Ecosystem infrastructure for smart and personalised inclusion and PROSPERITY for ALL stakeholders

Integrated Runtime Environment Use-Case Scenarios

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List of Abbreviations

AT	Assistive Technologies
AsTeRICS	Assistive Technology Rapid Integration & Construction Set
ARE	AsTeRICS Runtime Environment
ACS	AsTeRICS Configuration Suite
REST	REpresentational State Transfer
UCH	Universal Control HUB
URC	Universal Remote Console
IRE	Integrated Runtime Environment

1 Introduction on Use Case Scenario *"Assisted Living"*

In this document a use case scenario is described in order to show how the IRE can be used effectively in real life situations.

1.1 Personas

We have used personas from D103.1, aiming to reveal the behaviour of various stakeholders in the ecosystem.

Mrs Moroz

Mrs Moroz has had a stroke a year ago, which paralyzed the right side of her body and took her speech away. Fortunately, she still has good head control which enables her to use a variety of different technologies. For example she is competent in using a headmouse control, a mouth stick and a chin control for her electric wheel chair. She spends a lot of her time in an Assisted Living dormitory.

Nicholas Gallo

Nicholas Gallo, an 11 year old, was diagnosed with cerebral palsy. He lives in a small town with his parents and younger brother. He moves around in an electric wheelchair, which he controls via a joystick. His hands need to be placed on the joystick by a care-person and then he can use it with very small movements of his fingers. However, using the joystick is exhausting for him. That's why he prefers to control the mouse with (limited) head movement whenever possible. Nicholas also spends time in the Assisted Living dormitory.

Vasili Moroz (Care Giver)

Vasili Moroz is Mrs Moroz husband, 78 years old and is also the care giver of Mrs Moroz in the dormitory.

James Olsen (AT Developer)

James is an independent developer working for the past 15 years in the area of accessibility. He is interested in supporting people regarding accessibility by using open source AT and he is very interested in supplying the Assisted Living dormitory with AT to facilitate the people with moving limitations that spend time there. He is currently working with the DSpace tool and he is excited to discover various solutions, technologies and applications for accessibility within DSpace that he can use as is or extend to meet the needs of the people in the dormitory. He and a small group of passionate AT developers, like experimenting with AT

S/W and H/W and find the idea of being AT enablers for the dormitory fascinating. Their future plans include starting a company specializing on providing full AT solutions based on open source platforms, such as the DSpace, therefore the dormitory is an excellent opportunity to start applying AT solutions and test them with real users.

1.2 Environment/Available Technology

Mrs Moroz and Nicholas Gallo spend much of their time in assisted living, a really nice and warm dormitory that provides accessibility. Specifically, Mrs Moroz spends her weekdays there, while Nicholas spends only a few hours on most of the week days. The dormitory has a separate bedroom for every resident and a common room for getting in contact with other people. The common room has two different areas. One is equipped with a TV set and the other one with tables so that people can sit together.

The common room, as well as each bedroom, is equipped with the following:

- Philips HUE lights (a lamp that changes colours remotely controlled by URC – it is a remote URC actuator) so that it can be illuminated to individual colour wishes.
- An electricity outlet (Wöhlke Websteckdose that is remotely controlled by URC – it is a remote URC actuator as well) connected with a fan heater that can be turned on/off from the network
- Both Philips HUE lights and the electricity outlet in a room can be controlled from a central control panel within the room, a computer screen that can adapt to users' preferences

1.3 Personalized Technology Control

The central Philips HUE light and the fan heater can be controlled via the computer screen. All three people, Mrs Moroz, Nicholas and Vasili should be able to control them as follows:

Mrs Moroz:

- needs to use the headmouse feature with sensitivity set to "normal": requires normal head movements to operate the mouse. Keeping still for four seconds over something selects it.
- due to her wheelchair the distance between her and the control panel is about 1.0m to 1.5m

For Mrs Moroz the following is needed: **"normal" headmouse control + increased button size.**

Nicholas

- needs to use the headmouse feature with sensitivity set to “increased”: even with limited head movements the mouse can be operated. Keeping still for four seconds over something selects it.
- due to his wheelchair the distance between him and the control panel is about 1.0m to 1.5m

For Nickolas the following is needed: **“sensitive” headmouse control + increased button size.**

Vasili Moroz

- wants to use a mouse or touchscreen
- needs to see as many information as possible (e.g., lights + fan heater)

For Vasili Moroz **no assistive technologies are needed + normal button size.**

General required adjustments:

- increased font size/less information for bedridden people due to increased distance between display and user
- different input technologies: “sensitive” headmouse control, “normal” headmouse control

Room parameter control

Every room has its own control panel which must adjust to each resident’s preferences for that room. The control panel in the room enables controlling the Philips HUE lights and the fan heater in a personalized manner.

