D4.1.2

COMPLEMENTS TO SCENARIOS, FUNCTIONAL AND TECHNICAL SPECIFICATIONS RELEASE 1

October 2014

ABSTRACT

This document describes use cases developed in the "Pervasive Game Platform" for open call partners. The scenarios are grouped per partner.

DISCLAIMER

DELIVERABLE DETAILS

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EXECUTIVE SUMMARY

This document specifies the "Pervasive Game Platform" reference applications for the open-call partners. The main use cases introduced in this document have been discussed with all WP4 partners, technical partners and experimentations site owners. The scenarios are composed of technologies grouped into key strategic areas for interactive entertainment, including virtual and augmented reality environments on the Future Internet.

ETHZ and DRZ describe two scenarios, "Gnome Trader" and "Treasure Hunt",that were defined by the consortium in 3rd semester of the project in place of "Agent vs Agent" and "Augmented Marble Run", and that use similar enablers.

DNET has proposed an additional scenario that is focused on demonstrating two SEs that are being developed as part of the Pervasive Games platform. The overall scenario is to enable the creation of an engaging AR game called ARvatar utilising the cloud based SE named ARTool and a SLAM based AR extension. Additionally, the ekoNET environmental monitoring service will be utilised within the game in order to demonstrate the integration of IoT based services and real-time data feeds. The overall aim of the scenario is to demonstrate the AR technology within the city-wide scenario and at the same time show how the applications can be developed and deployed without any programming knowledge. Furthermore, the ARvatar game can be used to raise an awareness of the air pollution issues within the cities and promote these aspects using the social networks utilised within the game.

Mivoq aims to demonstrate the capabilities of its FA-TTS technology, by integrating this specific enabler into one of the city-wide game scenario. The idea is to develop an SE that implements speech synthesis for augmented reality applications. This SE will serve as a demonstration of rapid high quality content creation and integration in the field of speech synthesis. It will be delivered through the SaaS model over the internet, and it will be based on a client/server architecture.

Takomat will demonstrate how emotional and interactive storytelling with virtual 3D-characters can be used to improve the emotional experience and immersion in pervasive games. The game scenario to demonstrate this will enhance the scenario of the ARPix application with

- an interactive dialogue system between the user and the virtual character, and
- a real-time animation of the virtual character that corresponds emotionally to the dialogues.

Due to the late contractual amendment and the delayed pre-financing in FI-Content 2, Takomat had to adapt its original development plan of PHENOMOBILE: They are implementing the dialogue system at first because it can already be used in current commercial projects. The real-time animation system of the virtual character will be developed after the dialogue system.

LIST OF AUTHORS

Organisation	Author
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ETH	Marcel Lancelle, Fabio Zünd
DNet	Boris Pokric
Mivoq	Fabio Tesser, Giacomo Sommavilla
Takomat	Daniel Schwarz

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ABBREVIATIONS

AR	Augmented Reality
CG	Computer Graphics
FI	Future Internet
FI-PPP	Future Internet – Public Private Partnership
GPS	Global Positioning System
GPU	Graphics Processing Unit
HCI	Human Computer Interaction
iOS	Apple iDevice Operating System
LED	Light Emitting Diode
POI	Point of Interest
SE	Specific Enabler
SLAM	Simultaneous Localization and Mapping
XML3D	Three Dimensional Extensible Markup Language
TTS	Text To Speech
FA-TTS	Flexible and Adaptive Text To Speech
Saas	Software as a Service

1 - INTRODUCTION

1.1 - Overview

In phase 1 of FI-CONTENT and in firmly establishing WP4 for phase 2, we have created and described our 3-tiered scenarios that, together, address the main types of today's content for the Game Platform; we have extracted from them architectural and technical requirements for the FI-CONTENT 2 platform, as well as the liaison with the Core Platform. From this list of phase 1 requirements, we have built the FI-CONTENT 2 architecture and identified the needed building blocks, namely enablers that will fit the use case scenarios. The enablers are divided in two types: Generic and Specific Enablers. Generic Enablers are common to most use case projects linked to FI-WARE while specific ones are specific to the FI-CONTENT 2 project.

The goal of WP4 is to draw upon and refine earlier requirements towards building the open Games Platform for games and virtual worlds. Careful consideration with depth is employed in scenario specification, application platform development, content preparation and management, deployment and establishing user testing criteria and analysis of feedback.

In this document, we present the specification of game platform scenarios for the open call partners. It is an addendum to D4.1. It must be understood as a patch with respect to D4.1 and read along the latter.

