

# COMP EIT

D5.3

Broadcast Presence Studio 1.0

Version 1.0

WP5 New Media Services

Dissemination Level: Restricted

Lead Editor: Maor Conforti, LiveU

28/11/2014 + adjustments

Status: Submitted

**SEVENTH FRAMEWORK PROGRAMME THEME**

**ICT -2013.1.6**

Project full title: COnnected Media and Presence from European Institute of Technology

Grant agreement no.: 611324



## Context

WP 5	New Media Services
WPL	Noam Amram (LiveU)
Task 5.3	Broadcasting Presence Studio
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Dependencies	This deliverable uses specifically the input of D5.1 User Profile and D2.4 Value Sensitive Requirements 1.0. It will be integrated into D3.4 First Prototype and is the basis for further collaborations between the partners in the BPS service and in WP5 in general.
Starting date	03/09/2014
Release date	30/11/2014

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Approved by:	Project Management

## History

Version	Date	Authors	Sections Affected
0.1	30/10/2014	Noam Amram (LiveU)	First Draft
0.2	27/11/2014	Maor Conforti (LiveU)	Added diagrams and screenshots
0.3	5/12/2014	Maor Conforti (LiveU)	Applied comments from review by Markus Ylikerälä (VTT)
1.0	29/10/2015	LTU Johan E. Bengtsson	Final adjustments for Year 2 submission, improving explicit linkage to other deliverables. Expanded the Conclusions and the Summary somewhat, and minor improvements.

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# Abbreviations

BPS	Broadcast Presence Studio
CDN	Content Delivery Network
COMPEIT	COnnected Media and Presence from European Institute of Technology
HD	High Definition (video)
P2MP	Point-to-Multipoint (aka broadcast)
UI	User Interface
WebRTC	Web Real Time Communication

# 1. Summary

This is a short report that accompanies the implemented prototype that is the first result of T5.3 Broadcast Presence Studio.

The Broadcast Presence Studio (BPS) is a service for sharing media from a remote contributor, over the network, for example live video. It uses new technologies that enhance the authenticity of the experience, such as HD video, bi-directional communication and more.

In order to have a clear and coherent understanding of this service, we progressed existing scenarios for the COMPEIT system by adding media production aspects. This scenario describes a sick child who's currently admitted in a hospital, and uses the system to (virtually) be with his family and friends wherever they are, and to consume and produce media for others to use.

This document presents the BPS service and its user scenario, and then describes the first implemented prototype of Broadcast Presence Studio. The first prototype uses advanced video streaming technologies to transmit high definition video from a mobile phone to a web page on browsers with minimum latency.

We expanded the existing COMPEIT architecture from WP3 and implemented a subset of its components that was needed for the BPS service.

The design includes several User Interfaces (UIs) for the different types of users. There is a UI for configuring the system, a UI for transmitting video and a UI for selecting and receiving video streams.

PBS is driven by a strong business case at LiveU, where millions of users will be enabled to contribute live media for main broadcasters as well as to smaller media producers on the Internet.

## 2. Introduction

This document describes the first prototype of the "Broadcast Presence Studio" [BPS]. BPS is developed in T5.3 Broadcast Presence Studio of the COMPEIT project.

COMPEIT creates a web-based system for highly interactive, personalized, shared media experiences. Research and development is linking content-delivery networks with tools for enhancing mediated presence. COMPEIT takes the view that Internet-based distribution will transform traditional broadcasting towards higher levels of interactivity and integration with virtual, mixed and augmented reality, enabled by advanced web technologies and the proliferation of audio/video/tangible devices.

WP5 New Media Services finds out, researches and develops new key media services based on knowledge beyond the current state-of-the-art. It interacts with and builds on the application scenarios described in D2.4 Value Sensitive Requirements 1.0 and progressed in D5.1 User Profiler, the technical specifications described in D3.2 Initial System Specification and D3.3 Platform and Framework 1.0, and it leverages on the ideas and components developed and tested in WP4 Mediated Presence Components. The goal is to create new usable end-user services for future media needs including how to break out of the classical video box on the web and based on emerging HTML5-technologies (WebGL, WebRTC, CSS3 etc.) to create a novel user experience all in the web browser. Overall, all prototypes are developed for the cloud and the web allowing the user to produce and consume the media independently of where he/she is located without the need to install any extra software besides a modern web browser.

