



INTERNATIONAL TELECOMMUNICATION UNION
**ITU WORKSHOP ON
UBIQUITOUS NETWORK SOCIETIES**

Document: UNS/10
11 April 2005

Original: English

ITU NEW INITIATIVES PROGRAMME — 6-8 APRIL 2005

CHAIR'S REPORT

Introduction

1. At the invitation of the ITU Secretary-General, a workshop on “Ubiquitous Network Societies” was held in Geneva, Switzerland, from 6-8 April 2005. The workshop was organized as part of the Secretary-General’s “New Initiatives” programme.¹ Some 40 experts participated in the workshop, representing a range of regulatory and policy-making agencies, mobile operators, service providers, academic institutions, futurologists, private firms, and others. Those present at the meeting participated in an individual capacity. Professor Robin Mansell, who holds the Dixons Chair in New Media and the Internet at the London School of Economics and Political Science, chaired the meeting.

2. Three background papers were prepared for discussion at the workshop: “*Ubiquitous Network Societies: Their impact on the telecommunication industry*” (presented by Professor Elgar Fleisch, University of St-Gallen, Switzerland), “*Ubiquitous Network Societies: The case of RFID*” (presented by Lara Srivastava, SPU, ITU), and “*Privacy and Ubiquitous Network Societies*” (presented by Dr. Gordon Gow, London School of Economics and Political Science). In addition, a number of case studies were prepared covering country experiences in Italy, Japan, Korea, and Singapore.² The experiences of other economies were also presented, including India, Hong Kong SAR, France, Spain, Russia and the United Kingdom.

Case studies on ubiquitous network societies

3. The four countries selected for the case studies each represented early adopters of mobile and ubiquitous technologies in their regions:

- The case of **Italy**, together with the results of a survey of opinion-shapers in Italy, was presented by Maria Cristina Bueti. The Italian government is committed to making Italy a leader of the digital age and, to this end, has committed to making consumer subsidies available for the adoption of broadband (€75 per household) and set-top boxes for digital TV (initially €150 per household, but subsequently reduced to €75). In particular, the use of interactive TV has been identified as a way of extending access to government services (“T-government” or “television-government”, which enables local television companies to transmit content for third parties as part of their public service mission), beyond those reached by other new media.
- The case of **Japan** was presented by Lara Srivastava. Japan defines the Ubiquitous Network Society (UNS) as one in which there is “anywhere and anytime access for anyone and anything”. Since 2003, the Ministry of Internal Affairs and Communication (MIC) has been working with industry and academia to stimulate the development of ubiquitous networks, namely in three areas: next generation networks, universal communication, and safety and security. A Charter of the Ubiquitous Network Society has been proposed to balance technology and societal interests.

¹ For more information on the ITU New Initiatives Programme, see <http://www.itu.int/spu/ni>.

² All of the meeting documents are available on the ITU website at: <http://www.itu.int/ubiquitous> and will be published later as part of the ITU New Initiatives series of publications. Workshop presentations can be downloaded at <http://www.itu.int/osg/spu/ni/ubiquitous/presentations/>.

- The case of the [Republic of Korea](#) was presented by Tim Kelly. Korea can be seen as a laboratory of the future, as it holds a leadership position in both broadband and 3G mobile. This has resulted, *inter alia*, from a unique public/private consensus-making process, which has shaped government policy for promoting Korea's position in the Information Society. One recent element of this has been the IT839 strategy, which targets 8 services, 3 infrastructures and 9 new growth engines for a ubiquitous ICT environment.
- The case of [Singapore](#) was presented by Eric Lie. Singapore has long been a leader in the field of e-government and has pioneered the use of ubiquitous technologies in fields such as traffic management and library automation. Singapore's current strategy is built around its aim to become the "Next Generation I-Hub", with the vision of creating a secure, ultra high-speed network to drive next generation connectivity.
- In addition to the formal case studies, the experiences of a number of other countries were presented. The case of [India](#), and other developing countries, was presented by Rakesh Kumar (Cognizant Technology Solutions), who noted, in particular, two applications of RFIDs in India: for delegate management (at NASSCOM 2005) and livestock management (Chitale Dairy Farms).

