



A Framework for Privacy Protection and Usage Control of Personal Data in a Smart City

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**Joint Research Centre
Institute for the Protection and Security of the Citizen
Digital Citizen Security Unit**

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... is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.

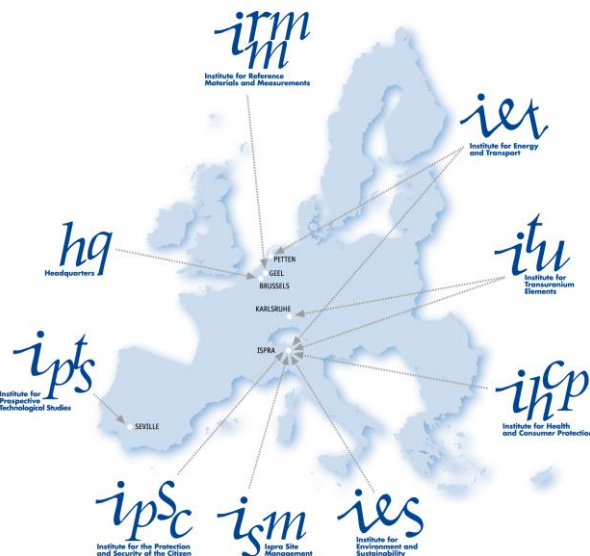
As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union.

Close to the policy-making process, it serves the common interest of the Member States, while being **independent** of special interests, whether private or national.



Established 1957

- 7 institutes in 5 countries: Italy, Belgium, Germany, The Netherlands, Spain
- 2,845 permanent and temporary staff in 2010
- 1,398 scientific publications in 2010
- 125 instances of support to the EU policy-maker annually
- Budget: €356 million annually, plus €62 million earned income



Where you can find us

- **Corporate Services** – *Brussels*
- **IRMM** – *Geel, Belgium*
Institute for Reference Materials and Measurements
- **ITU** – *Karlsruhe, Germany and Ispra, Italy*
Institute for Transuranium Elements
- **IE** – *Petten, The Netherlands and Ispra, Italy*
Institute for Energy
- **IPSC** – *Ispra, Italy*
Institute for the Protection and Security of the Citizen
- **IES** – *Ispra, Italy*
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- **IHCP** – *Ispra, Italy*
Institute for Health and Consumer Protection
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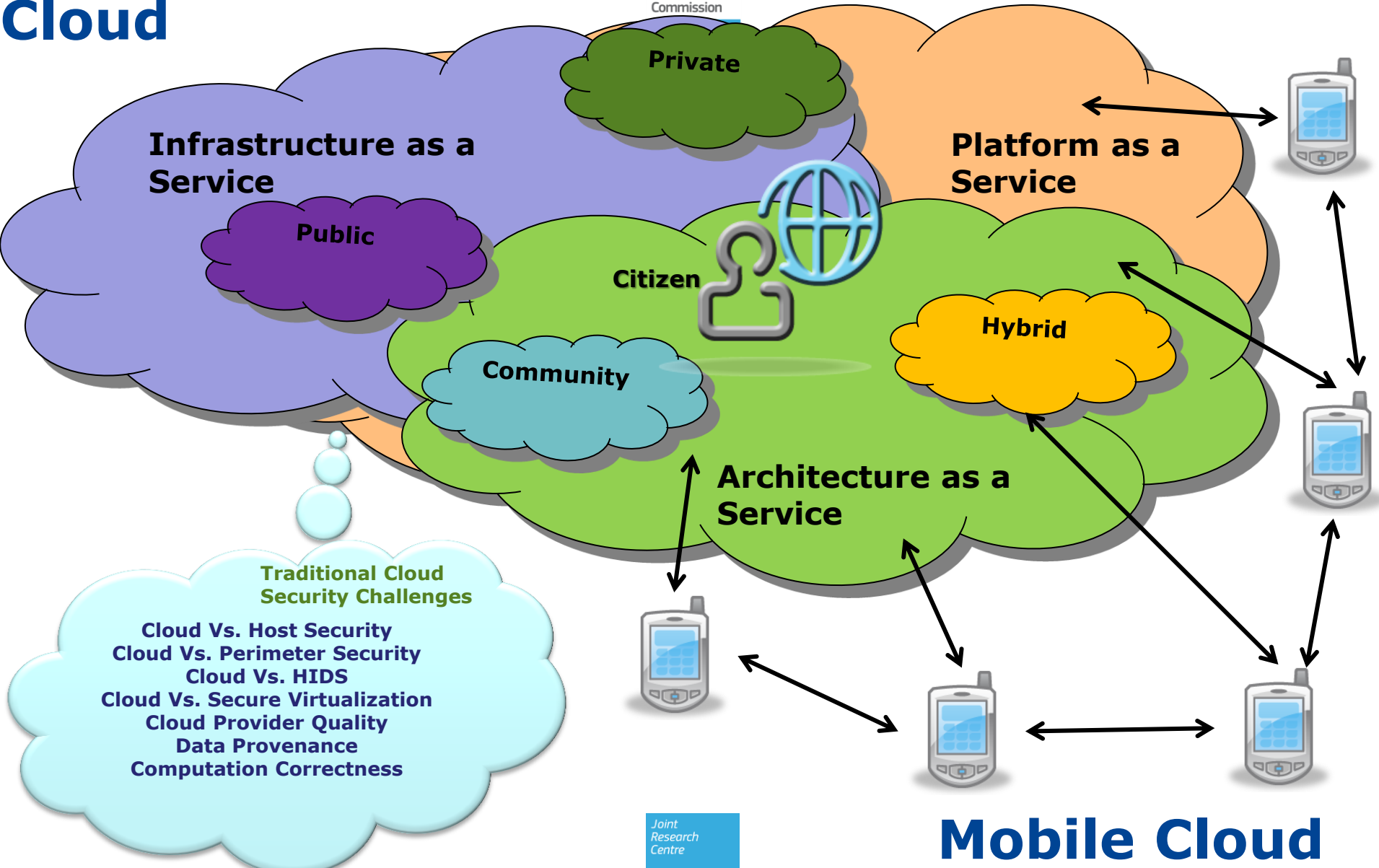


