Enabling context-aware applications

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Outline

- **Context – brief introduction**

- Akogrimo* IST Project

- Context handling in Akogrimo

- Conclusions and outlook

* Akogrimo is a project funded by the EC under the FP6-IST programme
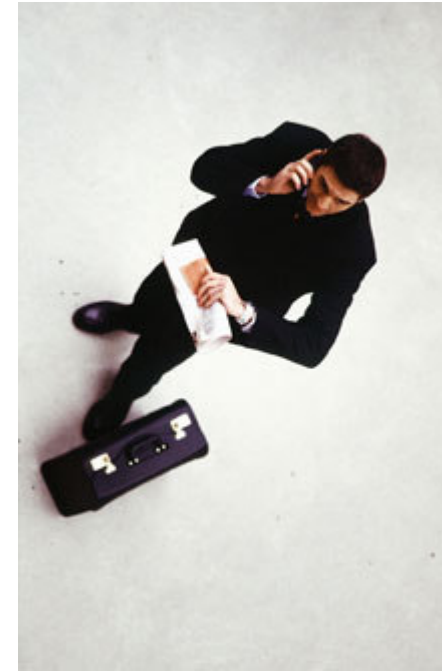
What is your context?
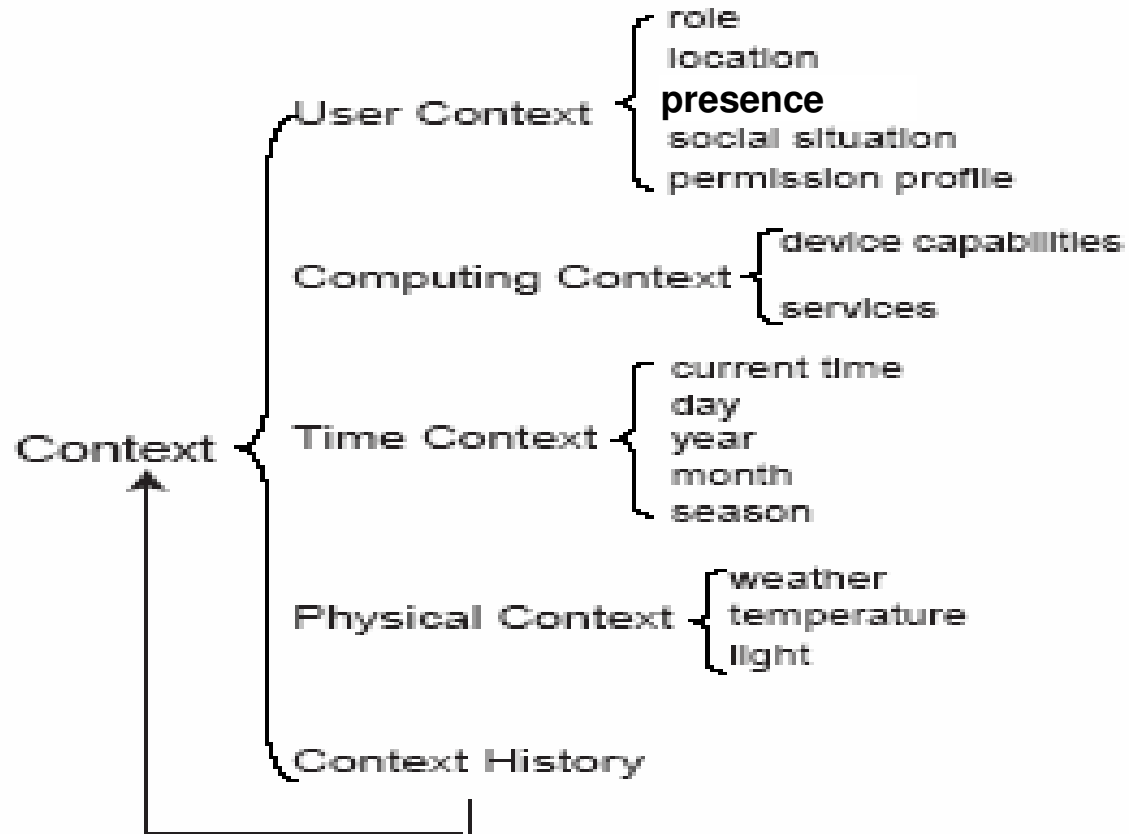
schedule

