



7<sup>th</sup> International ICST Conference on  
Mobile and Ubiquitous Systems,  
December 6<sup>th</sup> to 9<sup>th</sup> 2010

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## ***User Centric Systems: Ethical Consideration***

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**2nd PerAda Workshop on User-Centric Pervasive Adaptive Systems**

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Sydney, Australia

# Outline

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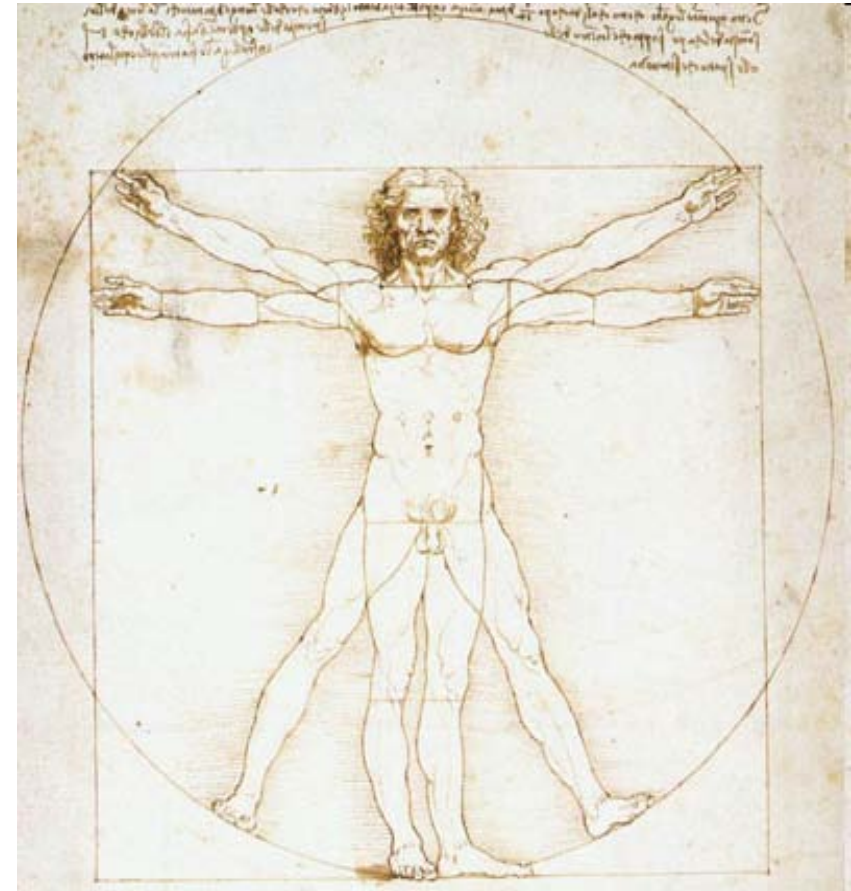
## I. Motivation

- State-of-the-art
- Tendencies
- Consequences

## II. Technology

- Pervasive adaptation
- Reflective approach
- Privacy matters

## III. Future ...



# I. Motivation

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*How can we protect privacy when we do not know what endangers it?*

- Staus quo

- IT Trends
- IT Impacts

- Quo vadis

- E–society?
- Homo technicus [1]?
- Homo simplex?
- Brave new world?

- Philosophical view

Infosphere and Inforgs [2]

# Status Quo

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- IT trends:
  - Mobile Systems
  - Smart Technology
  - Case study on most mature: E-Systems
  
- Impact on us
  - Mental
  - Social

# Smart Technology

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- Mobile technology
  - Mobile = traditional
- FET – European FP7 initiative “Future Emerging Technology”
  - Pervasive adaptation [REFLECT] 
  - Brain-computer interface
  - Evolutionary computing
  - Smart robotics
  - [BCI Berlin] 
- Cute Circuit [1]
  - Mobile Hug
  - Wearable Displays
  - Twinkle T-Shirts
  - Kinetic Dress

