



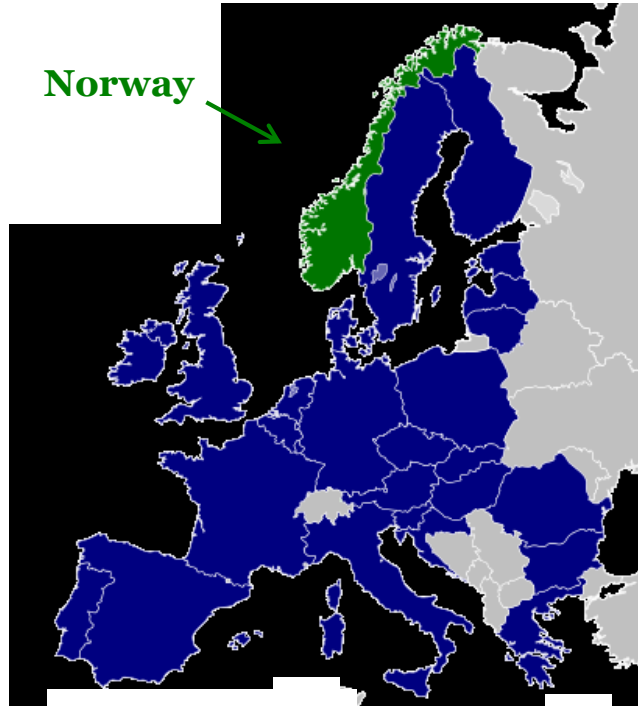
Net Neutrality in Europe

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Open Net Korea, Seoul, 13 February 2019

My background and brief bio



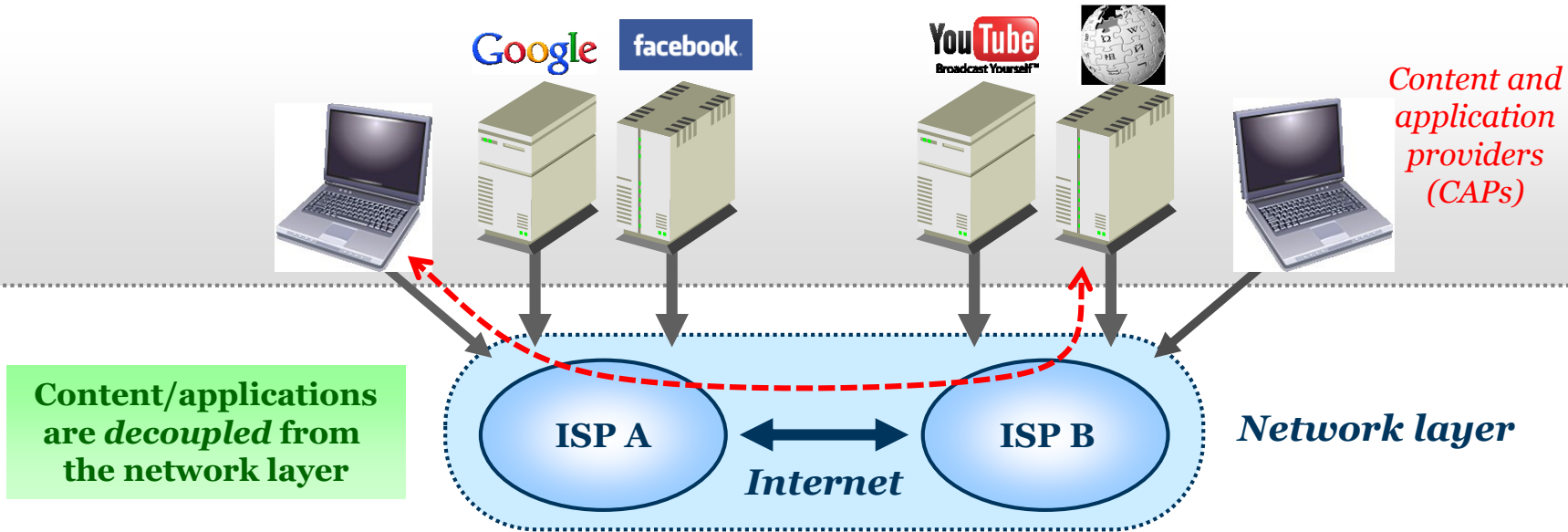
- Norway – in the north of Europe
- Nkom – Norwegian regulator
- Net neutrality rules issued 2009
- Senior adviser net neutrality

- European economic area (EEA)
- BEREC – European regulators
- Net Neutrality Expert Working Group
- Chairing NN EWG 2010-2018

