Multi Agent System Frameworks for Ambient Intelligence

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- Ambient Intelligence
- Agents & AmI
- MAS for AmI
- Conclusion

Multi Agent System Frameworks for Ambient Intelligence

overview

Ambient Intelligence (AmI)

Vision/interfaces

Productivity Future Vision

[Microsoft, 2011]

see also:

A Day Made of Glass [Corning Glass]

A Day Made of Glass 2 [Corning Glass]

Productivity Future Vision, 2009 [Microsoft]

Productivity Future Vision, 2015 [Microsoft]

Ambient Intelligence (AmI)

Vision/relevant information

Project Glass: One day...

[Google]

Ambient Intelligence (AmI)

"a ubiquitous electronic environment that assists people in their daily life, in a pro-active manner, while remaining invisible and non-intrusive."

[Ducatel et al., 2001]

$\rightarrow$ *the future of computers and the Internet*

Ambient Intelligence (AmI)

- interfaces that are natural to use
- the right information at the right time
- intelligent action – context-awareness

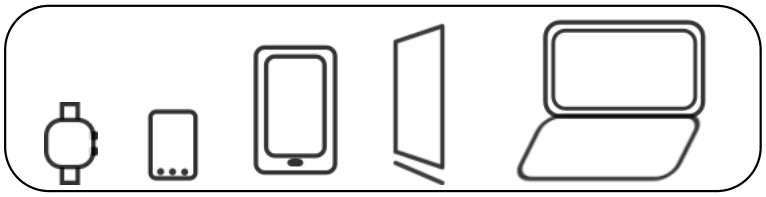
- pervasive
- connected

Ambient Intelligence (AmI)

Interfaces

Ambient Intelligence (AmI)

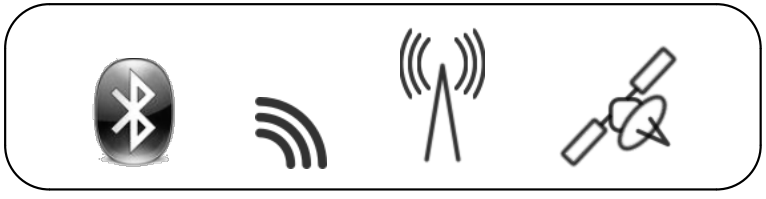
Interfaces



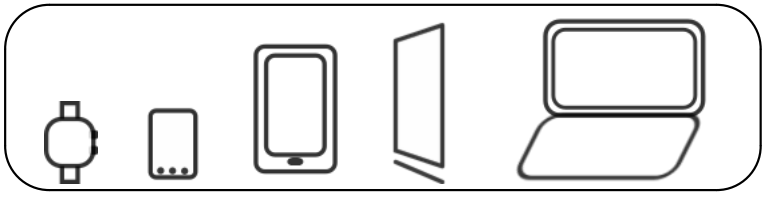
Hardware

Ambient Intelligence (AmI)

Interfaces



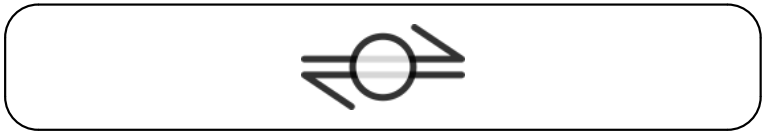
Network



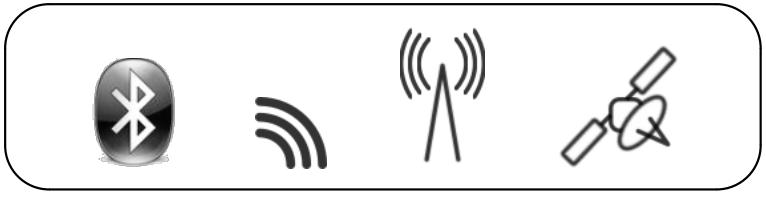
Hardware

Ambient Intelligence (AmI)

Interfaces



Interoperability



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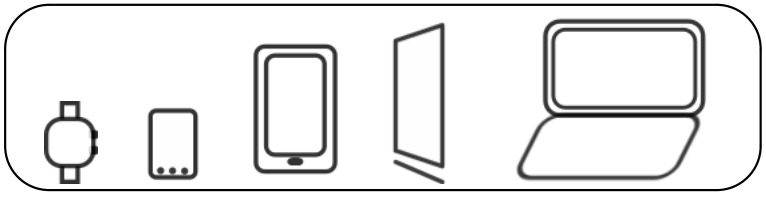
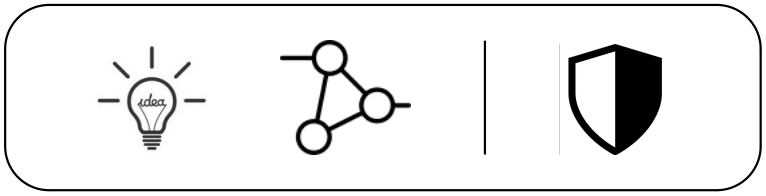


