This report summarizes the progress made in the development of the PLAYHIST experiment, following the description of goals, requirements, design and implementation plan included in D4.14.1. Details are given regarding the game design and the chosen architecture for the system, and also regarding the use and integration of resources bundled in the EXPERIMEDIA facility. Updates of risk and opportunities management, value impact and privacy impact assessment, and dissemination efforts are included too.
<table>
<thead>
<tr>
<th><strong>Project acronym</strong></th>
<th>EXPERIMEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full title</strong></td>
<td>Experiments in live social and networked media experiences</td>
</tr>
<tr>
<td><strong>Grant agreement number</strong></td>
<td>287966</td>
</tr>
<tr>
<td><strong>Funding scheme</strong></td>
<td>Large-scale Integrating Project (IP)</td>
</tr>
<tr>
<td><strong>Work programme topic</strong></td>
<td>Objective ICT-2011.1.6 Future Internet Research and Experimentation (FIRE)</td>
</tr>
<tr>
<td><strong>Project start date</strong></td>
<td>2011-10-01</td>
</tr>
<tr>
<td><strong>Project duration</strong></td>
<td>36 months</td>
</tr>
<tr>
<td><strong>Activity 14</strong></td>
<td>Experimentation</td>
</tr>
<tr>
<td><strong>Workpackage 4.14</strong></td>
<td>EX14 PLAYHIST</td>
</tr>
<tr>
<td><strong>Deliverable lead organisation</strong></td>
<td>TECNALIA</td>
</tr>
<tr>
<td><strong>Authors</strong></td>
<td>Rosa Peral, Sara Sillaurren, Ainhoa Pérez, Pablo Aguirreizabal (TECNALIA)</td>
</tr>
<tr>
<td><strong>Reviewers</strong></td>
<td>Magnus Eriksson (Interactive)</td>
</tr>
<tr>
<td><strong>Version</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Final</td>
</tr>
<tr>
<td><strong>Dissemination level</strong></td>
<td>PU: Public</td>
</tr>
<tr>
<td><strong>Due date</strong></td>
<td>PM31 (2014-04-31)</td>
</tr>
<tr>
<td><strong>Delivery date</strong></td>
<td>2014-05-09</td>
</tr>
</tbody>
</table>
# Table of Contents

1. Executive Summary .................................................................................................................. 5
2. Introduction ................................................................................................................................. 6
3. PLAYHIST system architecture description .............................................................................. 9
4. Gameplay design features .......................................................................................................... 12
   4.1. 3D scenery selection ............................................................................................................. 12
   4.2. 3D models transformation ................................................................................................. 13
   4.3. 3D terrain transformation ................................................................................................. 13
       4.3.1. Stage 1 ...................................................................................................................... 13
       4.3.2. Stage 2 ...................................................................................................................... 13
       4.3.3. Stage 3 ...................................................................................................................... 14
       4.3.4. Stage 4 ...................................................................................................................... 14
       4.3.5. Stage 5 ...................................................................................................................... 15
       4.3.6. Stage 6 ...................................................................................................................... 16
       4.3.7. Stage 7 ...................................................................................................................... 16
4.4. Game concept ......................................................................................................................... 16
5. Design and implementation of the PLAYHIST system .............................................................. 18
   5.1. Visitor's environment .......................................................................................................... 18
       5.1.1. Work done so far ....................................................................................................... 18
       5.1.2. Future work ............................................................................................................... 18
       5.1.3. Comments ................................................................................................................ 19
       5.1.4. Progress screenshots ................................................................................................. 19
   5.2. Expert desktop environment ............................................................................................... 19
       5.2.1. Work done so far ....................................................................................................... 19
       5.2.2. Future work ............................................................................................................... 19
       5.2.3. Progress screenshots ................................................................................................. 19
   5.3. Playlist core environment ................................................................................................... 20
       5.3.1. Work done so far ....................................................................................................... 20
       5.3.2. Future work ............................................................................................................... 20
       5.3.3. Comments ................................................................................................................ 20
       5.3.4. Progress screenshots ................................................................................................. 20
6. Legal and privacy issues ........................................................................................................... 23
6.1. Privacy .......................................................................................................................... 23
6.2. Participants / recruitment .............................................................................................. 23
7. Dissemination efforts ...................................................................................................... 24
  7.1. Meetings ..................................................................................................................... 24
8. Conclusions .................................................................................................................... 25
Annex A: PLAYHIST experiment educational goals ......................................................... 26
Annex B: PLAYHIST game mechanics ............................................................................. 27
Annex C: PLAYHIST game flowchart .............................................................................. 29
1. Executive Summary

