

NATIONAL SCIENCE FOUNDATION (NSF)  
AND THE  
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

at the National Science Foundation Boardroom  
(Room 1235, 12th floor)  
4201 Wilson Boulevard  
Arlington, VA USA

## NSF / OECD WORKSHOP

# SOCIAL & ECONOMIC FACTORS SHAPING THE FUTURE OF THE INTERNET

WASHINGTON, 31 JANUARY 2007, 8:00 – 17:00

## AGENDA



**GENI (Global Environment for Network Innovations)** is an experimental facility being planned by the United States National Science Foundation (NSF), in collaboration with the research community. Its goal is to enable the research community to invent and demonstrate a global communications network and related services that will be qualitatively better than today's Internet.

**The Organisation for Economic Co-operation and Development (OECD)** is an intergovernmental organization of 30 member countries. The goal of the OECD Committee on Information, Computers and Communication Policy is to help governments maximize the benefits of the "information society". Evolutions in ICT technologies, applications and uses constantly challenge policy development, co-ordination and implementation. Through benchmarking, research and analysis, the Committee is able to help countries with policy recommendations and best practices. For the OECD ICCP Committee, the objective of this workshop is to help inform and prioritize key areas of focus for its programs of work on Internet-related policy issues, in view of an OECD Ministerial meeting to take place in June 2008.

## OVERALL SUMMARY

The Internet is a critical infrastructure underpinning social and economic development around the world. It is rapidly evolving into a 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.

In terms of the Future of the Internet there is a current window of opportunity to consider economic, social and regulatory issues in relation to work being undertaken under the umbrella of the Global Environment for Network Innovations (GENI) and the OECD Committee on information and communications policy (ICCP). The NSF/OECD Workshop will bring together economists, policy-makers, social scientists and technologists, to consider a broad range of factors which have relevance for the future of the Internet.

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. Specifically, Workshop participants are asked to draw lessons from the applications and use associated with the evolution of the current Internet and 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 and social issues.

Guiding themes for the Workshop will be the dynamics of economics, responsibility, accountability and trust that help to ensure a balance between economic, social and technological tensions, as well as the necessary dialogue between technologists and policy makers, economists, or social scientists. The latter will include discussion on functions that can be embedded into the design of future networks which bear on privacy, security and personal choice, as well as on the evolution of networking infrastructures. In these considerations a very broad 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.

The joint NSF/OECD Workshop "Social and Economic Factors Shaping the Future of the Internet" will bring together about 30 participants to debate and brainstorm issues. Participants are experts in their fields from a broad range of disciplines and areas of expertise, including the technical and academic communities, high-level policy-makers, and private sector representatives.

During each session the moderator will invite selected participants to respond to a series of questions or issues raised in their position paper. Following these interventions, the floor will be opened to all participants, sitting around the NSF Board Table, for an interactive discussion. Apart from the opening session, keynote address and closing session, there will be no PowerPoint presentations.

## Workshop AGENDA

“Social and Economic Factors Shaping the Future of the Internet”  
31 January 2007, 8:00 to 17:00 – Arlington, Virginia, USA.

### REGISTRATION [8:00 – 8:45]

### WELCOME AND INTRODUCTION [8:45 – 9:15]

*Following welcoming remarks and introductions, a brief presentation will be given of the GENI project, its goals, requirements, and anticipated timeline. A brief presentation will be given on the OECD’s project on the Future of the Internet, its goals and timeline.*

- **Peter FREEMAN**, Assistant Director for Computer & Information Science & Engineering (CISE), US National Science Foundation
- **Ambassador David GROSS**, U.S. Coordinator for International Communications & Information Policy, U.S. Department of State
- **Deborah CRAWFORD**, Deputy Assistant Director for Computer & Information Science & Engineering (CISE), US National Science Foundation (NSF)
- **Andrew WYCKOFF**, Head of Division, Information and Communication Policy, Organisation for Economic Cooperation and Development (OECD)
- **Suzanne IACONO**, Senior Science Advisor for Computer & Information Science & Engineering (CISE), US National Science Foundation (NSF)

### 1. ARE WE AT AN INFLECTION POINT? [9:15 – 10:00]

Keynote by **David CLARK**, Senior Research Scientist, M.I.T.

