NSF/OECD Workshop
"Social and Economic Factors Shaping the
Future of the Internet"
31 January 2007

Proposals of priority issues relative to the future of the Internet are set out on page 4 of this document. Please validate or invalidate and rank the issues page 4 **and return by 22 January 2007 to FutureInternet@oecd.org** or fax to +33-1 44 30 62 56.

Social and Economic Factors Shaping the Future of the Internet: Proposed Issues List

Opportunities and Challenges

The "Future Internet", and the systems it connects, must be capable of efficiently supporting the information societies' and digital economies' need for social and economic development. To achieve this objective, the Internet must be accessible, trusted and secure, as well as able to robustly scale to meet the increasing reliance placed on it.

A successful "Future Internet" offers the promise of improved communication for increasing productivity, better research, health care, and education opportunities, as well as accelerating the growth of scientific knowledge in areas such as biophysics and environment management. Three large trends are increasingly influencing the current Internet's ability to meet the requirements of users:
- Widening security threats endanger network operation;
- Digital convergence increases the functionality and places new demands on the Internet; and
- An increasing number and variety of communities and businesses critically rely on the Internet.

Socio-economic priorities for consideration – Issues list

In preparation for the workshop, a list has been developed, on page 4, of several leading social, economic, regulatory and ethical considerations relating to the future of the Internet, which could be considered from a public policy angle and from a research angle. The purpose of this list is to provide a high-level perspective on a few of the major trends affecting the "connected" world, so as to start developing a common understanding of priorities, to start mapping out the interaction of these trends and to start discussing potential ways of addressing some issues.

Workshop participants are expected to complete and prioritise the issues on the list PAGE 4 by order of importance and return the list BEFORE THE WORKSHOP, BY 22 JANUARY 2007. During the workshop an initial discussion will be launched on various approaches to addressing priority issues.

A guiding theme for this issues list is the dynamics of economics, responsibility, accountability and trust that help to ensure a balance between economic, social and technological factors.[1] Socio-economic considerations are particularly important as they relate to security and robustness, wireless sensor networks, distributed services and applications, network management and economic issues, which lead to questions of economic growth and social well-being, scientific innovation, or individual privacy and security, which impact not only on our everyday lives, but also on the social, economic, legal and ethical frameworks in which we live.

A second guiding theme relates to the necessary dialogue between policy makers and researchers, including functions that could be embedded into the design of future networks, which bear on privacy, security and personal choice, as well as on future evolutions of networking infrastructures. According to Adam Greenfield, "it is ethically incumbent on the designers of ubiquitous systems and environments to afford the human user some protection".

In these considerations a very broad and socio-technical view of the "Future Internet" is taken, including innovations at all levels of the architecture, as well as other communications infrastructures and networks that interact with the Internet, such as sensor networks.

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[1] Kc Claffy, http://www.oecd.org/sti/ict/futureinternet

All stake-holders share responsibility, including policy-makers

A new chapter for the Internet raises a wide range of economic and social opportunities and challenges that underscore the need for a high-level perspective so that inter-relations can be seen, broad implications identified, and policies of all stake-holders rise to the challenges of adapting to a new environment: *The Internet itself is changing "from the inside out and from the outside in" with more devices, more bandwidth, more data.*

The Internet landscape includes users, who run applications over the Internet, Internet service providers, who sell public Internet access on a commercial basis, private network operators, policy-makers, intellectual property rights holders, and providers of content and services.

Long-term research and development

In terms of the Future of the Internet there is a current opportunity to consider economic, social, and policy/regulatory issues in relation to work being undertaken under the umbrella of the Global Environment for Network Innovations (GENI) and work being conducted by the OECD's Committee on Information, Computer, and Communications Policy: a broad range of factors have relevance for the conception and design of a new experimentation facility as well as to enhance cooperation with other international platforms for experimentation.

The rationale for a project such as GENI, and its counterparts in other countries, is that the future of the Internet has become too important for society to rely wholly on serendipity and that real experimentation is required. According to Professor David Clark, a critical point in the life of the Internet has been reached whereby it will be unable to meet future needs by incremental improvement: "we cannot patch our way into the future in a 10-15 year horizon". The GENI project is motivated by the need to be able to conduct research without migration and backwards compatibility constraints and to test a wide variety of solutions. It aims to provide basic architectures, technologies, and policies for networking in the 2010-2020 timeframe.

New challenges and lessons learned since the Internet's creation

In considering a new infrastructure, such as GENI, it is important to highlight the Internet's growing role as a driver of innovation leading to economic growth and social well-being and to identifying current and future factors that could be decisive for the success of particular network designs. Research challenges identified so far for the Future Internet include ensuring high availability and trust, enabling seamless information access anywhere and anytime, providing information about the physical world in real time, and providing access to bandwidth-on-demand with low latency and with service guarantees.[2]

Specifically, lessons can be drawn from the applications and use associated with the evolution of the current Internet to identify the features that have been critical to the Internet's success. At the same time, the Internet faces many challenges, which are not only related to its technical limitations and it is increasingly clear that many of the problems the Internet has encountered concern economic, social and regulatory issues. Indeed, social factors co-evolve with technological factors. GENI is designed for experiments with different architectures and designs that enable an assessment of socio-economic impacts, *e.g.* different architectures might lead to more or less openness.

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[2] http://www.geni.net/

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The Internet itself is changing "from the inside out and from the outside in"[3] with more devices, more bandwidth, more data.

