anything …anytime

an introduction to networked RFID

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TSAG Tutorial

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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

current trends towards ubiquity

- trends in ICT market point to the preponderance of radio technologies, for instance the phenomenal growth of mobile cellular and wireless broadband networks
  - over 2 billion mobile phone users today
- Importance of always-on access and availability of communications and information anywhere, anytime
- As such, communications and processing power becoming “ubiquitous”

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towards an internet of things

- We have often talked about anytime and anywhere connection by anyone
- But it can go further still
  - Anywhere, anytime, anyone AND **“anything”…**
- This is the vision underlying the concept of a “network of things or objects”
  - Giving each thing its own “identity” in cyberspace
- In other words: the internet now connects computers to one another, but imagine if it could also connect computers to things – a whole new dimension?
  - Is this the dawn of an **“Internet of things”**?

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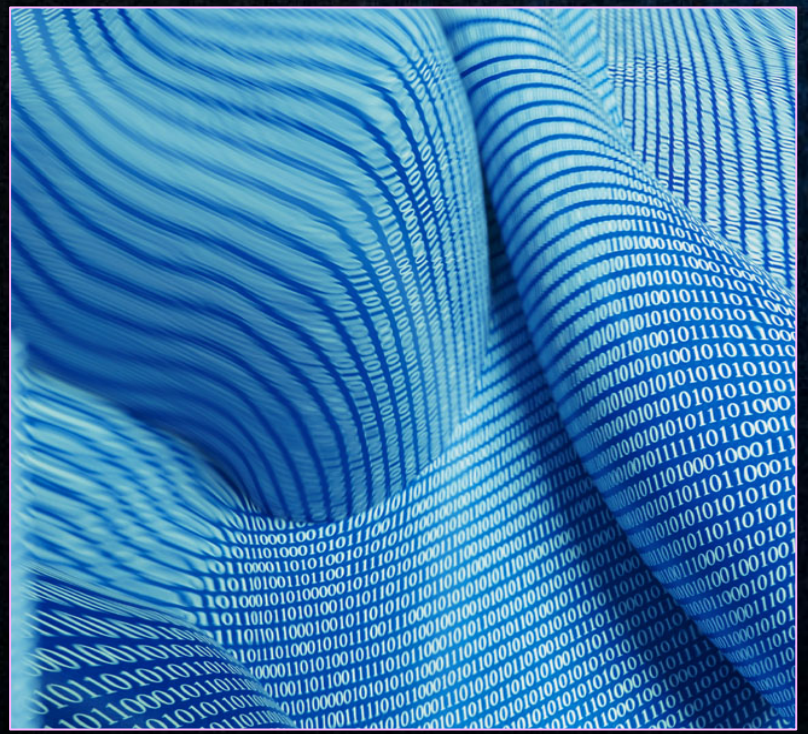
RFID is a key enabler of this dimension

- The term RFID consists of two parts: *radio-frequency* (RF) and *identification* (ID)
- RFID systems allow us to identify individual “things” in the environment
  - they can wirelessly (without contact) monitor objects in real-time, without necessarily having line-of-sight
- as such, RFID systems provide a sort of “map” of the real world in the virtual world



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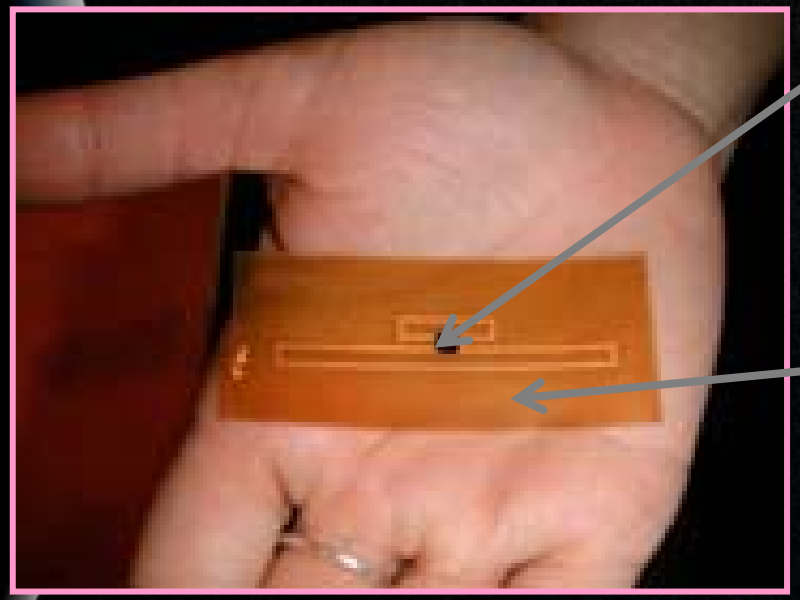
big idea in a small package