Content of presentation

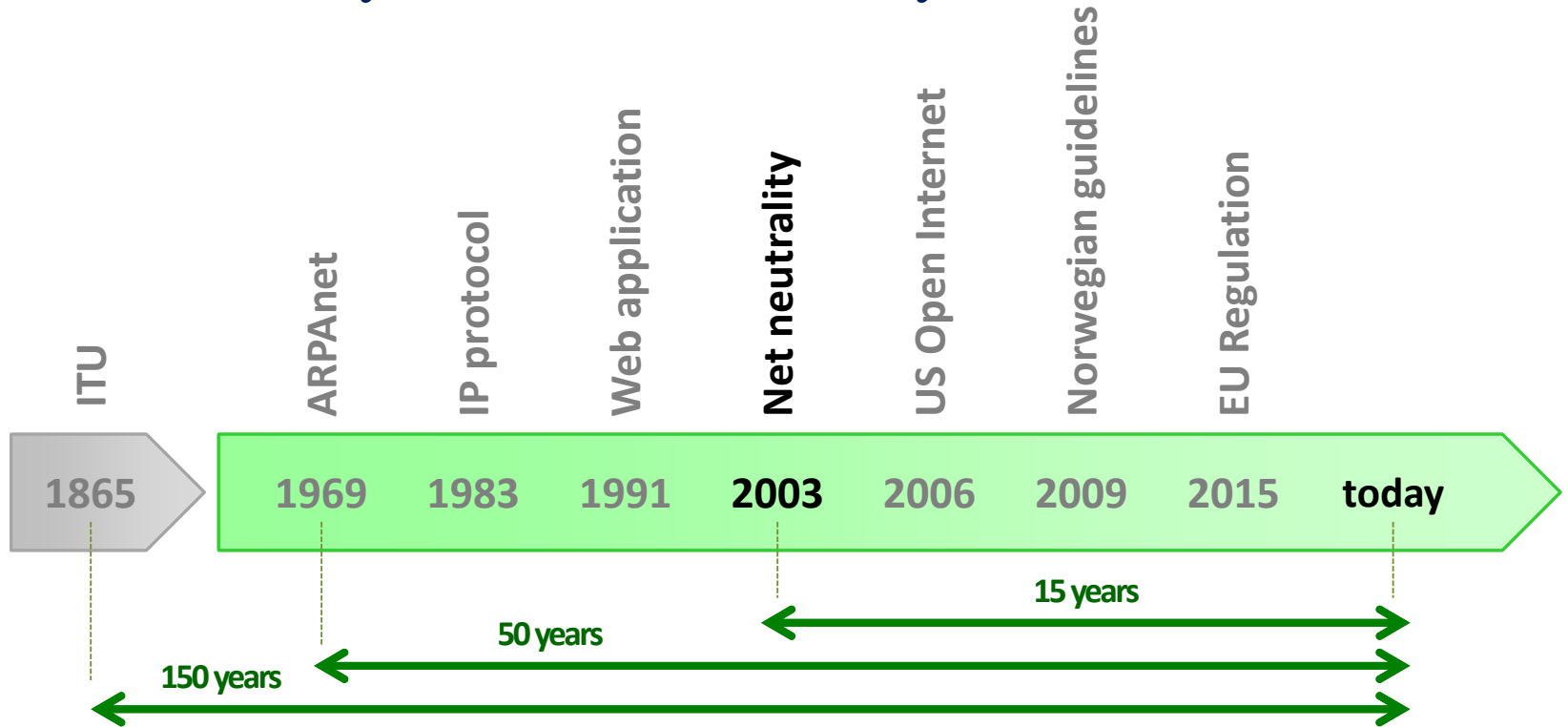
1. Introduction to European net neutrality
2. Traffic management (*also covering 5G discussion*)
3. Specialised services (*also covering 5G discussion*)
4. IP interconnection (*also covering charging*)
5. Zero-rating (*challenging issue in Europe*)

What is net neutrality?

