

RFID: road to ubiquity



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Lara Srivastava

Strategy and Policy Unit (ITU)

Note: The views expressed in this presentation are those of the author and do not necessarily reflect the opinions of the ITU or its membership. Lara Srivastava can be contacted at lara.srivastava@itu.int

*“the most **profound** technologies are
those that **disappear***

...

*they **Weave** themselves into the fabric of
everyday **life** until they are
indistinguishable from it”*

Mark Weiser (1991)
The Computer for the 21st Century

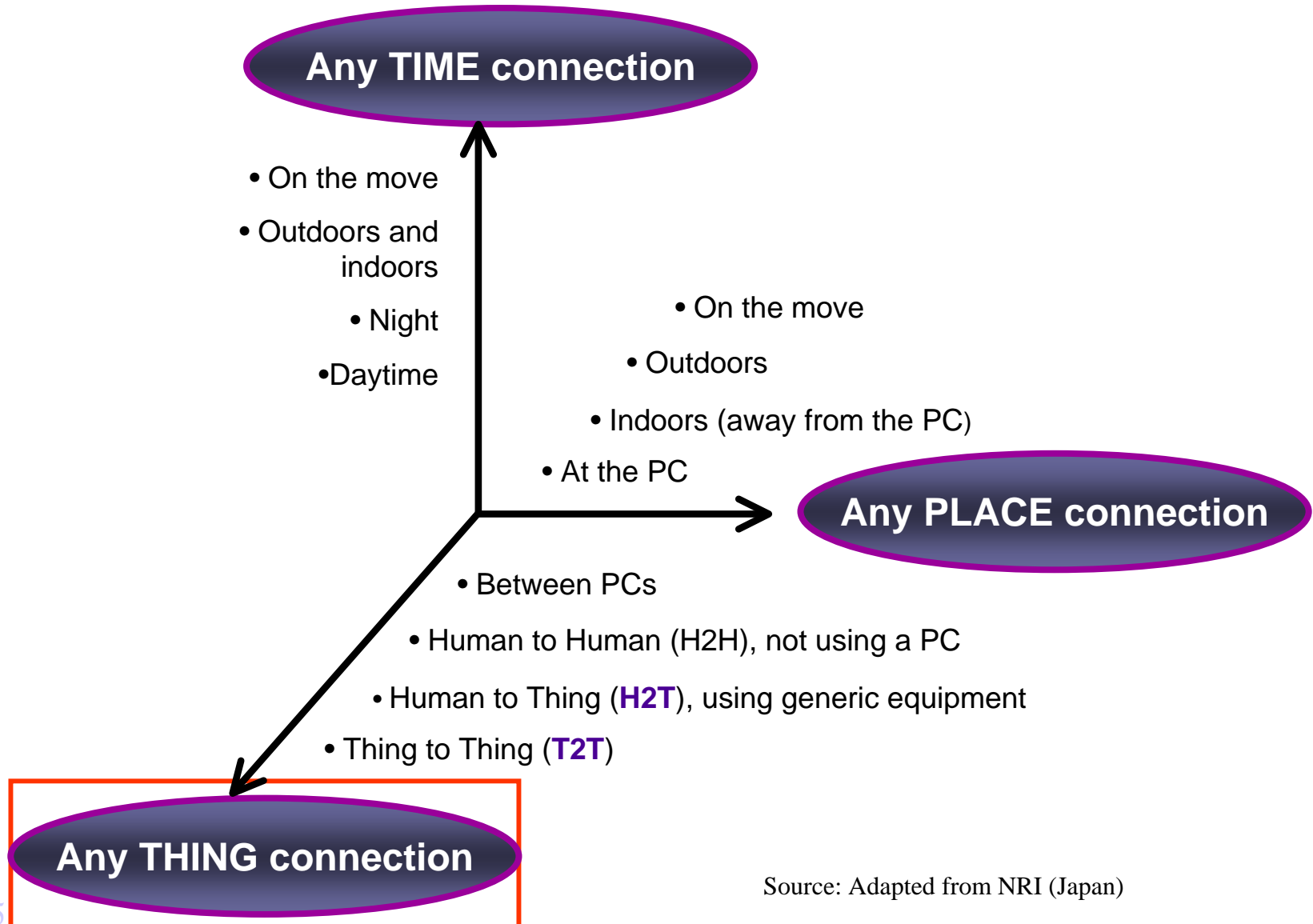
visions of technological ubiquity

- about the term “ubiquitous”
 - In the context of ICTs, “ubiquitous computing” was coined by the late Mark Weiser
 - His vision: dedicated IT devices will eventually disappear, while information processing capabilities will be increasingly available
