Agent-Based Information Sharing for Ambient Intelligence

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- Context
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overview

Ambient Intelligence – or AmI – is an ubiquitous electronic environment that supports people in their daily tasks, in a proactive, but "invisible" and non-intrusive manner.[Ramos et al., 2008, Weiser, 1993]

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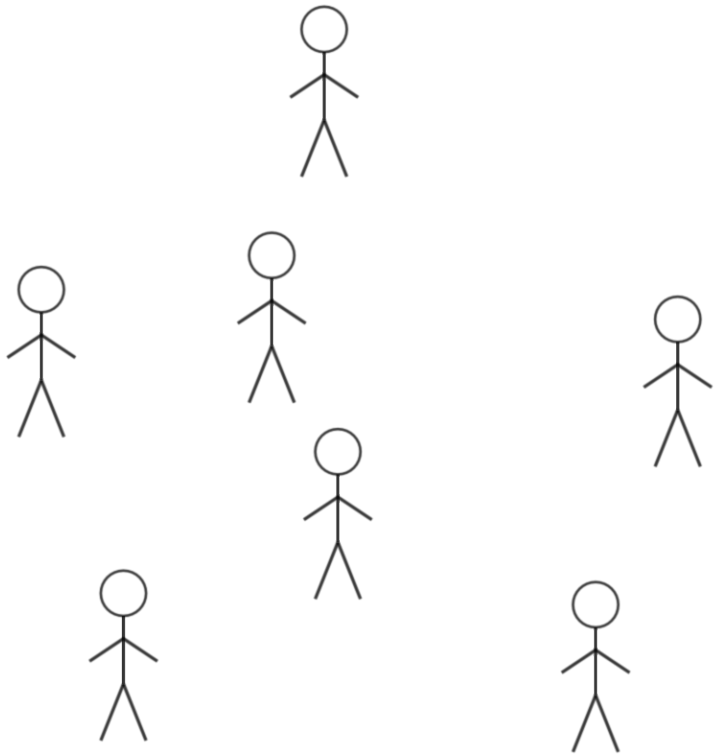

People

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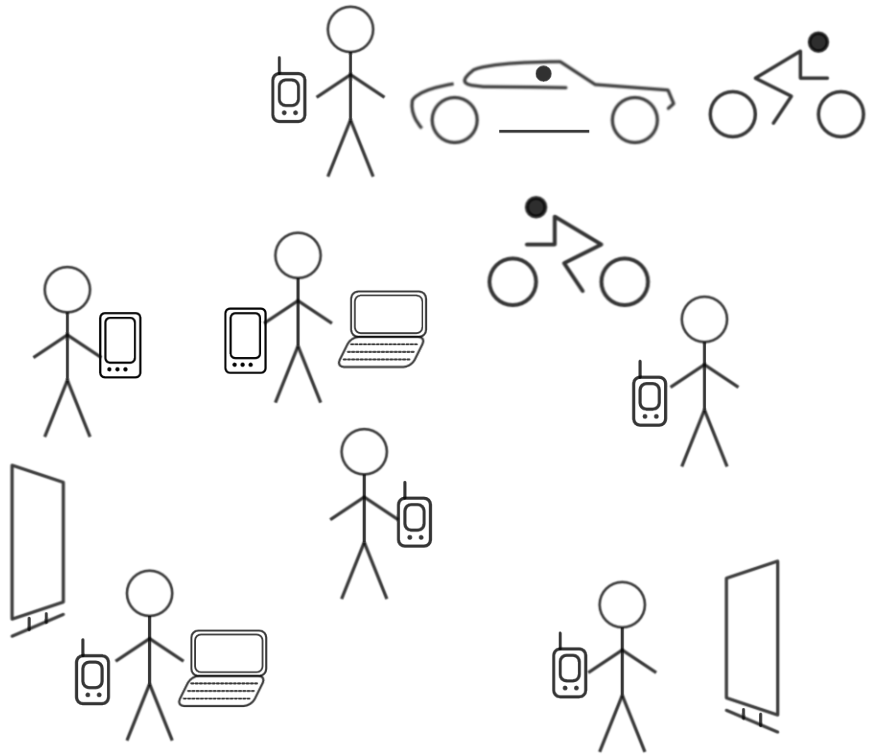

People · Devices

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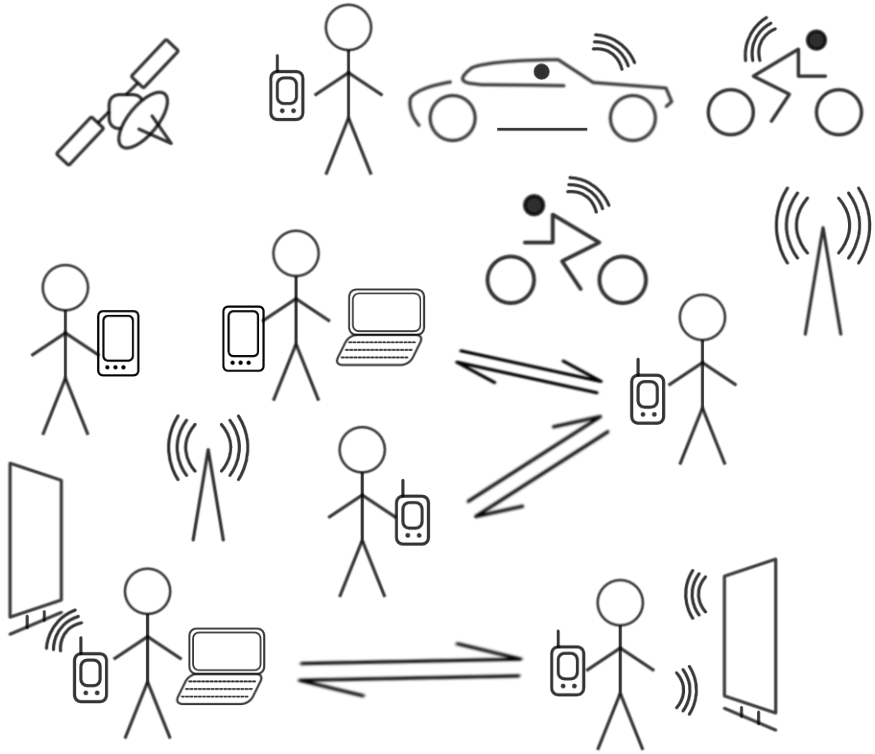