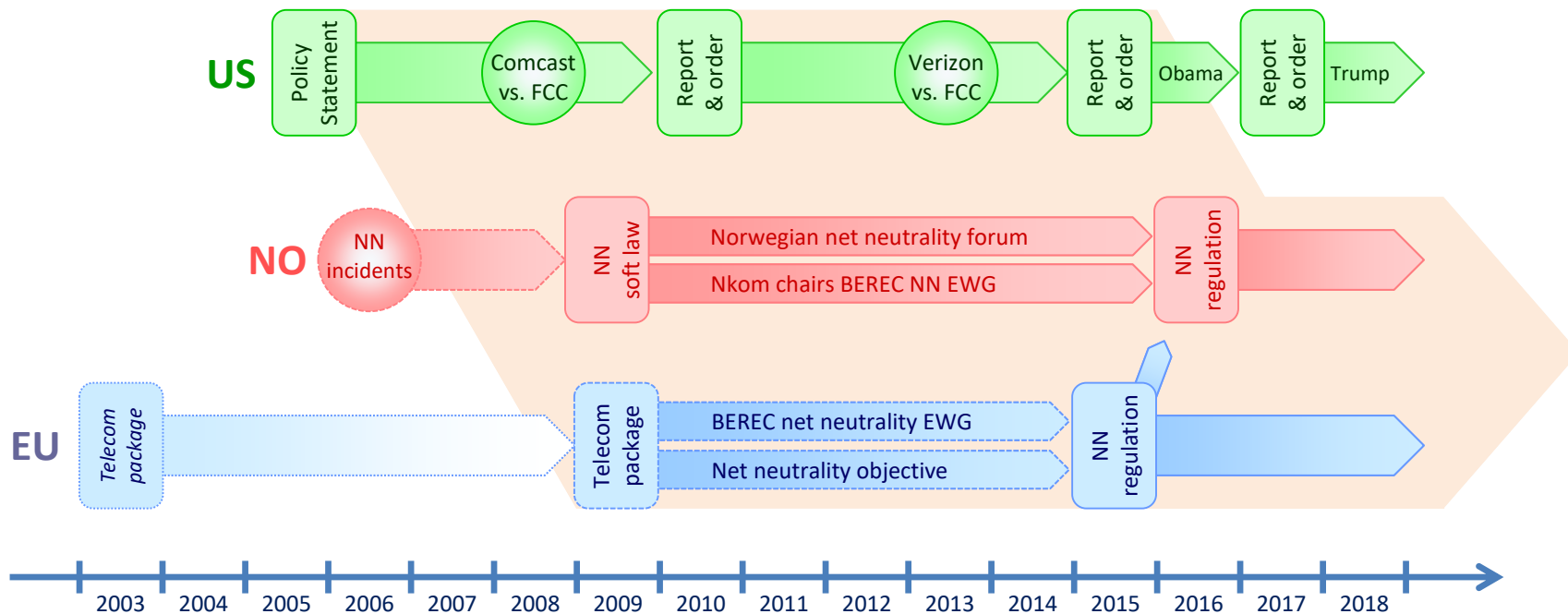


Net neutrality means application-agnostic treatment of traffic in the network

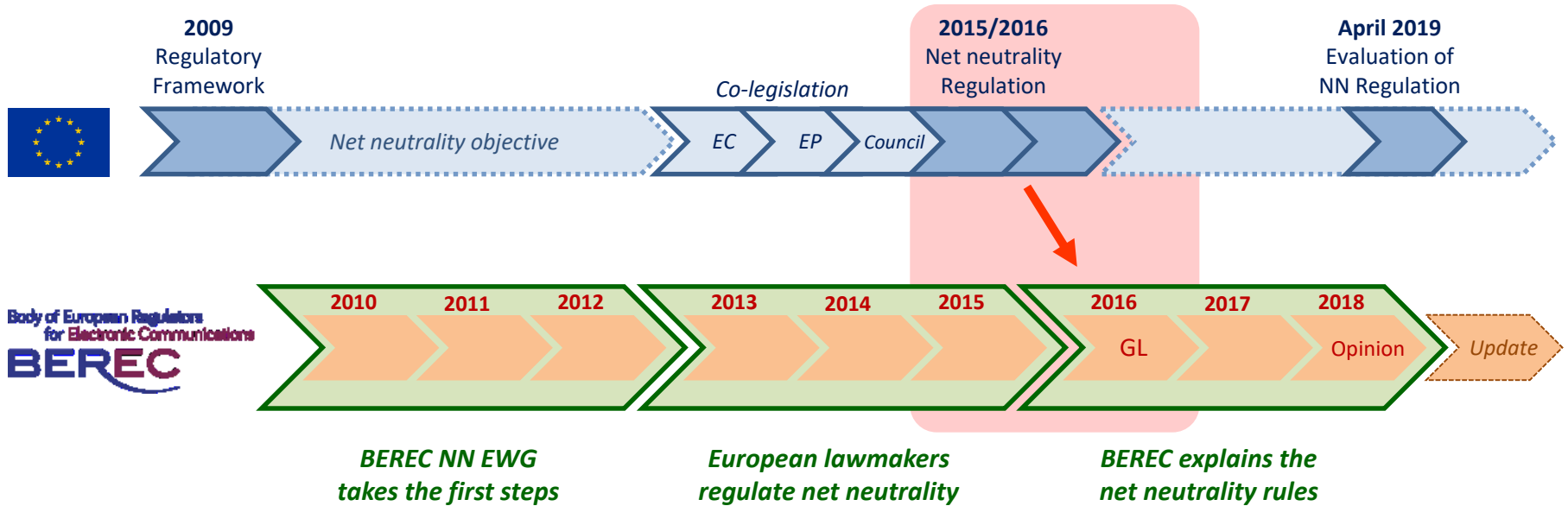
Net neutrality and Internet history



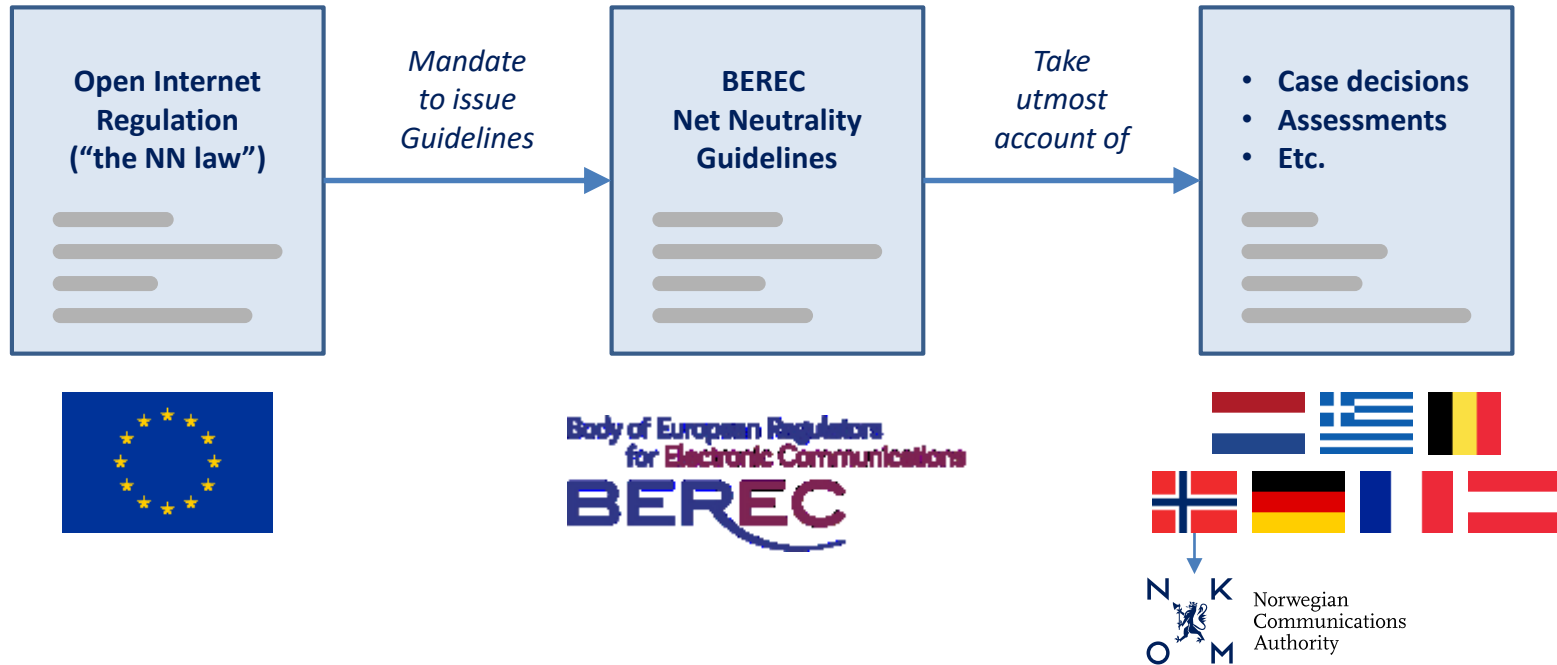
Timeline for net neutrality regulation



BEREC Net Neutrality Expert Working Group



Regulation – Guidelines – National enforcement



Section 2. Traffic management

- European net neutrality
- **Traffic management** →
 - *Congestion management*
 - *Quality of Service classes*
 - *Reasonable traffic management*
 - *Exceptional traffic management*
- Specialised services
- IP interconnection
- Zero-rating

*5G vs. NN/
traffic management*

Is 5G challenging NN regarding traffic management?

No, because of...

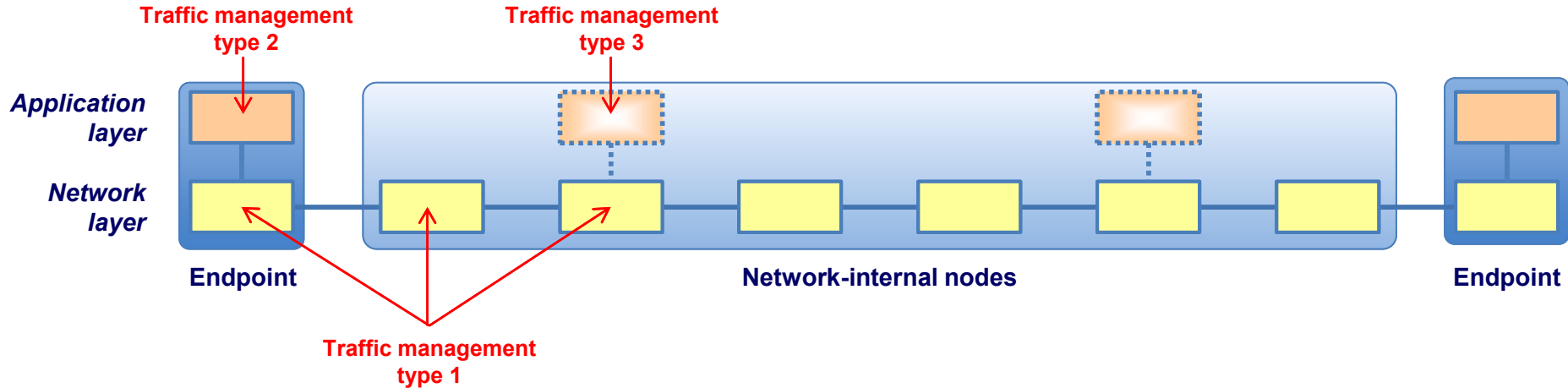
- *Internet traffic management* which is based on built-in congestion management
- *Reasonable traffic management^(*)* which is allowed in networks such as 5G
- *Quality of service traffic classes^(**)* which are allowed in networks such as 5G
- *Exceptional traffic management^(*)* which is allowed in networks such as 5G

...to be elaborated on the following slides

() Reasonable and exceptional traffic management is terminology in the European NN rules*

*(**) Quality of service traffic classes refers to application-agnostic traffic management*

Internet traffic management model



- Traffic management type 1 – executed *at* the network layer
- Traffic management type 2 – executed *above* the network layer *in the endpoints*
- Traffic management type 3 – executed *above* the network layer *in network-internal nodes*

Congestion control / congestion management

- Major difference between traditional telecoms and Internet communications
 - *Note the end-to-end principle regarding the design of the Internet*
- The scope of the Regulation: Electronic communication services
- Two types of congestion handling: 1) endpoint-based and 2) network-internal
- 1) Endpoint-based congestion control – this is how traffic is regulated on the Internet
 - *Endpoints back off when facing congestion in the network (e.g. TCP)*
 - *Currently significant standardization effort in this area in IETF*
- 2) Also, any application-agnostic network-internal congestion management is ok!
 - *Such measures are often assisting the endpoint-based mechanisms*

Reasonable traffic management – Article 3(3)

- Definition of “*reasonable traffic management*” different from other jurisdictions!
- Reasonable TM shall be transparent, non-discriminatory and proportionate
- Shall be based on technical QoS requirements of specific “*categories of traffic*”
 - Applications with similar QoS requirements must be treated equally
- Such measures shall not monitor the specific content
- Specific content = transport layer protocol payload (BEREC NN Guidelines)
 - I.e. IP header and transport layer protocol header (e.g. TCP) may be monitored
- Such traffic management is not commonly implemented, as far as we know

