Common Ambient Assisted Living Home Platform for Seamless Care

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ABSTRACT
The CareStore project is investigating the feasibility of creating an open and flexible infrastructure for facilitating seamless deployment of assisted living devices and applications on heterogeneous platforms. The Common Ambient Assisted Living Home Platform (CAALHP) is intended to be the main user interface for patients and healthcare staff in the CareStore eco system. The aim of this abstract is to demonstrate the currently implemented features and outline relevant perspectives and future work in the CareStore project.

Keywords
Ambient assisted living, pervasive healthcare, telemedicine

1. INTRODUCTION
Europe is experiencing a demographic shift with a rising population of seniors and chronic patient groups causing significant pressure on the healthcare systems [1, 2]. Current state-of-the-art technology in this area is limited to proprietary or de-facto proprietary solutions which only supports hardware and software provided by a limited number of vendors [3]. This includes products from Bosch [4], Tunstall [5], Intel [6], and a range of other [3]. Care institutions, such as hospitals, nursing homes, and rehabilitation facilities, run the risk of vendor-lock-in when acquiring new telemedicine, pervasive healthcare, and ambient assisted living (AAL) devices and systems. If components from two or more vendors are needed this often implies that two or more complete technical system infrastructures need to be deployed, resulting in parallel silo-systems resulting in higher maintenance costs and increased complexity [3]. Also, installation and support is most often provided by a technical support organisation making deployment complicated and costly [7]. Intel's Continua Alliance relies on the IEEE 11073 Personal Healthcare Device (PHD) standard as a platform for co-developing software interfaces to support devices from Continua Alliance compliant vendors [8]. However, this is currently limited to primarily biomedical devices, and does not allow for deploying other relevant third party software applications. Also, integration with electronic healthcare records is not always feasible to achieve, as only the platform vendor is typically allowed to do this. Opposing this, general purpose platforms, such as Linux, Windows, and Android, are fully open for both software and hardware extensions. However, these solutions may be perceived as too open, posing intolerable security risks to the patients and staff. Also, currently there are no easy means of deployment available for state-of-the-art devices

The aim of the CareStore project is to investigate the potential of introducing a common platform for seamless deployment of healthcare and AAL devices and applications in the home of citizens in need of care. Specifically, this demo abstract presents the initial outcome of the development phases of CareStore, with a focus on the CAALHP platform and its applications.

2. PROTOTYPE DEMONSTRATION

2.1 The HomeScreen
The HomeScreen is the starting point of all user interaction with the CAALHP. From here, all applications can be accessed. Depending on which user is logged in, the HomeScreen will display relevant applications for the user to interact with on the touch screen display in the home of the patient. The available applications are either installed initially when the system is deployed in the home, or during daily management activities, e.g. when a home nurse brings a new healthcare device to a patient's home, such as a pulse oximeter saturation device. Installation of new applications and drivers can either occur explicitly when the user selects the Marketplace app and then selects an application, or through automatic deployment using the Common Recognition and Identification Platform (CRIP).

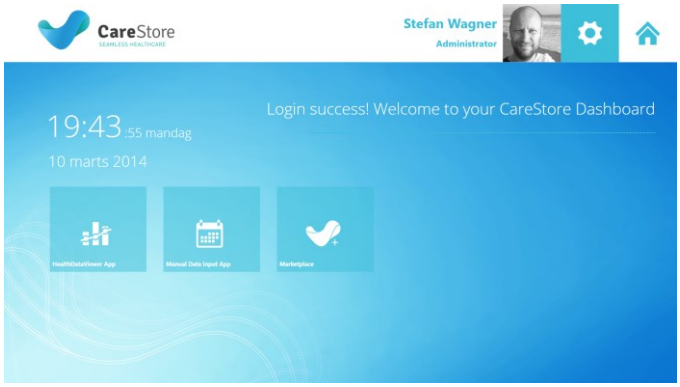

Figure 1. The HomeScreen application showing the installed applications as a collection of icons.

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2.2 Installation via Marketplace Application

The CareStore Marketplace application allows users to install applications and services from the online CareStore Marketplace. Here, the user may browse all types of certified CareStore applications. CareStore is based on open source and open standards which simplifies development of CareStore applications and drivers. Also, any vendor may create a CareStore Marketplace infrastructure, or use the existing CareStore Marketplace Cloud service and web site.

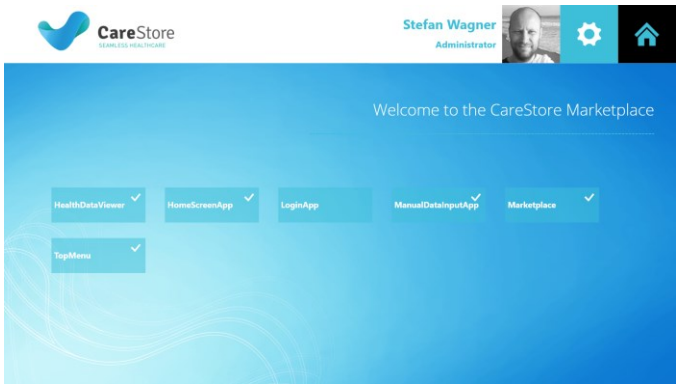

Figure 2. The Marketplace application showing a list of applications available for manual download

2.3 Automatic and Seamless Installation

If a home nurse wants to deploy a new saturation device, such as the Nonin 9560, and associate it with the patient, she can do this by touching the saturation device on the CRIP platform, after she has logged in using her fingerprint as authentication. The CAALPH automatically registers that the healthcare device, the nurse, and the patient, should be joined into a device/user group, and then starts the download and installation process automatically. After this, all measurements made on this device will be attached to the patient. The CRIP can automatically detect a range of devices using automatic radio discovery techniques. The CRIP is also used for authentication purposes, allowing a user to log in to the system using radio and biometric recognition technologies.

2.4 The Healthcare Data Viewer Application

The CRIP automatic download facility may be used in a more complex manner than only installing a single driver archive. If for instance a new IEEE11073 compliant saturation device is detected by the CRIP, the corresponding driver is automatically identified on the online Marketplace, downloaded and instantiated by the CAALHP. However, the driver vendor may also have specified that a user interface application should be downloaded to complement the CareStore driver. In this case, the Healthcare Data Viewer application is downloaded and automatically coupled to the driver following the successful installation of the driver. The Healthcare Data Viewer application is capable of presenting healthcare data originating from any source, including a standardized HL7 database. Furthermore, any future driver may use the Healthcare Data Viewer, as well as the HL7 healthcare database service, and subscribe to events from the saturation device driver. This is due to CAALHP being based on a Service Oriented Architecture, either using Microsoft Add-in Framework, or ZeroC's open Ice middleware and infrastructure, and its ability to support Service Orchestration.

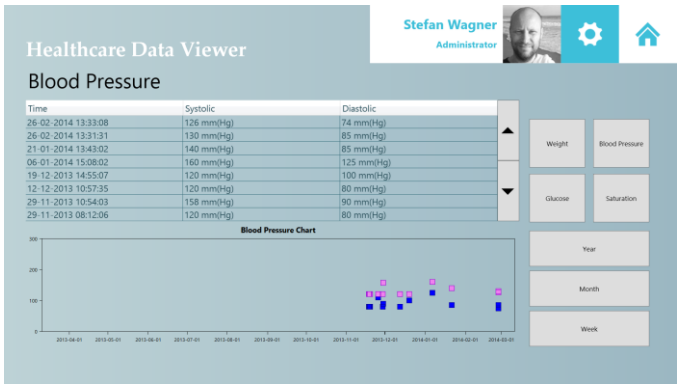

Figure 3. The Healthcare Data Viewer application showing blood pressure data of the currently logged in user.

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