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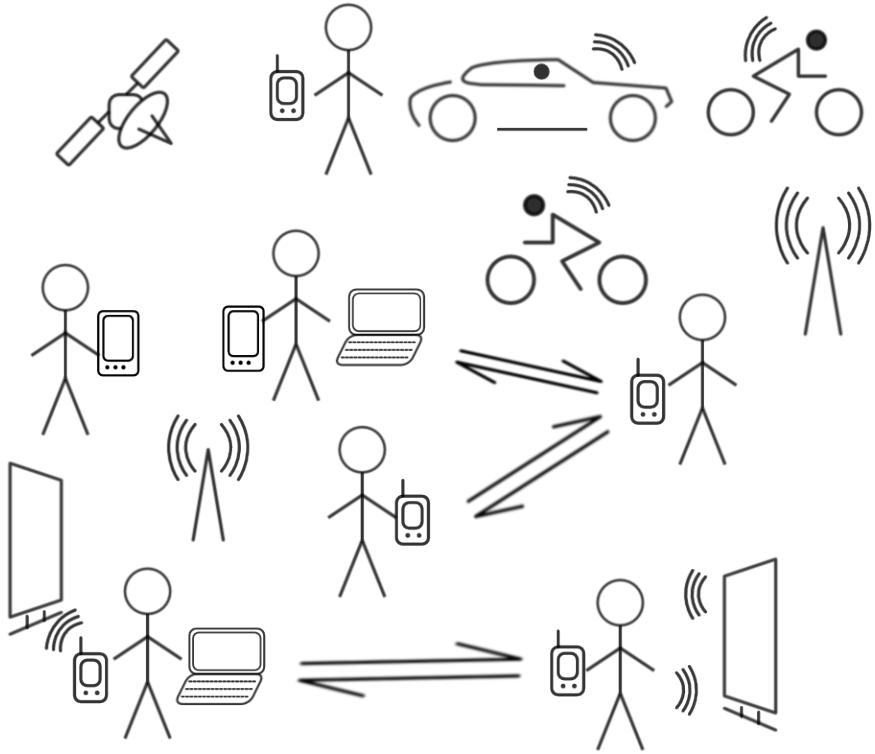
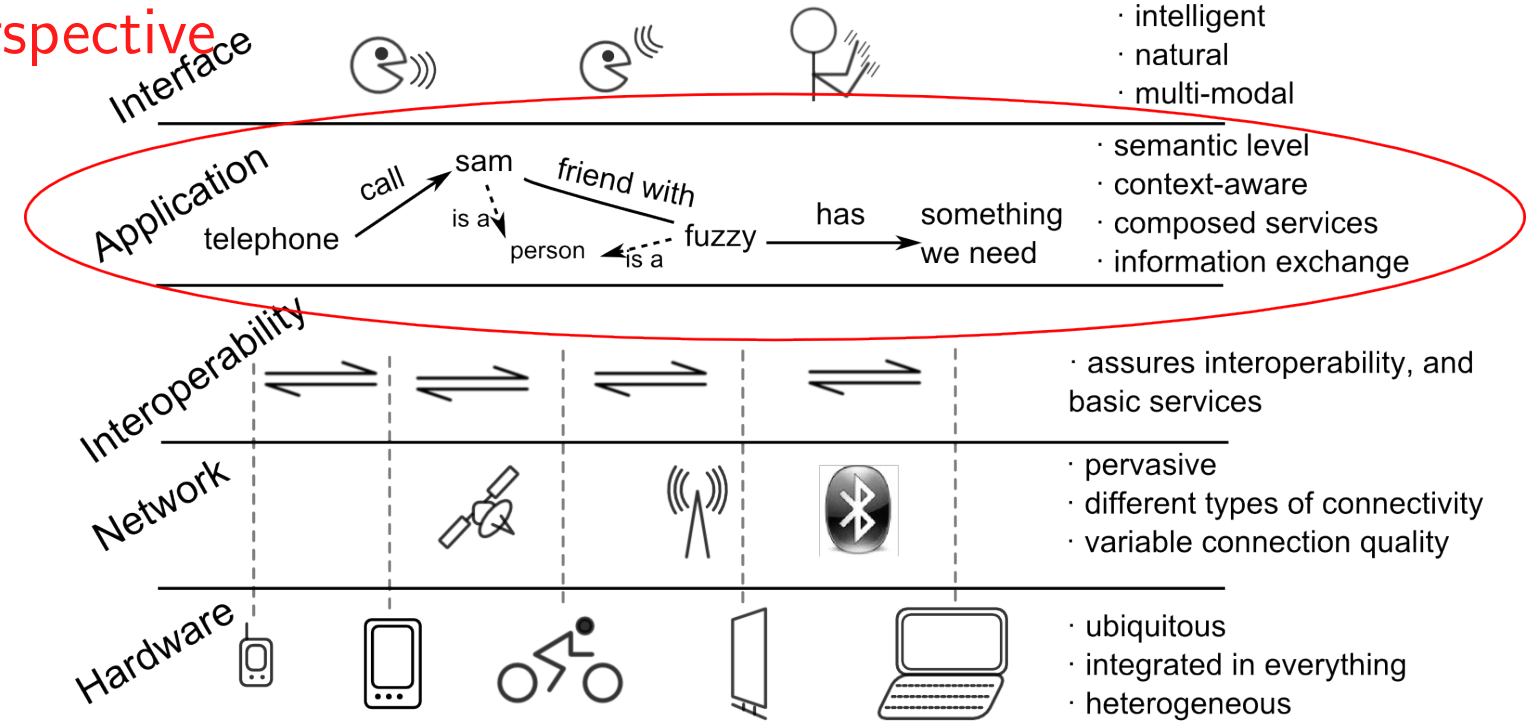
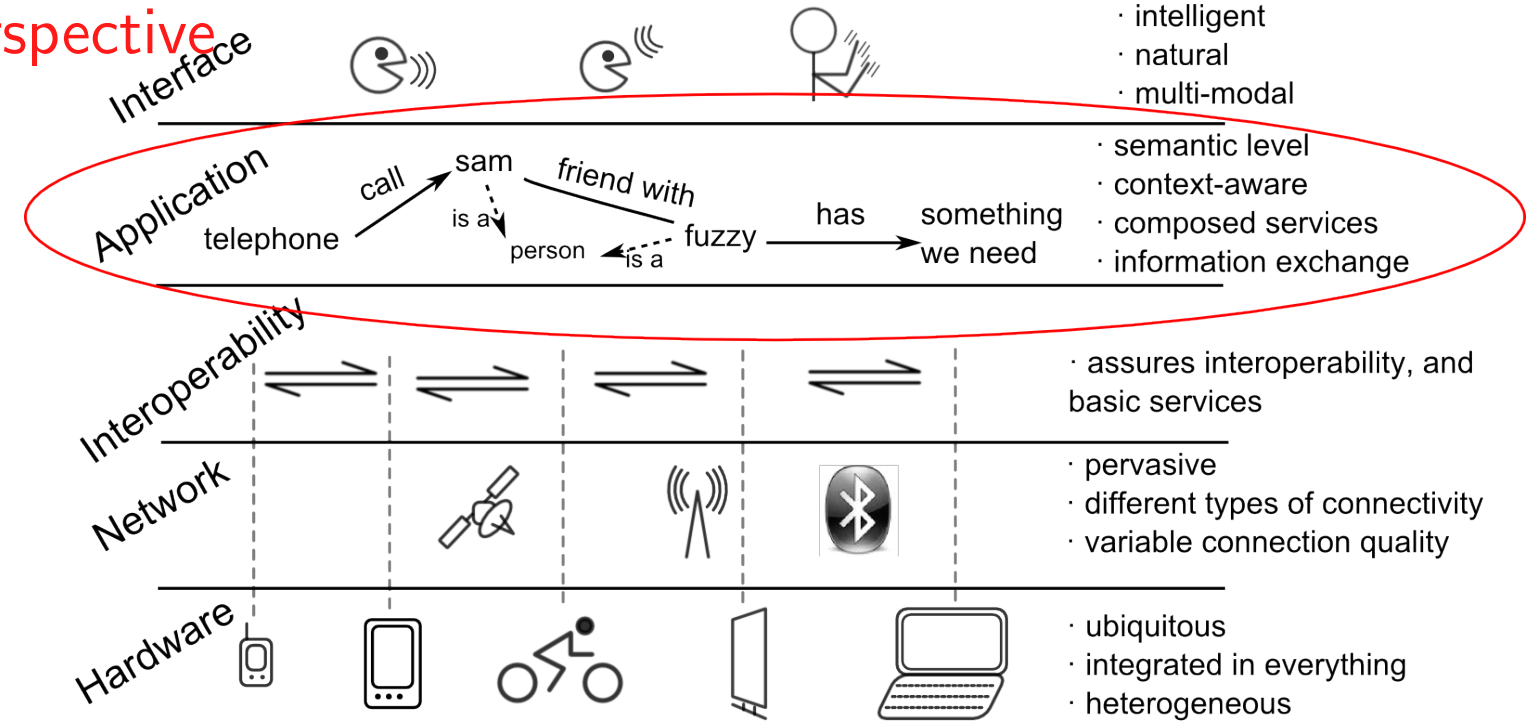


People · Devices · Communication

Problem: How to get the relevant information to the interested users?