Broadcast Presence Studio (BPS) is a web-based environment for mixing live (or stored) media with other types of web-based media, such as photos, maps, web pages or even full web applications. Further, this is envisioned to facilitate pre-processing for virtual eye contact, using multiple cameras or full stereoscopic field cameras. The BPS will also facilitate consumption of media through the services developed in T5.1 Shared Media Distribution, see for example D5.2 Shared Tangible Experience Service.

Figure 1 below shows BPS as one of many possible COMPEIT user interfaces. See D5.1 User Profiler for details on this map of components and interaction possibilities.

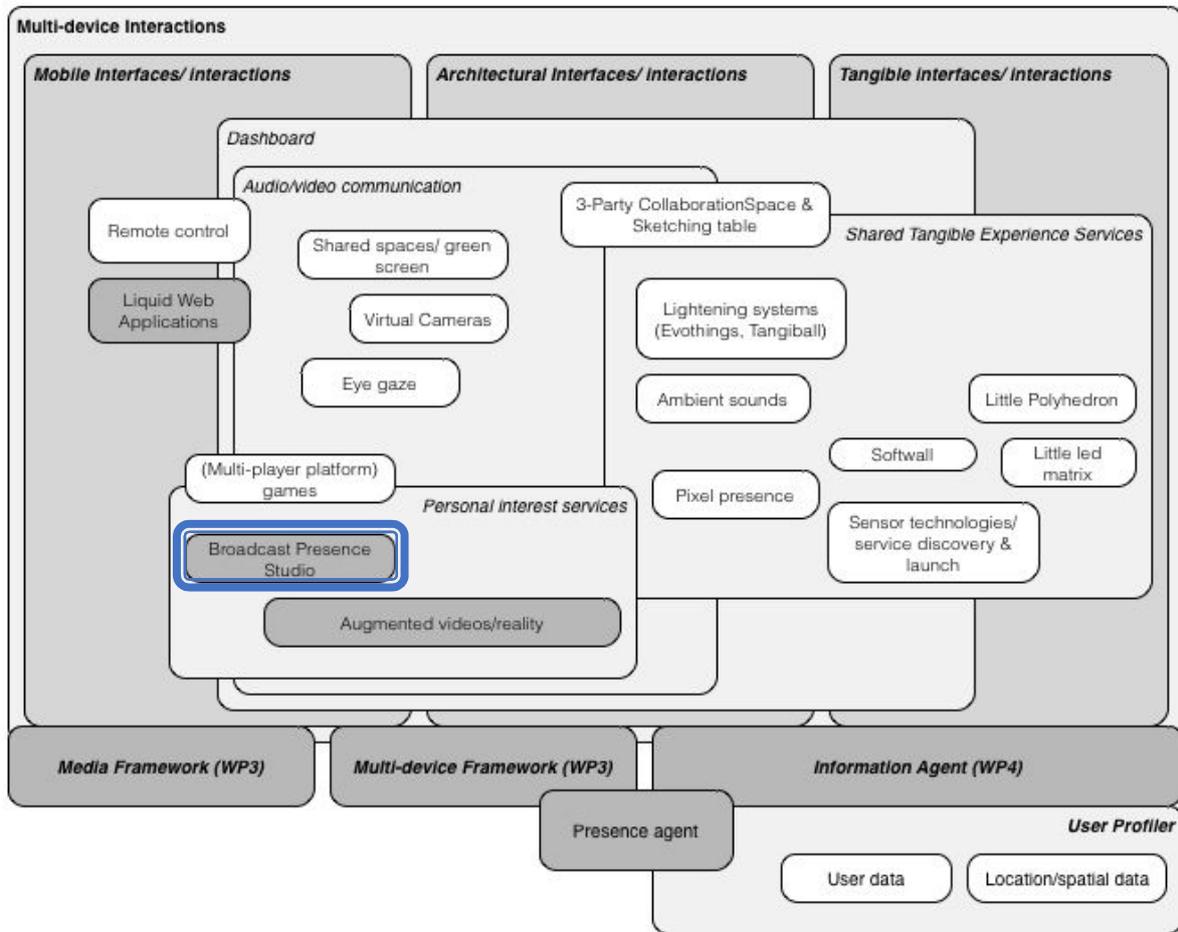


FIGURE 1: COMPEIT COMPONENTS AND SERVICES MAPPED ON INTERFACES

This report is organized as follows, the main use case is described first, then there is a description of the BPS service, followed by detailed description of the developed prototype together with a description of the planned system architecture so that the reader can understand the context of the work that has been done.

