ETNO paper on Contribution to WCIT

ITRs Proposal to Address New Internet Ecosystem

1. **Introduction**

The telecommunications market and the telecoms industry as a whole is undergoing a fundamental shift. Catalysed by the availability of higher bandwidth connectivity, new applications and services are being enabled that go far beyond the traditional services of voice calling. In both the consumer and enterprise segments, services such as Voice over IP (VoIP), social networking, instant messaging and the rise of 'apps' have changed the way customers use their mobile and fixed connections. This development is significant and telecoms operators need to adapt and rebalance their tariff structure between voice and data services.

From a technical point of view, networks are evolving towards an 'all-IP' platform. There is a progressive shift from the current model of separate 'circuit switched' and 'packet switched' networks (for voice and data services respectively), to a single future-proof 'all-IP' network, supporting all services that the operator offers. At the same time, the increasing availability of fibre to the end-user is stimulating the demand for new services and bandwidth consumption.

The aim of the ETNO proposal is to contribute to the achievement of a more sustainable model for the Internet. ETNO is not asking for increased regulatory intervention but aims to establish a reference for commercial negotiations. The current interconnection model has some shortcomings that need to be addressed. Today there is a huge disproportion amongst revenues and a clear shift of value towards players (Over the Top players - OTT) who are not contributing to network investment. Traffic and revenue flows need to be realigned in order to assure the economic viability of infrastructure investment and the sustainability of the whole ecosystem. The revision of the ITRs offers a unique opportunity to propose high-level principles for IP interconnection.

ETNO believes that **the revised ITRs should acknowledge the challenges of the new Internet economy** and the principles that fair compensation is received for carried traffic

and operators' revenues should not be disconnected from the investment needs caused by rapid Internet traffic growth. **The ITRs should be flexible enough so as to further encourage future growth and the sustainable development of telecoms markets, while respecting the guiding principles that led to the successful development of the Internet: private sector leadership, independent multi-stakeholder governance and commercial agreements.** ETNO is certainly not asking for any change to the current Internet Governance model which is based on private sector leadership and multi-stakeholder dialogue.

ETNO wants to avoid decisions that would prevent new business models from emerging or that would hamper differentiated offers, hence limiting consumer choice. The risk of undesirable economic and technical regulation of operator rates, terms and conditions will be much higher if the development of the Internet continues to be jeopardized by the lack of sustainability and/or by the lack of end-customer satisfaction.

> **ETNO members have reiterated on many occasions their commitment to an open Internet** and to continue enabling consumers to access services and applications of their choice as well as being completely transparent about terms, conditions and limitations. As recognized by the European Commission, operators should not be prevented from developing differentiated offers based on customer needs, in addition to the best effort Internet. It is important to note that **nobody will be cut off from the Internet as the best effort Internet will continue to exist and to evolve**. New business models based on differentiated offers will ultimately create more choice for consumers**.**

The ITU is the only globally recognized telecoms organization where all countries are actively involved. The ITRs treaty is therefore the only truly global treaty on Telecoms and as such, ETNO sees the ITRs as a fitting 'home' for the principles that it wishes to see introduced during the revision process.

ETNO has introduced its views in Contribution C 109 submitted to the last meeting of the ITU Council Working Group to prepare for 2012 WCIT. ETNO's proposal concerns:

-   the rules for IP networks and interconnections, with reference to best effort delivery and end-to –end quality of service delivery, with related definitions;
-   the economic background, advocating for an adequate return on investment based, where appropriate, on the principle of sending party network pays;
-   the role of commercial negotiations and differentiated quality of service.

This paper elaborates on the details of the ETNO proposal, and also addresses some misinterpretations or inaccuracies that have been publicly expressed.

2. Quality of Service in the Internet and the ETNO Proposal

Today Internet-based services and applications are generating increasing demand for QoS delivery to improve the performance provided by the traditional best effort delivery.

Quality is needed

a.   **To deliver services**, such as streaming video, that require a guaranteed minimum bit rate, latency and error rate. Video traffic today represents about 48% of global IP traffic and this will rise to about 60% in 2015.

b.	**To increase the customer base** by improving the reach of some services, such as the delivery of films and video conferencing.

c.	**To guarantee that the Internet is able to provide the services requiring strict network performance** (minimum bit rate, latency, jitter and packet loss). This is critical because in the future, the Internet will be the "sole" network.

d.	**To ensure a balance of revenue** across the Internet ecosystem. To generate incremental revenues across all Internet ecosystem through enhancing Ecommerce transactions and improving customer experiences of web searches. As an example, a reduction in response time for web browsing results in an increase in revenue. Major OTT report that a 400ms delay in browsing results in a reduction of 0.6% of web searches and a large decrease in revenue. Bing reports that 2 second response delay results in a 4.3% reduction in revenue per client.

