

Ubi-Board: A Smart Information Diffusion System

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Content

- Introduction
- Ubi-Board in action
- Implementation
- Performances
- Conclusion

Introduction

- When you arrive at St Petersburg airport, if you don't know/read russian you have problems to access information on displays
- Possible solutions
 - To provide multi-window displays
 - One window associated to one language
 - To provide a specific keyboard,
 - One touch per language

Introduction (2)

- Very static solution
 - Every possibility has to be planned before used
 - Not scalable
 - For example, it is hard to support dynamic multi-mode display
 - French and blind
- Another approach, (Ubi-Board), dynamic and scalable
 - Based on ubiquitous computing

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Ubi-board in action (1)

- Video.

– <http://ubiboard.inria.fr/>

Ubi-board in action (2)

- Main ideas behind Ubi-Board
 - User mobile phone considered as a sensor
 - Used to store user profile (language, handicap,...),
 - Dynamic collection of user profile, (i.e. context) in a defined physical perimeter related to the board and depending on the wireless communication facilities (Bluetooth, Rfid,...)
 - Determine the treatment due to collected user profiles:
 - Majority: main display
 - Minorities: user mobile phone display.

Ubi-board in action (3)

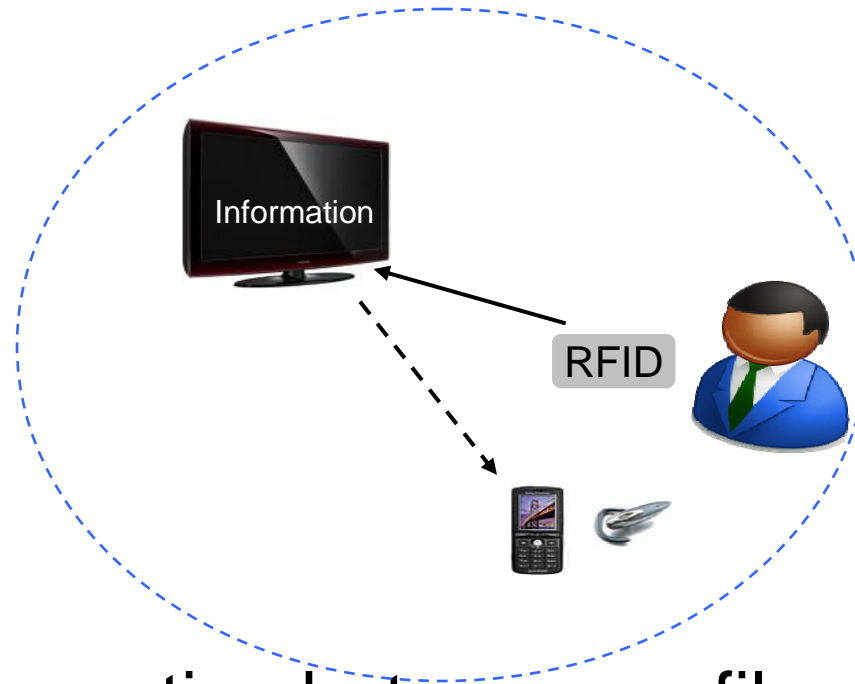
- Profile sensing
 - Three modes
 - Bluetooth proximity (video)
 - Proximity sensing
 - Perimetric sensing

Ubi-Board in action (4)

- **Bluetooth proximity**
 - **First approach:**
 - Profile database,
 - Database entry: bluetooth address or predefined user UID
 - » Problems due to
 - » Privacy (« big brother »)
 - » Efficiency (database accesses)
 - **Second approach:**
 - A user profile is created and stored on his mobile phone.
 - » No database
 - **Efficiency**
 - Strongly related to bluetooth SDP

Ubi-Board in action (5)

- RFID profile sensing
 - The idea:



- Physical separation between profile support (RFID tag) and information display (phone/bluetooth)

Ubi-Board in action (6)