2 Enabling the Scenario

James Olsen has undertaken the job of supplying the Assisted Living dormitory with AT to facilitate the people with moving limitations that spend time there. James was thinking that what he really needed as a developer was a clever, easy and fast way to integrate a number of different technologies from AT, Smart Interfaces, Smart Sensors and Accessibility domains to be able to facilitate the many different, as well as very specific needs of the habitants. Before becoming aware of DSpace, he could not think of a solution to his problem. He could of course use many different technologies and frameworks, but the installation, maintenance and support costs, as well as the time needed for his developers' team to learn all the different technologies had made him reluctant to proceed. Not to mention the many different types of S/W and H/W licenses he would need to manage.

A few weeks now he has been accessing a new environment that is promising solutions to problems such as the one he is facing. The DSpace is an open source platform that provides various solutions, accessible components, tools, parts, and building blocks for developers to browse, search, learn about, and use. After spending some hours familiarizing with DSpace, he has effectively used DSpace's search and indexing tools to search for a solution to his problem, retrieving as a potential solution the Integrated Runtime Environment. This environment seemed promising as it combined support for diverse and individually tailored AT, access to a variety of services and remote sensors/actuators, as well as usage of flexible, runtime adaptive user interfaces that match dynamic personal needs of the user.

James felt that this Integrated Runtime Environment is promising and that it can very well be the best ecosystem offering solutions for technologically supporting the dormitory. He and his developers team had spent some time with the installation and developers' manuals to learn the full potential of the tool, and after some experimentation, they decided to actually use it experimentally at the dormitory (as a first test to support Mrs Moroz and Nicholas Gallo, therefore technologically facilitating 3 rooms: their private rooms and the common room). Provided that the Integrated Runtime Environment is open source and therefore free for use, the costs for their experiment included only the cost for purchasing three cameras, three Philips HUE lamps, three electricity outlets Wöhlke Websteckdose, three fan heaters and three PCs with large screens.

3 Integration Method 1

3.1 Scenario Part 1

Introduction

Mrs Moroz is sitting in her bedroom where she has set the Philips HUE lights and fan heater according to her current needs: “light green” light and fan heater “on”. At some point she uses her electric wheel chair to move to the common room to watch TV. Since nobody has been there for a while, the temperature is lower and the lights are out, so Mrs Moroz needs to switch on the fan heater, as well as control the lights in the common room. She uses the control panel in the common room to make the necessary changes so she needs to use increased button size (to be able to read characters from a distance) along with “normal headmouse control”. The system makes the necessary adjustments to assist Mrs Moroz.

Scenario

As Mrs Moroz enters the common room, GPII detects her entering the room. Mrs Moroz needs to switch on the fan heater and control the lights, therefore she uses the control panel (screen) to make these changes. Based on Mrs Moroz’s NP (Needs Preferences), “increased button size” is adjusted by MyUI so that Mrs Moroz is able to read characters from a distance. Moreover, the ARE starts the “normal” headmouse control model. Via the headmouse control Mrs Moroz can use *normal head movements* to interact with the *increased button size UI of MyUI* (Figure 1) to *control the remote URC actuators*: change the colour of the Philips HUE lights (see Figures 2 and 3) and switch on the fan heater (Figure 4 depicts the electricity outlet Wöhlke Websteckdose that controls the fan heater).

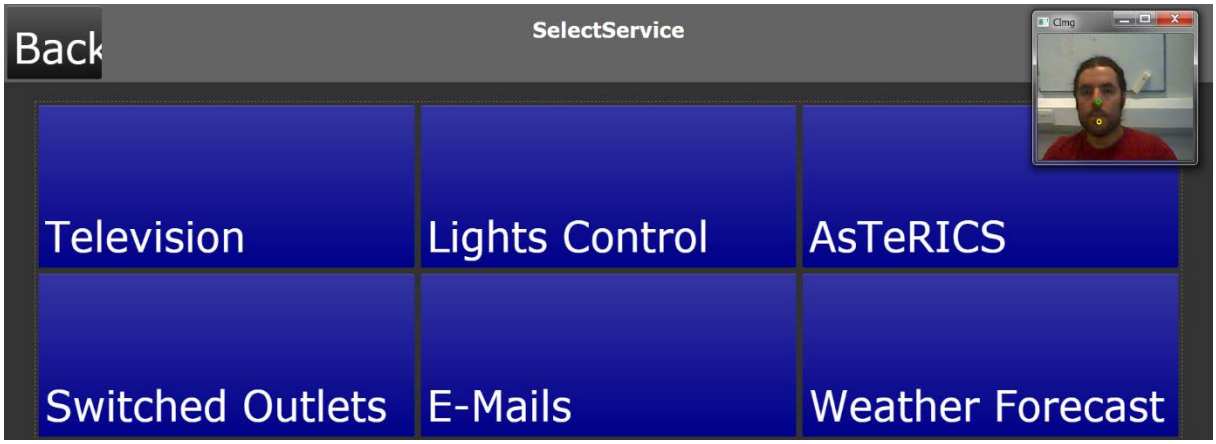

Figure 1: MyUI increased button size UI for usage with the AsTeRICS headmouse model

