2-IMMERSE: A Platform for Orchestrated Multi-Screen Entertainment

Ian Kegel
BT Research &
Innovation
Ipswich, UK[1]

James Walker
Cisco
London, UK[2]

Mark Lomas
BBC Research &
Development
Salford, UK[3]

Jack Jansen
CWI
Amsterdam, The
Netherlands[4]

John Wyver
Illuminations,
London, UK[5]

ABSTRACT

This demonstration will showcase a new approach to the production and delivery of multi-screen entertainment enabled by an innovative, standards-based platform developed by the EU-funded project 2-IMMERSE. Object-based production enables engaging and interactive experiences which make optimal use of the devices available, while maintaining the look and feel of a single application. The 'Theatre at Home' prototype offers an enhanced social experience for users watching a live or 'as live' broadcast of a theatre performance, allowing them to discuss it with others who are watching at the same time, either in a different room or in a different home.

Author Keywords

Multi-screen; companion apps; object-based broadcasting; TV production; HbbTV; cloud services; entertainment.

ACM Classification Keywords

H.5.1 Multimedia Information Systems

INTRODUCTION

The 2-IMMERSE project, an EU-funded collaboration within the Horizon 2020 programme, is developing an innovative approach to the production and delivery of multi-screen entertainment. The project is focused on experiences that are conceived as multi-screen in production and delivered to be flexible across single-screen to multi-screen environments and responsive to the preferences of individual audience members. 2-IMMERSE has developed an extensible, standards-based delivery platform based on re-usable components in order to accelerate the development of new immersive multi-screen experiences.

The project is building and trialling four prototype multi-screen experiences in order to drive requirements for its platform and to validate its architecture at scale. Two of these, 'Theatre at Home' and 'Theatre in Schools', will create compelling experiences using the performances of the Royal Shakespeare Company for audiences at home and in schools. Two further prototypes will create personalised sports experiences, both for viewers of MotoGP races in their

homes, and to enhance the enjoyment of football fans watching the UK's FA Cup tournament in pubs and clubs. The resulting platform will be open to extension by third parties enabling new genres of multi-screen experiences to be created.

Flexibility of delivery enables audiences to share and personalise their engagement. Programmable access to the flow of this broadcast and broadband media enables third parties to create new media apps and plug-ins to extend and innovate in the new synchronised broadcast and broadband media landscape.

OBJECT-BASED BROADCASTING

In current industry practice, when the composition of digital media content is completed during the production process and before delivery to the consumer, it is exceptionally difficult to create a personalised, interactive experience. Furthermore, producers are limited in their ability to optimise that experience for the different combinations of screens and input devices available to each consumer.

Unlike existing services, in 2-IMMERSE multi-screen experiences the content layout and compositions are orchestrated across the available screens and created using an object-based production approach. This enables efficient delivery of experiences that are immersive, responsive and personalised. Everything is captured as objects, while object-based delivery and late composition can be scaled up and down to meet the needs of a broad range of multi-screen environments and operating constraints using cloud-based composition.

THE 2-IMMERSE PLATFORM

2-IMMERSE experiences are composed of many applications configured to work together to deliver the look and feel of a single application. 2-IMMERSE calls this collection a Distributed Media Application, or DMApp. Re-usable components (DMApp Components) are assembled within a Distributed Media Application (DMApp) to create coherent multi-screen experiences. Figure 1 shows a high-level overview of the 2-IMMERSE platform, indicating both the core services (in orange and yellow) and those provided by the infrastructure platform (in green), as well as a simplified client application architecture.

At the core of the 2-IMMERSE architecture is Mantl, a modern platform for rapidly deploying globally-distributed services, typically as containers. It provides an integrated set

of industry-standard open-source components and can be deployed with a variety of different cloud infrastructure providers. This is supported by an Origin Server, on which digital content assets, DMApp Components, timeline and layout documents are hosted.
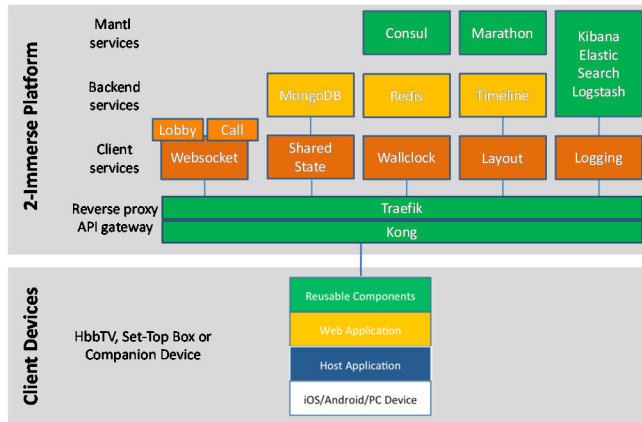