Quality of Service classes – Article 3(2)

- Different rationale than Article 3(3), but might use the same technical measures
- Subscriber agreements on characteristics *such as* price, data volumes or speed
 - Could also include other QoS parameters, e.g. latency, jitter and packet loss
- I.e. different subscriptions with different non-discriminatory QoS classes
- Important : These QoS classes shall be application-agnostic
 - I.e. any application may populate any QoS class (user-controlled)
- Subscribers may buy more than one subscription with different QoS classes
 - Subscribers may use different QoS classes for different applications
- TM based on 3(2) is more common than TM based on 3(3), as far as we know

Exceptional traffic management – Art. 3(3) 3rd subpara

- Three specific exceptions going beyond reasonable TM
 - a) Legislative measures – compliance with European law, including court orders
 - b) Network integrity – DoS attacks, hacking, malicious software, viruses, etc.
 - c) Congestion management – see further elaboration below
- Exceptions are subject to strict interpretation (Recital 11)
- Regarding the congestion management exception,
 - 1st defence against network congestion is *endpoint-based* congestion control
 - 2nd defence is network-internal measures *assisting endpoints* (possibly AQM)
 - 3rd defence is *application-agnostic* congestion management (throttle all traffic equally)
 - 4th defence is the *exception* allowing application-specific congestion management

Section 3. Specialised services

- European net neutrality
- Traffic management
- **Specialised services**
- IP interconnection
- Zero-rating



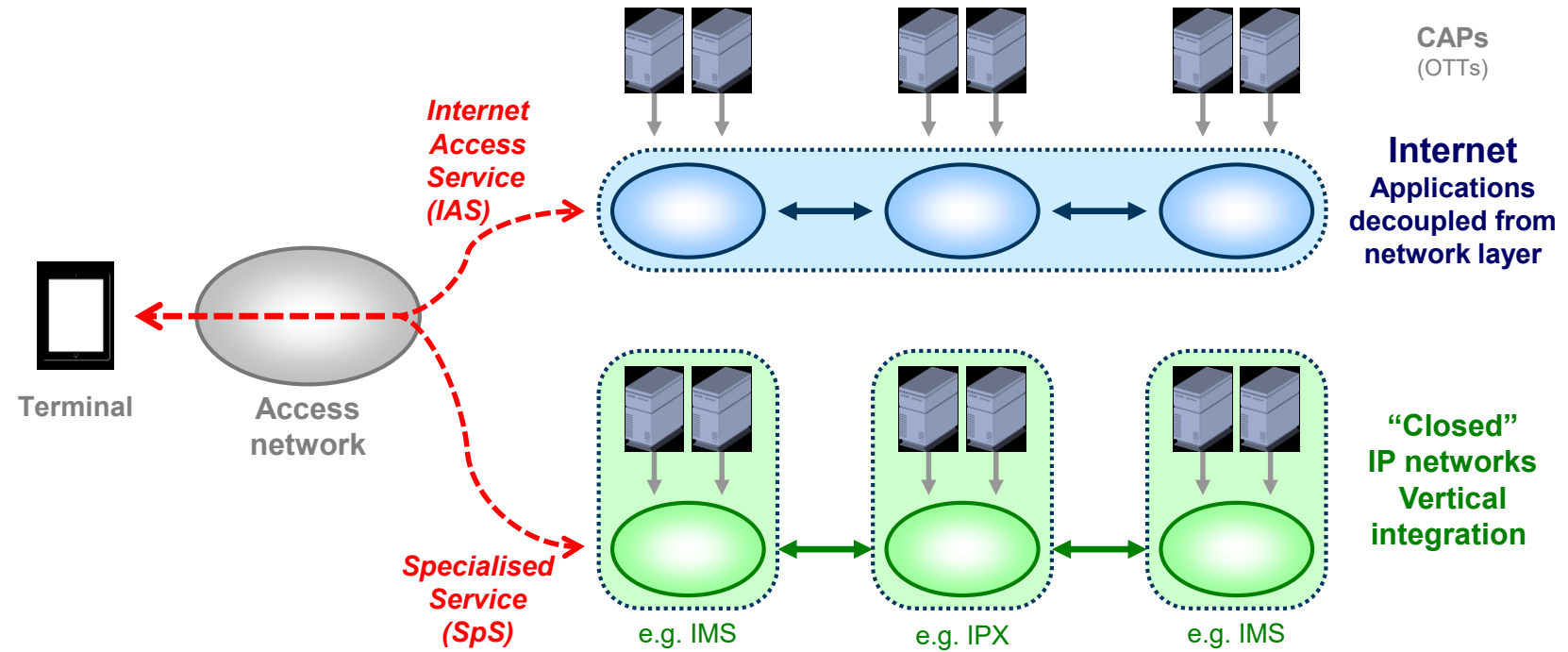
- *The NN service model*
- *Principal discussion*
- *The necessity requirement*
- *The capacity requirement*

*5G vs. NN/
specialised services*

Principal discussion of specialised services

- One should not regulate absolutely everything, of course 😊
- Therefore “specialised services” are introduced as a regulatory concept
- Innovation is a major argument for net neutrality, as we know
- Some argues about innovation with specialised services too
- Compare with “innovation *without permission*” on the Internet
- Distinguish between innovation *at the edge* and *in the core*
- Should also ensure that the latter is not restricted by NN

The Net Neutrality service model



Is 5G challenging NN regarding specialised services?

No, on the contrary,
5G network slicing is actually contributing to
compliance with the NN rules for specialised services!