Ubiquitous network societies

4. The term "ubiquitous computing" was coined in 1991 by the computer scientist, Marc Weiser. He described a new era in which computer devices will be embedded in everyday objects invisibly at work and the environment around us; in which intelligent, intuitive interfaces will make computer devices simple to use and unobtrusive; and in which communication networks will connect these devices together to facilitate anywhere, anytime, always-on communications. Now, almost fifteen years later, technological change and the diffusion of mobile communications and the Internet are making this vision a reality. The term "Ubiquitous Network Societies" (UNS) captures the convergence between a number of technological fields as well as their implications for the economic, political and social aspects of society. Key trigger points in making this possible might include radio frequency identification (RFID) chips available at less than US\$0.05, US\$20 mobile phones and US\$200 computers.

5. However, the business case for implementing longer-term visions of UNS remains unproven. In addition to the difficulties of reaching the price points at which widespread hardware diffusion becomes possible, there is the problem of keeping usage or subscription charges at a sufficiently high level to maintain incentives for investment without deterring usage. Other difficult challenges include simplifying the inherent complexity of ubiquitous networks; interpreting issues of liability and ensuring interconnection; and countering any tendency towards monopoly provision by fostering competition between networks that offer multi-purpose functionality.

6. Different visions of UNS were presented at the workshop, some focusing on the use of sensor technology, and others more broadly encompassing a range of new technologies. A major characteristic of UNS is the mapping of activities in the 'virtual' and 'real' worlds. For some, the migration path to UNS is incremental, with capabilities such as self-adaptive or context-aware operation of devices being added slowly to today's products and services. For others, the migration path is longer-term, disruptive and potentially requiring huge investment in infrastructure and applications. For instance, some argue that using RFIDs effectively in inventory management will require a complete rethink of existing management systems rather than an incremental adoption of the technology within existing supply chains. Others stress the importance of differentiating between today's RFID applications and future nano-scale or sensor-enabled radio technologies.

Technologies and their applications

7. There are likely to be multiple platforms for the delivery of ubiquitous networks and computing applications based upon interworking and the interoperability of systems, as well as convergence at the network, device and services levels. Broad definitions of UNS encompass a wide variety of information and communication technologies, while more narrower definitions focus more directly on developments in RFID and sensor technologies. Although, by no means the only technology development of concern to UNS, at present the best developed is RFID (both passive and active), the subject of one of the background papers prepared for the workshop. Many other technologies, such as Near Field Communications (NFC), sensors,

and Zigbee are coming to market and will likely play a major role in future developments. Key considerations in this area are the usability, utility and ubiquity of new applications. A number of presentations provided examples of early adoption of UNS applications. For instance:

- Sensor networks have been established to provide flood-warning systems through a network of sensors in a river bed near Nice in France;
- In Japan, RFID chips have been used to improve food traceability, for instance to track the origin of meat, or the freshness of fish;
- RFID chips are being used to distinguish legitimate pharmaceuticals from counterfeit ones. It is estimated that 30 per cent of drugs in the developing world and 6-10 per cent in the developed world are counterfeit;
- RFID chips in ID cards and passports have been proposed as a way of improving security and streamlining procedures at airports. However, this may have the undesired effect of enabling citizens to be more easily tracked and making particular nationalities more recognizable to terrorists and other criminals;
- In the Republic of Korea, self-adaptive ICT devices (like KT's "One-Phone" or "Nespot Swing"), automatically recognize which network is being accessed and which one is the cheapest or fastest available;
- In Switzerland, RFID is widely used in ski-passes to provide access control and an easy mechanism for payment;
- In Singapore, RFID chips have been used in road pricing since 1998 and there is 100 per cent penetration of vehicles in the country;
- RFIDs are widely used in inventory management and in maritime transport and logistics, with WalMart and Gillette being among the early adopters and bulk purchasers of chips and readers, a process which is essential to reducing unit prices;
- Bio-medical applications include RFIDs that contain identity information or medical records and which can be implanted in dental prosthetics or injected into the body. The latter are also used, for instance, in the Baja Beach Club, Barcelona, for controlling access to certain parts of the club, and to facilitate purchases of drinks and food.

