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BEREC calls for input for further guidance on 5G network slicing

Submitted by: The Telecom Industry Association – Denmark (TI)

The Telecommunications Industry Association in Denmark (TI) thanks BEREC for the opportunity to submit input for additional guidance on the compatibility of 5G network slicing-based services with the OIR, published on 18th December 2025.

TI is a Danish industry organization representing the vast majority of Danish private entities related to and within the Danish telco sector. Currently, TI has 28 members ranging from MNOs, MVNOs, fibre, cable and copper opera tors, tower cos to internet and TV-service providers.

Background

BEREC observes that in the public debate some stakeholders call for greater certainty concerning the compatibility of innovative services, in particular those based on 5G network slicing, with Regulation (EU) 2015/2120 – the **Open Internet Regulation** (OIR). Similarly, the European Commission, in its latest **Report on the implementation of the open internet access provisions of Regulation (EU) 2015/2120**, emphasised that greater legal certainty in this area would be beneficial to both innovators and consumers. This view was repeated in its **Call for Evidence** on its planned Digital Networks Act legislative initiative.

TI believes that 5G slicing allows operators to move from "best effort connectivity" to deterministic, secure, monetisable services across very different use cases at scale.

We hope the guidance and regulation will be clear, but not too detailed to ensure the industry can implement 5G slicing in practice.

Contribution from The Telecommunications Industry in Denmark

1. Network Slicing Outlook

1. To what extent have you already deployed network slicing and are you considering deploying new slices? Please describe the slicing implementation and associated use case(s).

The operators in Denmark have not yet introduced products using network slicing primarily because it has taken time to implement 5G SA in existing networks and especially because the framework contained in the OIR is narrow and to some extent unclear.

The narrow and somewhat unclear OIR framework risk limiting providers ability to offer new 5G-enabled services that are based on objective and neutral technical parameters. We therefore call for a regulatory framework which enables innovation, and to drive innovation the market must be allowed to offer premium quality products based on transparent technical characteristics, and the rules for specialized services must be clear. Without such adjustments, OIR risks slowing 5G innovation and reducing service availability for citizens and businesses.

2. In your view, how will network slicing, as a concept and technology, develop in the upcoming years? Please describe the use cases that you believe to be prominent and would need to be taken into account in this exercise.

The management in the core, standalone part of the 5G, will be able to allocate slices for different use of services or connections. This means that the total capacity can be effectively used for different slices for different purposes, instead of all capacity being shared on a best effort basis. Network slicing is expected to develop gradually over the coming years rather than through rapid, large-scale deployment. While the technology is mature from a technical standpoint within 5G standalone networks, its commercial uptake will largely depend on the existence of clear regulatory frameworks, predictable investment conditions, and sufficient demand from customers willing to pay for differentiated network performance.

In the near to medium term, network slicing is likely to be adopted primarily in niche and enterprise-driven use cases rather than in mass-market consumer services. Prominent use cases include providing a slice for employees in enterprises, industrial applications such as smart manufacturing and automation where guaranteed latency, reliability and bandwidth are essential, as well as mission-critical services for public safety and emergency communications. In addition, slicing may play a role in enabling advanced services for large events or specific geographical areas where temporary, enhanced network performance is required.

3. How do you see the role of CAMARA network APIs or other similar concepts to manage network slicing in the upcoming years?

CAMARA is an API specification of the control plane for" Network as Code" that can be used to adjust or configure the network to a specific use case. From a customer perspective" Network as Code" in an intriguing concept, that requires OSS investments at the MNO (systems and processes). Slicing can, from a pure functional perspective, be delivered by the MNO using more manual configuration. While current efforts focus on applications like KYC, fraud prevention, device location, number verification, SIM swap detection and carrier billing, advanced features such as quality on demand and network slicing services will likely follow as 5G Standalone networks mature.

Further CAMARA network APIs and similar concepts may become relevant in the future, as they could enable specific users or applications to request on-demand Quality of Service (QoS) based on real time needs such as latency or throughput. This would allow networks to dynamically adjust performance when, for example, an application initiates a time-critical task, or a device enters a high demand scenario. However, the technical architecture required to expose these network capabilities—often referred to as the Exposure Function—is still immature and highly complex. It relies on industrywide standardization, secure interfaces, and significant operational integration. Because of this, such capabilities are not expected to play a major practical role before 2028.

2. General Regulatory Questions
Given the OIR and BEREC's guidelines on the implementation of the OIR:

1. As it concerns the conception, development, marketing, implementation and operation of services relying on 5G network slicing, what are, if any, the specific issues and/or challenges (e.g. ambiguity, gaps) with the existing guidance provided by BEREC? If applicable, please describe the issues that will and/or have prevented, impeded or otherwise challenged the implementation of such services.

