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WORKSHOP "THE FUTURE OF THE INTERNET": PROCEEDINGS

Held on 8 March 2006

This document contains the proceedings of the OECD Workshop on the Future of the Internet, co-organised by the Organisation for Economic Co-operation and Development, and the US National Science Foundation held in Paris on 8 March 2006.

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MAIN POINTS

1.   This document contains the proceedings of the OECD workshop, "Future of the Internet", held in Paris on 8 March 2006. The event marked the beginning of the project on the future of the Internet by the OECD Committee for Information, Computer and Communications Policy (ICCP) and attracted some 160 participants.

2.   The objectives of the workshop were as follows:

- To provide the venue for an exchange of views and information between policy makers, experts from the research community and from the private sector, academia, and civil society.

- To discuss the trends shaping the future of the Internet and foster a forward-looking, international discussion on critical issues related to the future of the Internet.

- To explore the various approaches – technical, regulatory, and economic– that are being taken or can be taken to create new functionality for and increased trust in the Internet, in order to promote its sustained growth and adoption.

- To identify opportunities for increased international co-operation on pressing issues.

3.   The morning sessions concentrated on technical, social and economic trends shaping the future of the Internet and on technical/research approaches being taken to address some short-term and long-term issues on the Internet. The afternoon sessions focused on policy approaches, with perspectives offered from the public and private sector, and on international multi-stakeholder co-operation efforts for Internet governance. Participants shared the goal of working to "invent the future", whether from a technological or a policy viewpoint.

IS THE INTERNET READY FOR ITS FUTURE ROLES?

Strong economic and social drivers for the Internet mean that the world's societies and economies increasingly depend on the Internet

4.   The economic and social drivers for Internet adoption and widespread use are strong and participants agreed on the pervasiveness of the medium. Beyond the current Internet, a set of new technologies, such as radio frequency identification (RFID) and location-based technologies, are predicted to enable new innovative applications.

5.   Participants view the future Internet as user-oriented, with a significant role for active users creating new content; ultimately leading to increased innovation as well as new business models.

6.   While participants agree on the importance of intellectual property rights, they expressed very different opinions on the enforcement of these rights: some considered them essential, providing incentive to innovate, while other considered them as potentially hindering innovation, when enforced thoughtlessly.

7.   As a result of the economics of the industry, convergence is finally taking place at various levels: at the content level with Video on Demand (VoD) and television over Internet Protocol networks (IPTV); at the business level, with cross-ownership and triple play services offered by telecom operators and broadcasters; at the network level with unified networks to transmit signals; and at the device level, with multi-purpose devices.

8.   The Internet is widely viewed as both a critical infrastructure in itself and a key enabler of other forms of critical infrastructure. Participants agreed that the Internet plays and is likely to play an increasingly important role in support of critical infrastructure such as transportation, telecommunications, broadcasting, banking, finance, and provision of government services.

9.   Therefore governments feel the need to be involved in its future, although the limits of public policy for the Internet are also widely recognised, underscoring a necessary balancing act.

The Internet does not currently meet requirements to satisfy its role as a critical infrastructure

10.   After three decades, the Internet is becoming a mature network. Participants believe that in many ways, the Internet "only just works" and that, while short-term improvements can be made, for the long-term, the research premises on which the Internet was built need rethinking, in order to enable new paradigm shifts that preserve and expand opportunities for innovation and economic growth.

11.   There is widespread recognition of the challenges facing the Internet including convergence with other communication platforms, in particular telecommunications and broadcasting. The Internet as a collection of independent systems is not currently capable of properly handling many existing and foreseen applications. However, it has demonstrated a clear capacity to foster competition and innovation.

THE MOST DIFFICULT CHALLENGES ARE ECONOMIC, SOCIAL OR POLITICAL, RATHER THAN TECHNICAL

12.   The opportunities offered by faster, more capable, and increasingly pervasive IP (Internet protocol)-based applications at the service level, both wired and wireless, are accompanied by issues that need addressing at the infrastructure level, including ensuring reliability and manageability, security and privacy, interoperability of the network of networks, and enabling the global open exchange of information and views.

13.   Most challenges are not solely technical but are rooted in issues of economics, ownership and trust. In particular, no-one "owns" the security issues, and there needs to be more co-operation between competing network providers and researchers in order to find solutions that mitigate the effects of security breaches.

Sustainable business models are needed to support infrastructure development

14.   Participants agreed on the need for sustainable business models to support the deployment of infrastructure, although with the Internet there is often tension between ease of use and cost recovery:

- In a competitive market, Internet service providers have often lacked incentives to adopt new standards developed by the research community to improve functionality or security. The examples of IPV6 (the latest version of the Internet Protocol), multicast and QoS (quality of service) were given to show the failure to adopt innovation of private firms competing to provide network services, due to lack of capital and of incentives to make the necessary investments: success requires every network provider to implement and does not provide any competitive

advantage. On the other hand, firms co-operating at the edge are successfully innovating (search engines, news delivery, VoIP).

- A key role is to be played by the private sector, in particular developing sustainable business models and encouraging innovation and users' creation of content. However, participants stressed the difficulty in an environment that is currently in flux of determining both the identity of a service recipient as well as the beneficiary of value and therefore of determining which party to bill and how. On the other hand, new synergies are being discovered between telecommunication infrastructure providers and content providers and marketplace solutions developed within "walled garden" networks, conditioned by favourable regulatory environments. In addition, although at this stage of development there are limitations in terms of full substitutability between wireless and terrestrial communications facilities, wireless is creating considerable new market opportunities for content owners.

- Policymakers also play a role in balancing the needs and interests of consumers, service providers, industry, online content creators, and encouraging environments that foster innovation, investment and growth.

Allocating wireless spectrum requires a global strategic approach

15. Many participants stressed the importance of wireless communications and expressed the view that spectrum allocation has become a strategic international issue that is key to connecting anyone or anything. In addition, it was suggested that governments could reduce the cost of network build-out by charging less for spectrum use.

Evolving towards an inclusive multi-stakeholder approach is the starting point for good governance in the information society

16. Participants agreed that as global Internet governance evolves in the future, international multi-stakeholder co-operation should play an increasingly important role. The process should focus on transparency, expertise and adequate representation. The new Internet Governance Forum is seen as the right forum for moving forward on Internet governance issues and other global issues such as capacity building, spam, multilingualism and security. Participants also credited the OECD with a key role in helping bring issues to the surface early on from a systemic perspective, and identifying ways to work on them.

The ability to measure and assess the network's performance is essential for informed policy but is lacking today

17. The Internet still represents a "black box" for many stakeholders, despite its status as an increasingly critical infrastructure in many countries. As the Internet grows in importance, it will inevitably become an object of significant public policy engagement. As it does so, the lack of understanding of fundamental characteristics of the Internet's macroscopic structure, workload, performance, and scalability could pose significant challenges.

18. Misunderstanding the Internet is partly due to its complexity and that it defies some kinds of measurement and analysis that would inform public and private sector stakeholders. It is also the case that the Internet has been not grown up with the sectoral reporting requirements that accompanied the regulation of the telecom sector. Many direct Internet participants have conflicting commercial interests, and little incentive to share proprietary information. What information is shared on a voluntary basis is naturally informed by particular commercial interests. Although tools have been developed to provide

objective third-party Internet performance and security metrics, limited support and co-operation have constrained widespread deployment. Greater interdisciplinary and international support for scientific Internet measurement and evaluation could result in severely needed objective inputs to inform Internet policy development and evaluation.

PUBLIC RESEARCH, AN INTER-DISCIPLINARY APPROACH, AND INCREASED CO-ORDINATION ARE NECESSARY

19.   The "Internet" is not a network *per se*, but rather a continually expanding universe of administratively independent networks, each built to address specific users and service requirements, assembled using locally available inputs, in accordance with locally defined rules and commercial conditions. This universe currently encompasses almost 23 000 individual "autonomous systems," with some 300 new networks appearing, and 100 or more disappearing every month. No single network directly controls more than a small fraction of the estimated 1.5 billion publicly visible Internet resources.

