

Migrating User Interfaces

The MUI-project is Part of the LUCAS Research Center at Lund University and is funded by VINNOVA. In the project we study how mobile (and stationary) units can be connected in an ad-hoc network in a flexible and user-friendly way. The user interface is moved between units in a way that makes

them behave as an integrated system.

From a handheld device (Palm, Cellphone) the user can:

- Discover units. The services they offer are presented on the handheld device.
- Control another unit. The user

interface code is downloaded and displayed on the handheld device. It can then be used to interact with the unit.

- Connect units. Typically they can then exchange data directly. The connected units can be controlled from the handheld device.

1. Discover. The user uses his Palm to get a list of available services which includes the MP3 player (Control and Audio-output) and the Speakers (Control and Audio-input).
2. Connect. Using his Palm the user connects the Audio-output from the MP3-player to the Audio-input of the Speakers.
3. Control. The user uses the Palm adjust the volume of the Speakers and select music from the MP3-player.
4. The user can alternate between controlling the units directly (by buttons on their fronts) and using the Palm.



Scenario

You are coming home listening to music in your iPod (MP3 player). Now you want the music to play through your stationary speakers.



Protocol

We have used this (and other) scenarios to drive the development of protocol for communication between units. The aim is to develop a protocol that is general and in no way depends on the nature of the units controlled. It defines:

- How units are discovered and how services are presented.
- Format of pre-defined media-types (such as streaming audio).

The protocol is characterized by:

- The communication is full duplex and asynchronous. Commands can be sent to the unit and updates of information sent from the unit. Such events can be sent at any time.

- Which commands that exist is not defined in the protocol, nor the format of the communication between a controlling device and controlled unit. This is up to the designer of the unit to decide.
- The protocol is currently based on XML. Information such as lists of Services, description of the User Interface are XML documents.

The very simple User Interface for the Speakers can for example be described as:

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!DOCTYPE UI SYSTEM "MUI.dtd">
<UI text="Speaker">
  <Button text="Mute" command="mute"/>
</UI>
```