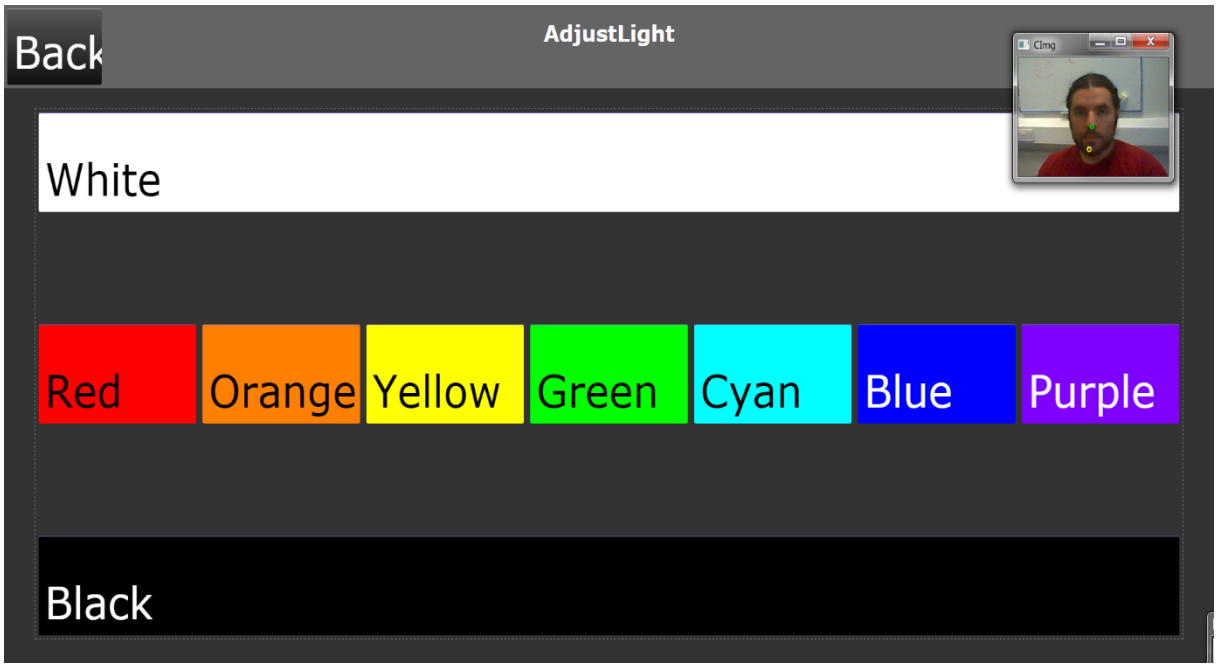

Figure 2: Mrs Moroz can change the colour of the Philips HUE lights through the MyUI UI via head movements

Figure 3: The Philips HUE lights in different colours

Figure 4: The electricity outlet Wöhlke Websteckdose that controls the fan heater

3.2 Scenario Part 2

Introduction

After some period of time, Nicholas also enters the common room. He has been out with his parents and brother. He feels hot so he thinks of switching off the fan heater. Also, he wants to read a new book his brother gave him, so he asks Mrs Moroz's permission to make the room a little bit brighter by changing the colour of the lights to something brighter, as well as less hot by switching off the fan heater. Mrs Moroz doesn't mind so Nicholas approaches the control screen. Due to his wheelchair the distance between him and the control panel is about 1.0m to 1.5m, so the system increases the font size and enables "sensitive headmouse control".

Scenario

When Nicholas enters the common room, he needs to switch off the fan heater and also to change the colour of the lights to something brighter. Nicholas approaches the touch screen. Based on Nicholas's NP (Needs Preferences), IRE understands that due to his wheelchair, the distance between him and the control panel is increased (about 1.0m to 1.5m), so it is needed to increase the font size and also enable "sensitive" headmouse control. MyUI starts with "increased button size" UIs, while the ARE starts the corresponding model that utilizes the "sensitive" headmouse control for Nicholas to use. Nicholas is now able to use very limited head movement (as a limitation of his illness) to control the mouse and interact with the *increased button size UI of MyUI* to *control the remote URC actuators*: change the colour of the Philips HUE light and switch off the fan heater.

