Costing and Pricing Infrastructure Access

Rabat, MOROCCO

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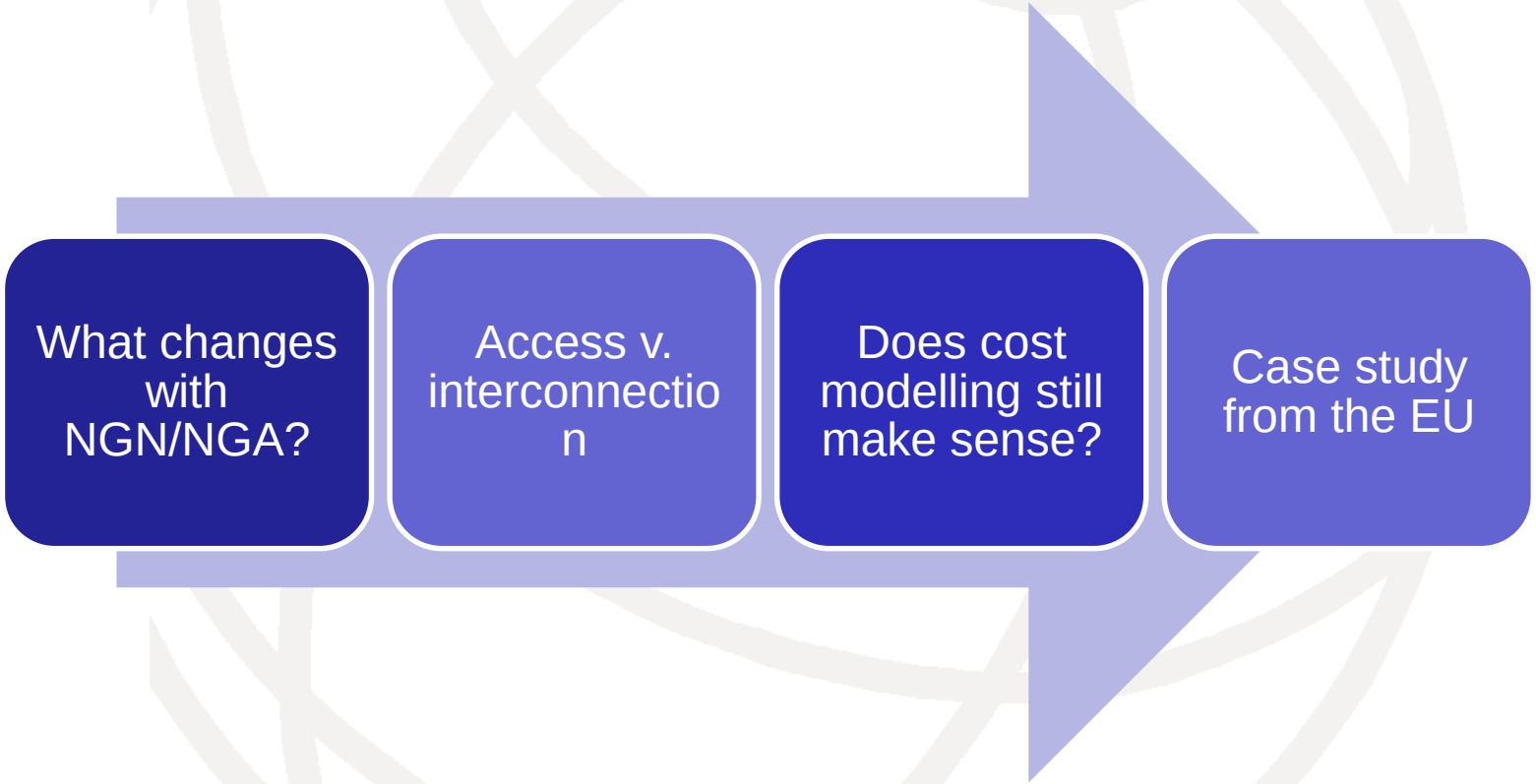
Session 5:
Trends in NGN and NGA Interconnection and Regulation

Agenda

Aims and objectives for this session



What changes with NGN & NGA?