- *The NN rules clearly state that for applications with requirements for a specific level of quality, specialised services are allowed.*
- *The NN rules require the provision of specialised services not to be to the detriment of the general quality of IAS, and using separate network slices to provide IAS and SpS should be a perfect match 😊*

...to be elaborated on the following slides

The necessity requirement – Article 3(5) 1st subpara

- **Specialised services (SpS) =**
services other than IAS which are optimised for specific applications, where the optimisation is necessary in order to meet requirements for a specific level of quality
- **Example SpS**
Typical examples of specialised services provided to end-users are VoLTE and linear broadcasting IPTV services with specific QoS requirements, subject to them meeting the requirements of the Regulation, in particular Article 3(5) first subparagraph.
- SpS shall not be usable or offered as a replacement for IAS (prevent circumvention)
- However, VPNs could be a SpS, if application-agnostic TM is used internally

The capacity requirement – Article 3(5) 2nd subpara

- **ISPs may offer SpS only if** network capacity is sufficient to provide them in addition to any IAS provided
 - In simple words, SpS should not be provided at the expense of IAS
- SpS will typically have some **built-in “protection mechanism”** based on the QoS architecture operated by the ISP – this is the nature of SpS
 - Note that the Regulation safeguards IAS (not any SpS provided in parallel)
- SpS shall not be to the detriment of the availability or general quality of IAS
 - Challenge: How should “the general quality of IAS” be assessed?
- 5G network slicing could actually contribute to compliance with the NN rules!

Discussion regarding “the general quality of IAS”

Article 5(1) – shortened/simplified wording

- NRAs shall promote the continued availability of non-discriminatory IAS at *levels of quality that reflect advances in technology.*

Recital 17 – shortened/simplified wording

- In order to avoid the provision of SpS having a negative impact on the availability or *general quality of IAS for end-users*, sufficient capacity needs to be ensured. ISPs should therefore, offer SpS only if the network capacity is sufficient for their provision in addition to any IAS provided.
- NRAs should assess the impact on the availability and general quality of IAS by analysing, inter alia, QoS parameters (such as latency, jitter, packet loss) etc.


BEREC Opinion on the Regulation (2018)

- BEREC will, as a mid-term goal, seek to leverage on the *NN Measurement tool* to further develop the measurement methodology regarding measuring of the general quality of IAS.

5G – and retrospect to 3G and 4G

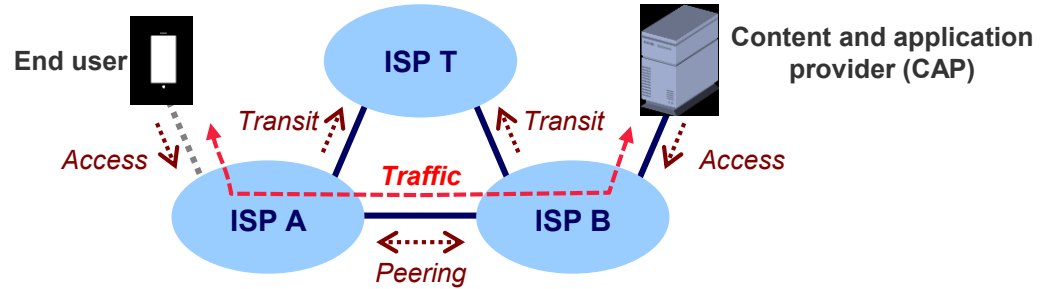
- **QoS architecture in 3G and 4G:** PDP Context / EPS Bearer params
 - How many years did it take to get differentiated QoS running?
- **Multimedia in 3G and 4G:** IMS/VoLTE/RCS (vs. Skype, Viber, WhatsApp)
 - How many years did it take to get VoLTE running on 4G?
- **Where are all the specialised services?** (Compare with IAS growth)
- There has never been any regulatory prohibition of specialised services!
- So what is the problem – the Regulation or simply unnecessary concern?
- Isn't SpS reverse engineering traditional telecoms into IP networks?
- 5G network slicing is a new way of providing virtual networks

Section 4. IP interconnection

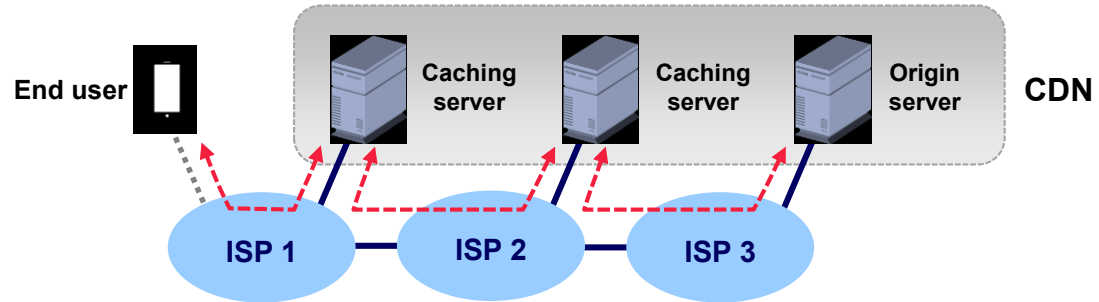
- European net neutrality
- Traffic management
- Specialised services
- **IP interconnection** 
 - *Interconnection and CDNs*
 - *Principal discussion*
 - *Internet interconnection*
 - *Internet charging*
- Zero-rating

