An epistemology of
IT models
for pervasive computing

Def'n of epistemology: branch of philosophy that investigates the

origin, nature, methods, and limits

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TELECOM
ParisTech

FP7 : Inco-Trust
www.inco-trust.eu

Our location in Ireland

A: Waterford Institute of Technology

- University level institution with 10k students and 1k faculty

- Telecommunications Software and Systems Group (TSSG)

RESEARCH AT THE INTERNATIONAL LEVEL – INCO-TRUST Project http://www.inco-trust.eu
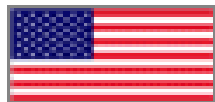
INCO-TRUST and BiC

Intl Co-operation in Trustworthy, Secure and Dependable Infrastructures

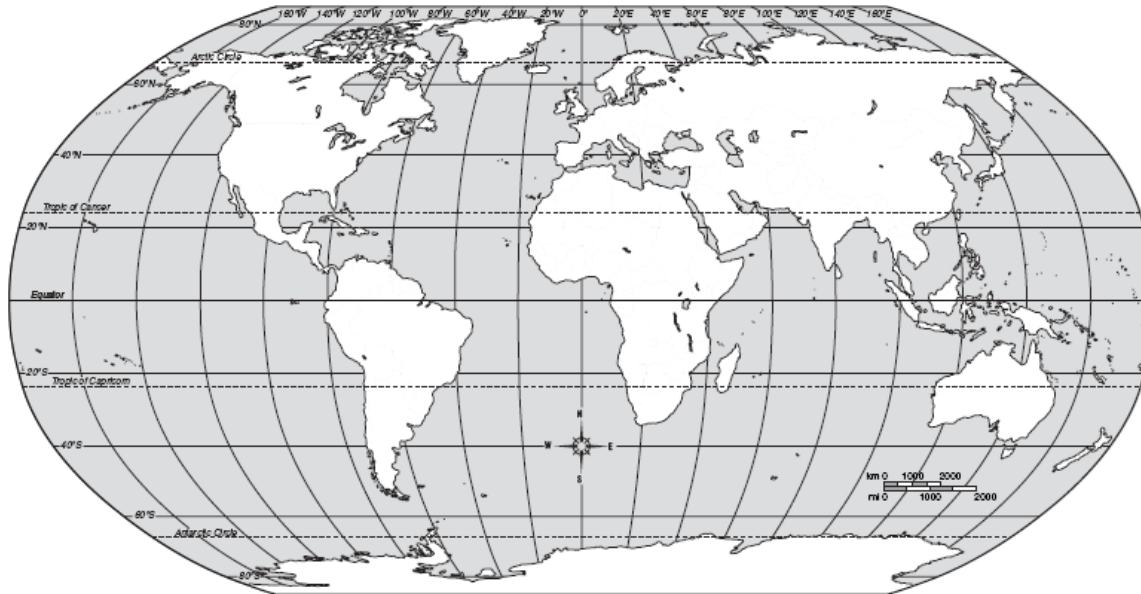**Building International Co-operation for Trustworthy ICT (Jan. 2011)**

Canada   US   EU   Korea   Japan   Australia

	FP6	FP7
Biometrics	3D Face Biometric Research, BIOSECURE, HUMABIO, SecurE-Justice, securephone	ActiBio, MOBIO - Mobile Biometry, TURBINE
Privacy, identity	PRIME Privacy and Identity Management for Europe, fidis, CONNECT PROJECT, DISCREET	PrimeLife, PICOS, PRISM, Swift
Network	DESEREC, IRRIIS, SeiNIT, Anti Phish, CRUTIAL CRitical UTIlity InfrastructurAL resilience, FastMatch, Ubi Sec&Sens	AWISSENET Ad-hoc personal area network & Wireless Sensor SEcure NETwork, inter SECTION, WSAN4CIP, GEMOM Genetic Message Oriented Secure Middleware, Swift, WOMBAT
Services	HIDENETS Highly DEpendable IP-based NETworks and Services, TrustCoM	MASTER Managing Assurance, Security and Trust for sERvices, TAS3, CONSEQUENCE, AVANTSSAR, securescm
Secure Implementation	SECOQC, ECRYPT, SERENITY System Engineering for Security & Dependability, S3MS	cace, SHIELDS Detecting known security vulnerabilities from within design and development tools
Trusted Computing	OTC Open Trusted Computing	TECOM
Coordination Action	SecurIST, ESFORS	INCO-TRUST www.inco-trust.eu, THINK-TRUST, FORWARD, PARSIFAL, AMBER

Objectives

* **Security & Privacy of Data and Future Internet is a KEY European Commission Driver**

– Involvement of **Program Management (funding bodies)** and **Researchers** is essential to **success;**

– **Prioritisate** vision and research directions in ICT Trust and Security, including **alignment of work programs in Calls**;

– **Facilitate** technical & program level **catalysts** for engagement, collaboration and **networking activities** internationally;

– **Harmonise** with International researchers → **dedicated results oriented workshops** on **Trust and Security** topics to help shape future EC Calls

Progress to date

– Held number of exploratory visits with program management and researchers;

– Information pack with countries on Objective 9.2 INCO for calls 4 and call 5 (available on web site);

– This all enabled putting together a Terms of Reference and organisation for the 1st Workshop;

– First International Workshop held 31 March – 01 April 2009 with program management and researchers from all countries;

– Set up working groups (WGs) aligned to working sessions;