### 2. ECONOMIC LANDSCAPE [10:00 – 12:15], INCLUDING SHORT COFFEE BREAK [11:00 – 11:15]

*The first track, on economic issues associated with the Internet, will discuss economic incentives for sustainability, reliability, and security, as well as for further innovation in competitive markets.*

- (Session moderator) **Kevin WERBACH**, Assistant Professor, Wharton School of Business, University of Pennsylvania
- **John KNEUER**, Assistant Secretary of Commerce for Communications and Information and Administrator of the National Telecommunications and Information Administration
- **Geoff HUSTON**, Senior Internet Research Scientist, Asia Pacific Network Information Centre (APNIC)
- **Bruce SCHNEIER**, Founder and Chief Technology Officer, BT Counterpane
- **Shane GREENSTEIN**, Elinor and Wendell Hobbs Professor, Management and Strategy Department, Kellogg School of Management
- **KC CLAFFY**, Principal Investigator for the Distributed Cooperative Association for Internet Data Analysis (CAIDA)
- **Bill ST. ARNAUD**, Senior Director Advanced Networks, CANARIE, Canada
- **Dennis WELLER**, Chief Economist, Verizon
- **Bill WOODCOCK**, Research Director, Packet Clearing House

<b>SERVICE PROVISION</b>	<ol style="list-style-type: none"> <li>1. <b>ENSURING A HEALTHY ECOSYSTEM FOR PRIVATE NETWORK SERVICE PROVIDERS:</b> Which roles do economic, social and political factors play in creating a healthy ecosystem for private network service provider? Can research help in designing a healthier economic infrastructure for network service providers while also facilitating competition?</li> <li>2. <b>ENSURING INVESTMENTS IN BETTER TECHNOLOGIES CONTINUE TO BE MADE:</b> In the cases of a monopoly network provider or duopoly network provider, what motivates network providers to make investments in better technologies such as fiber?</li> <li>3. <b>FINANCING EDGE INFRASTRUCTURE BUILD-OUT:</b> How can we ensure there is sufficient investment to meet the network capacity demands of new applications and of an expanding base of users? Given the costs involved, is it realistic to expect that migration will be managed while preserving a competitive environment? What pricing models are likely to prevail?</li> <li>4. <b>ENSURING COMPETITION AND INNOVATION AT THE SERVICE LEVEL/AT THE EDGE:</b> Is there room for multiple infrastructures? In what ways will shifting control between the edge of the network and vice versa, play out?</li> <li>5. <b>USING PUBLIC INVESTMENT INCENTIVES:</b> What is the role of municipal, state or national networks in providing service? What, if any, provisions are needed so that they do not distort viable markets? With respect to incentives, how helpful can government's own procurement and use be to both demonstrate value and provide experience in understanding costs and therefore ideas for lowering them (<i>e.g.</i> RFID, IPV6)?</li> </ol>
<b>CONVERGENCE</b>	<ol style="list-style-type: none"> <li>6. <b>ADAPTING POLICIES TO CONVERGENCE OF NETWORKS, ON CONTENT FOR BROADCASTING, ON UNBUNDLING, ON FIXED/MOBILE CONVERGENCE, OR ON SPECTRUM:</b> While business models are in flux and as previously distinct industries such as broadcasting and traditional telecommunications converge on the Internet, are there criteria that can help guide policy makers and researchers?</li> <li>7. <b>ADDRESSING TRAFFIC EXCHANGE BETWEEN NETWORKS:</b> Could the current commercial solutions used for Internet traffic exchange be used as a model for traffic exchange between convergent networks?</li> <li>8. <b>EMPOWERING AND PROTECTING CONSUMERS:</b> Is service/device bundling a threat (for competition and consumer policy) to be concerned with, as consumers are locked into a proprietary "experiences"/ provider "lock-in"? What new consumer issues are arising?</li> <li>9. <b>PRESERVING THE INTERNET'S CAPACITY TO FOSTER INNOVATION AND COMPETITION:</b> What do different people mean by "openness" of the Internet? Is openness the Internet's key success factor? Could the Internet increasing complexity impact the Internet's openness and role as a driver of innovation?</li> <li>10. <b>ADDRESSING NEW REQUIREMENTS OF THE SHIFT FROM A ONE PERSON PER PC PARADIGM TO A COMPLEX MULTI-DEVICE ENVIRONMENT, ESPECIALLY WIRELESS:</b> How will we migrate towards truly converged next generation broadband networks, with abundant bandwidth and seamless integration of fixed and mobile networks? What are the challenges to integrate commercial or non-commercial wireless networks <i>e.g.</i> sensor networks with the Internet?</li> </ol>
<b>CORE INTERNET PROTOCOLS</b>	<ol style="list-style-type: none"> <li>11. <b>IMPROVING NAMING AND ADDRESSING SCHEMES TO IMPROVE EFFICIENCY OF INTER-NETWORKING AND SCALABILITY OF ROUTING:</b> How can naming and addressing be improved so as to improve efficiency of inter-networking? In designing new protocols, what lessons does IPv6 deployment provide?</li> <li>12. <b>OVERCOMING THE GLOBAL INTERNET PROTOCOL ADOPTION PROBLEM:</b> What are the roles and limitations of physical test-beds and overlays? Can Virtual Networks help to address the global Internet protocol adoption problem? Could/should the Future Internet have a dynamic architecture?</li> </ol>
<b>SECURITY AND ROBUSTNESS</b>	<ol style="list-style-type: none"> <li>13. <b>DEVELOPING HOLISTIC APPROACHES TO SECURITY OF INFORMATION SYSTEMS AND NETWORKS:</b> Can a coherent layer for security be deployed in the Internet's architecture to help address trust issues? What are the main considerations for the economics of security in respect to the Internet? Can design experimentation and instrumentation assist in addressing some of security's leading problems <i>e.g.</i> botnets, malware and so forth?</li> <li>14. <b>ALIGNING INCENTIVES OF ALL STAKEHOLDERS TO INCREASE SECURITY:</b> What motivates increased cooperation on security between competing providers and vendors? What types of incentives have helped us increase security measurably in the real world? How can incentives be aligned with the roles of different stakeholders to increase Internet security <i>e.g.</i> technical, legal and social measures (standards, regulation or peer "naming and shaming")?</li> <li>15. <b>ENSURING THE INTERNET MEETS REQUIREMENTS AS CRITICAL INFORMATION INFRASTRUCTURE AND ENABLER OF OTHER CRITICAL INFRASTRUCTURE:</b> What areas should <b>governments</b> take a more pro-active stance on? Which areas should be left to private sector actors?</li> </ol>
<b>MEASUREMENT</b>	<ol style="list-style-type: none"> <li>16. <b>BEING ABLE TO MEASURE / ASSESS THE NETWORK'S PERFORMANCE FOR INFORMED POLICY:</b> How can growth in and means of Internet resource production, and correspondence of sources and destinations of traffic, be measured on the commercial Internet? What are the benefits of greater instrumentation, understanding, and transparency to industry, consumers, policy makers, researchers, and for the future of the Internet? How can the privacy concerns of individuals and industry be balanced with the information requirements of the public sector and academia?</li> </ol>

