

# Workshop on Ambient Intelligence Infra Structure (WAmII 2012)

Johan Lukkien



J.J.Lukkien, System Architecture and Networking  
Mathematics and Computer Science Department

**TU/e** Technische Universiteit  
Eindhoven  
University of Technology

**Eindhoven Institute  
for Research on ICT**

# Organizers

- Alina Weffers-Albu, Philips Research
- Tanir Ozcelebi, Eindhoven University
- Johan Lukkien, Eindhoven University



J.J.Lukkien, System Architecture and Networking  
Mathematics and Computer Science Department

# Aml and Amll

- Aml: invisible and unobtrusive digital presence supporting users in their daily life
  - embedded, context aware, personalized, adaptive, anticipatory
- Amll: integration infra structure of networking, processing and user interfacing, supporting Aml



# Motivation for the workshop

- Observations:
  - many Aml scenarios and much Aml motivated research
  - Aml motivated international projects
    - experimentation
    - infra structure output
    - development frameworks
- However,
  - showcases are proof-of-concept like, or stand-alone
  - Aml goes slow in deployment
    - in particular the ‘integration’ is slow
- Is this true, and what role is Aml playing in this?



# Aim: answer these questions

- What are concepts and elements of a (successful, future) AmII?
  - success: large-scale deployment, acceptance, commercial success
- What is required for AmI and an AmII to be successful?
- What are current research issues and pending problems in this domain?



# Workshop topics

- An overview of projects of the last 10 years
- And further
  - Architecture and design criteria leading to decisions regarding differentiating between application-specific and infra structure functionality,
  - Ambient Intelligence services,
  - Multi-device communication and interaction,
  - Ethical aspects, privacy, security and trust,
  - User interaction, embedded intelligence and learning behavior,
  - Resource management and Quality of Service (QoS) management .



# Aspects and elements of an AmII

- *Hardware infrastructure*
  - a (home) network, consisting of ~4 technologies + gateways
    - Wifi, Ethernet, Bluetooth, Zigbee, powerline
- *Open and extensible software platform*
  - add devices, services, users
  - standardization...
- *Functionality as services*
  - discoverable, e.g. player, media
- *Cooperation at the network level*
  - to ensure platform independence
- Successful examples
  - ???
  - UPnP
  - Web services
- Distributed, concurrent collaboration is not easy!
  - quality and reliability are key
  - not to speak of security, privacy, transparency



# Principles of an AmII

- *Set of **platform** services*
  - collaborative management (resources, membership), storage, discovery, ...
- *Separation of service and coordination*
  - all functionality is a service
  - avoid control within the services
  - admit third-party management
- *Separation of data collection and data processing*
- *Machine-process-able semantics for data and operations*
- *Automated behavior based on semantics, data fusion, rules and learning*
- Successful examples
  - ?
  - ongoing work within projects
  - no clear winner
- Where is intelligence, and where is it supported?





# Aml and Amll: towards smart spaces

- Interesting, challenging and useful demonstrations of Aml exist
  - (however, how many practical ones are there?)
    - perhaps focus on realizing simple scenarios first)
  - need to reuse these...
  - ... and build them using an established Amll
- Scenarios of change and sharing are just as important as functionality, e.g.,
  - loading a new Ami application into the in-home infra structure
  - management, to guarantee quality
  - learning, in a distributed context
- Need to have an open, public repository of applications, and an open 'API' for development of Aml (and practicing)
- Such Amll is currently called: a *smart space*



# Smart Spaces: defining properties

- *adequate*:
  - behavior minimizes a cost function
- *adaptive*
  - such cost function may refer to the context
    - state and history of the Smart Space and its contents
- *learning*
  - such minimization is learned, improved over time
- *dependable*
  - fraction of failures may not exceed a given number
- *open*
  - protocols and data formats are well-described and generally available
  - new devices can connect to the Smart Space easily
- *self-managed*
  - installation and operation are without technical user involvement



# Elements of success



services **beyond** calls



smart phone **apps**



J.J.Lukkien, System Architecture and Networking  
Mathematics and Computer Science Department

# Elements of success



services **beyond** simple sensing and actuation



- Process in place for application *development* and *deployment*
  - c.f. apps and app store
- Business model
  - stakeholders clearly identified
  - clear benefit for all stakeholders
- Evolution path
- There is a (technology) pull from stakeholders
  - successful scenarios, perhaps just fun, commercial success



J.J.Lukkien, System Architecture and Networking  
Mathematics and Computer Science Department

**TU/e** Technische Universiteit  
Eindhoven  
University of Technology

**Eindhoven Institute  
for Research on ICT**

# Questions to presenters

- What are properties that you (your project) identify as important for AmlI?
- What were contributions of the project to (an) AmlI?
- What were lessons learned from the project?
- From the project perspective, what should be (have been) next steps?
- Which roadblocks for Aml do you see?



# Hypotheses

- Successful Aml introduction is slow because
  - of limited utility of Aml
  - of a lack of consensus on how it should work
  - of flaws in the R&D approach towards Aml
  - it requires new devices that do not have any other function
  - there is no killer app
  - there is no evolution path
  - physical technology as well as software is too diverse
  - infra structure equipment cannot be programmed
  - security, privacy and the likes are not taken care of
  - it is too complicated for people



## Workshop Program

The workshop will take a full day consisting of 25 minute presentations followed by short discussions.