- the concept refers to unobtrusive connectivity anytime and anywhere, by anyone
 - Extending connectivity to the underserved
 - Early example: mobile phones (reaching 2 billion subscribers in 2005)
- **bUT also by *anything***
 - Creating a “network of things”

a paradigm shift...

- this vision requires a paradigm shift in computing...
 - The ability to determine the status of everyday objects or thing in real-time
- ...leading to paradigm shift in the nature of today's cyberspace
 - The complete mapping of the real world by the virtual world
- ...this, combined with developments in miniaturization, will further spur innovation in ubiquitous technologies and drive costs down
 - nanotechnology and the disappearing processor

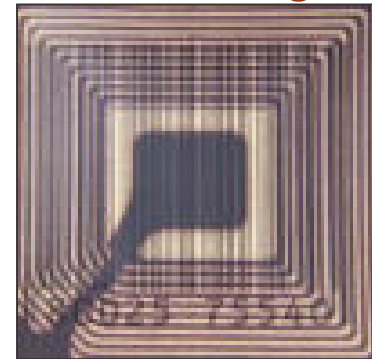
... introducing a new dimension



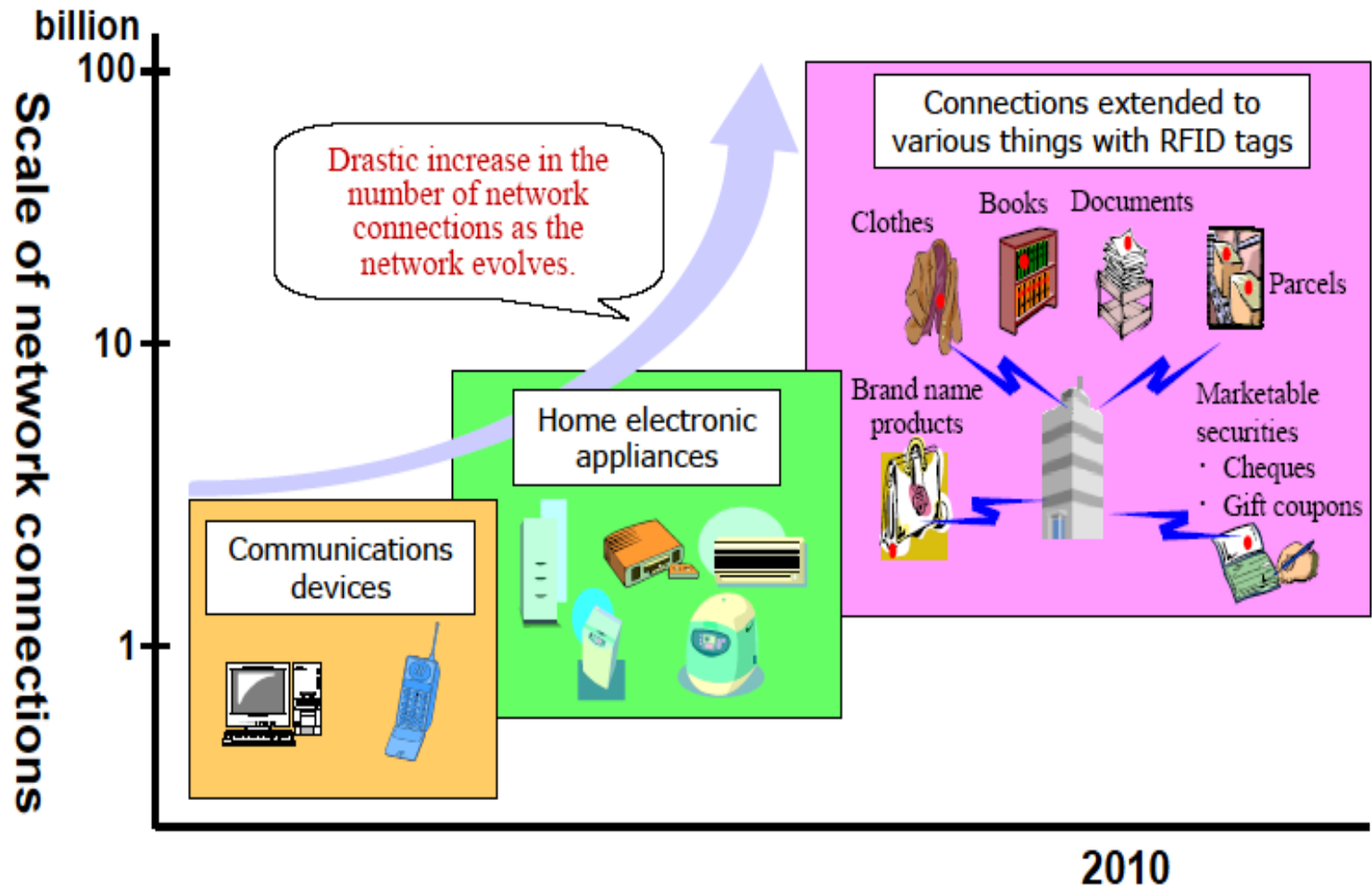
enabling this new dimension: “Radio-Frequency Identification”