environment

availability

location

mood

Context awareness is vital to pervasive applications
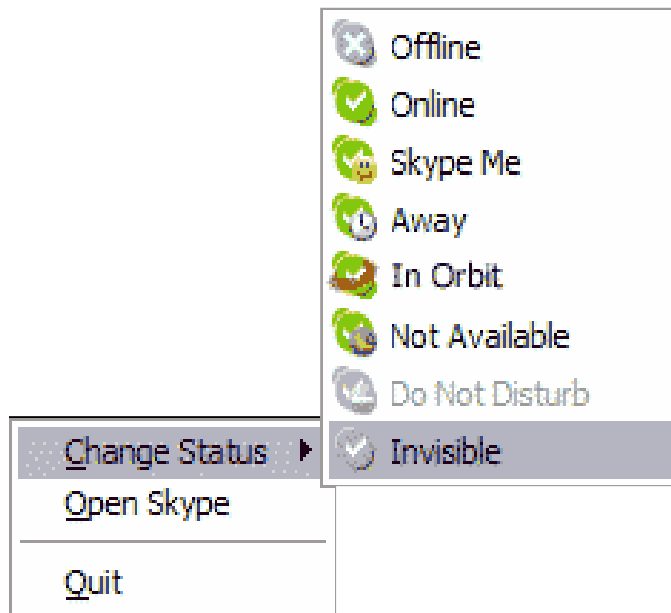
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Context – general model
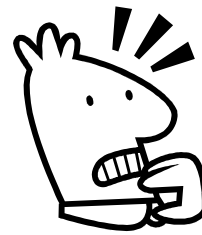(Mostéfaoui 2003)