**LUNCH, ROOM ADJACENT TO 1235, COURTESY OF ORACLE [12:15 – 13:00]**

**3. SOCIAL IMPLICATIONS [13:00 – 14:45]**

*The track on social issues will address topics related to the fact that social, democratic, cultural growth and not only economic growth are at stake.*

- (Session moderator) **Elliot MAXWELL**, Fellow, Communications Program, Johns Hopkins University; Distinguished Research Fellow, eBusiness Research Center, Pennsylvania State University
- **Michael GEIST**, Canada Research Chair of Internet and E-commerce Law at the University of Ottawa
- **Leslie DAIGLE**, Chair, Internet Architecture Board (IAB)
- **Rishab AIYER GHOSH**, Senior Researcher, UNU-MERIT
- **Inuk CHUNG**, Senior Research Fellow Korea Information Society Development Institute (KISDI); Chair, APEC TEL WG
- **Simson GARFINKEL**, Associate Professor, Naval Postgraduate School
- **Brian KAHIN**, Adjunct Professor and Research Investigator, University of Michigan
- **Jonathan ZITTRAIN**, Professor of Internet Governance and Regulation, Oxford University
- **Lee MCKNIGHT**, Director Wireless Grids Lab, Syracuse University

<b>CONTENT</b>	<p>17. <b>PRESERVING THE PARTICIPATORY NATURE OF INTERNET CONTENT PRODUCTION:</b> Users are increasingly part of the creative flow of content and processes, promising a more participatory and active content society. Should the contribution and distribution of user-produced content be facilitated and planned via research? How can experimentation with new models for the economic use and creation of new digital content be encouraged?</p> <p>18. <b>ENCOURAGING INTEROPERABILITY OF TECHNOLOGIES AND APPLICATIONS</b></p> <p>19. <b>BALANCING INTERESTS OF SUPPLIERS AND USERS:</b> (e.g. IPR or DRM). Is it possible to ensure the conditions are in place for innovation at the edges of the network to continue, and how can this be enhanced or protected? Are there practices or technologies that can hinder innovation at the edges? What are the key factors that deserve further research in terms of the long term future of the Internet?</p>
<b>SOCIAL NORMS</b>	<p>20. <b>CONSIDERING SOCIAL NORMS, ETHICAL VALUES AND EXISTING LAWS IN THE DEVELOPMENT OF INTERNET SERVICES:</b> Communication networks enable unprecedented levels of convenience (e.g. in the workplace, homes, transportation, stores, healthcare), which positively influence quality of life. Can researchers, companies and policy-makers start to develop a common understanding of the concrete implications of ubiquitous communications?</p> <p>21. <b>FACTORING IN SOCIETAL BENEFITS AND PUBLIC POLICY OBJECTIVES (E-HEALTH, E-EDUCATION, ETC.) IN CONSIDERING “RETURN-ON-NETWORK INVESTMENT”:</b> The Internet can help in addressing societal challenges such as demographic changes, lifelong skills, or healthcare.</p>
<b>PRIVACY OF PERSONAL DATA</b>	<p>22. <b>CONDUCTING SOCIETAL RISK ASSESSMENTS OF POSSIBLE IMPACTS OF MOBILE WIRELESS AND SENSOR NETWORKS AND TAKING RESPONSIBILITY:</b> Once benefit/risk assessments have been performed, how can all participants, as appropriate to their role, assume responsibility?</p> <p>23. <b>EFFECTIVELY PROTECTING PERSONAL DATA:</b> In ubiquitous environments, can OECD privacy principles be safeguarded? For example, how can users be informed about the data that is being collected and processed about them if the data collection is ubiquitous and the system is designed to be usable?</p> <p>24. <b>ENSURING “PRIVACY BY DESIGN”:</b> Can research help in reconciling the conflict between sharing personal information and safeguarding individual rights, in particular the right to privacy and the protection of personal data? Can technical solutions help move forward with issues such as Whois?</p> <p>25. <b>BALANCING LAW ENFORCEMENT NEEDS WITH FREEDOM, PRIVACY AND BUSINESS IMPACTS:</b> Anonymity can promote democracy and creativity. At what level do we need more traceability on the Internet for better law enforcement? What is the balance between law enforcement and freedom/privacy?</p>

