Internet of Things Perspective

Keith A. Osman
AIDC-UK Ltd
Birmingham City University
Email: keith.osman@bcu.ac.uk
Email: keith.osman@aidc.org

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The "Internet of Things (IoT)" Perspective

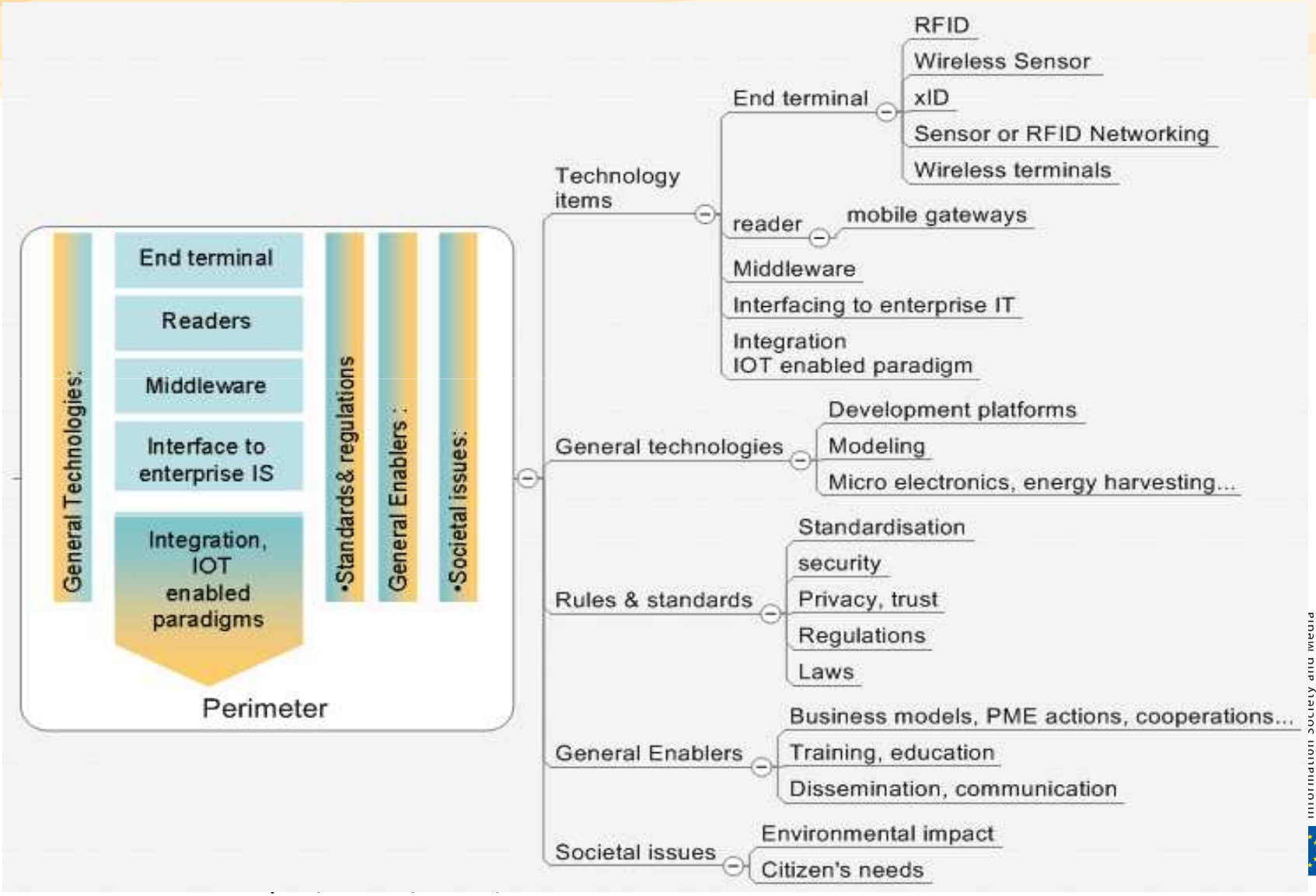
Projects involved:

- ASPIRE - IP
- COIN - IP
- CuteLoop - STP
- iSURF - STP
- CASAGRAS - CSA

What are the “Things”?