### 3. The BPS Service

The result of of T5.3 Broadcast Presence Studio is the delivery of BPS prototypes. This document describes the first version of the prototype and the design and architecture of the planned service in general. Let's first understand the BPS service in general, which is a super-set of the current implemented first version.

#### 3.1. The Service

The BPS is a service that delivers live video from a contributor who uses a mobile phone (currently iPhone, but Android will also be supported) to viewers who watch it on web browsers.

The contributor runs the LU-Smart application, or, in the future, a simple web browser that encodes and transmits the video to a cloud server. The video is then transmitted on demand to any web browser viewer. This flow runs with minimum delay and excellent video quality.



FIGURE 2: BPS OVERVIEW

From the web browser the media producer will be able to see the currently available video streams shown on a map, where clicking on any of them will play the stream on the browser.

The service will also allow bi-directional communication with the video contributors, using D5.2 Shared Tangible Experience Service and later versions of it.

## 3.2. The Scenario – Live Life

This scenario describes a sick child who is currently admitted in a hospital, and uses the system to (virtually) be with his family and friends wherever they are. It expands upon and adds precision to the scenarios described in D2.4 Value Sensitive Requirements 1.0 and D5.1 User Profiler. All COMPEIT scenarios will be put together in the upcoming D2.5 Value Sensitive Requirements 2.0.

We use this story, which is easy to relate to, as the main use case to design and then to evaluate the effectiveness of the BPS prototype that we build.

*“The best thing in the world is field hockey. It might sound a little stupid, but it really is! Together we work to make it a great season, to learn from each other but also to have fun. We have a great team, and during the season more people joined. The more we grew in number, the more we grew as a team. And we wear awesome T-shirts. Mom and dad, Sven and Hannah are always there to support me. When Sven got cancer we were all really sad. In the beginning there was a lot going on. Everything was new, the hospital, doctors and the chemo. But everything else just continued. My school, mom and dad’s work but also watch the field hockey games. But now it was always just one of my parents watching and sometimes Hannah. The rest would be at the hospital. It might sound selfish, but I really liked having everybody there. It’s something we would do together, making jokes. In the beginning of the season my dad would send some pictures of the game to Sven but it’s not the same.*”



FIGURE 3: FIELD HOCKEY

*Once we started using COMPEIT it all got more natural, we could be more together. We can watch what the others are filming live. And now we can be together at the hockey field again! We are all hooked up to the COMPEIT services. When I got used to it I realized that I could go anywhere, since everybody around the world can use it. Together with Sven we watched the Niagara Falls, and we watched the football game of Sven’s favourite team. We could switch from a lot of angles because there were so many people filming. We watched from the audience and even from the field, because the coach is using COMPEIT too! When I’m at school I sometimes worry about our goldfish Blub. Did I forget to feed him?*

*I use COMPEIT services to see that he's swimming around happily. When Santa visited our school I filmed it. Sven joined in and got a present too! At Christmas the mayor of our town always gives a speech in the town square, and because we were a 2 hour drive away at my grandparents, we instead watched it live using COMPEIT. I like that I can watch what happens in the world right now. I can go visit places but I can also see how other peoples' goldfish are doing, if they allow it. I just type in: goldfish, and can choose which one I want to see. Are they as funny and good looking as Blub?*

*Last week I got really worried. There was a fire at my dad's work. I could see that he was filming it so I used COMPEIT to view his public livestream from YouTube. That way I knew what was happening and that he was fine. He filmed the whole thing and it was on the 8 o'clock news! The news channel was really happy with it because they didn't have a reporter on the site. My dad has a really cool job. I don't know exactly what he does but he is always really busy. He talks to people all around the world. He has a lot of meetings. They use COMPEIT to show what their products can do. Or when my dad can't go to China because Sven has a chemo, he participates in the meeting using COMPEIT.*

