

**REPORT ON OECD WORKSHOP “INTERNET TRAFFIC EXCHANGE”  
Hosted by Federal Ministry of Economics and Technology, Germany**

**Thursday 7 June and Friday 8 June 2001  
Federal Ministry of Economics and Technology (BMWI), Berlin, Germany**

The OECD, together with the Federal Ministry of Economics and Technology of Germany, held a workshop on the Internet traffic exchange in Berlin on 7 and 8 June 2001.

The workshop was attended by about 80 participants from government, industry and academia. Sessions ranged over a number of existing and emerging issues in respect to Internet traffic exchange. Below are brief summaries of the sessions.

### **Opening**

The workshop was opened with welcoming remarks by **Mr. Ulrich Mohr**, Head of Section, International Policy on Telecommunications and Posts, BMWI, and **Mr. Sam Paltridge** of Information, Computer, and Communications Policy Division, OECD. Both speakers introduced general issues in relation to Internet traffic exchange and a summary of recent discussions in OECD on this subject. Mr. Paltridge noted recent developments in which major carriers were putting together backbone networks in foreign countries (particularly in the United States) by way of joint ventures, swapping capacity, purchasing a share of an operator in that market or taking over that operator.

### **Session 1: TRAFFIC EXCHANGE IN THE NEW ENVIRONMENT: GLOBAL NETWORKS**

**Chaired by Mr. Dietmar Plesse, BMWI and Vice Chair OECD Working Party on Telecommunications and Information Services Policy (Germany)**

#### **Part 1**

The first presentation was given by **Mr. Scott Marcus**, Chief Technology Officer, Genuity, who provided a comprehensive summary on the development of interconnectivity between Internet backbones, with particular focus on peering, both shared and direct, and transit in the North America. The presentation covered the historical development of Internet backbone connections and how they are negotiated, (*e.g.* bilaterally or multilaterally). Mr. Marcus noted the basis for these negotiations and gave the example of Genuity's guidelines for prospective partners wishing to enter into commercial arrangements. He also covered recent developments in Europe, including the benefits of liberalisation had for the provision of infrastructure. These included the declining cost of circuit prices -- both continental and transoceanic capacity -- and the increasing number of traffic exchange points (IXPs). Mr. Marcus summarised the results of economic modelling of Internet backbone peering suggesting that, for international interconnection, higher prices are charged for higher cost customers where they are distinguishable. He noted that this prediction was consistent with developments, in practice, in the United States and elsewhere. Mr. Marcus also summarised “scaling issues”, (*i.e.* growth of autonomous system numbers, the availability of IPv4 address, and increases in the size of the routing table). He pointed out different network requirements among different Internet applications, *e.g.* email, real time web service, real time voice or video over IP, in terms of their different levels of tolerance to delay or loss of data. He also referred to the difficulties in cross-provider measurements of service levels and spoke of the need for business arrangements to provide incentives for the use of Internet metrics to monitor service level agreements (SLAs).

The second speaker was **Mr. Jean-Claude Geha** from Telia, who introduced the company as one of the first non-US ISPs with peering arrangements with all US ISPs. He pointed out that one of the driving forces of recent developments of the Internet was abundance of capacity due to overbuild of fibre networks within the United States and Europe and between them. Another factor was pricing changes: in 1998 transit prices into the United States from Europe were five to ten times higher than those out of the United States, but now they were equivalent. Mr. Geha noted that the emergence of interactive content was an important consideration. Whereas in the past content seekers and content providers were

distinct with applications such as Napster content seekers were also content providers. Mr. Geha said that server firms were reluctant to share the revenues with backbone providers. He was of the view that building an IP backbone to offer IP transit on the basis of 'best effort delivery' was no longer a viable business. In this context he pointed to a lack of service level agreements (SLAs). For the development of the next generation IP services, end-to-end service quality, reliability, security and performance had to be ensured. Lack of certain financial incentives is also a barrier. He then moved on to describe what the next generation IP services will look like, *e.g.* traffic exchange structure based on quality of service, and how the money may flow. He also explained the conditions and requirements for the next generation traffic exchanges: measurement and accounting tools, agreements on traffic classes amongst ISPs and backbone providers, settlement resources embedded in the switching and routing platform.