- RFID transponders contain “unique” identifiers, which can contain information ranging from: location, price, washing instructions, banking details, medical records etc...
- RFID already used in transport and supply-chain management
 - e.g. retailers such as Wal-Mart, Tesco, Metro AG
- RFID now being embedded under human skin, and talked about in the context of tracking bank notes and passports

RFID Tag



RFID multiplies network connections



applying RFID

- **for Business:**
 - Supply-chain management
 - Transport and logistics
 - Medical/Pharmaceutical
 - Retail
- **for Government:**
 - Defense/Security
 - E-government
- **for the Consumer:**
 - Personal safety and security
 - Leisure & lifestyle



Image Source: Metro AG

RFID for Smart Consumer Lifestyles

- RFID in combination with sensor technologies to develop smart appliances, houses, and cities
- RFID for easy transactions (e.g. taxis, McDonald's)
- RFID tags getting smaller (e.g. Hitachi μ chip)



RFID Smart Bag for the Not-So-Smart?

MIT Media Lab has designed a build-your-own bag for those who tend to forget keys, mobile phones and so on, when leaving home. The bag is made of computerized fabric patches with a radio receiver and antenna, which communicate with the signals from RFID tags attached to a mobile phone, a key ring or a wallet.

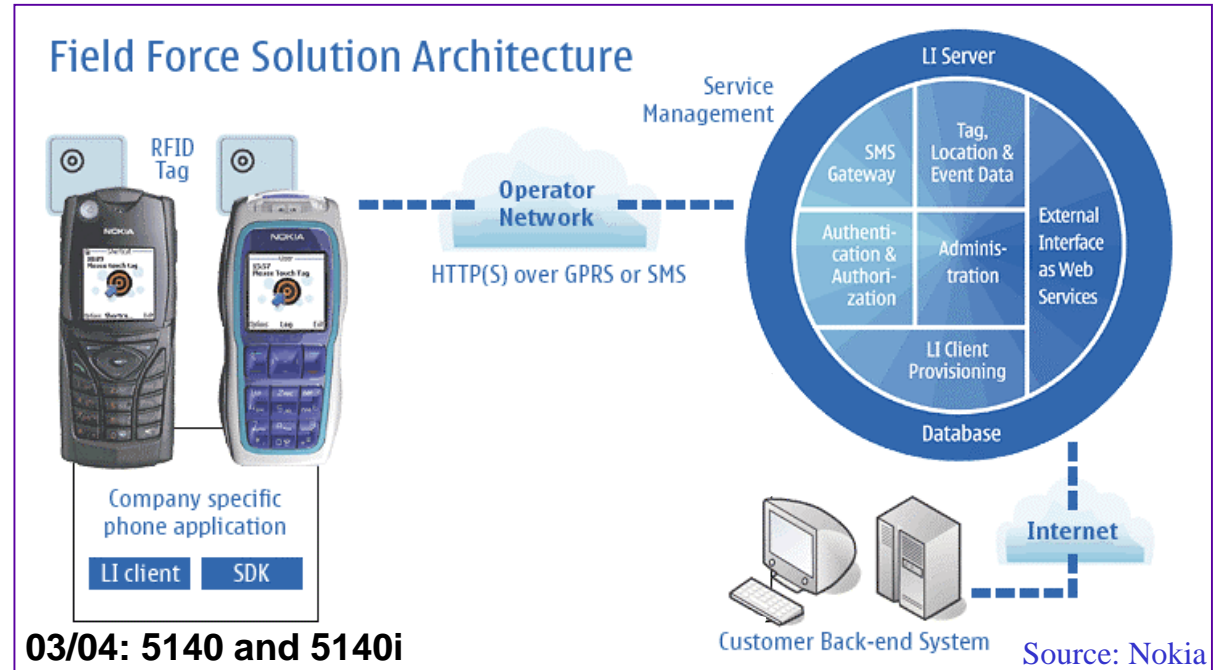
RFID for implanting humans?

- Verichip™ developed by Applied Digital Solutions is the size of a grain of rice
- already being used today, e.g. by Baja Beach Club in Barcelona
 - VIP patrons can order drinks by simple wave of the hand
 - Access control to exclusive lounges
- Verichip™ was recently approved by US FDA (Food & Drug Administration), for medical purposes (for now)



the mobile world wakes up to RFID

Nokia



NTT DoCoMo



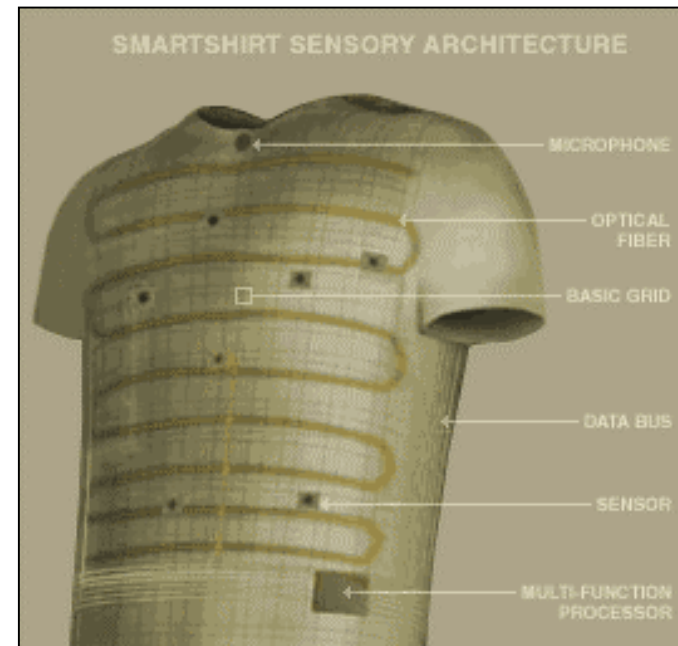
but not only the mobile world

- key IT industry players are thinking ahead
- Managed services for RFID networks are being deployed, e.g.
 - Cisco
 - AT&T
 - Microsoft
 - BT
 - Sun Microsystems