(layers based on [Seghrouchni, 2008])



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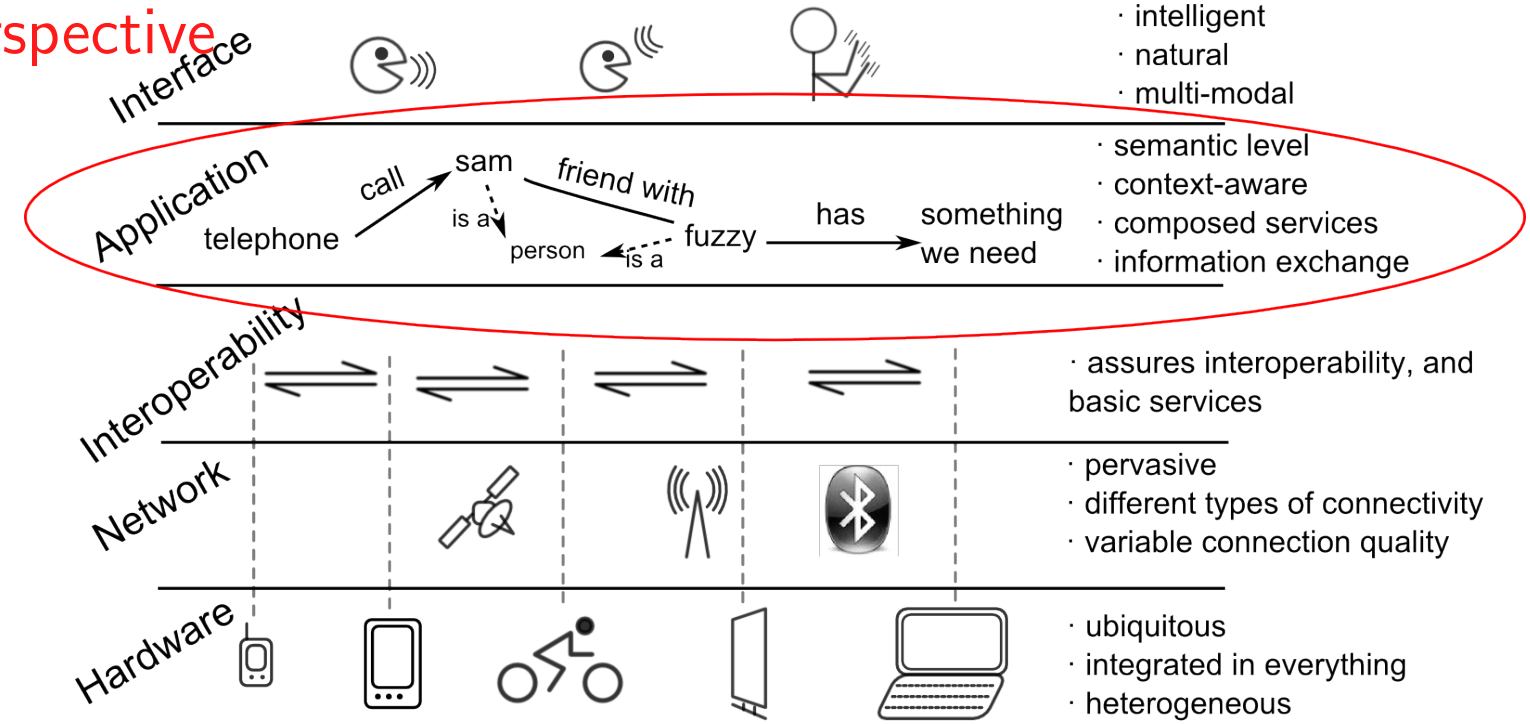
Hardware



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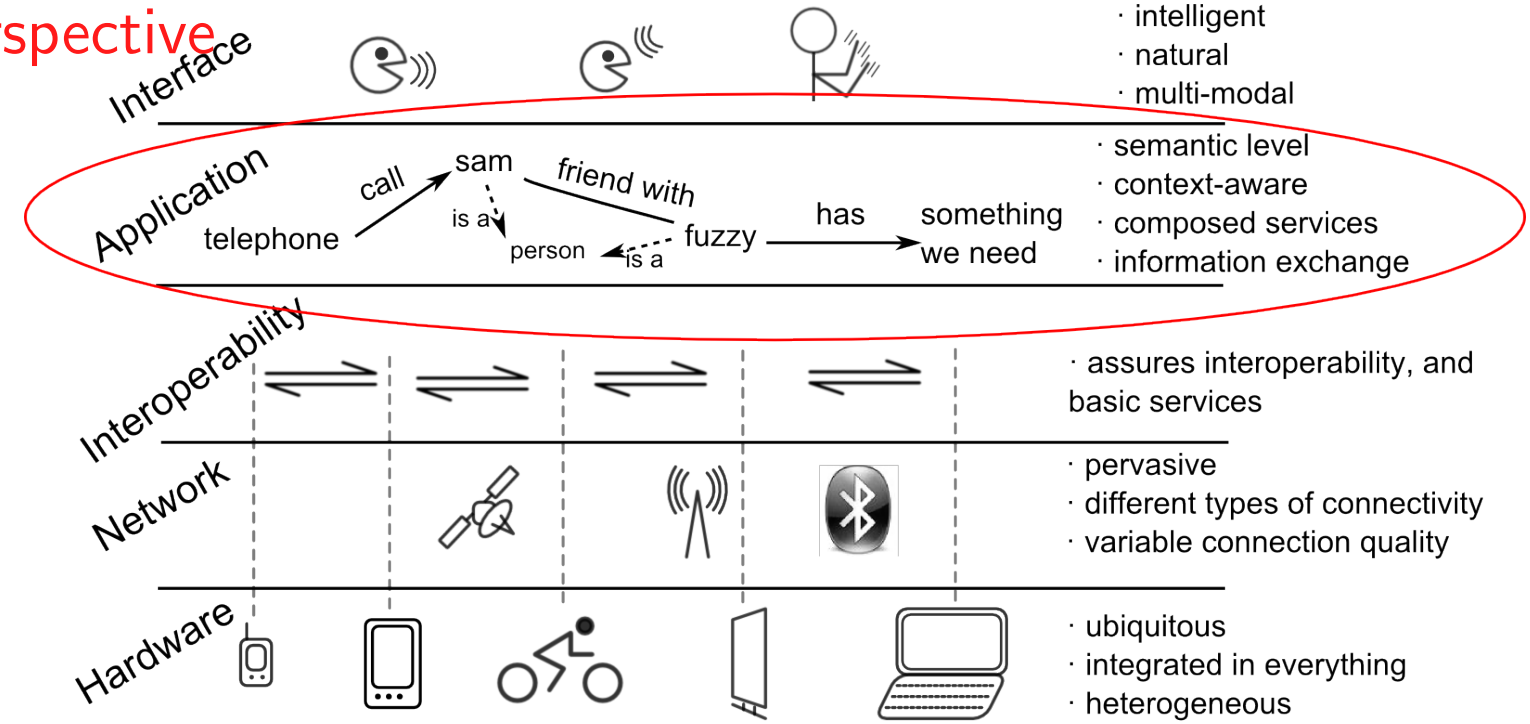
Hardware · Network