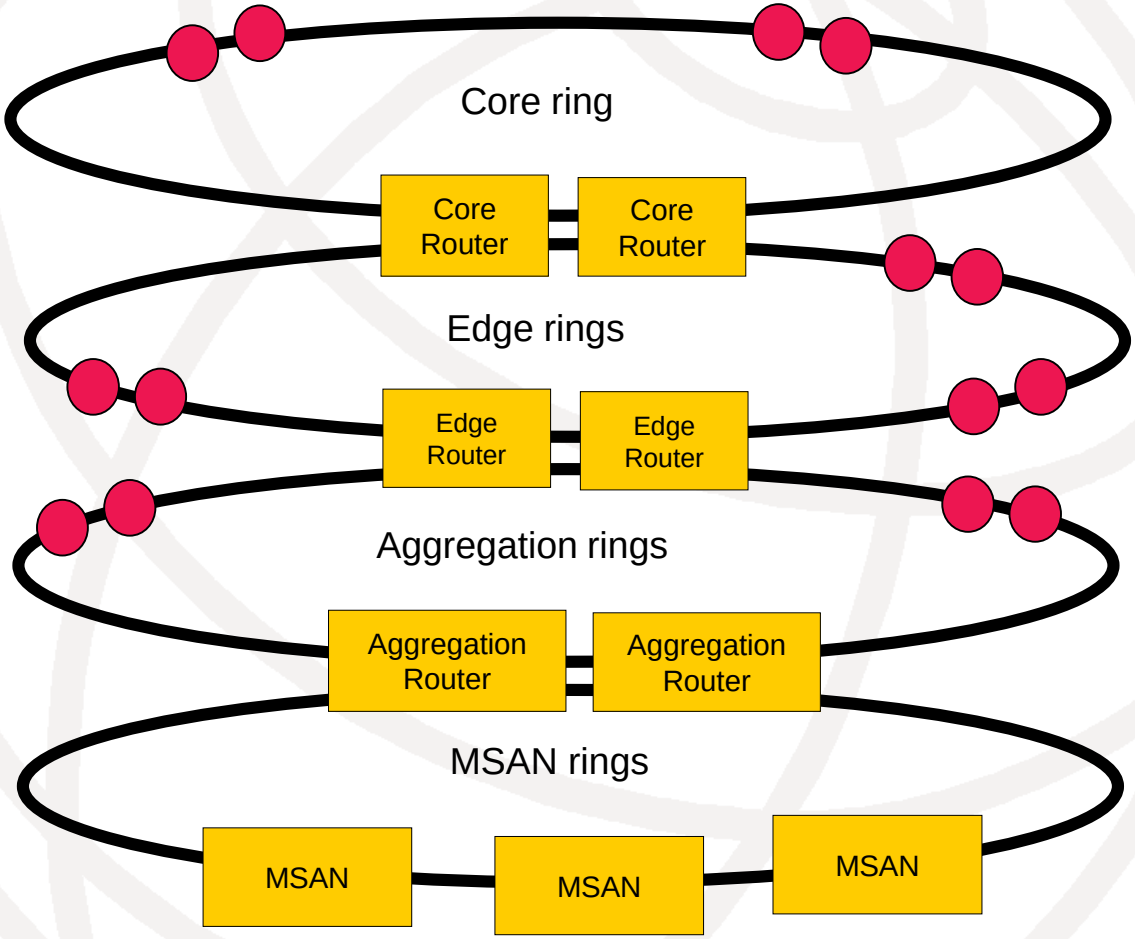
A typical NGN Architecture

Ring rather than star topology

Routers rather than switches

Fewer nodes

Costs driven by capacity rather than minutes of traffic



Shared transmission paths

End of SDH technology; Ethernet and DWDM

Access nodes further from customer

Key changes relevant to cost modelling

- Asset-base changes:
  - Need to obtain new prices and asset lifetimes
  - Recalibration of numbers and types of nodes
- Cost drivers change:
  - Element costs need to be broken into fixed costs (chassis) and variable costs (per Mbps).
- Redesign the transmission network:
  - Each layer has to be costed separately (even where infrastructure is shared)
  - Costs to be allocated amongst traffic on capacity requirement and probability of usage by each service.

Practical issues - 1

- Obtaining traffic data by service in Mbps:
  - Requires subscriber numbers by access speed, contention ratios and busy hour usage assumptions.
- Voice to Mbps translation:
  - 64kbps channels or further voice compression?
- Modelling the transmission network:
  - Numbers and lengths of rings difficult to obtain
  - Need to separate urban, suburban and rural rings with different construction (e.g. number of fibres, ducted?)
- Nodes per ring
  - based on theoretical approach or/and calibration with actual numbers?

Practical issues - 2

- Disaggregation of equipment costs:
  - Common equipment (chassis, power supply, racks) may be taken as fixed cost
  - Processor will typically be costed per Mbps
  - Router modules are costed per Gigabit Ethernet (GE) … which leaves a lot of unutilised capacity and removes variability in the cost model.
- Routing factors:
  - Generally a flatter structure: more service provided at the core
  - Balancing between the theoretical and the actual (e.g. at which level bitstream services are or can be offered)

Conclusions

- NGN models are substantially different from PSTN models.
- The tendency is to have high fixed and low variable costs, thus making usage-based charges somewhat theoretical.
- It is hard to reconcile assumptions within the model between theoretical efficiency and actual deployment practice.
- This is especially hard during the transition phase from circuit-switched networks.

Cost modelling during the migration to NGN

Migration options

- Option 1: retain TDM interconnection and require conversion of all IP traffic to/from TDM.
  - Interconnection charges will be based on traditional cost models of circuit switched network
- Option 2: require IP interconnection and require conversion of all TDM traffic to/from IP.
  - Interconnection charges will be based on NGN cost models
- Option 3: move from TDM to IP interconnection as and when this reduces total interconnection costs.
  - By commercial negotiation or by regulatory decree based on examination of the costs involved.

Regulatory preferences

- Technology neutrality: it is not the role of regulators to specify the technology used for interconnection
- Protection of competition: imposing costs of TDM-IP conversion could harm smaller operators
- Cost minimisation:
  - if IP interconnection is cheaper then it should be given regulatory preference
  - Operating both TDM and IP interconnection adds unnecessary costs.