20.   Nevertheless, in general, each Internet resource is able to reach all of the others thanks to inter-operable technologies and institutional practices that represent the Internet's defining features. The concepts of overlay networks and virtualisation networks were highlighted as enabling networks to perform different tasks such as manage grids or critical infrastructures.

21.   Several participants stressed the need for networks to be designed to remain neutral with regards to applications, *i.e.* support any possible future applications.

22.   A key challenge relates to how the Internet can be developed in a more efficient way, so as to reach long-term goals, while it is kept working. A critical goal for both medium and long-term planning is more effective co-ordination activities across the Internet community (*e.g.* between equipment vendors, Internet providers, researchers, economists, academics, and policy makers).

Short and medium-term approaches

23.   Meeting participants identified several technical strategies that might provide potentially useful solutions to current problems. These include IPv6, and the ITU-T led Next Generation Network (NGN) standardisation efforts, aimed at upgrading circuit-switched networks to support new applications. Policymakers need ways to assess whether new technical approaches are consistent with those factors that have contributed to the Internet's unique success to-date.

24.   Many governments, including those of Canada, the United States, China, Japan, Korea and in Europe, are fostering infrastructure facilities and services where returns are long-term and shared, through active public policy strategies.

Basic, pre-competitive research is needed to achieve long-term goals

25.   Longer-term pre-competitive research is needed in many areas. Research investments are necessary in order to create the environment for the discovery of new paradigms. The goal of network investigation environments with low costs of failure, such as GENI, is to make experimentation at scale possible and to encourage experimental research attitudes at the architectural level, which is not possible with the current Internet.

26.   An inter-disciplinary approach is required, that takes into account economic, social and regulatory issues. In addition, international co-operation and collaboration among stakeholders is needed, and there is a role for both public research and private research.

27.   Closing the gap between long-term research experimentation (such as CANARIE's CA*net[4] or the future GENI facility) and actual implementation will be a major challenge, and managing the process of change and transferring outcomes of research into the real world requires caution and forethought.

WELCOMING REMARKS AND INTRODUCTION

28.   The workshop was opened by Hugo Parr, Chair of the OECD Committee for Information, Computer and Communications Policy. He underlined the growing importance of the Internet in the global economy and that, while the future of the Internet cannot be predicted, many trends shaping the future of the Internet are here to observe and act upon. He emphasised the goals of the workshop *i)* to foster international and inter-disciplinary dialogue on the future of the Internet by discussing the initiatives that are being undertaken by policymakers, research institutes and academia worldwide, private sector actors, and civil society actors; *ii)* to start to build an international community of experts from various fields who can begin to work together to address some of the issues associated with the future of the Internet; and *iii)* for the OECD ICCP Committee to help identify and prioritise some key areas of focus for its programme of work on Internet-related policy issues.

21.   Mr. Parr concluded his remarks by thanking the US National Science Foundation for its active support in organising the workshop with the OECD and by thanking the Internet Society and IBM for their support.

SESSION 1. THE INTERNET AND GLOBAL NETWORKS: VISIONS OF THE FUTURE

29.   **Jennifer Schenker**, International Editor, Red Herring, and moderator of the session, introduced the first session by stating that a large amount of innovation happens on the edges of the network. In the future, assuming enough bandwidth for all the devices connected at the edge of the network, both people and objects will be connected for many everyday things: for instance, parents could be notified over the Internet when their children are dropped off by the school bus.

30.   She ventured that issues of neutrality, censorship and privacy need to be addressed. She further suggested that there may eventually not be any dominant languages on the Internet (like English or Chinese), since e-businesses, in order to succeed, will need to address most users in their own language.

31.   **Trevor Barr**, Professor of Media and Communications, Swinburne University of Technology and Program Manager, Smart Internet Technology CRC, Australia, reported on the results of an Australian study on the future of the Internet, which uses "schools of thought" through which to view the future of the Internet as four different scenarios: *i)* the first is a continuation of unanticipated user innovation with a user-centred design (*e.g.* blogs, wikis, podcasts etc.); *ii)* the second is that people don't need a smart Internet, but instead, an Internet for all, which leads to difficult questions of ensuring universal access and exchanging digital content freely within self-organising digital communities; *iii)* the third school envisages rich media, multi-device environments, with anyone accessing any content on any device at any time in natural language and *iv)* finally, the fourth school believes that the rate of Internet problems are growing faster than we can solve them, which will lead to chaos.

32.   Mr. Barr believes that the Internet, driven by innovative new killer technologies, will become an indispensable lifestyle tool, integrate location-based technologies and a changing relationship between content and context, cause structural change in some industries such as travel or the hyper distribution of media, and usher in a new do-it-yourself media culture (*e.g.* 100 million new blogs predicted). His viewpoint was that the future of the Internet was not chaos, nor would it bridge the "digital divide": hence necessitating "Internet for All" strategies.

33.   **KC Claffy**, Principal Investigator for the Distributed Cooperative Association for Internet Data Analysis (CAIDA), stated that the main challenges facing the Internet today are tied to economics, ownership and trust (EOT). The Internet was explicitly designed to facilitate efficient multiplexed use of existing (incumbent) networks, but not to reproduce or replace them. This design philosophy has led to a complex ecosystem of tens of thousands of independent networks, and to unprecedented growth, economic dynamism, and innovation in information, entertainment, services, and technologies. Indeed, the Internet is becoming essential to most other economic sectors and activities. However, this distributed service model has also brought unique co-ordination challenges. Claffy believes that effective solutions to many perennial operational problems, *e.g.* network security, authentication, spam, scalable configuration management, robust scalability of routing systems, will depend on resolution of the underlying challenges of economics, ownership and trust.

34.   She stated that free markets have not solved core infrastructure issues. For example, backbone provisioning is returning profits toward zero, with a consolidation toward monopoly, as well as insufficient security and innovation.

35.   She stressed that there was an urgent need for funding research on the key economic sustainability issues that need to be addressed when considering any new architectures. She re-emphasised that the main issues of safety, scalability, sustainability and stewardship (four "S"s), are not only technical in nature, but affect economies and democracies, and are interconnected. She further noted that there was a need for public sector help including a need for sound measurement and analysis methodologies, in order to develop enlightened policy.

36.   **Jun Murai**, General Chair Person, WIDE Project. Vice President, Keio University. Professor, Faculty of Environmental Information, Keio University, Japan, gave a technological perspective on the future of the Internet. With packet-switching technologies providing the common digital platform for all economic and social activities today, he described the recurrent process of *i)* non-profit research and development and experimentation by academia followed by; *ii)* deployment in business and feedback; and *iii)* development of economic and governance issues, that lead to a return to the starting point of research and experimentation.

37.   Regarding requirements for the future of the Internet, he emphasised wireless technologies, including RFID, and provided examples of how the wireless Internet supports mobile *ad hoc* networks for transportation systems, elderly care, digital cash, etc. As a result, he believes that spectrum allocation has become a strategic international issue, key to connecting anyone or anything. In addition, the speed-of-light offered by lambda Internet (spanning the globe in 133 ms) enables very high-speed real-time communication. He continued by stating that in planning the future Internet, an evaluation needs to be made of "best line of sight" connections providing shortest latency, versus existing global fibre connections that follow coast lines. He added that one-to-many (multicast) could be used on satellites to provide universal connectivity. He mentioned overlay networks whereby creating logical networks over IPV6-enabled Internet raises additional issues. He concluded that the globe is covered with air, allowing us to communicate with each other in less than one second and that this environment constitutes the infrastructure for the future of the Internet.

38.   **John Horrigan**, Associate Director, Research, Pew Internet & American Life Project ("The Social Impact of the Internet: Content Creation & Social Networking Online"), reported that their December 2005 research showed that home broadband users: are content creators and managers, consume a wide range of online information (news, medical information etc.) and use the Internet intensively for a variety of online activities. He stated his belief that an open access (network-neutral) model is consistent with the behaviour of early-adopters of broadband and that upload, as well as download, speeds are important.

