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Verification of technical and functional aspects

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Abstract

This document summarizes the technical and functional validation of the applications developed in the Amigo project. The aim is to demonstrate the prototypes of the three different scenarios developed the Home Care and Safety, the Home Information & Entertainment, and the Extended Home Environment domains.

The main objective behind the technical and functional validation is to ensure that once the middleware, Intelligent User Services and applications are deployed together in the demonstrator of each domain, the system is working as it should.

The verification procedure consists of checking the compliance of the demonstrator components with the initial set of functional specifications. As there is a direct relationship between the requirements and the application functions, the requirements can be verified by checking the functions.

This document describes how the verification has been done and the results obtained. Furthermore it also includes an overview of core conclusions derived for the applications of each domain.

Keyword list

Ambient intelligence, networked home, application domain, home care and safety, home information and entertainment, extended home, integrated demonstrator, functional requirements, technical requirements, technical and functional verification.

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1 Introduction

The networked home is, a home in which several pieces of equipment are connected by using an infrastructure, where the traditional separation of activities (consumer electronics, mobile communications and personal computing) is no longer valid. This networked home environment leads to many new opportunities. The most important one is Ambient Intelligence, in which technology is completely integrated into our environment so people can freely and interactively use it. However, general user acceptance of home networking is not yet in place. To get broad user acceptance and fast market introduction two elements need to be resolved:

- Installation and use of the networked home system must be simple and user-friendly, that is the usability of the system must be high.

- Attractive applications and services must be present which clearly offer an advantage over what is offered by today's non-networked systems. Many of these applications will use new context and user information services in a way that is not possible in present non-networked systems.

While the verification of functional and technical aspects of Intelligent User Services and Middleware components has been done in WP3 and WP4 as part of the development process, in WP8 the prototypes implemented in WP5 (Home care and safety), in WP6 (Home information and entertainment) and WP7 (Extended home) have been validated .

In WP8 Amigo software has been tested in integrated demonstrators. In other words, we have tested whether they work as they claim they do, even when they are all working together.

In the following chapter 2 the approach of the verification technical and functional aspects is described, touching upon the specific aim, scope and procedure of verification. Chapter 3 is the compilation of the user requirements. Chapter 4 describes how the technical and functional verification has been done, it describes briefly the applications of each domain and also provides conclusions that can be derived for the applications of each domain.

2 Technical and functional verification approach

2.1 Aim

The focus of the Amigo lies on the three domains as described in the Amigo Description of Work: Home Care and Safety, Home Information and Entertainment and the Extended Home.

The aim was to demonstrate the prototypes of the three different scenarios developed.

The main objective behind the technical and functional validation was to ensure that once all the middleware, Intelligent User Services and applications are deployed together in the demonstrator of each domain, all the system was working as it should.

2.2 Scope

The verification and validation of the technical and functional aspects has been performed over the demonstrators built for each application domain. Using the demonstrators, the applications and the usage of Intelligent User Services and Middleware components in them have been tested. The analysis of the performance, robustness and other relevant parameters for each application, service and middleware component on its own, was out of the scope of this verification.

A description of the labs that have been used to install the demonstrators in each domain can be found in the document "D8.1-Methodology and test plan".

2.3 Procedure

Before doing users tests, the consortium has to assure that the user requirements established in WP1 have been achieved in the prototypes of the general demonstration set-up.

The verification of technical and functional aspects has consisted on checking that applications implemented in the demonstrators meet the user requirements established in WP1.

To do this verification, the first step was the structured compilation of the specific technical and functional requirements, described abstractly in previous documents, for each application domain.

There is no common standard testing procedure for the requirements. Some requirements have been tested by observing the system's response to typical interaction users are supposed to do. Others have required verifying some logs of the middleware to see how applications and the middleware were interacting. Some of them had been as simple as seeing that the user interface of an application was shown properly and others more complex. So, as a conclusion we can say that each requirement had its own way of being tested.

As there is no common testing procedure, each specific test needed to be described for each requirement. The results are presented in the form of a table similar to the following one:

Requirement	How it has been tested	Results	Comments

The verification of technical and functional aspects has been carried out by Amigo consortium members iterating with the system.

3 General user requirements

The general user requirements for the Amigo applications have been taken from the document "D1.2 - User requirements, summary and conclusions - Volume I".