Quality based delivery is already in operation.

Companies such as Akamai, Level 3 and Limelight, already successfully offer quality based content delivery to Over the Top players/Content Providers. Moreover, Google has built the largest worldwide IP backbone to improve the quality of its delivery. Quality is based on Content Delivery Networks, web acceleration, caching, buffering and other techniques.

In the last year, telecoms operators have been receiving requests from Google, Akamai and other carriers looking to move their own servers from the edge of the network into domestic networks. This is needed to improve the Quality of Service (QoS) and the Quality of Experience (QoE).

The role of the Telecommunication Operators and the Telco/OTT/CP/CDN Provider in interconnection

a. In order to generate value out of their specific assets (end users, mobile and fixed access networks, and aggregation and backbone networks), telecoms operators should offer to OTT / Content Providers (CP)/ Content Delivery Networks (CDN) Providers connectivity services that guarantee end-to-end QoS, from the interconnection point to the end user. QoS based delivery can generate incremental revenues for telecoms operators and can contribute to solve the IP sustainability issue.

b. By endorsing the concept of "quality based delivery", new IP interconnection models can be defined to overcome the limitations related to traditional models that:

- do not allow traffic management according to its characteristics (i.e. source/destination, delivery requirements, value acknowledged by OTT and end-users), optimization of IP network efficiency and cost reduction;

- do not allow for the exploitation of telecoms operators' distinctive value-add items (end-users, access networks, domestic and international backbones);

- do not allow telecoms operators to make a value proposition to OTTs looking for a better user experience and a better reach of their services (eg differentiation with respect to best effort Internet by providing end-to-end quality of delivery).

The **goals for the new interconnection models** are:

- to enable incremental revenues by end-to-end QoS pricing and content value pricing;

- to deploy new business models (such as premium pricing and revenue sharing).

The ETNO Proposal

The ETNO proposal calls for a new IP interconnection ecosystem that provides end-to-end Quality of Service delivery, in addition to best effort delivery, enabling the provision of value-added network services, to both end-customers and OTT players and content providers.

Moreover, the contribution states that in order to ensure an adequate return on investment in high bandwidth infrastructures, operators shall negotiate commercial agreements to achieve a sustainable compensation for telecommunications services.

By endorsing the concept of "quality based delivery", it will be possible to establish new interconnection policies based on the differentiation of the QoS parameters for specific services and types of traffic (not only on the "volume"), enabling new business models and implementing an ecosystem where operators' revenues will not be disconnected from investment needs.

The ETNO proposal is not imposing any premium service obligations on network operators, because the QoS delivery will be based only on commercial agreements.

Indeed, the ETNO proposal aims at creating the best enabling environment to foster commercial agreements based on QoS delivery and to avoid any regulations that can prevent the development of these agreements.

ETNO considers the development of new Interconnection policies based on QoS delivery as an opportunity also for developing economies that need to grow their networks, because QoS delivery would offer additional sources of revenue necessary to finance their infrastructure.

ETNO's view on QoS delivery is quite different from the position recently expressed by ISOC(2012)[1]. While ISOC presents the QoS delivery market as a niche market, ETNO believes that there is already a growing demand for QoS to guarantee service delivery, to generate incremental revenues and to increase the customer base. This is confirmed by the investments and good market performances of companies such as Akamai, Level 3 and Limelight. Furthermore, in a few years, with the switch off of the PSTN network, IP based networks will be the only telecommunications infrastructure and it will be necessary for all operators to be able to provide services requiring service specific network performance.

Furthermore, the quality of service delivery will enrich the Internet ecosystem, allowing OTT, Content Providers, and telecoms operators and end users to enhance their business and increase the overall welfare of the Internet ecosystem.

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[1] ISOC (2012) "Internet Interconnections –Proposals for New Interconnection Model comes up short"

Where is this proposal coming from?