further ubiquity with RFID

- further integration of RFID with our “ubiquitous” mobile, through technologies like **NFC**
- Combination with **sensor technologies** and wireless sensor networks
 - for remote measuring of specific phenomena, e.g. Golden State Foods, targeted R&D in Japan
- from **smart** chips, to smart materials to “smart dust”?
 - smart vehicles
 - smart wearables
 - getting nano



important emerging challenges

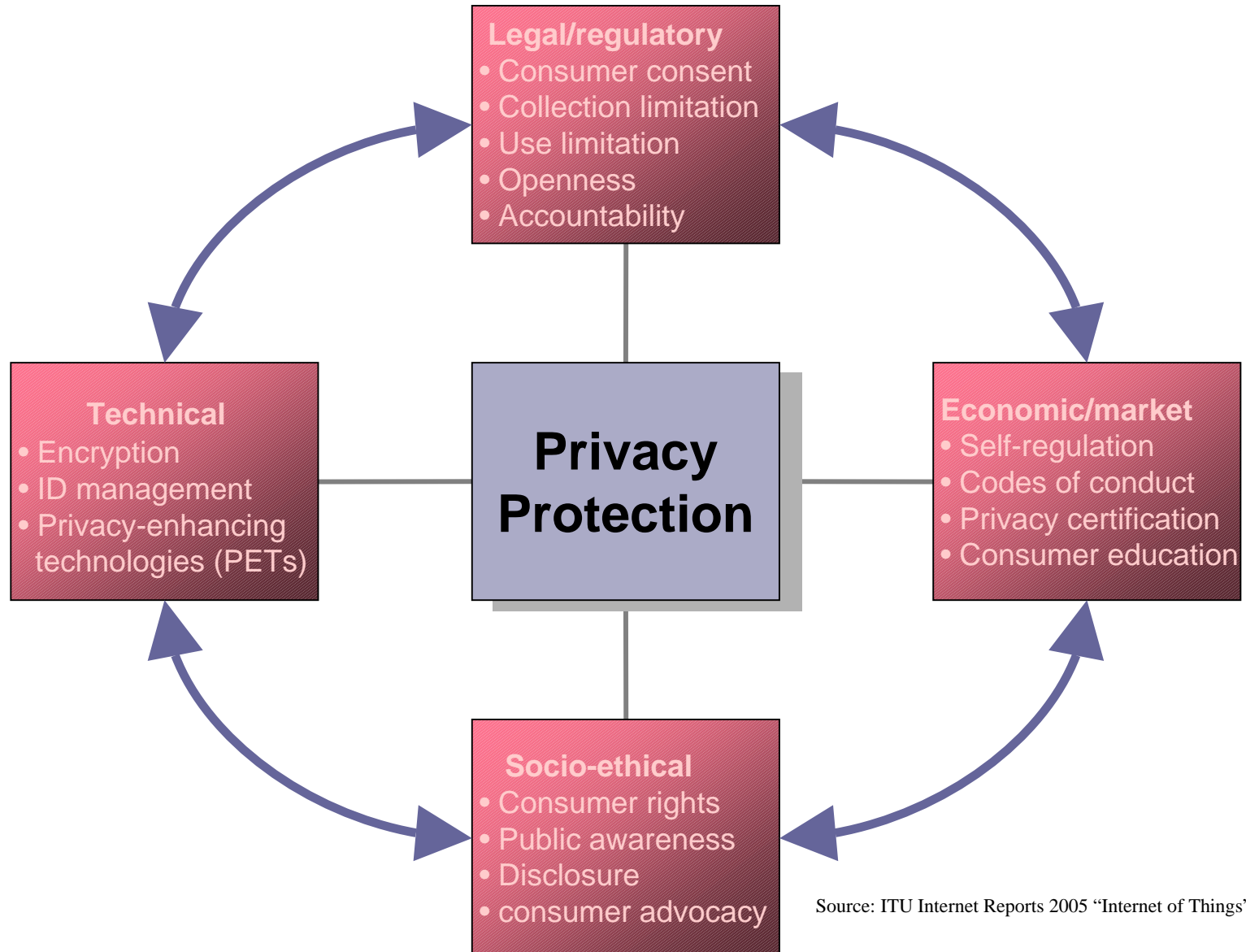
- Standards-setting and interoperability
 - Harmonization required particularly in the area of transmission protocols
 - Tag formats have *de facto* standard “EPC”
- Governance of resources
 - Who controls the unique identifiers?
 - More commercial value at stake than DNS...
- data protection and consumer privacy
 - Information contained on tags should appropriately managed and controlled