- What are the “**things**”?

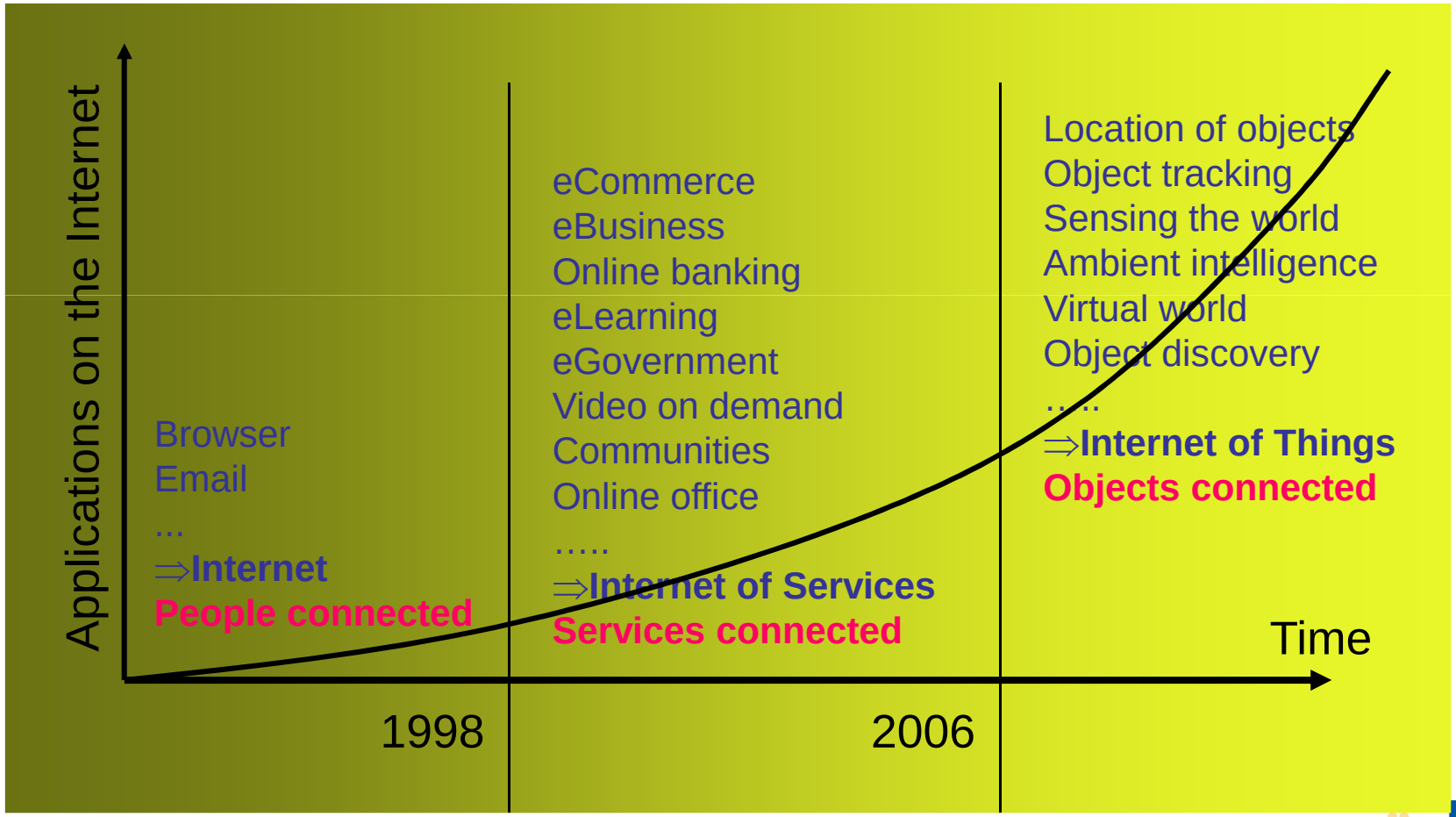
Issues to cope with



Essential Considerations

- Numbering and identification schemes
  - Co-existence of EPC / UbiID / GS1 etc
  - Accomodation of legacy issues
- Data carrier technology
  - Passive / active / BAP RFID
  - 1D barcodes = uniqueID
  - 2D barcodes = ID + local r/o data caches
  - Harmonisations issues
- Universal Data Appliance protocols
  - Plug and play for multiple technologies
  - Wrapping of ISO 18000 / 15691/2 14443 standards
  - Handling of sensory data, RTLS, etc
- User, context, location aware service delivery