This document summarizes the progress made by TECNALIA in the development of the PLAYHIST experiment, following the description of goals, requirements, design and implementation plan included in D4.14.1, “PLAYHIST Experiment: Problem Statement and Requirements”. In section 3, we are including a detailed description of the system architecture finally chosen. In section 4, major gameplay design features will be described and extended in Annex A and Annex B, along with a number of screen captures illustrating the state of implementation of the gameplay and features. In section 5, implementation of the software developed that will make up the PLAYHIST system, paying attention to how they rely on the components of the EXPERIMEDIA facility. In section 6, we include an update of the value impact and privacy impact assessments. In section 7, we provide a report of dissemination efforts and plans.
2. Introduction

As explained in D4.14.1, the goal of the PLAYHIST experiment is to investigate an approach to enhance visitor experience in history learning by using a 3D interactive and collaborative serious game that will engage visitors with new ways of interactive group activities. The experiment will be carried out by taking advantage of the technological features provided by the EXPERIMEDIA facility, as well as of the spaces, equipment and contents available at the Foundation of the Hellenic World (FHW). PLAYHIST experiment will try to create a more engaging experience for the FHW visitors transforming one of the interactive projections in a multiuser game in which the participants must achieve a specific goal moving and interacting in the virtual world with a complex aim: obtaining an engaging learning experience about Hellenic history.

The PLAYHIST experiences will be organised in two stages to achieve the experiment goal:

- Visitors to the FHW will be randomly assigned to two different groups:

  1) Group A will be the control group and will define the baseline for subsequent comparisons. They will play with the interactive film that is already on exhibition in the venue.
  2) Group B will be the experimental group, and they will play a 3D serious game that will be developed using Unity 3D Engine\(^1\). The plot of this serious game will be aligned to one of the interactive movies already exhibited in the FHW. The game will recreate an historical place where people will have to interact and complete specific tasks along the 3D scene for achieving a goal and at the same time, getting historical and cultural information.

- Visitors in Group B will play the historical game. The main steps for the game progression will be:

  1) The visitors get their tablets or an external laptop (now the two possibilities are being considered) and begin to configure their character in the game. They will have to choose between a standard character and a personalized one. If they decide to personalize the character, they will have to take a picture of themselves and through the application get their own character with their face.
  2) The visitors will be presented the main objective of the game, a brief historical introduction to the game and the steps or mini-games to get the final objective.
  3) For each mini-game, there will be an initial brief presentation of the specific challenge, and immediately, the visitors will begin to play the mini-game. The end of each mini-game will be defined both by time ending assigned to each mini-game or by all the visitors finishing and reaching the objective, the first of both events. Depending on the level of achievement on each mini-game, the visitor will be assigned punctuation and ranked in a general list (visible on the general screen of Tholos for all the visitors).

\(^1\) [http://unity3d.com/](http://unity3d.com/)
4) Once all the visitors have passed through all the mini-games, the winner will be considered the one who has got the more points in less time.

The work-plan of the PLAYHIST experiment remains as presented in D4.14.1, with tasks allocated over the next four phases:

- EXPERIMENT DESIGN (M1 to M2, completed). The goal of the EXPERIMENT DESIGN phase was to fully work out the problem statement and the experiment design, bearing in mind the advance of Activity 3 (construction of the EXPERIMEDIA facility). An initial review of the ethics and privacy considerations was conducted, too, and implementation and experimentation plans were sketched to drive the rest of the work. The results from this stage were gathered into D4.14.1.