**Dr. Mathew Dovens**, Senior Director, Cable and Wireless (UK) talked about relationships among networks. After a brief overview of the global growth of the Internet, he explained how peering had developed in the United States. This covered how peering of backbone networks developed since the late 1980s, how direct and public peering is structured in the United States, and how the US industry is structured (Tier 1 to 3, or national backbone providers, regional providers, and local ISPs). Then he showed the structure of global peering, followed by peering strategies of networks where peering takes place among those with similar market positions deriving mutual benefits. He continued by presenting the development of peering in Europe, pointing out the lack of written rules. In this context he concluded with the peering policy and requirements of Cable and Wireless, US.

## **Part 2**

In the second part of Session 1, **Mr. Bill Scott** from the National Office for the Information Economy (Australia) presented a view on the issues related to Internet charging. Following a brief overview of Australia's telecommunications policies, which are characterised by open market access and competition, he focused on issues of international Internet charging arrangements, where he differentiated connectivity in the Internet from traditional telecommunications. He said that global traffic was concentrated in Tier-1 level, and that non-Tier-1s pay all transport costs to and from Tier 1s, regardless of usage; putting smaller and more distant networks at a greater disadvantage. In the view of NOIE this led to a cost penalty on remote economies working against decentralisation of global information economy and reinforcing US-centric Internet. He stated the belief that, Australia was competitively disadvantaged in the sense that less investment were made in that country, the costs to do business were higher, and the Internet users paid higher prices. He concluded his remarks by noting discussions that had taken place or were underway at the international level including APEC, where principles were adopted at ministerial level, ITU, and WTO.

The next speaker, **Mr. Ricardo Rodriguez**, Cofetel (Mexico), spoke of the perspective of developing countries in the debate on internet traffic exchange at APEC, ITU, and OECD. His presentation covered current considerations in each of these organisations: in APEC, the discussion over ICAIS and the contribution of each network; in the ITU discussion over voice over IP taking into account costs and benefits, and the development of the broadband market in the OECD. He added that REGULATEL (Latin American forum for telecommunications regulations) had undertaken a survey and research on the arrangements and development of the Internet connectivity in Latin America. Then he went on to describe the shift from switched telecommunication to IP communications and what it may mean including its effects on cross border trade balance of payments. He also introduced arguments on the balance of payments in relation to the development of infrastructure. In conclusion, he emphasised the importance of level playing field, pro-competitive regulation and more dialogue among players.

The last speaker of this session was **Mr. Richard Cawley**, European Commission. He discussed three aspects of traffic exchange in Internet: lessons that could be drawn from market data, lessons from economic theory and finally the role of policy. He first pointed out that it was important to examine the issue by defining the relevant market. He picked what appeared to be two key ones; local access to Internet where demand from end users (in conjunction with the evolving supply possibilities and offers) is the driver for traffic exchange within Internet and backbone connectivity between networks. He pointed out two key developments in the so-called backbone connectivity markets. Firstly, from a European perspective, a number of companies have now developed pan-European and national backbone networks. Secondly, prices for backbone transmission capacity in Europe have decreased by

up to three orders of magnitude in the period 1998-2001. This has provided incentives to route and exchange traffic within Europe as opposed to exchanging traffic via North America.

Moving on to economic aspects, he pointed out that the key policy question is whether the traffic arrangements that emerge are conducive to efficiency, and whether they facilitate or inhibit or distort internet development. He pointed out the dangers of unnecessarily intervening to mandate the terms of interconnection. He also argued that there appeared to be important differences between network interconnection for the termination of a voice call and traffic exchange between packet based Internet networks. Intuitively this is because an end user is effectively paying to receive as well as send traffic. Moreover, the recent literature on the off-net-cost pricing principle pointed to an alignment between private and socially optimal pricing for traffic exchange within Internet, in contrast to the situation for telecommunications where incentives exist to price interconnection above cost. Finally, he dealt with the policy and regulatory framework in the European Union. The current sector framework covers the right to interconnect but not the terms for IP based traffic, although competition policy fully applies to the sector and has been applied in a number of cases. The future framework, due for adoption by the end of 2001, is more generic in nature and more closely aligned to competition policy principles in the identification of market power on defined markets. In principle the sector regulation could in the future apply to a company that is dominant or jointly dominant in any market. However, the prescribed list of markets for ex-ante regulation that emerges is likely to be limited.