*But maybe this is enough about COMPEIT so back to business. Today is the final match of the season. We really have to win this one. Everybody will be watching, my mom, dad, and my sister Hannah. My brother Sven will join live from the hospital. I check my bag one more time, have I got everything? 'Dad? Are you bringing the little LED matrix ("Max") so Sven can keep the score?' 'Yep, I've got it!' On my way out I quickly tap the lamp (Smart Lamp) once. It turns pink and so does the Lamp at Sven's room. Off we go! Once we arrive at the hockey field I go to the changing rooms. Dad is going to plug in Max. My mom and Hannah are getting something to drink in the cafeteria and are filming already. When we enter the field the entire team feels a little nervous. But we will work together. I know my family is watching. My mom yells: 'Go Lizzie!!' Max is blinking, Sven is here. Then I hear him shouting: Go get 'em Liz! I turn around and see his smiling face projected live on the scoreboard. I'm so happy they are there and it makes me feel more confident. Let the game begin!"*

### **3.3. General Architecture**

In order to provide high quality live video for the scenario described above, we expand on technology designed for news broadcasters. News broadcasters use the technology to transmit live HD video from the field to TV newsrooms, and we integrate it into the COMPEIT services. We are relating to the architecture described in D3.3 Platform and Framework 1.0, and that will be fully documented in D3.4 First Prototype:

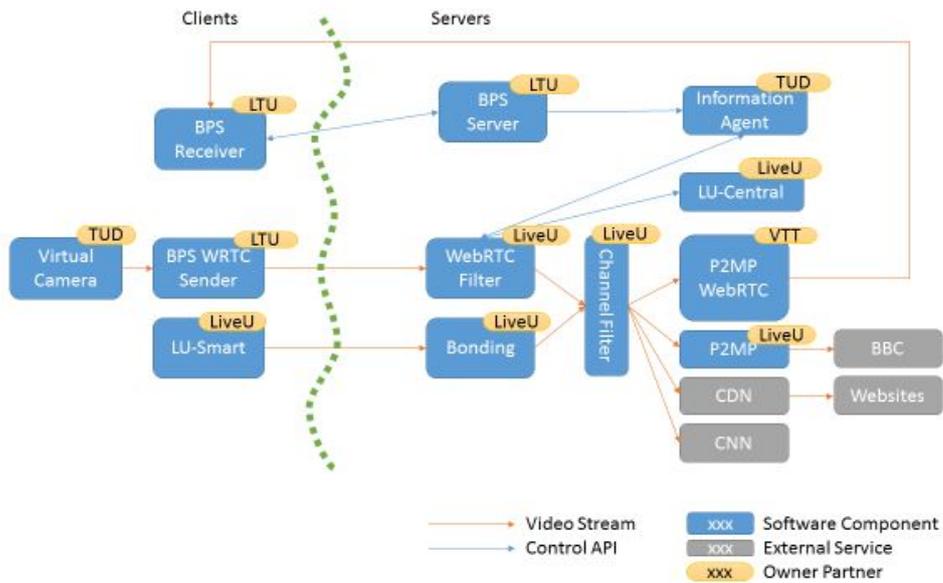


FIGURE 4: BPS SERVICE SYSTEM ARCHITECTURE

The different components are described here:

Component	Description
<b>LU-Smart</b>	A mobile app that transmits HD video to a cloud server using a proprietary bonding technology.
<b>Bonding</b>	Receives multi-channel video transmission from LU-Smart and converts it to a standard video stream.
<b>Channel Filter</b>	Transmits a video stream to a preconfigured target.
<b>P2MP</b>	A proprietary broadcast engine for distributing streaming video to multiple professional news organizations.
<b>P2MP WebRTC</b>	A broadcast component that can simultaneously transmit video to multiple targets using different video qualities.
<b>LU-Central</b>	Management web console to control and monitor video transmitting devices and servers.
<b>Information Agent</b>	A COMPEIT component that tracks users' location, emotional status, activities and plan etc. [D4.2 Information Agents 1.0]
<b>BPS Server</b>	Web Application Server that is part of the COMPEIT app server serving the BPS Receiver HTML/JS/CSS and dynamic data from the InformationAgent and LU-Central servers.
<b>BPS Receiver</b>	A web page in the COMPEIT prototype website that contains the main UI for BPS. It allows user to select video to watch, watch the video, and communicate with video providers.

# 4. BPS Prototype 1.0

The work on BPS service is done in iterations where each new version of the prototype (Prototype 1.0, Prototype 2.0, etc.) provides more features, and is closer to the service that we want to provide.