RFID and sensors as enablers of the ubiquitous communication environment

8. ["Ubiquitous Network Societies: The case of RFID"](#), one of the background papers prepared for this Workshop, was presented by Lara Srivastava (ITU). Though there are early examples of ubiquitous technologies and their applications, such as the mobile phone, access "anytime, anywhere, by anyone and anything" is currently limited by our inability to collect raw data about where things are located and changes in their status. RFID promises a shift in the computing paradigm such that in the future not only people and their communication devices will be connected to global networks, but also a large number of inanimate objects from tires to razorblades. RFID applications will enable the automatic and autonomous collection of data about all the things we see and use in our environment, thereby creating truly intelligent and ambient network spaces.

9. RFID applications are quickly gaining momentum in public transport, toll collection and contactless payment cards. Though not a new concept, RFID is being seen as an enabler of the "Internet of things", the next and crucial step beyond person-to-person person-to-machine communication. In the future, "things" will communicate with each other in the interest of (and on behalf of) people. However, the tremendous potential of RFID-based applications is currently being hindered by the absence of new international standards to ensure interoperability. Continuing fragmentation in standard-setting in this area may mean that organizations will incur higher costs to ensure compatibility with multiple types of systems. Workshop participants called for concerted efforts to encourage global harmonization of RFID standards and their interoperability, so as to stimulate smooth and rapid technological advance in the field. This holds particularly true for the harmonization of frequency use and communication protocols which vary across regions. Data formats for RFID tags, or electronic product codes, on the other hand, have benefited from international collaboration through organizations such as Auto-ID Centre, now EPCGlobal, and Ubiquitous ID Centre.

10. The potential benefits of RFID applications range from better and more efficient medical care to increased convenience at points of sale, improved fraud prevention, and streamlined business processes (in particular, in supply-chain management applications). It was suggested that near-term growth in RFID use will continue to be driven by business applications with consumer applications growing in the mid- to long-term. Given its potential for tracking the location of individual items and people (using wearable or implantable RFID tags), consumer advocates remain concerned about the potential risks RFID poses to individual freedoms and privacy protection.

The challenges of ubiquitous networks for the traditional telecommunication industry

11. The background paper on "[Ubiquitous Network Societies: Their impact on the telecommunication industry](#)" was presented by Professor Elgar Fleisch (Univ. of St Gallen, Switzerland). The hope for the telecommunication vendors and service providers is that ubiquitous communication will create new revenue streams, in particular, from machine-to-machine communications (the "Internet of Things"). Operators are expecting greater revenue growth from data services than from voice services, on both fixed and mobile networks.

12. Ubiquitous technologies promise to be engines for economic growth, which is one reason that so many operators and firms are targeting this area. However, for traditional operators there is also the threat of cannibalisation of existing revenue streams. There are continuing tensions between the economics of Internet Protocol and Time Division Multiplexing (TDM) networks that will need to be addressed, together with issues of billing, quality of service, and network security. For instance, self-adaptive telephones will tend to reduce the price paid for calls without necessarily increasing their duration or number. Advanced wireless technologies (such as WiMAX, WiFi or Korea's WiBro standard) were also seen to complement and build on current third generation mobile technologies. The introduction of "always-on" pricing models will provide a significant improvement over traditional per-minute charging schemes. In Korea, two out of the three licensees for WiBro are fixed-line operators (KT and Hanaro) that see WiBro as a way of winning back traffic that has shifted to their mobile competitors.

Implications for government policy and regulation

13. The different types of service underlying UNS each have difficult spectrum requirements that are difficult to foresee, but certainly substantial. There also are issues around who should bear the risk and costs associated with changes in spectrum management approaches and allocation decisions. Within ITU, the ITU-R Working Group 8F is working on the spectrum requirements of services beyond IMT-2000 (3G), with a typical radio interface of 100-1'000 Mbit/s (depending on the level of mobility), as well as enhancements to today's 3G systems. A market analysis of future service requirements is being undertaken in order to develop recommendations for the next World Radio Conference. For RFID applications, various spectrum allocations and power limitations have been agreed in different regions (for instance, 902-928 MHz, 2.4W ERP (Effective Radiated Power) in United States but 868-870 MHz, 0.5W ERP in Europe). This is hindering the further development of global RFID applications and future decisions will have an impact on the structure and competitiveness of emerging markets.