39.   He added that 36% of the US adult population used broadband and that users increasingly rely on the Internet for news. They also use the Internet heavily for gaming and entertainment, as well as for producing creative content, with a greater impact for the younger age groups and 35% of the users aged 50 or more creating online content. Furthermore, for the "high-power" online users, the Internet has become the most likely place to gather news.

40.   Mr. Horrigan concluded that, as the Internet is more and more embedded in people's lives, society is at an inflection point regarding the Internet's impact for governance and civic life and that an open Internet is crucial.

41.   **Mauro Sentinelli**, Managing Director TIM International NV., Deputy Chair GSM Association, reminded the audience that the GSM association represents 1.7 billion phone users throughout the world and that one of the reasons mobile phones and increasingly, PDAs with Internet access, have been so successful is the use of calling-party-pays billing plans, where the person initiating the call is the one who pays and cascade payments are carried out between providers.

42.   He pointed out that the Internet is different, as each side pays a flat fee for its part of the connection (thus creating the "spam" problem), and that, as mobile and IP networks converge, it is necessary to retain a "calling-party-pays" system to avoid degraded quality and efficiency, lack of scalability or admission control, as happens with mobile TV when there are too many users ("best effort"). He re-emphasised that with mobile and broadband as the future standard access platforms, business sustainability depends on retaining this model.

43.   Gus Hosein, Senior Fellow, Privacy International, warned about dangerous dynamics whereby both governments and industry are trying to collect ever more information on users and centralising data in large databases that often lead to security breaches.

44.   He further forewarned that laws aimed at protecting individuals' privacy are difficult to implement although people retain privacy expectations.

Panel discussion

Calling-party-pays model

45.   KC Claffy, noting that the market has not been able to resolve the payment model, raised the difficulty of determining where value is generated and who benefits from an Internet communication transaction, in order to derive an appropriate payment system. Who should pay for e-mail, sender or receiver? Charging the sender is challenged by lack of authentication of source IP address in an IP packet, hindering identification of actual sender. Charging the receiver brings its own measurement challenges, but will also have a dramatic effect on the prevalence and usage of mailing lists, as complex charge-back mechanisms are deployed to recover costs from receivers. Claffy challenged the contention that traditional telecommunications "caller pays" billing arrangements are a viable alternative to the Internet's flat-rate model, noting the collapse of the ITU's international accounting arrangements and the increasing migration of voice services to flat rate models as evidence that an altogether new model might be needed. The

challenge for researchers and policy makers is to develop models of cost recovery that support a reasonable return on investment without sacrificing the openness and innovation that gives the Internet its greatest social value. Mauro Sentinelli believes that in order to sustain investment for the future, value-added services should be treated like SMS, *i.e.* paid by the sender, not the receiver. Jun Murai answered that when there are clear processes and a clear distinction between user and provider such as in the SMS example, charging models are possible. However, he noted the difficulty of identifying applications beneficiaries in the current and future Internet where there is significant uncertainty and creativity, in terms of applications as well as change of beneficiaries. He ventured that there could be a future charging system, but that using the public Internet infrastructure, which provides a basic platform for development, should be differentiated from other types of charged services. Trevor Barr believes that Internet services should include public policy safeguards to ensure universal service for some disadvantaged groups, including rural dwellers or the disabled, so as to narrow the divide between information-rich and information-poor.

Role for international organisations to develop best practices and which organisations

46.		Gus Hosein recalled the role of the OECD in privacy guidelines and data flows as well as in cryptography, but he remains suspicious of international organisations, such as the EU, UN, or Council of Europe, who so far have been slow to act to protect privacy, focusing instead on law enforcement. Trevor Barr pointed out the somewhat ambivalent attitude of individuals towards privacy, appreciating it, but being ready to trade it off for some services they consider important.

Concrete ways for policy makers to fix the economics of ownership and trust

47.		KC Claffy replied that interdisciplinary network research was difficult to achieve, but required nonetheless. Although the commercialisation and privatisation of Internet infrastructure produced vast benefits, it also handicapped the Internet research community, especially with respect to innovation of the core Internet architecture. For example, the technical community invested over ten years in developing technical protocols to support differentiated quality of service (QoS) of traffic across different administrative domains. This effort failed to get traction in an inter-domain way, *i.e.* across different providers, for reasons that eventually became obvious: the IP architecture had no supporting "market layer" of enforceable agreements between providers, and bandwidth-multiplying "multiplexing" technologies[1] rendered irrelevant the notion of QoS for the core providers who would have to support such an architectural shift. Claffy reiterated that research on next-generation architectures must consider economic and regulatory issues as well as expected technological developments.

Multi-homing functionality in IPv6

48.		IPv6 represents another attempt by the technical community (the IETF[2]) to design a next generation architecture whose deployment ran into EOT (economics, ownership, and trust) obstacles. KC Claffy mentioned a recent NANOG (North American Network Operators Group) meeting where network operators insisted that a primary reason they were not investing in IPv6 deployment was deep dissatisfaction with the way IPv6 supports multihoming, *i.e.* redundant interconnection and traffic exchange with two or more independent networks. Indeed, multihoming has become a key tenet for designing robust IP networks: compensating for the best-effort nature of the IP architecture with topological diversity. Claffy speculated that continued dissatisfaction with IPv6's approach to multihoming could stimulate broad interest in another next-generation protocol.

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[1]		Such as DWDM, Dense Wavelength Division Multiplexing, an optical technology used to increase bandwidth over existing fiber optic backbones.

[2]		IETF : Internet Engineering Task Force.

Session summary

49.   Jennifer Schenker summarised the participants' key points:

- The Internet is an indispensable lifestyle tool and one that needs to work for all (Trevor Barr).

- The Internet will be used for everything, including transport, and integrated in all parts of our lives and that spectrum allocation is a strategic issue that requires tackling on a global basis (Professor Murai).

- Young people's use of the Internet is clearly creative (John Horrigan).

- Both technical and business model issues regarding the Internet still need to be resolved (KC Claffy).

- In order for the Internet to provide new services, it is necessary to move towards more sustainable business models (Mauro Sentinelli).

- Privacy concerns still need to be addressed (Gus Hosein).

SESSION 2. SETTING THE NEXT STAGE

Panel A. Technical/research approaches

50.   **Patrick Cocquet** stated that ICT is different from other fields in that it impacts all sectors of the economy and can bring new solutions for socio-economic problems, as well as new services to customers.

51.   He pointed out that research is required to realise a next wave of ICT developments, to bridge ICT and other disciplines, such as bio or nanotechnology, from where radical innovation will arise. He described technology development trends for next generation ICT as networked, mobile, seamless, scalable, always-on and always connected, embedded into everyday things, in an invisible way for the user, bringing new forms of intelligence, personalised: hence more user-centered. He stressed the need for a systems-wide and inter-disciplinary approach to research and asserted his belief that IPV6 is the solution for the future to bring back true end-to-end connectivity as well as reliability.

52.   **Peter Freeman,** Assistant Director for Computer & Information Science & Engineering (CISE), US National Science Foundation emphasised the importance of international partnerships for research and of robust, experimental, scientifically-validated methodologies for network and distributed systems research and that, while IPV6 is an improvement from the early 1990s, the Internet is not ready for its future role in critical infrastructures, transportation, telecommunication, banking and finance.

53.   Mr. Freeman explained that the US approach with the Global Environment for Networking Innovations (GENI) project is based on serious experimentation at scale, with new architectures, technologies, services and policies, incorporating security, end-to-end models for mobile data, location-aware networking techniques, etc., starting initially with the exploration of new solutions to networking issues. He also emphasised that industry, as well as international partnerships, are important for the success of the project and that the NSF's presence at the OECD ICCP workshop was a first attempt at bringing an international dimension to the project.

54.   Mr. Freeman further explained that the GENI project was intended to be a large, shared, experimental facility for the scientific community, aiming to bridge the gap between small scale test beds and architectures that are ready for large scale deployment, and to explore ideas beyond any current solutions for use 10 to 20 years from now. While existing test-beds are built for specific new technologies or specific new architectures, the GENI experimental and shared facility should allow concurrent exploration, by real users doing real work, of a broad range of experimental networks and distributed services. It should further allow for interconnection with other networks and allow thorough measurement.