We find that there are two regulatory issues that challenge the development, marketing and implementation of innovative 5G services:

1. Premium quality products
2. Open Internet Access (OIA) quality

Regarding nr. 1: The regulatory uncertainty surrounding premium-quality products
The current EU OIR framework includes a special services exception intended for services that require quality levels beyond those available through best-effort internet access. We consider that this exception can also accommodate commercially offered premium-quality products that provide enhanced characteristics such as low latency,

greater stability or other performance-related features demanded by consumers and businesses. A clear regulatory recognition of this would reflect the evolving needs of the market and support the introduction of high-performance or mission-critical services that rely on guaranteed quality levels.

A clearly formulated regulatory acceptance of premium tiers within the interpretation of the special services exception would boost the development of new applications, including real-time collaboration tools and a wide array of business-critical solutions. At the same time, it would allow customers to choose products that match their needs and budgets, rather than being placed in a one-size-fits-all model where users with modest requirements indirectly support the most advanced applications. In this context, it should be noted that Ofcom, in its updated net neutrality review from October 2023, creates room for premium quality offers and broader use of flexible, technically justified traffic management.

Regarding nr. 2: The regulation of OIA quality
The current framework creates uncertainty because specialized services may only be offered if OIA quality is "not materially affected," yet this obligation has no operational definition. In mobile networks with constantly changing conditions, it is nearly impossible for operators to demonstrate compliance. This ambiguity introduces regulatory risk without delivering meaningful consumer protection.

Competitive market conditions already ensure that operators maintain high-quality internet access, and no provider has any incentive to degrade its IAS offering. An undefined requirement therefore risks inhibiting innovation rather than safeguarding users.

BEREC should provide clear and practical guidance that supports a predictable framework for all types of specialized services, including premium-quality products. The priority should be feasible criteria for demonstrating compliance—especially how "no detriment" and "sufficient capacity" are assessed in dynamic mobile environments. Such clarity is essential to avoid arbitrary reclassification and to enable the development of high-performance, continuity-critical and premium-quality services within a stable regulatory setting.

2. Assuming the current rules do not change, what form of additional clarity or guidance could BEREC usefully provide with a view to ensuring that the OIR continues to be a driver of innovation in this area, i.e., by offering sufficient regulatory predictability to business cases?

The industry acknowledges that BEREC cannot anticipate all future services or market developments. More frequent updates of the guidance would therefore be beneficial, as this would allow BEREC to progressively include examples of emerging services.

See also comment further below to point 3 Specific Regulatory Questions regarding Article 3(5) OIR.

3. Regarding the 5G slicing applications/use cases/services mentioned below, what is, in your view, the likelihood that they will not give rise to OIR conformity concerns? Please detail (a) your reasoning and (b) whether more guidance is needed.

- ***Reliability enhancements and priority for public emergency services***
- ***QoS enhancements (reliability, latency, jitter) for telemedicine applications like remote surgery***
- ***Capacity reservation and QoS guarantees for virtual private networks***
- ***QoS enhancements for IPTV Broadcasting***
- ***Capacity/QoS guarantees for tiered quality services for IAS (e.g. IAS with different QoS per subscription)***

The industry finds that the services mentioned under point 3 are all market relevant. Public emergency services are already available under specific legislation. Considering the above-mentioned points 1 and 2, there is a clear need for more explicit regulatory guidance on how the special services exception and the OIA quality obligations apply to a range of emerging high-performance services. This includes services where enhanced reliability and prioritization are essential, such as connectivity for public emergency services, as well as advanced telemedicine solutions like remote surgery, which depend on tightly controlled latency, jitter and availability. Likewise, capacity reservation and QoS guarantees for virtual private networks require predictable and stable regulatory treatment to ensure that business-critical applications can operate without the risk of retrospective reclassification. Finally, tiered quality offerings within IAS—where consumers can select subscriptions with differentiated QoS levels—represent an important market innovation that warrants clear and operational guidance. Across these service types, regulatory clarity is essential to promote innovation, safeguard investment incentives and ensure that customers and society can benefit from reliable, high-performance connectivity products.

4. Notwithstanding Question 3 (of section 2), are there any 5G network slicing-based application(s)/use case(s)/service(s) that, in your view, are (or are in all likelihood) in line with the OIR? Please detail your reasoning.