# Quo Vadis: E-Society

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- Technology vs. Business
- Principles vs. Practice
- Distribution vs. Centralisation  
(democracy vs. autocracy)



- E-Mutation
- E-Privacy

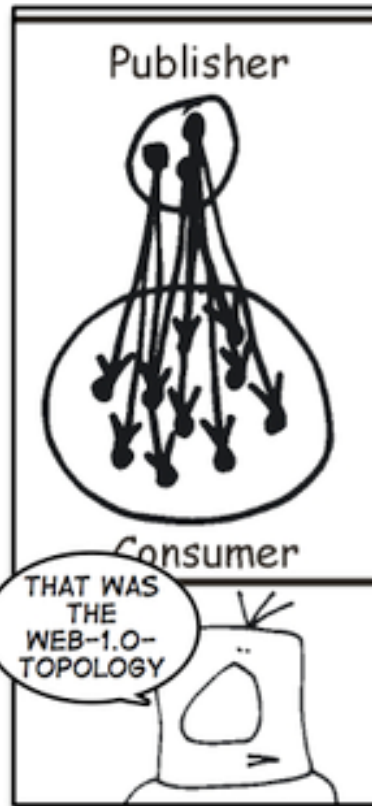
# Technology vs. Business

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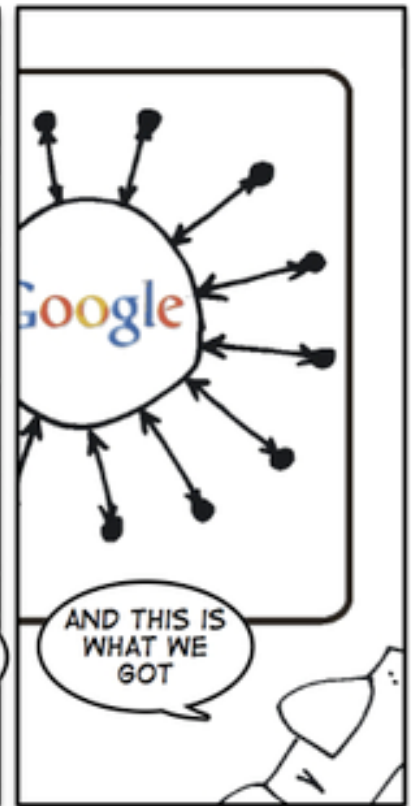
## Web 2.0 News

- Sony acquired digital media identification company Gracenote for about **\$260M**
- Amazon Web Services on its way to surpass **\$500M** in sales this year  
In a recent conference call
- VC deals show a decline in the first quarter of 2008  
While angel investors are taking on venture capitalists and have last year invested as much as VCs did the VC deals show a decline in the first quarter of 2008.
- Angel investors have invested as much as **\$26 billion** in start ups last year, almost as much as VCs did
- Federated Media raises huge round of funding - **\$50M**
- ...

# Principles vs. Practice



LOOK BACK ON WEB 2.0



GEEK AND POKE

# Not on the Agenda

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- E-Mutation?

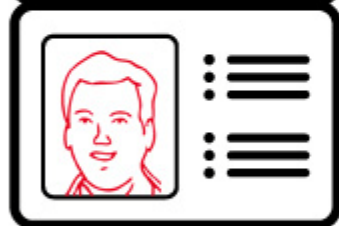


# Not on the Agenda

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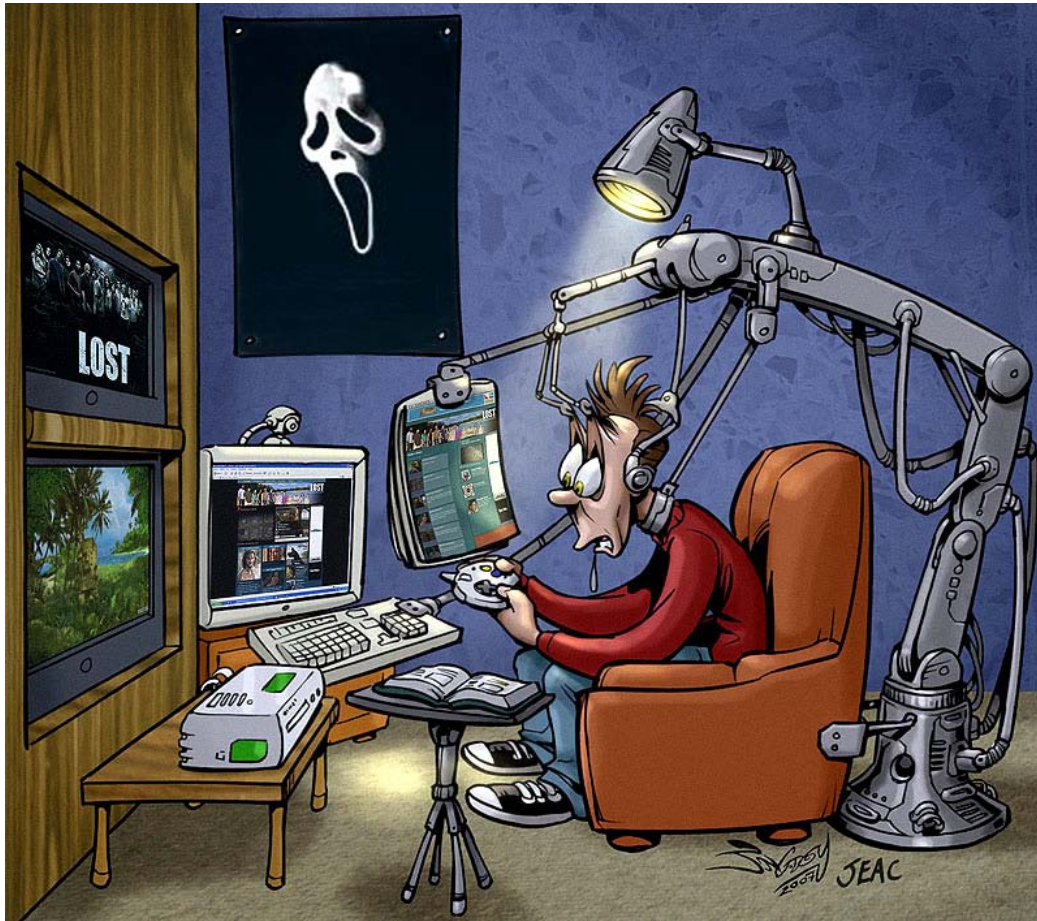
- E-Privacy?





# Quo Vadis Homo Technicus

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# Quo Vadis Homo Simplex

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- Adaptation (technology vs. us)
  - Who is more adaptive?
- Evolution (technology vs. us)
  - who is in control?
- Privacy protection
  - Who needs that?
  
- Simplification (technicus vs. simplex)
  - Who is simpler?

???

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- So, do you feel that the perfect plasticity of your brain is being moulded into a more infantile state by the constant 'yuck' and 'wow' of the web?
  - *We might be entering a world that is more sensory than what we would traditionally call cognitive (fast and colourful)*
  - *Twitter*, a banality of exchange, a place to hold the things that people feel they need to transmit to other human beings. *What does this say about how you see yourself? What does this say about you as a person?*
  - *And the real question is not so much what can we do with the web, but rather what will it do to us?*
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# Infosphere

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- Within the information society, it seems that we are modifying our ontological perspective, from a materialist one, in which physical objects and processes still play a key role, to an informational one, in which
  - a) objects and processes are **dephysicalised**, **typified** and perfectly **clonable**;
  - b) the **right of usage** is perceived to be at least as important as the right to ownership; and
  - c) the criterion for **existence** is no longer being immutable (Greek metaphysics) or being potentially subject to **perception** (modern metaphysics) but being interactable.