Potential outcomes

- TDM interconnection (with charges based on cost models) remains the default position until IP traffic comprises at least 50% of traffic on both interconnected networks.
- To date regulators which have looked at this issue have tended to retain the default position.
- Deviation from this position may be reached via commercial agreements, with the current regulated TDM interconnection acting as a price reference point.
- Rather than establish NGN equivalents to TDM regulation, there will be an increasing reliance on ex-post remedies to correct for anti-competitive behaviour.

Access vs. Interconnection

Different characteristics; different requirements

Access	Interconnection
A one-way transaction: service provider purchases access to a network operator's facilities	A two-way transaction: two suppliers exchange traffic across a Point of Interconnection
Danger of anti-competitive practices based on bottleneck control of essential facilities and economies of scale/scope.	Some balance of power between the parties, with less risk of competitive abuse. Internet proves that commercial agreements are possible.
Need for on-going ex-ante regulation	Potential to remove ex-ante regulation and rely on ex-post competition law

A shift in the regulatory balance

The need for regulated cost-based interconnection is reducing

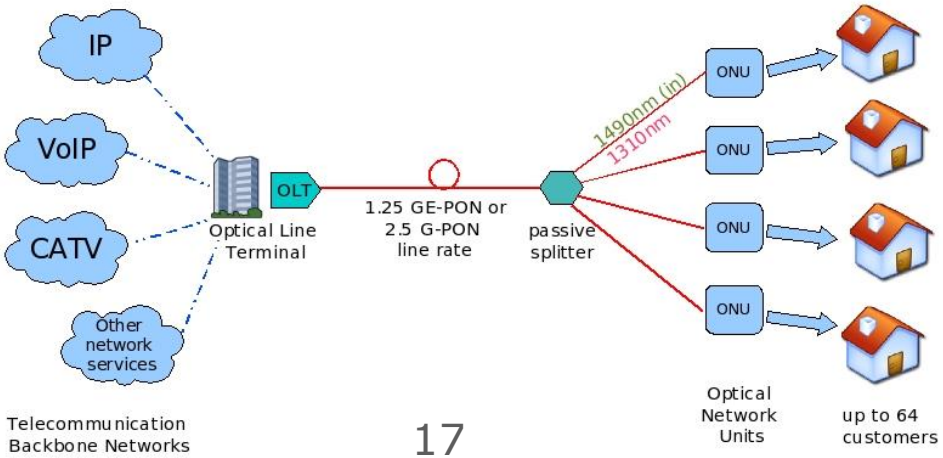
The need for regulated cost-based access is increasing

Access means …

- Access to facilities



- The access network (i.e. access to the facilities that provide access to the customer)



Access to facilities cost models

- Looks at the cost of supplying space in passive or active infrastructure (e.g. tower, duct, submarine cable) in different locations.
- Assume a three-stage costing process:
  - Identify the fixed and variable costs of the relevant assets
  - Identify the cost savings from sharing fixed costs
  - Identify the incremental costs of establishing access to the facility
- Model output is typically a cost per-month of leasing space at or on a specific facility.

Cost models for various forms of Facilities Access (e.g. access to cable landing stations) may be needed

Infrastructure sharing

- Access via infrastructure sharing can reduce uneconomic duplication of investment, boost rates of return on investment, and promote broadband roll-out.
- Especially appropriate where there is potential for competition between multiple networks.
- Regulators may require open access as part of network sharing agreements.
- Most common for mobile networks:
  - Economic service provision in higher cost areas
  - Facilitate moves to mobile broadband
  - Overcome planning and environmental concerns
- Incentives for sharing may be provided – e.g. in reduced licensing or spectrum fees.

Cost savings from mobile infrastructure sharing

- Potential cost savings are greatly dependent on the depth of sharing involved.

