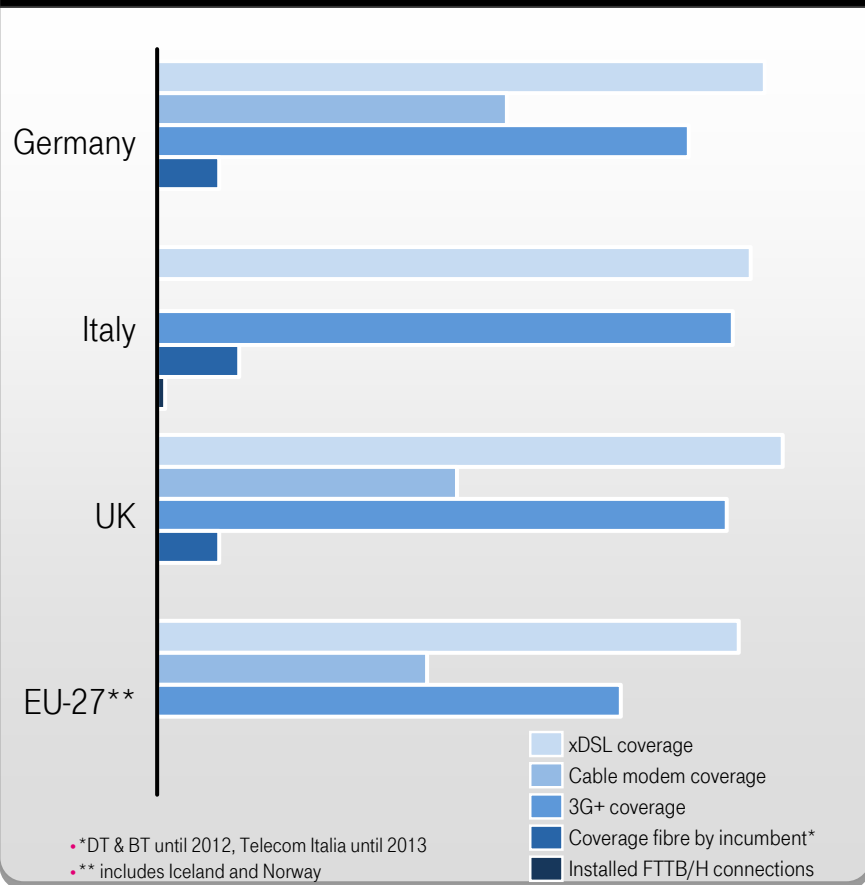


Market environment in Europe.

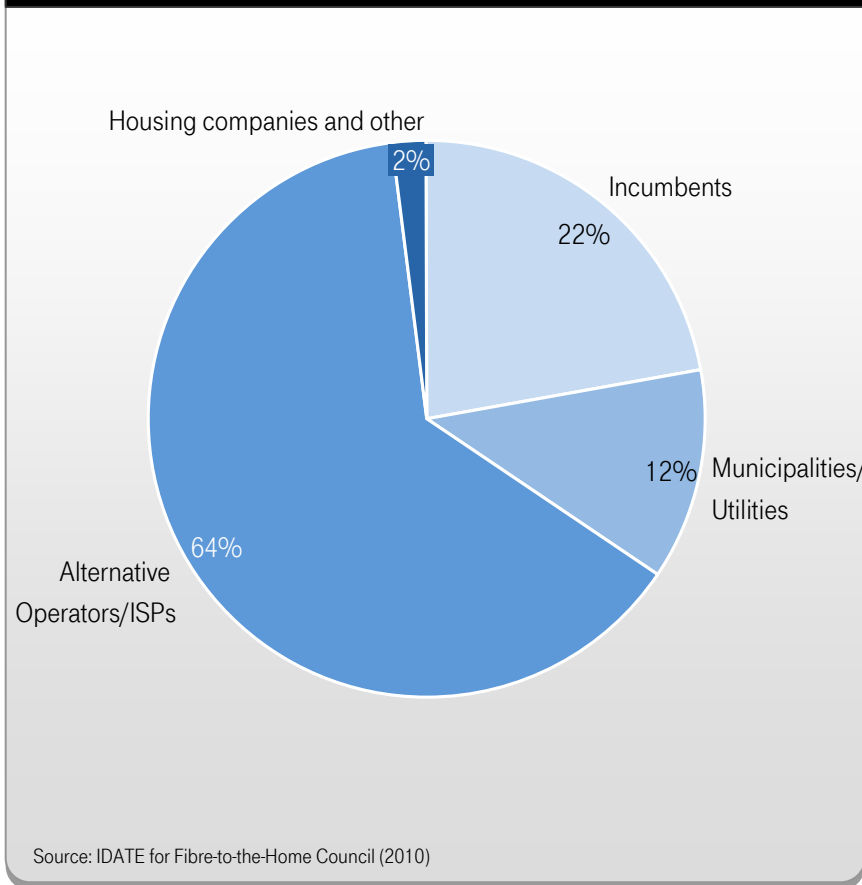
A lot of new players are emerging.