– Second International workshop held 4-5th May 2010 in NYC, USA. WS topic was **International Data Exchange with Security and Privacy**;

– Held successful networking session at ICT 2010. Details can be found **http://ec.europa.eu/information_society/events/cf/ict2010/item-display.cfm?id=3016**

WG1. Security and Dependability of Future Large scale Networked Systems
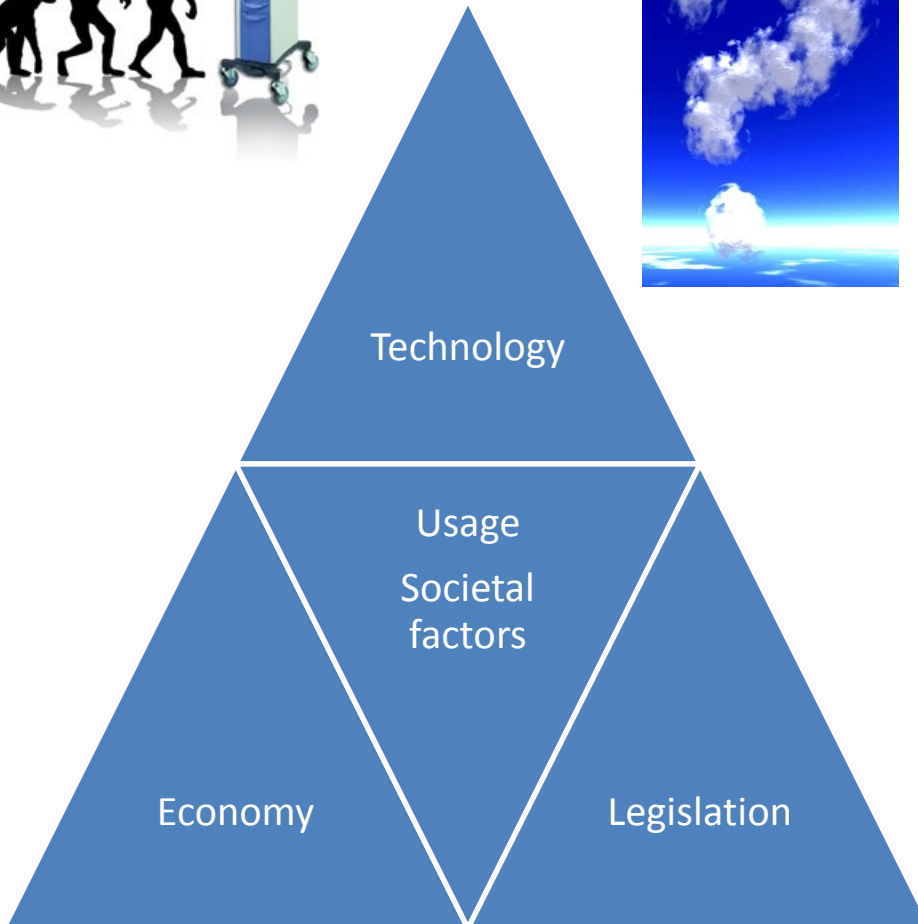
- ❑ **WG1: Strong technology focus**
- ❑ **Chair:** Prof. Neeraj Suri**,** TUD

  Co-Chair: Jim Clarke, WIT
- ❑ **FOUNDATIONS** – Key enabling technologies, new computation/ communication models, crypto models, trust architectures,…
- ❑ **NETWORKS/SERVICES INFRASTRUCTURE ISSUES** – TSD relevant network/services issues in the Future Internet.
- ❑ **CONTENT –** TSD challenges in data acquisition, dissemination, access and storage.

Technology

Usage
Societal
factors

Economy

Legislation

WG2. Privacy and Trust in the Information Society

Trusted People

Trusted Data

Trusted Networks
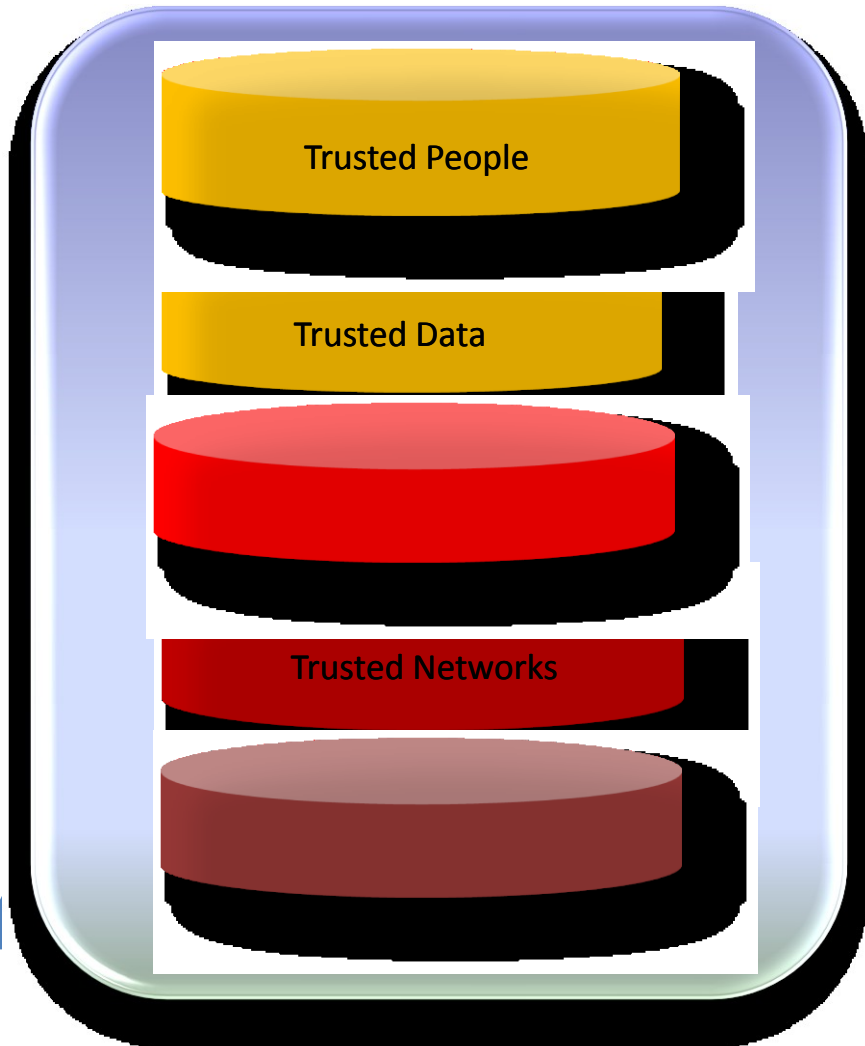
- ❑ **WG2: User Centric/Trust oriented**
- ❑ **Chair:** Prof. Michel Riguidel, ENST