Digital Citizen Security Unit

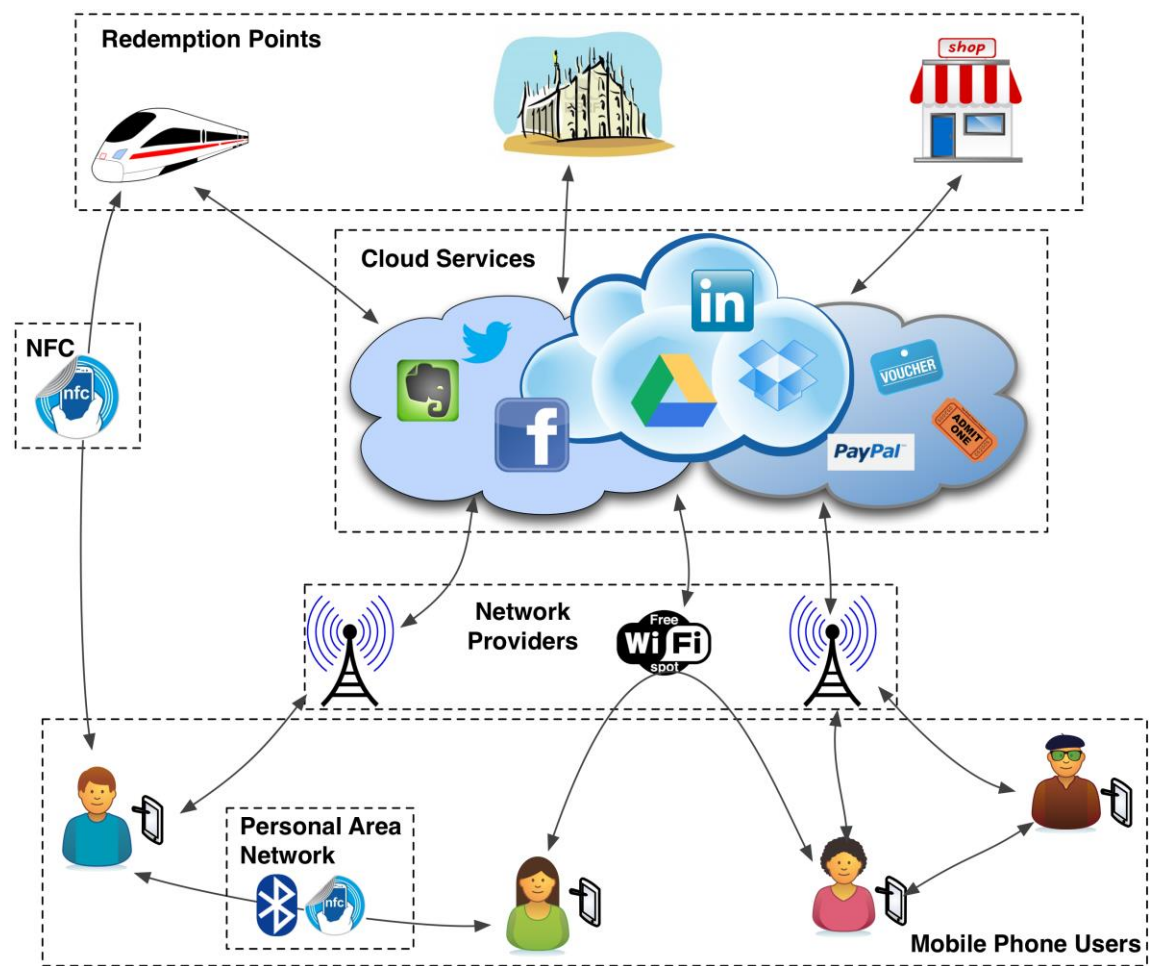
The mission of the IPSC is to provide research results and to support EU policy-makers in their effort towards global **security** and towards **protection** of European citizens from **accidents, deliberate attacks, fraud** and **illegal actions against EU policies**