These user requirements are derived from the user feedback. They do not explicitly address the distribution over application domains. For each application, the specific list of requirements to be fulfilled by the application's functions was needed to be derived.

There are two types of user requirements:

- *functional requirements*: these are directly related to the application's functions.

- *non-functional requirements*: these are to be taken into account during the development of the Amigo System, but they are not directly related to the application's functions.

3.1 Functional requirements

The functional user requirements are as follows:

REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around.
R2	The system must be secure, safe and protect the privacy of all users.
R3	The system must provide an added value to existing systems.
R4	The system should never unnecessarily replace direct interaction between people.
R5	The home comfort should always be maintained and not be subservient to the system.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R8	The system should support storage and archiving of data in diverse ways.
R9	The system should support having control over data and information for best performance.
R10	The system should reduce the time needed for household chores and where possible do cleaning jobs.
R11	The system should integrate and combine functionality of appliances.
R12	The system should be energy saving.
R13	The system should be cost saving.
R14	The system should maintain the appropriate environmental conditions of the house (temperature, humidity, light, air, dust, mites, etc.).
R15	The system should support the activity organization and planning for multiple

REQUIREMENTS	
ID	**Description**
	persons at home, between homes and between home and work.
R16	The system should protect against abuse, intrusions, loss of data, house hackers.
R17	The system should provide controllable access and respect individual preferences and authorities.
R18	To system should support alignment of individual and group planning, updates and notifications.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R20	The system should support the integration of playing computer games in family routine, and approved settings.
R21	The system should support playing games and entertainment with multiple people in the same room or networked environment.
R22	The system should take implicit social rules of behaviour into account.
R23	The system should support increasing number of communication moments in multiple different contexts.
R24	The system should enable communication with multiple people at the same time, e.g. broadcasting, democratic group planning.
R25	The system should support keeping in touch with select group of friends, no need to always be connected as "me"-time is just as important.
R26	The system should support feeling of connectedness to family and friends.
R27	The system should support 'trusted' relationships, e.g. meeting new people mainly through mutual friends.

3.2 Non-functional requirements

The users add other non-functional requirements which should be taken into account during the development of the Amigo System:

REQUIREMENTS	
ID	**Description**
R28	Be easy to use and to configure – no need for programming by the user.
R29	Not be used for surveillance.
R30	Enable individual settings and preferences.
R31	Be configurable by the user or service provider.
R32	Be movable, in case of moving house.
R33	Be extensible - easy to upgrade.
R34	Be flexible.
R35	Enable turning off individual features.
R36	Be modular.
R37	Be maintenance free (i.e., no need for maintenance by the user).

4 Verification

This chapter describes how the technical and functional verification has been done Furthermore it also includes the results and conclusions of that verification.

The applications have been developed from a set of functional and non-functional requirements. Therefore, the verification procedure has consisted on checking the compliance of the demonstrator components against these requirements.

The aim of the technical and functional verification was to check whether the applications developed meet the initially established requirements. As there is a direct relationship between the requirements and the application functions, the requirements were verified by checking the functions.

For each application, the procedure was the following:

- To extract from the overall requirements list the subset of requirements to be fulfilled by the application's functions.

- To define the specific list of the application's functions.

- To map functions and requirements, taking into account that each function can answer one or several requirements.

The Validation Plan specifies how function fulfilment is to be checked. A series of test cases have been defined and executed to demonstrate whether the application fulfils the established functions or not.

A description of the verification of technical and functional aspects in each domain is enclosed below.

4.1 Home Care and Safety

To validate the prototype implemented in WP5 a demonstrator has been installed. This demonstrator is formed by a set of applications that had been installed in DomoLab over the resources that maintain it. The demonstrator has been installed in a room that simulates a home with a living room, a kitchen and a bathroom.

The specific applications and features described in the Home Care and Safety scenario have been validated: comfortability, self-learning, user profiles, customization, security and safety feeling, non-intrusive systems and so on.

The applications that constitute the Home Care and Safety demonstrator are:

- Personal Health Care Centre

- Health Management

- Food Management

- Appliances Management

- Entrance Manager

- Comfort system

- Technical alarms Management

The deliverable "D5.2 - Home Care and Safety - Application specification" describes the functional behavior of each Home Care and Safety application and the Amigo components that are implied.

A detailed description of the applications and its functioning can be found in the document "D5.4 - WP5 User Manual".