   Co-Chair: Aljosa Pasic, Atos Origin
- ❑ **IDENTITY PROVISION & MGMT** Physical, virtual, service, session, device ID's; ID mgmt issues: who/what/where/when/how?
- ❑ **INTERPLAY OF SECURITY & PRIVACY** - E2E Trust-Privacy-Security Envelope, Quantification of Trust-Privacy-Security? Tradeoffs?
- ❑ **INFO ACCOUNTABILITY** Appropriate Use, Access Control, Traceability, Governance, Liability, Compliance…

Research Governance at the international level

Trusted People

Trusted Data

Trusted Networks

- Research, based on **progress & human values**
  - Awareness of
    - what is **achievable** (technical)
    - what is **acceptable** (civilized ethics, democratic values)
  - Countries: bearers of a **variously facetted humanism**
    - to be instantiated in the communications or protection tools
- Knowledge, partitioned for choice
  - **Users' awareness** to grasp the security & intimacy stakes
    - The choices: multiple, ephemeral and adaptable
    - Defining the demarcation line: movable
  - **Users' behavior** to be taken into account
    - imagining and anticipating the effects on the behavior of both individuals and groups
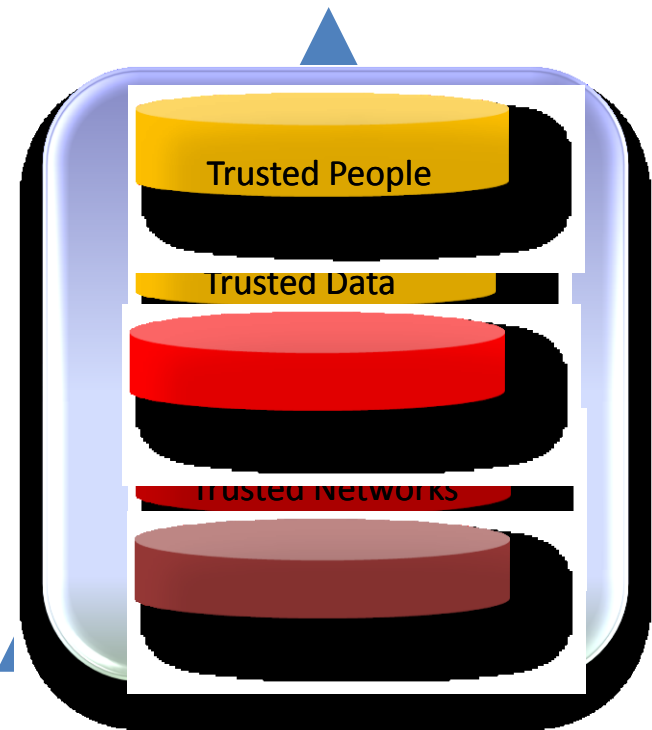
Transcontinental Thinking: new models beyond
a pre-written, idyllic vision of future networks

- **No single or providential solution**
  - Model, Counter Model, Alter-model
  - Arrival of new countries on the computer scene
    - Changing issues (demography, environment, hunger)
    - Amendment of powers
  - Alter-models
    - The pseudo-libertarian (naïve Internet)
    - Actors supporters of pure repression (government)
- **Cyberspace & E-Governance (Κυβερ)**
  - The free reign of technology
    - Description of an order
      - No control, regulation is autoreflexive
    - Setting the standards for an Order
      - How to lead and manage the order to define
  - In technology, researchers talk ...
    - Often: "here is what is"
    - Rarely "here is what we should do, what we could do and what we ought to do