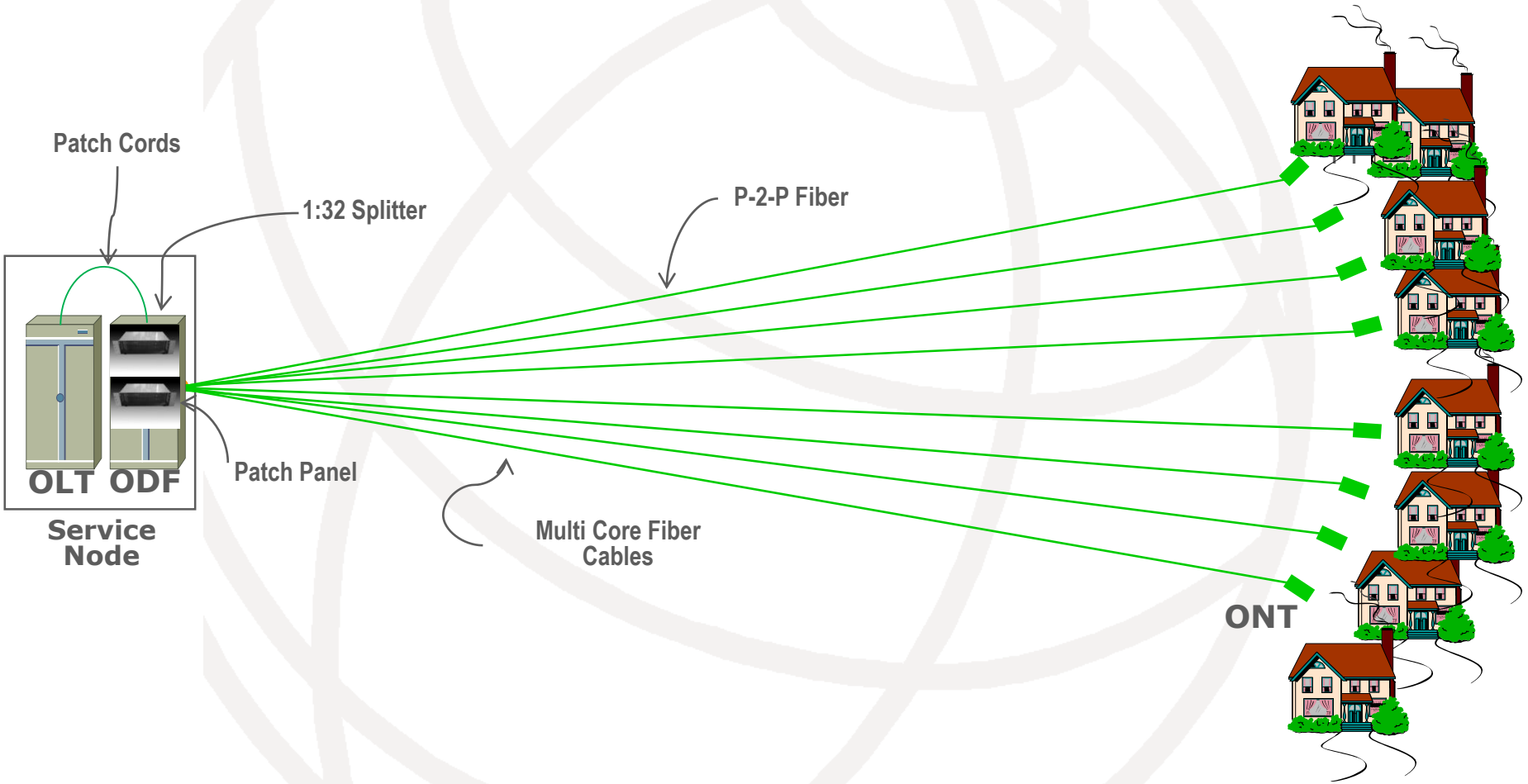
	2-way sharing in Brownfield	2-way sharing in Greenfield	3-way sharing in Greenfield
Passive – towers /sites	< 10%	≈10%	≈15%
Passive – including antenna/power/aircon	> 15%	< 20%	>20%
Single network /national roaming	> 30%	> 30%	>40%
Active - full RAN sharing		> 40%	>50%

Source: ITU, Trends in Telecommunications Reform, 2016, p59 (based on data from GSM Association and Vodafone)