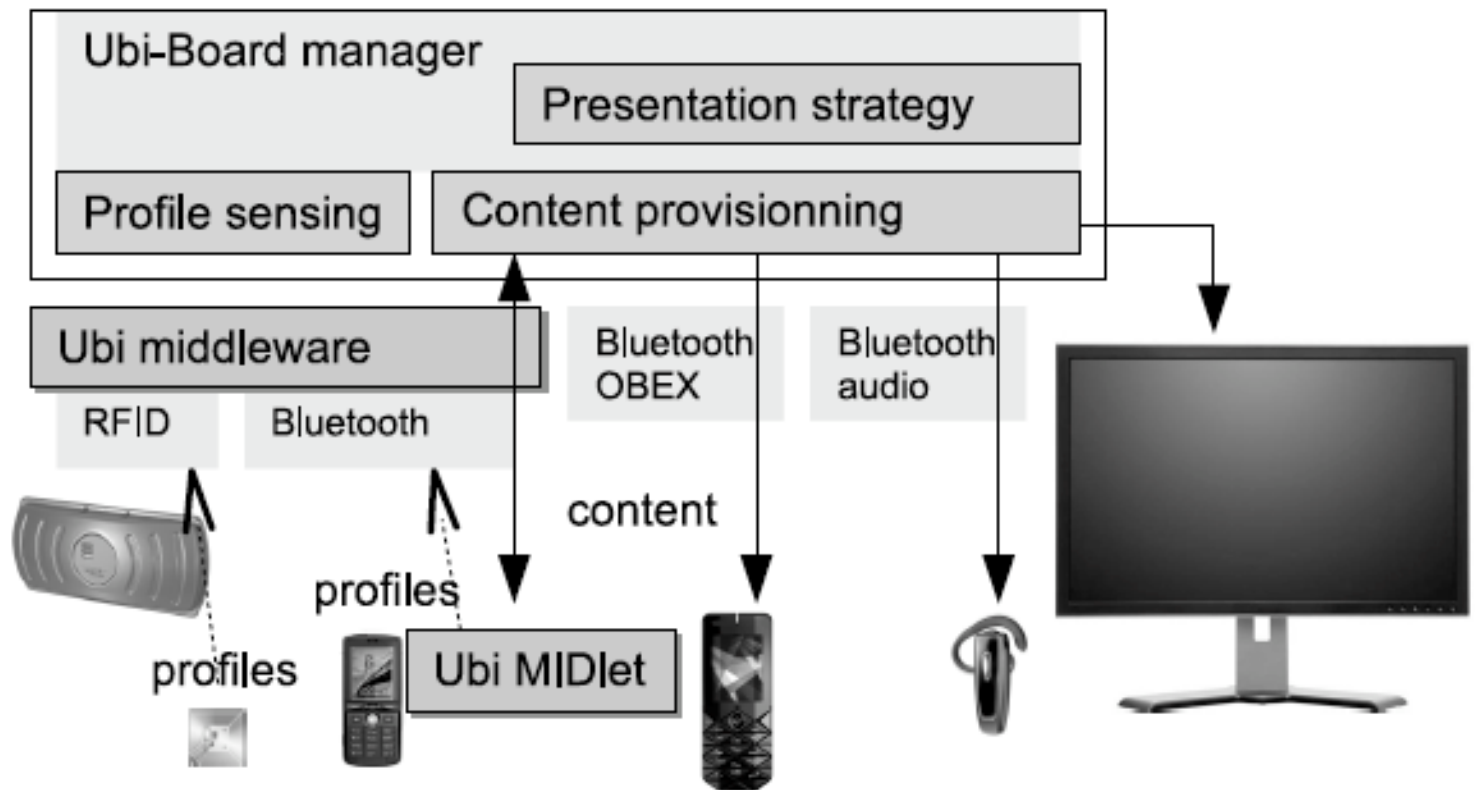
- RFID profile sensing
 - Proximity sensing
 - Design of spatial area based on multiple directive antennas.
 - Perimetric sensing
 - Applicable in closed space (rooms) in which entry point are well defined (doors,...)
 - One antenna to each entry point.
- Efficiency purpose
 - Bluetooth address (i.e. the terminal information display/mobile phone) is also stored on the RFID tag
 - To avoid expensive Bluetooth inquiry scan.