- **Multipolar vision**

The thinking dictatorship in the digital world

- **Multidisciplinary vision**

Web Science (T Berners-Lee)
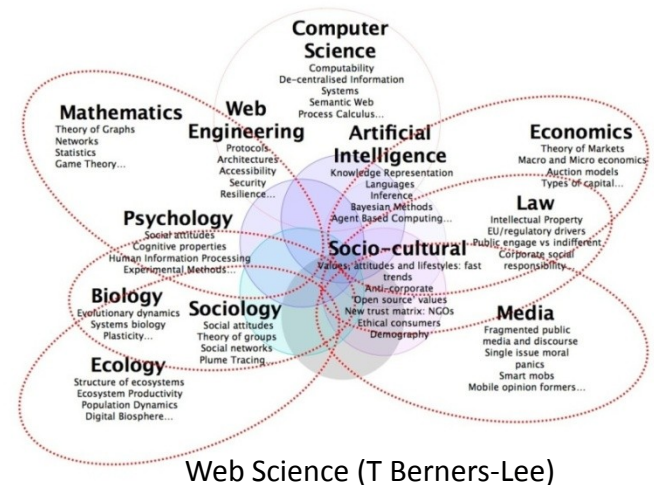
Digital Governance in shadow & light

Secrets' management

- Security
  - Sharing secrets
  - Security in darkness

- Identity management
  - Life cycle, heritage

- Privacy
  - Gray area
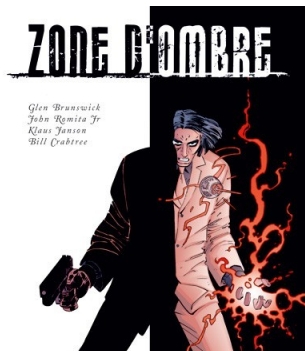
Governance of visibility

- Trust
  - Transparency, Sincerity

- Responsibility, Disclaimer
  - Accountability
  - Property

- Traceability, monitoring
  - The blurred boundaries
  - Conflicts (electronic surveillance)

Beyond schematic good and evil
The paranoid fantasy: Proprietary software, expensive, dark, closed, buggy and spying
The candid myth : Free software, transparent, open, without bugs, without backdoors

PERVASIVE COMPUTING

Pervasive Computing Challenges

- Mobility
  - persistence and continuity of communication
  - the movement of communicating entities, the contextualization and learning of the milieu, remote presence of physical persons, or the expanded presence of the body
- The identity and ID-management of various objects
  - Incl. their mass extension
  - Outside 10^9, element identity can lose their effectiveness
- The primordial properties of communicating objects
  - safety, transparency of function, non-intrusion, non-addiction for the end-user
- Multi-mode interfaces
  - heterogeneous interactions in the assemblage of the urbanization of the whole, and the composition of the different aggregates of architectures of different systems, and their negotiation
- Integration, cooperation, collusion, capacity to learn
  - on every level of granularity, in niches that overlap, and the management of this complexity
- Transversal aspects of uses, incl. multidisciplinary ones

Non-technical scope of pervasive computing

- Simplicity, friendliness
  - intuitive interaction, more general than ergonomics
- Psychology
  - the phenomenon of rejection of apparatuses for assistance to the aged
- Legality
  - the safety of the use of robots
  - the area of intellectual property, the right of access to a digital entity, the right of oblivion of records saved by these objects
  - the regulation of physical objects
- Ethics
  - respect for the private sphere of individuals
  - digital dignity in infrastructures for monitoring purposes
- Politics
  - The freedom of expression of citizens within semi-private areas

Digital security governance:
sovereignty + dignity

System S
Digital
Technology

System Σ Ambient
including human value

Digital security is also cultural

DIGITAL IT ROADMAP

Evolution of ICT concepts

Out of breath dichotomies

- Hardware - Software

- Computer - Network

- Software - Data

- Protocol - Architecture (time / space)

- Service - Infrastructure

- Secret, Private Sphere - Transparency, public space

- 1 0 0 1 0 1 1 0 1

Ideology of convergence

- Land re-allotment & consolidation
  - Alignment of formats, protocols, architectures
  - Swiss army knife
- The seamless world
  - All IP, all XML
- "Cloud Computing"
  - Apogee of digital convergence?