Mission: to strengthen **trust and security** of the **European Citizen** in a sustainable and inclusive ICT based European society by scientific research on how emerging Information and Communication Technologies will impact citizens' daily life. In the balance between **European security needs** and **fundamental citizen rights**, the unit works on **risk mitigation**, on **cyber security**, **data protection**, **privacy and other ethical considerations**, and on the associated legal and regulatory frameworks.

Cloud



Threats and Vulnerabilities



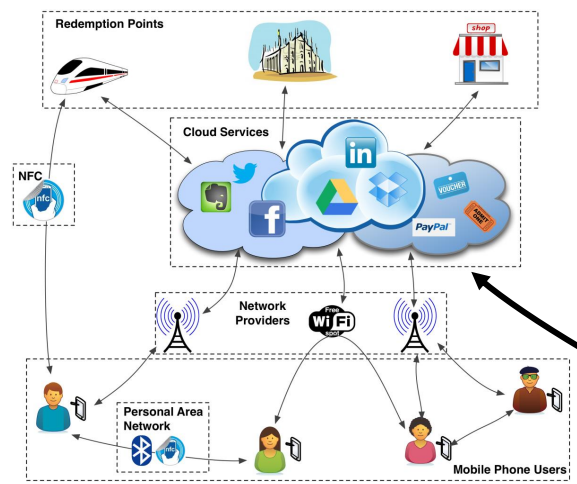
- 24h exposure
- Fading Perimetral Security
- Stronger links to the owner
- Poor attention to security issues

- Wireless Threats
- NFC Threats
- Bluetooth Threats
- MitM Threats
- Physical Threats
- Mobile App Threats
- Mobile Web Content