In the current version 1.0 we have a working system that has the following software structure:

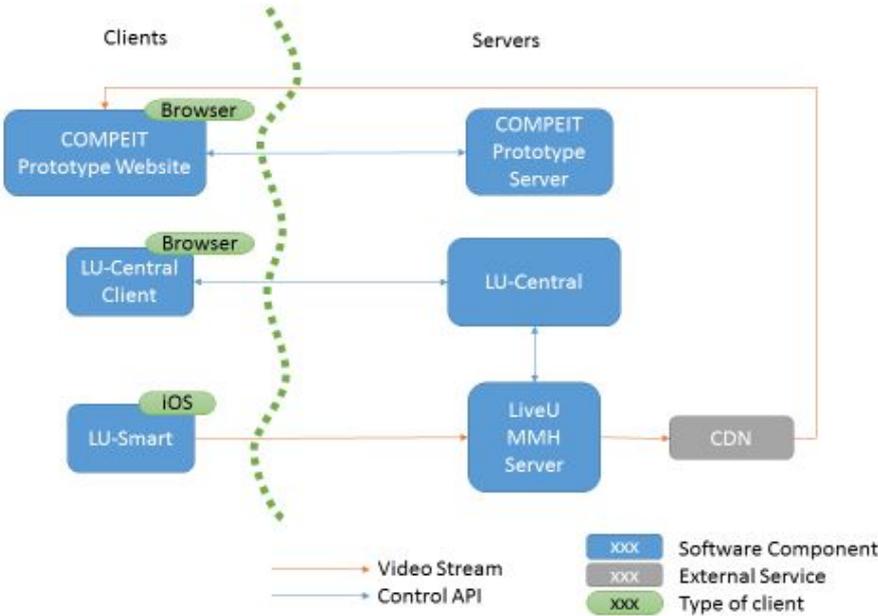


FIGURE 5: BPS PROTOTYPE 1.0 - ARCHITECTURE OVERVIEW

The developed technology in BPS 1.0 involves three video software modules. The first is the mobile SDK called LU-Smart, that runs on iOS mobile unit<sup>1</sup>. It transmits video through cellular networks and WiFi. The second is a web application server called LU-Central, and the third is the LiveU "MMH" server that bonds the video channels from the unit into a standard video stream.

In the current prototype any user with credentials to the LU-Central that wishes to view live video stream from a specific location, can search geographically by specifying the location on the map. All he/she needs to do is mark the desired area with a rectangle, and choose the devices they want to see video feeds from. They can select a specific device found at the location (at the moment using their cell ID, however it will be possible to utilize also GPS location from the Information Agent) "Live" device, or to contact the devices marked as "Ready" in order to get their video feeds. As we continue development, similar functionality will be available from inside BPS itself.

<sup>1</sup> Android will be supported in a future version.

The 1.0 prototype does not yet integrate with COMPEIT's User Agent and does not yet support WebRTC web clients, however it is prepared to be able to pass on video feeds to YouTube from which they can be viewed in D5.1 Shared Tangible Experience Service.

## 4.1. User Interfaces

BPS has a few types of users (Video Photographer, Viewer, and System Administrator), with an available user interface for each. In the future we may move functionality between the different interfaces.

### 4.1.1. Broadcast Presence Studio UI

Viewers of the video transmission uses the main COMPEIT Prototype UI (see the upcoming D3.4 First Prototype for details), where they can see a static map and a video player.

The map shows pins representing the different transmitting devices. We plan to make those pins clickable. Clicking a pin will make the video stream of that device visible in the video player that is on the right side. In BPS 1.0 the player shows a stream coming from a CDN channel.