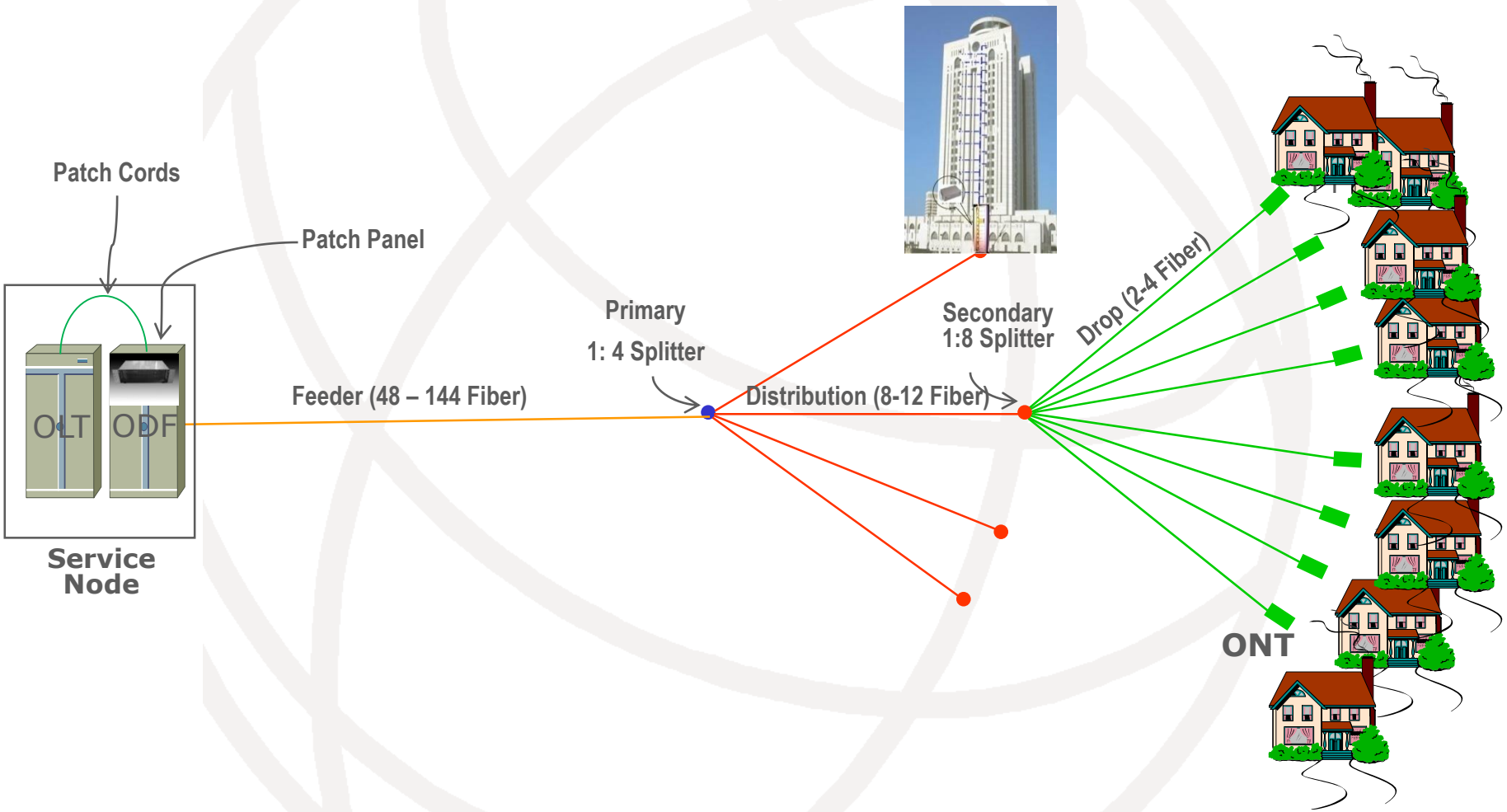
Access network cost models

- Looks at the most efficient way to deploy infrastructure to serve customers within a local area.
  - Focuses on when to deploy fibre rather than copper, and relative costs of GPON versus point-to-point fibre.
- Assume a three-stage hierarchy of:
  - Primary distribution (MDF to Cabinet)
  - Secondary distribution (Cabinet to Distribution Point)
  - Drop wire (Distribution Point to customer)
- Based on demand within the area assess to what extent it is worthwhile deploying fibre.