14. New spectrum requirements for UNS are also posing challenges for traditional command and control or administrative spectrum allocation techniques. Some countries have already adopted market-based mechanisms for spectrum allocation (including spectrum trading in some countries) while license-exempt services like Wi-Fi are also being deployed in a growing number of countries, creating demand for a larger spectrum "commons". Some services (for instance, public protection disaster relief) still require global harmonization. Different mechanisms for spectrum management will most likely coexist in ubiquitous network societies, and it will be important to consider whether allocation should be done on a application-specific basis on a technology neutral one.

15. Government policy and regulatory issues are important considerations as UNS emerge. In some economies, there is a shift in focus from 'e' to 'u'-strategies, to reconsidering the treatment of universal service and the ubiquity of access for potentially excluded groups, including the elderly, and, potentially, to discussing new codes of social conduct. In addition, the roles of the public and private sectors in encouraging the spread of the new technologies will continue to need to be reviewed to ensure an appropriate balance in their respective contributions.

Data protection, privacy, security and consumer protection

16. The third background paper commissioned for this workshop was on the topic of “[Privacy and Ubiquitous Network Societies](#)”, presented by Dr. Gordon Gow of the London School of Economics and Political Science. Notions of privacy and related concepts also were raised by other speakers in the context of increasing technological pervasiveness. The “privacy paradox” associated with ubiquitous network societies involves three co-dependent domains: the technical domain (e.g. encryption and spyware), the regulatory domain (e.g. rules on disclosure and retention of personal data) and the sociological domain (e.g. blurring boundaries between public and private spaces). In the sociological domain privacy issues are evaluated as they relate to social systems and norms and, in this respect, education and awareness about the concept of privacy are important starting points.

17. Specific challenges related to privacy in UNS were raised such as authentication mechanisms (e.g. forgotten passwords or stolen identities), individual profiling (i.e. prediction or categorization of human behaviour), and unsolicited and fraudulent communication (e.g. spam, spim and phishing). Other concerns included surveillance, retention of data, and security.

18. Although PETs (privacy enhancing technologies) have emerged on the market for the protection of individual privacy and identity, serious problems remain in terms of their usability. In addition, if sensor networks should “announce” their presence rather than remaining undetected, there are issues as to whether this capability should be mandatory. It was suggested that mechanisms for protecting privacy should not be provided at a premium and businesses should not charge more for services or products that free users from tracking or profiling. The question was raised as to whether privacy is to become a commodity available only to those with the necessary financial means?

19. Privacy is widely recognised as a shared set of common values (cf. UN resolution 45/95 of 14 December 1980 on Guidelines for the Regulation of Computerized Personal Data Files) and in many countries it is recognised as a human right. Privacy is also an important business consideration, especially as consumer demand and the building of consumer confidence are pivotal to any business case for ubiquitous network applications. In this respect, fears related to the social impact of new technological developments are important considerations for the mass take-up of ubiquitous network technologies and applications. Privacy issues need to be considered along with other consumer issues such as affordability, health, and environmental concerns. Although there are considerable concerns about privacy protection, it was suggested that the notion of individual privacy is not absolute and that protections must be balanced against collective interests in economic growth, business and social development, and the public interest. The resolution of issues in this area will have a fundamental impact on the trust and confidence that consumers and citizens place in UNS.

20. In the specific context of data protection it will be necessary to elaborate solutions based on shared principles in response to new challenges presented by ubiquitous networks and the use of sensors that otherwise might result in surveillance. Solutions are likely to entail the use of technology, regulatory, administrative and financial mechanisms and will need to cover data collection, retention and security issues.