Internet interconnection and CDNs

«Bill & keep»
B&K



CDN
Content Delivery Network



Principal discussion of charging on the Internet

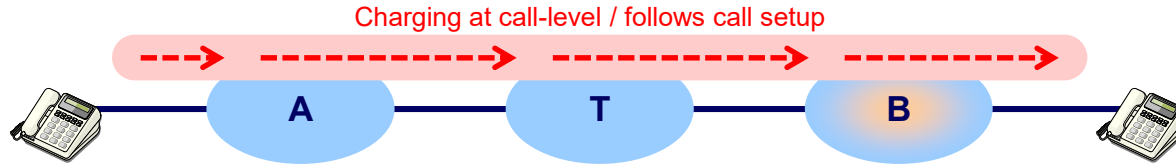
- The relationship between ISPs and CAPs is a win-win relationship
 - Without Internet access, there is no access to content
 - Without content, there is no interest in Internet access
- Growing Internet traffic sometimes described as a problem
 - But the growth is actually an indication of the success of the Internet
 - And it is a business opportunity to ISPs to sell more bandwidth
- CAPs and end-users already contribute to paying for Internet connectivity
 - No evidence that ISPs' costs are not fully covered in the Internet value chain already (BEREC)
 - The current model has enabled a high level of innovation and growth in Internet connectivity
- This approach has been successful for many years in the evolution of the Internet

Internet interconnection (European perspective)

- BEREC report on IP interconnection in the context of net neutrality (2017)
- Internet interconnection has managed to adapt without regulatory intervention
- Some observations from the BEREC IP-IC report
 - Internet *traffic volumes* continue to increase, mainly due to video streaming
 - Prices for *transit and CDN services* are still declining due to competitive market
 - CDNs are contributing to limitation of the need for interconnection capacity
 - Economic relevance of CDNs continues to grow due to increased traffic share
 - *Paid peering* seems to have been growing in importance during the last years
 - *Interconnection disputes* are typically resolved without regulatory intervention

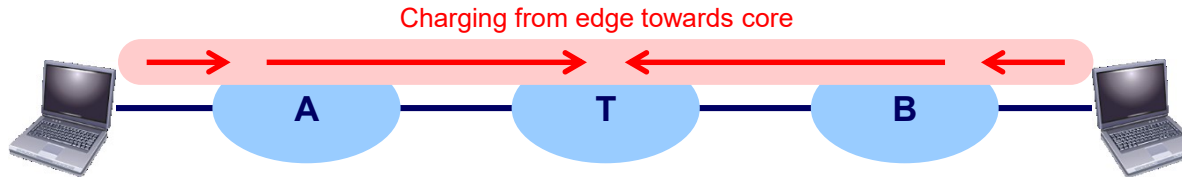
Termination monopoly discussion

Telephony
 Calling Party
 Network Pays



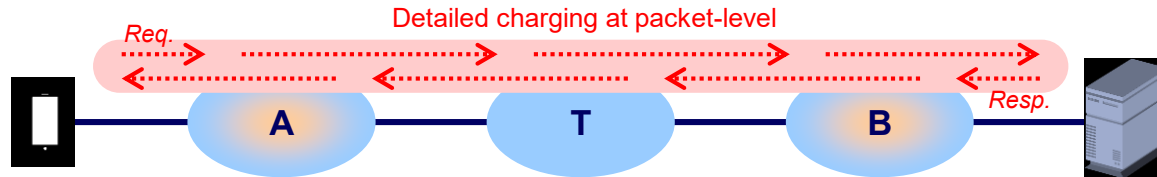
Termination monopoly => regulation

Internet
 «Bill & keep»



Eliminates termination monopoly

Internet
 Sending Party
 Network Pays




Reintroduce termination monopoly?

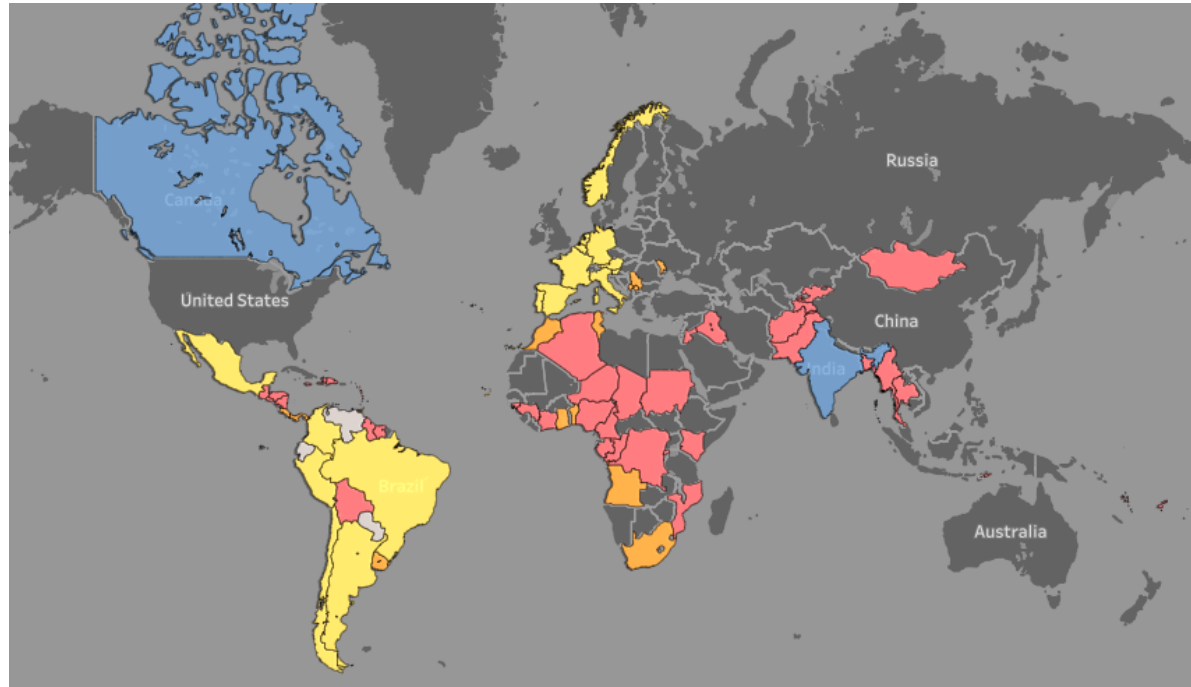
Sending Party Network Pays (SPNP)

