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APEX STANDARDS

From Principles to Protocols: IETF and 3GPP's Roles in Upholding Net Neutrality

Net neutrality, since the term was coined by a Columbia Law School Professor, Tim Wu, in 2003, is the principle that Internet service providers (ISP) should treat all Internet data equally, without discriminating or charging differently by user, content, website, platform, application, or method of communication. The concept has sparked global debate, touching on issues of freedom, competition, and the nature of the Internet itself.

Net Neutrality and QoS Implications

Quality of Service (QoS) is essential for managing network traffic and ensuring the smooth delivery of real-time services like VoIP. However, it creates a dilemma where ISPs may prioritize traffic to maintain quality, potentially leading to unfair advantages and a tiered service model. The debate centers on whether QoS can be misused to circumvent net neutrality, allowing ISPs to favor their services over competitors'.

Industry Attitudes

Views on net neutrality vary. ISPs and network operators often argue for the freedom to manage their networks and justify the need for paid prioritization to recoup hefty investments made in building high-capacity infrastructures. Content providers like Netflix and YouTube, major bandwidth users, are staunch advocates for net neutrality, which is crucial for their service quality and operational costs. In contrast, the net neutrality debate takes on additional dimensions in emerging economies, intertwining with broader concerns over internet access and the digital divide. Net neutrality itself stands for the equal treatment of all internet data, irrespective of its origin or nature, a principle at the heart of ongoing global discussions about internet freedom and regulation.

Government Attitudes Globally

Partisan positions in the U.S. regarding net neutrality have been marked by fluctuating federal policies which are closely tied to the political party of the administration in power. The core of the net neutrality debate hinges on whether ISPs should be classified under the Communications Act of 1934, as amended by the Telecommunications Act of 1996, as either Title I "information services" or Title II "common carrier services". This classification affects the FCC's authority over ISPs. During the Obama administration, the FCC, led by Chairman Tom Wheeler, voted to classify ISPs as Title II common carriers, thus subjecting them to net neutrality principles. This classification was upheld after a legal challenge raised by the ISP industry. In contrast, the Trump administration's FCC reverted to classifying ISPs as Title I information services, which carry less regulatory authority for the FCC and allowed for more leeway in state-level legislation. Most recently, under President Biden, the FCC voted to approve a Notice of Proposed Rulemaking that seeks comments on a plan to restore net neutrality rules and the regulation of Internet service providers. These shifts reflect the broader partisan divide, with Democrats generally supporting more regulation to enforce net neutrality, while Republicans advocate for less federal control, favoring market-driven solutions.

In contrast, the EU has consistently championed net neutrality, establishing anti-discrimination rules for online data in 2015. The global landscape varies, with India maintaining stringent laws, while other nations have limited or no regulations, each influenced by their unique contexts. **Table 1**

Country	Attitude	Authority	Enforcement
United States	Varied by administration; less strict approach since 2017.	Federal Communications Commission (FCC)	Reduced FCC oversight; court rulings have influenced policy changes.
Canada	Strong support for net neutrality.	Canadian Radio-television and Telecommunications Commission (CRTC)	CRTC enforces regulations against ISP traffic discrimination.
United Kingdom	Maintains regulations; influenced by EU standards.	Office of Communications (Ofcom)	Ofcom enforces net neutrality, post-Brexit framework under discussion.
European Union	Strong proponent of net neutrality; established regulations.	National Regulatory Authorities (NRAs) in EU Member States	Enforces Open Internet Regulation across member states.
Finland	Proactive in upholding net neutrality, aligns with EU regulations.	Finnish Transport and Communications Agency (Traficom)	Ensures ISPs cannot block or throttle internet traffic.
Sweden	Aligns with EU regulation.	Swedish Post and Telecom Authority (PTS)	Monitors ISP compliance with equal treatment of traffic.
South Korea	Advanced internet infrastructure with a complex stance.	Korea Communications Commission	Guidelines promote fair treatment; instances of preferential treatment exist.
Japan	Industry-led approach; guidelines rather than strict regulations.	Ministry of Internal Affairs and Communications	Relies on industry self-regulation, with government encouraging fairness.
China	Focus on internet censorship and control.	Ministry of Industry and Information Technology	Regulations exist but are part of broader internet policies.
India	Strong stance in favor of net neutrality.	Telecom Regulatory Authority of India (TRAI)	Comprehensive regulations by TRAI prohibiting data discrimination.
Australia	No specific net neutrality legislation; market-driven approach.	Australian Competition and Consumer Commission (ACCC)	ISPs manage traffic freely, ACCC intervenes in anti-competitive practices.