- IMPLEMENTATION (M3 to M9, current). The IMPLEMENTATION phase deals with the realisation of all the processes required to obtain the IT and human resources needed to run the experiment at the FHW. From M3 to M8, the efforts would be devoted to the implementation of the elements of the PLAYHIST system, which would be integrated and deployed between M8 and M9.

- EXECUTION (M8 to M10). During the EXECUTION phase, between M8 and M10, the goal will be to collect as much data as possible for the evaluation of Quality of Service, Quality of Experience and Quality of Learning, as explained later in this document. In parallel with the running of the experiments, TECNALIA personnel will examine the feedback gathered in order to prepare new releases of the software, solving bugs and implementation defects.

- ANALYSIS AND PUBLICATION (M7 to M12). Finally, the ANALYSIS AND PUBLICATION phase will be devoted analysing the data gathered during the EXECUTION phase.
Here is an actualized Gantt graph with all the task by colours:

<table>
<thead>
<tr>
<th>WP</th>
<th>Task</th>
<th>Activity</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M7</th>
<th>M8</th>
<th>M9</th>
<th>M10</th>
<th>M11</th>
<th>M12</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.14.1</td>
<td><strong>Experiment Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.1.1 Experimental Method Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.1.2 EXPERIMEDIA resources requirement definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.1.3 PLAYHIST scenario definition and gamification structure definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.1.4 PLAYHIST functional definition and EXPERIMEDIA components connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.14.2</td>
<td><strong>Implementation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.2.1 3D World adaptation module implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.2.2 Gamification module implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.2.3 3D Avatar adaptation module implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.14.3</td>
<td><strong>Execution</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.3.1 PLAYHIST experiment monitorization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.3.2 Experiment associated data collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.3.3 EXPERIMEDIA technical activities support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.14.4</td>
<td><strong>Analysis and publication</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.4.1 Experiment data analysis and evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.14.4.2 Reports / Publications generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. PLAYHIST system architecture description

During the PLAYHIST experiment an interactive and collaborative serious game will be developed, by reusing and adapting the 3D content from the FHW 3D Model Repository, related to one of the interactive movies projected at the FHW. This game will allow visitors to act and interact as a historical character in a 3D environment recreating one of the historical moments depicted in the FHW. Visitors will be proposed with a mission or set of tasks that must be developed to achieve a specific goal, in an engaging and collaborative experience enhancing the learning process and therefore achieving a better historical knowledge.

TECNALIA’s first option was the direct execution of the experiment using the actual cloud rendering Alienware Linux machines of the Tholos Dome. The idea was use one external machine to control the different clients: projectors output and visitor tablets clients. The following figure shows the first PLAYHIST system architecture approach:

Some tests have been driven, in order to achieve this architecture. FHW Tholos rendering machines have Debian 5 Lenny distribution installed, so to run the desktop game developed for the experiment, we exported it to Linux. The problem we found was that when we execute the game on a Debian 5 machine it failed. This was exactly the problem given:

```
./aw.x86: /lib/i686/cmov/libc.so.6: version GLIBC_2.11' not found (required by ./aw.x86)
./aw.x86: /usr/lib/libstdc++.so.6: versionGLIBCXX_3.4.11' not found (required by ./aw.x86)
./aw.x86: /usr/lib/libstdc++.so.6: version `GLIBCXX_3.4.14' not found (required by ./aw.x86)
```
Basically, after a little research, we realized that these libraries were too old versions to be compatible with any Unity Player for Unix development, not just our game. Unity3D game engine supports officially Linux compatibility for Ubuntu 10.04 or later.

And we had an extra problem; FHW told us that these machines are absolutely critical for them, so they didn’t want to upgrade their systems. So we started researching the possibility of having multiple glibc libraries available on a single host.

After lots of effort, even against the Unity support team warnings\(^2\), we gave up trying this possibility. Basically we were trying to use two C and C++ runtimes for the operating system. We can assert this is almost impossible.

After this we tried to install an early version of glibc in a chroot environment in the same machine. Basically the idea was create a virtualized copy of the system with the appropriate glibc libraries. But we finally dismissed this option due to the fact that we were suspicious about the effectiveness on the link between the chroot environment and the gpu, and the complexity in the approach of this solution\(^3\).