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Implementation (1)

- Software architecture



Implementation (2)

- Ubi-Middleware
 - Programming environment for pervasive computing based on the interaction of physical objects .
 - Benefits:
 - The program is structured around physical objects and their interactions
 - Programming is simple because
 - You don't have to determined what is the context, and then take the appropriate actions:
 - You just have to "attach" code to already existing interactions (in the real world), reflected in the system
 - Implementation is based on a distributed tuple space management, derived from Linda tuple space

Implementation (3)

- Profile sensing
 - To determine the current profile of potential users,
 - Based on used wireless technologies, Bluetooth; RFID,...

Implementation (4)

- Presentation strategy
 - Information are selected from a local or remote data base, depending of the user profile
 - Adapted to the terminal
 - Public display
 - Mobile phone

Implementation (5)

- Information providing
 - Obex push
 - Data/image/video are push on the user terminal
 - One limitation
 - » No possible user interaction
 - Dedicated client
 - One client application has been loaded on the user terminal
 - Possibility to support rich interactions
 - Audio support
 - Direct stream audio to the user device (headset) using bluetooth
 - Limitation due to the number of bluetooth time slots (7)
 - One solution
 - To support multiple bluetooth units

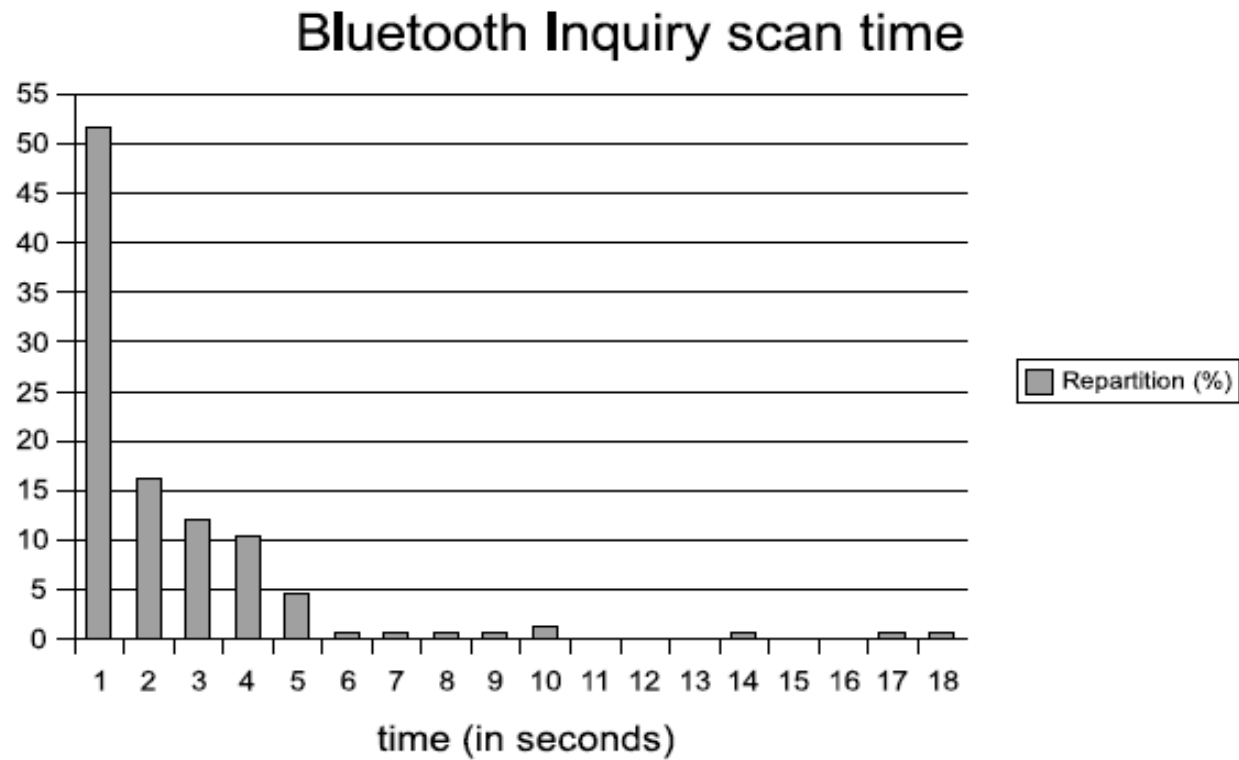
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Performances (1)