Fiber roll out vs. other access technologies



Investors in FTTH/B in Europe

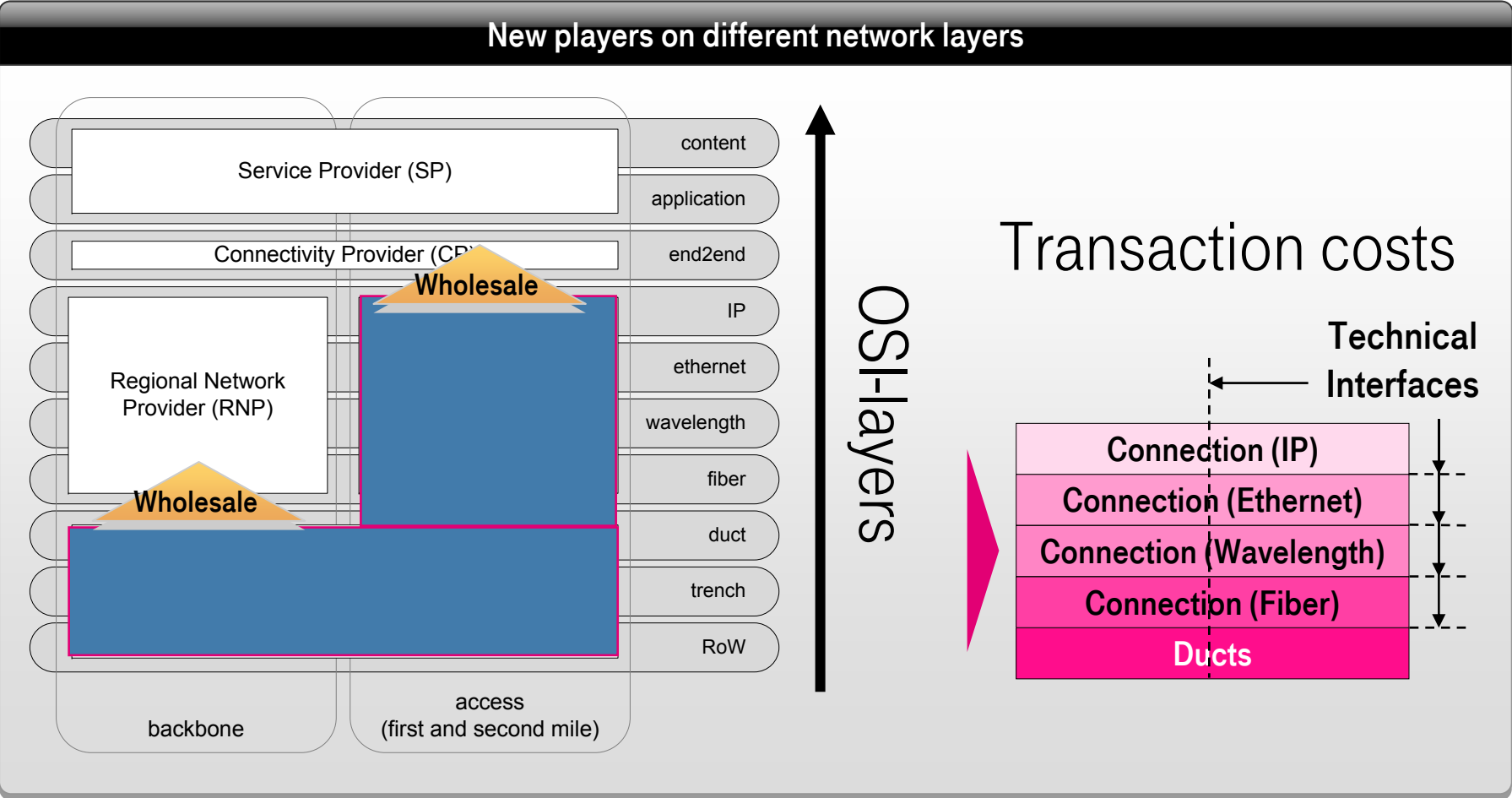


Fragmented ecosystems will emerge.

Chances for co-operations.



New players on different network layers



Thank you!

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