Table 1 Perspectives and Enforcements by Countries

Company	Viewpoint	Potential Reasons
Nokia	Supports limiting unattended data as a tool for congestion management	Believes in a multifaceted approach to manage network congestion.
TeliaSonera	Sees potential utility in the approach but emphasizes the need for a broader perspective and liaison with other groups.	Advocates for a comprehensive strategy that considers all aspects and requirements.
Deutsche Telekom	Views the solution as potentially useful but not sufficient for extremely loaded cells.	Concerned about the effectiveness in high-congestion scenarios.
CATT	Agrees on the potential benefits from an operator's perspective.	Cautious about the implementation and overall impact.
Intel	Agrees in principle but highlights concerns about definitions and regulatory compliance with net neutrality.	Focused on clarity and legal compliance, particularly with regard to net neutrality rules.
Telecom Italia	Sees benefits in reducing or distributing unattended traffic but emphasizes the need for wide applicability.	Stresses the importance of a solution that works across a vast majority of UEs.
ZTE	Agrees on the benefits but emphasizes liaising with other groups for a comprehensive understanding.	Suggests a collaborative approach to fully understand requirements and implications.
Ericsson	Supports restricting unattended traffic during network overload, advises adhering to SA1 definitions.	Believes in the effectiveness of the solution for managing overload but emphasizes standard definitions.
Huawei	Agrees with the necessity of the SA1 requirement but suggests further clarification.	Seeks clarity on how the requirement integrates with UE OS.
MediaTek	Sees the benefit of restricting unattended traffic, especially in power saving and congestion contexts.	Focuses on the existing capabilities of smartphones and how they can be leveraged.
Qualcomm	Agrees with restricting unattended data traffic in congestion scenarios.	Supports the approach as a method to mitigate RRC signaling congestion.
NTT Docomo	Acknowledges the potential gain in allowing only foreground traffic but has concerns about predictability and effectiveness.	Concerned about the practical implementation and effectiveness in varying traffic conditions.

Table 2 Net Neutrality Perspectives: The Corporate Differences from 3GPP TDoc R2-156223 (2015) — A Reflective Look Considering Potential Evolution Over Time

Technology Response

Responses to the net neutrality debate have spurred innovation of alternative approaches. Decentralized technologies, such as blockchain and decentralized applications (DApps), are being explored as ways to avoid centralized internet control. Meanwhile, VPNs and encryption serve as interim measures to circumvent ISP-imposed restrictions, although they represent more of a workaround than a long-term solution.

Standardization Nuances

In the telecom industry, 3GPP discussions on net neutrality influence ISP business strategies. A pertinent example is the debate around the Edge DNS Client (EDC) in 5G networks, highlighted in TDoc *S2-2108694*. This document discusses using EDC in a way that complies with both net neutrality and technical specifications. It addresses concerns about the potential for operators to override user DNS preferences, which could impact user freedom and network control.

The topic on traffic management extends from the service aspects in (SA) to the physical layer (RAN), for example, in *R2-156223*, where strategies like Access Class Barring (ACB) are scrutinized for their crude approach to managing surges during events, often at the expense of network performance. Proposed measures aim to differentiate between attended (user-initiated) and unattended traffic to enhance efficiency. This raises questions of net neutrality adherence. Companies have diverse concerns on these proposals due to their varying priorities and market positions. Firms like Nokia and Ericsson prioritize congestion management techniques, considering their impact on network reliability. Telecom Italia and Huawei focus on broad applicability and seamless integration, respectively, which may indicate their emphasis on user experience. Qualcomm and MediaTek at the forefront of chipset innovation, support such differentiation to alleviate congestion and conserve energy. **Table 2**

Understanding IETF's approach to net neutrality is crucial for 3GPP, which relies on IETF for internet protocols. The IETF's proposed network tokens, as per *draft-yiakoumis-network-tokens-01*, offer a way to manage network traffic in line with net neutrality. These tokens facilitate a dialogue between endpoints and networks about traffic treatment, enabling operators to provide higher QoS for specific services and users to consent to such treatment. This approach respects net neutrality principles by prioritizing user preference and privacy, and aims to balance efficient resource use with a fair internet.

3GPP's progression with 5G, 5G Advanced and 6G, particularly in network slicing, introduces further complexity. Network slicing allows the creation of distinct virtual networks, each optimized for different services, which implicates the net neutrality considerations. As technology advances, it is likely that an increasingly detailed approach will be needed to ensure net neutrality principles remain relevant.

Current Trends and Future Outlook

Net neutrality remains a debated issue, with the need to balance the open internet's ideals against network management's realities and business imperatives. This debate is expected to evolve under the continuous dialogue among regulators, industry stakeholders, and the public to navigate these challenges. ∎