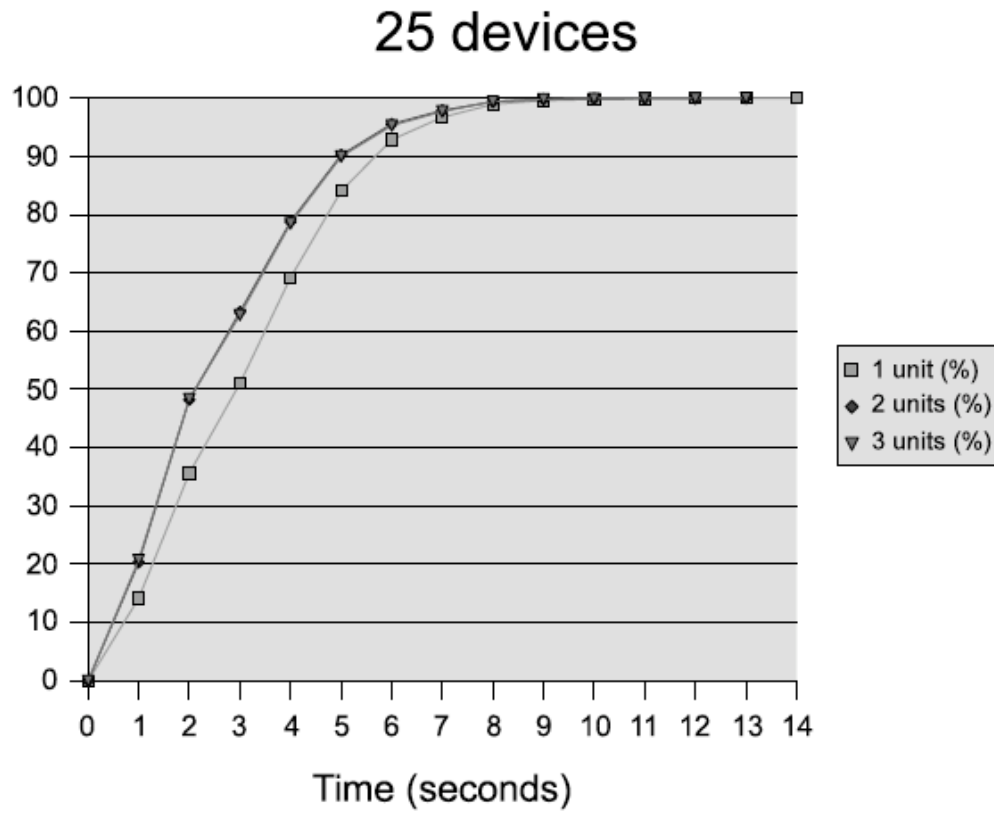
- Performances are strongly relied to bluetooth
 - Two performance evaluations
 - Bluetooth address is stored in a database/Rfid tag
 - Inquiry scan time performance
 - Dynamic discovery of the bluetooth terminal
 - With multiple units from the display side.
 - Realistic service useful need good performances

Performances (4)