1.2 - Change of scope

This deliverable aims at bundling contributions from all three open-call partners, but because of a shift in contractual amendment and pre-financing, some partners did not receive funding yet. Nevertheless, as a sign of good will, they already started to work on the scenarios on their own funding. This deliverable is the result of this work.

In addition, this deliverable describes two new city-wide game scenarios, "Gnome Trader" and "Treasure Hunt", which were defined by the consortium in H3 in place of "Agent vs Agent" and "Augmented Marble Run".

1.3 - Terminology

The following terminology is used:

Enabler: Software module or web service providing well-specified functionalities, accessible and usable by application developers through clearly-described APIs (Application Programming Interfaces).

Generic Enabler (GE): An enabler realized by the FI-WARE project or its follow-up sustainability project.

Specific Enabler (SE): An enabler realized by the FI-CONTENT 2 project. Specific Enablers may be layered on top of, or otherwise make use of, Generic Enablers. Please refer to the definition of a FI-CONTENT 2 SE from Deliverable D6.1 Architecture specification.

Platform: A comprehensive combination of technology infrastructure and Generic and Specific Enablers capable of hosting and supporting development of application software.

Application or **Application software**: Software layered on top of one or several platforms for realizing tasks for end-users.

Scenario: Description of foreseeable interactions of users with one or several applications.

Experiment or **Experimentation**: Concrete test with actual users of one scenario in one of the experimentation sites within a given time frame.

Functional requirement: Either calculations, technical details, data manipulation, processing or other specific functionality that define what a system is intended to accomplish.

2 - GNOME TRADER SCENARIO

Gnome Trader	
Category/topic/context	Tier 3: City-Wide Games
Owner(s)/contacts	Marcel Lancelle, Fabio Zünd, Mattia Ryffel
Abstract	Gnome Trader is a city-wide location aware Augmented Reality resource trading game. Food can be bought from and sold to Gnomes hidden in newspaper boxes all around the cities. Gardener gnomes produce food and sell it to the player at a dynamic price. Gnome families are waiting for the player to bring them food and will pay more as their storage gets low.
Detailed description	This scenario is a tier 3 game and demonstrates new ways of Augmented Reality games. Using the combination of GPS and a simple form of image based localization, the mobile device's location and orientation is known with high accuracy. For the Zurich test site, newspaper boxes in Switzerland will be used. They depict a very distinct and ubiquitous logo, which can be used as a strong image marker. Pointing a mobile device running the game at the newspaper box gives the illusion that a gnome lives inside the box.

In the game the player carries a virtual bag with limited size and gold. The player's goal is to make profit by strategically trading with the appropriate gnomes. Each gnome offers to trade resources (peas or nuts) with a price based on the amount of resources it currently owns. That is, if a producing gardening gnome has only a few resources left, it will ask for a high price per resource. On the other hand, if its storage is almost full (because nobody has purchased any resources recently) it will sell its resources to the player at a very low price. For the buying gnome families the process is exactly inverted. This economic system yields an interesting multiplayer aspect: Player A could choose to not go to the gnome living close to the player's house and wait until the resources are sold at a very low price. But player A's plan is threatened by player B, who also waits for a better price for the same gardener gnome but will buy the resources just a bit of time before player A does. The price development needs to be carefully balanced for a good gameplay.

With enough money, the player can upgrade his bag to be able to carry more resources at once. This will increase his trading efficiency. With the Leaderboard SE integrated the players can compare their trader level and experience with each other. Gnomes are automatically registered and added to the game if enough players visit a new newspaper box that is not already registered in the database. Hence, the game can grow autonomously. Apart from normal server administrative tasks, no other developer intervention is necessary.

Advanced features are planned. For example player-to-player trading is a very important feature that will greatly increase the multiplayer aspect of the game. An achievements system (meta-goals) would have a strong positive effect on gameplay. |
| Justification for inclusion of scenario | Audience/cultural criteria | Children as well as adults with access to a smart phone with internet connection are likely to enjoy this game. |
| | Commercial criteria | Similar games might be interesting for advertisement for |

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Gnome Trader		
		specific locations. Each gnome could advertise a different product.
	Academic criteria	Player interaction on a city-wide scale is novel and serves as an example for further research.