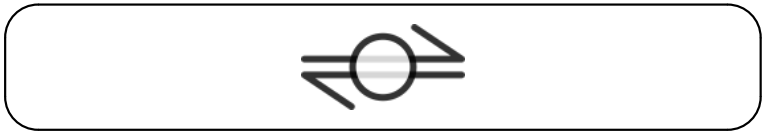
Hardware

Ambient Intelligence (AmI)

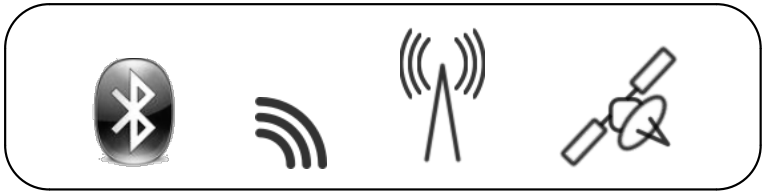
Interfaces



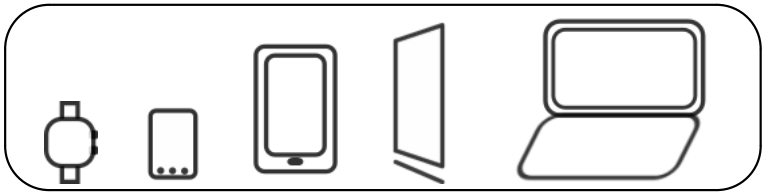
Intelligent applications



Interoperability



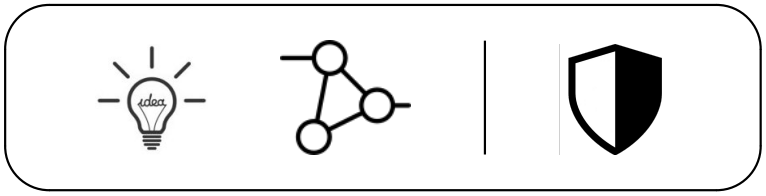
Network



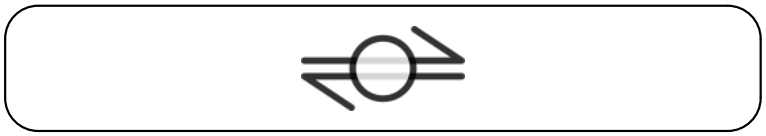
Hardware

Ambient Intelligence (AmI)

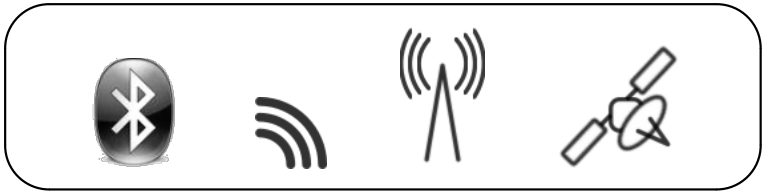
Interfaces



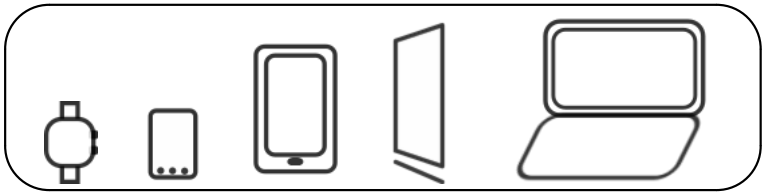
Intelligent applications + privacy-awareness



Interoperability
- uniform representation
- application transfer



Network
Technologies:
PAN/BAN, WSN, IoT



Hardware
Ubiquitous / pervasive computing

Vision/communication

Social Web of Things II

[Ericsson]

see also:
The Social Web of Things [Ericsson]

What are agents?

What are agents?

An agent acts outside its organization, representing the interests of its organization, having its own agenda, goals, and plan, and is capable of taking decisions in its interaction with the environment, without direct commands from human operators.

What software are agents?

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A software agent is a software entity (program) that is autonomous, has a continuous lifecycle over some time (is persistent), and interacts with its environment, in which other agents and entities may exist. It is oriented towards fulfilling a goal rather than processing data.