# Inforg

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- We become **mass-produced**, anonymous entities among other anonymous entities, exposed to billions of other similar inforgs online.
- So we self-brand and re-appropriate ourselves in cyberspace by blogs and facebook entries, homepages, youtube videos, and flickr albums.
- We use and expose information about ourselves to become less informationally indiscernible.
- We wish to maintain a high level of informational privacy almost as if that were the only way of saving a precious capital that can then be publicly invested by us in order to construct ourselves as individuals discernible by others.

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Inforg = *“Information organism - significantly but not dramatically different from natural entities and agents and smart, engineered artefacts”*, L. Floridi

*Are you an Inforg?*

*a quick indication (self-test):*

*“Do you spend more time being on-line or sleeping”*

## II. Technology

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*The best assistant is the one you do not notice!*

- **(Collective) Pervasive adaptation[1]**
  - Cognitive experience
  - Emotional experience
  - Physical experience
  - Case studies
- **Reflective approach[2]**
  - Theoretical background
  - Reflective Middleware
  - Case studies
- Ethical issues: {privacy, social, integrity} protection

# Pervasive computing

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- Pervasive computing is the next generation computing environment with information & communication technology available everywhere, for everyone, at all times.
- IT is becoming more and more an integrated part of our environments: from toys, milk cartons to cars, factories and whole city areas - with integrated processors, sensors, and actuators connected via high-speed networks and combined with new visualization devices ranging from projections directly into the eye to large panorama displays.
- Pervasive computing goes beyond the traditional user interfaces, on the one hand imploding them into small devices and on the other hand exploding them onto large scale walls, buildings and furniture.

# System Requirements

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A control system should continuously monitor users, diagnose their state and influence it, according to the application needs.

- Multimodal monitoring technology used to capture the user status, is divided into three distinct categories, featuring:
  1. overt actions (e.g. location tracking, observing, and pointing),
  2. overt expression (e.g. changes in behavior associated with psychological expression), and
  3. covert expression (e.g. changes in physiology associated with psychological expression).
- Numerous actuator devices are used to control and influence the users and their environment

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\* Overt actions and performance represent a source of data that is open to visual inspection

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# Reflective Approach

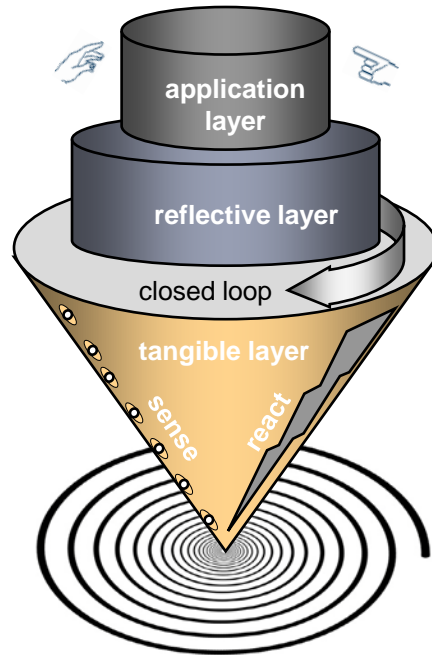


- Biocybernetic loop
- Reflective computing
- Reflective ontology
- Reflective architecture
- REFLECT framework
  - Transparent distribution
  - Component-based support
  - Dynamic and Flexible Architecture
- Theoretically sound and safe

Software

Emotional loop carrier

Cognitive loop carrier



Physical loop carrier

The aim of the cognitive loop is to monitor the level of **mental effort** exerted by the user during task activity in order to prevent:

- **information overload**
  - too much to process in given time
  - safety-critical performance
- **task disengagement**