A roadmap to the digital world

1 - 1995-2015

The waning of the concepts and the digital convergence

2 - 2010-2030

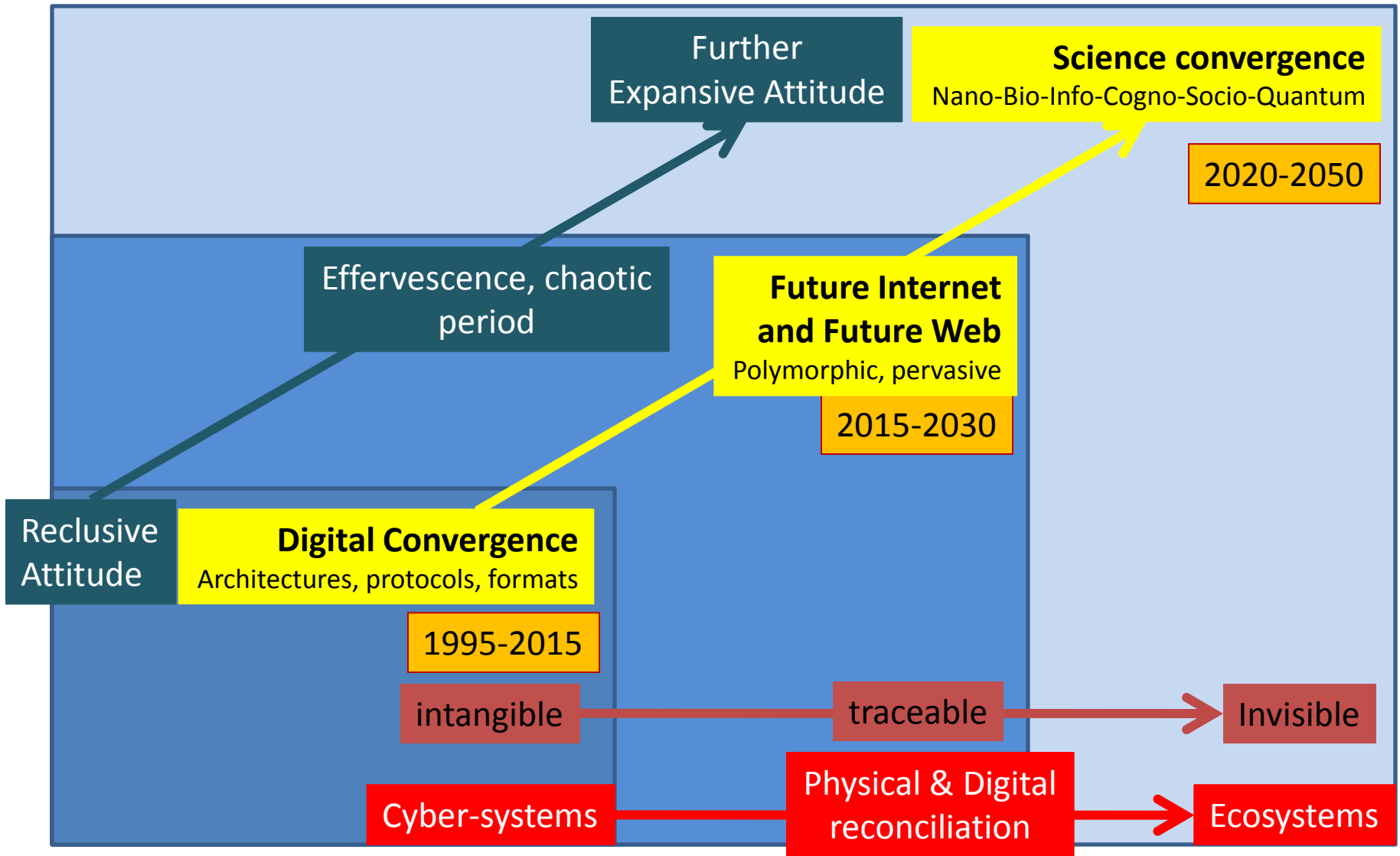The coming effervescence

3 - 2025-2050

NBIC technologies and attoscopic (10^{-18})science

Digital world roadmap:
at a crossroads of intangible & invisible entities
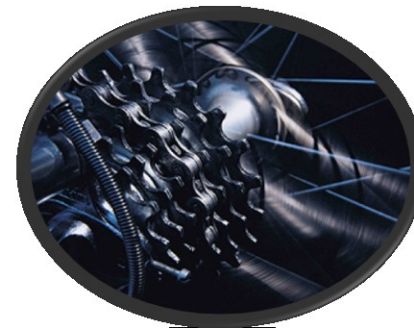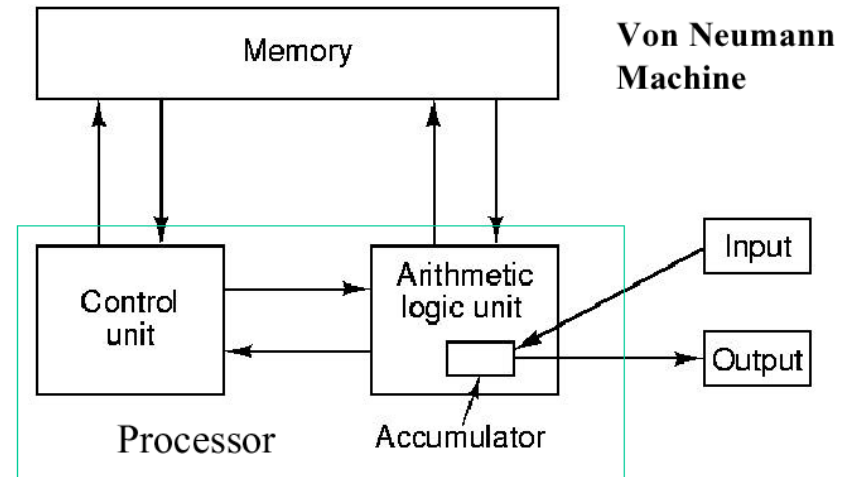
HOW INFORMATION TECHNOLOGY MODELS EVOLVE?

Loosening :
metamorphosis of paradigms requires a bit of slack

J Von Neumann

Architecture of a computer

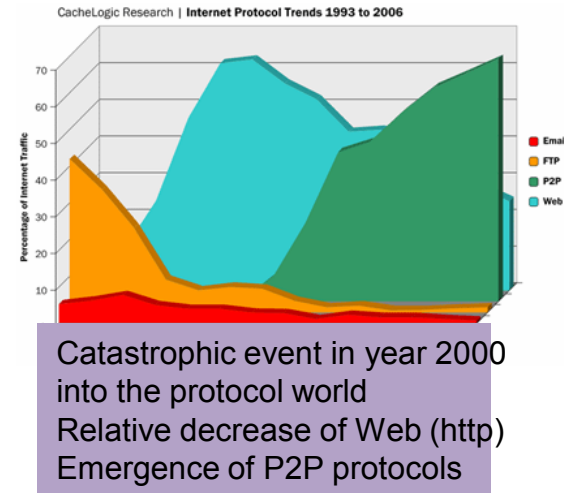To ease up, to leave in a bit of slack into the structures

