

# Situatedness for Global Display Web Apps

Constantin Taivan<sup>1</sup>, Rui José<sup>1</sup>, Helena Rodrigues<sup>1</sup> and Bruno Silva<sup>2</sup>

Centro Algoritmi  
Campus de Azurém  
4800-058 Guimarães, Portugal  
+351253510319

<sup>1</sup>{constantin, rui, helena}@dsi.uminho.pt, <sup>2</sup>brcpsilva@gmail.com

## ABSTRACT

Most display systems are making use of static definition for the places in which they are situated. The content shown on these displays is predefined as is the case of television broadcasting. In this paper we present an approach that allows local display managers, e.g., display owners, to instantiate global display web applications on each display basis. We describe an innovative model for content presentation that takes into consideration both the display environmental data, e.g., sensors and user interactions, and app specific configuration. This approach enables the content being shown to be highly personalized, thus reflecting the dynamic and situated behavior of global display web apps.

## Categories and Subject Descriptors

H.4 [Information Systems Applications]: Miscellaneous

## General Terms

Experimentation

## Keywords

Public Displays, Display Web Apps, Situatedness

## 1. INTRODUCTION

Supporting web applications for public displays is not a new idea [1][2]. Recently the research is moving towards open display networks, that are, large scale networks of pervasive public displays and associated sensors that are open to applications and content from many sources [3]. A fundamental step in that direction is to have a model for third-party applications, which supports a clear separation of concerns between display ownership and content creation.

An open model for application development by third-parties should empower developers to create applications that can be distributed and deployed across a global network of public displays [4]. This is a tremendously powerful idea for both applications developers and display owners. For developers, it would mean that instead of developing applications to be deployed in a specific display system, they could now make their applications available anywhere, significantly increasing the potential reward for investing in well-designed applications. For display owners, this would mean access to a wealth of interactive

applications from a variety of sources and a wide range of general purpose content.

A major challenge to be addressed is how to enable these global applications to be deployed to the entire display network while being able to exhibit a situated behavior on each of the displays where they are used. While not all applications need to be situated, public displays are inherently situated artifacts that should be deeply embedded in their specific physical, social and cultural setting.

Situatedness is thus the ability of a global application to generate, on each of the locations where it is being used, content that is deemed specific to that location. The global applications are available across the entire network, while at the same time being able to integrate specific settings in a way that allows them to consider the specific situations in which they are being used and the potentially broad range of resources that may compose the local setting.

In our research, we explored how to support this ability of applications (*apps* from now on) to combine the global and the local perspective, i.e., serving the entire network while being able to adapt their behavior according to each of the multiple environments in which they are used. We considered multiple cases to support this situated behavior, more specifically: *explicit configuration*, *connection to a service with information about the local environment*, *user interactions* and the *particular usage history of the apps* in a certain display. This work contributes into the understanding and specification of an open display web application model for future public displays.

## 2. DEMONSTRATION OVERVIEW

Our system demonstration comprises four components: 1) an online service for local display managers to subscribe for display apps; 2) a large display that schedules and renders apps; 3) a set of interactive global display web apps that can be configured on display basis; 4) an environment service that aggregates the local display sensing data and situated users' interactions. Display viewers (users) can interact with the apps using a mobile phone that is available for the experiment, or they can install a mobile app to experiment from their own mobile devices.

An actor of our demonstration can play two distinct roles: 1) local display manager, i.e., display or place owner and 2) user of the situated apps. A local manager is the one who configures global display web apps through the online service. Firstly, he or she subscribes for a display web app in an App Registry or App Store. In this phase, the app is being associated to a specific place or display and the local manager sets the app's place parameters. For example, in the case of a chat app, when a local manager subscribes the app, she can input blocked words to be checked against all the messages or she can also block specific users.

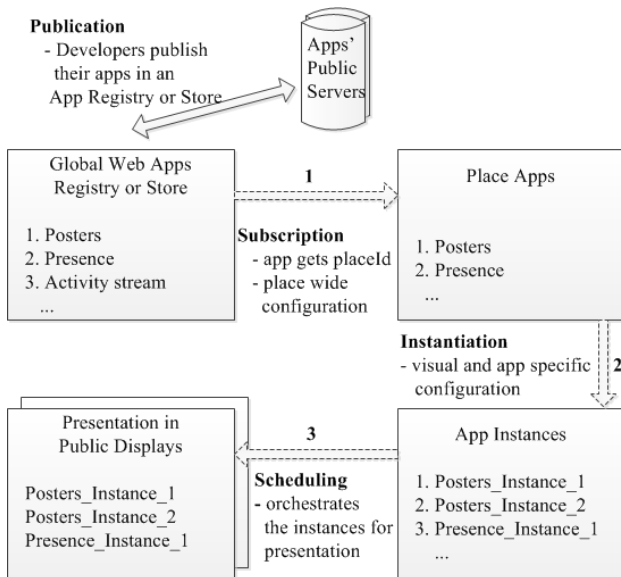
Secondly, the local manager may create multiple instances of the place-associated app by providing further app specific configuration, e.g., visual appearance. In the case of the chat app, the local manager may create app instances by instructing the application layout format, e.g., horizontal or vertical. Finally, in the presentation phase, the actor in the role of a user can interact with those apps and assess their situated behavior.

### 3. SITUATED DISPLAY WEB APPS

Employing situated behavior of an app requires information from several inputs such as the place in which a display system is installed and the interactions of people with the content shown. Previous research highlighted how the display relevance can be strongly affected by the lack of consideration for the space, the people around and the local activities [5] and ultimately how this may impact on people expectations and lead to display-blindness [6]. Recent research deployments are increasingly designing their display systems to allow personalization [2] and to support situation-aware applications [1][7]. We provided an approach that advances the personalization techniques for content presentation in public displays by investigating towards an open and global web model for development and usage of display applications.

A web-based display app is a mechanism to provide value for a ubiquitous computing infrastructure and, in particular as a driver for the evolution of open display networks. Like any other web apps, a display web app is also based on web technologies and standards, e.g., HTML, JavaScript and CSS. These apps are deployed in public servers and may become globally available through the publication in an app registry or store – from which they can be found and subscribed for a particular display. Display apps run in any standard web browser or other types of specially tailored web stacks.

Our display infrastructure architecture (Figure 1) is also supported by web technologies, e.g., HTML 5 specification.



**Figure 1:** The architecture of our display infrastructure; the dotted arrows highlights the phases covered for this demonstration. The apps configuration is handled within the online service in two consecutive steps. Firstly, the local display manager associates an app with the environmental service by sending to the app the

identification of the place or display, i.e., *place's ID*. Based on this identification, the app can access the display environmental data, e.g., users' interactions or particular usage history of the apps within that place. In this step, the local manager may set the app specific place wide parameters, i.e., setup parameters, by loading an app configuration view within an *iframe* HTML element. Secondly, depending on additional app configuration requirements the local manager may load another configuration view, i.e., instantiation view, within a similar *iframe* element. In this step, he or she sets further app specific configuration, e.g., background color. For each distinct configuration an instance is created with a distinct presentation URL. After the second configuration step, the online service gets the apps' URLs, which are orchestrated for presentation using a time-based player. For both configuration steps, we assume that the apps are responsible to manage the generation and storage of the presentation URLs by themselves.

### 4. REQUIREMENTS

Our demonstration requires power, wireless Internet connection, a white board or wall space for a projection and small amount of table space for a projector and associated computer.

### 5. ACKNOWLEDGMENTS

The research has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement no. 244011 and "Fundação para a Ciência e a Tecnologia", under the research grant SFRH/BD/75868/2011.

### 6. REFERENCES

- [1] N. Memarovic, I. Elhart, and M. Langheinrich, "FunSquare: First Experiences with Autopoiesic Content," in Proceedings of the 10th International Conference on Mobile and Ubiquitous Multimedia - MUM '11, 2011, pp. 175–184.
- [2] T. Kubitzka, S. Clinch, N. Davies, and M. Langheinrich, "Using mobile devices to personalize pervasive displays," ACM SIGMOBILE Mobile Computing and Communications Review, vol. 16, no. 4, p. 26, Feb. 2012.
- [3] N. Davies, M. Langheinrich, R. José, and A. Schmidt, "Open Display Networks: A Communications Medium for the 21st Century," Computer, vol. 45, no. 5, pp. 58–64, Mar. 2012.
- [4] C. Taivan and R. José, "An application framework for open application development and distribution in pervasive display networks," in On the Move to Meaningful Internet Systems: OTM 2011 Workshops, Springer Berlin / Heidelberg, 2011, pp. 21–25.
- [5] E. M. Huang, A. Koster, and J. Borchers, "Overcoming Assumptions and Uncovering Practices: When Does the Public Really Look at Public Displays?," in Pervasive, 2008, vol. 5013, pp. 228–243.
- [6] J. Müller, D. Wilmsmann, J. Exeler, M. Buzcek, A. Schmidt, T. Jay, A. Krüger: "Display Blindness: The Effect of Expectations on Attention towards Digital Signage," in Pervasive Computing, 2009, vol. 5538, pp. 1–8.
- [7] R. José, H. Pinto, B. Silva, A. Melro, and H. Rodrigues, "Beyond interaction: tools and practices for situated publication in display networks," in Proceedings of the 2012 International Symposium on Pervasive Displays - PerDis '12, 2012, pp. 1–6.