Tag/Transponder
(omewhere within this dark dot)



orange material just for display

Reader/
Interrogator
(backstage)

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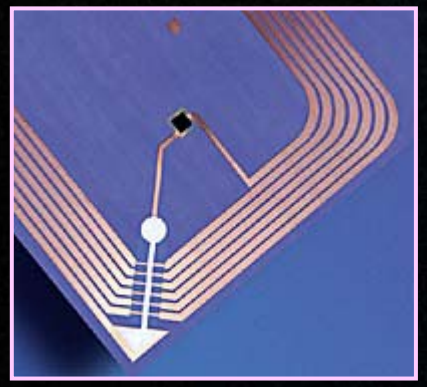
an RFID system consists of three main parts

- Tag or transponder (which stores the data)
- Reader or interrogator (which reads the data)
- Middleware (which forwards the data)



Tag or Transponder

Portable or Fixed
Reader or interrogator

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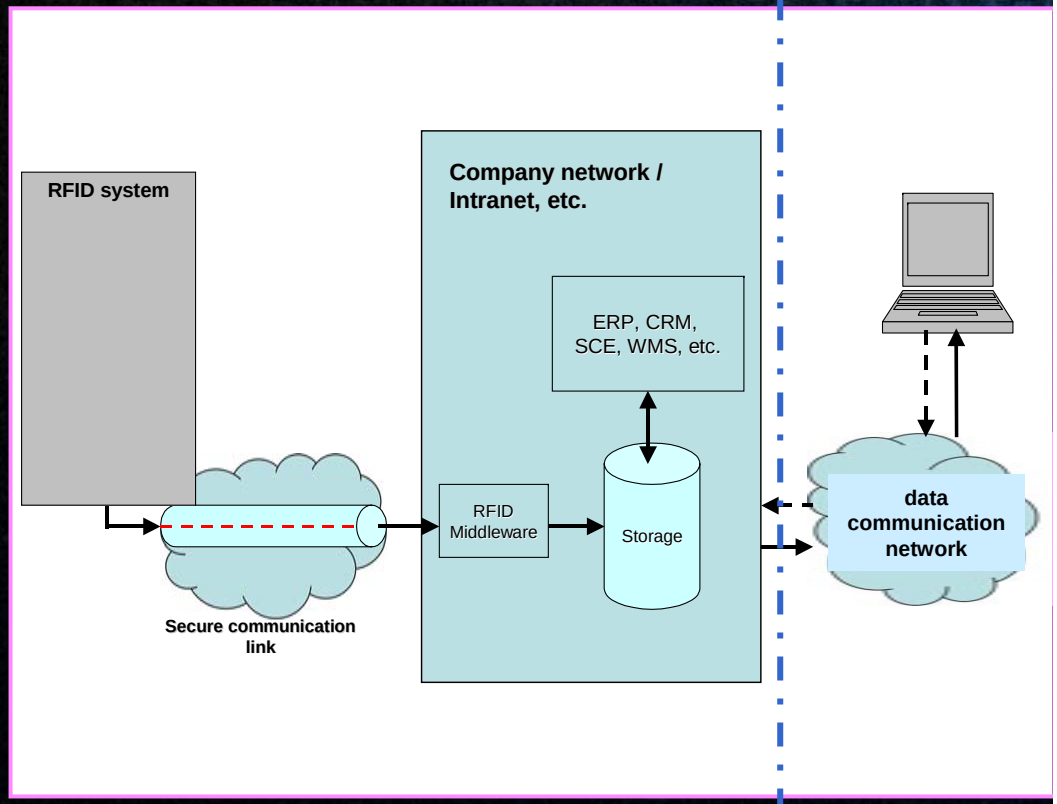
RFID systems can either be networked or stand-alone