Scope of IoT by 2015



Applications and Scenarios

	RFID-Application Fields	Description
Mainly Object Tagging	**A.** Logistical Tracking & Tracing	*Solely identification and location of goods and returnable assets (e.g. pallets or containers)*
	B. Production, Monitoring and Maintenance	*Smart systems in combination with RFID-Technology to support production, monitoring, and maintenance of goods and processes*
	C. Product Safety, Quality and Information	*Applications to insure quality (e.g. sensors to monitor temperature) and product safety (e.g. fight against counterfeiting)*
Tagging with Reference or Potential Reference to People	**D.** Access Control and Tracking & Tracing of Individuals	*Single function tags for identification and authorisation applications for entries and ticketing*
	E. Loyalty, Membership and Payment	*Smart Card based identification and authorisation systems for multifunctional applications (e.g. loyalty, payment, and banking systems)*
	F. eHealth Care	*Systems for hospital administration and smart systems to support and monitor health status*
	G. Sport, Leisure and Household	*Sports applications, rental systems (e.g. cars or books), smart home*
	H. Public Services	*Systems mandated by law or to fulfil public duties (e.g. ID-Cards, Health Insurance Cards, Road Tolling Systems)*

Deployment Scenarios

- ***Architecture and Governance of IoT systems.*** The architecture of IoT applications will require optimised service discovery strategies, tools and architectures that may in turn impact the overall business models and governance policies of the IoT.
- ***Event-driven middleware.*** With the huge classes of information to be made available from the edge of the network to the applications, new classes of middleware are needed in the network, with advanced and intelligent event filtering capability, enabling management of frequently disconnected and asynchronous operating networks in the IoT.
- ***Scale.*** IoT applications, through the connection to the network of billions of tags and sensors will generate an unprecedented amount of transactions and require new levels of storage requirements. Current Internet protocols may not be fully adapted to the transport of sensor generated information, whilst access network symmetry requirement may be affected by massive number of access devices.
- ***Spectrum.*** IoT applications imply the use of large numbers of tags that have to cohabit on the frequency spectrum. Various techniques (e.g LBT or FHSS) may be called upon to solve the issue.

Deployment Scenarios

- ***Resilience of systems.*** As IoT becomes a reality, it will affect people's life in vital aspects that cannot accept failures. IoT systems of the future will need to be resilient to vulnerabilities and allow graceful service degradation after a failure.
- ***Sensor networks.*** As applications grow in complexity, they will require an increasing number of networked and pervasive sensing functionalities (e.g. temperature, pressure, humidity, light, noise…)
- **"Plug and play" Sensors.** As researched in the field of dynamic service composition, new sensors inserted in networks will need to auto-declare their capabilities and characteristics. A Universal Plug&Play (UPnP) protocol for sensors may need to be developed and made available.
- ***Ad-hoc networks.*** As objects move in the real world, on-the-spot networks will be created on the fly (without user-interaction) and for short periods of time, requiring new levels of interoperability.
- ***Human computer interaction.*** With day-to-day objects becoming part of the network, the traditional user-interfaces ought to become multimodal and fully intuitive.
- ***Everyone becomes a user.*** With day-to-day objects becoming part of the network, all individuals, regardless of their computer-literacy will be in contact with IoT applications and to exploit their potentials, individuals as well as organisations will require appropriate training and approaches for both using and realisation of IoT potentials.

Cross domain perspective

- **Network infrastructure (scalability)**
- **Software and services**
- **Content creation and distribution**
- **Virtual and physical objects fusion**
- **Security**
- **Experimental facilities and Test beds**