As a main rule we see all 5G slicing based products and services including premium quality products to be in line with the OIR. But as stated above, there is a need for a significant expansion of guidance to address regulatory uncertainty. If regulation is unclear, innovation is inhibited and the development that could be driven by the demand for new solutions is not achieved.

3. Specific Regulatory Questions regarding Article 3 (5) OIR

Given the OIR and BEREC's guidelines on the implementation of the OIR, in particular Article 3 (5):

1. Have you encountered any examples of regulatory uncertainty that have prevented, impeded or otherwise challenged your implementation of 5G network slicing-based public specialised services?

The current regulatory guidance does not provide sufficiently clear criteria for determining when optimization within a slice is "objectively necessary" and cannot be delivered over a best-effort IAS, nor does it clarify under which circumstances such optimization will not be to the detriment of the availability or general quality of IAS for other end-users.

BEREC's existing guidance is difficult to apply to 5G technology where traffic load is inherently dynamic and time-varying. As a result, operators risk that services designed as specialized services may later be reclassified as IAS.

Even in cases where a distinct and objectively identifiable QoS-requirement exists, it remains difficult to assess how such services may lawfully be managed during periods of high network load.

For certain services, the key QoS parameter is not latency, jitter or throughput, but rather the requirement that the service must remain uninterrupted, telemedicine being a prime example, where even brief service discontinuity may undermine the functionality or safety of the application.

Under **Article 3(3)(c)** of the Net Neutrality Act, congestion-related traffic management is permissible only where measures are strictly necessary, limited in time and applied equally to technically equivalent traffic categories. However, the current guidelines do not explain whether services which defining technical requirement is service continuity may be treated as a distinct traffic category for the purpose of congestion management, nor how operators should balance uninterrupted-service requirements with the strict equal-treatment obligation. As a result, operators face uncertainty as to whether continuity-preserving measures during exceptional or temporary congestion would be considered technically justified or instead viewed as prohibited commercial differentiation.

At the same time, **Article 3(5**) offers a possible regulatory pathway if uninterrupted operation is deemed a requirement that cannot be reliably ensured over best-effort IAS. Yet the guidelines provide no operational criteria for determining when continuity-critical services - such as telemedicine - can lawfully be considered specialised services, nor how the "no detriment" and "sufficient capacity" safeguards should be applied in highly dynamic environments where network load fluctuates constantly.

Consequently, even where the QoS-need is indisputable, operators lack clarity on whether the service should be structured as a specialised service under Article 3(5) or as an IAS subject to the congestion rules in Article 3(3)(c), and how uninterrupted-service requirements can be accommodated within either framework.

Clearer criteria are needed to ensure that operators can protect essential services without risking non-compliance, and to unlock the full public-value potential of 5G network slicing.

Critical infrastructure services:
As a sub-category of the above, the challenges also arise when operators are required to support critical infrastructure services.
There is significant regulatory uncertainty regarding how operators should treat critical infrastructure services - such as emergency communications, public safety systems, NIS2-classified entities, and health-critical applications - under OIR.

While these services often have objectively higher requirements for reliability, continuity and resilience than ordinary internet access, the current guidelines do not provide clear direction on how such requirements should interact with the strict non-discrimination obligations in Article 3(3) or the "no-detriment" condition for specialized services under Article 3(5). As a result, operators lack clarity on whether critical infrastructure services may justifiably receive enhanced or protected quality – especially during high network load - or whether such measures would constitute unlawful preferential treatment within an IAS.

2. If so, what were the specific problem(s) and which specific requirement(s), relating to Article 3 (5) OIR, therefore need(s) further guidance? Please describe concrete improvements that would be useful to overcome the problem(s) you encountered.

Please refer to the arguments presented above

3. Why is optimisation necessary in order to meet specific QoS requirements of these content, applications or services and are there any difficulties in interpreting what "necessary" means?

In any network capacity comes at a cost and therefore is limited. ISP's and MNO's work diligently with capacity forecasting and planning to ensure that committed SLA's can be met on a daily basis.

As all services are based on radio access and shared resources with finite capacity, every component in the delivery chain must be optimized to ensure both maximum network utilization and the delivery of committed Quality of Service (QoS). This involves continuous monitoring and dynamic resource allocation, as well as the implementation of advanced traffic management techniques to balance user demands

with available capacity. Without such optimization, it becomes challenging to guarantee the required performance levels for specialized services while maintaining overall network efficiency.

4. How would you address the possibility that advances in IAS technological capacities render the provision of a given specialized service no longer objectively necessary?