## **Session 2: TRENDS IN GLOBAL CAPACITY AVAILABILITY AND TRADING**

**Chaired by Mr. Svend Kraemer, European Commission**

**Mr. Jeremy Barnes** of Level 3 was the first speaker, with a presentation entitled “Capacity Trends and Silicon Economics”. Mr. Barnes spoke of current trends in the supply of capacity and demand for capacity. He began by providing data on the bandwidth available from major networks in the United States but pointed out that not all this ‘dark fibre’ would be lit in practice. Mr. Barnes said that the demand for capacity had increased by two percent for each 1% decrease of price. He also showed the results of an econometric model on this topic. He drew attention to fibre optics networks changing their character from a fixed to variable cost element, and projected how unit costs will decrease in future. In this context, he pointed out how multiple conduits are required to leverage technical improvements in optical fibre. He said the ownership of empty conduit in the United States was concentrated in less than ten builders on key routes, whereas in Europe the ownership is much less concentrated albeit concentration is widely anticipated. He then went on to explain that while technology industries are characterised by horizontal integration the communications industry is vertically dis-integrating. It was noted that disaggregation had created substantial value in the computing industry. Finally, he depicted the supply chain in the disaggregated communications industry and concluded the presentation by describing the remaining constraints for the development of the network capacity, in the future, such as congestion at traditional aggregation points and lack of transparency in interconnection pricing.

The second speaker, **Mr. Bruce Girdlestone**, Band-X, spoke of trends in global capacity availability and trading. He began by referring to the change in trading of bandwidth from vertical integration (global players) to horizontal specialisation (*e.g.* switching, wholesale transport, network management, hosting, trading). Mr. Girdlestone then explained how bandwidth is exchanged between buyers and sellers through Band-X. After summarising how capacity is deployed internationally the speaker showed some examples of declining prices for capacity.. He pointed out problems of current bandwidth exchange and noted that interconnection was the key to future successful trading of capacity. He felt that although the commoditisation of bandwidth was increasing it was still not homogenous therefore providing a role for a mediator.

**Mr. Geoff Huston’s** presentation, Telstra Internet, on how the structure of Internet was changing, was made on his behalf by **Ms. Mirjam Kuhne**, RIPE. The presentation compared and contrasted a packet based charging model and a PSTN call based model. It was noted in the presentation that packet switched networks do not have well defined transactions as in the circuit switched world. The presentation then explored some of the new models for inter-provider relationships for Internet traffic

exchange. One such development, in interconnection arrangements, was multiple upstream contracts (*i.e.* multi-homing by smaller ISPs). After touching upon trends in cable systems, in Asia-Pacific and other regions, including their price movements, the presentation covered the growth of the number of ISPs and routes as well as declining costs of carriage. The presentation also described how interconnectivity was developing among traditional hierarchical views of the Internet (*i.e.* the Internet being structured as hierarchy of providers). It was noted that the hierarchy had been evolving due to competitive pressures and lateral peering within the same tier and over a few tiers, making the Internet much less hierarchical in nature. Further, attention was drawn to global trends such as IP packet transmission that was becoming a commodity market, that interconnection that was becoming far more dense and therefore less reliant on Tier-1 providers, and that Internet content market was becoming a critical issue.

### **Session 3: GLOBAL INTERNET CONNECTIVITY**

#### **Chaired by Ms. Kathy Fisher, Industry Canada (Canada)**

Following the introduction of the chair, **Mr. Donald Abelson**, Chief of the International Bureau, FCC delivered the first presentation of Session 3 entitled “ICAIS: myths and realities”. Mr. Abelson said the presentation was aimed at dispelling some misconceptions surrounding ICAIS. The first myth that he took up was the notion that the Internet traffic was U.S. centric and he pointed out that this was becoming less valid in Asia and in Europe in particular. Mr. Abelson said the barrier for developing countries was not that they had to pay to route Internet traffic to the United States but that there was not sufficient capacity within their country or region. He said that exploring new and creative ways to build infrastructure would provide a real solution. The major initiatives that could be taken in this area were liberalisation and reform to telecommunication regulation in developing countries. Mr. Abelson said that while some international Internet traffic flows were to the United States because it is content rich, he pointed out that many foreign companies locate their content on U.S. servers because of the affordability of the U.S. infrastructure and that underdeveloped infrastructure in those countries was the real barrier. At the same time, he said, domestic telecom policies sometimes made it economically cheaper to exchange traffic through the United States. On the other hand he noted that commercial forces were at work and were providing ways to address many issues in this area. For example, there was a misconception that only U.S. Tier-1 ISPs peered with each other and that non-U.S. ISPs had to pay transit fees to access the Internet. Yet commercial strategies were available for U.S. and foreign ISPs to access Internet backbone networks, and peering was not restricted to the Tier 1 providers. Regarding a perception that the Internet market was a strict hierarchy, in which transit prices were fixed and no peering policies were published, he countered that it was becoming less hierarchical and companies were disclosing peering policies, and also the FCC had not received any complaints that any U.S. Internet backbone providers were abusing their market power.

