Device Selection by a Personal Proxy Agent

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Project goal
To build a framework that:
- Permits a mobile user to access communication devices currently present in his Personal Area Network (PAN)
- Performs automatic selection of a device in a PAN for a specific application based on the communication session requirements, the user preferences and the capabilities of the devices
Building blocks of the framework

- A home Directory Agent (HDA)
- A Personal Proxy Agent (running on a PDA)
- A Wireless-LAN technology (Bluetooth)

<table>
<thead>
<tr>
<th>Device Capability</th>
<th>User Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU, memory</td>
<td>Frame Rate</td>
</tr>
<tr>
<td>Camera, screen res.</td>
<td>Display Resolution</td>
</tr>
<tr>
<td>Micro, speaker</td>
<td>Audio Quality</td>
</tr>
</tbody>
</table>

An example Scenario: Connecting Alice and Bob w/o a Personal Proxy
Steps in the Scenario

1. Bob’s wants to establish a communication session with Alice.
2. Bob’s sends an invitation to Alice through his Home Directory Agent to Alice’s Home Directory Agent.
3. Alice’s Home Directory Agent locates Alice depending on location information and the links to her devices stored in Alice’s user profile (ex: from 8am to 5pm, Alice can be reached at her office through her station, office phone, or PDA), the devices send their profiles to Alice’s HDA.
4. Alice’s HDA selects the appropriate device.
5. Data is sent between Alice and Bob.

Home Directory Agent (HDA)

- Keeps the profile (preferences) of each user.
- Locates the user based on the information stored in his/her profile.
- Uses the devices’ links stored in the user profile to get the device profiles.
- Selects the appropriate device based on the session requirement, the device profile, and the user’s preferences.
Example of a user profile

**Personal Identification**
- Name: Alice Alley
- Employer: University of Ottawa
- Email: alice@site.uottawa.ca
- Phone Number: 613-562-5800
- QoS Selection Weight: 0.5

**Public Preferences**
- Music: Jazz, Blues
- Sport: Squash, Tennis

**Device links**
- Time: 8 am - 5 pm
  - Office Phone: 613-5625801
  - Workstation: 137.122.20.102 :7512
- Time: 7 pm - 11 pm
  - Home Phone: 819-7702266
  - Laptop: 137.122.40.30 :7512
- Time: any
  - Cellphone: 613-2236598

**Calls**
- Bob: bob@wam.umd.edu
  - QoS Selection Weight: 0.6
  - Price Ceiling: 15 cents per minute
  - Audio Weight Factor: 9
  - Video Weight Factor: 2
- John: john@nortelnetworks.com
  - QoS Selection Weight: 0.75
  - Price Ceiling: 30 cents per minute
  - Audio Weight Factor: 1
  - Video Weight Factor: 1
- Callers: www.sportsnews.com
  - QoS Selection Weight: 0
  - Price Ceiling: 18 cents per minute
  - Audio Weight Factor: 0
  - Video Weight Factor: 0
- Callers: www.newsondemand.com
  - QoS Selection Weight: 0
  - Price Ceiling: 11 cents per minute
  - Audio Weight Factor: 0
  - Video Weight Factor: 0

**Video Preferences**
- Receive Video: Yes
- Send Video: Yes
- Frame Rate: Min Acceptable 10, Ideal 30
- Frame Resolution: Min Acceptable 320x240, Ideal 800x600

**Audio Preferences**
- Receive Audio: Yes
- Send Audio: Yes
- Min Acceptable: Telephone Quality
- Ideal: CD Quality

Example of a device profile

**A headphone**
- **Hardware**
  - Voice-Input Capable: Yes
  - Voice-Output Capable: Yes
  - Video-Input Capable: No
  - Video-Output Capable: No
- **Software**
  - Audio Codecs: MP3, G711

**A PC**
- **Hardware**
  - CPU: AMD Athlon
  - Memory Size: 128 MB
  - Voice-Input Capable: No
  - Voice-Output Capable: No
  - Video-Input Capable: Yes
  - Video-Output Capable: Yes
- **Software**
  - Audio Codecs: MPEG-1, MPEG-2, H.261, H.263
  - Applications: JMF, Vic, Vat, WhiteBoard
Device selection algorithm

- Selects devices that can support the session requirements based on their services and capabilities.
- Uses the user’s preferences as selection criteria.
- Combines more than one device to provide compound services:
  - Example: select a headphone and a monitor to receive an audio-video data presentation

Why do we need a Personal Proxy (PDA)?

- Discovers current available devices in the vicinity of the user.
- Reduces delay for session initiation
- Receives profile from HDA as soon as activated
- Merges the preferences of the user and the capabilities of the discovered devices to select the device(s) required for the session.
Issues with the Personal Proxy

- Authentication
  How can I be identified to the surrounding devices?

- Authorization
  Can people reach me through my supervisor’s phone office when I’m in there?

- Geographical location
  Will the phone ring in the adjacent locked room when I’m near that room?

Connecting Alice and Bob through a Personal Proxy
Steps in the scenario

1. Bob wants to establish a communication session with Alice
2. Bob sends an invitation to Alice through his Home Directory Agent
3. Alice’s Home Directory Agent forwards the invitation to Alice’s PDA
4. Alice’s PDA recognizes and identifies the devices surrounding her, the
   devices nearby send their device profile to the PDA
5. Alice’s PDA selects the adequate device(s) and inform Alice about the
   invitation (ex: headphone having the capability to receive audio and a
   monitor to receive video)
6. The PDA replies to the invitation with the addresses to use for the data
7. Data is sent between Alice and Bob

Summary

- A personal proxy (PDA) selects the appropriate devices by merging user’s and
  devices’ profiles.
- Combine multiple independent devices in a PAN into one distributed machine.