At present, 5G networks can deliver very high speeds and low latency, and applications are increasingly optimized through advanced codecs and buffering techniques. As a result, services such as music and video streaming can run perfectly well on a best-effort basis, and the need for specialized services for these use cases is no longer significant.

It is necessary to implement service boundaries to ensure that the resource consumption of any single customer does not degrade the performance experienced by other users.

Within the given boundaries, or slices, assigned to a customer, "network as code" frameworks such as CAMARA offer the ability to adjust the slice to specific use cases.

Advances in IAS capacity do not automatically eliminate the need for specialized or premium-quality services. Even as best-effort IAS improves, new applications and business-critical uses continue to require guaranteed performance, low latency and high stability—qualities that best-effort IAS cannot consistently deliver, especially in mobile networks with fluctuating conditions.

Therefore, the assessment of whether a specialized service is "objectively necessary" must be dynamic and based on whether best-effort IAS can **reliably** meet the required performance levels in practice. As technology evolves, so do user needs, and specialized or premium-quality services remain essential for supporting high and predictable quality levels.

5. With regards to network capacity:

5.1 How do you ensure that network capacity remains sufficient when providing specialised services alongside IAS?
We are able to manage the network in different ways, allowing us to adjust how capacity is allocated. However, from an industry perspective, there is still uncertainty about what constitutes a minimum level of "sufficient capacity," and we therefore seek clearer regulatory guidance on this point (see comments above).

5.2 Are there any issues in interpreting whether network capacity is "sufficient" in this context?
Yes, see the arguments above.

6. How do you ensure that services based on quality guarantees are not used or offered as a replacement for IAS and what criteria do (or would) you use to justify your view that that these services do not substitute IAS?

First and foremost, competitive market conditions already ensure that operators maintain high-quality internet access, and no provider has any incentive to degrade its IAS offering.

We will continuously ensure that sufficient capacity remains available for all users. This can be achieved by designing any new slicing service to be dynamic and limited by a predefined cap. For example, the slicing service would only be activated at a specific site when a user subscribed to the service is present. Even if many slicing-enabled users are on the same site, only a limited share—e.g., 10% of the total capacity—would be allocated to them, while the remaining 90% would continue to be available to all other users.

This approach safeguards general IAS quality while still enabling innovative premium services.

7. How do you ensure that these services are not to the detriment of the availability or general quality of IAS and what criteria do (or would) you apply for assessing this?

See response to question 6.

4. Specific Regulatory Questions regarding Art. 3 (3) OIR
Given the OIR and BEREC's guidelines on the implementation of the OIR, in particular Article 3 (3):

1. Have you encountered any examples of regulatory uncertainty that have prevented, impeded or otherwise challenged your implementation 5G network slicing-based services?
There is insufficient regulatory guidance in relation to private networks and how hybrid or partially open architectures are treated. This complicates product design for customers needing partial internet reachability, because even limited IAS exposure may potentially trigger the full equal-treatment obligations.

Moreover, 5G network-slicing-based services are still new, and Danish operators are only now assessing how products and services based on 5G SA technology can be introduced. Throughout this assessment phase, which has been ongoing for more than a year, legal uncertainty regarding the interpretation of the net neutrality regulation has been one of the key issues requiring further clarification.

2. If so, what were the specific problem(s) and which specific requirement(s), relating to Article 3 (3) OIR therefore need(s) further guidance? Please describe concrete improvements that would be useful to overcome the problem(s) you encountered.
Please refer to the arguments presented above.

Bearing in mind the two questions above and differentiating between current and future (projected) use cases/concepts:

3. Regarding "equal treatment" of traffic:

3.1 How do you ensure "equal treatment" of traffic providing IAS via 5G network slicing?
For IAS delivered over a 5G network, we ensure 'equal treatment' by complying with the requirements of the OIR and BEREC guidelines.

3.2 Are there any difficulties in interpreting this requirement?
Please refer to the arguments presented above– particularly under point 2.1 and 3.1.

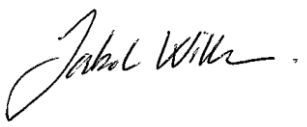
4. Regarding "reasonable traffic management":

4.1 What kind of traffic management measures do you consider "reasonable"?
We consider traffic management to be reasonable when it is transparent, proportionate and directly linked to delivering a consistent quality of experience for all users.

4.2 Do you have any difficulties in interpreting what is "reasonable" traffic management when providing IAS via 5G network slicing?
N/A.

4.3 In particular, how do you identify technically equivalent traffic without monitoring the content, in order to treat equivalent traffic equally?
We identify equivalent traffic using standard 3GPP signalling such as URSP, without inspecting content.

Best regards



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