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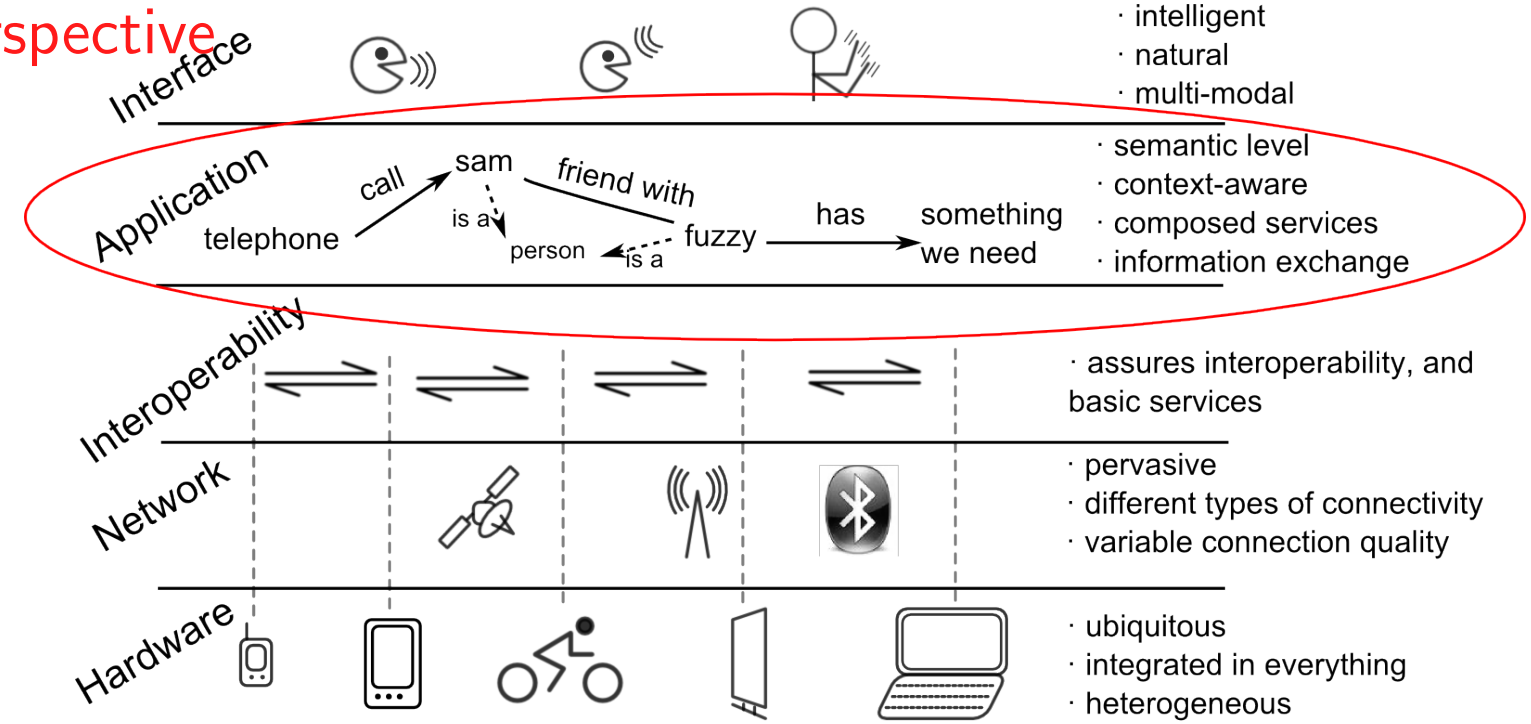
Hardware · Network · Interoperability



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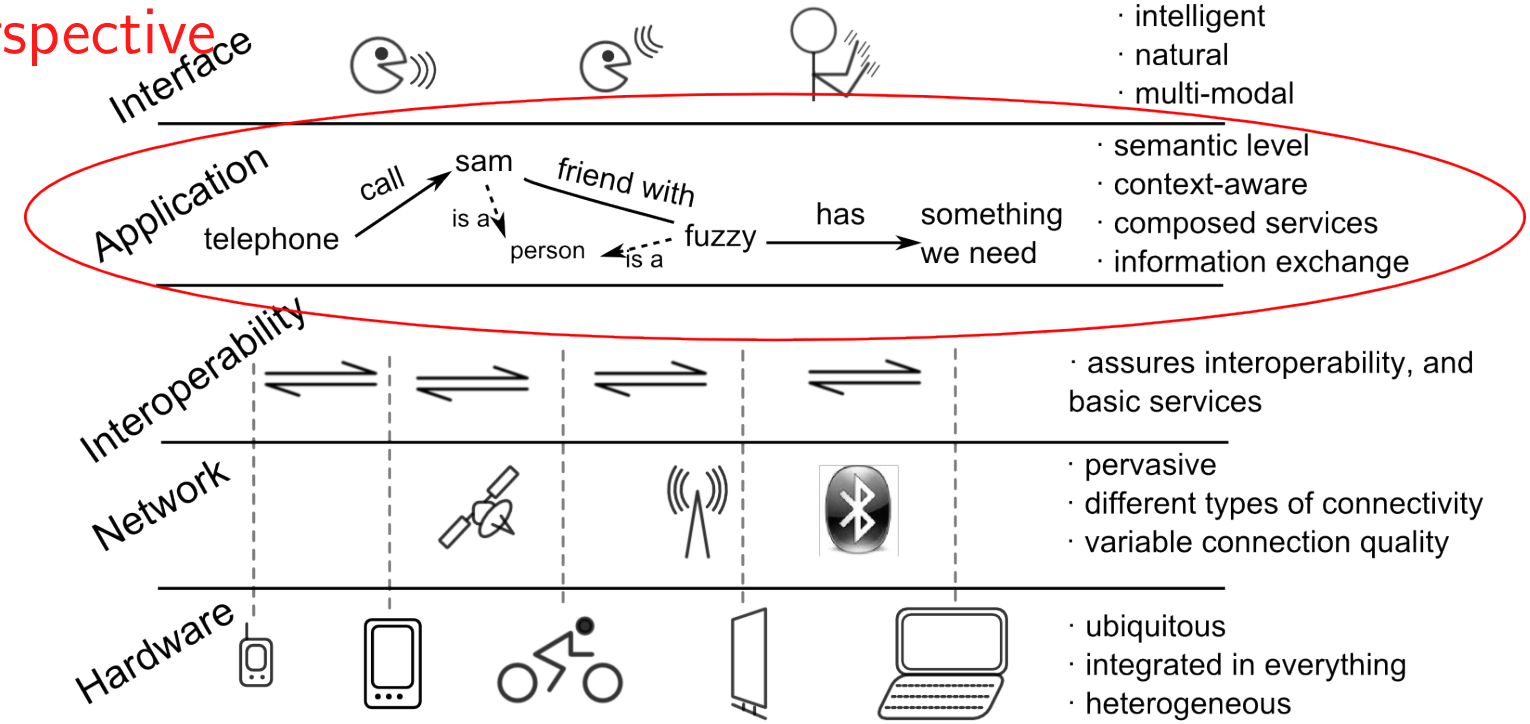
Hardware · Network · Interoperability · Application



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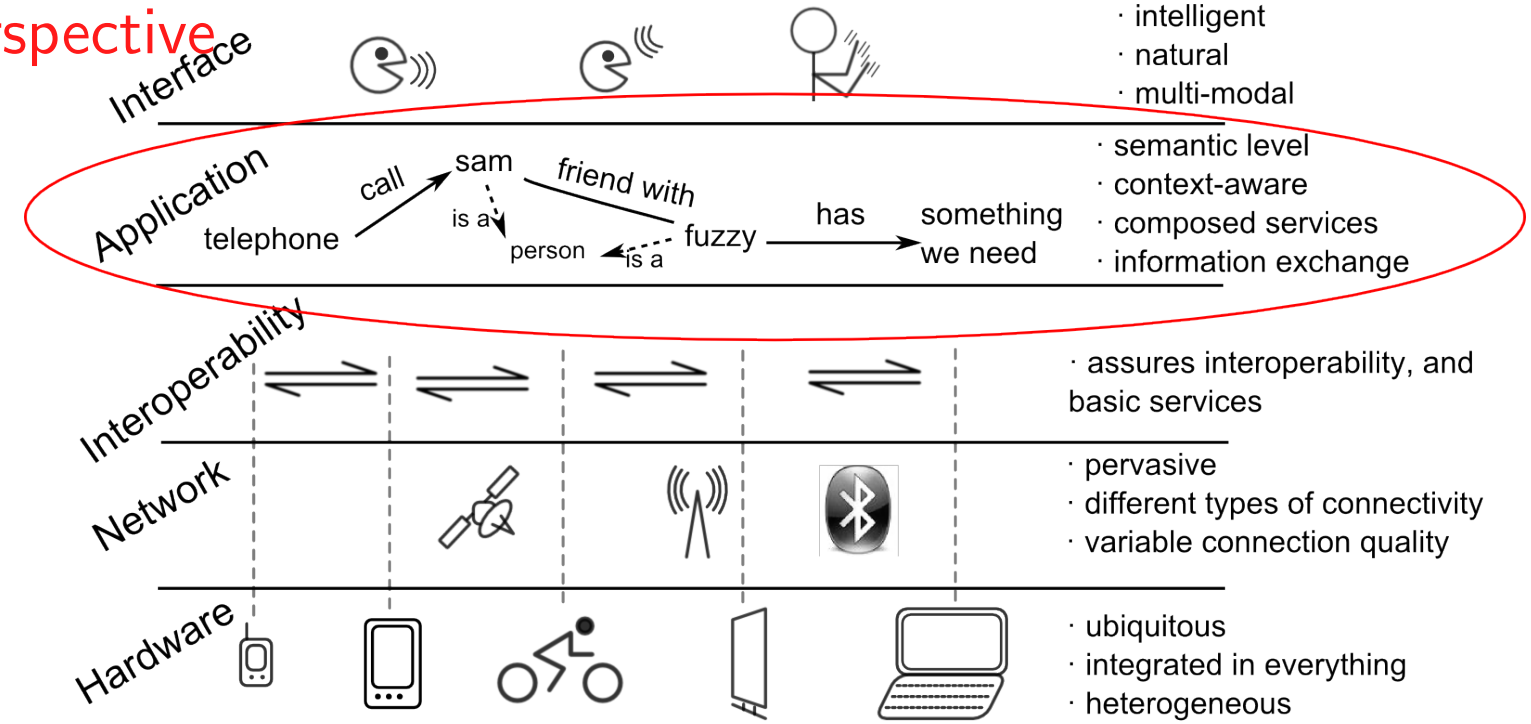
Hardware · Network · Interoperability · Application · Interface