User Context - Presence

- Availability

- Mood

User context - Location

- Coordinates

  - Latitude/longitude/altitude
    44 50' N,   0 34' W

  - Universal Transverse Mercator
    Zone 30T, 4 967 316 m N, 692 339 m E

- Geographical

  - Country: France

  - Area: Aquitaine

  - City: Bordeaux

- Descriptive

  - In the slopes

  - On a sunny beach
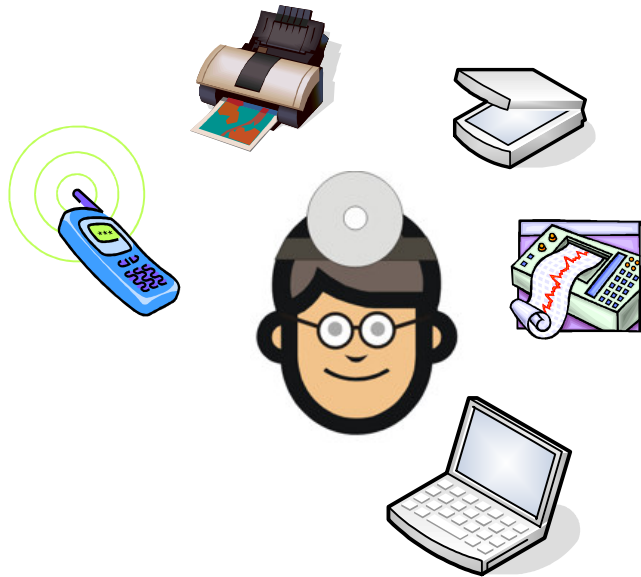
  - Conference area

- Building plan

  - Building A

  - Fifth floor

  - Room A 506

Computational context

- Office

- Operating room

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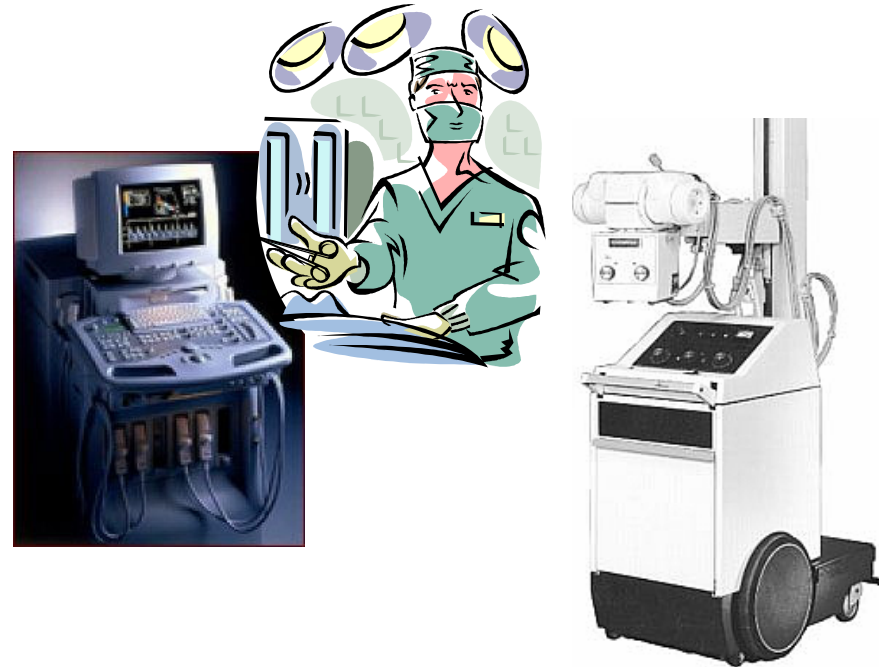
Physical context

- Weather, temperature, humidity, light conditions, …

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Akogrimo IST Project

- <u>A</u>ccess to <u>Kno</u>wledge through the <u>Gri</u>d in a <u>mo</u>bile World

- Funded by the EC under FP6-IST.

- Duration: July 2004 – September 2007

- www.mobilegrids.org

Summary

- Grid services, pervasively available, are meeting the needs of fixed, nomadic and mobile users

Key Scenarios

- <u>ehealth</u>

- eLearning

- Crisis management

Akogrimo partners

Telecom Operators & Research

- Telefónica Investigación y Desarrollo, Spain
- Instituto de Telecomunicações , Portugal
- Rechenzentrum der Universität Stuttgart RUS, Germany
- Telenor, Norway
- Universidad Politécnica de Madrid, Spain
- Universität Zürich, Switzerland

Tool Provider / Business Models / Applications

- University of Hohenheim, Germany
- BOC Asset Management GmbH, Austria

GRID Infrastructure & Research

- Höchstleistungsrechenzentrum der Universität Stuttgart HLRS, Germany
- Institute of Communication and Computer Systems, Greece
- Council for the Central Laboratory of the Research Councils, UK
- Centro di Ricerca in Matematica Pura ed Applicata, Italy

Grid & IT Industry

- DATAMAT S.p.A. , Italy
- ATOS ORIGIN, Spain

Akogrimo in a Nutshell

Classic Grid:

- Complex problem solving (weather forecast, car crash simulations, flow calculations)

Key Akogrimo characteristics (with examples from eHealth)

- Complex problem solving in a mobile setting, focus on end users

- Resources

  - Information (patient journal, medication plan)
  - Advanced services (analysis of medical data, translator service, …)
  - Local services (ambulance, hospital, medical equipment, communication tools)
  - Human resources (doctor, nurse, rescue personnel, …)

- Grid has mechanisms for

  - manage complex problem solving (Workflow)
  - handling resources (Virtual organization)

More info

- www.mobilegrids.org

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Context handling – Design choices
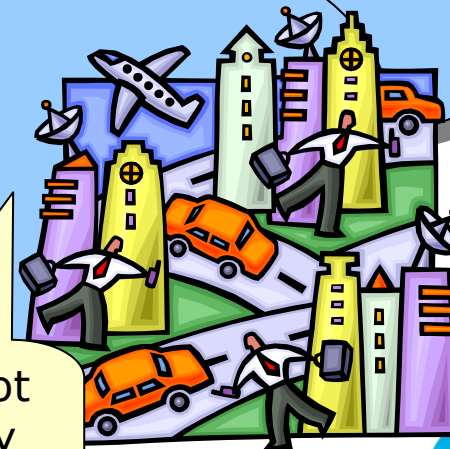
Depends on the application domain

Context is open-ended; No unique model

Akogrimo provides a context infrastructure for managing fundamental user context based on scenarios

Context cannot be completely specified for all purposes

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Context handling – Design choices …

- User-centric context model
- Context handling separated from service logic
  - Should not contain service logic (i.e. no inference)
  - Must support several applications
- Flexible w.r.t. adding context sources

Context Manager

- Purpose: Proof of concept / demo
- Acts as middleware for context-aware applications
- Basic operations
  - Handle subscriptions
  - Gather and distribute context
  - Refine raw context