The starting point to understand ETNO's proposal for a new IP interconnection ecosystem based on Quality of Service (QoS) is the acknowledgment that the technological and economic environment of the Internet has dramatically changed since the mid-1990s. According to recent literature (Yoo, 2012[2]), four major changes have forced the networks to evolve since then:

1)   *Increase in the number and diversity of end users*: from a small population of scientists and researchers to a user base much larger, more diverse and less technologically sophisticated;

2)   *Increase in the diversity and intensity of applications*: from low intensity bandwidth applications such as email and web-browsing to videoconferencing, to online gaming which is much more bandwidth demanding and P2P and cloud computing applications that create traffic patterns fundamentally different from previous mass market applications;

3)   *Increase in the variety of technologies*: while in the mid-90s access to the Internet was granted through dial-up modems provided by local telephone companies, now access is guaranteed through a variety of technologies such as cable modems, digital subscriber lines (DSL), fibr to the home and wireless solutions. These new technologies have different characteristics in terms of bandwidth, reliability and mobility, bringing a substantial degree of heterogeneity in the Internet world compared to the uniformity of the wireline solutions of the mid-90s. Furthermore, the number and type of devices to connect to the Internet have increased and now include laptops, smartphones, RFID tags and ad-hoc e-readers, bringing new complexity to the Internet's world.

4)   *The emergence of more complex business relationships.* In the mid-90s, the topology of the Internet was characterized by a strict three-level hierarchy: backbones, regional Internet service providers and last mile access providers. Now the Internet, as a network of networks, is characterized by a set of much more diverse business relationships such as, for instance, private peering and content delivery networks.

These technological and economic changes over the past fifteen-plus years have placed increasing pressures on the Internet to develop new architectural principles and in, particular, have led to the implementation of a diversity of pricing relationships.

Indeed, when the Internet started, pricing was characterized by three fairly simple relationships:

•   First, the end user paid a fixed amount for a monthly service (flat rate), regardless of how much bandwidth they consumed;

•   Second, network providers connect to the Internet through transit agreements, in which the network charges its customers based on the quantity of bandwidth used;

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[2] Christopher Yoo, "The Dynamic Internet: How Technology, Users and Business Are Transforming the Network", American Enterprise Institute", October 2012. This part draws from Yoo's chapter 8th.

• Third, backbones usually interconnect through a pricing scheme known as peering. When the volume of traffic passing in each direction is roughly equal, the charges the operators pay offset each other. Therefore, the networks can avoid the cost of tracking and billing the traffic in each direction, by exchanging traffic on a settlement-free basis. It is clear that backbones peer only with networks of comparable size and that terminate and originate traffic.

It is important to notice that, even when Internet pricing relationships were relatively homogenous, before the mid-1990s, there was already a significant disparity between prices charged to similarly situated actors in the interconnection chain. For a network consisting of thirty five thousand autonomous systems working out interconnections agreements, this outcome was almost inevitable.

The changes to the Internet previously mentioned and the differences in the size of the investments between the last generation and the current generation of broadband technologies, are adding pressure, particularly on end user pricing and on the peering relationship. The ETNO proposal is concerned with connectivity services with end to end QoS from the Interconnection point to the end user, involving backbone, aggregation, and access for both mobile and fixed networks.

As already mentioned, peering means that backbones carry incoming traffic without monetary compensation although terminating traffic arriving from the other network is quite costly. According to Christopher Yoo, (2012) *"peering is better understood as a form of barter, since it is in effect an in kind exchange that depends on the value on each side of the transaction being roughly equal"*. However, "*…..when value is no longer equal on both sides of the transaction, barter no longer makes sense "*.

The way in which Internet has evolved since the mid-1990s, has created strong imbalances in the values of the peering relationship. The flow of traffic is a case in point. Today about 10-15 OTTs, Content Providers and carriers originate more than 70% of the incoming traffic (for instance in the USA, Netflix generates more than 25% of all IP traffic).

A similar divergence has also grown on the revenue side. Advertising is today the most important Internet source of revenues, but advertising revenues go primarily to content providers and OTTs and not to network providers making unbalanced the value of the peering based transaction and undermining the case for barter.

As suggested by Yoo (2012), when "*values are asymmetrical, using barter to exchange traffic on a settlement-free basis no longer makes sense. Instead, the literature on two sided markets indicates that society would be better off if the side of the transaction incurring lower costs and deriving more revenue from the network were to make a side payment to the side of the transaction that faces higher cost and lower revenues"*.