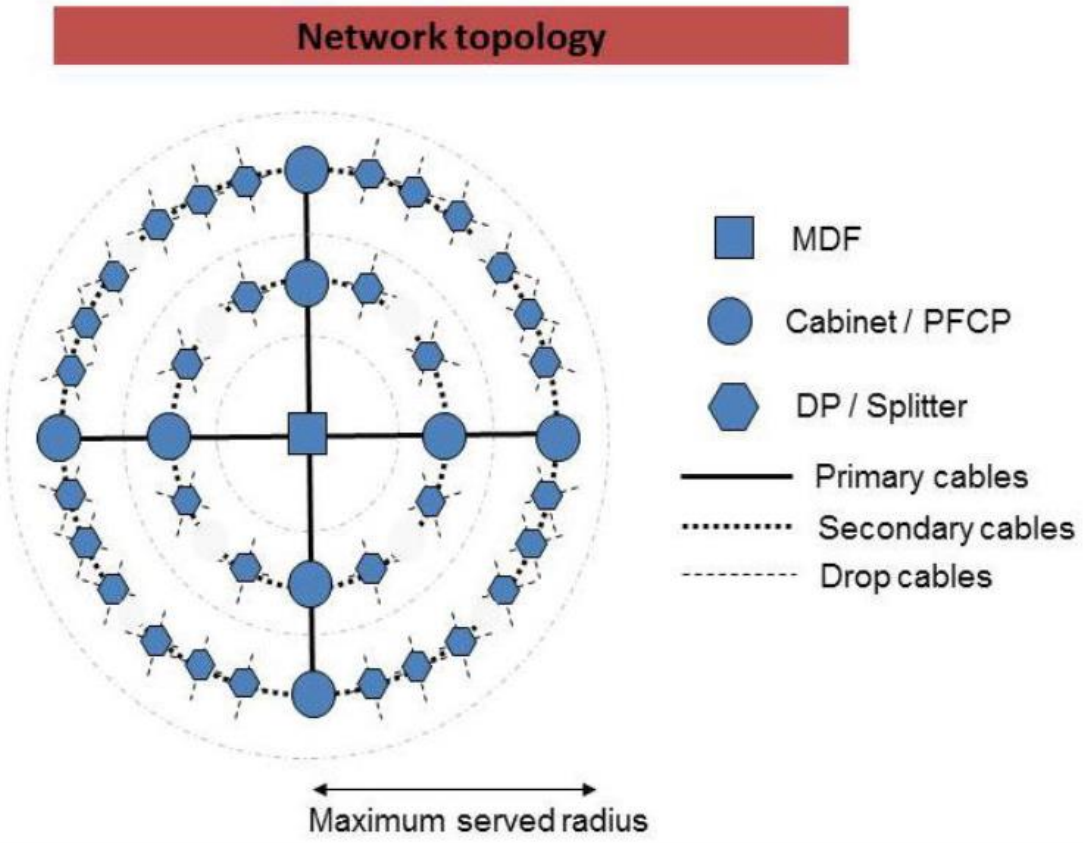
Network Topology – Point-to-Point



Network Topology – GPON



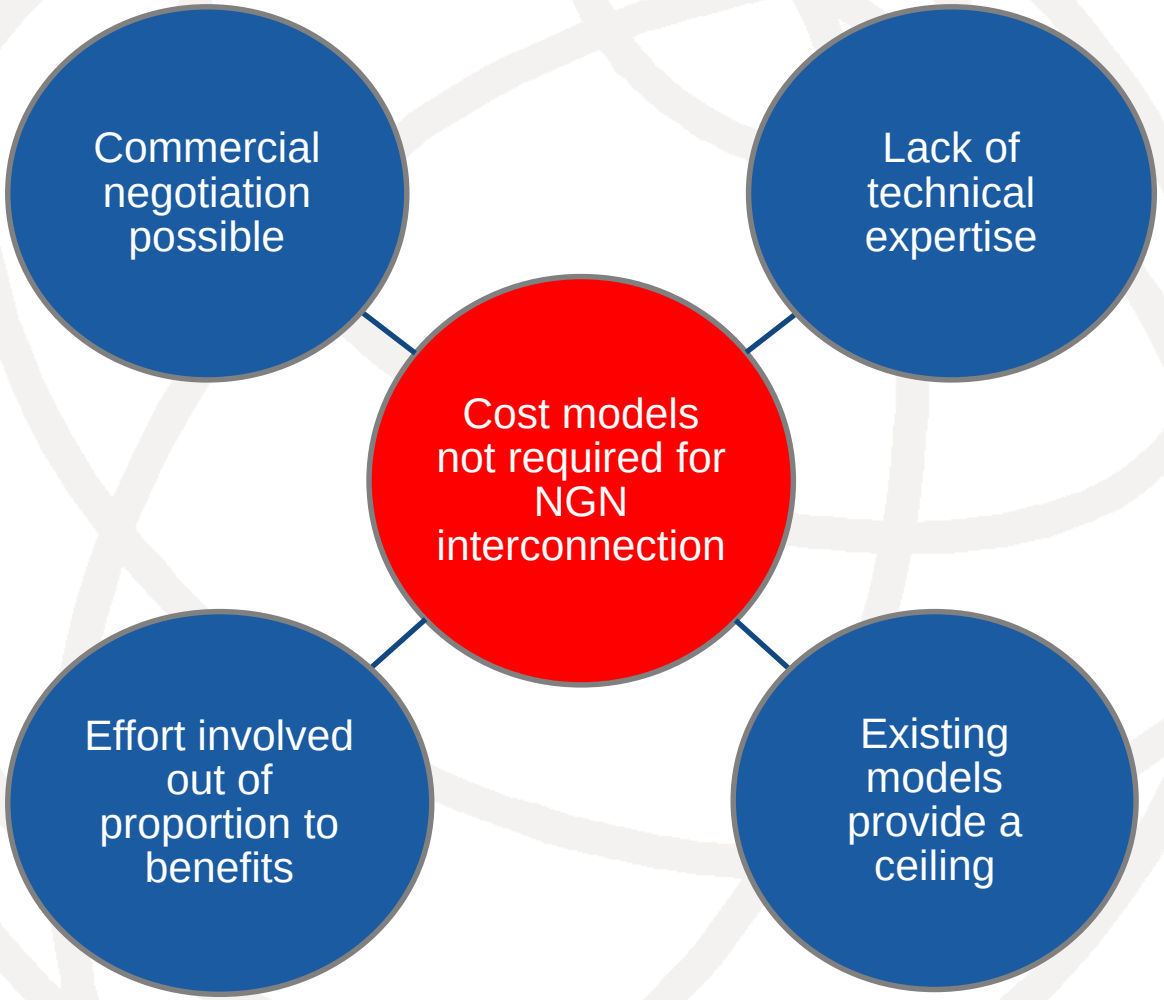
The theoretical access network design



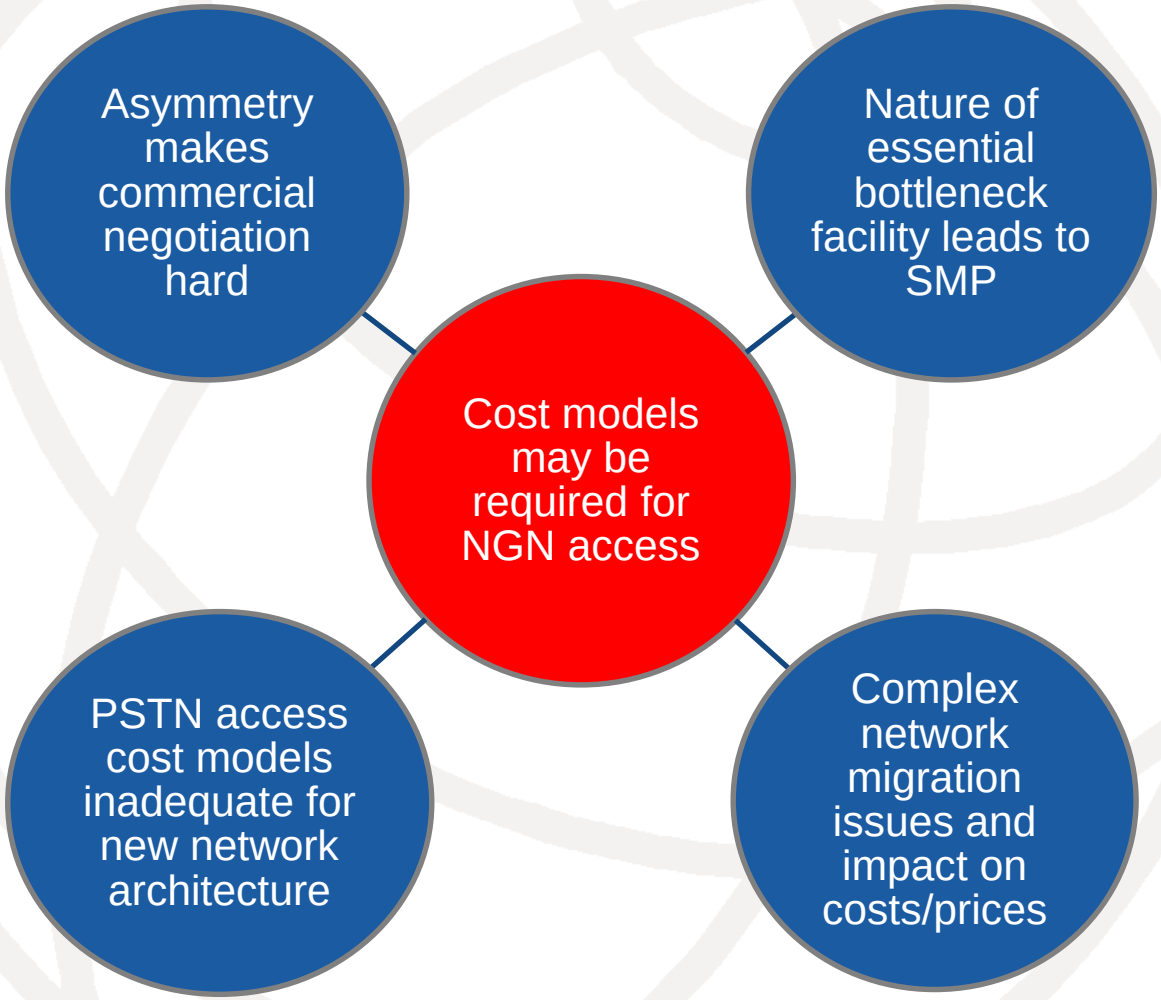
Much of the complexity in an NGA cost model is in mapping the network topology to customers in each local area.

Are NGN / NGA cost models necessary?

Cost models for NGN interconnection



Cost models for NGA



Case study: the European Union

Digital Agenda for Europe – 7 pillars

Actions required on broadband access

- Each pillar is supported by a long list of Actions to be taken at EU and Member State (MS) level
- Actions in support of *Pillar IV. Fast & Ultra-fast Broadband Access* include:
  - Foster the development of NGA networks
  - Each MS to develop a national broadband plan
  - Regulatory measures to promote investment and enhance competition
  - Use structural funds to finance the roll-out of high-speed networks
  - Update State Aid Rules for broadband.

The State Aid Rules

- The majority of funding is expected to come from commercial sources under competitive conditions
- The Rules describe how public funds can be channelled into broadband investments in areas where private funding is hard to obtain.
  - competitive areas ("black areas"), where public funding can only support a "step change" needed to achieve >100Mbps.
  - unprofitable "grey areas" or underserved "white areas", in which State Aid may be justified under regulated conditions (see next slide).
- Proposals must take account of both existing infrastructures and concrete investment plans.

Regulatory conditions for public funding of broadband

- Access under fair and non-discriminatory conditions.
- Fair and full unbundling.
- Access to passive as well as active infrastructure.
- Access to ducts, poles, dark fibre and street cabinets as well as local loop unbundling and bitstream access.
- Effective wholesale access for at least 7 years.