the RFID Privacy Problem

- Strong opposition by many consumer advocacy groups
 - CASPIAN, EPIC, EFF
 - Based on uncertainty surrounding status of tag information after product purchase
- Public sector is becoming more aware of problem, e.g. EU Data Protection WP
- Still, lack of clarity as to rules and guidelines for RFID use, combined with low consumer awareness of benefits
- risking a “privacy divide”?



facets of Privacy Protection



RFID: Social & Human Impacts

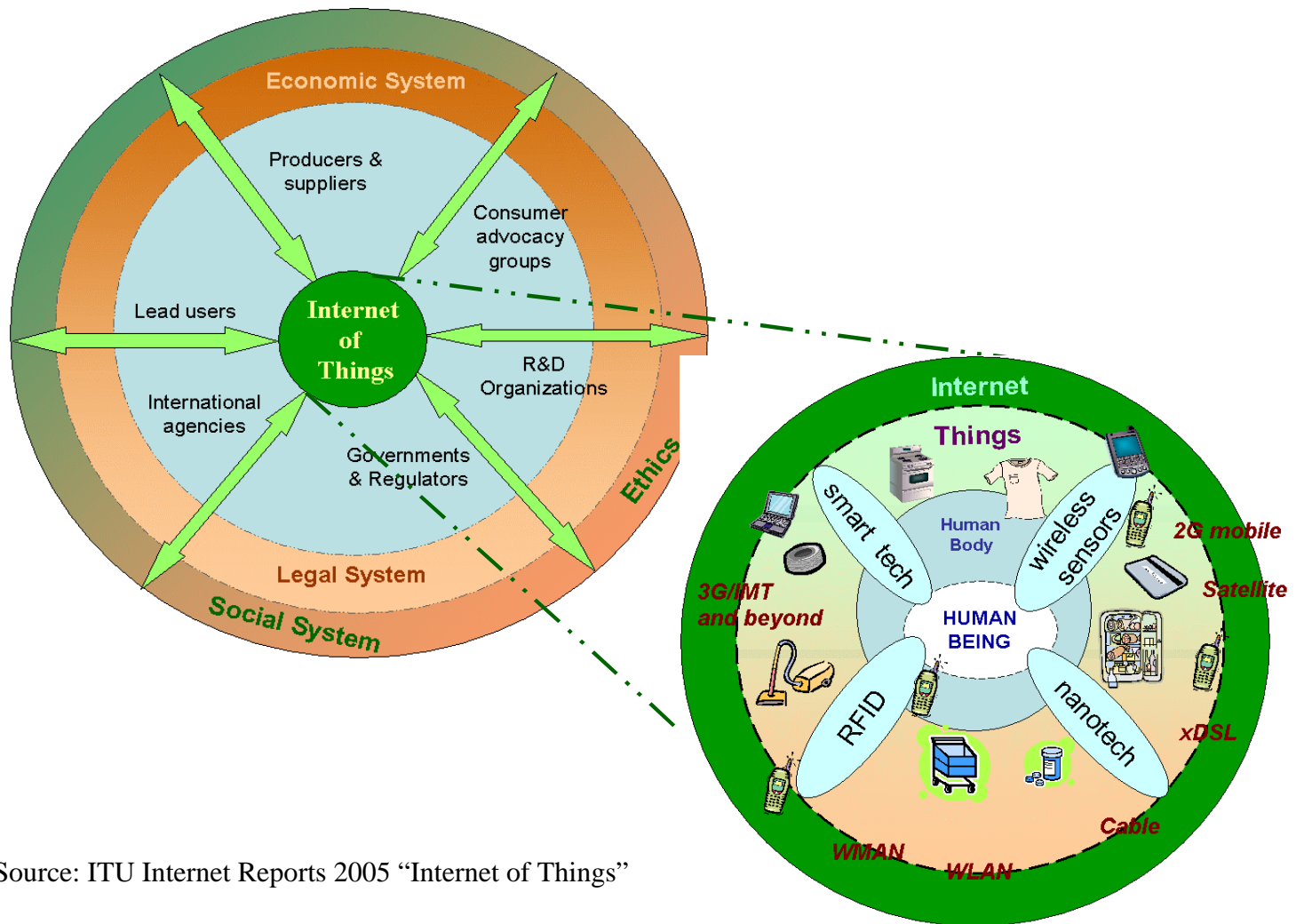
- **b**etter personal security
- **m**ore efficient care of human health
- **i**ncrease in quality of life