For these reasons, TECNALIA has decided to move on and implement an alternative architecture using a Tecnalia Alienware machine (with Windows 7) with three graphic card exits. Tecnalia will bring to the FHW this machine to act as a render machine and also as server, and it will be directly connected to three Tholos projectors.

The next figure shows the final PLAYHIST system architecture:


\(^3\) [http://devpit.org/wiki/Gnu_Toolchain/GLIBC/Building_GLIBC#Build_and_Install_GLIBC_in_a_chroot_env](http://devpit.org/wiki/Gnu_Toolchain/GLIBC/Building_GLIBC#Build_and_Install_GLIBC_in_a_chroot_env)
With this architecture a single main machine will be responsible for rendering the game on the Tholos and also act like a server to manage all the interactions between the clients and also with the expert. This machine will host also the ECC.
4. Gameplay design features

4.1. 3D scenery election

On TECNALIA’s visit on November 2013 to Hellenic Cosmos, there were three possible 3D sceneries to be chosen for the gamification. People from FHW inform to TECNALIA that until 2005 they have used OpenGL Performer to make their 3D sceneries run. From then they have been using Open Scene Graph. These sceneries were:

WORKSHOP OF PHIDIAS (before 2005)

It is a complete game of how to construct a statue. It has different steps of gluing ivory to the statue. Pros: the game is already done. Cons: it is an indoor scenario and not all the visitors can be in the same mini-game at the same time. The final aspect of the scenery is not very realistic.

ANCIENT PRIENE

It is a full reconstruction of the two important Hellenistic cities of Asia Minor (Ionia), which are located in the territory of modern day Turkey. It can be divided in two different sceneries. The first would be related to Olympic game, with the stadium and the Palestra, or a classroom with students (only the room). The gamification would be about the ancient Greek and the athletic games. Pros: it is very realistic, and has a lot of avatars to choose. Cons: if the gamification is related to sports, we would have to model all the elements/characters/ animations.

ANCIENT MILETUS (Asia Minor, after 2005)

It is a full reconstruction of the two important Hellenistic cities of Asia Minor (Ionia), which are located in the territory of modern day Turkey. It is a harbor town with a complete Agora (with all the little shops inside and a central block for sacrifices). The harbor has two different boats. One of them could be used for the gamification (with old vases inside). Pros: very realistic reconstruction, a lot of 3D avatars available, with animations, quite a lot of different mini-scenarios inside the Agora (more information about the Agora life is needed in order to plan the gamification storyboard. Cons: quite complex 3D scenery to move on.
The final chosen 3D scenery was the Ancient Miletus, due to the possibilities in the different scenarios and the different type of places it could offer to the gameplay design.

### 4.2. 3D models transformation

In order to be used inside Unity3D game engine, we had to transform FHW Open Scene Graph models to Unity3D compatible models. The sequence of steps is:

1) Use osgconv tool to convert .osg files to .obj + .mtl
2) Transform the .sgi textures to png using a gimp batch module. (Previously, we used to consume osgconv tool with --compressed parameter because it automatically converted sgi to dds, but then we detected that this command flipped the textures.)
3) Import .obj + .mtl + .png to 3DS
4) Directly export to .fbx
5) Import the .fbx into Unity3D
6) Inside Unity3D we change the materials in order to take alpha into account, and also we include the normal textures.

### 4.3. 3D terrain transformation

In order to obtain valid 3D terrain for the Unity graphic engine, the process of transformation is explained here:

#### 4.3.1. Stage 1

Import the received model to Autodesk 3D MAX

#### 4.3.2. Stage 2

Detected problem: the terrain is irregular and broken.

There's a necessity to generate the “heightMap” on a uniform terrain.
This trouble leads us to export the terrain to FBX format.

4.3.3. **Stage 3**
Import the 3D model in Unity and generate the “heightmap”.

4.3.4. **Stage 4**
Problem detected: low resolution when importing the “height Map” and applying it on the mesh.