**Mr. Tim Kelly** of the International Telecommunication Union followed with his presentation entitled Global Internet Connectivity and Digital Divide, which focused on the importance of connectivity, in order to bridge the digital divide, in the least developed countries (LDCs). Mr. Kelly showed data of distribution of fixed and mobile phones and Internet users. He warned that the LDCs were falling behind in terms of the development and use of the Internet. Mr. Kelly noted the differences between telecommunication connectivity and Internet connectivity in terms of the technology, levels of service, financial arrangements, and cash flow. He emphasised that the issue of connectivity was about distribution and not about total quantity, that many countries had less international connectivity to the Internet than a single ADSL link, and that the vast majority of fibre optic cable was left dark largely because of the price level. The uneven development in inter-continental Internet bandwidth was also pointed out. After touching upon the question of where LDCs can develop revenue streams in relation to the Internet, Mr. Kelly turned to two success stories-- those of Nepal and Uganda. In Nepal, a 16-fold increase in IP connectivity was achieved in 8 months following liberalisation of the VSAT market in 1999, bringing in the lowest IP access prices in South Asia. Mr. Kelly said, however, that income from international settlement payments had decreased. In Uganda, rapid network growth followed the start of competition, and it became the first country in Africa where mobile phone subscribers surpassed the fixed. However, Uganda still had an entire national capacity of less than 2Mbit/s. In conclusion, he

emphasised again that without connectivity, demand side initiatives were largely irrelevant. He added that opening the market could help LDCs although the incumbent telecommunication carrier may derive less revenue from international settlements.

The last speaker of this session was **Mr. Sam Paltridge** of the OECD, who introduced work undertaken at the OECD in relation to developing international Internet connectivity. He noted that while virtually all countries are now connected to the Internet, around half of them had less than five ISPs. Mr. Paltridge also summarised the share of backbone connections to countries with less than five ISPs, noting that France Telecom, Cable and Wireless and Teleglobe were the major providers of international Internet connectivity in these countries. He noted some examples of new infrastructure providers in developing countries and their efforts to improve the Internet connectivity. For example, an Indian ISP Dishnet had contracted Tycom Global Network to build up end-to-end capability to the United States. The ITU case study of Uganda was also introduced as an example that competition was driving growth in developing countries. The same positive experience had been observed in Sri Lanka. Then he contrasted the behaviours of the state owned monopolist and the new entrants in Bangladesh, where the latter provided telephone services in rural areas making profit without a share of international settlement payments. In addition he noted recent developments in Kenya where the regulatory authority had closed the Kenyan Internet exchange point (KIXP) after only two weeks of operation based on a complaint from the telecommunication monopolist. While the exchange had been in operation it had improved quality of service and offered the potential for lower cost domestic connectivity. In the absence of KIXP he noted traffic would have to continue to be routed internationally. Mr. Paltridge used this example by way of pointing to the need for domestic reform to telecommunication markets and the need for increasing the skills and knowledge available to regulators as being fundamental for Internet development. He concluded by showing the relationship between the numbers of ISPs and the leased line connections to the Internet to show that if ISPs could flourish so would the Internet.