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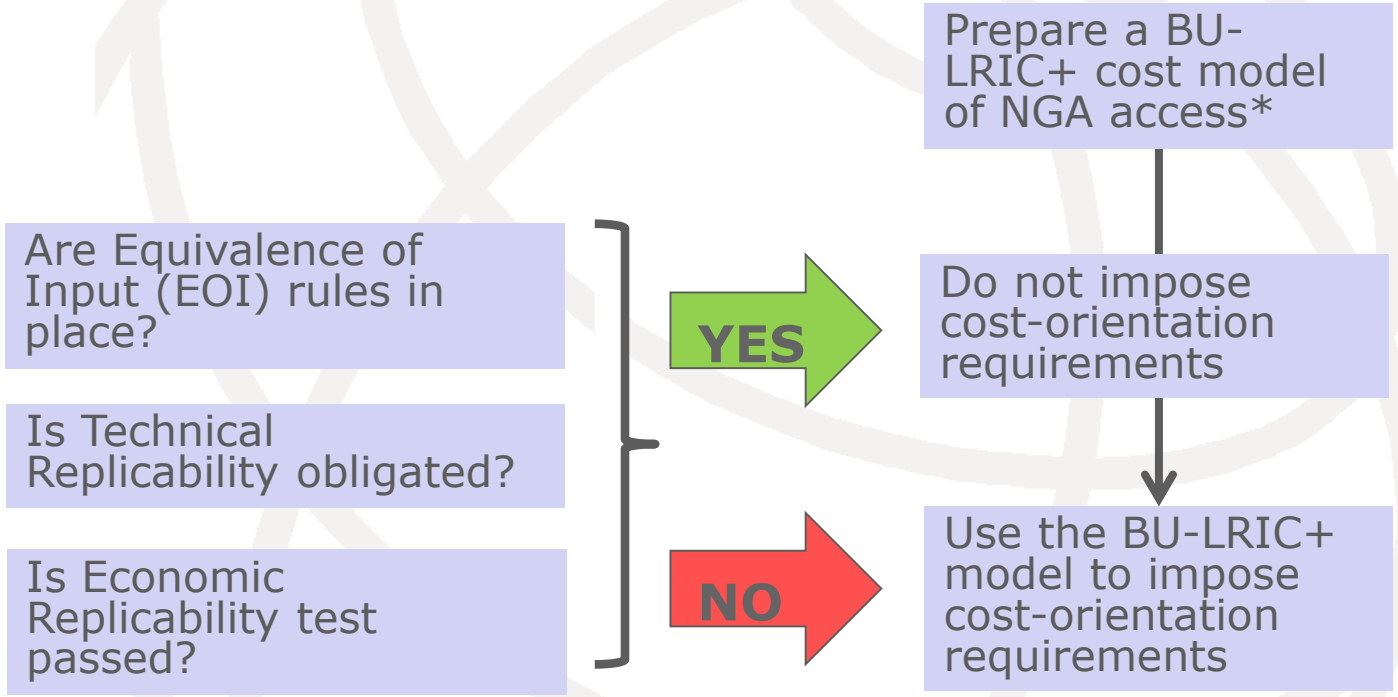
This is where cost-based regulation comes in. The EC has published Recommendation C(2013)5761 on costing methodologies for NGA.

The role of cost modelling in EU NGA regulation

The approach to NGA costing and pricing



* With some exceptions – see next slide

The relevant tests

- Equivalence of Input test
  - meaning that all relevant services and information supplied to the access seeker are the same, and provided on the same timescales, as to the downstream businesses of the SMP operator.
- The technical replicability test
  - the access seeker must be able to replicate the retail offers of the downstream businesses of the SMP operator, based on having timely availability of all wholesale inputs and access to equivalent Service Level Agreements (SLAs) and Key Performance Indicators (KPIs) including: service ordering, service provision, quality of service, fault repairs, network migration.

The relevant tests (continued)

- The economic replicability test
  - the margin between the retail price and the price of regulated wholesale inputs (being the most representative combination of active and passive elements in the time-frame of the analysis) covers the incremental downstream costs (of an operator equally efficient to the SMP operator) plus a reasonable percentage of common costs.

Exceptions to use of BU-LRIC model

- NRAs may continue with other costing approaches beyond beyond 31 December 2016 provided:
  - i) if not modelling an NGA network, it should reflect a gradual shift from a copper network to an NGA network;
  - ii) it should apply an asset valuation method that takes into account that certain civil infrastructure assets would not be replicated in the competitive process;
  - iii) the alternative methodology meets the objective of regulatory transparency and predictability as well as the need to ensure price stability;
  - iv) it should require only minimal modifications with respect to the costing methodology already in place in order to meet the first three criteria.

The BU-LRIC+ cost methodology

- The cost model should reflect a hypothetical, efficient operator capable of delivering DAE targets
- It should be based on existing and new infrastructure (not all new) to include re-usable legacy civil engineering assets
- Full replacement costs; but legacy assets valued by indexation method.
- Asset lifetimes to reflect actual physical lives (e.g. minimum 40 years for ducts)
- For services based on copper assume FTTC network is efficient and estimate cost difference of copper. EC expects €8-10 for copper LLU in 2012 prices.
- Models to be in place by end 2016 and maintained for minimum of 6 years.

EC comments on price regulation of NGA

- Austria (2015) – use of BU-LRIC for infrastructure access but retail-minus for wholesale broadband access *may result in excessively high wholesale prices*
- Czech Republic (2015) – all assets (whether replicable or not) valued at current costs *runs the risk of not properly reflecting the distinct economic characteristics of the relevant assets.*
- France (2016) – *Although current wholesale access prices are well within the price band foreseen, the Commission asks ARCEP to implement the new costing methodology within the planned time horizon and without further delay.*
- Lithuania (2016) – FAC/HCA approach: *the Commission considers … can compromise price stability in the long term*

Conclusion

- Cost-based regulation of evolving network infrastructure is fiendishly complicated
- Allow the market to establish interconnection arrangements as far as possible within a principle of any-to-any connectivity.
- Minimise NGN/NGA regulation to what is strictly justified and proportionate.
- Keep interconnection regulation as simple as possible to avoid unintended consequences.
- Regulate primarily on an ex-post basis.
- Retain ex-ante cost-based regulation only for non-replicable broadband infrastructure access.

Sources

- Digital Agenda for Europe: https://ec.europa.eu/digital-agenda/en
- EU State Aid rules: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF
- EU Recommendation on NGA Costing: http://ec.europa.eu/digital-agenda/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies