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## **PANEL UBICOMM/AMBIENT**

**Ubiquity + Ambient Environments + Mobility:  
Are we Better Served?**

# Panel

- **Moderator**
  - > **Michael Massoth, Hochschule Darmstadt - University of Applied Sciences, Germany**
- **Panelists**
  - > **Simon Bergweiler, German Research Center for Artificial Intelligence (DFKI), Germany**
  - > **Weyn Maarten, University of Antwerp, Belgium**
  - > **Markus Ullmann, BSI, Germany**
  - > **Achilles Kameas, Hellenic Open University, Greece**

# METAPHORS TO SERVE US BETTER

Achilles Kameas  
Hellenic Open University

# Ambient Ecologies

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- **Intelligent environments** (IEs) are spaces equipped with a variety of sensors, supporting heterogeneous devices and providing a multitude of services
  - Applications are formed as orchestrations of services deployed on compositions of devices
  - The high degree of heterogeneity of these components makes their configuration and maintenance as part of an integrated system a non-trivial task
  
- We use the “**Ambient Ecology**” (AE) metaphor to conceptualize a space populated by connected devices and services that are interrelated with each other, the environment and the people, supporting the users’ everyday activities in a meaningful way
  - All kinds of “smart” appliances and devices, context aware artifacts and services, even robots are part of ambient ecologies

# Activity Spheres

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- An “**activity sphere**” (AS) is an ephemeral knowledge-based system, which is formed to achieve a specific goal composed by specific tasks, by binding in an adaptive manner to the most suitable resources that are available within an Ambient Ecology
- Inspired by object-oriented approaches, an AS expands the **bubble notion** to contain not only the data and models, but also the associated processes and other resources that create, use or otherwise affect this data, leading to the **specification of autonomous and coherent entities, which can adaptively execute on changing infrastructure**

# Basic assumptions

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- At the basis of our approach is the assumption that **the end-user(s) want(s) to fulfil aims or goals** such as *feel comfortable, go shopping or prepare dinner*
- These **goals are composed of a number of interrelated tasks and subtasks**, each requiring the use of resources from an ambient ecology
- **Goals and tasks are independent from any ecology**, but always must be realized within some ecology.
- The realization of a goal requires the **binding of ecology resources to the goal-specific tasks**

# The role of ontologies

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- An ontology is a structure of knowledge, used as a means of knowledge sharing within a community of heterogeneous entities
- Activity sphere ontologies:
  - **Local ontologies** are provided by both active and passive entities and encode their state, properties, capabilities and services.
  - The **user profile**, as the user is at the centre of each activity sphere.
  - **Policy ontologies**, representing privacy, interaction, etc.
  - **Interaction ontology**, which describes the elements of domain independent context aware interaction
  - The **sphere ontology**, an information and knowledge pool which is constantly evolving and being updated. Different ways of forming this ontology are possible, by aligning, merging and mapping of entities' local ontologies

# Agents

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- Agents are responsible for automated adaptation, resolving conflicts, interacting with the user, establishing plans and in general realizing the concrete tasks in the task model
- Three types of agents are used:
  - Planning agent
  - Fuzzy Task Agent
  - Interaction Agent



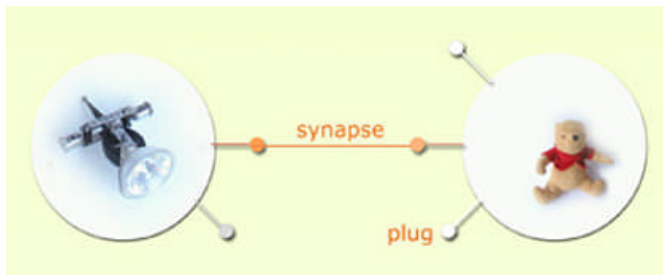
# Five dimensions of adaptation

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- **Artifact adaptation**
- **User behaviour adaptation**
- **User interaction adaptation**
- **Network adaptation**
- **Sphere adaptation:** It happens along two dimensions:
  - ▣ **Functional adaptation:** the system supports the realization of the same activity sphere in different ambient ecologies,
  - ▣ **Structural adaptation:** refers to the persistent achievement of the goal
    - ▣ when changes on the available resources occur (as AE components may appear and disappear and users may come and go over time) and
    - ▣ when changes on the cardinality of the available resources occur (as the numbers of AE components or users that participate in the realization of an activity sphere may differ in time)

# GAS

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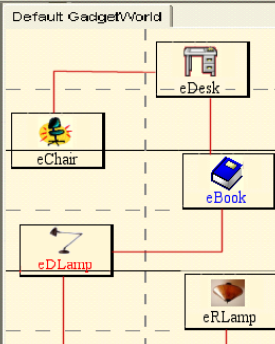
GadgetWorld Editor ver 2.5

Gadgetworld Gadgets Synapses View Options

**Gadgets Discovered**

- eDesk
- eChair
- eDLamp
- eRLamp
- eClock
- eBook
- eBook2
- eBook3
- eSLamp

Default GadgetWorld



**Synapse Information**

- Default GadgetWorld
- eBook
- Open/Close <-> eDLamp.On/Off
- eDLamp
- eChair
- eDesk
- eRLamp

Set Synapses  
Remove Selected Synapse  
Synapse Properties

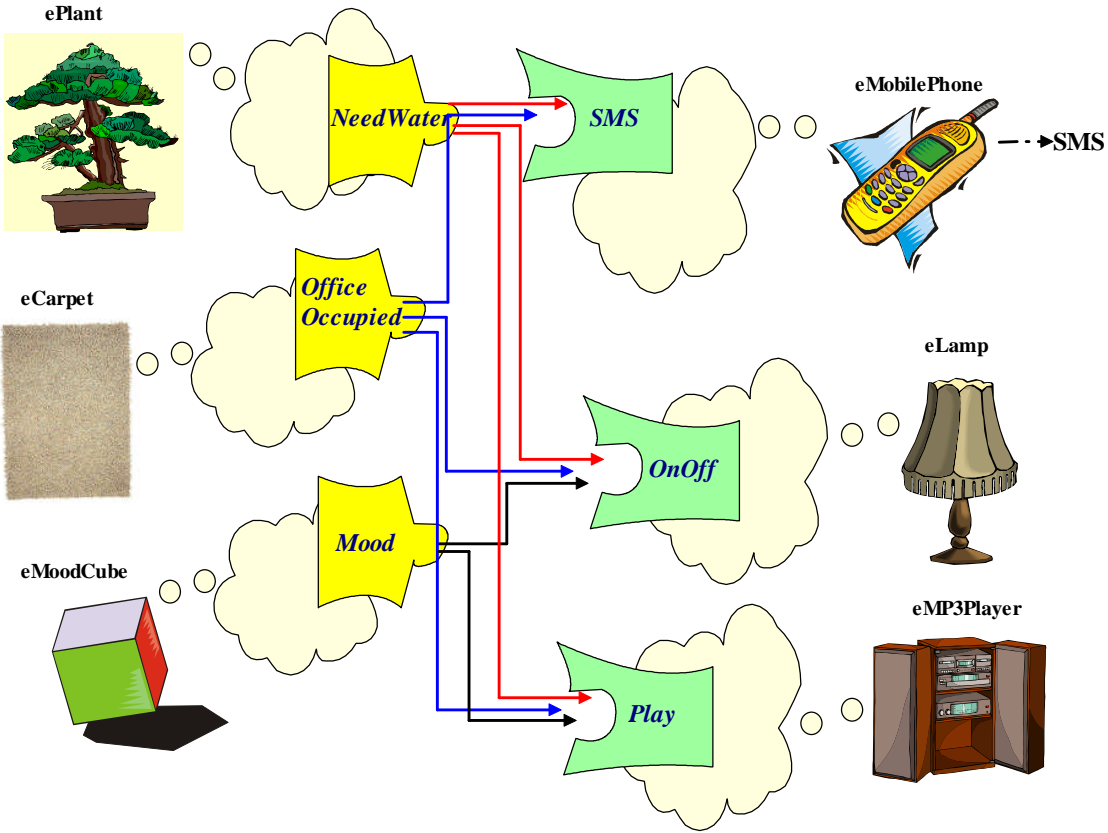
Physical Properties | Plugs

Type	Value
Width	15cm
Sensors	8
Length	18cm

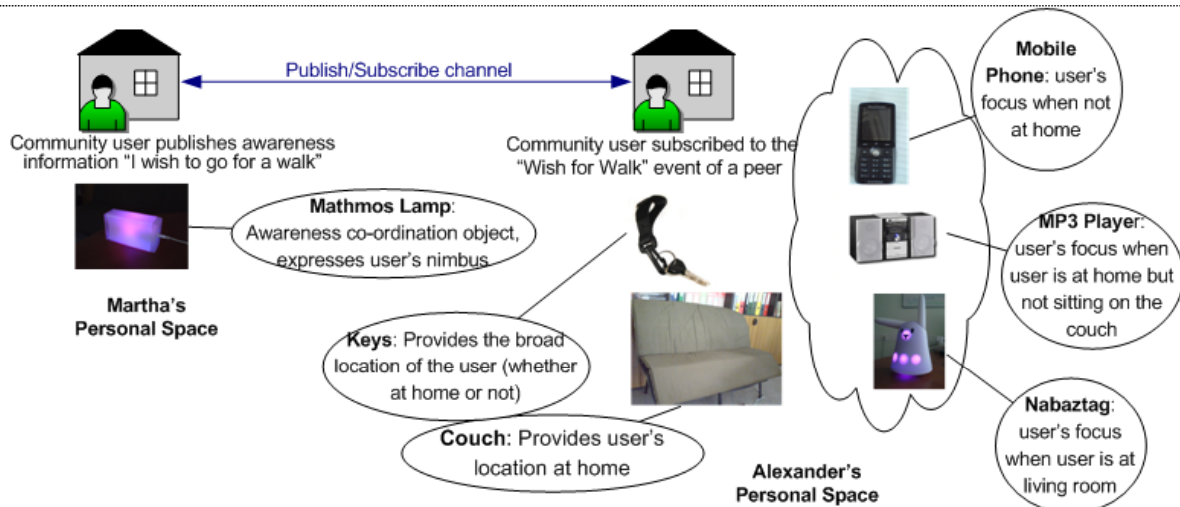
Add to GadgetWorld

COMMUNICATION MODULE: Gadget Found \*\*\* Name: eDesk \*\*\* ID: eDesk@1048686232054  
COMMUNICATION MODULE: Gadget Found \*\*\* Name: eDLamp \*\*\* ID: eDLamp@1049792372312

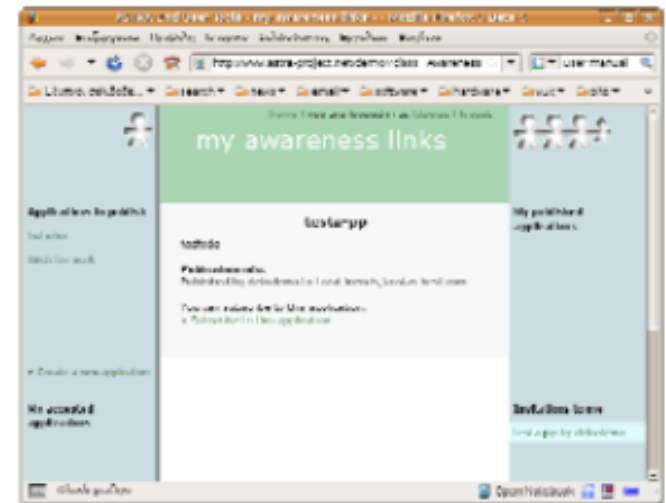
# The connected plant



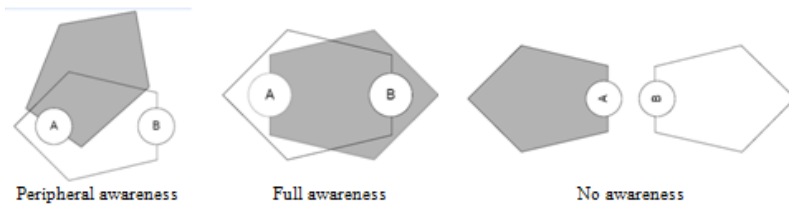
# Awareness



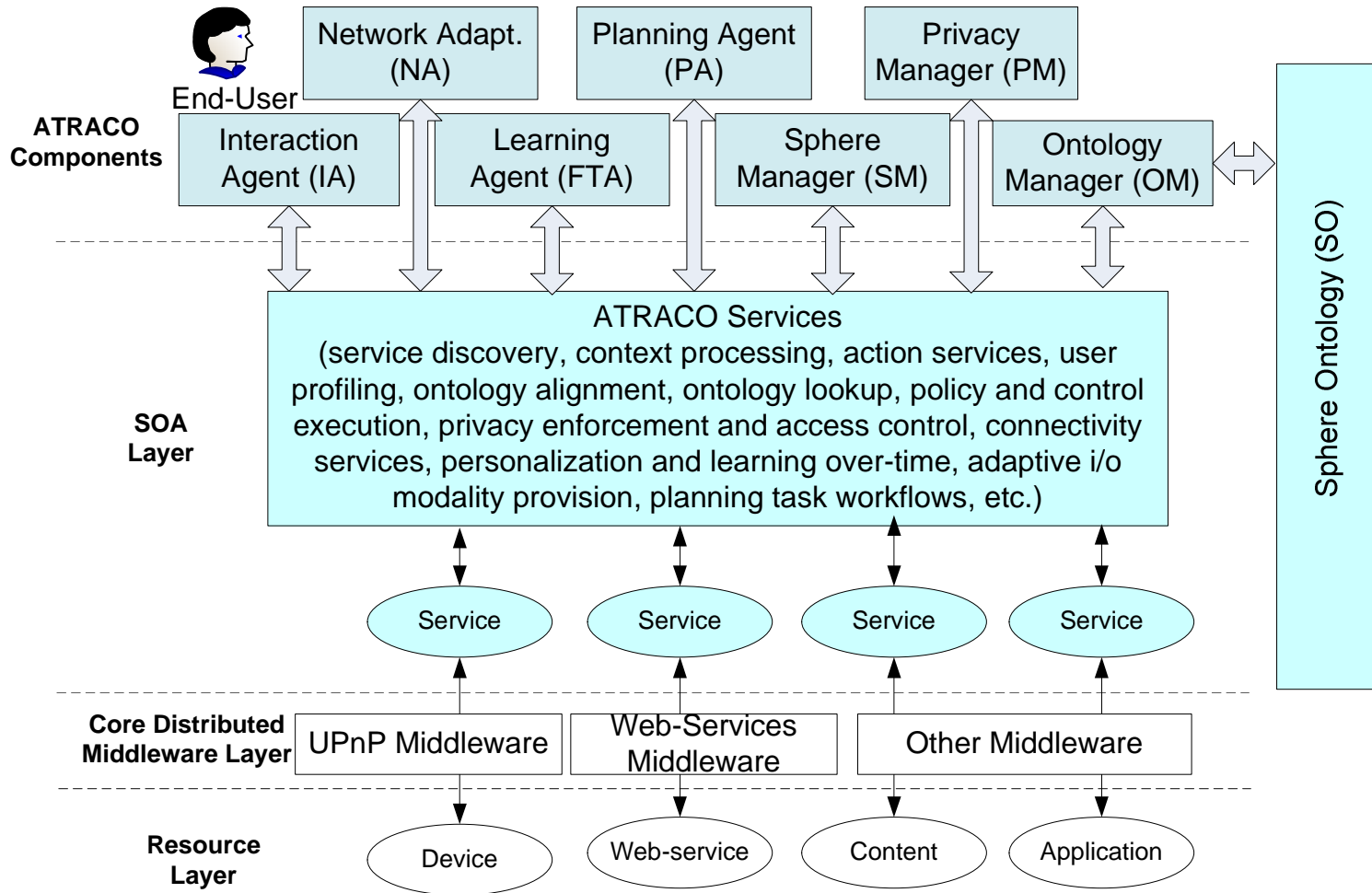
Main menu



My Awareness Links (application selection)



# ATRACO

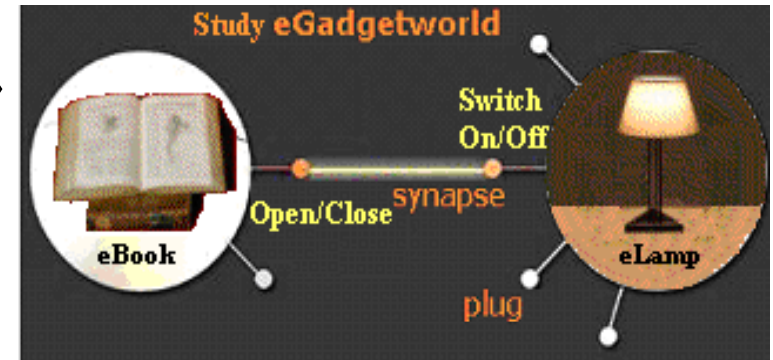
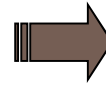
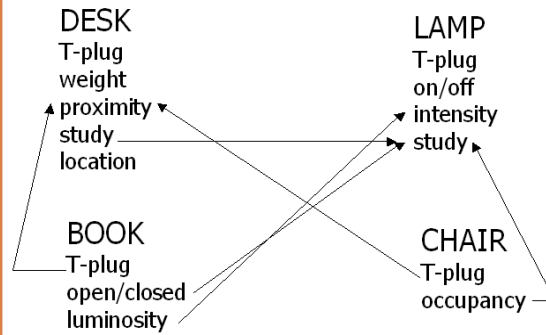




# “Studying” AS

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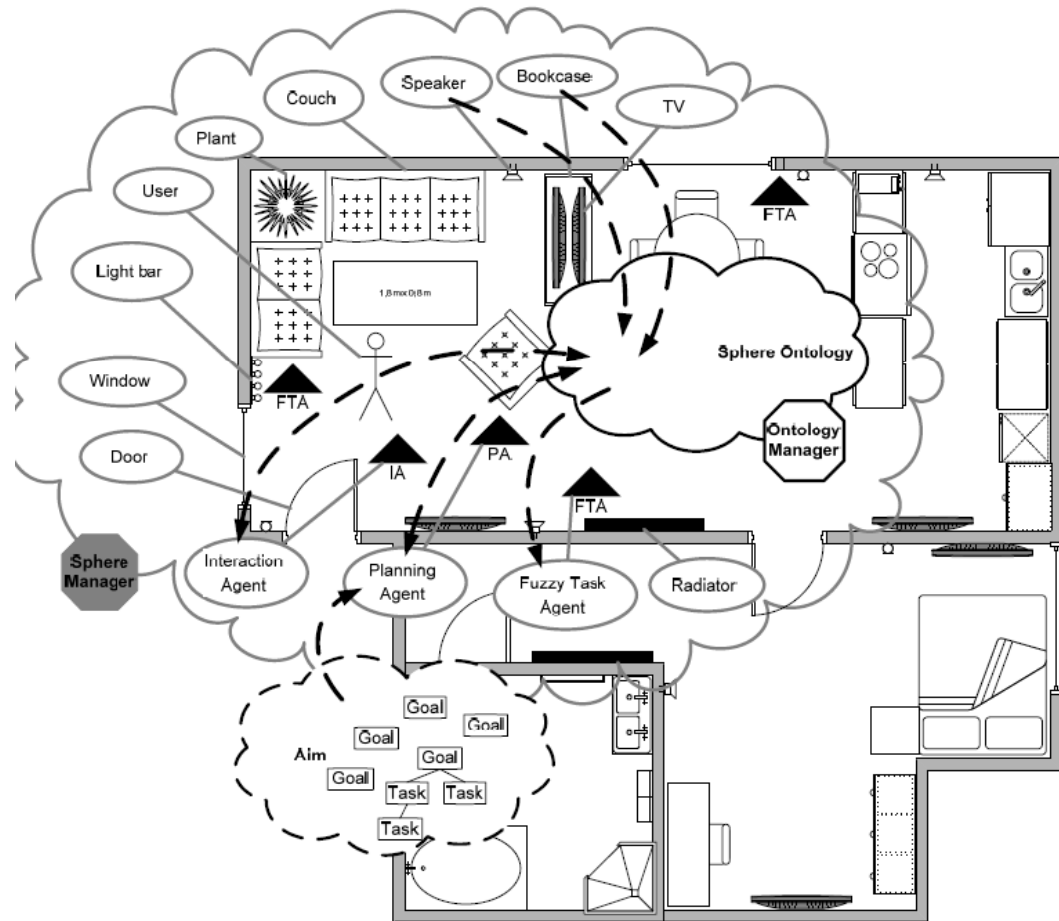
*In the “Studying” activity sphere, we are using four objects, a lamp, a chair, a book and a desk. According to the task description, when the chair is occupied and it is near the desk and the book is open on the desk, the lamp is turned on.*



# “Feel Comfortable” AS

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*Suki has been living in this new adaptive house for the past 10 months. When he comes home after work he wants to feel comfortable and for this reason the house should adapt the temperature, set level of lighting and sometimes present his favourite TV program. Suki prefers a warm living room and a cold bedroom.*



# Projects

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- eGadgets (extrovert gadgets)



- FP5 / IST-2000-25240 / FET Proactive/Disappearing Computer

- [www.extrovert-gadgets.net](http://www.extrovert-gadgets.net)

- Plants (Enabling Mixed Societies of Communicating Plants and Artifacts)

- FP5 / IST-2001-38900 / FET Open

- <http://daisy.cti.gr/plants/>



- Astra (Awareness Services and Systems – Towards Theory and Realization)

- FP6 / IST-2004-2.3.4.1.b7 / FET Open

- [www.astra-project.net](http://www.astra-project.net)



- Atraco (Adaptive and Trusted Ambient Ecologies)

- FP7 / ICT-1-8.2 / FET Proactive/Pervasive Adaptation

- [www.atraco.org](http://www.atraco.org)





# (Only some of the) issues to consider in order to be better served

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- Human interaction & control
  - Is it intuitive enough?
  - Safety and trust
- Scalability of the approach
  - Many resources
  - Many users
  - Many activities
- Performance
  - Start up time
  - Adaptation to changes in an activity sphere
- Evolution
  - Learning
  - Mobility

# Thank you!

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- You can reach me at
  - [kameas@eap.gr](mailto:kameas@eap.gr)
  
- DAISy (Dynamic Ambient Intelligence Systems) group web site
  - <http://daisy.cti.gr>
  
- E-CoMeT (Educational Content, Methodology & Technology) Lab web site
  - <http://eeyem.eap.gr>

# Ubiquity + Ambient Environments + Mobility: Are we Better Served?

**Markus Ullmann**

markus.ullmann@h-brs.de

# 1. Instant Messenger

- ❑ Example: WhatsApp
- ❑ Widely used.
- ❑ No secure channel (end-to-end encryption)



## 2. Wearables

- ❑ Example, LG G watch with Android Wear OS
- ❑ Permanently capturing of geographic position, heart frequency and walking steps and centralized data storage.
- ❑ Location/personal privacy ?



## 3. Glass

- ❑ Example: Google head glass
- ❑ Show information on the glass, live environmental full-video
- ❑ Violation of personal rights due to environmental audio and video monitoring ?




## These

- ❑ Functionality and data capturing is always the primary manufacturer issue, security and privacy are peripheral.
- ❑ Personal view: From a security and privacy perspective **I'am not better served.**

### **These:**

**Only if security and privacy issues are a buying decision of the consumer or regulation comes in place, situation is changing. But consumers like new functionalities.**

**So, forget about security and privacy ?**



# UBICOMM / AMBIENT Ubiquity + Ambient Environments + Mobility: Are we Better Served?

**Simon Bergweiler**



German Research Center for Artificial Intelligence

UBICOMM'14 – Rome, August 2014



# Embedded Systems



Smart Factories  
Smart Products



Mobile Devices



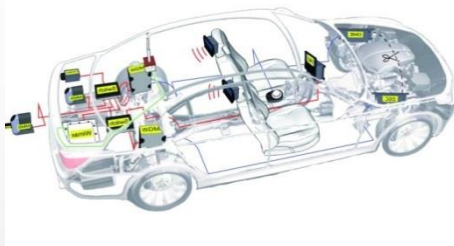
Entertainment - SmartTVs



Automotive – Electric Mobility



Wearable  
Technologies



Medical Devices  
Virtual Patient



# Are we better served?

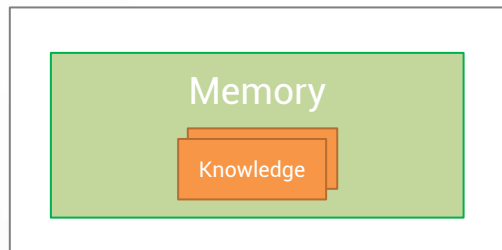
- Sensor Networks (technical infrastructure) are an **essential piece of the foundation** for
  - factories, buildings, energy supply, and public transport infrastructure
- Enriched with Intelligence by embedded analytics
  - Monitoring / Controlling
  - Management
- Software-defined platforms make sensor data available and processable
  - Home Automation: My house is intelligent, everything is interconnected.
  - Heating system, lighting or music is controlled by mobile devices and doors open automatically
- Smart Factories and Smart Products
  - Gathering and fusion of sensor information (networked via Cloud-services)
  - More computing power in many small devices
  - Create object memories, e.g., *“product memory”*

# Bridging the gap

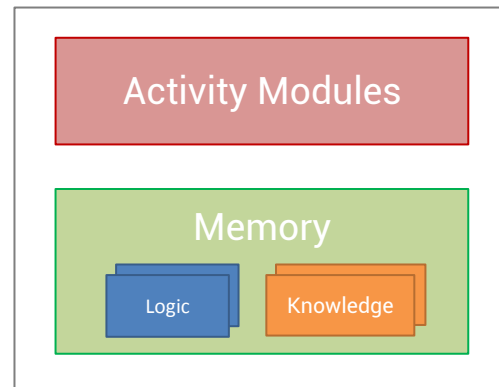
- Connect the real world with the virtual world
- Digital Worlds - each real object has a digital virtual counterpart (digital twin)
- Industry is on the threshold of the fourth industrial revolution - "Industrie 4.0"
- Production of individualized products



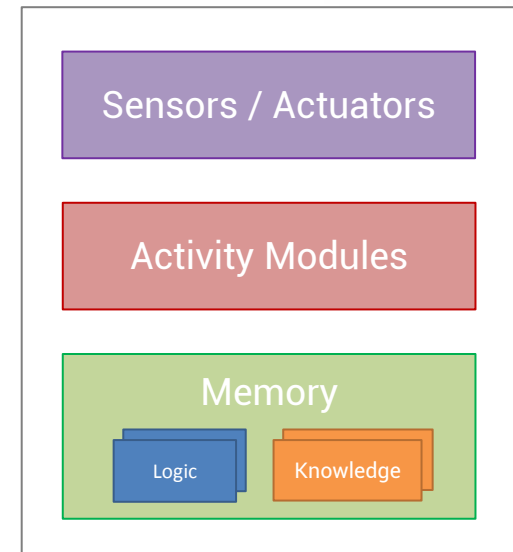
# Digital Object Memory to CPS



Digital Object Memory



Active DOME (ADOME)



Cyber-physical System

# Are we Better Served?

