the Ambient Intelligence project

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by INESC Porto
What is Ambient Intelligence?

- Ambient that
  - Is sensitive to people’s presence
  - Is sensitive to people’s needs
  - Anticipates people’s behavior
Components of Our Intelligent Ambient

- Network
- Personal information server
- Service discovery and delivery protocol
- Ambient services
Scenario

IPv6 AdHoc Network

Recording point

Symbian Phone User

PDA User

TabletPC User

Projection Point

Internet

Jukebox
Ambient Services – Recording Point

- Emulates a receptionist capable of getting messages, or a guard that records users when they are detected

- Services provided
  - Shortfilm (automatic)
    - Service that detects the presence of a person, identified by his personal PDA or mobile phone, and starts recording a short video clip without the person noticing it
  - Message (requires user control)
    - Service announced by the Recording Point to visiting terminals, which may use it to leave an audio-video message to another person.
Ambient Services – Projection Point

- Emulates a receptionist, but now delivering messages. Provides also a general purpose display.

- Services provided:
  - ShortFilm (automatic)
    - Enables a person to let about videos in which he appears.
  - Message (requires user control)
    - Enables a person to see its audio-video messages.
  - Display (requires user control)
    - Enables a person to project the display of his device.
Ambient Services – Jukebox

• Plays music; selects the next music to play according to the preferences of the majority of the people

• Services provided
  - MusicPreference (automatic)
    • Service that reacts to multiple persons simultaneously
  - Gateway to the Internet
Symbian Phone

- Symbian phone
- Provides 2 services
  - Short Messaging Service
    - Enables other users in the network, with no GSM access, to send SMSs
  - Camera
    - Enables other persons to use the phone’s camera
Network – Characteristics

• Spontaneous connectivity
  – Devices connect to each other
  – Infrastructure may exist or not

• Location-aware
  – Services offered only in given location
Network – Requirements

- Broadcast/Multicast enabled network
  - Service Announcements are broadcast/multicast

- Nodes may act as routers
  - Need to forward packets

- Auto-Configuration
  - Required
  - No point having Intelligent Ambient, and have to configure Physical and IP level connectivity
Network – Modules

- Ad-hoc routing software – Unicast (OLSR)
  - OLSR provides default route configuration

- Flooding/Multicast module
  - Simple flooding

- Gateway Info auto-configuration
  - Based on prefix continuity
  - May configure default route or not
Network – Broadcast Using Simple Flooding

- Loops prevented by a sequence number field
- Message discarded if sequence number is equal or less than the latest sequence number received
• The Ambient needs to know about the people

• Person’s characteristics/preferences inscribed in the hardware wear by the person
  – Some characteristics obtained by sensors
  – Other characteristics filled by the person

• Person spends most of his time in the same Ambient
  – Home, office, shopping, car
Service Discovery and Delivery Protocol

- **Protocol at the User side**
  - Announces user entrance/departure in the ambient

- **Protocol at the Provider side**
  - Announces provider presence and services offered

- **Announcement is conditional**
  - The service list announced by provider is customized to each user
  - Some services are provided only to people having characteristics/preferences that match some criteria

- **Services ➔ 2 paradigms**
  - **Client-server**
    - SDDP advertises client application and its usage
  - **Webservices**
    - SDDP advertises URL
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Aml SDDP – Service Description

- Description at provider
- Services described in XML
- Conditions to be satisfied

```xml
<?xml version="1.0"?>
<provider>
  <information>
    <provider_name>Projection Point</provider_name>
    <description>Provider that has a projector</description>
  </information>
  <services>
    <service type="custom">
      <name>Shortfilm</name>
      <port>2001</port>
      <description>Plays a shortfilm automatically</description>
    </service>
    <service type="custom">
      <name>Message</name>
      <port>2002</port>
      <description>Display your messages</description>
      <conditions>
        <var name="mac" logic="plugin" evaluation="local">isNear()</var>
        <and />
        <var name="id" logic="plugin" evaluation="local">hasMessages()</var>
      </conditions>
      <application>
        <executable arch="arm">message</executable>
        <url arch="arm">http:///%i/message/arm/</url>
        <arguments>%i %p</arguments>
      </application>
    </service>
  </services>
</provider>
```
**AmI SDDP – Mechanics**

**Basic mechanism**

- **Periodic announce phase**
  - Announce (IP, FormId, ServicesId)

- **Form gathering phase**
  - FormRequest ()
  - FormReply (list of characteristic variables required for a remote evaluation)

- **Services gathering phase**
  - ServicesRequest (user specific values of the variables requested in the form)
  - ServicesList (services that the specific user can use, services with conditions set for local evaluation)

**Remote and local evaluations**

- **Remote re-evaluations**

**Remote client**

- Client arrival
  - If new provider, or different form Id
  - If unknown list, or different service Id, or Update Message
  - Remote re-evaluation

**Remote provider**

- Announce (IP, FormId, ServicesId)
- Remote re-evaluation

**Remote server**

- ServicesRequest
- ServicesList

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Putting It All Together

- **Network**
  - IPv6, ad-hoc, multicast

- **SDDP informs**
  - Users about providers, services, and other users
  - Providers about users

- **Aml advertises infoservers**

- **Services**
  - Communicate with user’s infoservers
  - Adapt to user’s characteristics
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Aml in Action

Services requiring user control

Aml browser
Questions?