- Typically, data collected by an RFID system is stored in a database
- As such, an RFID system can be “online” or “offline”, depending on its use of data communication networks
- encryption, read/write capability, passive/active



Source: ITU Internet Report 2005
“*The Internet of Things*”

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the RFID tag goes much beyond the bar code

- tags contain “unique” identifiers, and as such do not identify a series of products but individual and seemingly identical items
- tags can include a wide variety of information about an item: location, availability, status, price, category, but also washing instructions, credit card/banking details, medical records…

- RFID already used in transport and supply-chain management, and applications areas are growing

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growing markets, growing revenues

- VDC predicts that global shipments of RFID systems to reach USD 2.7 billion by 2007
- Frost & Sullivan even more optimistic with predictions of 11.7 billion by 2010
- In-Stat predicts that 33 billion radio tags will be produced by 2010 (that's just about 5 tags per human being), as costs drop from about 20 US cents to 5 US cents
- most analysts agree that item-level tracking will provide catalyst for widespread RFID adoption in short-term and across industries

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a wide variety of emerging applications

- Business Applications, e.g.
  - Transport and Logistics.
  - Access control
  - Supply-chain Management
  - Manufacturing
  - Medical/Pharmaceutical Applications



- Public Sector Applications, e.g.
  - E-government
  - Defense/Security
  - Library systems



- Consumer Applications, e.g.
  - Personal welfare and safety
  - Sports/leisure
  - Shopping
  - Smart Lifestyles



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medical and pharmaceutical

- in hospitals, RFID enables fully automated solution for information delivery at patient bedside
- using internet access, via e.g. IMT-2000 or wireless LAN, tags embedded in medication or patient bracelets can provide fast access to a remote records database
- RFID can also serve to thwart pharmaceutical counterfeiting through traceability

Example: Preventing kidnapping

A “Hugs” RFID system has been developed by Instantel/Verichip to prevent the abductions of newborn babies from hospitals. System includes tags on wrists/ankles of newborn babies and electronic monitoring systems in healthcare facilities.

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e-government, defense & security

- many authorities considering RFID for making services more efficient, secure
- thwarting fraud, through tracking people (e.g. passports) and/or money, and storing this information in large databases
- this of course raises even more privacy concerns

Example: US State of Virginia and Driver's Licenses

Virginia is one of first US states to consider use of RFID in drivers' licenses. These may in future employ RFID in combination with biometric data, e.g. fingerprints. In Feb 2005, US House of Reps approved measure to have licenses comply with Federal anti-terrorist standards by 2008.

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retail applications & mobile commerce

- Wal-Mart first/largest retailer to deploy RFID for item-based tagging
- first advantage in future for customers is the speedier checkout
- contactless payment systems on the rise

Example: Making McDonald's fast food even faster

Mastercard's PayPass is a wireless credit card system using RFID. It has been deployed at McDonald's, where customers only need to wave their PayPass card near an RFID card reader and thie amount is automatically charged to their credit card account.

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smart homes, smart cars, smart lifestyles

- RFID deployment in combination with sensor technologies to develop a sensor-enabled smart car or fridge
- RFID spaces for physically challenged
- RFID making life easier to manage, and reducing number of mundane daily tasks

Example: Smart Watch (U. of Washington/Intel)
Working prototype is an intelligent, integrated and responsible system, capable of prompting users who leave house or workplace without essential items, e.g .keys, wallet, which are tagged. When the watch passes a reader, information is sent to a personal server that checks whether all critical items are present.