55.   **Mark Handley**, Professor of Networked Systems, University College, London pointed out that, while the Internet has been a great success, it does not do anything very well, and that, due to its size today, the costs of making changes are too great in comparison to benefits, thus creating, for example, a situation where people place phone calls on a network which is vulnerable to security attacks. With digital convergence actually finally happening, huge additional demands are placed on the net, although the solutions needed to support these demands are not in place. Instead, additional problems are accumulating faster than they are being fixed. With no significant architectural change at the core of the network for over a decade and as we put more demands on the network, the consequences of anything failing are increasing.

Just about every core piece of technology in the core of the Internet has short-term or long-term problems that need addressing, since the Internet is built out of pieces of technology that are a patch to previous problems caused by the Internet's failure to scale. Development cycles consist of equipment vendors responding to short-term problems and demands of Internet providers, resulting in non-optimal local maxima.

56.   For Mark Handley, the key challenge is how to change the Internet in a planned way – not through short-term-patches – to achieve long-term goals, without disruption of on-going Internet operations. Technical approaches that build on existing systems, such as Internet Service Provider approaches or IPv6 implementation are necessary. This process of switching is difficult, as exemplified by the slow take-up of IPV6. Quick solutions to particular problems (*e.g.* Network Address Translators or NATs to solve the perceived lack of IPV4 addresses) create unintended problems which make it ever more difficult to evolve the network. He suggested that evolving the network requires basic long-term research, while closing the loop between long-term research and actual implementation –as the GENI project is attempting – with more effective co-ordination between vendors, ISP and researchers. He expressed concerns about how the output of GENI would make its way into the real world and emphasised how carefully the process would need to be managed.

57.   Mr. Handley concluded that the principal critical issue for the future is more effective co-ordination activities; *i.e.* finding ways to bring together equipment vendors, Internet providers, researchers, economists, academics, public policy analysts. There have been some attempts to do this in the United Kingdom and within the Internet Research Task Force (IRTF).

58.   **Bill St. Arnaud**, Senior Director Advanced Networks, CANARIE, Canada, also stressed the need for Internet research and research and education initiatives. Noting that the Internet today is supporting other critical infrastructures, he listed some important trends: *i)* the impact on architecture and security of the current trend of customers acquiring their own networks and the interconnection of private business-owned networks; *ii)* new network architectures needed to support critical infrastructures and meeting the needs of "big" science (such as CERN, eVLBi and Ocean observatories) as the precursors of next generation needs; *iii)* the trend towards two-tiered Internet in the last mile might be addressed through technical solutions; *iv)* analysing the causes of the slow market adoption of IPv6 before moving to the next step after IPv6 and the DNS – taking into account these conclusions in developing new solutions might minimise regulatory and policy issues; and *v)* much of the research on Web 2.0, the next phase of the web, which will bring a revolution with the combination of services, needs to be performed on experimental networks such as GENI.

59.   Pointing out the large potential impact of "mash-ups" and service-oriented architectures (SOA), which allow ordinary people to create new value through the linkage of services (*e.g.* process material concept) to create new value and new services for other individuals, Bill St. Arnaud cited the case of the CA*net 4 Network in Canada, which supports many virtual networks each managed by different groups who control the topology, routing and architecture of their own network.

60.   **Sang-Chul Shin**, Vice President, IT Infrastructure Division, National Computerization Agency, Korea, highlighted current limitations of the Internet including the lack of IP address resources, poor quality of service in a "best effort" network, weak security in an open architecture, the absence of profitable business models and billing mechanisms, as well as the lack of an RFID/USN (ubiquitous sensor network) solution. The Korean government acts as a facilitator through its "IT839 Strategy" which contains both services, infrastructures and products, and aims to promote the development of the whole ICT industry.

61.	Mr Shin indicated that Korea's medium-term plan includes switching over to IPV6, the connection of the USN (Ubiquitous Service Network) with the Internet, and the management of network addresses, tag/sensor addresses and location-based addresses. Korea's long-term plan is to conduct research on a new Internet protocol concept and explore co-operation with other OECD members. He put forward Korea's strength in providing the environment and facilities to conduct tests.

62.	**Arshey Odedra**, Counsellor, ITU-T, International Telecommunication Union, ("ITU-T Next Generation Networks Standardisation") presented an overview of the standardisation process of NGN's (Next Generation Networks), and proposed the following definition for NGNs, which aim to enable anyone to do anything at any time, from any network: *"a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalised mobility which will allow consistent and ubiquitous provision of services to users".*

63.	Mr. Odedra further explained that the key concepts behind NGNs were: separation between service and transport, personal and terminal mobility, resource and admission control, QoS (Quality of Service) selection and control, as well as accommodation of legacy terminals and systems. The ITU created the Next-Generation Network Global Standards Initiative (NGN-GS1) in early 2006 to combine the work of expert working parties and aims to harmonise, in collaboration with other bodies, different approaches to NGN architecture worldwide.

64.	Patrick Cocquet summarised the session by stating that we are in the process of different migrations; from legacy telecommunications networks to IP technology, within the IP-world from IPV4 to IPV6, from transport system to a service system. These migrations are the results of usage.

Panel discussion

Anticipating Internet usage, so as to provide better support for new applications

65.	Mark Handley warned that it is impossible to anticipate, but that the network can be designed to support any new application. Peter Freeman replied that the focus of GENI is to address needs that are known today and those that can be reasonably predicted, but also to encourage an attitude or research methodology of experimentation so that, when a new service is proposed, one can experiment at scale before rolling it out *i.e.* take a more measured approach to new services.

The Internet as an assortment of networks

66.	Noting the different speeds in technology deployment, Patrick Cocquet differentiated migrating architecture that is a difficult task, from deploying new services, which can be done as soon as a business model warrants it. The chair asked whether we could consider today that there is one Internet infrastructure. Bill St. Arnaud replied that there is not one Internet network, but many, with varying types of interconnection. As a result, he believes that these networks will evolve over time to meet different types of needs. He emphasised the importance of overlay networks and virtualisation networks as they enable different networks to perform different tasks such as grids or critical infrastructures.

67.	Arshey Odedra stressed that there are many different networks (Internet, telecommunications, data, broadcasting, fixed mobile, operator networks etc.) and many services used on these various networks. He introduced the notions of goal and time-scale, specifying that the ITU NGN effort does not aim to invent the next generation of Internet but rather, is an approach towards next generation public telecommunications networks that will offer services that people are used to, as well as some possible

future services. He further noted that future services might be based on open APIs (Application Programming Interfaces) that would enable services from the top to hook onto an NGN services platform.

Proper tools to monitor the Internet are not available and more co-operation is needed

68.   Mark Handley stated that proper tools to monitor the Internet do not exist. As a result, the actual workings of the Internet are poorly understood. There is partial understanding based on experiments, but not at scale, and experimenting at scale is not possible because of the risk of breaking the network. Designing monitoring techniques is therefore a great challenge, akin to monitoring techniques used in epidemiology. He underlined that some co-operation exists on specific areas of research, for instance on mechanisms against denial of service (DoS), but that more collaboration between network operators and researchers is definitely needed.

Efforts to improve security do not eliminate security risks but mitigate their effects

69.   A participant commented that when building a freely and openly accessible network, it is not possible to prevent spam and other security threats, just like road design has nothing to do with the intentions of people who use it.

70.   Mark Handley replied that the technical situation can be improved, but that, unlike in other areas which can solve issues with laws, regulatory solutions are more difficult with the Internet due to the basic technology that is currently deployed and its cross-border characteristics. He believes that we can improve security on the technology side and that although security risks cannot be eliminated, their effects can be mitigated.

Panel B. Future policy frameworks for the information society

71.   **William Dutton**, Director, Oxford Internet Institute introduced this session. As moderator, he summarised the points made earlier in the day, *i.e.* that the Internet is not ready for its future role and that, as a result, it is necessary to spur investment in order to get to the next generation, and resolve important issues such as network neutrality, security, competition policy and far-reaching social implications of new networks.