The Web: a second shock to predict

- Old Web: importance of connectivity
  - Connected Computers (Web pages, Web sites)
    - 1986 : ante-Web : (Wide Electronic Board)
    - 1991 : Web (Berners-Lee)
      - Web with text
      - 1995 : first success (Java encapsulated)
        - Problem of bandwidth (wait-wait-wait)
    - 2000 : Data rate growth
      - Web with Multimedia
      - Web2 (Multiparty, Virtual), semantic Web

CacheLogic Research | Internet Protocol Trends 1993 to 2006

Catastrophic event in year 2000 into the protocol world
Relative decrease of Web (http)
Emergence of P2P protocols

- Future Web: importance of mobility, context, and the reinvestment of human and reality
  - Computers (Mobile, 4D), in large networks (machines, humans, objects)
    - Profound changes in parallel to the internet

      Emergence of "situated IT" : traffic
      Capillary protocols around the periphery

      - Geography: Mobility, Ubiquity
        - » Reconciliation with nomadicity (vocal Web), Search with locality
      - History: Memory of the Web and hidden Web
        - » stochastic XML (see P Senellart thesis, 2007)
      - Knowledge
        - » Representation, Visualization, Social Networks, Natural Language Processing
  - Web intentional things (Sensor Networks)
    - Objects display the public life cycle, blogging for maintenance

FUTURE INTERNET ASSEMBLY (FIA)

What is it?

"The European Future Internet Assembly also known as FIA, is a collaboration between projects that have recognised the need to strengthen European activities on the Future Internet to maintain European competitiveness in the global marketplace. " [1]

[1] http://www.future-internet.eu/
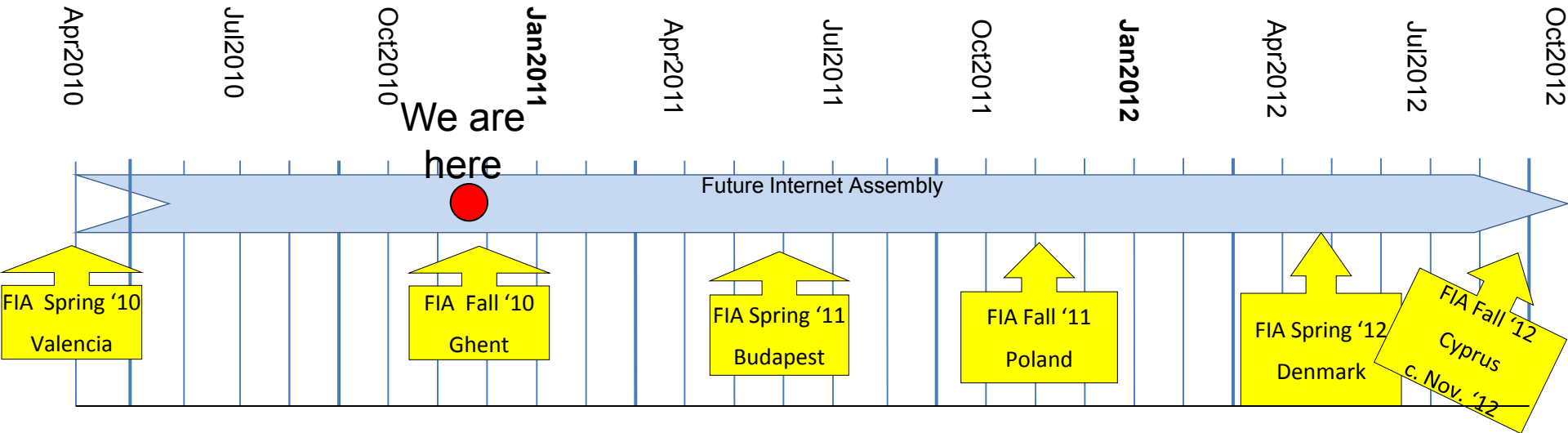
Future Internet Assembly (FIA)

- Consisting of over 100+ signatory projects working on Future Internet (FI) topics.
- Assembly is structured to permit open interactions and cross-fertilization across technical domains, reaching out to whoever has talent.
- Domains include:
  - Management and Service-aware Networking Architectures (MANA)
  - Services and Software
  - Content Creation Media Delivery
  - Security, Privacy and Trust: Caretakers include J. Clarke and Michel Ruigidel
  - Internet of Things
  - Real world Internet
  - Future Internet Research and Experimentation
  - Future Internet Socio-Economics
- FIA Objectives are:
  - Common deliverables creating value for the projects concerned
  - Joint strategic research agenda regarding common actions and requirements
  - Developing a consolidated calendar of events aiming at avoiding fragmentation of efforts
  - Handling of IPR between countries.

Future Internet Assembly (FIA)

- Work Process of FIA
  - The Assembly is supported by WEB site (http://www.future-internet.eu) hosted by Eurescom;
  - Two physical meetings are held per year;
  - Actions are set at each meeting of the Assembly;
  - Work progress is reviewed at the subsequent meeting of the Assembly;
  - Work in between two consecutive meetings is carried out by e-mail using the tools of the portal and also interim workshops where appropriate;
  - Projects concerned with the actions set, are called upon to actively participate and drive the work.