The solution for this detected problem is subdivide the mesh and treatment of the elevation parameters depending on the importance of the location.
4.3.5. **Stage 5**

At this stage, we faced some new trouble. The maximum number of polygons supported by Unity for a unique object is overloaded. There is a need to adjust this number of polygons to locate the buildings on the terrain.

The solution founded for this problem was optimizing (reducing polygons) non-important zones (those not very visible) and adjust the location of the buildings. Also the square form of the subdivisions was maintained to avoid future problems.
4.3.6. Stage 6

Export to FBX format and Unity terrain generation adjusting exact location, height and rotation parameters to the model generated in 3D MAX. Previous stages should be repeated if the model doesn't adjust or the number of polygons is greater than the Unity limits.

4.3.7. Stage 7

In this stage the textures have been applied to the terrain. Because it is a unique object (the terrain), terrain tools for the entire object can be used.

4.4. Game concept

The game player will have a main objective in his/her way in the city of Miletus. The objective will be:

To erect a votive stele along the Sacred Way to celebrate the annual festivities in honour of Apollo called Didymeia, which included a procession starting at the Delphinion along the Sacred Way.

For this objective, the player will have to play the role of a merchant from Miletus purchasing goods from overseas, perhaps Ptolemaic Egypt or Seleucid Syria and sell them in the market (Agora). With the benefit the character get with the selling of goods (like precious metals: silver or gold), he/she will buy a votive stele for the annual festivities in honour of Apollo and do the procession along the Sacred Way.
4.5. Game-flow summary

The main steps for the game progression will be:

- The visitors get their tablets and begin to configure their character in the game. They will have to choose between a standard character and a personalized one. If they decide to personalize the character, they will have to take a picture of themselves and through the application get their own character with their face.
- The visitors will be presented the main objective of the game, a brief historical introduction to the game and the steps or mini-games to get the final objective.
- For each mini-game, there will be an initial brief presentation of the specific challenge, and immediately, the visitors will begin to play the mini-game. The end of each mini-game will be defined both by time ending assigned to each mini-game or by all the visitors finishing and reaching the objective, the first of both events. Depending on the level of achievement on each mini-game, the visitor will be assigned points and ranked in a general list (visible on the general screen of Tholos for all the visitors).
- Once all the visitors have passed through all the mini-games, the winner will be considered the one who has more points in less time of playing the game. The rest of the participants will finish the game (with a logic limitation of time in each game).

First of all, for the PLAYHIST gameplay definition the educational goals for the game were defined, depending on the placements of the different sceneries. A summary of this definition can be found on Annex A: PLAYHIST experiment educational goals.

After that, the game mechanics were defined. They are described in the Annex B: PLAYHIST game mechanics.

Finally, the complete PLAYHIST game flowchart was designed. A graphic flowchart of the game-flow is shown in Annex C: PLAYHIST game flowchart.
5. Design and implementation of the PLAYHIST system

The PLAYHIST experiment will involve three runtime environments that will (directly or indirectly) rely on/interact with the components of the EXPERIMEDIA facility and some of the resources available to the venue of the Hellenic Cosmos. The three components are:

- The visitor's environment: include an Android application that delivers the interactions envisaged for the participants during the gameplay stage (move through the 3d scene, play the mini-games, etc.). The application will include the 3D Content Component (3DCC) avatar creation module to capture the face of the players (in the case they decide to participate with a tailored character) and insert this image on the character chosen to play. This application will also register player particular metrics to the ECC component, to be registered and subsequently analysed.

- The expert desktop environment: this is a desktop application providing the functionalities needed by the expert to appear in the second mini-game (the one running in the Agora). It is basically the 3DCC motion capture module running through a .exe program and the visualization of the 3D game. It allows the experts not to be physically present at the FHW and to help the players indicating them the best buyer for their goods in the Agora.

- The Playhist core environment: this desktop application will render the 3D game scenery directly linked to Tholos projectors, so all the players can understand where they are located inside the game. It will provide information about the "hall of Fame", that's to say the ranking of the different participants, so they are informed in which position they are, respecting the other players. For each mini-game, this application will provide a unique view of the game ground, where all the players located in their placement. It will be also connected to the ECC for metrics recording and with the 3DCC to "listen" expert movements.