72.   Using the United States as an example, he pointed out that some people are not interested in the Internet or, as in the case of children, are using the Internet solely for entertainment, thus hindering the development of e-government and other services. As a result, the challenge for future policy frameworks is to develop an active Internet, *i.e.* a creative medium.

73.   **Qiheng Hu**, President, Internet Society of China, Vice president of the China Association for Science and Technology, and Chair of the Steering Committee for the China Network and Information Centre, introduced the China Next Generation Internet (CNGI) initiative, which was adopted as a national project in 2003, with the active involvement of 8 Chinese ministries and the top 5 Chinese carriers. Its main purposes are to develop network technology and applications, helping to facilitate the development of the information industry, and promoting international co-operation on Next Generation Internet (NGI). She added that the CNGI initiative also has a role in transforming traditional carriers, which are evolving towards IP-based technology, hence evolving from basic telecommunications service providers towards comprehensive information service providers.

74.   Ms. Hu described CNGI as a nationwide demonstration platform and large-scale test bed for IPv6 SIP (Session Initiation Protocol), providing peer-to-peer communication, wireless and mobile applications, computing grid and data grid, video conference and HDTV (high definition television), environment

measurement, remote control of instrument and virtual reality, advanced manufacturing, remote education and digital library and remote medical treatment. She elaborated on field trials of NGI and NGN conducted in China, which involve several international collaborations, such as the China-Japan IPv6 Network test-bed and the China-US-Russia science trial network. Ms. Hu then presented the CERNET2 (Next Generation Education and Research Network) initiative. Launched in December 2004, it is a trunk test network infrastructure based on pure IPv6 that provides high-speed connection to international next generation Internet nodes through CNGI-6IX. This CERNET2 platform provides services for studying, testing and developing applications on NGI as well as international co-operation on NGI.

75.   She underlined the change in Internet users' behaviour, which has shifted from e-mail, to news and Internet search. As China has the largest number of mobile phone users in the world, the mobile handset is becoming the main terminal for Internet access, replacing the personal computer. Ms. Hu added that the number of Internet users in China could grow from an estimated 100 million currently, to 600 million by 2020, with growth of Internet usage and sustainable economic development supporting one another. Since the cost of Internet access is paramount to ensure future growth, China's challenge is to develop and commercialise low-cost and secure technology and products for its future network.

76.   She concluded by saying that the low-cost technology challenge, along with the promotion of the convergence of fixed and mobile and that of telecommunication, TV and Internet, and international co-operation, is a major task for China. The goal is to provide a ubiquitous and high-speed network that is accessible and usable for everyone, including people from rural areas and poor villages.

77.   Before introducing Ms. Deutsch as the next speaker, the chair pointed out that, while it is common knowledge that it is only a matter of time before Internet use is high in China, the role of China in developing e-science and in building the Internet may often be overlooked; although the Chinese government is the lead investor in the Internet infrastructure build-out in China.

78.   **Sarah Deutsch**, Vice President & Associate General Counsel, Verizon Communications pointed out that new synergies are being discovered between telecommunication infrastructure providers and content providers, *i.e.* "pipes and content". Verizon is deploying fibre optic cables with large bandwidth supporting Internet and TV/video: the "FiOs" service. Verizon is entering into business agreements with content owners, such as Disney, while bypassing cable companies who often refuse to license content.

79.   She further explained that the Verizon/Disney agreement is a good example of a marketplace solution in which Verizon helps to curb infringements of Disney's copyrighted works over the Internet, while at the same time appropriately safeguarding the privacy of Verizon Internet service subscribers. She mentioned that the situation in Europe is different in that ISPs have to comply with more stringent legal requirements. Ms. Deutsch then pointed out the considerable market opportunities offered by wireless, with 90% of mobile phones integrating a camera, the advent of high resolution and 3G phones that are transforming the mobile phone from a communications device to a tool used for music, multi-media, ring-tones, gaming, video on demand and multicast TV. Mobile telephony offers new licensing opportunities for content owners.

80.   As challenges with going forward, she explained the cumbersome franchising process in the United States, whereby cable and now telecommunications companies are required to obtain franchises from municipalities who often add delay and place excessive demands, and cable operators' campaigns to impede new entry.

81.   **Masaaki Sakamaki**, Director of International Policy Division, Ministry of Internal Affairs and Communications presented the policy Framework for Ubiquitous Network Society (also called e-Japan strategy) and the progress of Japan in the Broadband arena.

82.   Mr. Sakamaki pointed out the phenomenal (300% p.a.) growth of backbone traffic in Japan in a market being fuelled by convergence at several levels: at the content level (telecom, Video on Demand and IPTV), at the business level (telecom and broadcasters with cross-ownership and triple play services), at the network level (unified networks, both wireless and wired, to transmit signals of both telecom and broadcasting with broadcasting via communication satellite and via fibre-to-the-home) and at the terminal level (multi-purpose terminals). Broadband service subscribers in Japan have grown very fast with 30 million subscribers out of 45 million households and services are very high speed (26 MB service, some 40 MB for 20-30 USD per month) including on mobile 3G services.

83.   He underlined that the current "u-Japan Policy", after a previous focus on infrastructure, strives for the realisation of a ubiquitous network society by 2010 (with 100% of the population having high-speed Internet access and 80% feeling comfortable using ICT). The policy aims at meeting 21st century challenges, such as a declining birth rate and an aging society, in wide-ranging application areas, such as society and living, medical and welfare, labour and employment, transport and distribution, public safety and disaster prevention, and international affairs.

84.   Mr. Sakamaki identified ICT core challenge areas: convergence of telecommunication and broadcasting, regulatory issues in the IP area, Internet governance, the promotion of IPv6, as well as R&D in core technologies including RFID. He also delineated issues related to ICT usage including information security, illegal or harmful online information, intellectual property, privacy protection, and international co-operation. To materialise these objectives, consumers, industry and academia play a leading role in developing the economy and society, while government plays a supporting role.

85.   **Andrea Servida**, Deputy Head of Unit, European Commission, Information Society and Media Directorate General presented the ongoing European Commission work areas concerning the strategy for a secure information society, for adoption in April 2006: *i)* fighting spam, spyware and malware; *ii)* combating cyber-crime (both by prevention and better law enforcement co-ordination); *iii)* review of regulatory framework on integrity, security and privacy in the light of convergence, mobile services, pervasive ICT; and *iv)* the European programme on critical infrastructure protection (a green paper has been published).

86.   He highlighted the European Union's efforts to ensure the coherence of its policies, so that security is an enabler and does not hamper business. The EU shares the opinion put forward by some speakers on the crucial role of fundamental research; it considers research as a playground for assessing societal aspects as well as privacy and security issues.

Panel discussion

87.   William Dutton asked how decisions concerning major investments could be made, considering that the future of communications is uncertain. Ms. Qiheng Hu, while acknowledging that the future of the Internet is indeed uncertain, replied that without investment, uncertainty would be even greater and failure would be guaranteed.

Panel C. International multi-stakeholder co-operation efforts

88.   **Mark Esseboom**, Director, Coordination, Strategy and International Affairs Directorate, DG for Energy and Telecom, Ministry of Economic Affairs, The Netherlands, and moderator of the session, introduced the session by reminding the audience of the lengthy debates during the World Summit on the Information Society (WSIS) process to delimit Internet governance – who should co-operate, with whom, on what issues. As global Internet governance evolves in the future, various forms of international multi-stakeholder co-operation are likely to play an important role. The first outcome of the WSIS was an

agreement on the need for further multi-stakeholder dialogue and discussion within a newly created Internet Governance Forum (IGF), focussing on cross-border issues such as spam, multilingualism and security.

89.   The second outcome of the WSIS process, still at a very early stage, is the call in the Tunis Agenda for "enhanced co-operation" on Internet governance, which should eventually lead to the development of public policy principles.