- User Profiling
- Economical Damage
- Privacy leakage
- Frauds
- Impersonation

Citizen's Threats

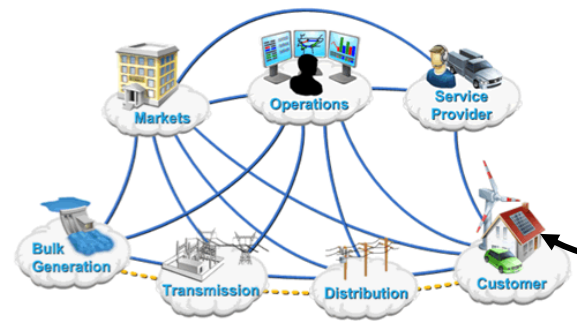
Smart Home



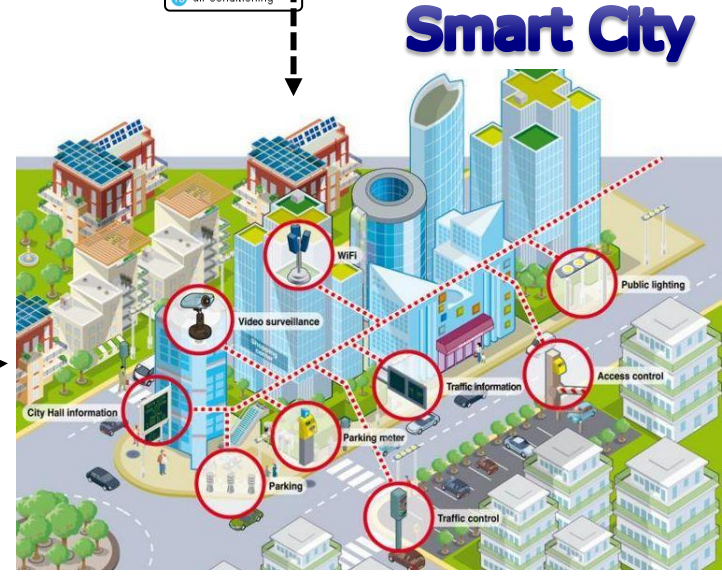
- 1 sunblind
- 2 street light
- 3 power meter
- 4 Ethernet gateway
- 5 GSM gateway
- 6 mobile phone
- 7 Hi-Fi
- 8 PC
- 9 gate
- 10 door
- 11 light
- 12 router
- 13 heating
- 14 security system
- 15 thermometer
- 16 air-conditioning



Identity




Smart Grid



Identity



- Hard Identities 
- Soft Identities
- Service Identities
- Identity Federation
- Smart Device Identities

Needs & Challenges

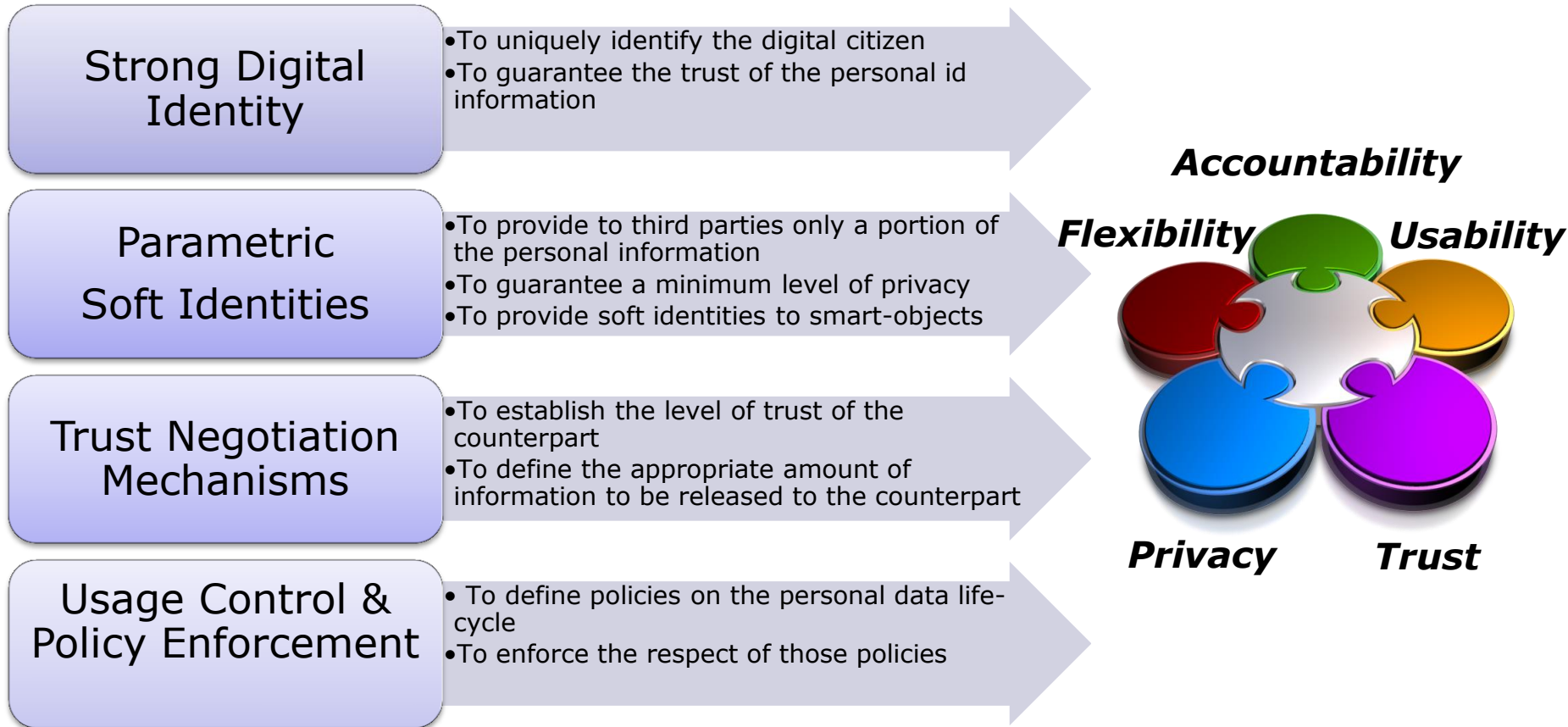
- Mechanisms enabling the citizen to easily '**control**' the identity flow
- Mechanisms allowing to establish chains of trust
- Governance of the identity
- Policy & Regulations of soft identities
- Anti-counterfeiting