4.1.1 Personal Health Care Center

4.1.1.1 Brief application description

Personal Health Care Centre helps look after the health. The application collects health data from available (legacy) health devices, presents relevant information retrieved in the most suitable screen (the most suitable screen depends on the context and user preferences) and stores relevant health data in the user profile so that it can be used by other applications.

The Personal Health Care Centre allows user to change the health device configuration (time and date information).

The health devices are registered in the AMIGO System when they are turned on as devices offering health services.

The Personal Health Care Center application consists of the following components:

- weight scale
- blood pressure meter
- a PC/laptop in order to interact with the application
- a PC/laptop which serves as UPnP Proxy and hosts the application

4.1.1.2 Requirements for application

The requirements to be fulfilled by the Personal Health Care Center application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R8	The system should support storage and archiving of data in diverse ways.
R9	The system should support having control over data and information for best performance.

4.1.1.3 Application components functions

The functions of the Personal Health Care Center application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The PHCC detects which devices (weight scale, blood pressure meter) are switched on.
F2	The PHCC allows the user to select the desired device using a Tablet PC.
F3	One of the devices takes a measurement and sends it to the AMIGO System.
F4	The AMIGO System stores the health data in the user's record so that they can be used again by the PHCC or by other applications.
F5	The PHCC displays the information requested by the user on the Tablet PC: latest measurements taken, record, etc.
F6	The PHCC interacts with the user via the Tablet PC.
F7	The PHCC allows the user to change the configuration (time and date) of the devices.

4.1.1.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	F7
R1		X					
R6	X			X			
R7		X	X		X	X	
R8			X	X			
R9		X				X	X

4.1.1.5 Verification plan

The scenario in which the tests for the Personal Health Care Center application are carried out is situated in the lounge, where the Tablet PC with which the user manages the application is located, together with the medical devices making up the Personal Health Care Center (weight scale, blood pressure meter).

Function	F1	The PHCC detects which devices (weight scale, blood pressure meter) are switched on.		
Initial conditions		The user must be identified in the AMIGO System and must be registered as a user of the PHCC.		
		The devices must be switched off.		
		The tests are carried out are carried out in the lounge using various devices.		
Test	**Description**		**Result**	**Observations**
P1.1	The user switches on the scales.		**Passed**	
	The supervisor checks that the PHCC has detected that the scales have been switched on.			
	The user switches on the blood pressure meter.			
	The supervisor checks that the PHCC has detected that the blood pressure meter has been switched on.			
P1.2	The user switches off the scales.		**Passed**	
	The supervisor checks that the PHCC has detected that the scales have been switched off.			

Function	F2	The PHCC allows the user to select the desired device using a Tablet PC.		
Initial conditions		The user must be identified in the AMIGO System and must be registered as a user of the PHCC.		
		The scales must be switched on.		
		The test is carried out in the lounge using the scales and the Tablet PC.		
Test		**Description**	**Result**	**Observations**
P2.1		The user selects the scale on the PHCC using the Tablet PC. The supervisor checks that the PHCC is showing the scales as the device the user has selected.	**Passed**	

Function	F3	One of the devices takes a measurement and sends it to the AMIGO System.		
Initial conditions		The user must be identified in the AMIGO System and must be registered as a user of the PHCC.		
		The scales and the blood pressure meter must have been switched on.		
		The tests are carried out in the lounge, alternately using the scales and the blood pressure meter.		
Test		**Description**	**Result**	**Observations**
P3.1		The user selects the scales on the PHCC using the Tablet PC, and weighs himself. The supervisor notes the weight shown on the scales. The supervisor checks that the scales have sent the data item to the AMIGO System and checks that the value registered in the user's record coincides with the weight shown on the scales.	**Passed**	
P3.2		The user selects the blood pressure meter on the PHCC using the Tablet PC, and takes their blood pressure. The supervisor notes the value shown on the blood pressure meter. The supervisor checks that the blood pressure meter has sent the data item to the AMIGO System and checks that the value registered in the user's record coincides with the value shown on the blood pressure meter.	**Passed**	

Function	F4	The AMIGO System stores the health data in the user's record so that it can be used again by the PHCC or by other applications.
Initial conditions		The user must be identified in the AMIGO System and must be registered as a user of the PHCC.
		The blood pressure meter must be switched on.
		The test is carried out in the lounge using the blood pressure meter.