90.   **Markus Kummer**, Executive Coordinator, Internet Governance Forum Secretariat, identified three phases in the history of the Internet Governance debate:

> Phase 1 of WSIS in 2003: a "clash of two cultures" in which governments requested increased power on private sector-led Internet issues and a Working Group on Internet Governance (WGIG) was created bringing together governments, as well as the private sector and civil society.

> The WGIG legacy: a pioneer of the multi-stakeholder approach, whereby all Internet stakeholders participated on an equal footing and recognised the merit of multi-disciplinary discussions. The WGIG report shaped the outcome of the Tunis agenda: placing the debate on the development context, proposing a broad definition of Internet governance (not only DNS issues, but a broad range of public policy issues) and the creation of the IGF which imitates the OECD model of sharing best practices and exchanging information; and

> Phase 2 of WSIS in 2005: The Tunis meeting, with the creation of the IGF, as a multi-stakeholder and inclusive development-oriented platform for dialogue on public policy issues, sharing best practices and providing a neutral meeting point.

91.   He outlined the key issues for the first Forum discussions, against the backdrop of the overarching goals of development and capacity building: spam, cyber-crime, multilingualism, privacy and consumer protection, interconnection fees and measures to ensure that developing countries can actively participate in the work of the Internet Governance Forum.

92.   **William Drake**, Director of the Project on the Information Revolution and Global Governance at the Graduate Institute for International Studies in Geneva, also addressed the panel theme in relation to the IGF. He began by noting that the current architecture of Internet governance is highly distributed and comprises a heterogeneous array of public and private-sector rule systems and programs. These vary widely in terms of their substantive foci and institutional forms, and their diversity poses challenges due to the variable ability of different stakeholders to participate in or even track and analyse the multiple collaborations relevant to their interests. In parallel, the distributed governance architecture makes it difficult for the international community as a whole to address cross-cutting or multidimensional issues applicable to two or more mechanisms; "orphaned" or new issues that fall between the cracks of organisational mandates or, conversely, become contested territory; and potential complementarities or conflicts between governance systems. As the diversity and complexity of Internet governance arrangements is likely to increase in the future, it would be useful to have a mechanism that could, as appropriate, foster inclusive dialogue, collective learning, capacity building, holistic trend monitoring and analysis, and best practices across them.

93.   Drake suggested that the IGF could usefully play this role. Indeed, he pointed out that the report of the Working Group on Internet Governance (WGIG), which proposed the creation of the IGF, and the WSIS Tunis Agenda for the Information Society, which approved it, both specifically envisioned that the IGF could do so. For example, the latter mandated the IGF to, *inter alia*, facilitate discourse between

bodies on cross-cutting policies and discuss issues outside the scope of any existing body; interface with appropriate inter-governmental organiszations and other institutions on matters under their purview; facilitate the exchange of information and best practices, and strengthen the engagement of stakeholders in existing and/or future governance mechanisms; identify emerging issues, bring them to the attention of the relevant bodies and the general public, and, where appropriate, make recommendations; and promote and assess, on an ongoing basis, the embodiment of WSIS principles in Internet Governance processes. These principles hold, *inter alia*, that Internet governance should be multilateral, transparent and democratic, with the full involvement of governments, the private sector, civil society and international organisations. As such, the IGF could foster dialogue and analysis on the extent to which governance mechanisms are transparent, accountable, and inclusive.

94.   Drake noted that for political and operational reasons, it would be difficult to advance this agenda at the inaugural IGF conference in Athens in 2006. Accordingly, he suggested that stakeholders consider establishing a virtual working group to explore these matters with an eye to preparing inputs for consideration at the 2007 IGF to be held in Rio de Janeiro. Absent such an effort, the Tunis Agenda's mandate for the IGF would not be fulfilled, and the international community would continue to lack a mechanism to promote broadly inclusive engagement and cross-cutting improvements in Internet governance.

95.   **Mike Nelson**, Director, Internet Technology and Strategy, IBM/USA, VP of public policy, ISOC (Internet Society) listed the six goals of ISOC for preserving the openness of the Internet: preserve end-to-end (ability to connect); oppose censorship (ability to speak); open standards (ability to innovate); ensure fair use (ability to share); foster competition (ability to choose); security and reliability (ability to trust).

96.   He added that ISOC's focus today is the interrelation between policy, Internet standards and allocation of Internet resources. He stated his opinion that the Internet generated a clash of models, whereby governments are used to old models (government monopolies, subscribers at the bottom, and one international co-ordination organisation, the ITU or International Telecommunications Union), whilst the Internet is very different: millions of Internet users make the real decisions that drive the investments of thousands of IT vendors, network providers and ISPs, hundreds of governments and national consortia and many co-ordination organisations (standard bodies, intergovernmental organisations, non-governmental organisations, etc.) manage the Internet.

97.   Mr. Nelson believes that the next few years will be the most critical years for the Internet, as many issues are being discussed and addressed. He highlighted that technology can provide answers to some policy problems, such as for privacy, piracy, or pricing while other issues are purely in the governmental sphere, including trade policy, cybercrime, development aid, censorship, telecom regulation or e-government.

98.   Mike Nelson outlined three possible very different scenarios for the future: *i)* handling more issues at the inter-governmental level, *ii)* more private-international control or *iii)* taking a multi-stakeholder approach involving end-users. He stressed the importance of preserving the openness of the Internet with open standards, participation, users in control, and minimal governmental regulation. He pointed out that the IGF could be important in helping institutions and governments to understand the Internet's evolution. It could also highlight new issues and opportunities and involve groups that are currently under-represented in international discussions within standards organisations and within fora such as ICANN, the ITU or the OECD.

99.   **Olivier Muron**, Vice-President R&D Governance, France Telecom, explained France Telecom's involvement in the "technical governance" of the Internet, recalled France Telecom's support of the representation of technical actors (network operators and ISPs) within ICANN, stressed ICANN's

successes in a variety of fields, and stated his belief that ICANN's remaining problem is its institutional status.

100.　While welcoming the creation of the IGF, Mr. Muron cautioned that its success depends on meeting the following conditions: *i)* Strong private participation in IGF, in its work and organisations; *ii)* Focus on major topics, avoiding duplication of existing work and *iii)* Providing a framework for dialogue and exchange among stakeholders.

101.　The moderator (Mark Esseboom) concluded that we are currently in a new phase of the Internet and that it is necessary to involve all stakeholders, defining the role of each stakeholder, in particular that of government.

Panel discussion

Good governance and a multi-stakeholder approach

102.　Mark Esseboom commented that 'Multi-stakeholderism' does not mean that everybody has to be involved in everything. William Drake stated that 'Multi-stakeholderism' is important for good governance, but that transparency is another important element, and that all decision-making institutions have an obligation to be open and transparent. Mike Nelson agreed with the focus on transparency and "multi-stakeholderism", but stressed the need to make sure that participants bring expertise, provide real input and are representative of a group or community.

SESSION 3. ROUNDTABLE: NEXT STEPS AND THE ROLE OF THE INTERNATIONAL COMMUNITY

Summary of important elements from the Workshop

103.　**Hugo Parr**, Chair, OECD Committee for Information, Computer and Communications Policy, introduced the Session, stating the need for policy priorities to determine future work.

104.　**Tony Sims**, Director, Europe & International, Consumer & Competition Policy Directorate, Department of Trade and Industry, United Kingdom, Chair, OECD Committee for Consumer Policy (CCP) indicated that the consumer dimension of the Internet is an area where the CCP can assist the ICCP. He stressed the importance of the following points:

- Building consumer trust, with fair marketing, advertising and business practices, protection against fraud, and dispute resolution.

- Fostering consumer empowerment for increasingly complex technology offers, and improving communication from businesses to consumers.

- Recognising that consumers are creators and innovators while technological copyright-holders are protecting. And

- Keeping the net neutral in relation to content providers and preventing anti-competitive behaviour, including through disclosure to consumers and ease of switching Internet service providers.

105.   **Larry Landweber**, Senior Advisor, US National Science Foundation, focused on technology and research issues and stressed the following policy points:

- Paradigm shifts and technology changes are not predictable and we cannot assume that today is a precursor to the future.