The interplay between technological ubiquity, human behaviour and socialization

21. No technology can develop without an effect upon society and *vice versa*. The mobile phone, as an early example of a ubiquitous technology, provides an interesting case study. Mobile communication, in particular, among young people, has been accompanied by changes in social values and norms. For young people, mobile phones are regarded more as personal gadgets than as communication devices: they serve as fashion statements, as a link to their peer groups and often as a means of gaining independence from parental control. The mobile phone of the future may change radically, perhaps by being integrated into users’ glasses or clothes (“invisible mobile”), accompanied by further changes in social practices. There is a need to manage increasing complexity, to ensure that functionality for users is transparent, and to develop ways of fostering trust and minimizing risk.

22. It was suggested that the extensive use of ubiquitous technologies may lead to a reduction in face-to-face contacts and to greater individuality or isolation. It also was argued that any form of mediation is an essential aspect of human communication. Human beings have always communicated using some kind of

“utility”, be it a language or a technology. The emergence of ubiquitous or ambient spaces is likely to affect the “form” or “type” of mediation, but will not be the first instance of mediated communication environments. Technological mediation of human relationships is likely to become more intense and frequent, however, thereby influencing social behaviour and human identity formation. The real (or perceived) social consequences that may result from the global and pervasive use of ubiquitous technologies (such as RFID) will need to be considered along with the economic, organizational and political considerations, possibly in the context of multi-disciplinary global forums.

23. An important consideration in any assessment of these technological developments and their policy and regulatory implications (as well as the likelihood of compliance with legislative measures) is the extent to which people will remain a systemic weakness in UNS. Decisions with respect to the liability assigned to various human actors within these societies will play an important role in whether policy and regulatory goals can be met. A further consideration is the development of a better understanding of the user motivations that shape demand for new applications and services and of the socio-economic factors that influence them. In particular, there is a need for ongoing discussion of the distinctive social, cultural and other values that will become embedded in the architecture of UNS and whether these are consistent with agreed values and ethical norms.

Shaping ubiquity in the developing world

24. For most developing countries, achieving universality of information and communication technologies is more important than achieving ubiquitous networks. Priorities suggest that access to basic telecommunication services must come before access to more advanced ones. Nevertheless, developing countries will certainly benefit from advanced technologies that achieve economies of scale in production in the industrialized countries as this will reduce their unit prices. Equally, certain RFID applications - such as those in the field of agriculture or emergency warning systems - are of potentially greater benefit in developing countries than in the industrialized countries.

25. One of the major factors influencing developing economy firms to adopt ubiquitous technologies is the need to meet requirements for participation in global supply chains including the requirements of their clients in the industrialized countries. For instance, the retailer WalMart, which sources many of its products from China, is progressively requiring the use of RFID tags throughout its supply chain. Although the benefits of supply-chain automation for labour-saving may not be as significant in developing economies, the potential gains in terms of reduction of inventory losses, traceability of origin and improvements in timeliness of delivery will provide benefits. As in the case of the industrialized economies, there are issues of security, spam and privacy intrusion which may be more severe in developing economies and need to be taken into consideration, together with issues of public and private sector sources of investment.

Opportunities for international collaboration and further work

26. The development of ubiquitous, next generation networks will require international coordination in many different areas including standardization, both of technical interfaces and product codes, frequency allocation, allocation of IPv6 addresses, etc. As one participant in the workshop observed, “it is difficult to speak about the future, especially during a technological revolution”. However, it is clear that consideration must be given to what a standards development organization in the 21st Century would be like and to the priorities that should be given to global harmonization in certain areas. This will require continuous institutional evolution and, perhaps new types of mechanisms, with broader membership that could handle the many different coordination requirements, while remaining flexible, responsive and cost-effective.

27. Further inter-disciplinary research is required in many of these areas including the crucial question of the level of ubiquity that may be considered appropriate by users in different countries and regions in the world. In addition, it will be important in some cases to consider alternative approaches to “marketing” the importance of privacy protection in ubiquitous network societies, for instance by placing more emphasis on the commercial benefits to business enterprises, rather than on human rights considerations.