FIA Timeline

Aug2007 | Oct2007 | **Jan2008** | Apr20-8 | Jul2008 | Oct2008 | **Jan2009** | Apr2009 | Jul2009 | Oct2009 | **Jan2010**

Preparation workshops held

Future Internet Assembly

FIA Spring '08
Bled

FIA Fall '08
Madrid

FIA Spring '09
Prague

FIA Fall '09
Stockholm

Apr2010 | Jul2010 | Oct2010 | **Jan2011** | Apr2011 | Jul2011 | Oct2011 | **Jan2012** | Apr2012 | Jul2012 | Oct2012

We are here

🔴

Future Internet Assembly

FIA Spring '10
Valencia

FIA Fall '10
Ghent

FIA Spring '11
Budapest

FIA Fall '11
Poland

FIA Spring '12
Denmark

FIA Fall '12
Cyprus
c. Nov. '12

Where I work mainly in FIA

- I am a FIA "Trust, Security and Privacy 'Caretaker'"
  – Provide links between the FIA and EC projects
  – Organisation of sessions. For FIA Ghent, sessions on
    - Privacy and Citizenship
    - Can the Cloud be trusted?
- Working on FIA Roadmapping activities
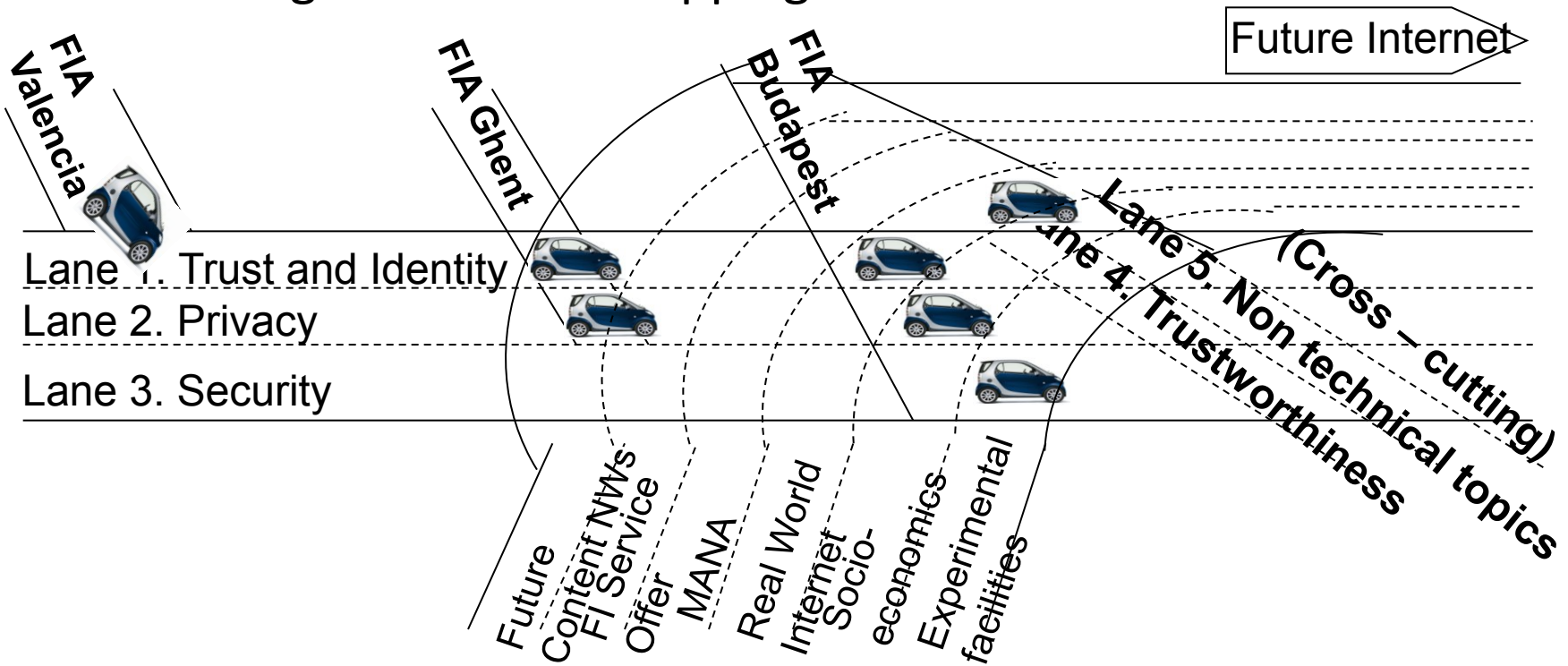
FIA overall structure