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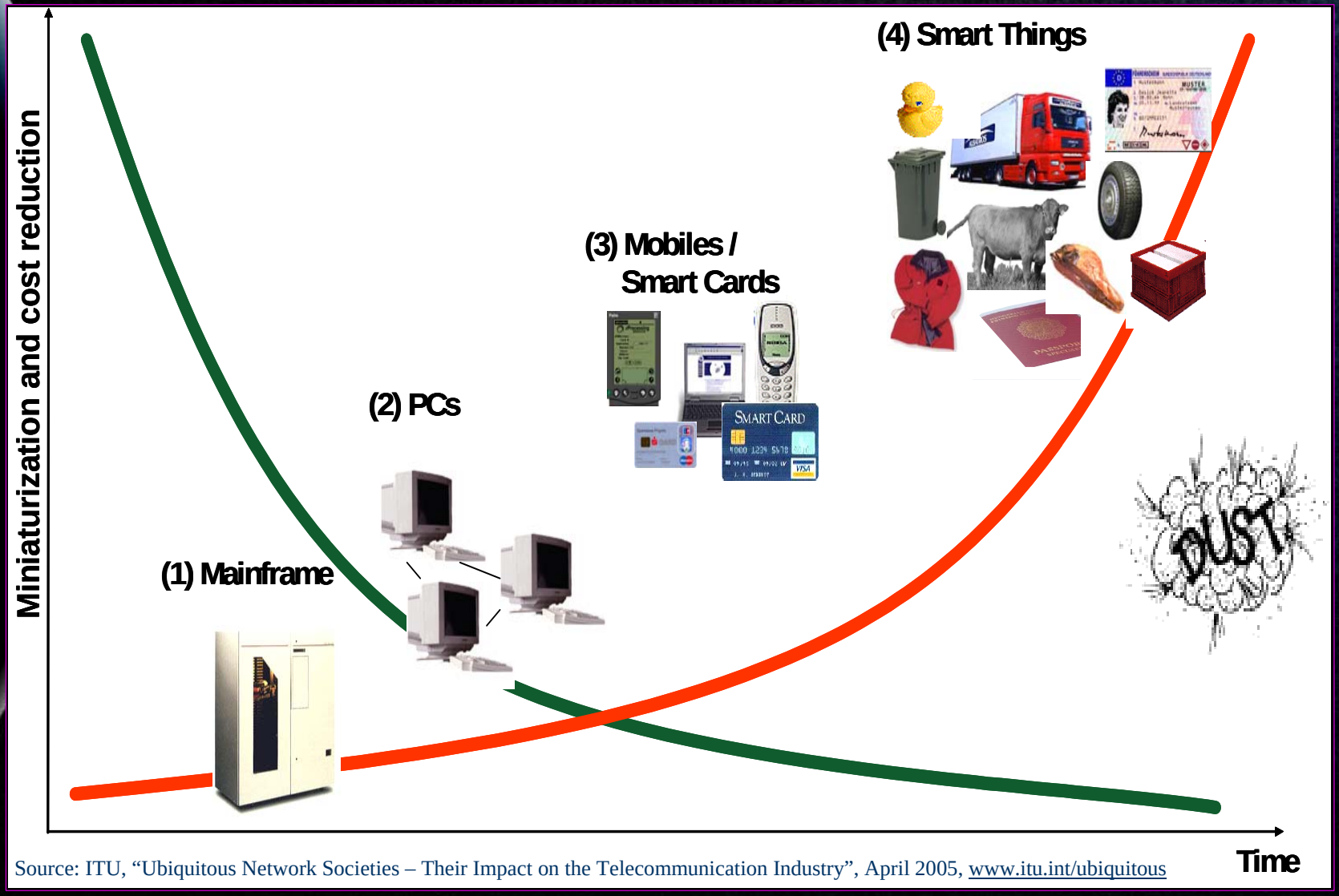
network connections multiply, as size and cost shrink



Source: ITU, "Ubiquitous Network Societies – Their Impact on the Telecommunication Industry", April 2005, www.itu.int/ubiquitous

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the key challenges in an RFID world

- Standardization on a global scale
  - Need for global standardization called for at ITU Workshop on Networked RFID: Systems and Services (Feb 14-15th 2006)
  - RFID players willing to work with ITU-T on globally harmonized standards
- Consumer protection
  - in particular, data protection, privacy & security
- Governance of Resources
  - Who owns the identifiers?

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standardizing RFID

- RFID currently hindered by fragmented efforts towards standardization
- 2 main areas in RFID standardization
  - RFID frequency and protocols for communication of readers & tags/labels
  - Standardization of data formats placed on tags and labels
- Main international players include ISO, ETSI, EPCglobal, NFC Forum
- Though much effort has been made regarding data formats, in the area of network standards, a lot of work needs to be done, notably within ITU-T

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some areas that have been identified as requiring further standardization

- network architecture
- signalling and control protocols
- performance
- quality of Service
- authentication
- identity management
- privacy
- security

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