NSF/OECD WORKSHOP -- WASHINGTON, 31 JANUARY 2007
SOCIAL & ECONOMIC FACTORS SHAPING THE FUTURE OF THE INTERNET
SPEAKERS' POSITION PAPERS

The Future of the Internet is not the Internet: Open Communications Policy and the Future Wireless Grid(s)

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Introduction

Wireless grids will inevitably grow from the social and economic dynamics of the future Internet, I argue in this brief paper, as the next stage in the evolution of the global network of networks. It will become a global network supporting grids of grids.

Therefore, research on the future Internet's social and economic effects will increasingly focus on wireless grids, Internet governance, and the chaotic educational Internet. Of course projects such as the NSF's GENI research facility are critical, but must be cognizant of the relevance of changes in technology, and in social and business structures, up and down the protocol stack, from above the application layer and on down to the physical layer.

Not coincidentally, those are topics where I and my Syracuse University School of Information Studies colleagues focus tremendous research effort already.

These key factors or forces shaped by social and economic conditions surrounding the Future Internet – wireless grids, Internet governance, and the chaotic educational Internet - are described in turn below, as answers to the NSF/OECD's questions.

This brief paper concludes with suggestions for the U.S. National Science Foundation and the Organization for Economic Cooperation and Development and its member states to take into consideration at the national and international level, to ensure the Internet's continued development for the social and economic benefit of all of us.

Encouraging Interoperability of technologies and applications

Open Communication Policy

As previously distinct industries such as broadcasting and traditional telecommunications converge on the Internet, what principles could best guide policy-makers and regulators?

The principle of 'open-ness' is **THE** defining characteristic of the Internet itself, and is reflected in actions, standards and protocols at many levels. Open, interoperable systems are critical for the delivery of services and content across the Future Internet and will be the most innovative. This does not mean however that proprietary and/or closed technologies and sub-systems have no place in the future Internet, quite the contrary.

Because of its significance to the Internet, and in this day age to the global economy, a high level political signal of support for openness, or in general the interoperability of technologies and applications, I would argue, is long overdue. Rhetorically we hear supportive sounds from policymakers, but the level of explicit public and political support for openness and interoperability and applications.

What it does mean however, is that as an overarching policy principle, an Open Communications Policy, is most appropriate for governments, industry, and users. The implicit openness to innovation and change, and the explicit support of open systems such as the Internet in principle, provides guidance to industry and citizens globally.
Having said that, some relevant issues, such as the specific applications future Internet users will prefer, are of course difficult if not impossible to predict in detail, and an Open Communications Policy framework will provide admittedly only limited guidance to policymakers.

My prior research and writing on Open Communications Policy (see 'The Gordian Knot: Policitical Gridlock on the Information Highway' has now extended to work with governments in the Caribbean, whom I have persuaded to consider adoption of open communication policy as a defining model for the future. Work is ongoing, but the Caribbean's role as an incubator of an alternative policy model exemplifies the benefits of the Internet's global connectivity.

Could making the Internet more complex impact the Internet's openness and role as a driver of innovation and economic growth?

Of course the answer is yes; therefore it is imperative that even as the Internet and the markets enabled by the Internet grow in complexity, a countervailing movement towards increased simplicity also gather force. The wireless grid holds that promise of ease and simplicity for the user, while similarly allowing developers to write code to a new, very simple, abstraction layer, for the sharing of resources on and off the Internet. These are questions I have addressed in prior academic articles, for example in IEEE Internet Computing, and have sought to operationalize through my founding of the Wireless Grids Corporation.

Wireless Grids

The NSF and OECD ask: "Wireless sensor networks are expected to create significant productivity in supply chains. What are the challenges for integrating commercial and non-commercial wireless networks with the Internet? Conducting societal risk assessments of possible impacts of mobile wireless and sensor networks and taking responsibility: Once benefit/risk assessments have been performed, how can all participants, as appropriate to their role, assume responsibility?"

Wireless sensor networks, and wireless networks in general, are playing a tremendously significant role for consumer and business uses of the Internet. It is certainly critical that the concomitant risks be assessed, and to the extent possible mitigated in advance. But the focus of these questions is misplaced, as sensor networks will be just one more input source into wireless grids which can span and integrate – inter-operate – multiple sensor networks as well as other wired and wireless networks. There is no question that wireless and wired sensor networks will be increasingly ubiquitous, pervasive, and economically valuable. But the sensor networks themselves are significant but relatively dumb, low bit rate data pipes. The interesting socio-economic-technical challenges are therefore about the dynamic inter-operation, integration, and dis-integration of networks, applications, and users, in real time.