Planned experimentation		
	Experimentation site(s)	Zurich, Barcelona
	Estimated schedule	Beta September 2014, Deployment December 2014
	Maturity of implementation	Beta under testing
	Content, provider, availability	*Content will be provided by ETHZ and DRZ*

Functional requirements and their candidate enablers

Functional requirement	Candidate enabler	GE/SE/Gap
Coarse grained location of area of interest	Point of Interest	GE
Realistic augmented reality content	Reality Mixer – Camera Artefact Rendering	SE
Marker-less tracking city-wide	Augmented Reality – SLAM	Gap
Player competition	Leaderboard	SE

Performance requirements

Type	Requirements
Hardware	Recent handheld device with powerful CPU and GPU, good camera, GPS. In addition, for one location with around 50 active users and 500 gnome locations we estimate to use one basic web-server running apache, PHP, and MySQL.
Software	For a satisfactory user experience, the tracking and rendering frame rates should be at least 20 Hz.
Miscellaneous	**Network**: There should be a low network latency to quickly transfer the state of the game to the mobile devices. **Scalability**: We expect to have at most a few dozen active users per site.

3 - TREASURE HUNT SCENARIO

Treasure Hunt		
Category/topic/context	Tier 3: City-Wide Games	
Owner(s)/contacts	Marcel Lancelle, Fabio Zünd, Mattia Ryffel	
Abstract	Treasure Hunt Zurich is a city-wide Augmented Reality scavenger hunt game that is played in the city of Zurich, Switzerland. The player is sent on a quest that leads through the city to find a hidden treasure. The locations are found with the help of text descriptions and clues. At several locations throughout the quest Augmented Reality puzzles have to be solved in order to continue.	
Detailed description	The player found an old journal that turns out to be enchanted. It has a consciousness and communicates with the player through the text written inside of it. Hundreds of years ago it used to belong to an adventurer that has hidden all his riches somewhere in Zurich. The journal, which has no use for gold and is tired of being lonely for centuries, agrees to guide the player to the treasure. Yet, it wants to make a game out of it. Four pieces of a treasure map were hidden in the city. Each one is protected by a puzzle, which is invisible to human eyes. Luckily, the journal emits a magical aura that surrounds the player and allows him see those hidden secrets. The player has to locate and access all map pieces to assemble the map and find the hiding location of the treasure.	
	This tier 3 scenario explores the use of Augmented Reality (AR) technology in the context of pervasive city-wide mobile games. A fully functional city-wide AR treasure hunt game is developed together with a framework, which assists in building similar games. It is implemented using the Unity game engine and Vuforia. The game resembles a traditional scavenger hunt where players sequentially navigate to several locations by following hints. Here, AR is used to augment building facades with virtual puzzles on the device's screen. Solving a puzzle unlocks the next hint to find the next location.	
	The player's position is tracked using GPS. When the player arrives at a puzzle location and enables the camera, the position and orientation is estimated to a very high degree by state-of-the-art AR algorithms.	
	The player's path is recorded and the time needed to complete the quest as well as the number of hints requested are captured. After finishing the game a high-score is calculated and submitted to a leaderboard, thereby allowing players to compare their performance to each other.	
Justification for inclusion of scenario	Audience/cultural criteria	Children as well as adults with access to a smart phone with internet connection are likely to enjoy this game.
	Commercial criteria	Similar games might be interesting for advertisement for specific locations. Each puzzle could advertise a different product.
	Academic criteria	Player interaction on a city-wide scale is novel and serves as an example for further research.
Planned experimentation		
	Experimentation site(s)	Zurich

Treasure Hunt		
	Estimated schedule	Beta September 2014, Deployment December 2014
	Maturity of implementation	Beta under testing
	Content, provider, availability	Content will be provided by ETHZ and DRZ

Functional requirements and their candidate enablers		
Functional requirement	*Candidate enabler*	*GE/SE/Gap*
Coarse grained location of area of interest	Point of Interest	GE
Realistic augmented reality content	Reality Mixer – Camera Artifact Rendering	SE
Marker-less tracking city-wide	Augmented Reality – SLAM	Gap
Player competition	Leaderboard	SE

Performance requirements	
Type	*Requirements*
Hardware	Recent handheld device with powerful CPU and GPU, good camera, GPS.
Software	For a satisfactory user experience, the tracking and rendering frame rates should be at least 20 Hz.
Miscellaneous	**Network**: There should be a low network latency to submit the high-scores to the leaderboard. **Scalability**: Not an issue.