	Time	Authors	Affiliations	Topic	Projects
<b>Opening by the workshop chair</b> Johan Lukkien	9:30		Eindhoven University of Technology	Welcome speech by the chair	
Presentation + discussion	10:00	Maddy Janse	Philips Research	AMIGO in hindsight - lessons learned	<b>AMIGO</b>
Presentation + discussion	10:30	Marcus Ständer, Aristotelis Hadjakos, Steven Luitjens	Technische Universität Darmstadt, Philips Research	Towards context-aware user guidance in smart environments	<b>SmartProducts</b>
Presentation + discussion	11:00	Juha-Pekka Soininen,	VTT Finland	Opening embedded information of devices for intelligent applications	<b>SOFIA</b>
Presentation + discussion	11:30	Monique Hendriks, Ville Antila, Tine Lavrysen	Philips Research, VTT Finland, Human Interface Group Belgium	Inter-usability & intelligent communication: usability aspects in a multi device personal attentive system	<b>SMARCOS</b>
Presentation + discussion	12:00	Boris de Ruyter	Philips Research	Nomadic Media ITEA0219	<b>Nomadic Media</b>
Presentation + discussion	12:30	Dietwig Lowet, F. van Heesch	Philips Innovation Group Research	Florence - A multipurpose robotic platform to support elderly at home	<b>Florence</b>
<b>Break</b>	13:00	<b>LUNCH BREAK (1 HOUR)</b>			
Presentation + discussion	14:00	Berardina De Carolis, Stefano Ferilli	Univesity of Bari	A multiagent system providing situation-aware services in a smart environment	
Presentation + discussion	14:30	Joelle Coutaz, G. Calvary, A. Demeure L. Balme, S. Laviotte, G. Rey, J.Y. Tigli	University of Grenoble, Immotronic, University of Nice	Infrastructure and architectural principles for plastic user interfaces	<b>CAMELEON and ANR CONTINUUM</b>
<b>Closing by the workshop chair</b> Johan Lukkien	15:00		Eindhoven University of Technology	Summary and conclusions	
<b>The End</b>	16:30				



# Results of the workshop

- Input to a journal paper
- (Possibly) proceedings: as research report in the series of CS @ TU/e
  - needs revision and editing





# Summary

- Significant, and focused efforts on WAmII have been executed
  - though with a ‘see what we made for you’ flavor
  - FPx structure does not help here
  - Uptake was not a KPI – and cannot be, really
- Partner-level (re)use, insertion of results in other project was observed
- Scenario thinking has been dominant; the same scenarios were repeated
- Nobody actually pursues deployment of these scenarios in practice
- Different styles have been used
  - would it be possible to assert the quality of a certain WAmII approach in terms of being right for the purpose?
  - for example, by referring to the complexity of incremental uptake, or application development?
- User is key, it starts and ends there
- The projects were instrumental in learning!



# Besides the already mentioned characteristics

- **Pervasive** Interoperability
- Support for context dependent behavior – context base
- Aml applications require lots of different frameworks
  - separate Aml from application-specific?
  - integrate based on Aml APIs rather than application-specific?
- Service oriented! (do we all mean the same?)
- More than a collection of services
  - The Smart Environment must have a soul, a single, consistent attitude
  - Transparency – intuitive mental model of the system, understanding the behavior, predictable and expected
  - Tangible -
  - User want to achieve goals, not operate a system



What are properties that you (your project) identify as important for AmII?

- Support of social activities
- Multi modal interaction
- Trustworthiness – can rely on
- Besides service oriented: component based
- Simulation



J.J.Lukkien, System Architecture and Networking  
Mathematics and Computer Science Department

# What were contributions of the project to (an) AmII?

- Open source software, and communities
- Fairly complete frameworks
- Scenarios and demonstrations
- Description languages



# What were lessons learned from the project?

- Many
- Intelligence is difficult
- With respect to WAmII:
  - existing frameworks are (necessarily?) complex...
  - ... therefore, new projects do not want to depend on it
  - ... use an ad-hoc approach from some basic framework
  - for successful acceptance a committed receiving party is needed
- Research projects want to learn more than deliver



# From the project perspective, what should be (have been) next steps?

- From: everyone should have started using it
- to: we had a nice project that gave much insight
- Still,
  - it remains important to investigate the ‘quality’ of infra structure
  - and to obtain a common description of WAmII, what it should provide



# Which roadblocks for Aml do you see?

- Successful Aml introduction is slow because
  - of limited utility of Aml
  - of a lack of consensus on how it should work
  - of flaws in the R&D approach towards Aml
  - it requires new devices that do not have any other function
  - there is no killer app
  - there is no evolution path
  - physical technology as well as software is too diverse
  - infra structure equipment cannot be programmed
  - security, privacy and the likes are not taken care of
  - it is too complicated for people



# Which roadblocks for AmlI do you see?

- Successful AmlI introduction is slow because
  - we don't get it quite right
  - we don't have it in focus