- *FIA Research roadmap – dedicated to FIA roadmapping;*
- *FIA Architecture (FIArch) – working on Architecture issues;*
- *FIA Portal upgrade;*
- *FIA Standardisation;*
- *FIA International cooperation;*
- *FIA Book;*
  - *Continuation of bi-annual FIA events.*
- *FISA – Future Internet Support Actions – group providing glue for all of the above.*
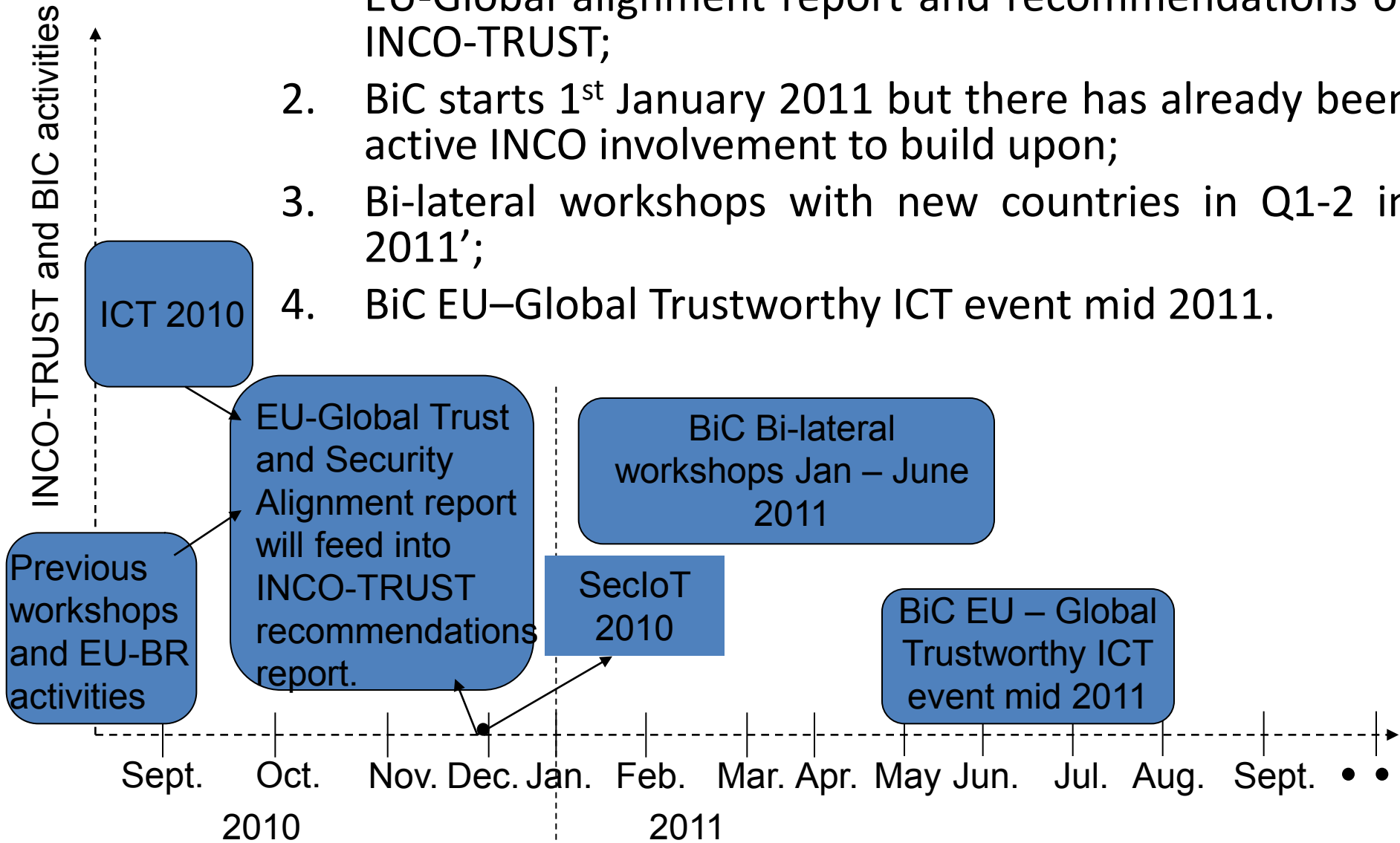
What do we mean by "FIA Road Map" ?

- **Our vision for FI research and beyond**
  - **how the FIA will address societies' big challenges**
  - **high-value, big-payoff technologies and approaches needed to win**
  - **significant technical challenges we'll face getting there**
- **Providing input to the Framework Eight research programme**

Information on FIA roadmapping can be found at http://fisa.future-internet.eu/index.php/FIA_Research_Roadmap

Roadmap of next year and how you can help:

1. Feed results from ICT 2010 and SecIOT 2010 into the EU-Global alignment report and recommendations of INCO-TRUST;
2. BiC starts 1st January 2011 but there has already been active INCO involvement to build upon;
3. Bi-lateral workshops with new countries in Q1-2 in 2011';
4. BiC EU–Global Trustworthy ICT event mid 2011.

INCO-TRUST and BIC activities

ICT 2010

Previous workshops and EU-BR activities

EU-Global Trust and Security Alignment report will feed into INCO-TRUST recommendations report.

SecIoT 2010

BiC Bi-lateral workshops Jan – June 2011

BiC EU – Global Trustworthy ICT event mid 2011

Sept.   Oct.   Nov. Dec. Jan.   Feb.   Mar. Apr. May Jun.   Jul. Aug. Sept. ● ●

2010   2011

For further Info

- – Please visit
  http://www.inco-trust.eu

- – Public deliverables available at

  http://www.inco-trust.eu/incotrust/general/project-impact.html

- – Contact directly Jim Clarke and Michel Riguidel
  jclarke@tssg.org, **michel.riguidel@telecom-paristech.fr** and
  suri@cs.tu-darmstadt.de

- – Reminder: BiC (covering Building INCO + security & privacy + extending I-T to India, South Africa and Brazil) starting in Jan 2010!!! Stay tuned, there is still a role for EU-Japan!