#### **Session 4: LOCAL INTERNET INTERCONNECTION**

**Chaired by Mr. Wolfgang Jauk, Ministry of Transport, Department of Telecommunications (Austria)**

**Mr. Simon Hampton**, AOL Europe, opened his presentation by emphasising the need for flat rate pricing structures since they would address the usage gap between Europe and the United States. He said this would help to increase the Internet penetration and thus electronic commerce, noting at the same time that the vast majority of households in the Europe still used narrowband Internet connection. Mr. Hampton introduced unmetered PSTN interconnection models and variations of per-user pricing system employed in different countries, *e.g.* per-call, unlimited and so forth. Further, he contrasted per-user pricing and capacity-based pricing in relation to the cost structure of PSTN and IP networks. Capacity based pricing, namely FRIACO (Flat Rate Internet Access Call Origination), was explored in detail emphasising that without new arrangements ISPs were largely indifferent to managing their customer's use of networks. He suggested that FRIACO could solve the congestion problem in the evening hours which had resulted from off-peak metered pricing. Turning to local and regional interconnection, he pointed out that ISP innovation depended on call termination competition, and raised a discrimination issue regarding some dominant telecommunications companies offering retail flat rates. In conclusion, he emphasised that flat rate pricing structures were the key stepping stone to broadband access, and that FRIACO was the key ingredient of flat rate consumer prices. Also, both regional and local interconnection was needed, and real non-discrimination in capacity-based pricing was needed.

**Ms. Barbara Dooley**, President of Commercial Internet eXchange (CIX) provided their experiences in the United States regarding local competition and ISPs. She first introduced CIX as a world-wide trade association of ISPs and industry stakeholders, and then described the role they played in supporting the "new economy". Having provided a global picture of the "communications investment hospitality", to show growth prospects of different countries and regions, she explored a "myth of unregulated Internet". Ms. Dooley stated that the Internet grew because regulators had restrained the anti-competitive behaviour of incumbents. On the other hand she noted that enforcement of regulatory safeguards was lacking in many countries. In the United States she said competition provided by new entrants,

following the 1996 Act, had driven the development of broadband, but that the pace had decreased in the face of anti-competitive actions by incumbents. Ms. Dooley said that without reasonable access to local loops, and stronger enforcement of regulatory safeguards, ISPs would not be able to compete with incumbents.

**Mr. Wolfgang Kopf**, Deutsche Telekom, spoke in respect to local Internet interconnection in Germany. He began by introducing some positive performances of the German Internet market, such as competitive retail prices and improved Internet penetration. Mr. Kopf described what Deutsche Telekom saw as the fundamental differences between IP and PSTN markets. These differences included content as the main driver in the IP market, and the view that incumbents had incentives to provide local Internet interconnection services without regulation. Mr. Kopf said Deutsche Telekom did not support flat rate models for narrow band access. He stated his belief that flat rate structures do not stimulate e-commerce or provide economically sustainable incentives. He said that network over-usage was a risk with flat rate structures. Mr. Kopf said there was a risk in importing regulatory decisions taken in other countries, such as the British FRIACO model. Mr. Kopf then reviewed the situation in Germany in regard to flat rate pricing. He said a German court had reversed the regulator's decision that the incumbent should offer a wholesale flat rate. At the same time he stated that the goals policy makers had for the development of the Internet were already being met in Germany. He emphasised in conclusion that regulatory interventions in terms and conditions of local Internet interconnections were superfluous and would lead to market distortions.

**Mr. Geoff Brighton**, and **Ms. Priya Sinha**, from OFTEL, were the next speakers and they gave a presentation on unmetered Internet access in the UK with FRIACO. They first provided an overview of how British Telecom's network architecture had changed since 1999 in order to separate Internet traffic from other traffic and to introduce an unmetered retail service. Responding to a complaint from MCI/WorldCom in December 1999, OFTEL determined that new entrants were exposed to significant risk in offering their own unmetered retail price options if metered wholesale prices applied. BT argued that it faced the same risk and unmetered wholesale would overload or collapse its trunk network. OFTEL's view was that other operators could not compete effectively with BT without appropriate unmetered wholesale pricing, and that wholesale product could reasonably be provided at the tandem premises. In recounting the evolution toward unmetered access, Mr. Brighton said that OFTEL's experts found, in May 2000, that introduction of unmetered system would exhaust BT's tandem network capacity by mid-2001. Accordingly, they recommended that BT should move to IP interconnection for Internet traffic with wholesale unmetered call origination. The speakers then explained the steps that would be undertaken to implement FRIACO. Ms. Sinha explained the technical aspects of FRIACO, *i.e.* how FRIACO charges were calculated, including the concept (fixed charge for a virtual circuit for call origination for Internet access) and the methodology used by OFTEL. She noted that FRIACO was still undergoing work to refine it. In conclusion, she mentioned that FRIACO was necessary to address pressure for sustainable unmetered access: lack of suitable wholesale alternatives: network capacity constraints: and to bridge the gap until broadband became widely available.