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Hardware · Network · Interoperability · Application · Interface

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· Agents satisfy the needs of AmI in terms of:

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· Agents can provide the intelligent component of Ambient Intelligence – they are distributed, they act locally, etc.

[Ramos et al., 2008]

- orientation towards personal assistance; centralized knowledge databases, ontologies and services:
  - iDorm [Hagras et al., 2004] – learning user behaviour
  - MyCampus [Sadeh et al., 2005] – privacy management
  - ASK-IT [Spanoudakis and Moraitis, 2006] – assistance of elderly
- orientation towards distribution, information and connection management:
  - SpatialAgent [Satoh, 2004] – mobile agents
  - LAICA project [Cabri et al., 2005] – distributed data exchange and processing
  - AmbieAgents [Lech and Wienhofen, 2005] – context management agents
  - CAMPUS framework [Seghrouchni et al., 2008] – scalable, layered architecture for context sensing and ambient services
  - SodaPop model [Hellenschmidt, 2005] – device interoperation and fully distributed control

Our goal: build a multi-agent system for the context-aware sharing of information.

· how can we obtain context-aware behaviour with simple agents acting locally?

· features:

- local behaviour
- simple behaviour
- small knowledge base
- use feedback and self-organization techniques
- use simple and generic measures for context-awareness

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These measures are aggregated into a measure of relevance.

· create a certain distribution of interest – by inserting facts with low persistence and pressure, and different specialties.

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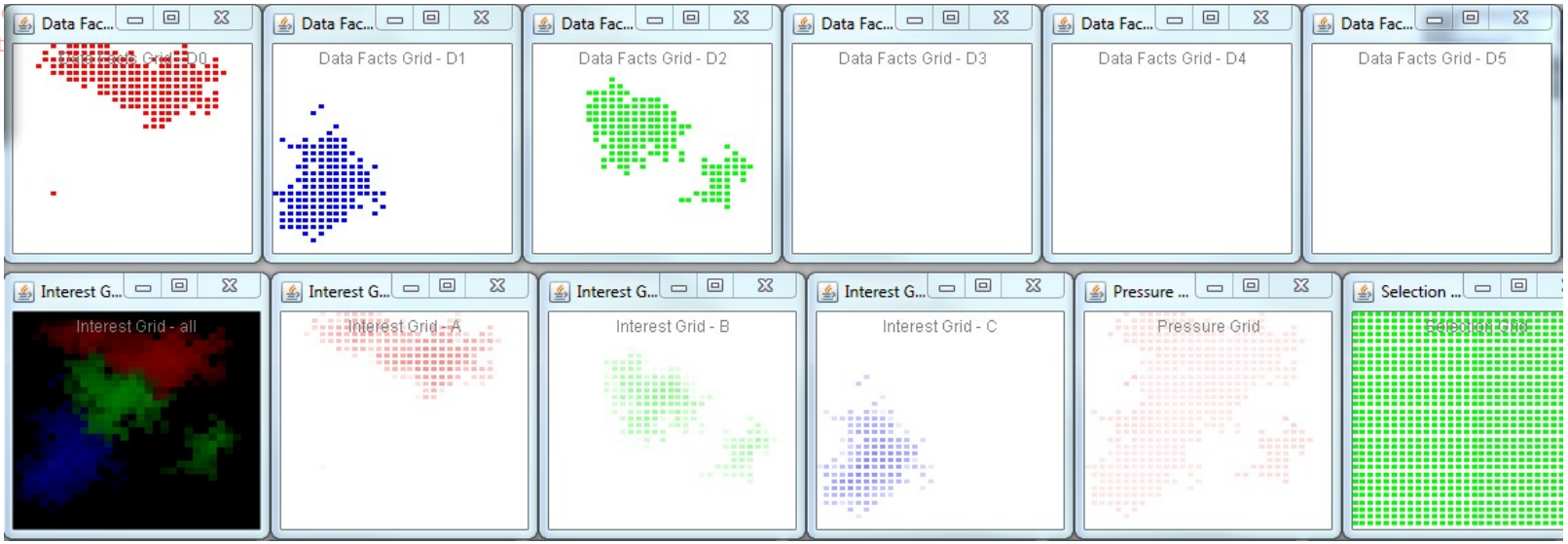
Expect: control of the resulting distributions depending on their respective measures of context-awareness.

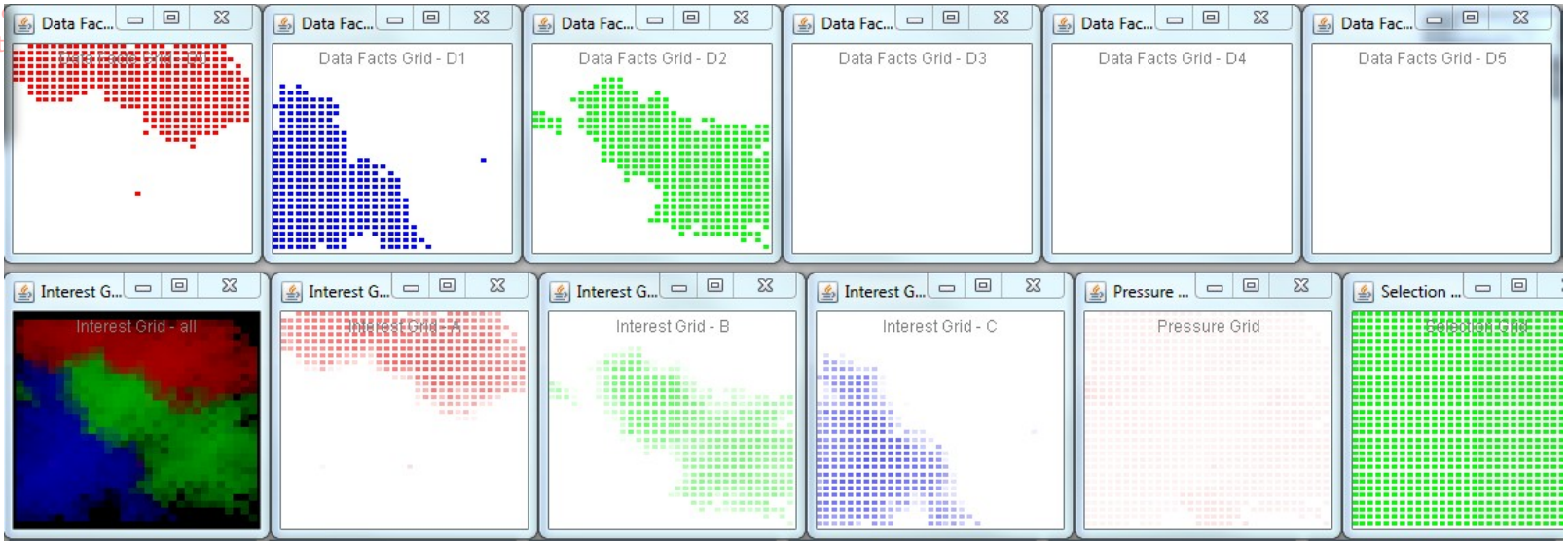
fact distribution in the agent grid



agents:

specialty specialty for each domain pressure

fact distribution in the agent grid



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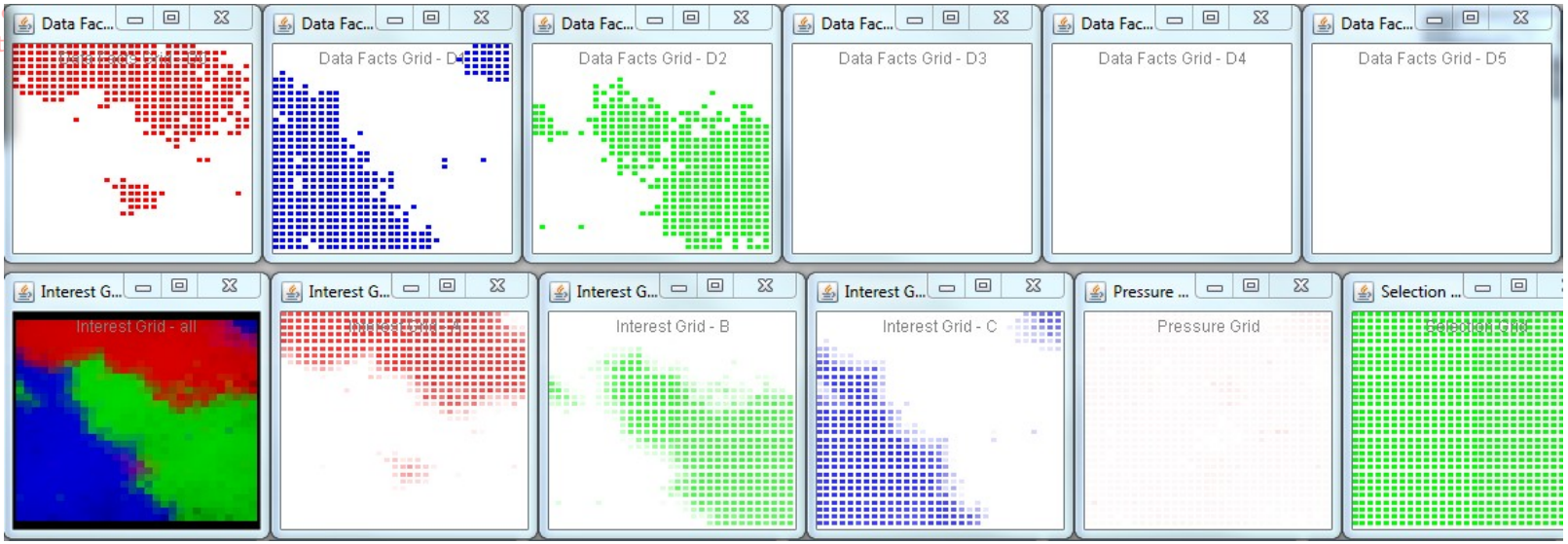

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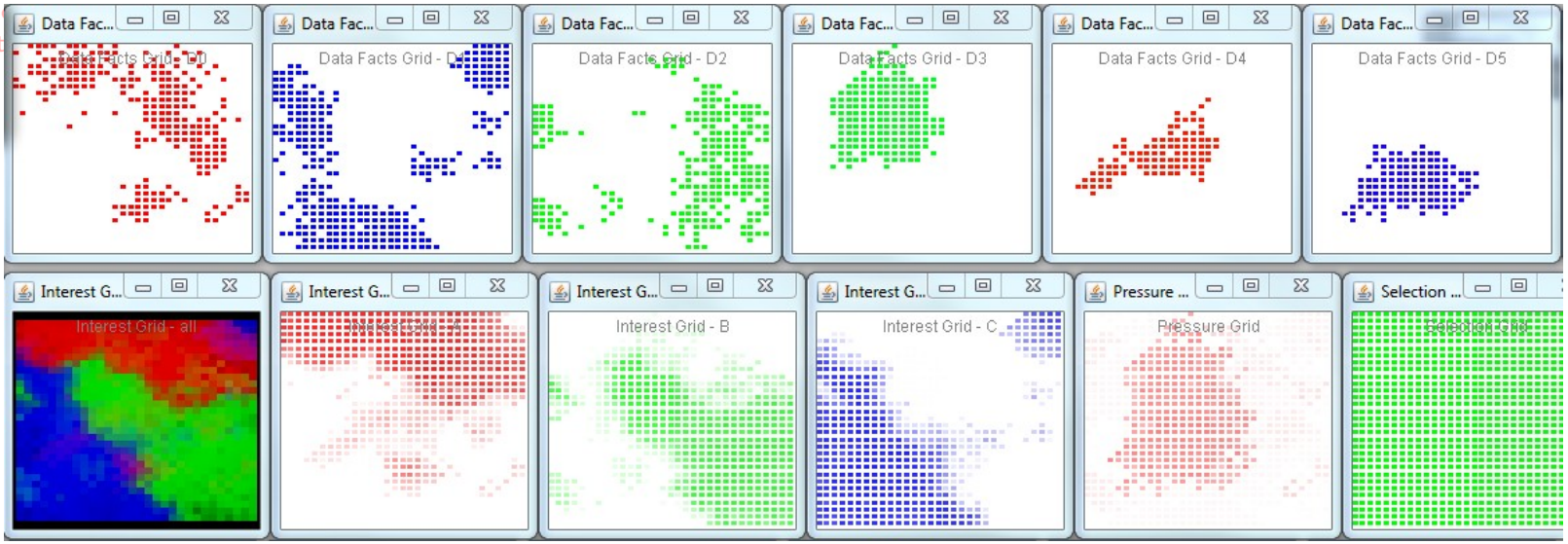

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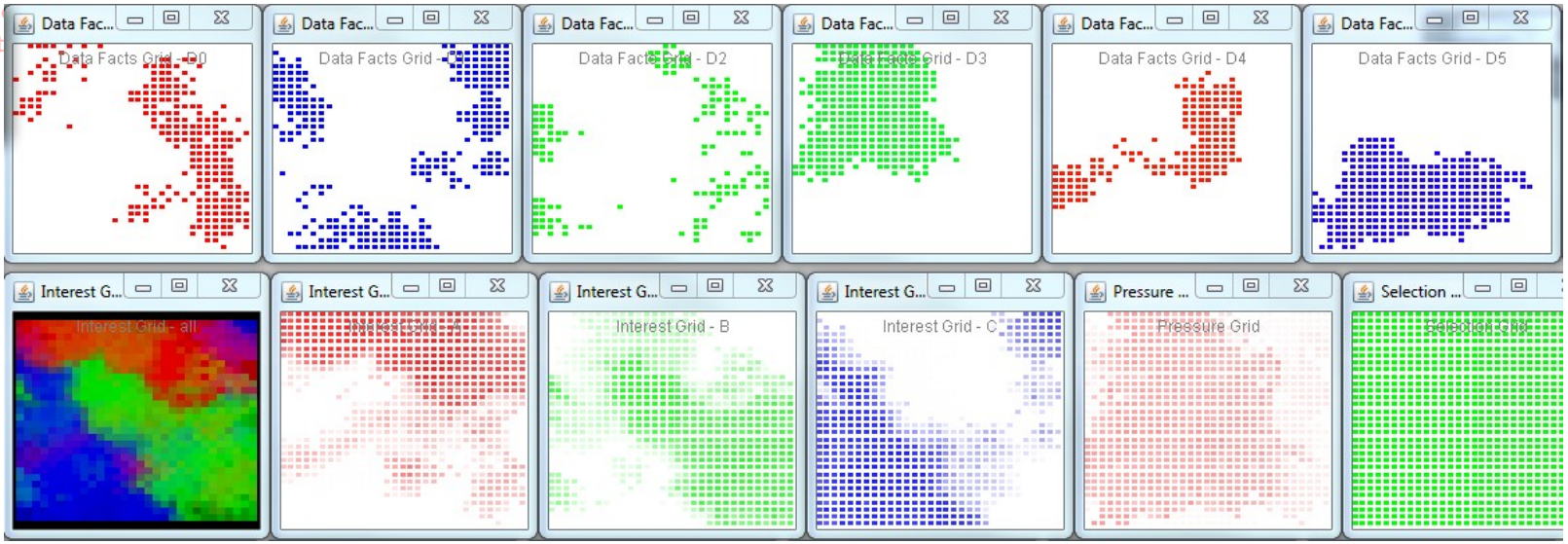