Figure 1: The 2-IMMERSE Platform and Client Architecture

The Distributed Media Application (DMApp) is a collection of applications which are co-ordinated to deliver a multi-screen experience within a household. In order to facilitate the re-use of key functionality which is common to all experiences, the application stack implemented on each client device is split into multiple layers, including a bootstrapping application, an onboarding application and the application responsible for the individual experience.

DMApp Components are a way to encapsulate functionality and user interface elements in discrete entities which are individually specified and controllable by the Layout Service. Twelve reusable DMApp Components have been developed so far, including components which play audio and video, present text and image content and provide real-time video communication and text chat. The Component Switcher is a key component which provides a UI to enable different parts of the experience (and hence DMApp Components) to be selected. Authors may use a range of web standards to implement DMApp Components, including the Web Components standard.

The Timeline and Layout Services are unique to 2-IMMERSE. The Timeline Service is responsible for the overall temporal orchestration of the experience (DMApp) within a single household. It manages the lifecyle of DMApp Components as the experience progresses. The Layout Service is responsible for managing and optimising the presentation of a set of DMApp Components across a set of participating devices. This is achieved through a series of rules and constraints reflecting device capabilities while allowing personal overrides.

The Shared State Service provides a repository for key information which must be shared between different clients participating in a multi-screen experience. It includes a simple notification subscription model, managed through a

client API, and reduces the amount of bespoke application logic required.

The 2-IMMERSE platform is also making extensive use of the HbbTV 2.0 specification (latest version: HbbTV 2.0.1, available from www.hbbtv.org), a group of standards which enable interactive services over broadcast and broadband networks. HbbTV 2.0 provides companion screen support, companion device discovery and communication and synchronisation mechanisms, all of which are essential ingredients for a multi-screen experience.

THEATRE AT HOME DEMONSTRATION

We will demonstrate how the 2-IMMERSE platform enables flexible, object-based multi-screen experiences to be created and delivered, using the project's first service prototype, 'Theatre at Home'. It offers an enhanced social experience for users in a domestic context to watch a live or 'as live' broadcast of a theatre performance and to discuss it with others who are watching at the same time, either in a different room or in a different home. The 'Theatre at Home' DMApp runs across a TV and one or more companion devices. The TV prioritises DMApp Components which contribute to the communal experience, including not only the theatre broadcast but also live video chat and a synchronised script display. The companion devices enable the audience to interact with each other and to personalise their experience with synchronised information streams related to the play and the production. Figure 2 shows an example screen shot from a companion device.
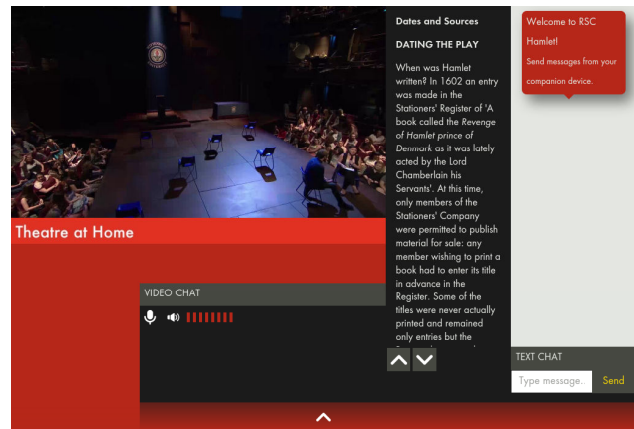

Figure 2: Example of a companion device display from the 'Theatre at Home' DMApp

CONCLUSION

By creating a platform, reference architecture and exemplar services, 2-IMMERSE is opening up a number of opportunities and challenges for the delivery of shared and personalised audience experiences across multiple screens, multiple content genres (beyond the examples of sport and theatre) and multiple situations (in the home, in schools and in public spaces).