## **Session 5: ENUM INFORMATION SESSION**

### **Chaired by Ms. Karen Rose, NTIA (USA)**

Following introductory remarks by the Chair on ENUM as forum for standardisation to use telephone numbers and telephone keypads to find services on the Internet, **Mr. James Casey** of Neustar was the first speaker of this session. He opened his presentation by introducing Neustar as the leading provider of database, clearinghouse, and registry services that enabled communications networks to interoperate. He also introduced Neustar's expertise in numbering, including being the North American Numbering Plan Administrator, US Number Portability Administration, and its neutral and third-party character in performing these functions. Mr. Casey then described how to find services on the Internet with a telephone number, namely the ENUM standard protocol. He showed in detail the structure of ENUM/DNS Directory service and how it worked technically using a sample flow. He also covered the definitions of various tiers. Then he introduced the progress of work at the global level (Global ENUM) including the collaborative efforts by the ITU and IETF to advance ENUM, noting that the ITU was

seeking a global implementation of ENUM. Turning further to policy aspects of ENUM, he stressed that countries should participate in a single common approach to implement ENUM in accordance with ITU policies. He also stressed that national control over the domestic implementation of ENUM was most important. Other policy matters according to Mr. Casey included selection and regulation of various ENUM entities, and privacy.

The next speaker, **Mr. Anthony Rutkowski** of VeriSign presented a public policy perspective on an emerging ENUM directory services marketplace. He started with an explanation of VeriSign, being a company that built and scaled commercial Internet Domain Name Systems infrastructure and which was the principal architect of Internet digital certificate and digital cash infrastructure. Mr. Rutkowski said Verisign had also pioneered key open ENUM technology initiatives. He emphasised that the central thrust of ENUM was to converge namespace directories. Mr. Rutkowski described the pros and cons of using the PSTN and mobile telephone numbering systems in relation to ENUM. On the positive side he mentioned familiarity and that it would facilitate IP telephony. On the other hand he noted that these systems had an inheritance of monopoly regulation and that there were privacy concerns. He also pointed out that viable public implementation of ENUM still required significant technical, operational, and business experimentation. Mr. Rutkowski said that differentiating providers in terms of reliability, performance, and so forth would be key as well. He mentioned that one of the main public policy issues would be if governments should regulate online directory services like ENUM, but that it would be inappropriate and premature because the technology and business were immature and the situation is an unprecedented one. In his view existing generic laws and competition policies would suffice and privacy issues would be best solved by differentiation among competitors in the marketplace. In sum, market place solution would be better to serve public interest, as companies offered competitive ENUM solutions would better deal with consumer concerns such as privacy and security.

In his remarks, **Mr. Carsten Hess**, Director for European Affairs of WorldCom summarised the work in progress regarding the Memorandum of Understanding between the ITU and IEFT (Internet Engineering Task Force). He explained that protection of telephone users was one of the most important issues to be addressed in the MoU. Also, the MoU was aimed at creating a single tree structure of DNS. He also explained the ITU guidelines being developed in co-operation with IETF for the global implementation of ENUM.

**Mr. Ewan Sutherland**, of INTUG provided a perspective from users on ENUM. First he explained the membership and activities of INTUG as a telecommunication's users association. From a user's perspective, according to him, there were a number of issues and concerns with ENUM. There was a question, for example, as to whether people wanted to be identified by their telephone numbers. Certainly, Mr. Sutherland felt, there would be some commercial and other organisations that might wish do so. Mr. Sutherland also said there were a number of complicated problems such as what happened if someone moved to another country. At the same time he noted that many households would have a single telephone number in view of the fact that majority of people still had one Internet connection per household. Mr. Sutherland noted that there were certain things that ENUM did not do such as providing routing information, ensuring that the DNS was populated, and ensuring interconnect or inter-working of competing services. On the other hand he acknowledged that there were certain things that ENUM did such as integrating PSTN and Internet, the potential to improve less expensive IP telephony and to act as a possible bypass to GSM bottlenecks. Mr. Sutherland raised questions that users would have including, when ENUM would become available, the pricing, who would control it, security, and so forth. He stated that privacy was another important issue. From a perspective of public policy, he said, fragmentation and private monopoly should be avoided and consumer confidence should be ensured. Regarding how to measure the success of ENUM, he believed that it should be measured in respect of rapid deployment, accurate population of databases, simplicity of use, confidence and security in use and low cost. Finally he noted that there were competition law problems in areas such as interconnection and inter-working.