Test	Description	Result	Observations
P4.1	The user selects the blood pressure meter on the PHCC using the Tablet PC, and measures their blood pressure. The supervisor notes the value shown on the blood pressure meter. The supervisor checks that the value registered in the user's record coincides with the value shown on the blood pressure meter.	**Passed**	

Function	F5	The PHCC displays the information requested by the user on the Tablet PC: the latest measurements taken, their record, etc.		
Initial conditions		The user must be identified in the AMIGO System and must be registered as a user of the PHCC.		
		The user's record must be registered in the AMIGO System (a few data items will be sufficient).		
		The test is carried out in the lounge using the Tablet PC.		
Test		**Description**	**Result**	**Observations**
P5.1		The user selects the information they wish to consult using the Tablet PC: their record.	**Passed**	
		The supervisor checks that the PHCC is displaying the user's record on the Tablet PC and that the data coincides with values registered in the AMIGO System.		

Function	F6	The PHCC interacts with the user via the Tablet PC.
Initial conditions	The user must be identified in the AMIGO System and must be registered as a user of the PHCC.	
	The scales must be switched on.	
	The test is carried out in the lounge using the scales and the Tablet PC.	

Test	Description	Result	Observations
P6.1	The user selects the scales as a device using the Tablet PC, and weighs himself. The supervisor notes the value shown on the scales. The supervisor checks that the PHCC is indicating the weight read by the scales to the user, and that the data item coincides with the value noted.	**Passed**	Technically is perfect, but as a suggestion for refinement of the application, instead of selecting the device using the Tablet PC, an automatic way of doing it will be much convenient in our opinion.

Function	F7	The PHCC allows the user to change the configuration of the devices (time and date).
Initial conditions	The user must be identified in the AMIGO System and must be registered as a user of the PHCC. The scales must be switched on. The test is carried out in the lounge using the scales and the Tablet PC.	

Test	Description	Result	Observations
P7.1	The user selects the scales as a device using the Tablet PC, and changes the time and date appearing in the configuration. The supervisor notes this data. The supervisor checks that the configuration (time and date) of the scales registered in the AMIGO System coincides with the time and the date indicated by the user.	**Passed**	

4.1.2 Health Management

4.1.2.1 Brief application description

The Health Management application is based on the home having a specific space dedicated to monitoring physiological values (bathroom). On that basis, it helps to look after the health of those using it, by carrying out certain tasks involving information processing, trend checking and informing the users about any significant changes that need to be looked at by healthcare professionals.

Each user has an active RFID identifier which will enable the AMIGO middleware to know who is at home and the specific location of each person, so that the Health Management application knows who is using the physiological monitoring resources, thereby enabling the pick-up, storage, analysis and notification processes, if required, to be personalised.

The use of any of these systems will activate the Health Management application, which will store the data received in the historic records for the user and show the performance of the value measured using the AMIGO middleware interface resources: a mirror in the bathroom, a television set in the lounge and a Tablet PC.

If any problem is detected in the data analysis, especially any significant variation with regard to the trend for that value, the user will be informed or a notification will be send to a doctor.

The Health Management application enables configuration and follow-up of the health plan (which parameters it should control, how many times and how often) for each of the users.

The Health Management interacts with the user in two ways for presenting and requesting information or for giving messages: through voice messages and a display.

The user interacts with the Health Management using a remote control (PDA) or by voice command.

The Health Management application consists of the following components:

- weight scale
- blood pressure monitor
- ECG
- microx pulsoximeter
- a PC with communication resources for Power Line, WiFi and RF

4.1.2.2 Requirements for application

The requirements to be fulfilled by the Health Management application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R2	The system must be secure, safe and protect the privacy of all users.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.

REQUIREMENTS	
ID	**Description**
R8	The system should support storage and archiving of data in diverse ways.
R9	The system should support having control over data and information for best performance.