- Intellectual Property protection is vital for innovation.

- There is an increasing risk to privacy and we should assume that an Orwellian 1984-type surveillance is possible. And

- Internet access is still uneven/asymmetric and not really broadband or high speed yet while for some applications, users need symmetry.

106.   He predicted that, in 2010, the Internet would be more user-friendly, but that "real" people will still have trouble using the Internet. He added that, in the technology area, the debate about packets and circuits has been going on for 40 years and optical technologies might have a great impact. However, significant research is still required because of the necessity to provide an environment conducive to the discovery of new paradigms. He stressed the participants' shared goal of working to invent the future, whether from a technology viewpoint or a policy viewpoint.

107.   **Keith Besgrove**, Chief General Manager of the Information Economy Division in the Department of Communications, Information Technology, and the Arts (DCITA), Australia, underlined that the sessions showed that many questions still required answers, and further research. He noted that bodies such as the OECD and ICCP helped to surface the issues and identify ways to work on them. With Internet as both a critical infrastructure and an enabler of other critical infrastructures, he considers it difficult for governments not to be involved. Furthermore, he expressed concern about the lack of adequate measurement and monitoring of the Internet, about the state of the current Internet, and emphasised the need to build much stronger security and trust. With regards to the GENI facility, he raised the question of how to concretely evolve the Internet and of how policymakers could better anticipate issues, analyse the network as a whole system, and address issues from a systemic perspective.

108.   **Andrea Camanzi**, Chair of the Business and Industry Advisory Committee to the OECD ICCP Committee, regarding the question on how to cope with change of the Internet, stated the belief of BIAC that relying on the evolution of technologies is a better strategy than drafting plans for replacing existing networks and services.

109.   He added that the importance of involving stakeholders in the evolution process should not supplant the question of how to build the next generation Internet. In this process, it is necessary to keep in mind the importance of investment, for which capital markets need to be trusted and, as a result, it is important to continue deregulatory policies to counterbalance risks and provide the right incentives for investment.

110.   **Hugo Parr** welcomed the proposition for more co-operation between the OECD Committee for Consumer Policy (CCP) and the Committee on Information, Computer and Communication Policy (ICCP).

111.   **Jacques Bus**, Head of Unit, ICT for Trust and Security; Directorate General INFOSOC, European Commission, cautioned that the strength of open simple protocols is also its weakness and that crime, policing, law enforcement, national security or protection of critical infrastructures, are legitimate and necessary concerns for governments.

112.   He added that much needs to be done, for example, with regards to privacy and security or issues related to new technologies like RFID or ubiquitous networks. He believes that the OECD is uniquely positioned to help further discussions at the international level.

113.   **Harald Tveit Alvestrand**, Engineer, Google, Norway, stressed that fear and innovation are key themes, with Internet-enabled services reshaping the world, and that governments have the power to make Internet revolutions "slower and more painful".

114.   Stressing his belief that the Internet is facilitating further revolutions, he listed ways in which governments could delay this revolution with: *i)* ill-considered regulations such as e-mail regulation or firewalls against inappropriate content; *ii)* increasing costs through regulation by, *e.g.* requiring an identity card to get on line or requiring the sender to pay; *iii)* enforcing intellectual property rights thoughtlessly, so as to stifle innovation; and *iv)* scaring innovators with threats of copyright and patent infringements.

115.   **Neil Anderson**, Head of UNI Telecom, Union Network International, spoke from the perspective of workers in the telecommunications/Internet industry and highlighted several aspects not emphasised by the other speakers:

- As universal broadband service is increasingly required, there is a need to replace copper wiring with optical fibre network, thus creating job opportunities for telecommunications workers.

- Creator's rights should not be underestimated, as in many cases such rights may provide their income. And

- Skills and training needs should be focused on, encouraging young people to come into the Internet job marketplace.

Open discussion of important elements from the Workshop

116.   A participant commented that the slides from Mike Nelson could be used to develop more detailed scenarios regarding actors' respective roles, with a focus on the substantive future of the Internet, rather than just on organisational or inclusiveness processes (such as WSIS).

117.   A participant stated his belief that multi-stakeholderism should include Open Software people, who were not represented in WSIS. He added that some technical matters, including Web 2.0 or semantic web top level domain (TLD) names, were not addressed adequately and further that limitations should be placed on the rights of intellectual property holders, so as to preserve the freedom of the web.

118.   Another participant commented that skills were an essential element of any ICT strategy, as detailed in the OECD's Working Party on the Information Economy, and that today's similarities with 1999 before the dot.com crash of the year 2000 should trigger reflection and caution.

119.   A participant asked Mr. Alverstrand what governments should do. His answer was to start with enforcing existing laws.

Overall summary and next steps

120.   Hugo Parr, ICCP's chair, concluded the meeting by commenting that the meeting had been very positive, bringing together all stakeholders, including "strong and clear" voices, and that it is important for governments and the OECD to realise that the net has perhaps become the most important common infrastructure.

121.   Mr. Parr briefly summarised the main points of the "Future of the Internet" Workshop by listing eight points that are central to considerations of the future:

1. The basic features of interoperability and scalability of the Internet must be preserved. It needs to evolve to meet new demands (*e.g.* more users, torrents of data) but through evolution rather than drastic system changes.

2. The basic premise of openness and transparency should be maintained. "The Internet is like paper: no-one should be able to tell you how to use it or what you can or can not write."

3. The future Internet must be user-oriented, with a special focus on active users creating new content. This will stimulate innovation and new business models.

4. The Internet should be kept as an innovation oriented network.

5. Privacy and security and the development of a culture of trust is fundamental to the current and future Internet.

6. The traditional notion of intellectual property is challenged by the new technologies, begging the question as to if and how it should be altered from the paper age.

7. Identifying a business model that pays for this essential infrastructure is elusive, presenting a paradox.

8. As a disruptive technology, the Internet has important impacts on employment that need to be better understood and handled in a policy context.

122.   He closed the meeting, emphasising that the OECD is one of very few organisations that has the analytical power and credibility to look into the totality of the issues.

ANNEX - WORKSHOP AGENDA: "THE FUTURE OF THE INTERNET"

Introduction

As the world's societies and economies depend increasingly on the Internet, it is clear that after three decades, the Internet and other global networks are approaching a crossroads. Leading Internet architects believe that the premises on which the Internet was built need rethinking, in order to preserve and expand opportunities for innovation and economic growth. The window of opportunity is now, for international co-operation and coherent policies to help shape a global Internet, that meets the needs of as many users as possible, is robust and secure, and that can scale itself to evolving requirements.

Against the backdrop of a broadening base of users worldwide and rapid convergence to IP networks for voice, data, and video, the Internet offers the world's economies and societies increasing opportunities for economic growth and social development; whether it be through information, e-commerce, communication/social networks, the participative Web, entertainment, Web services, e-government or for critical infrastructures such as power grids, financial systems, air traffic control and intelligence systems.

The Internet is rapidly becoming a key ingredient in our economic infrastructure – akin to electricity and roads – as well as our social structures. And its significance is poised to dramatically increase as we usher in a new era of ubiquitous sensor networks using technologies such as RFID to connect the physical world – supply chains, items, and people – in real-time.

The opportunities offered by faster, more capable, and increasingly pervasive IP-based applications, both wired and wireless, are accompanied by issues that need addressing, including ensuring reliability and manageability, security and privacy, interoperability of the network of networks, and enabling the global exchange of information and views.

The OECD ICCP workshop "The Future of the Internet" will bring together policymakers, leading academics, private sector organisations, and civil society organisations to discuss the trends shaping the future of the Internet, explore the various approaches – technical, regulatory, and economic – that are being taken or can be taken to create new functionality for and increased trust in the Internet, to promote its sustained growth and adoption, and to identify opportunities for increased international co-operation on pressing issues.

The OECD is an intergovernmental organisation of 30 member countries. The OECD's Committee for Information, Computer and Communications Policy (ICCP) analyses the evolution of Information and Communication Technologies and their social and economic implications. A forum for constructive dialogue between governments, business, civil society and academia on how best to design and implement policies to sustain growth in knowledge-based economies, the ICCP Committee helps governments maximise the benefits of the information society with evidence-based analysis and forward-looking policy guidance.