Application

Application

Distribute context

Subscribe

Context Manager

Gather context

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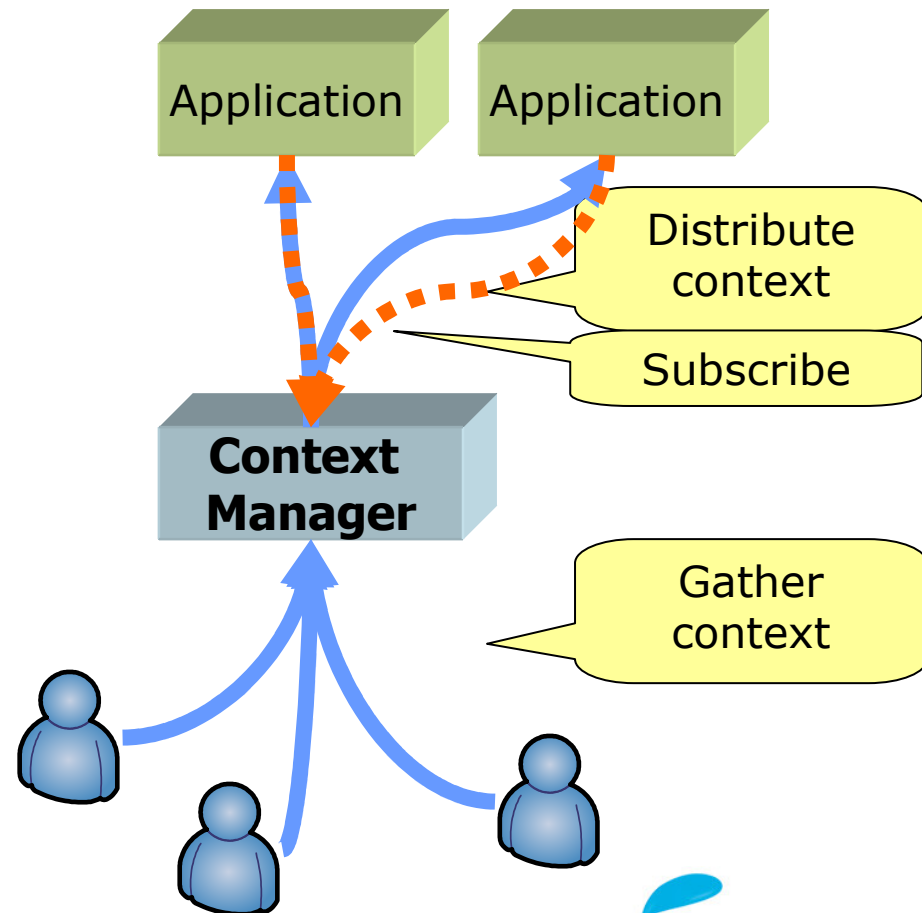
Context Manager Architecture

Context Consumers

Context Consumer 1 | Context Consumer 2 | ----- | Context Consumer n

Context-aware applications

Context Manager

Context Consumer GW

1. **Subscribe** to user context.
Key: User ID = user@domain
Web Service interface

5. **Notify** consumers

Context Engine — Context DB

4. **Store** most recent context
Refine, filter, …

SIP GW | SLP GW | RFID GW | A4C GW

3. **Request and collect** raw context data

2. **Map user ID** to key for context sources:
- SIP URI
- RFID TAG

Context Sources

SIP PA | SLP DA | RFID Reader

A4C

A4C Server

A4C server stores user profile

Presence

Computational context

Location

ICIN 2006

Context Manager Implementation

- Language:
  - Mostly Java 1.5
  - C/C++ for parts of SLP, RFID
- DB: MySQL
- Interfaces:
  - Context Consumers: Web Service interface, context repr. in XML
  - Presence: SIP SIMPLE
  - Computational Context: Service Location Protocol (SLP)
  - Location: Proprietary interface to RFID systems
  - A4C: Diameter
- OS:
  - Linux Ubuntu
  - Runs on Windows (but excludes SLP, A4C)