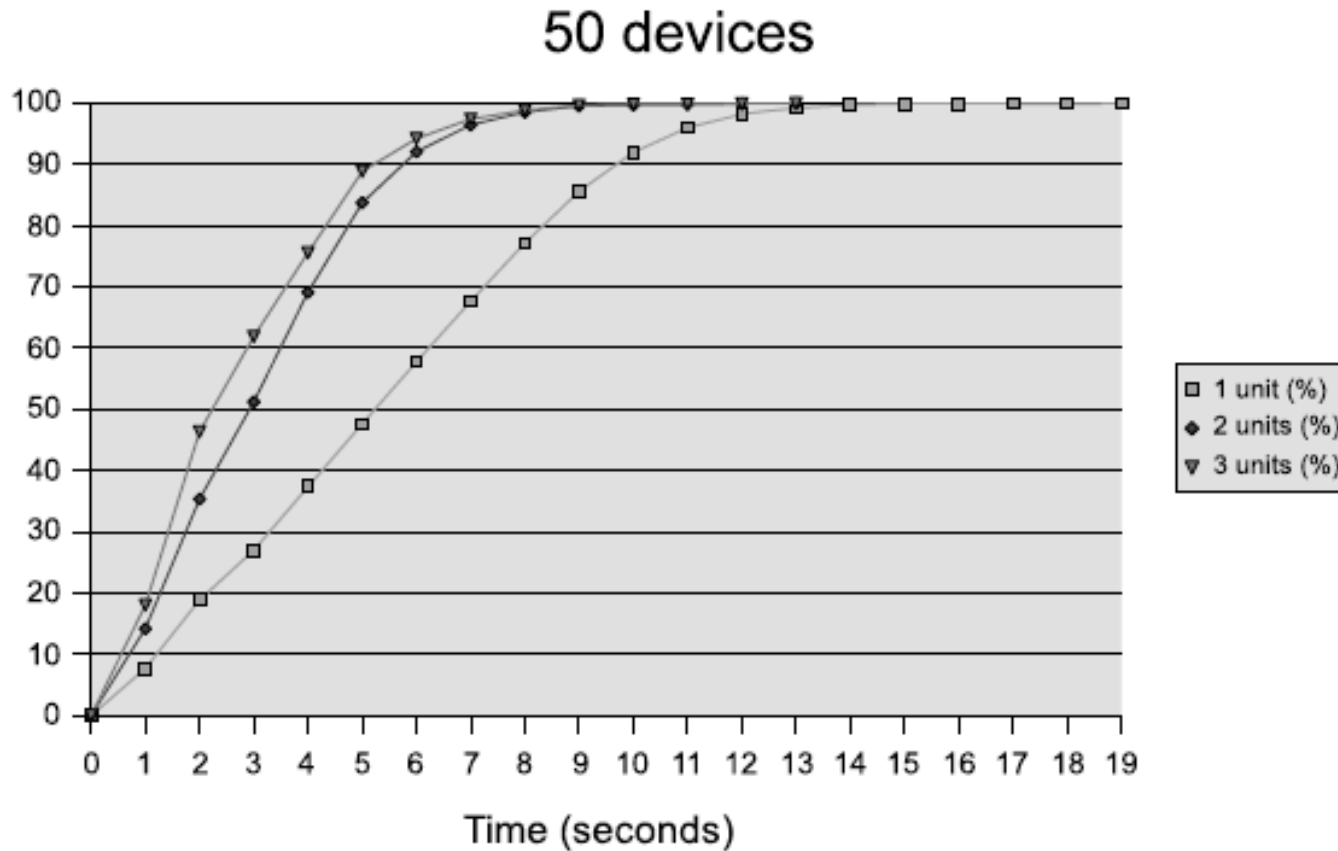
Performances (2)

Direct bluetooth discovery (with multiple units)



Performances (3)

Direct bluetooth discovery (with multiple units)



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Conclusion (1)

- Innovations brought by Ubi-Board
 - The concept of *fragmented display* based on a context aware architecture.
 - The dedicated display and the content are selected due to people near to the public display.
 - The public display is used for the majority.
 - The mobile phone is used for the minorities. More, when the content of the public display is changing it is also changing on the mobile phone display (used by minorities).
 - Our solution is well adapted to support handicapped people (audio message instead of video) .

Conclusion (2)

- Performances
 - Bluetooth is not efficient enough to support the service
 - It is necessary to couple Rfid and Bluetooth
 - Rfid tag supports user profile,
 - Bluetooth address for display (stored in RFID tags)

Conclusion (3)

- Ubi-Board status
 - Big pilot demonstrations:
 - European parliament,
 - ADP (Paris Airports), ...
 - Light solutions from Ubi-Board,
 - Ubi-point: contextual information to one user
 - Ubi-lobby: contextual shared multi-displays (used in lobbies)

Conclusion (4)

- Strong experience in the design of efficient and useful ubiquitous services
 - One hard point: how to instrument « users » in a realistic way?
 - Other services
 - Ubi-Bus, Ubi-Q,...
- New research directions
 - Ubiquitous computing and resiliency
 - How to build resilient/safe services based on ubiquitous concepts?

Conclusion (5)

- Industrial aspects:
 - *SenseYou*:
 - An INRIA start-up created last july to build and commercialize solutions/products based on these research results/innovative services and associated IPRs, (patents, software,...).
 - <http://www.senseyou.fr>