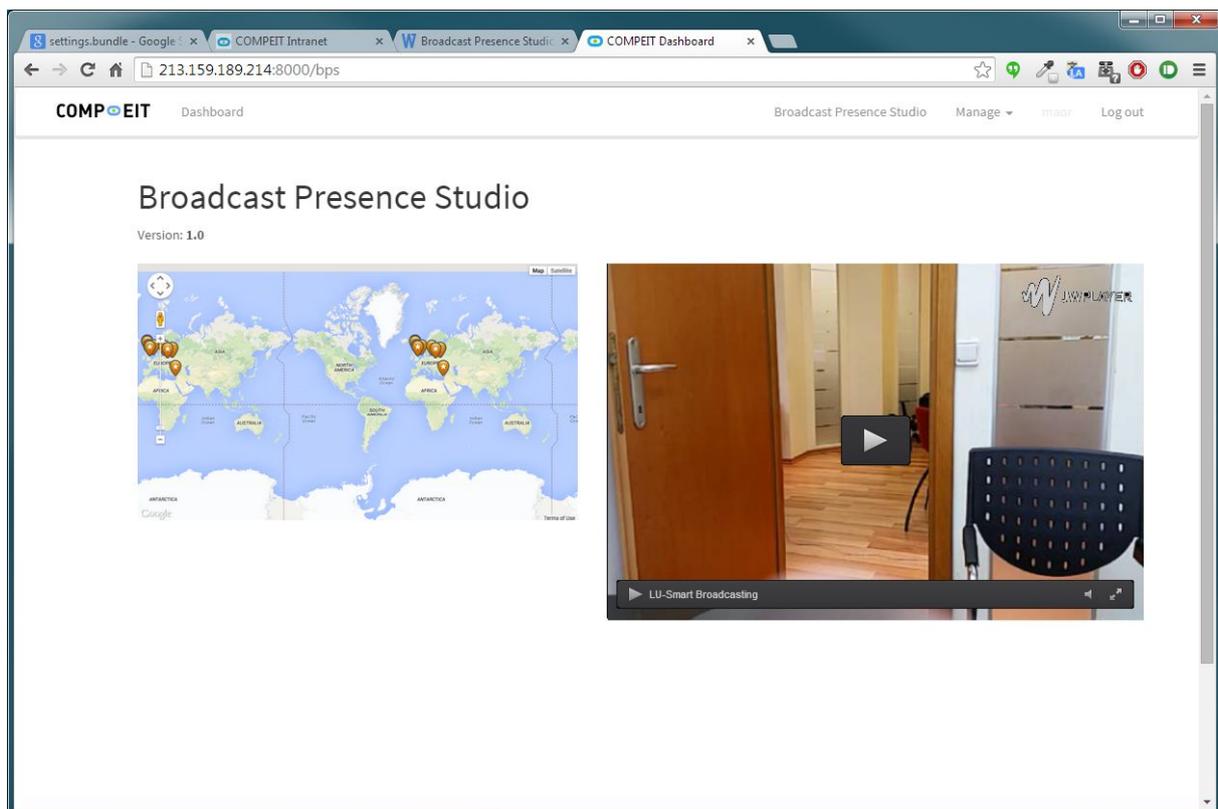


FIGURE 6: BROADCAST PRESENCE STUDIO UI

### 4.1.2. LU-Smart HD application running on iPhone 5s

LU-Smart HD is an iOS Application that transmits HD video to an "MMH" Cloud Server using a proprietary multi-channel bonding technology that sends data simultaneously through both cellular networks and WiFi networks, for robustness.

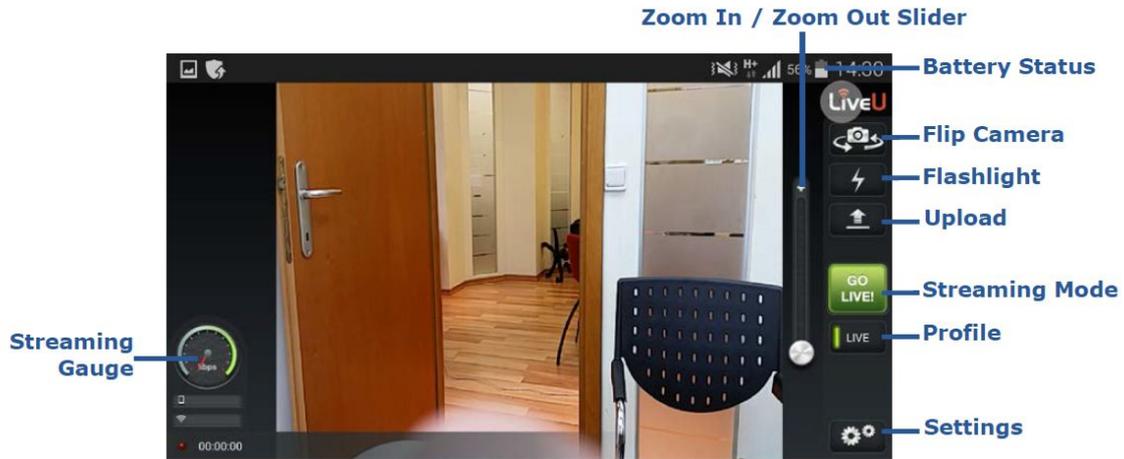


FIGURE 7: LU-SMART UI

In PBS 1.0 this is the only device that generates video stream into the BPS system.