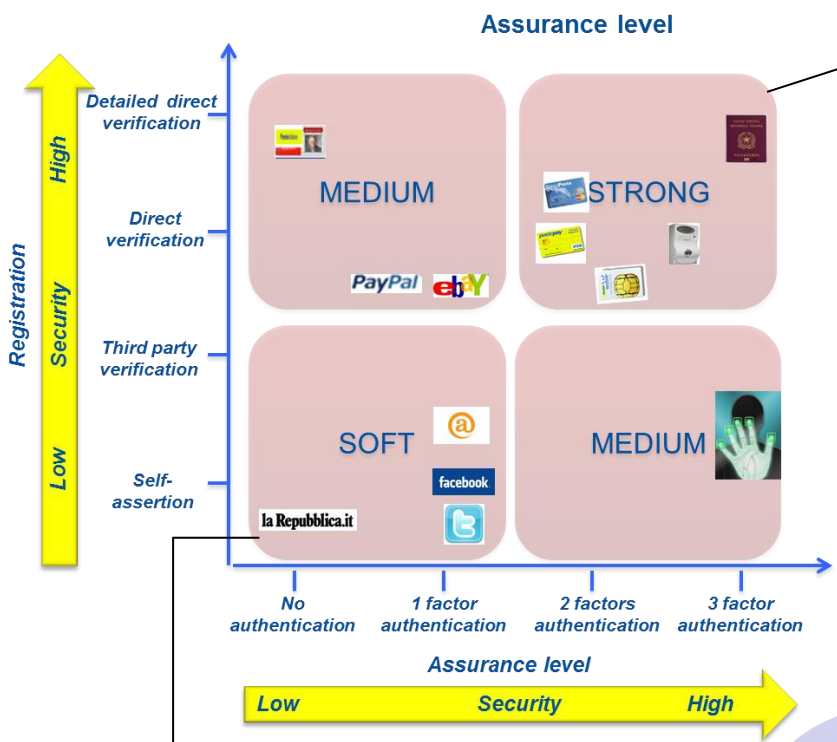
Identity Inheritance



Digital Identity Usage Control & Trusted Disclosure Elements:



Identities



Strong Digital ID



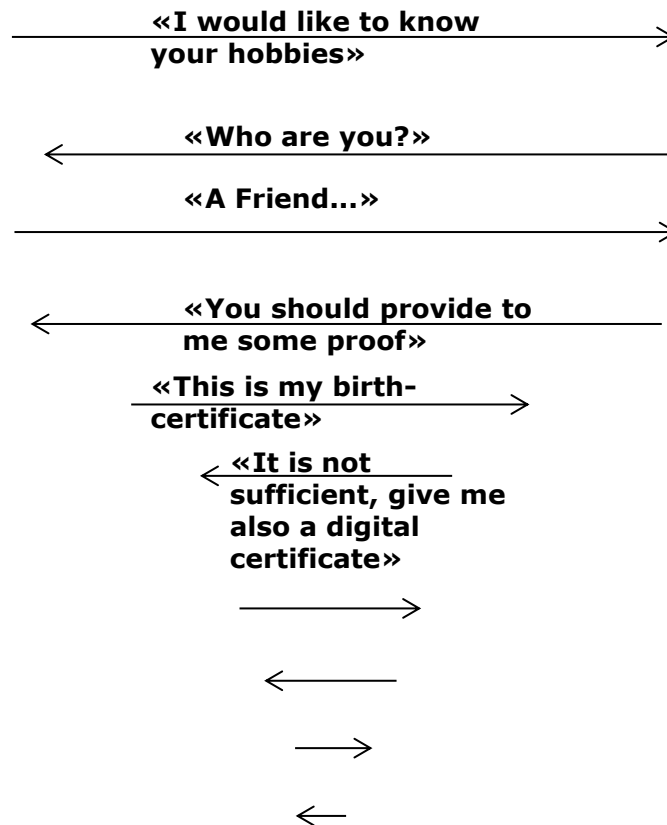
- A set of digital-certificates, one for each of the properties that are part of the hard e-ID;
- A general digital certificate summarizing all the others properties;
- A private-public keys couple uniquely assigned to the entity

Soft Digital ID



- **Uncertified and anonymous information**, i.e. information freely provided by the owner without any guarantee of truth;
- **Signed un-certified information**, i.e. information freely provided by the owner of the device and signed with his private key to guarantee that this Information has been indeed provided by him, but without any guarantee on the truth of what claimed;
- **Certified information**, i.e. information directly coming from a portion of the owner's hard e-ID and signed according to a *Blind Signature Scheme*

Trust Negotiation



Ok, on the basis of what you showed to me, I can tell you that I like outdoor activities

