Convergence of Internet of Services and Internet of Appliances: Extending the Universal Remote Console to Web Services

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Abstract

The combination of ISO/IEC Universal Remote Console and ANSI/CEA 2018 Task Model Description has proven to be a flexible and attractive technology for realising user interfaces particularly in scenarios where the users pose special requirements on the user interfaces. In Europe, more than 100 partners and a total budget of 60 Mi€ are involved in projects using this technology, most of them being publically funded. However, the technology has started to mature and move to industrial applications. Still, there are many things to do. Perhaps most importantly, there is a need for implementing the convergence of Internet of Appliances (IoA) and Internet of Services (IoS). Also, the building of an eco system is of great importance. In this statement, we describe the current state of development and project burning issues.

1. Introduction

The Universal Remote Console (URC) standard (ISO, 2008) has now developed since almost a decade. In Europe, since the i2home project (i2home, 2006–2009), the technology has been introduced in several other projects, either as a fundamental integration technology but also as platform for realising user interfaces (UIs) particularly for persons with special needs. Figure 1 shows a sketch of the momentary state of affairs in Europe. Currently running projects based on URC include (VITAL, 2006–2010; Zinnikus et al., 2010), (Brainable, 2010 2012), (MonAMI, 2006–2010) and (SensHome, 2010–2011). Additionally, the UCH is part of the German T-Systems' architecture which realises a travelling scenario. Here, the UCH is globally available and serves UIs on three distinct controllers: A computer at home, the head unit in the car and a mobile phone. Other ongoing scenarios include mobility & public transportation, energy and health care.

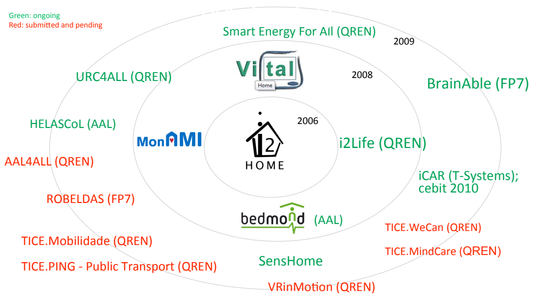

Figure 1: European projects based on the URC technology (stand April 2010). Green projects or projects with logos are running projects, red are applied projects.

Being available as an ANSI standard since 2006, the URC standard was ratified under ISO/EIC 24752 in 2008 during the runtime of i2home.

The URC technology includes several innovative concepts which have since its conception been successfully implemented and used in other infrastructures[1]. Two of the most prominent ingredients are:

Pluggable User Interfaces One of the main motivations behind the URC technology is the ability to even dynamically change UIs. The UCH allows multiple UIs to interact with the target appliances simultaneously.

Global Resource Servers All dynamic resources necessary to implement and run the interaction between user and the target appliances are stored on globally available resource servers.

Already in the i2home project, the necessity for an extension of the URC approach with task-based modeling was met by implementing the CEA-2018 standard (Rich, 2009) into the UCH, see figure 2. From the point of view of the UIs, a Task-Based UI is displayed as an ordinary target, i.e., the description of such a UI is in the same standardised language as a socket. Task-based UIs can interact with any other target. The main advantage of this is perhaps that there is a UI independent processing logic directly on the platform.

2. Current and Future Work

Besides the more technically oriented requirements on the URC ecosystem, such as, tool support, other intelligent plugins than the CEA 2018 engine, we are currently following a number of research tracks. To start with, for the convergence of IoS and IoA, we have:

Semantic Socket Description The abstract user interface (socket) can today be described on a pure XML basis.

[1] Apple's app store corresponds to URC's resource server.

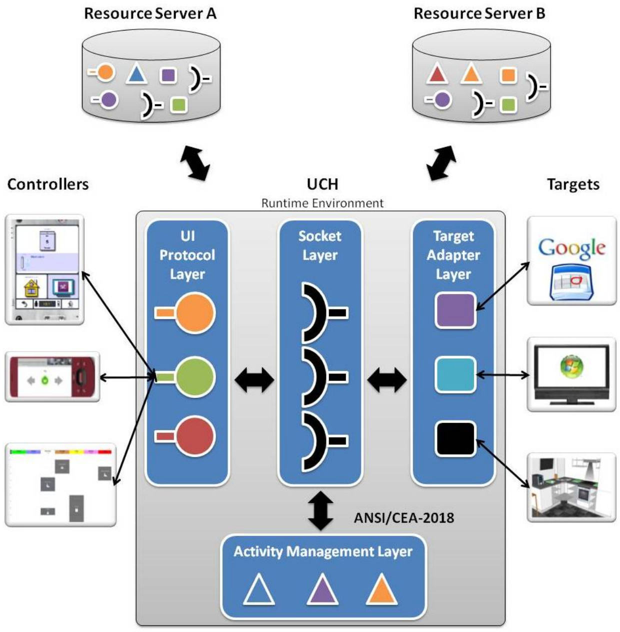

Figure 2: The URC Architecture. UIs run on controllers; the Socket is the abstract user interface that is plugged by the UIs; connection between the socket and the target appliances (devices and/or services) are realised in the socket layer. Finally, task models are operating on the sockets directly and are exposed as sockets towards the users.

Such a flat representation supports to some extent the automatic generation of UIs, but prevent the sophisticated generation thereof.

WSDL The main scenarios for the implementation above has been smart homes in the context of ambient assisted living (AAL). Moving from the i2home project to VITAL and other project, the necessity to include web services into the URC ecosystem has shown to be of great importance.

We are also looking into the following issues:

Personalization and Security By introducing, e.g., user and controller profiles into the architecture, it will be possible to automatically select or generate a suitable UI automatically. Personal profiles contain sensible information and have to be carefully handled. Therefore, security is a mandatory ingredient in this step.

Methodologies The following methodologies play important roles on different levels:

User-Centred Design Support What and how can the proposed platform better support UCD and related methodologies? We have experienced the advantage of the pluggable user interfaces architecture while executing the research methodology particularly in the i2home project.

Design Patterns For the design of the abstract user interfaces (sockets) on the one hand, but also other resources there is a need for methodologies and ontologies for speed up and support for interoperability issues.

Finally, in order to build a real ecosystem with many players, members of the above-mentioned projects are currently starting an alliance, the OpenURC alliance. This will serve as an international platform for promoting and boosting several aspects of the URC technology, e.g., sharing of resources, coordination of future work and roadmaps and, finally, identification of business opportunities. The organisation consists of several committees: business, governance, technical and user.

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