From the inside, Internet technologies are transitioning from an era of deployment and performance to an era of qualitative evolution where a diverse range of environments enables communication in a variety of forms and situations. Primary technological trends include digital convergence toward the Internet Protocol (IP e.g. VoIP, IPTV), towards mobility (with e.g. mobile broadband), towards human-oriented applications (e.g. the participative web often described as Web 2.0 or intelligent user interfaces), networked information technology with the web as the platform (with e.g. application service providers, Web Services, service-oriented architectures) and intelligent objects that can sense and control (e.g. RFID , home networks, or intelligent transportation systems). Mobile computing and embedded devices are expected to dominate future computing and communication.

From the outside in, the Internet is now a critical infrastructure underpinning global economic and social activity in a globalising world. Accelerating technological development in relation to the Internet has tremendous technological, political, social, and cultural ramifications that are difficult or in many cases, impossible to comprehend. The Internet is rapidly evolving into a broadband network-of-networks, with increasing fixed and wireless access, supporting close to a billion users. In the future it is expected that the Internet will connect an ever-greater numbers of users, objects and critical information infrastructures. The role of the Internet as a social and economic infrastructure is deepening. With this, the Internet needs to meet social needs placed upon it, expand opportunities for innovation and economic growth, be robust and secure, and scale to evolving requirements.

Workshop goals

In preparation for the workshop, a list has been developed of leading social, economic, regulatory and ethical factors that could be considered from a research perspective, both in the United States and internationally. The purpose of this list is to provide a high-level perspective on a few of the major trends affecting the "connected" world, as well as the interaction of these trends. These considerations are expected to be critical to the success of particular network designs for the future Internet and are specified to help guide and structure the workshop.

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.

As stated previously, the desired outcome of this list is for it to be confirmed and completed by workshop participants and issues to be prioritised by order of importance **before the workshop**, **by 22 January 2007**. During the 31 January 2007 workshop an initial discussion will be launched on various approaches to addressing priority issues that will have been identified.

The underpinning for the questions outlined in this issues list are that the impacts of the Internet are determined by the intersection of technological potential; commercial, practical, and/or popular development and use; and socio-economic acceptance.

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[3]   Marjory Blumenthal, presentation at OECD, June 2006, "Wither the Internet?"

Confirmation and prioritisation

<u>**Urgency**</u>: For all issues, please assign a time-frame: short-term considerations i.e. 0-5 years (ST), medium-term i.e. 5-10 years (MT), long-term i.e. 10-15 years (LT).

<u>**Complexity**</u>: For each issue, please assess complexity of resolving it; in terms of needed engagement by various stakeholders, as well of level of technical, social and/or economic challenge: (1) simple, (2) achievable with willpower/ investment, (3) requires major paradigm shifts and widespread partnership.

<u>**Priority**</u>: Please allocate priority-levels to the 30 issues considered: 10 (High), 10 (Medium), 10 (Low).

ISSUES UNDER CONSIDERATION (please edit where needed)	Urgency	Complexity	Priority
1/ Ensuring a healthy ecosystem for private **network service providers.**	ST	2	Med
2/ Financing **edge infrastructure** build-out.			
3/ Ensuring **investments** in better technologies continue to be made.			
4/ Ensuring **competition and innovation** at the service level/at the edge.			
5/ Using **public investment** incentives *e.g.* universal service obligations or other.			
6/ Adapting **public policy** to network convergence: content/broadcasting convergence, telecommunications unbundling, fixed/mobile convergence, spectrum.			
7/ Dealing with **traffic exchange** between networks.			
8/ Empowering and protecting **consumers**.			
9/ Preserving the Internet's capacity to foster innovation and competition.			
10/ Addressing new requirements of the shift from a one person per PC paradigm to a complex **multi-device environment**, especially wireless.			
11/ Improving naming and addressing schemes to improve efficiency of inter-networking and **scalability of routing**.			
12/ Overcoming the global **Internet protocol adoption problem.** [4]			
13/ Developing holistic approaches to **security** of information systems and networks			
14/ Aligning **incentives** of all stakeholders to increase security.			
15/ Ensuring the Internet meets requirements as **critical information infrastructure**			
16/ Being able to **measure** / assess the network's performance for informed policy.			
17/ Preserving the **participatory** nature of Internet content production.			
18/ Encouraging **interoperability** of technologies and applications.			
19/ Balancing interests of **suppliers and users** (e.g. IPR or DRM).			
20/ Considering **social norms, ethical values and existing laws** in the development of Internet services.			
21/ Factoring in societal benefits and public policy objectives (e-health, e-education, etc.) in considering "**return-on-network investment**".			
22/ Conducting societal **risk assessments** of possible impacts of mobile wireless and sensor networks and taking responsibility.			
23/ Effectively protecting **personal data** in managing digital identities.			
24/ Ensuring "**privacy by design**".			
25/ **Balancing law enforcement** needs with freedom, privacy and business impacts.			
26/ Considering different **national contexts'** and cultures' impact on policy stances.			
27/ Partnering internationally for **research and development**.			
28/ Cross-border **law enforcement** for online security, privacy, consumer protection.			
29/ Addressing **political challenges** to the Internet as it has evolved.			
30/ Facilitating Internet roll-out in **developing countries**.			
PLEASE <u>ADD</u> ISSUES THAT YOU FEEL HAVE BEEN OMITTED and <u>delete</u> issues that you do not consider to be valid, while making sure the list remains at 30.			

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[4] Mark Handley, Why the Internet only just works http://www.cs.ucl.ac.uk/staff/M.Handley/papers/only-just-works.pdf