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Demonstrated use of Context

eHealth scenario: Combined presence, location, and computational context

Location C

Location A

Available

Busy

Location B

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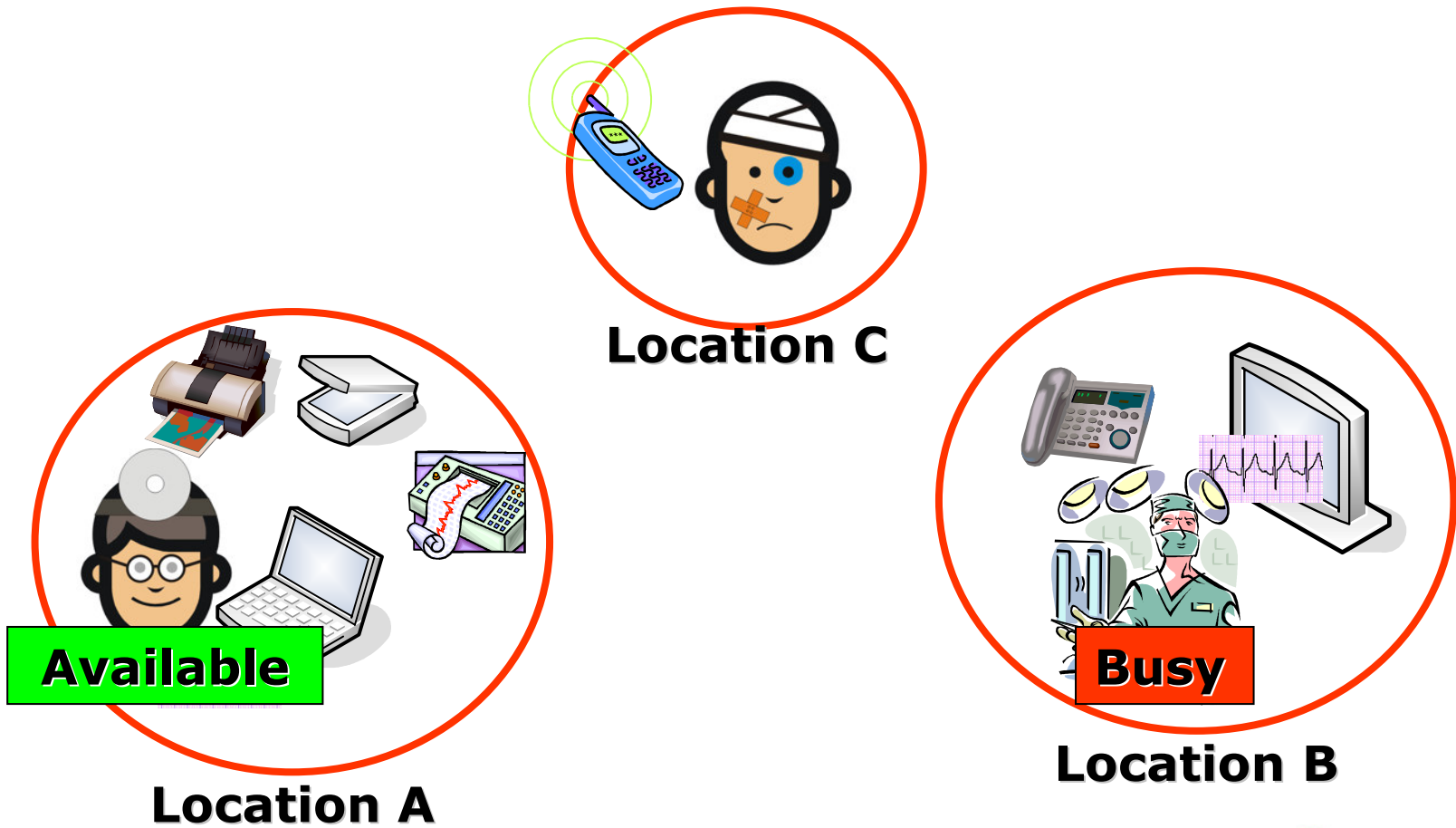
Conclusions and outlook

Conclusions

- Context awareness vital in pervasive applications

- Context Manager, part of Akogrimo IST project, is an enabler for context-aware services

- Design guidelines

  - User-centric context model

  - Context handling separate form service logic

  - Flexible w.r.t. context sources

- Use of Context Manager demonstrated in eHealth scenario

Outlook

- Introduce ontologies:

  - Enhanced interface for context consumers

  - Improved support for context filtering

- Add context sources

- Context mapping

- Scalability and performance

- Privacy and security

- Context - reliable information?

Thank you!