## **Session 6: ROUNDTABLE: the future of communication traffic exchange**

**Chaired by Mr.. Michael Tiger, Chairman of TISP (Canada)**

Following an introduction of speakers by the Chair, this last roundtable session started with a presentation of **Mr. Farooq Hussain**, CIX, who talked about the next generation interconnection of Internet. Mr. Hussain commenced with an overview of recent trends in the Internet interconnection. He said the number of Interconnection points was not increasing significantly in the United States, that large service providers had withdrawn from Internet exchange providers (IXPs), and that there was a preference for direct interconnection. He continued that there were less than 150 IXPs world-wide and that the growth of IXPs had slowed in key regions. Considering as well that a mix of interconnection models that were in use, there was a continued need for 'service provider neutral' facilities for interconnection. Mr. Hussain then summarised some next generation optical technologies for routing that were being introduced. He said that one of the capabilities this technology had was an increased capability for customer networks to manage routing and for increased quality of service in terms of being able to guarantee bandwidth. He suggested there might be new options for sharing interconnection costs and a potential growth in direct interconnection.

**Mr. Dai Davies**, Dante, was the second speaker in this session, and in his remarks he took up the issue from a user's point of view. One of the most important issues for users was that a certain guaranteed level of services be available, *i.e.* a reasonable and predictable level of services needed to be provided. At present, he said there were uncertainties, in this respect, with the Internet. From the perspective of someone managing one of the largest user networks there were increasing challenges in this regard, such as in interconnection requirements, in the many-to-many environment as, for example, suppliers were fragmented. He stated that development of infrastructure in the European continent was still an important issue as many networks still had patchy geographical coverage. He also said that the progress of liberalisation in different countries telecommunication markets was still a very important issue. In his view there was more to be done in ensuring market functions properly and to bring the benefits of cost effective telecommunications to users. Mr. Davies also touched on security issues. He noted that issues of what he termed "network vandalism" were of increasing importance and that issues of consumer protection were involved. He concluded by emphasising that there was a continuing need for governments to intervene in the interests of users in areas such as security and to safeguard competition..

The next speaker, **Mr. Ian Martin**, ABN-AMR.O, provided a financial perspective regarding new entrants in European markets. First he introduced financial performances of European backbone operators and showed that the revenue trend for the first half of 2001 marked a significant growth over 2000. He noted that these revenues came mostly from data communications rather than voice communications. Also he showed the performance in terms of EBITDA during the same period. In the area of capital expenditure, it was pointed out that C&W was one of the largest investors among new entrants. His analysis led to the finding that the key factor determining the performance of alternative network operators was cost control. In his view one of the most important factors for new entrants was building up the next generation networks, as defined by broadband end-to-end capacity and optical switching. He stated that this would bring new benefits in terms of new products and lower costs, bringing new revenues to the operators. Mr. Martin then gave an overview of prospective pan-European end to end (increasingly IP backbone) network operators. Finally, he compared the European situation with North America and Asia from a number of perspectives such as voice/data ratio, customer base and so forth.

**Mr. Scott Marcus**, Genuity, wrapped up the discussions by going over very briefly the presentations by previous speakers from the two days. He made a particular reference to an issue discussed in APEC arena, *i.e.* the ICAIS issue, and another one of digital divide for the least developed countries. He referred to appropriate roles for governments and international organisations. In closing the workshop, **Mr. Michael Tiger** commended panellists, thanked OECD and Ministry of Economics and Technologies for their support, and Mr. Dietmar Plesse and his colleagues for their excellent local organisation. **Mr. Dimitri Ypsilanti** (OECD) also thanked the Ministry, speakers and participants. He said that the workshop would provide a foundation for future work on this issue by OECD.