**COFFEE BREAK [14:45 – 15:00]**

#### 4. INTERNATIONAL DIMENSION [15:00 – 16:00]

*The track on international issues will address how different governments and economies address issues relating to a global infrastructure.*

- (Session moderator) **Richard BEAIRD**, Senior Deputy Coordinator for Communications and Information Policy, U.S. Department of State
- **João DA SILVA**, Director of the Network and Communication Technologies Directorate, DG Information Society and Media, European Commission
- **Michelle O’NEILL**, Deputy Under Secretary for International Trade, International Trade Administration, U.S. Department of Commerce
- **Richard SIMPSON**, Director General Electronic Commerce, Industry Canada
- **Makoto YOKOZAWA**, Senior Consultant Information Technology Research, Nomura Research Institute/Visiting Associate Professor, Kyoto University.
- **Markus KUMMER**, Executive Coordinator, United Nations Internet Governance Forum
- **Paul TWOMEY**, CEO, Internet Corporation for Assigned Names and Numbers (ICANN)

##### DIFFERENT NATIONAL CONTEXTS & CULTURES

26. **CONSIDERING DIFFERENT NATIONAL CONTEXTS’ AND CULTURES’ IMPACT ON POLICY STANCES** How do different governments view their role in balancing the needs and interests of users, service providers, industry, online content creators, and encouraging an environment that enables innovation, investment and growth What are the broader social drivers for the development of “ubiquitous societies” or “pervasive societies” across different cultures? How can social needs such as privacy and accountability be balanced in the context of diverse cultural and regional norms?

##### ROLE OF GOVERNMENTS AND OF INTERNATIONAL PARTNERSHIPS

27. **PARTNERING INTERNATIONALLY FOR RESEARCH AND DEVELOPMENT** What role for international partnerships between countries and funding agencies in developing new architectures? How can multilingualism and the fact that many people worldwide do not use ASCII scripts be taken into account in the designing of a future infrastructure?

28. **CROSS-BORDER LAW ENFORCEMENT FOR ONLINE SECURITY, PRIVACY, CONSUMER PROTECTION.** What can the international community do to protect the integrity of the Internet while facilitating e-commerce and global trade?

29. **WHAT ARE THE POLITICAL CHALLENGES TO THE INTERNET AS IT HAS EVOLVED?** What is the international context of the Internet? Is there a role for long-term technological development in addressing some of today’s concerns in respect to the Internet?

30. **FACILITATING INTERNET ROLL-OUT IN DEVELOPING COUNTRIES**

#### 5. PRIORITY-SETTING AND WRAP-UP [16:00 – 17:00]

*Building on the themes laid out in previous sessions, this session will focus on pulling together the main themes and will seek to prioritize the key current and emerging social, economic, regulatory and political issues that could be decisive factors in the success of particular network designs for the future Internet.*

- (Session moderator) **Marjory BLUMENTHAL**, Associate Provost, Georgetown University
- **Vinton CERF**, Chief Internet Evangelist, Google Vice President and Chairman of the board of the Internet Corporation for Assigned Names and Numbers
- **Lawrence LANDWEBER**, Professor Emeritus of Computer Science at the University of Wisconsin – Madison
- **Peter FREEMAN**, Assistant Director for Computer & Information Science & Engineering (CISE), US National Science Foundation

#### RECEPTION, HILTON ARLINGTON & TOWERS, ACCESSIBLE FROM NSF BY SKYWALK, COURTESY OF VERIZON [18:00 – 19:30]