ETNO, through its proposal, is not asking for a subsidy from OTTs to the network providers, but would like to foster the adoption of the new "quality based" delivery model as a basis to reduce the current imbalances in the value of traffic exchanges. Therefore, ETNO is proposing that the basis for commercial negotiation should not be the volume of the traffic exchanged between parties, or the "bit rate at the interconnection points" but the "value" that the traffic represents for the ecosystem. The way recommended to introduce "quality delivery" is fully in line with the successful process that was behind development of the Internet: not through artificial and rigid regulation but through commercial agreements.

C. Explaining Quality of Service differentiation

QoS mechanisms allow differentiating services and types of traffic as well as specific content according to the economic value they represent to consumers and producers (OTT players or CPs). As an example, we can consider the delivery of video on demand: video on demand has a value for the CP who is selling the content and for the consumer. The quality of the data streaming is the essential factor in ensuring a good viewing experience. Content Providers have a strong interest in end-to-end quality in order to meet the demands and expectations of their customers. Hence, they have already started negotiating with telecoms operators on the modalities of quality assurance.

 "Best effort" is generally sufficient for search queries. The value of this traffic is certainly lower than the value of the traffic in video streaming.

It is well known that when sites are slow, people hit the "back" button instead of waiting for the page to load. Smart Internet businesses have extensively tested the effect of slow pages by adding artificial delays into serving their own sites, and the results are dramatic:

* Amazon: 100 ms of delay caused a "meaningful decrease in revenue"

* Google: 400 ms of delay decreased searches by 0.59%, which would cost billions in advertising revenue [3]

* Yahoo: 400 ms of delay caused a 5-9% decrease in traffic[4]

So, the Internet's potential will receive a boost from the availability of new "quality based delivery", in addition to the traditional best effort.

3. **Policy Implications**

The ETNO proposal

3.1. Members **States** shall ensure that ~~Administrations*~~ **Operating Agencies** cooperate in the establishment, operation and maintenance of the international network to provide satisfactory quality of service. **Member States shall facilitate the development of international IP interconnections providing both best effort delivery and end to end quality of service delivery.**

4.4 Operating Agencies shall cooperate in the development of international IP interconnections providing both, best effort delivery and end to end quality of service delivery. Best effort delivery should continue to form the basis of international IP traffic exchange. Nothing shall preclude commercial agreements with differentiated quality of service delivery to develop.

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[3] Sources: http://brainshed.com/utos_2012.pdf, quoting the following sources:
http://www.stevesouders.com/blog/2010/05/07/wpo-web-performance-optimization/;
http://technology.edmunds.com/blog/2010/11/how-edmunds-got-in-the-fast-lane.html
[4] See footnotes 1, 2 and 4.

A proposal that is in line with European policy objectives

The European framework for electronic communication explicitly allows commercial differentiation of Internet access products and services, as long as transparency obligations are respected. This interpretation has recently been confirmed by Commissioner Kroes:

> *"… But I do not propose to force each and every operator to provide full Internet: it is for consumers to vote with their feet. If consumers want to obtain discounts because they only plan to use limited online services, why stand in their way? And we don't want to create obstacles to entrepreneurs who want to provide tailored connected services or service bundles, whether it's for social networking, music, smart grids, eHealth or whatever. But I want to be sure that these consumers are aware of what they are getting, and what they are missing[5]."*

The European regulatory framework focuses on promoting customer choice and competition while safeguarding innovation and economic growth. The ETNO proposal is contributing to these goals.

Customer Choice: ETNO proposes an extension of transport modes alongside "best efforts" that will increase the available options for OTTs and CPs as well as consumers.

Competition: The main competitive dimensions in European retail markets are price and "speed" (understood as available bandwidth, i.e. transmission rate). Adding the quality dimension to the mix would increase the competitive dynamics by allowing for the differentiation of products and services in an additional dimension. It will also require the providers of quality assured products and services to demonstrate the added utility and value to the customer.

Innovation: Today's best effort only Internet provides no means to guarantee a specific level of traffic delivery. In a most benevolent interpretation this means that "inelastic applications in fact work tolerably well over a best-effort network", as the Internet Society has put it in their position paper[6]. This broad statement is not only assuming that bandwidth may be increased indefinitely and ahead of actual demand but also neglecting the fact that certain applications, such as e-health cardiac monitoring services for example, may not depend on "tolerably well" transport but need to be quality-assured. There are inelastic applications that may never be realized in a best effort only Internet. Thus, extending the technical options is a necessary prerequisite for further innovation.