Policy chains

Trust Levels

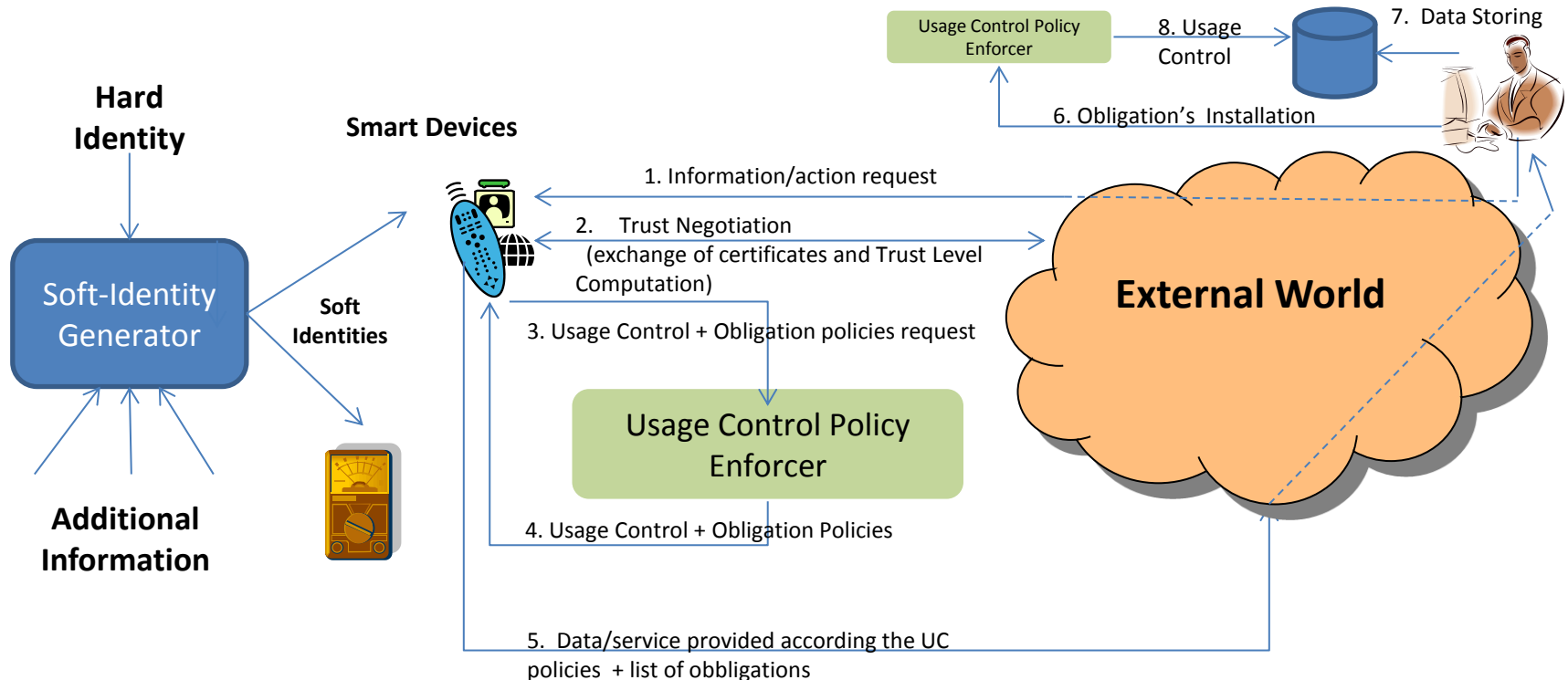
Convergence schemes

Roll-back mechanisms

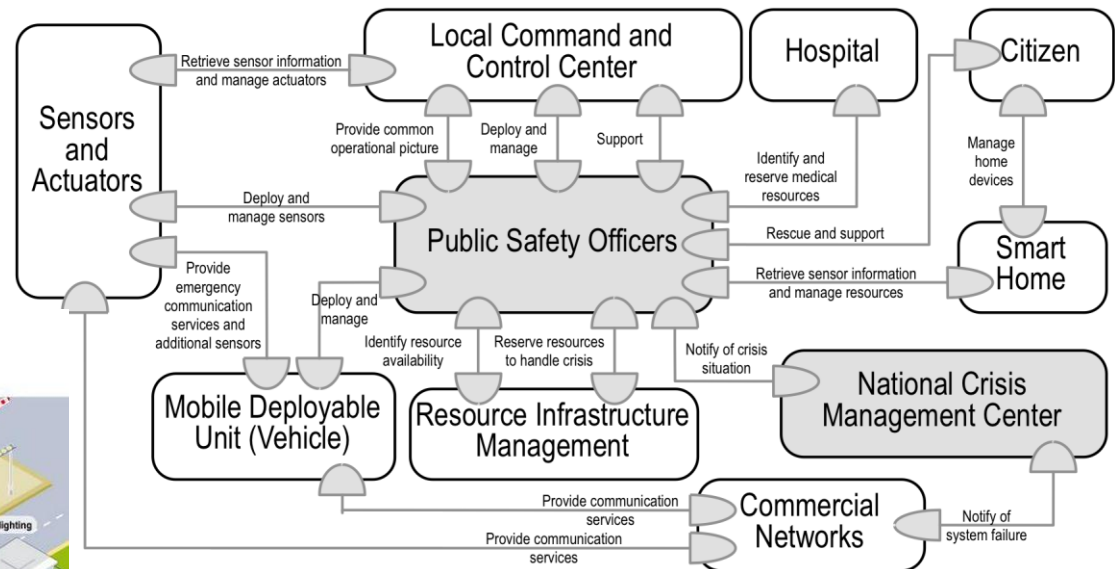
Usage Control

- Temporal logic
- System interaction Model
- Usage policy language
- Obligation policies
- **Enforcer** →
 - It's again a matter of trust and of requirements... But...
 - Distributed Computation and Cloud infrastructures can reduce the level of trust required

The Framework, an Operational Overview



Emergency in Smart-City - A Case Study



Conclusions

- The advent of smart-devices and Cloud services greatly increased the citizen's digital inclusion
- Soft-identities are more and more used to access services that are becoming vital for the digital life
- Soft-identities allow to access to relevant portions of the citizen personal information
- Urgent need for technical mechanisms empowering the citizen in controlling his personal information
- The presented framework aims at reinforcing the concept of soft-identities by introducing the properties of *Trust* and *Usage Control* while at the same time preserving the privacy right of the citizen

Joint Research Centre (JRC)

www.jrc.ec.europa.eu

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