### 4.1.3. LU-Central Web UI

LU Central is a management service for managing both the LU-Smart and the MMH Cloud Server. In PBS 1.0 it is used to configure the LU-Smart device to stream to a dedicated MMH, and from there to stream to a Limelight CDN account.

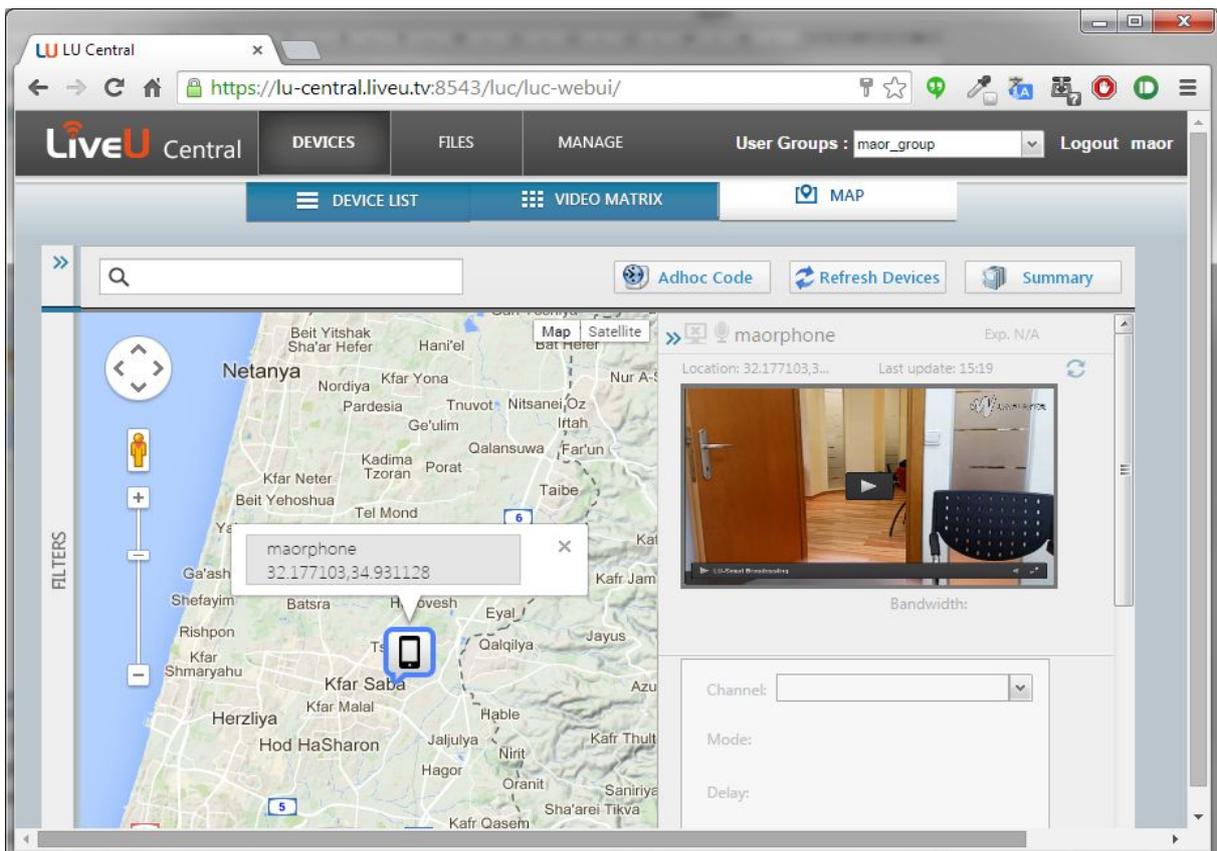


FIGURE 8: LU-CENTRAL UI

As soon as the LU-Smart is turned on, it keeps constant communication with LU-Central so that LU-Central can follow the device's status, its geographic location, and control communication parameters like desired latency.

## **4.2. Servers**

### **4.2.1. The COMPEIT Web Application**

For BPS the COMPEIT Prototype Application Server provides an execution framework. Specifically for BPS it provides static file resources (HTML/JavaScript/PNG/CSS files.)

### **4.2.2. LU-Central Server**

LU-Central monitors and controls the LU-Smart and the LiveU MMH Cloud Server. It applies the pre-defined configuration to the LU-Smart units as they are activated. It also monitors their proper operation.