- Traditionally internet was characterized by bill & keep and approximate accounting
- SPNP is an (alternative) Internet interconnection charging mechanism
 - Must not be confused with Calling Party Network Pays (CPNP) for telephony
- With the traditional Internet charging model, regulatory intervention is limited
- With bill & keep, ISPs seek to recover their cost at the retail level from the end-users
- Request for traffic stems from the ISP's own customers (already paying), not from CAPs
- Ultimately, it is the success of the CAPs which drives the demand for access bandwidth
- If B&K replaced with SPNP, regulatory intervention may be needed under EU rules
- Ref. BEREC statement on the SPNP proposal from ETNO on WCIT-12
 - ITU World Conference on International Telecommunications 2012 (previous 1988)
 - WCIT is a treaty-level meeting on International Telecommunications Regulation (ITR)

Section 5. Zero-rating

- European net neutrality
- Traffic management
- Specialised services
- IP interconnection
- **Zero-rating** 
 - *Global overview*
 - *Principal discussion*
 - *European ZR rules*
 - *European ZR cases*

Global view – Net neutrality and zero-rating



Zero Rating Map www.zerorating.info

The Zero Rating Map is an official outcome of the UN IGF Dynamic Coalition on Network Neutrality, coordinated by Professor Luca Belli.

- Net Neutrality and Zero Rating are regulated. ZR is not tolerated.
- Net Neutrality is regulated, ZR is tolerated and there is Data protection.
- Net Neutrality and Zero Rating are not regulated but there is Data protection. Zero rating is available.
- Net Neutrality, Zero Rating and Data protection are not regulated. Zero rating is available.
- Special cases

Principal discussion of zero-rating

- Regarding net neutrality: Zero-rating is an *application-specific* measure
- Operators shifting focus from technical to economic discrimination?
 - There are currently zero-rating products in almost all European countries
- Influences end-users freedom of choice (pre-selected applications)
- Increases entry barriers for Content and Application Providers (CAPs)
- The latter is of course a particular concern for non-US CAPs
- Current models of ZR regulation: Canada and India (and California)

Overview of European zero-rating rules

- “**Commercial practices**” – Article 3(2) of the Regulation
 - Typical example: zero-rating
- **Zero-rating** is currently the most challenging question
 - Only general norms, compared with the specific norms for technical practices
- ZR neither explicitly allowed nor explicitly prohibited in the EU
- Article 3(1): End-user right to access and distribute content of their choice
- Article 3(2): Commercial practices shall not limit the exercise of end-users’ rights
- Note, many offers combine technical and commercial practices
 - Typical example: ZR + data cap, where non-ZR apps are blocked after cap is reached

Zero-rating case assessment

- “Pure” ZR cases (assuming TM in line with the Regulation)
- Overall assessment based on several criteria (BEREC NN Guidelines para 46)
 1. Market position of the ISPs
 2. Effects on CAPs / market position of the CAPs
 3. Effects on end-users
 4. The scale of the commercial practice
 5. Eventually, circumvention of the goals of the Regulation
- Some considerations related to the criteria
 - Effects on end-users: Relative size of the data cap (smaller data caps)
 - Effects on CAPs: Exclusiveness of zero-rating (category of applications)

Zero-rating case examples

- Norwegian ZR cases 2017, Telenor and Telia “Music Freedom”
- Nkom expressed concerns
 1. the significant market position of the two ISPs in the national market
 2. the CAPs included are relatively limited, and cover only larger well-known CAPs
 3. the end-users’ choice is limited, relatively small data caps in proportion to the price
 4. the scale of zero-rating practices is increasing in the national market
- Nkom overall assessment
 - zero-rating practices still has a limited scale in the national market
 - at the time of assessment, no basis for issuing an order to take corrective action
 - follow up on zero-rating going forward, initiate corrective measures if necessary
 - if the zero-rating schemes in the market are not functioning as anticipated, especially if the scale increases significantly, Nkom is likely to have to reconsider the analysis

Further reading

- EU, 2015, [Regulation 2015/2120 of the European Parliament and of the Council laying down measures concerning open internet access](#)
- BEREC, 2016, [Guidelines on the Implementation by National Regulators of European Net Neutrality Rules](#)
- Frode Sorensen, 2016, [European Net Neutrality at the beginning of a new era \(Annual Report of the UN IGF Dynamic Coalition on Net Neutrality\)](#)
- BEREC, 2018, [Opinion for the evaluation of the application of Regulation 2015/2120](#)
- BEREC, 2017, [Report on IP interconnection practices in the context of NN](#)
- Nkom, 2017, [Assessment of the zero-rating offer Telia «Music Freedom»](#)
- BEREC, 2012, [Statement on ITR 2012 \(covering among else SPNP\)](#)