Wireless grids are not always wireless, and do not conform to the common definition of a grid as a meta-network for sharing computational resources. Rather, wireless grids are an emerging abstraction layer, above and beyond the Internet and the web, wherein many user applications will reside. Hardware, software, and content is all equally accessible and tradeable across the wireless grid. The concepts of virtual machines, peer to peer computing, software radio, web services and web 2.0 technologies.

Wireless grids are new social gatherings of people, content, software, devices and networks. Understanding of user experience on and off the grid will be critical. Hence people and their machines will have a deeper and mare variegated experience set than is presently the case. Even as the deepening integration of Internet infrastructure into daily life heightens our inherent social vulnerability from reliance on the Internet's 'best effort' – which usually is more than good enough.

The good news then is users will control more easily their own stuff on their own machines. The bad news is the future risks and threats can be still more devastating, as the future hackers and Internet criminals crash not only your computer, but also your TV, your lights, your home – your life.

These issues will require careful study and analysis as early commercial and experimental wireless grids emerge over the coming years.

Internet Governance and Privacy by Design

The NSF and OECD ask: "Ensuring 'privacy by design': 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?"

The newest UN institution, the Internet Governance Forum, met in Athens fall 2006. The meeting was by all accounts a tremendous success, from the point of view of advanced and developing nations alike, as well as civil society and the business community. The IGF as it is now known, has no decision-making authority, so could be dismissed as just another 'talk shop.'

However, it is clear that it is much more than that, it is the forum where critical technical, policy, economic, business, legal and social issues surrounding the global Internet.

Therefore the specific issue in this setting, building in and protecting privacy by design, was naturally on the table there, and I expect will be frequently discussed in the future.

Will the challenge be resolved in a way that will enhance privacy from the start?

Maybe, maybe not.

On the one hand, some of the same mechanisms that will enhance privacy may also in certain use settings create a substantial new risk, so truly doing 'privacy by design' is much harder than it sounds: privacy for whom, when, in which use case. What risks to other's privacy are created by my own efforts to protect my privacy?

Further, we may ask: what is privacy, in an era of pervasive computing, ubiquitous networks, and mobile devices which always know where you are – by design. Social attitudes towards privacy may be changing, as the popular assumption appears to be that privacy has already been irrevocably eroded. Has it? Conscious design for the future taking account of privacy is nonetheless the way to go.

Another Problem: The Chaotic Educational Internet

There is no question that the chaotic educational Internet is a major problem for students of all ages. The problem is not that the Internet is not useful for academic research, whether at the collegiate or elementary school level. Of course it is, after all the original designers were academics and the first thing they did it was use it for their own research. But how to integrate Internet into education and training at all levels?

Incoherent school Internet technology and policy is however a serious problem. How can the average classroom teacher hope to keep up with the ongoing changes in Internet technologies, never mind changing policies and a plethora of Internet content, which changes daily in real-time? What form of pedagogy works for the student, and for the 'instructor'?

On one hand Internet as educational infrastructure is relatively stable, and many students are enrolled in courses which are offered in whole or in part across the Internet. By that metric, the Internet is already a huge success for educators, as exemplified by my own School of Information Studies and its many distance education programs, including innovative consortia across institutions which would be practical if at all possible in the absence of the Internet.

So is there a problem and if so, is there a solution?

Digital Library Islands

Yes – the National Science Foundation and other agencies in the United States, and similar bodies elsewhere, have been supportive of the creation of Digital Library Islands – more commonly known just as digital libraries. The continued support and further development of curricular materials for use in schools and at home, or wherever, is something where governments can play a constructive role. Expecting the classroom teacher to spend many hours each day trolling the Internet randomly for pedagogically appropriate and truthful content, is just not going to happen.

Suggestions for NSF and OECD

Certainly there is a need for the NSF to support forward-looking research on 'greenfield' as well as more incremental and focused research, at the technical as well as social and economic aspects of the Internet.

Thinking 'way outside the box' is what is needed. And new types of research facilities will certainly be required for future research. The Global Environment for Network Innovations (GENI) will be a very significant research facility. I prefer Grid Environment for Network Innovations. Just as GSM first stood for Group System Mobile, bef