Detailed progress descriptions of the modules of the PLAYHIST experiment are given in the following subsections.

5.1. Visitor's environment

5.1.1. Work done so far
- Network connections with Playhist Core for the multiplayer game
- Remote player motion controller trough a touchable gamepad
- Connected to the ECC (client development)
- First version of the .apk released

5.1.2. Future work
- General Game UI
- 3DCC Avatar Creation inclusion
- Metrics definition
- Mini-games development
5.1.3. Comments
CERTH has been working on integrating the 3DCC Avatar Creation on a mobile device. Apparently there is a version that works on mobile devices, but it has to be improved to work faster.

5.1.4. Progress screenshots

5.2. Expert desktop environment

5.2.1. Work done so far
- Network connections with Playhist core for the multiplayer game
- Environment preparation for the 3DCC Motion Capture Module (Microsoft SDK 1.8, RabbitMQ, Kinect drivers, etc.)
- Game listener

5.2.2. Future work
- Ancient Avatar personalization

5.2.3. Progress screenshots
5.3. **Playhist core environment**

5.3.1. **Work done so far**

- 3D game scene created
- ECC 2.0 deployed locally (RabbitMQ, PostgreSQL, Tomcat, etc.) Dashboard running
- 3D Game and ECC connected
- Network developments a multiuser game: listen visitors and experts interaction
- First version of the .exe released

5.3.2. **Future work**

- General Game UI
- Metrics Definition
- Tholos rendering calibration
- Run experiments

5.3.3. **Comments**

The game is developed under Unity graphic engine. The original models provided by FHW have been modified and adapted for being rendered in Unity. There are three initial sceneries: the Harbour of Lions, the North Agora and the beginning of the Sacred Way, which are the places where the gameplay is running.

Historical characters have also been transformed to fit in the 3D scenery. They have currently the capacity of walking on the different locations.

5.3.4. **Progress screenshots**
6. Legal and privacy issues

6.1. Privacy

After the Ethics Advisory Board Meeting in December 2013, the following formal requirements were established for PLAYHIST experiment:

- Data controller: Tecnalia, possibly together with FHW;
- Notifications to the national DPAs of the controllers;
- Notification to all the participants (both groups) should include all the relevant information (see above);
- Consent form for the participants from the second group of the experiment (testing tablets) with all the relevant information;
- Clear policy on participation of minors: minors not allowed;
- Point of contact on the site should be communicated to the participants in case of questions/concerns/objections;
- Points of contact at the later stage should be indicated in the information provided (Tecnalia but possibly also FHW);
- Language of the communication: English and Greek.

Following the above mentioned requirements, TECNALIA notified the Spanish DPA the development of the experiment, and informed about the personal data we were going to collect. After their answer, delegating the responsibility in the Greek DPA, and assuming some issues were not clear enough or misunderstood by the Spanish DPA, Aleksandra Kuczerawy (Ethics work package responsible) decided to contact them again for further explanations. On April, 14th, the Spanish DPA’s answer was received, telling they finally consider the Spanish law to apply. This answer implies that an official notification about the processing activities in PLAYHIST must be filed. Aleksandra from Leuven has been asked for help. Tecnalia is waiting for the response to proceed. In any case, the notification to the Spanish DPA will be done of course, before the Tecnalia team travel to Greece in June.

6.2. Participants / recruitment

During Tecnalia visit o to FHW venue in November 2013, both partners agreed that FHW personnel would be the one in charge of the adult volunteer's recruitment (previous confirmation from Tecnalia of the dates of the initial test and experiment, with a month in advance). Nonetheless, during the General Assembly celebrated in Graz in February 2014, a new group of experimenters was suggested as interesting for the tests. Due to the type of technological solution tested, a video game, a focus group made of teenagers was proposed by some of the partners of EXPERIMEDIA project. Both Tecnalia and FHW considered feasible the proposal and so, FHW will try to recruit a group of teenagers mainly among FHW personnel's relatives. Keeping in mind these experimenters, in case of minors, the consent form will include the possibility of been signed by the tutor/parents.
7. Dissemination efforts

During the preparation of the experiment, TECNALIA has made the following submissions to present the ideas and goals behind the PLAYHIST experiment to the scientific community in the area of technology-enhanced learning. Inasmuch as no results are available yet, these submissions are extended abstracts or proposals for demonstration, intended to get early feedback that may be useful to assess the value impact of the proposal.