3.3 Scenario Part 3

Introduction

When Vasili Moroz enters the common room 2 hours later, he feels the room is a bit cold and he wonders how come the temperature is so low. He approaches the control screen in the common room and through the device normal interface (common font size, etc.) he switches on the fan heater. He then asks Mrs Moroz and Nicholas whether they had any problems with the technological equipment in the dormitory: the Philips HUE lights, the fan heater, the touch screen and the TV set. Mrs Moroz mentions that she would prefer the headmouse control to be even less sensitive so that she can handle it better. Vasili Moroz communicates with James Olsen (the AT developer) and informs him about Mrs Moroz wish. James then connects to the dormitory machines via remote connection, accesses the AsTeRICS ARE and adjusts the headmouse sensitivity according to Mrs Moroz's needs and

preferences. He then informs his AT developers group of the problem for consideration for future developments: a good idea would be to provide an easy to use interface for the user to be able to real-time adjust mouse sensitivity for the headmouse control of AsTeRICS.

Scenario

When Vasili Moroz enters the common room, he approaches the touch screen and needs to adjust various settings through the device normal interface (common font size, etc.). IRE knows Vasili Moroz's NP (Needs Preferences) and enables MyUI with common font size, while the ARE is not started since an AT service is not needed for Vasili Moroz's case. Vasili Moroz is able to turn on the fan heater via accessing the remote URC actuator through MyUI interaction.

4 Integration Method 2

4.1 Scenario Part 1

As Mrs Moroz enters the common room, GPII detects her entering the room. Mrs Moroz needs to switch on the fan heater and control the lights, therefore she uses the control panel (screen) to make these changes. Based on Mrs Moroz's NP (Needs Preferences), "increased button size" is specified by MyUI so that Mrs Moroz is able to read characters from a distance. Moreover, the ARE is started enabling the "normal" headmouse control actuator. Via the headmouse control Mrs Moroz can use head movements to interact with the increased button size UI of MyUI to change the AsTeRICS model via a simple click of a button so that she is able to handle the remote URC sensors/actuators needed by using AT. Now, Mrs Moroz can handle the remote URC sensors via head movements as follows:

- Philips HUE light: head movement continuously changes between available colours. By keeping still for 4 seconds Mrs Moroz can return to the "normal" headmouse control model to continue with other tasks. The colour of the lamp is then the last selected colour.
- Switch on the fan heater: mouth movement (opening) changes between "switch on" and "switch off". When the fan heater is set to the desired state, Mrs Moroz can return to the "normal" headmouse control model with a specific head movement (turning head to the right) to continue with other tasks.

4.2 Scenario Part 2

When Nicholas enters the common room, he needs to switch off the fan heater and also to change the colour of the lights to something brighter. Nicholas approaches the control panel. Based on Nicholas's NP (Needs Preferences), the system increases MyUI font size and enables "sensitive" headmouse control. Nicholas will then use "sensitive" headmouse control to interact with the increased button size UI of MyUI to change the AsTeRICS model via a simple click of a button so that he is able to handle the remote URC sensors/actuators needed by using AT. Now, Nicholas can handle the remote URC sensors via head movements as follows:

- Philips HUE light: head movement continuously changes between available colours. By keeping still for 4 seconds Nicholas can return to the "sensitive" headmouse control model to continue with other tasks. The colour of the lamp is then the last selected colour.
- Switch off the fan heater: mouth movement (opening) changes between "switch on" and "switch off". When the fan heater is set to the desired state, Nicholas can return

to the “sensitive” headmouse control model with a specific head movement (turning head to the right) to continue with other tasks.

4.3 Scenario Part 3

Vasili Moroz does not need AT, he would prefer to control the fan heater via the MyUI interface by using the touch screen, rather than via head movements through AsTeRICS.

5 Expected Results

Mrs Moroz and Nicholas Gallo are excited with the many interaction possibilities their new equipment provides. They really like the very easy and straightforward way they can handle the lights and fan heater to bring them to suit their needs and preferences. And they feel excided knowing that more devices can also connect in the future to provide even more cool solutions, making their lives at the dormitory easier.

However, the two end users are not as excited as James Olsen. James is happy that their first experiment was successful, satisfying thus the users, but his real excitement stems from the fact that:

- He has managed to perform a successful technological experiment at the dormitory while *lowering development costs to a minimum*: both equipment and development time for his team were minimal compared to the development time and equipment they would need to spend without using the Integrated Runtime Environment.
- The *potential* of this technology is great: he can use it to address a number of different problems in AT and smart adaptive UIs. Moreover, the platforms that constitute the Integrated Runtime Environment can be extended to facilitate more and diverse user needs, as well as to be integrated with even more platforms and applications.
- He and his team are now eager to start their own company specializing on providing full AT and Smart UI solutions based on open source platforms, such as the DSpace. They believe that they can begin by using and extending the Integrated Runtime Environment and potentially use more technologies from the DSpace to try to *achieve better market access for their company*.