- autonomy – agents operate without the direct intervention of humans or others, and have some kind of control over their actions and internal state;

Agents & AmI

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- social ability – agents interact with other agents (and possibly humans) via some kind of [agent-]communication language;

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- Also: representation, mobility, rationality, learning, adaptivity.

[Jennings and Wooldridge, 1999]

MAS for AmI

We could implement AmI applications with agents, by embedding context-awareness in the structure of the MAS:

- assign an agent to each element of context:

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- agents should communicate with other agents that share context

[Olaru et al., 2013] .

MAS for AmI

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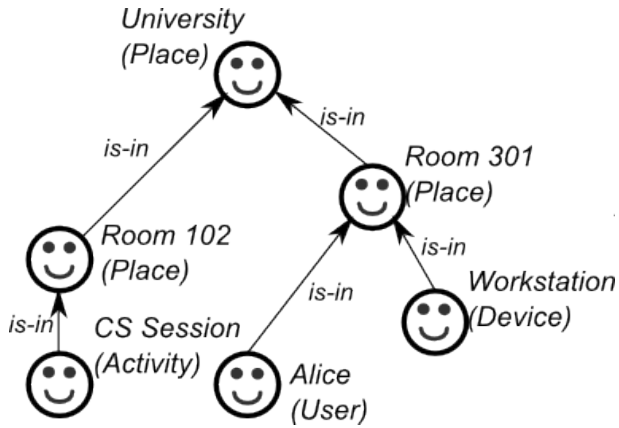
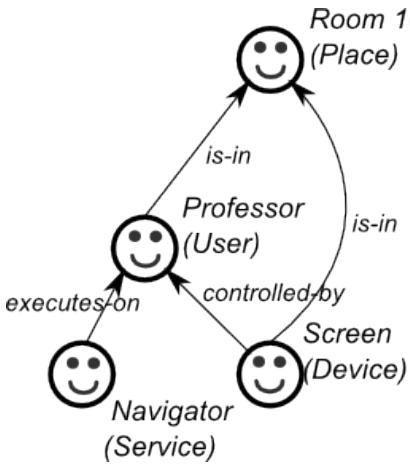
- agents should communicate with other agents that share context

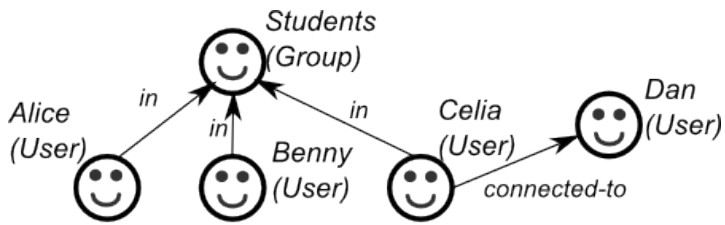
[Olaru et al., 2013] .

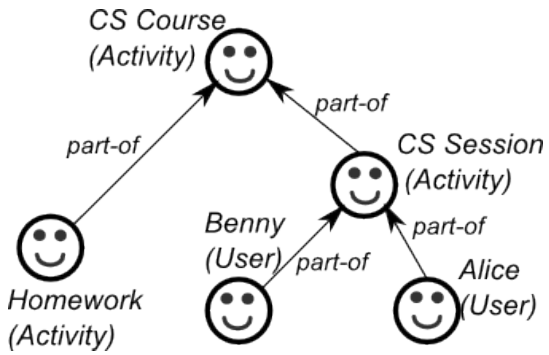
$\Rightarrow$ obtain a "world of information conveyors". [Weiser, 1993]

- information should be *conveyed* along the paths created by context-aware neighborhood relations:
  - spatial ← relation *is-in*
  - computational ← relations *controlled-by*, *executes-on*
  - social ← relations *in*, *connected-to*
  - activity ← relation *part-of*

