



Ubiquitous Computing for the public

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Introduction

- Ubiquitous Computing
 - Aid daily tasks
 - Reduce complexity
 - Exist in background
- Progress
 - Experience gained
 - Technological advances
- Benefits mainly
 - Restricted to research community

Mobile devices

- Pervasive mobile information devices
 - Daily interaction
 - Widespread use } Mobile phones, PDAs, ...
- Benefits from using off-the-shelf devices
 - Large scale distribution
 - Growing market
 - Familiarity



The BlueReminder

- Objectives
 - Introduce ubiquitous computing
 - Target the widest audience
 - Use available consumer products
 - Focus on the interaction *between* people
 - Aid people in their daily tasks

The BlueReminder

- Background
 - People tend to forget things
 - Traditional technologies
 - Calendar
 - Notepad
 - Post-It note
 - ... are not always suitable!



The BlueReminder

- Scenario:
 - You need to remember something when you meet someone
 - Then
 - ~~Calendar~~
 - ~~Notepad~~
 - ~~Post-It Note~~



The BlueReminder

- Virtual Post-it notes
 - Can be attached to anything identifiable
 - People, Places, Things
 - Conditional Triggering
 - Upon meeting someone / group of people
 - At particular time or place
 - Multimedia
 - Text, Sound, Vibration, ...
 - Proven Concept
 - Stick-e Notes, FieldNote

The BlueReminder

- How does it work?
 - Preparing
 - Note is written
 - Triggering conditions are set (identifier, date, ...)
 - Searching
 - Device searches for identifiers
 - Acting
 - Evaluate found identifier(s)
 - Issue reminder?

Architecture

- Chosen Technologies:
 - Mobile Phone
 - Bluetooth
 - J2ME (CLDC 1.0, MIDP 2.0)
 - Java APIs for Bluetooth (JSR-82)

Architecture

- Device discovery
 - JSR-82 API
 - DiscoveryAgent
 - Listener
 - Periodic discovery
 - Background thread
 - Inquiry → match → action
 - Manual discovery
 - Useful to add new contacts

Architecture

- Data storage
 - Persistent
 - Notes, contacts, settings
 - Separate record stores
 - Common access mechanism
 - Non-persistent
 - Device buffer (first in, first out)
 - Runtime variables

Architecture

- Graphical user interface
 - High-level API
 - Layout device specific
 - Optimised
 - Screen-based

BlueReminder / notes / add

Recipients:
Andy
Harry
John

Subject:
Group meeting.

Message:
Agree on a date for the upcoming meeting!

Use trigger date ?
 No
 Yes

Triggering date / time:

BlueReminder / groups / new

Group name:
Software revision group

Choose members:
 Robert
 Tom
 Suzanne
 Alicia
 Andy
 George
 Harry
 John

BlueReminder / configuration

Expiry actions setting:
 Notify on expiry date/time
 Delete on expiry date/time
 No expiry action

Default expiry period: 30 days

Default signal:
 Sound
 Light
 Vibration

Automatic device scanning:
 On
 Off

Preliminary findings

- Tests performed on two popular types of mobile phones
 - A) High-end device
 - Large-touch screen
 - Symbian OS
 - B) Medium-range
 - Small screen (output only)
 - Vendor specific OS

Preliminary findings

- Concept
 - Works well overall
 - Write notes
 - Issue reminders
 - Everyday situations
 - Extends usefulness
 - New functionality
 - Easy to use
 - Appearance consistent with device

Preliminary findings

- Energy consumption
 - Measured for 8 hours use
 - Three states
 - State 1: Bluetooth off
 - State 2: Bluetooth on
 - State 3: Bluetooth on, BlueReminder running
 - Results
 - State 3 consumes twice the energy as state 2
 - Approximately 90-95% of a full battery left (state 3)

Preliminary findings

- Stability
 - A measure of predictable behaviour
 - Results for high-end device
 - Bluetooth service stalls unexpectedly
 - Detectable by measuring inquiry time
 - Recovery requires manual Bluetooth restart
 - Frequency dependant on device and sleep time between inquiries (>180s significant reduction)
 - Infrequent VM errors
 - Minimised by optimising memory usage

Preliminary findings

- Results for medium-end device
 - No stability problems found
 - But application times-out
- Alternative High-end test application
 - Personal Java (using JNI)
 - Stability issues remain
- Overall outcome
 - Need to look at underlying OS and JVM
 - BlueReminder appears to be stable

Further work

- Verify preliminary findings
 - More tests
 - Wider range of devices
- Improve system
 - Additional functionality
 - Minor changes
 - Optimisation
- Perform a case study
 - General public

Conclusion

- Concept
 - Works well overall
- Energy consumption
 - Significant increase
 - But does not hinder everyday operation
- Stability
 - Stability problems occur with one device
 - Need to look at underlying OS and JVM

More information

- For more information contact
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