Investment: A business model which requires infrastructure based service providers to constantly increase their performance (or cut their costs of doing so), while being limited by economic regulation on the revenue side, may not be sustained in the long run. If infrastructure providers were not allowed to develop new business models which seek to

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[5] Neelie Kroes, Vice-President of the European Commission responsible for the Digital Agenda:
"Making Open Access a reality for Science", Speech delivered at the Publishing and the Ecology of European Research (PEER) Project Conference, Brussels, 29 May 2012
http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/12/392&format=PDF&aged=0&language=EN&guiLanguage=en

[6] Internet Society, „Internet Interconnections – Proposals For New Interconnection Model Comes Up Short", http://www.internetsociety.org/internet-interconnections-proposals-new-interconnection-model-comes-short

more evenly balance the distribution of risks and revenues across the ecosystem, the incentive to invest in network infrastructure would be damaged severely.

Wide Industry consensus

The discussion whether or not the extension of Internet transport modes by QoS classes is necessary is not new and has been led intensively in the past, for example at the CEO Roundtable summoned by Commissioner Kroes. The group composed of 50 companies from all levels of the Internet value chain (including Content Owners, OTT Service Providers, Incumbent and alternative network operators as well as vendors) agreed:

> *"There is a general consensus that a small number of quality classes are needed in addition to today's "best-effort" internet and should be implemented across network boarders as soon as possible. There is no need to decide whether this should be done "within" or "outside" of the public Internet because both options are feasible and desirable. They complement each other and serve different purposes. Extranet solutions outside the public Internet are generally considered to better achieve guaranteed End-to-End quality for service delivery (e.g. speed, packet loss, security). Extranet solutions are already widely standardised, up to the point of market readiness and actual implementation (in the case of the IPX solutions from the i3Forum and the GSMA). At the same time the vast majority of the participating companies agreed that there is merit in establishing concrete definitions of quality classes at the network borders in order to enable relative quality of services to be supported across networks within the public Internet."*[7]

4. <u>The Application of Sending Party Network Pays Principle (where appropriate)</u>

The ETNO proposal

3.2 ~~Administrations*~~ ***Operating Agencies*** shall endeavour to provide sufficient telecommunications facilities to meet requirements of and demand for international telecommunication services. ***For this purpose, and to ensure an adequate return on investment in high bandwidth infrastructures, operating agencies shall negotiate commercial agreements to achieve a sustainable system of fair compensation for telecommunications services and, where appropriate, respecting the principle of sending party network pays.***

Internet traffic is increasingly asymmetric, driven by 'Over-the-Top' services such as video streaming applications and a sending party pays model is capable of dealing efficiently with asymmetric traffic. Perpetuating an 'unpaid peering' approach for IP Interconnection that developed when traffic patterns were largely symmetric can hamper the incentive to invest in transport capacity and network quality.

Why sending Party Network Pays?

By proposing a charging principle that is well tested and has delivered efficient results ETNO is not trying to bring back the circuit switched architecture of the PSTN. The main aim is to

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[7] CEO Roundtable Working Group 2: Technical Framework for Digital Delivery – Open Access, Interoperability and Connectivity - Final report, July 13th, 2011
http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=870

promote , where appropriate, a charging principle which re-aligns costs and revenues by assuring that the agents which take the economic decisions – in this case the routing decision – are accountable for the costs they incur.

ETNO, through its proposal fosters, commercial agreements between parties are on a voluntary basis, therefore, the sending party pays principle would not be imposed but commercially negotiated.

ETNO is convinced those characteristics and economic effects will positively contribute to the further development of the IP ecosystem. By promoting both the introduction of end-to-end quality standards for innovative IP services and the increased adoption of SPNP models in commercial negotiations ETNO is presenting a sensible way forward.

What factors might lead to a fragmentation of the Internet?
When analyzing the structure of today's Internet, the most evident cause of fragmentation is government intervention for political reasons. While all Internet service providers strive to achieve "universal connectivity" – which means any device may communicate with any public IP address – the commercial reality is, that this is hardly ever fully achievable.. ETNO is not asking for increased governmental intervention but stresses the priority of commercial negotiations. Doing so in a timely manner will not increase fragmentation but – much to the contrary – foster the future cohesion of the entire ecosystem: if we do not manage to establish quality assured transport routes across the Internet, actors with a need for quality assured transmission (such as banks etc.) will return to building "extranets".