ICCP Workshop: "The Future of the Internet"
Château de la Muette, Paris – Room C
8 MARCH 2006, 9:00 – 18:00

WELCOME AND INTRODUCTION BY THE CHAIR [9:00 – 9:10]
Hugo Parr, Chair, OECD Committee for Information, Computer and Communications Policy

1.   THE INTERNET AND GLOBAL NETWORKS: VISIONS OF THE FUTURE [9:10–10:50]

Experts from different perspectives discuss opportunities and challenges for the future of the Internet.

Convergence of applications on IP networks:

- *What are the technical, social and economic drivers for Internet use and content development by an expanding user base of individuals, businesses, academic researchers and governments?*

- *What key opportunities and challenges does the growing use of services over IP raise, such as with regards to network neutrality or the global adoption of IPV6?*

- *What socio-economic and policy issues can be foreseen such as uptake, services settlements and billing or regulatory issues, and what are some potential solutions?*

Sensor networks and wireless networks/mobility:

- *What are the technical, social and economic drivers and key opportunities and challenges raised by the development and integration of ubiquitous wireless sensor networks?*

- *While today's wireless networks encompass all mobile technologies including wireless LANS and WANS, in a future sensor based model, what is the role of wireless and how will we address bandwidth requirements?*

Moderator: **Jennifer Schenker**, International Editor, Red Herring

- **Trevor Barr**, Professor of Media and Communications, Swinburne University of Technology and Program Manager, Smart Internet Technology CRC, Australia ("Schools of Thought based on user perceptions")

- **KC Claffy**, Principal Investigator for the Distributed Cooperative Association for Internet Data Analysis (CAIDA) ("Top Problems of the Internet")

- **Jun Murai**, General Chair Person, WIDE Project. Vice President, Keio University. Professor, Faculty of Environmental Information, Keio University, Japan ("Role of the Future Internet Technologies")

- **John Horrigan**, Associate Director, Research, Pew Internet & American Life Project ("The Social Impact of the Internet: Content Creation & Social Networking Online")

- **Mauro Sentinelli**, Managing Director TIM International NV. Deputy Chair GSM Association ("Wireless Sensor-based Networks: A Market Perspective")

- **Gus Hosein,** Senior Fellow, Privacy International ("What Could Have Been, Is, and May be Seen: The Challenges of Privacy")

COFFEE BREAK [10:50 – 11:10]

2.   SETTING THE NEXT STAGE [11:10–16:50]

- *Short-term and long-term approaches at different levels aiming to prepare for the next stage of global networks and their different implications.*

2.A Technical/research approaches [11:10–12:30]

- *How will today's architecture evolve over time to sustain the continuing growth in Internet use and to support emerging services? What role for public research and private research in this endeavour?*

- *How can wider policy implications be taken into account in developing Internet technology standards and protocols, such as the need for increased security that accompanies increased ubiquity and mobility?*

- *What are some of the technical approaches that build on existing systems, such as Internet Service Provider approaches or IPV6 implementation?*

- *What are the major ongoing and planned networking activities in the R&D community e.g. optical networks (Gλif) and new types of networks (GENI)?*

Moderator: **Patrick Cocquet**, Chairman 6WIND. Vice President of IPv6 Forum

- **Peter Freeman**, Assistant Director for Computer & Information Science & Engineering (CISE), US National Science Foundation ("GENI: Global Environment for Networking Innovations")

- **Mark Handley**, Professor of Networked Systems, University College, London ("Evolving the Internet")

- **Bill St. Arnaud**, Senior Director Advanced Networks, CANARIE, Canada ("Building the next generation Internet architecture")

- **Sang-Chul Shin**, Vice President, IT Infrastructure Division, National Computerization Agency, Korea

- **Arshey Odedra**, Counsellor, ITU-T, International Telecommunication Union, ("ITU-T Next Generation Networks (NGN) Standardisation")

LUNCH BREAK [12:30 – 14:00]

2.B Future Policy frameworks for the information society [14:00—15:15]

- *What is the role of the private sector and of government in fostering infrastructure facilities and services when networks are largely privately owned and operated, and returns are long term and shared?*

- *What are the drivers that trigger investments in new technologies?*

- *What are the broader social drivers across different cultures?*

- *How do governments balance the need and interests of consumers, service providers, industry, online content creators, and encourage an environment that enables innovation, investment and growth?*

- *What are the implications for the move towards technology neutral regulation and competition policy?*

PARTICIPANTS:

Moderator: **William Dutton**, Director, Oxford Internet Institute

- **Qiheng Hu**, President, Internet Society of China, Vice President of the China Association for Science and Technology, and Chair of the Steering Committee for the China Network and Information Center ("CNGI – China Next Generation Internet")

- **Sarah Deutsch**, Vice President & Associate General Counsel, Verizon Communications ("Private Sector Synergies and Challenges in the New Broadband Market")

- **Masaaki Sakamaki**, Director of International Policy Division, MIC ("U-Japan policy and other ICT strategies in Japan")

- **Andrea Servida**, Deputy Head of Unit, European Commission, Information Society and Media Directorate General ("The latest development of the EU policy on Network and Information Security")

COFFEE BREAK [15:15 – 15:35]

2.C International multi-stakeholder co-operation efforts [15:35—16:50]

As global Internet governance evolves in the future, what forms of international multistakeholderism are likely to play an important role?

Moderator: **Mark Esseboom**, Director, Coordination, Strategy and International Affairs Directorate, DG for Energy and Telecom, Ministry of Economic Affairs, The Netherlands

- **Markus Kummer**, Executive Coordinator, Internet Governance Forum Secretariat ("The pioneering role of Internet in multi-stakeholder co-operation")

- **William Drake**, President, Computer Professionals for Social Responsibility ("Using the Internet Governance Forum to Promote Multistakeholderism and Good Governance")

- **Mike Nelson**, Director, Internet Technology and Strategy, IBM, USA. VP of public policy, ISOC ("Preserving the Openness of the Net")

- **Olivier Muron**, Vice-President R&D Governance, France Telecom ("The involvement of France Telecom in the Technical Governance of the Internet")

3. ROUNDTABLE: NEXT STEPS AND THE ROLE OF THE INTERNATIONAL COMMUNITY [16:50 – 18:00]

Moderator: **Hugo Parr**, Chair, OECD Committee for Information, Computer and Communications Policy

- *Building on the themes laid out in previous sessions, this session will focus on pulling together the main policy themes and identifying the key current and emerging issues and challenges business, government and civil society need to address in developing frameworks and international co-operation for the future of the Internet as well as the role of the OECD Committee for Information, Computer and Communications Policy (ICCP).*

3A. Summary of important elements from the Workshop [16:50 – 17:25]

PARTICIPANTS:

- **Larry Landweber**, Senior Advisor, US National Science Foundation
- **Keith Besgrove**, Chief General Manager of the Information Economy Division in the Department of Communications, Information Technology, and the Arts (DCITA), Australia
- **Andrea Camanzi**, Chair of the Business and Industry Advisory Committee to the OECD
- **Tony Sims**, Director, Europe & International, Consumer & Competition Policy Directorate, Department of Trade and Industry, U.K. Chair, OECD Committee for Consumer Policy
- **Jacques Bus**, Head of Unit, ICT for Trust and Security; Directorate General INFOSOC, European Commission
- **Harald Tveit Alvestrand**, Engineer, Google, Norway
- **Neil Anderson**, Head of UNI Telecom, Union Network International

3B. Open discussion of important elements from the Workshop [17:25 – 17:50]

3C. Overall summary and next steps [17:50 – 18:00]

- Overall summary by **Hugo Parr**, Director General, Ministry of Modernisation, Norway, and Chair of the OECD Committee for Information, Computer and Communications Policy

- Potential future work by the OECD: Next steps

Cocktail at the Delegates Bar [18:15], courtesy of IBM and the Internet Society