4.1.2.3 Application components functions

The functions of the Health Management application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The HM is activated when the user takes a measurement on one of the devices.
F2	The HM recognises the user activating the device: - it uses the identification system to obtain the identity of the user or users who are in the bathroom. - if there is more than one user in the bathroom, it deduces their identity by comparing the measurement taken with the profile of the users in the bathroom. - if it cannot deduce their identity, it interacts by voice message or display with the user, asking them who they are.
F3	One of the devices (weight scale, blood pressure monitor, ECG, microx pulsoximeter) takes a measurement and sends it to the AMIGO System.
F4	The HM shows the measurement taken by the device on the display in the bathroom.
F5	The AMIGO System stores the health data in the user record, so that it can be used again by the HM or by other applications.
F6	The HM analyses the user's data and if it detects a problem it informs the user, or, if necessary, sends the relevant information to the doctor.
F7	The HM urges the user to comply with the health plan established.
F8	The HM shows the information requested by the user on the selected display (mirror, television, etc.): latest measurements taken, record, etc.
F9	The HM guarantees the confidentiality of the data by identity checking and by checking the users' permission before displaying the information.
F10	The HM interacts with the user by voice messages and display.
F11	The HM enables configuration of the health plan for each of the users.

4.1.2.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
R2		X							X		
R6					X	X	X	X			
R7	X		X	X				X		X	
R8			X		X	X	X				
R9										X	X

4.1.2.5 Verification plan

The scenario in which the tests are carried out is the bathroom, where the medical devices are located: weight scale, blood pressure monitor, ECG, microx pulsoximeter. It also has a mirror where information can be displayed. Two secondary scenarios are also used for some of the tests: the kitchen, with a Tablet PC, and the lounge, with a television set and a projector.

Function	F1	The HM is activated when the user takes a measurement on one of the devices.		
Initial conditions	The HM must be installed and in wait mode.			
	The test is performed in the bathroom using several devices.			
Test	**Description**		**Result**	**Observations**
P1.1	The user weighs himself on the scales and takes his blood pressure with the blood pressure monitor. The supervisor checks that the HM is activated.		**Passed**	

Function	F2	The HM recognises the user activating the device: - it uses the identification system to obtain the identity of the user or users who are in the bathroom. - if there is more than one user in the bathroom, it deduces their identity by comparing the measurement taken with the record of all the possible users. - if it cannot deduce their identity, it interacts by voice message or display with the user and asks them who they are.
Initial conditions		The users must be identified in the AMIGO System. Three users are required for the test: two users within the same weight range (U1, U2) and a third user whose weight is in a different range (U3). The AMIGO System must have at least one weight data item stored in the record for each user. The tests are performed in the bathroom using the scales.

Test	Description	Result	Observations
P2.1	Users U1 and U3 (different weights) enter the bathroom. U1 weighs himself on the scales. The supervisor notes the weight shown on the scales. The HM deduces the identity of user U1 by comparing their weight with the weights in the records for U1 and U3, as these values are not within the same range. The supervisor checks that the HM has registered the weight measured by the scales in user U1's record.	**Passed**	
P2.2	Users U1 and U2 (similar weights) enter the bathroom. U1 weighs himself on the scales. The supervisor notes the weight shown on the scales. The HM cannot deduce the identity of user U1 by comparing their weight with those registered in the records for U1 and U2, as the values are within the same range. The HM uses a voice message to request the identity of user U1. User U1 provides their identity. The supervisor checks that the HM has registered the weight measured by the scales in user U1's record.	**Partially Passed**	This test was repeated several times and two times the system did not ask for identification but it made the decision directly. The rest were satisfactorily executed.

Function	F3	Any one of the devices (weight scale, blood pressure monitor, ECG, microx pulsoximeter) takes a measurement and sends it to the AMIGO system.
Initial conditions		The user must be identified in the AMIGO System.
		The tests are performed in the bathroom alternately using the scales, the blood pressure monitor, the ECG and the pulsometer.

Test	Description	Result	Observations
P3.1	The user weighs himself on the scales. The supervisor notes the weight shown on the scales. The supervisor checks that the scales have sent the data item to the AMIGO System, checking that the value registered in the user's record coincides with the value shown on the scales.	**Passed**	
P3.2	The user measures his/her blood pressure on the blood pressure monitor. The supervisor notes the value shown on the blood pressure monitor. The supervisor checks that the blood pressure monitor has sent the data item to the AMIGO System, checking that the value registered in the user's record coincides with the value shown on the blood pressure monitor.	**Passed**	
P3.3	The user performs an electrocardiogram using the ECG. The supervisor notes the value shown on the ECG. The supervisor checks that the ECG has sent the data item to the AMIGO System, checking that the value registered in the user's record coincides with the value shown on the ECG.	**Passed**	
P3.4	The user measures his/her pulse with the pulsometer. The supervisor notes the value shown on the pulsometer. The supervisor checks that the pulsometer has sent the data item to the AMIGO System, checking that the value registered in the user's record coincides with the value shown on the pulsometer.	**Passed**	