4 - GAME SCENARIOS FOR DNET

Creating SLAM-based AR game (ARvatar) using web creator tool	
Category/topic/context	Tier 3: City-Wide Games
Owner(s)/contacts	Boris Pokric
Abstract	The ARvatar game will be completely developed in a web creation tool called ARTool. Once developed, other users will be able to modify it and deploy on their mobile phones. Each player chooses an ARvatar, which is a 3D model that can only be seen through an AR view. The ARvatar will be displayed on a global plane detected by the SLAMflex SE component (for example a street pavement or a table top). The appearance will (or can) depend on many factors but initially it will reflect the environmental conditions locally. This will be determined by the ekoNET service used within the game. The ARvatar appearance (i.e. image) can be shared with other people via social networks, such as the Social Network SE or Facebook, directly from the game.
Detailed description	The ARvatar game demonstrates how the web tool ARTool can be used to create engaging AR applications. The ARTool aims to dramatically simplify the development and deployment of AR applications by utilising pre-defined templates, components and modules enabling the creation of cross-platform applications with minimal or no programming effort required. The basic concept is that the conventional development of AR applications requires a high number of resources and tasks whereas the ARTool dramatically reduces both of these aspects, and shortens the development time from several months to several days only. By combining this tool with other components such as Unity3D, AR engines such as SLAMflex and appropriate content, end users can design and deploy a diverse range of AR applications. The SLAMflex engine will initially enable detection and tracking of a global plane on which the AR content can be superimposed, while the Unity3D engine will provide the necessary physics features. The ARvatar game is based on marker-less AR tracking where the AR content is superimposed on a global plane detected (e.g. on a street pavement or on a table top). Each user chooses its own ARvatar from a set of available 3D models. The ARvatar's appearance can be influenced by many factors but initially it will be dependent on the meteorological parameters determined by the ekoNET service. This is an IoT device connected to the ARTool platform providing real-time measurements on different meteorological parameters such as temperature, air pressure, humidity and air quality. Depending on the temperature and air quality, the ARvatar's appearance will be modified accordingly. The users can view the ARvatar and share the view with other users via Facebook.
Justification for inclusion of scenario	Audience/cultural criteria	The target audience for ARvatar are end users with a mobile phone and a Facebook account. The game should also raise the awareness of air quality in the cities. The available ARTool project that can be deployed on users' smartphones should attract people wishing to develop their own games but not having expert knowledge related to the application development.

Creating SLAM-based AR game (ARvatar) using web creator tool		
	Commercial criteria	City administrations aiming to raise awareness of air quality, marketing agencies promoting certain products and requiring rapid AR application development and deployment.
	Academic criteria	Researchers requiring a rapid AR application development and a deployment tool including features supporting the Internet of Things (IoT).

Planned experimentation		
	Experimentation site(s)	Zurich
	Estimated schedule	December 2014
	Maturity of implementation	First phase being finalised, October 2014
	Content, provider, availability	DNET

Functional requirements and their candidate enablers		
Functional requirement	*Candidate enabler*	*GE/SE/Gap*
Cloud service for AR application development	ARTool	SE
SLAM-based AR used for the detection of global planes	SLAMflex	SE
IoT Thing Discovery	Configuration Management	GE

Performance requirements	
Type	*Requirements*
Hardware	- Smartphone with a camera and with at least a dual-core CPU - ekoNET device
Software	Browser access to ARTool cloud service ARTool player mobile application (Android or iOS)
Miscellaneous	