The first paper, titled “Designing history learning games for Museums. An alternative approach for visitors’ engagement”, was submitted and accepted to the Virtual Reality International Congress (VRIC), to be held in Laval, France in April 2014.

PLAYHIST experiment will also be submitted to the following conferences:

- 6th International Meeting on Graphic Archaeology and Informatics, Cultural Heritage and Innovation ARQUEOLOGICA 2.0 to be held in Ciudad Real (Spain) in October 2014.
- International Conference on Cultural Heritage EUROMED 2014 to be held in Lemessos, Cyprus in November 2014.

Finally, TECNALIA has been invited to give a talk about PLAYHIST at the event “Seminar about Documentation and 3D musealization” on September, 2014. This event is organized by the European project V-Must.Net (http://www.v-must.net/) in Madrid (Spain). This event is a space to go deeper into the new possibilities of musealization and 3D documentation that ICT can offer to Cultural Heritage. This seminar was born with an open and binding vocation, as a meeting point between experts and as a base line for future professionals who will assure the preservation of Cultural Heritage.

7.1. Meetings

During the period from October 2013 to March 2014, the PLAYHIST team has attended the following meetings:

- Act 4 Teleconferences
- 2nd Open Call Workshop, Madrid
- 1 Visit to FHW
- EAB Meeting by Skype
- General Assembly, Graz
- Skype meetings with FHW
8. Conclusions

This document has provided a detailed description of the current state of the IMPLEMENTATION works regarding the PLAYHIST experiment, showing that most of the individual pieces of software of the PLAYHIST system have been developed to an initial state, and that TECNALIA is getting close to the point of starting to think about putting all those pieces together and integrating them with the components of the EXPERIMEDIA facility. Regarding the latter, there remain certain risks in the integration with the 3DCC, which may end up causing certain delays in the development works but should not affect the experimentation plan, inasmuch as the ex ante experimentation sessions may take place in Vitoria-Gasteiz (Spain) at any time during late May or early June, whereas the sessions in the Hellenic Cosmos can wait until the end of June and the ex post sessions in Vitoria-Gasteiz may occur at any time during July, August or even early September.

Following completion and delivery of this document, the ANALISYS AND PUBLICATION phase of the work-plan will also involve the preparation of a workshop in TECNALIA installations in Zamudio (Spain) inviting to all the stakeholders implied (at a national level), for presenting the PLAYHIST experiment results.
Annex A: PLAYHIST experiment educational goals

The game flow is composed of four main mini-games, located in the Harbour of Lions, North Agora of Miletus and Sacred Way.

Once the game has begun, the visitor will have to pass through different mini-games or steps, which are required to be solved to go on the game. The educational goals for each stage of the game-flow are described here:

<table>
<thead>
<tr>
<th>Mini-game</th>
<th>Where: location</th>
<th>What: the game</th>
<th>Educational goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do the ship’s cargo</td>
<td>The Hellenic boat outside of the Harbour of Lions</td>
<td>The player will have to load the boat with different goods of the Hellenic time: grain, copper, wheat, timber, purple dye, furniture (beds)</td>
<td>Learn which type of goods were sell in the Agora</td>
</tr>
<tr>
<td>Sell the goods in the Agora business</td>
<td>The North Agora</td>
<td>The player will have to sell the products he/she has charged in the boat and brought to the harbour to the people in the shops of the Agora. The main challenge will be to found the best price and buyer for those goods.</td>
<td>Learn about the system of exchange and the buy and sell system in the Agora of Miletus</td>
</tr>
<tr>
<td>Buy and compose a votive steal to dedicate it to the god in the annual festivities in honour of Apollo</td>
<td>The Sacred Way</td>
<td>With the precious metal obtained from the selling of goods in the Agora, the character will buy a votive stele which will be broken and the visitor will had to compose it again</td>
<td>Learn about the annual festivities in honour of Apollo and the offers the people did, the votive steles.</td>
</tr>
<tr>
<td>Historic date location and facts knowledge</td>
<td>Directly in the tablet. No specific location in the 3D scenery</td>
<td>A final mini-game to locate a specific event in the time. The player will have to locate in the time a specific event presented to him/her occurred in the Hellenistic period, and also respond a series of questions related with all the previous challenges</td>
<td>To have knowledge of a specific date of a historic event of Hellenic World and to learn about the life facts of Ancient Miletus</td>
</tr>
</tbody>
</table>
Annex B: PLAYHIST game mechanics