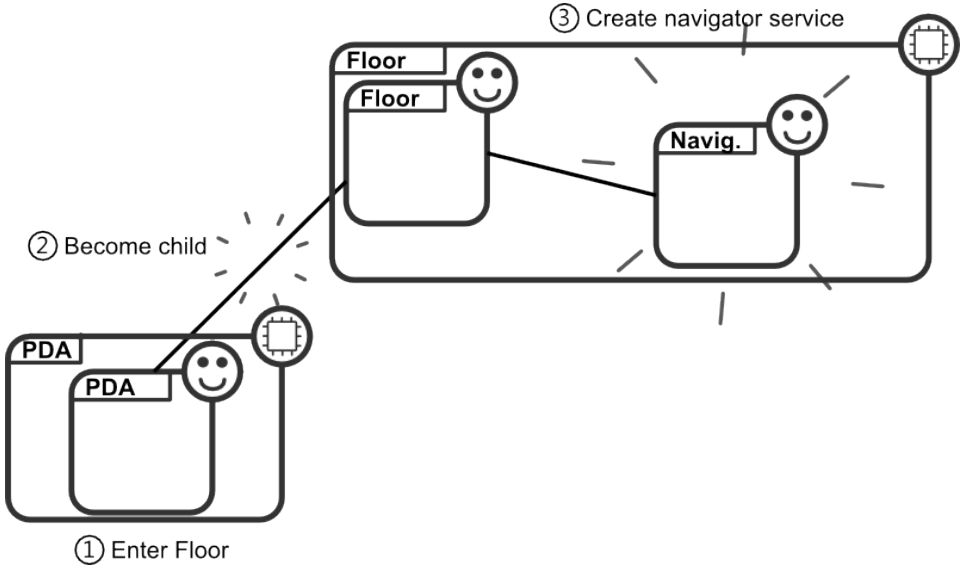




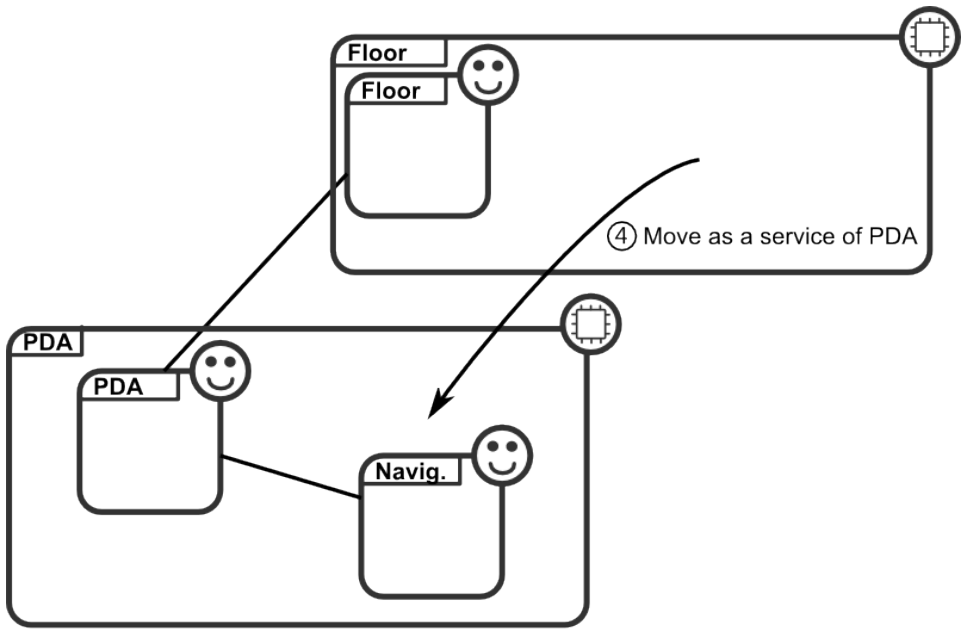




Example:


③ Create navigator service
Floor
Floor
Navig.
② Become child
PDA
PDA
① Enter Floor

Example:



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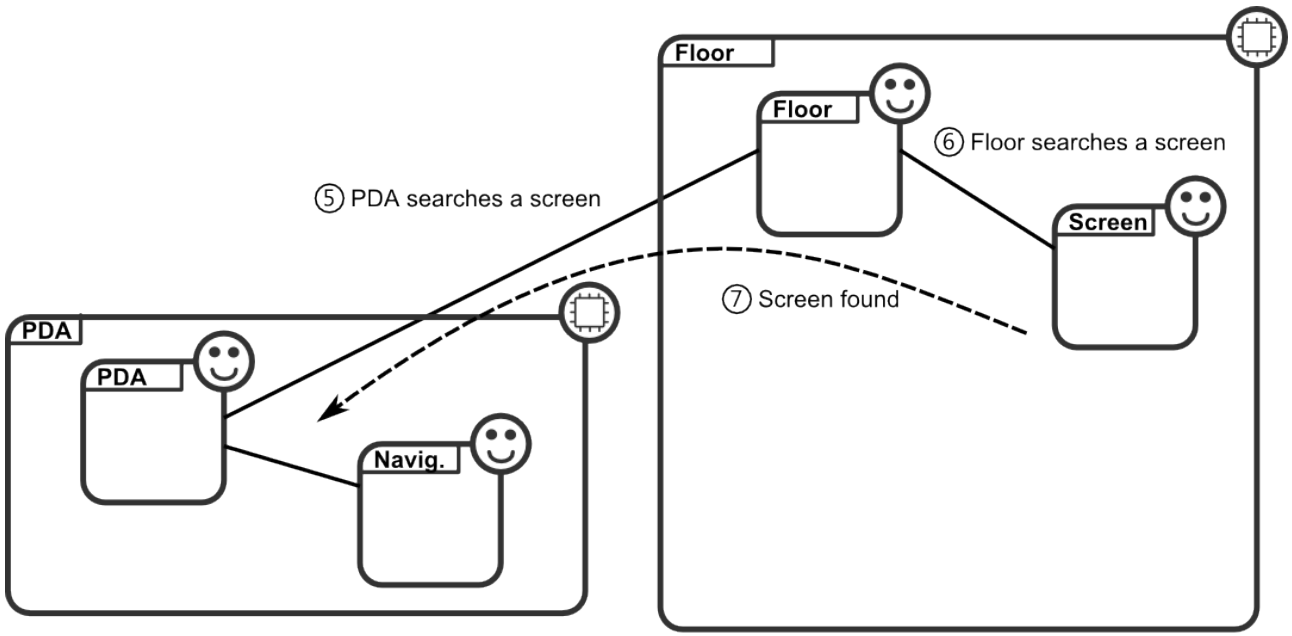
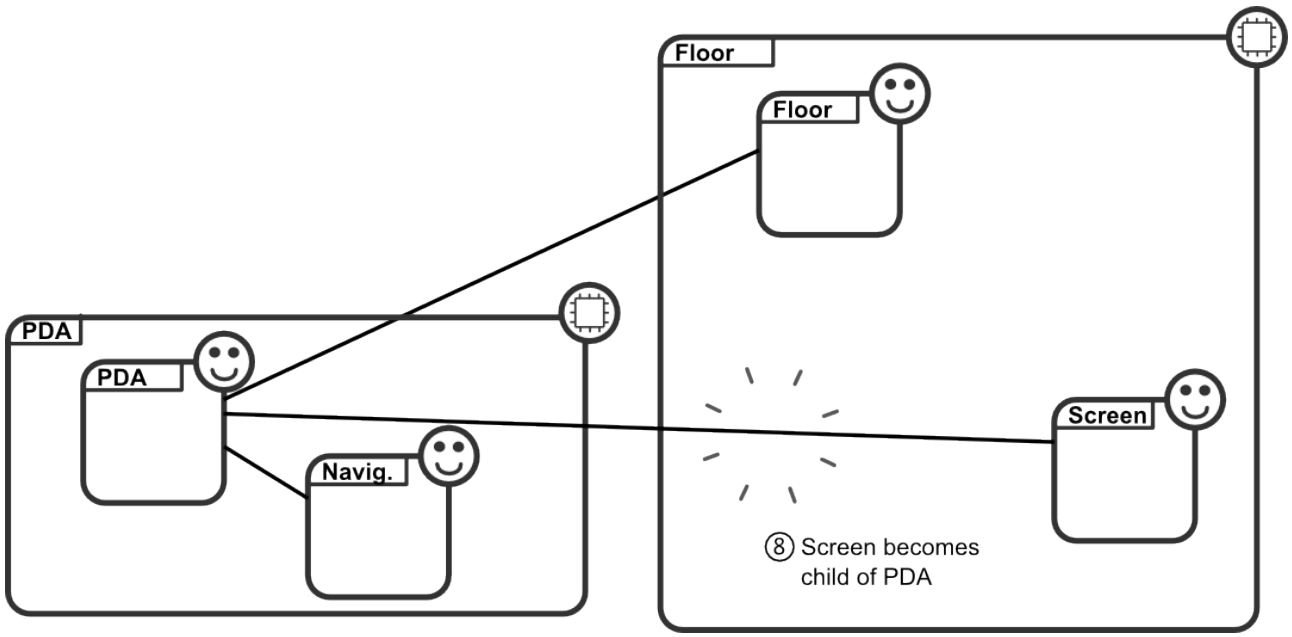

Floor
Floor
⑥ Floor searches a screen
⑤ PDA searches a screen
Screen
⑦ Screen found
PDA
PDA
Navig.

Example:


Floor
Floor
PDA
PDA
Navig.
Screen
⑧ Screen becomes
child of PDA

Conclusion

- Software agents are an adequate method of implementing Ambient Intelligence applications.
- We can create an agent-based model which embeds context-awareness.
- We will work with such a model at the hands-on session.

Thank You!

Any Questions?

Ducatel, K., Bogdanowicz, M., Scapolo, F., Leijten, J., and Burgelman, J. (2001).
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Weiser, M. (1993).
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Thank You!

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