Demonstrator  
Ferrari

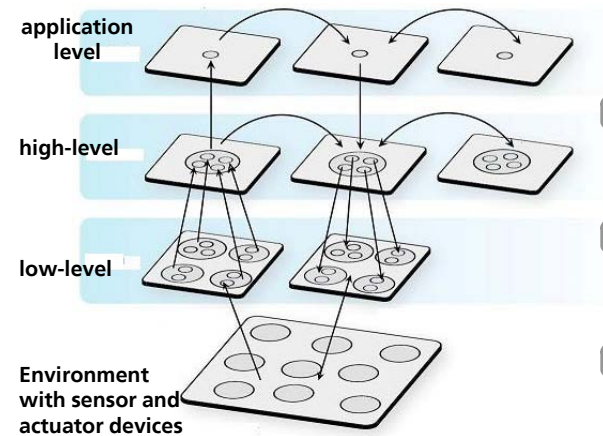
Numerous  
experiments



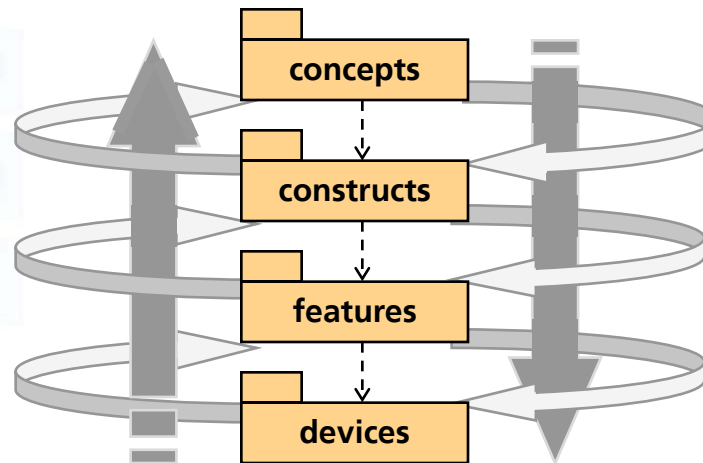
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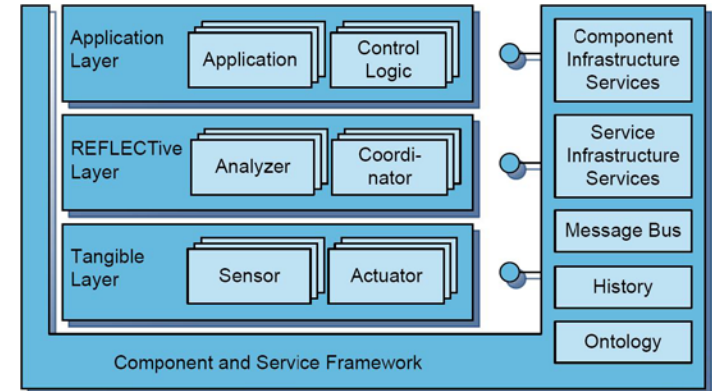
# REFLECT Framework (a quick overview)