..... *but also:*

- (perceived) **S**ocietal, individual surveillance
- ...and its **e**ffect on individuality and self-expression
- **i**mpact of technology on human relationships and intimacy



RFID as part of an “Internet of Things” Ecosystem



Source: ITU Internet Reports 2005 “Internet of Things”

new ITU report: “Internet of Things”

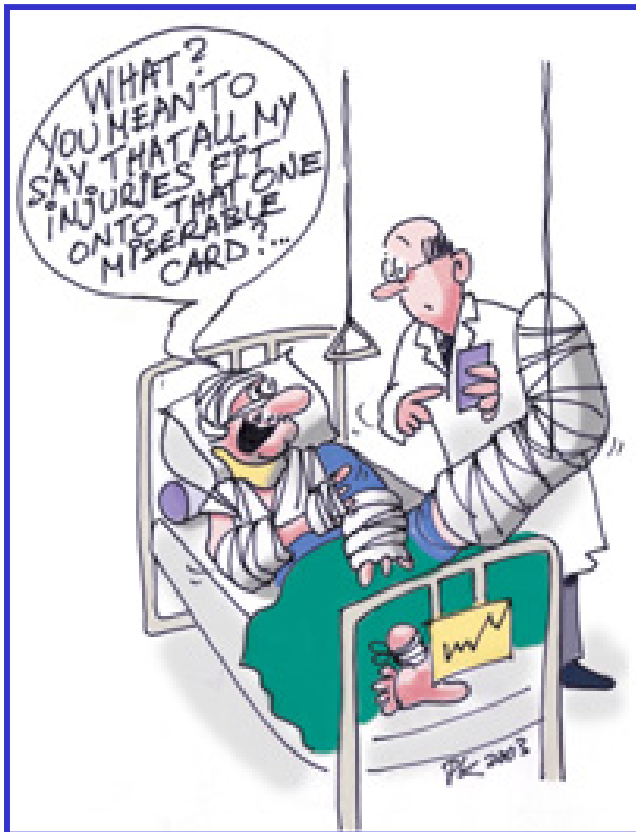
- Chapter 1: [Introducing the Internet of Things](#)
- Chapter 2: [Enabling Technologies](#)
 - RFID, sensor networks, smart devices, nanotech
- Chapter 3: [Shaping the Market](#)
 - From idea to market
 - Market growth
 - Inhibitors and drivers
 - New business models
- Chapter 4: [Emerging Challenges](#)
 - Standardization
 - Privacy protection
 - Socio-ethical considerations
- Chapter 5: [Opportunities for the Developing World](#)
- Chapter 6: [The Big Picture](#)



www.itu.int/internetofthings

“New Communication technologies are always introduced into a pattern of tension created by the Co-existence of Old and New”

(Marvin, 1988)



Helping the world communicate



thanks!

lara.srivastava@itu.int