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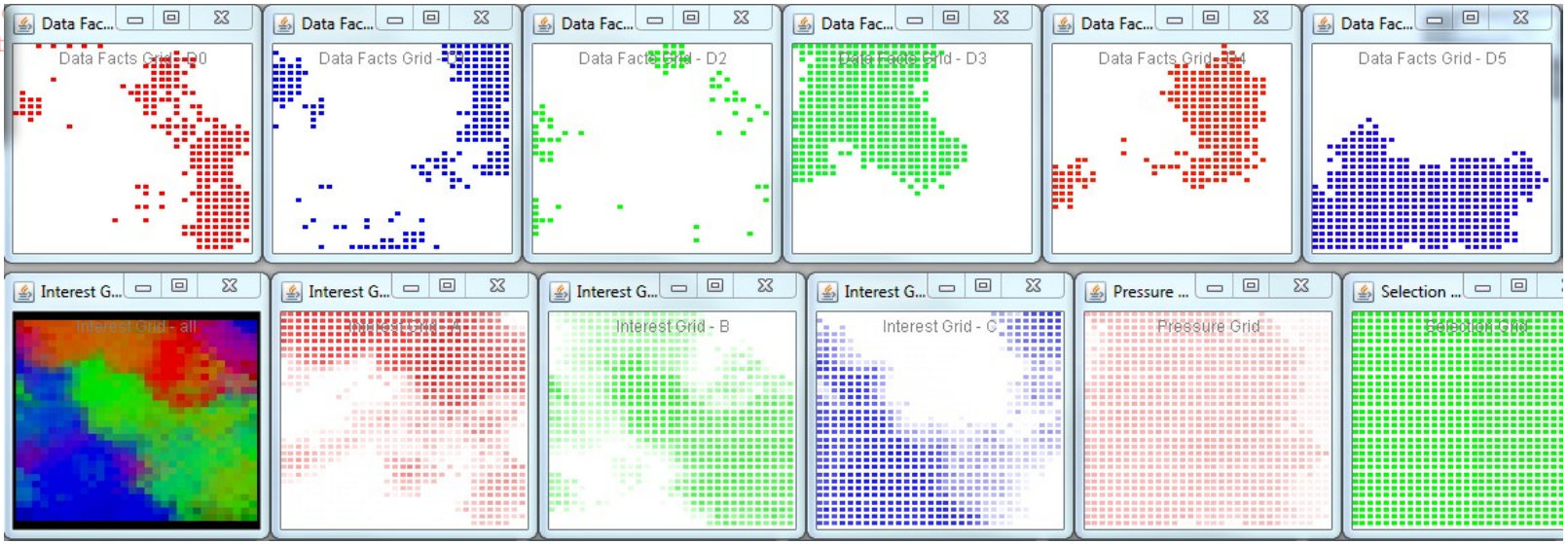

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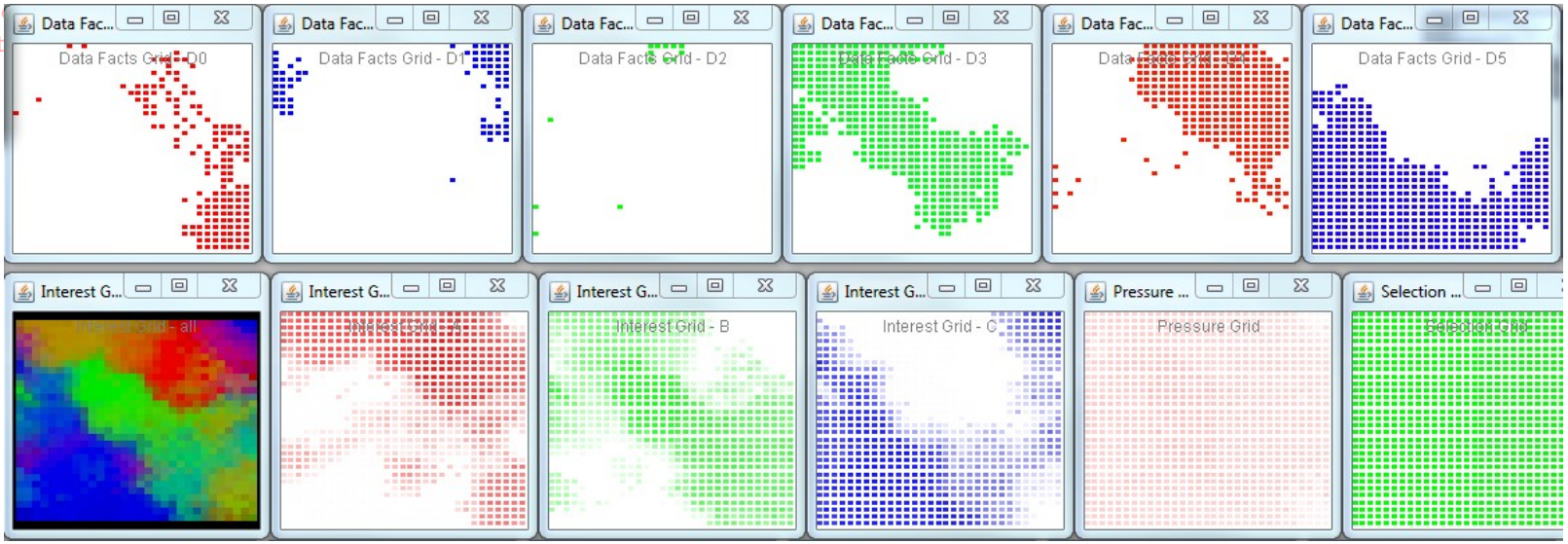

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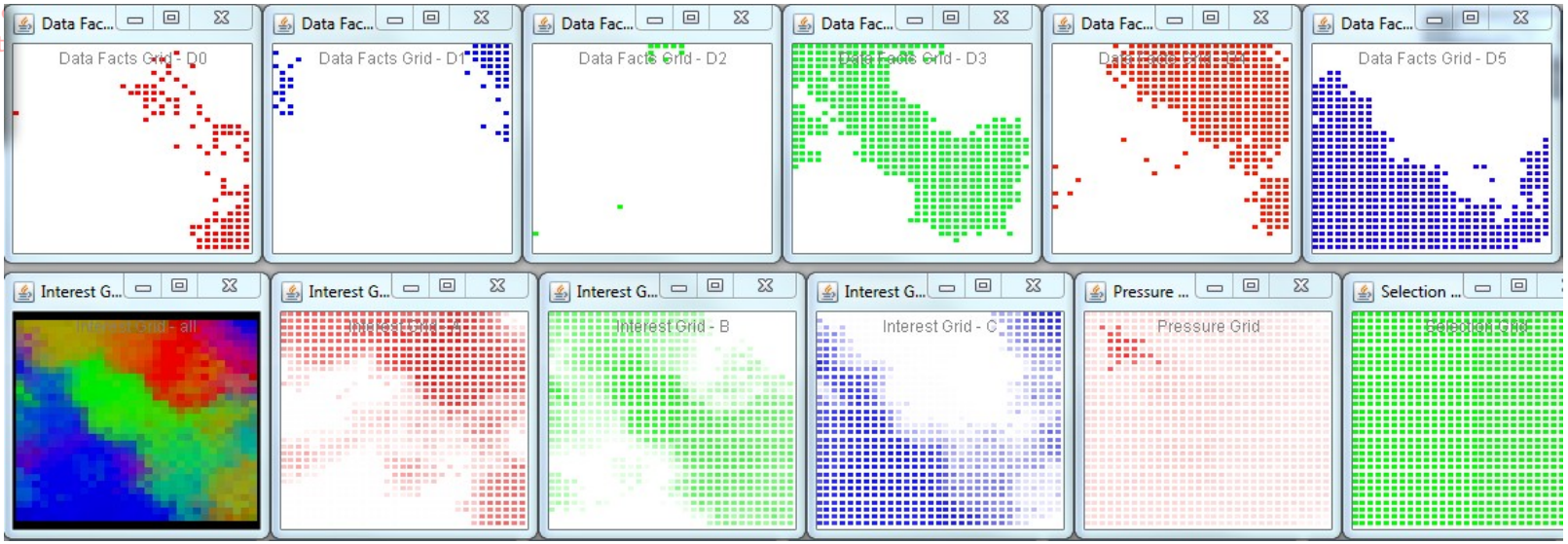