Conceptual view

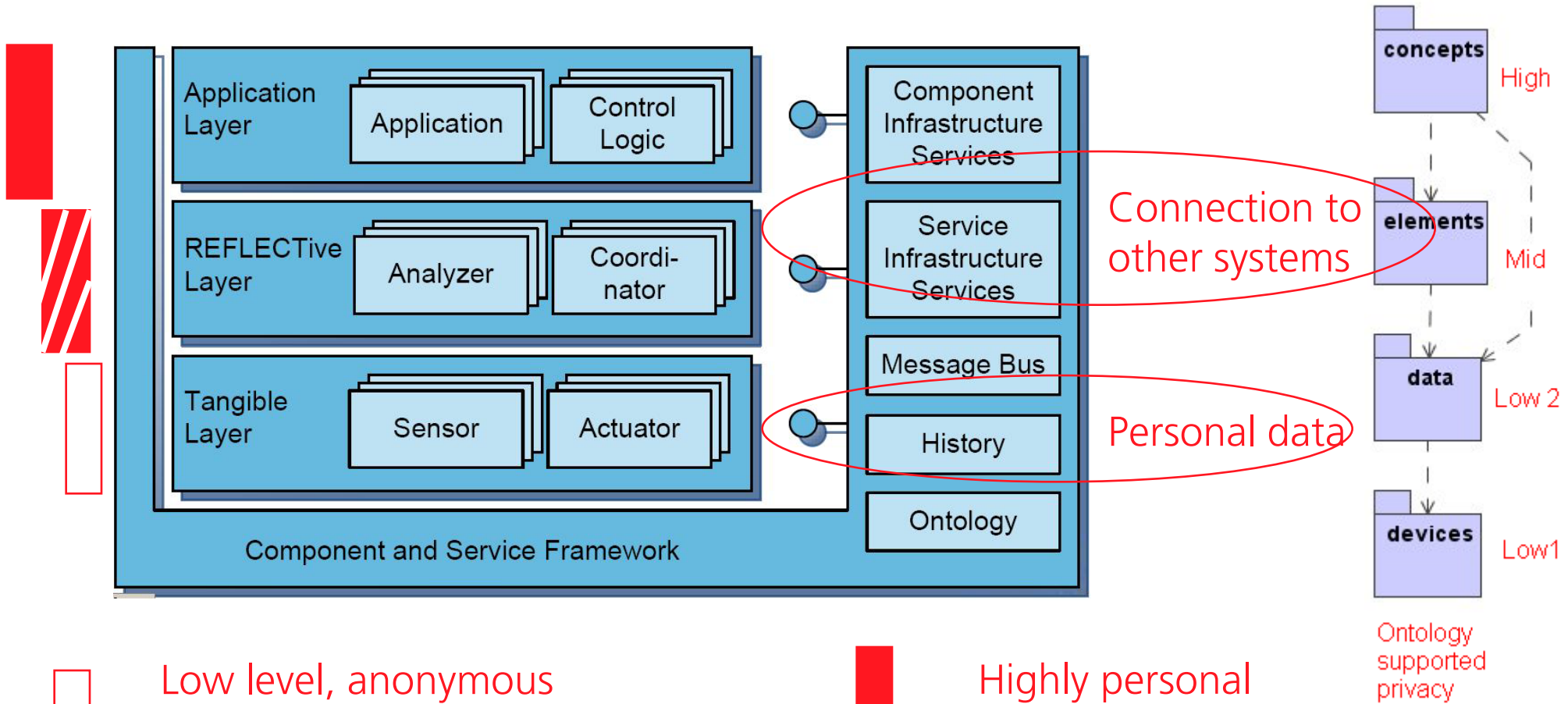


Ontology



Software architecture

# Framework Extension: PrivacyLevels



# Framework Extension: Personal Data

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- No personal-administrative data in system whatsoever!  
*(user recognition through personal characteristics)*
- Low level personal data (*ppv*)
  - system internal – non exchangeable
- Mid level personal data (*ppv versus user state*)
  - system internal – exchangeable only within “friendly systems”
- High level personal data (*goals, habits, preferences*)
  - Application and user specific – exchangeable only with explicit permission
    - Friendly systems
    - Familiar systems

# Framework Extension: Loyalty, Friendliness, Familiarity

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- Critical point: interaction with other systems
- Other systems:
  - Loyal systems (owned by the same user)
  - Friendly systems (owned by close friends)
  - Familiar systems (owned by familiar people, institution)
  - Other systems

Loyal: e.g. belonging to the same owner

Friendly: e.g. users with similar preferences

Familiar: e.g. applications with similar system goals

# Future Steps ?

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## Multidisciplinary Endeavour?

- **Technology**
  - data protection
  - E-privacy
  - E-cloning
- **Arts (literature, art)?**
- **Humanities ?**
- **Society ?**
- **Politics !**
- **Business !**