# 5. Insights on Technology Exploitation

BPS is strongly motivated and driven by a business case at LiveU. Below we share some confidential details of this business case.

LiveU's customers (mostly TV broadcasters) today are using the streaming technologies that are supported by BPS 1.0. LiveU is the leading provider in live video for news gathering with most first tier broadcasters around the world. LiveU are aiming and developing the mobile SDK to be integrated into LiveU customers applications (such as in 40 million CNN installed apps), and this will allow customers in the professional domain to get live media from unplanned news events where they do not have their own reporters and/or cameramen. This service is referred to be "Be First" service as shown in Figure 9.

An example is an early pilot from the Boston marathon (April 2013):

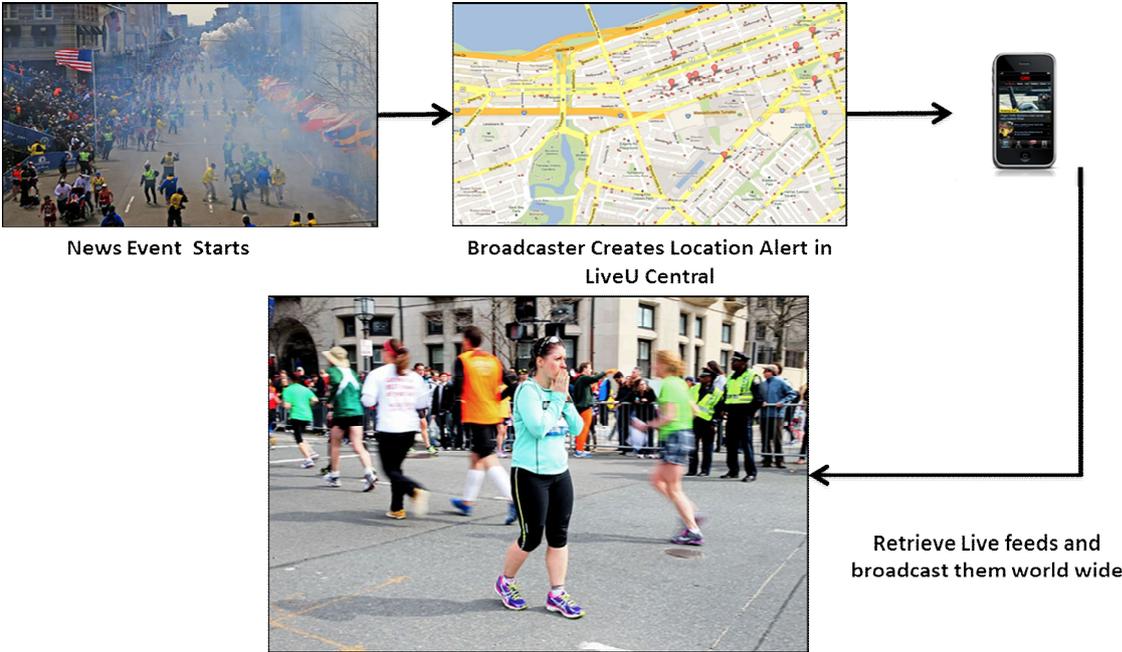


FIGURE 9: BE FIRST SERVICE EXAMPLE

Moreover, LiveU is constantly seeking to enlarge its services from professionals to prosumers and to consumers, and we see in the BPS service a great COMPEIT technology to approach those markets. We foresee that the COMPEIT technology will be used by news professionals/freelancer reporters all around the world to sell live news streams to many TV channels at the same time.

## 6. Conclusions and Further Work

As shown in this document above, we have a working subset of the components of the BPS service integrated and being usable by D5.1 Shared Tangible Experience Service. It is capable of transmitting high quality video from the field to a web page.

BPS has great commercial potential in itself, but will also be useful for enhancing services from T5.2 Shared Media Distribution so that consumers of media can become *prosumers* that also contribute media streams to broadcast and Internet-based media production.

The next steps for the next versions of BPS are:

- a. Create a web client that can also provide streaming video into the system. This client should be able to run on a browser on devices.
- b. Use WebRTC where possible for streaming video.
- c. Use a WebRTC broadcast technology (P2MP) instead of CDN.
- d. Provide bi-directional e-meeting communication between users, by relying on services from T5.1 Shared Media Distribution, or using platform components from T3.4 Platform and Integration Network.