5 - GAME SCENARIOS FOR MIVOQ

FA-TTS technology into City-Wide Scenarios		
Category/topic/context	Tier 3: City-Wide Games	
Owner(s)/contacts	Fabio Tesser, Giacomo Sommavilla	
Abstract	The FA-TTS technology will be used to create a Specific Enabler that is able to give voice for augmented-reality applications, for example in the existing "Treasure Hunt" or "Gnome Trader" scenarios. Also, through the FA-TTS SE it will be possible to modify the emotion of the voice depending on several factors that dynamically change in the game and to define a specific voice for every virtual character. The language of the city-wide games is English.	
Detailed description	The FA-TTS SE will be delivered by MIVOQ as SaaS over the Internet; it will be based on a client-server architecture, hosted in the cloud. Whenever in the gaming scenario there is the need for a character to utter a sentence, the augmented-reality application will act as a thin client: it will send the text to be synthesized to the FA-TTS SE server and it will receive the corresponding audio. The FA-TTS technology offers innovative features with regard to flexibility and adaptivity of the synthetic voice. The features of this SE that will be present in the augmented-reality applications are described below: **Emotion voice modification.** MIVOQ plans to implement emotion voice modification within the FA-TTS SE. There will be a number of emotions (e.g. neutral, sad, happy, etc.), to which a value in [0,1] can be assigned. This number represents the degree/level of said emotion. A markup syntax will be designed that allows to produce the avatar voice with the above mentioned emotive modification, by calling the speech synthesizer with a combination of [emotion, value]. **Agent Voice Definition.** A set of speech audio effects (e.g. vocal tract scaler, speech rate modifier, "whisper" effect, etc.) will be designed for the FA-TTS SE. As per the voice emotion modification, a value can be associated to each effect. Therefore, the voice of each single agent in a game can be characterized by a unique set of effects and corresponding values.	
Justification for inclusion of scenario	Audience/cultural criteria	Children as well as adults with access to a smart phone with internet connection are likely to enjoy this game.
	Commercial criteria	The FA-TTS SE is an example of using FA-TTS technology in the context of apps/games development.
	Academic criteria	Player interaction on a city-wide scale is novel and serves as an example for further research.
Planned experimentation		
	Experimentation site(s)	Zurich
	Estimated schedule	Basic voice: December 2014, high-quality voice: February

FA-TTS technology into City-Wide Scenarios		
		2015
	Maturity of implementation	SE: Concept, FA-TTS technology: deployed
	Content, provider, availability	MIVOQ
Functional requirements and their candidate enablers		
Functional requirement	*Candidate enabler*	*GE/SE/Gap*
FA-TTS	FA-TTS	SE
Enablers used in the host scenario	Depends on the host scenario	SE/GE
Performance requirements		
Type	*Requirements*	
Hardware	Smartphone with an Internet connection and a loudspeaker or earphone.	
Software	City-wide game based on Unity-3D.	
Miscellaneous		

6 - GAME SCENARIOS FOR TAKOMAT

Interactive dialogue system & Character animation in location-based Games like ARPix.		
Category/topic/context	Tier 2: Location-based Installations	
Owner(s)/contacts	Daniel Schwarz	
Abstract	The following game scenario will extend game scenarios like the location-based installation FI-Content (2) application ARPix (DRZ and BLRK) with an emotional and interactive dialogue system between the virtual 3D-character and the user of the application. In general, it will enable emotional interactive storytelling scenes in pervasive games.	
Detailed description	The scenario will extend existing FI-CONTENT game scenarios like the ARPix application (DRZ and BLRK) with • an interactive dialogue system between user and virtual character, and • an interactive real-time animation of the virtual character. The real-time animation will correspond emotionally to the dialogues. The dialogue and animation system will be implemented in different development versions along the duration of the project: • In a first version users can take pictures of "EVA" and a real person and write/select some messages that will appear as a speech bubble in the picture. This feature can be used by the ARPix application to add some written message in speech bubbles to the final picture of the virtual character. • In a next version the user can have an interactive multiple choice dialogue with the virtual character. • In a third version the emotional behaviour of the virtual character will be animated during the interactive dialogue in the story scene.	
Justification for inclusion of scenario	Audience/cultural criteria	Children as well as adults with access to a smart phone with internet connection are likely to enjoy this game.
	Commercial criteria	Emotional and interactive real-time character animation that corresponds to in-game dialogues is key for pervasive gaming with storytelling on mobile devices.
	Academic criteria	Player interaction on a city-wide scale is novel and serves as an example for further research.
Planned experimentation		
	Experimentation site(s)	Zurich, Cologne
	Estimated schedule	Dialogue system: February 2015, Animation system: April 2015
	Maturity of implementation	SE: Concept, Dialogue system: in development
	Content, provider, availability	takomat
Functional requirements and their candidate enablers		

Interactive dialogue system & Character animation in location-based Games like ARPix.		
Functional requirement	*Candidate enabler*	*GE/SE/Gap*
Realistic augmented reality content	Reality Mixer	SE
Managing interactive Dialogues in Game	Phenomobile dialogue manager	SE

Performance requirements	
Type	*Requirements*
Hardware	PC, later on mobile devices.
Software	Game scenario with interactive dialogues between user and virtual character based on Unity-3D
Miscellaneous	

7 - CONTENT SOURCES

Not applicable.

8 - CONCLUSION

This document gives a first vision of the game scenarios of the open-call partners of the "Pervasive Game Platform"; it will now evolve over the following months according to feedback from end-users, PMEs and developers.

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