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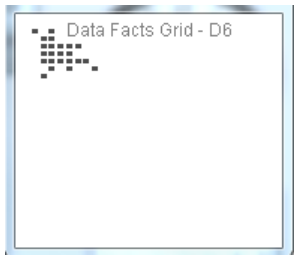

distribution of high-pressure fact

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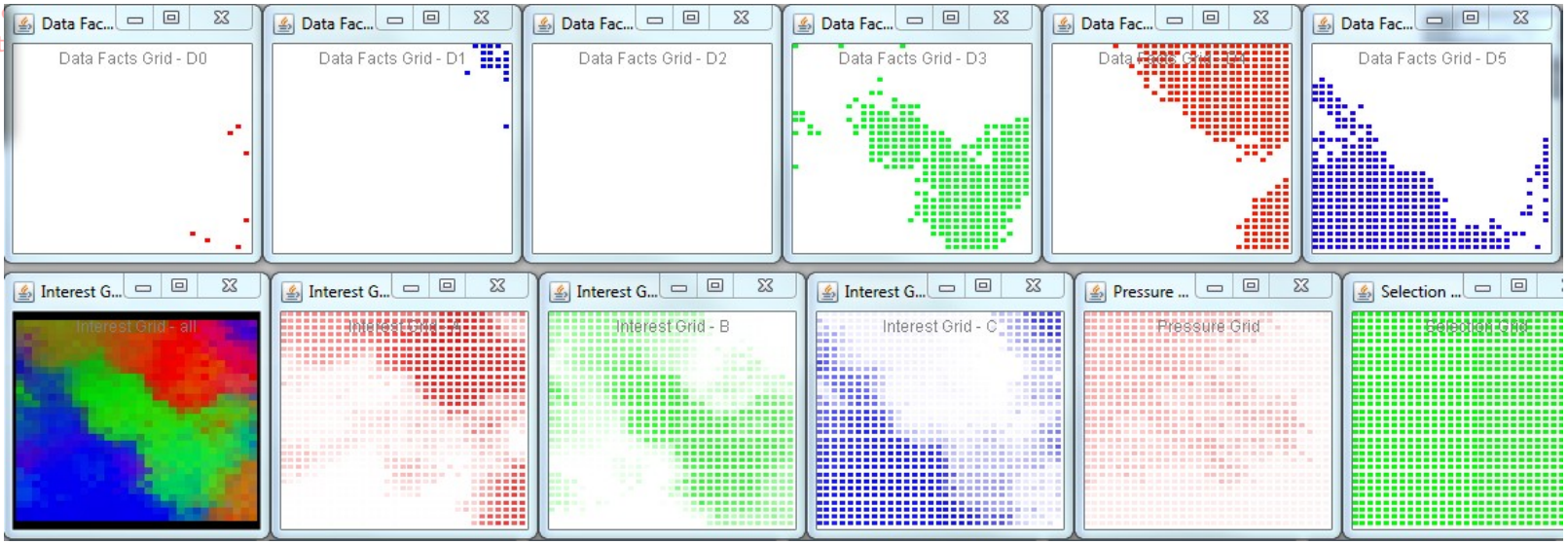

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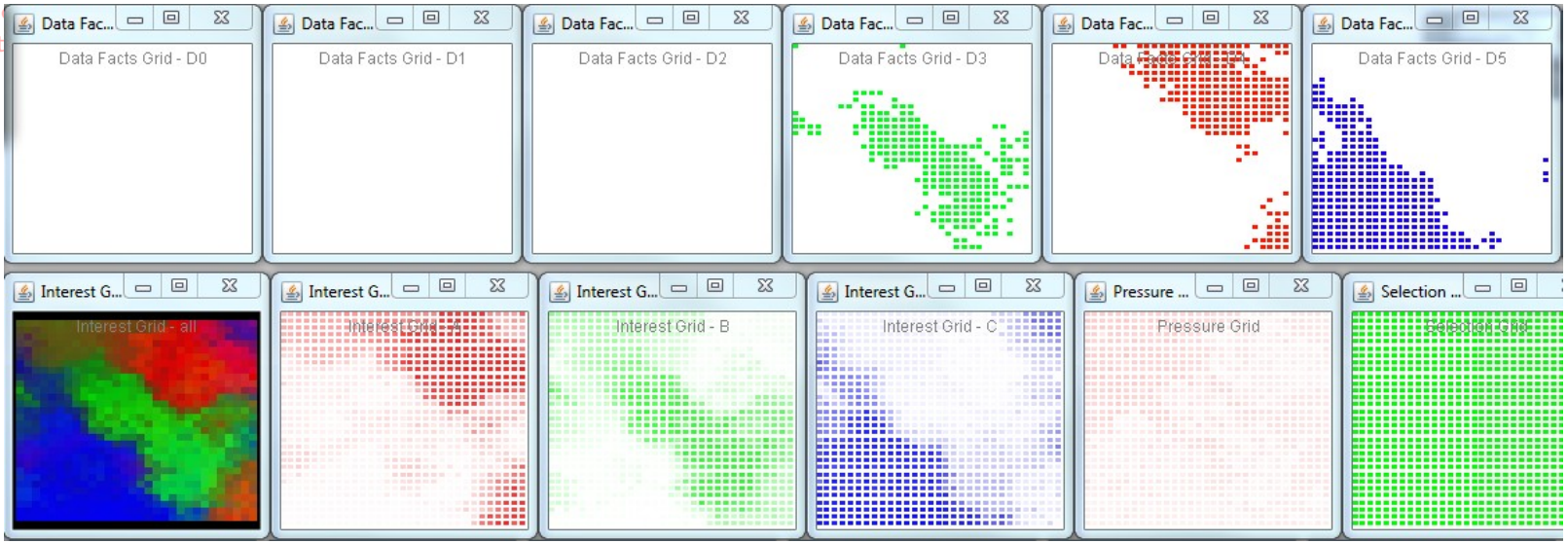

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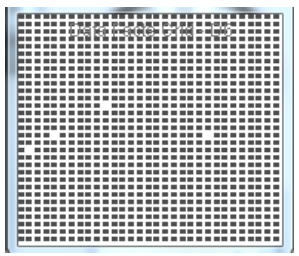

distribution of high-pressure fact

Why obtaining these results is not straightforward:

- agents only know about 20 facts, only few of them being about their neighbours.
- agents are both pro-active and reactive, so feedback may generate overloads in their message inbox.
- knowledge bases are very limited in size, so it is essential to have a good algorithm to sort knowledge and forget irrelevant knowledge.

- a multi-agent system was built, with agents that have local knowledge and interact locally.
- simple measures for context-awareness were developed, that allow the computation of the relevance of facts, according to their context, and also according to the agent's context.
- the system was tested and relevant results were obtained.

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Thank you!

Any Questions?