Here you can find the description of the game mechanics, depending on the challenges defined in the previous annex.

<table>
<thead>
<tr>
<th>Number of challenge</th>
<th>Challenge</th>
<th>Description of game mechanics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Load a boat with the goods to be sold</td>
<td>Each player will be in their boat, and some goods are coming, so they have to choose which ones to load in their boat. The challenging concept could be a time limit. Goods could be arriving to the ship and the player having to sort them before the next good comes. As the game progresses the arriving of the goods goes faster and faster. The player would have to choose strategy between taking the time to sort goods properly, or throwing them into the boat fast enough to be able to get back and take the next goods coming. If the player is not fast enough back for the next good, it will fall down and break. More goods stacked during the limited time of the game gives more goods to sell in the next game, but a too greedy player trying to stack too many goods will sink the boat and end up with nothing. The player will alternate between the screen of choosing goods and the screen of loading the boat. To increase the difficulty of the first stage there should also be goods coming that do not belong in this era and if the player stacks them they will destroy goods or somehow get a penalty. The player can thus not be too fast because they also have to make sure that the goods are the correct ones.</td>
</tr>
<tr>
<td>2</td>
<td>Trade with the dealers in the Agora in order to get the most benefits for the goods brought to Miletus</td>
<td>This game could be structured as a dialogue-based negotiation/haggle game where the player has to reach a deal with the buyer. It could be that each buyer has a limit in the type of goods he can buy, and this would fix the price he is ready to pay for the goods.</td>
</tr>
<tr>
<td>3</td>
<td>To buy a votive stele with the silver or gold obtained and present it in the Annual festivities in honour of Apollo</td>
<td>This challenge will be structured on the basis of solving a jigsaw puzzle. Depending on the amount of silver and gold the player has got in the previous challenge, he/she will be able to buy a votive stele, which in the process falls to the ground and breaks. This will lead to the player to a challenge type Jigsaw puzzle to reconstruct the votive stele and allow him/her to dedicate it to the god in the Sacred Way.</td>
</tr>
<tr>
<td>4</td>
<td>Guess the time location of a specific event in Hellenic World of Miletus and ask some questions about life in Ancient Miletus</td>
<td>The mechanics for this challenge will be in two parts: First of them, and in a time bar, the player will have to locate the event which is the objective of the game: the annual festivities in honour of Apollo. As it is not an exact date, but a period, the players who get the timeline inside the period will get some points. In a second stage, the player will have to answer a kit of questions (style &quot;who wants to be a millionaire&quot;), about issues related with the object of the rest of the challenges, for example: Do people living in Ancient Miletus use coins? Which were the exchange goods?</td>
</tr>
<tr>
<td>Number of challenge</td>
<td>Challenge</td>
<td>Description of game mechanics</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Which was the type of goods imported to Miletus? Which event happened each year along the Sacred Way?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Which object did you take as a dedication to the god in the annual festivities?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In this second stage, the player is allowed to speculate, but the more wrong answers he/she gets, the less score the player gets.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This challenge also will help to define the Quality of Learning of each Player.</td>
</tr>
</tbody>
</table>
Annex C: PLAYHIST game flowchart

Here is shown the flowchart defined for the PLAYHIST gameplay:

---

© Copyright TECNALIA and other members of the EXPERIMEDIA consortium 2014

29