Function	F4	The HM shows the measurement taken by the device on the display in the bathroom.		
Initial conditions		The user must be identified in the AMIGO System.		
		The test is performed in the bathroom with the pulsometer, using the mirror as a display.		
Test		**Description**	**Result**	**Observations**
P4.1		The user measures his/her pulse with the pulsometer. The supervisor notes the value shown on the pulsometer. The supervisor checks that the HM is displaying the measurement taken by the pulsometer in the mirror, and that the date item coincides with the value shown on the pulsometer.	**Passed**	

Function	F5	The AMIGO System stores the health data in the user's record so that it can be used again by the HM or by other applications.
Initial conditions	The user must be identified in the AMIGO System.

Initial conditions	The user must be identified in the AMIGO System.
	The test is performed in the bathroom using the blood pressure monitor.

Test	Description	Result	Observations
P5.1	The user takes their blood pressure using the blood pressure monitor. The supervisor notes the value shown on the blood pressure monitor. The supervisor checks that the value registered in the user's record coincides with the value shown on the blood pressure monitor.	**Passed**	

Function	F6	The HM analyses the user's data and if it detects a problem it informs the user, or, if necessary, sends the relevant information to the doctor.
Initial conditions		The user must be identified in the AMIGO System.
		The AMIGO System must have several weight data items stored in the user's record, which will serve as a pattern for detecting any problems occurring.
		A PC is installed in another room to simulate the doctor's server, which controls the health data alerts.
		The tests are performed in the bathroom using the scales, as this is the device on which it is easiest to simulate a measurement that is not within the user's pattern.

Test	Description	Result	Observations
P6.1	The user stands on the scales. The supervisor notes the weight shown on the scales, checking it is within the user's weight pattern. The supervisor checks that the HM analyses the data item and registers it in the user's record, but that it does not send an alert.	**Passed**	
P6.2	The user stands on the scales. To simulate that the user has put on weight, the supervisor also places a 5 Kg weight on the scales. The supervisor notes the weight shown on the scales, checking it is not within the user's weight pattern. The supervisor checks that the HM analyses the data item and registers it in the user's record and then informs the user via a voice message that they have a weight problem and that they should do something about it.	**Partially Passed**	In this test as well as in the next one, some times instead of only informing to the user it also sends the data to the doctor. For user tests and for the next version of the application a refinement of this will be needed.
P6.3	The user stands on the scales. To simulate that the user has put on weight, the supervisor also places a 10 Kg weight on the scales. The supervisor notes the weight shown on the scales, checking that it is much higher than the user's weight pattern and that there is cause for alarm. The supervisor checks that the HM analyses the data item and registers it in the user's record and then sends the data in the user's record to the doctor, checking that this data reaches the simulator PC.	**Partially Passed**	In this test as well as in the previous one, some times instead of sending the data to the doctor it only informs to the user about it. For user tests and for the next version of the application a refinement of this will be needed.

Function	F7	The HM urges the user to comply with the health plan established.		
Initial conditions		The user must be identified in the AMIGO System.		
		The user's health plan must be configured in the HM. To perform the test, a highly simplified health plan is configured: the user takes their pulse twice in a time interval of 3 minutes.		
		The test is performed in the bathroom using the pulsometer.		
Test	**Description**		**Result**	**Observations**
P7.1	The user takes their pulse with the pulsometer. The supervisor notes the value shown on the pulsometer. Two minutes after the first measurement has been taken, the supervisor tells the user to take their pulse again. The supervisor notes the value shown on the pulsometer. The supervisor checks that the HM informs the user via a voice message that they have carried out the actions established in their health plan.		**Passed**	As a suggestion for refinement, alerting messages should only be given whenever something out of the ordinary happens, but not in the normal situation. It can be annoying for the user.
P7.2	The user takes their pulse with the pulsometer. The supervisor notes the value shown on the pulsometer. The user does not take the second pulse measurement. The supervisor checks that the HM informs the user via a voice message 3 minutes after the first measurement that they have not carried out the actions established in their health plan.		**Passed**	Time was not exact, it sometimes has a delay of a few seconds, but this is not seen as a critical point as it fulfils its task without any problem.

Function	F8	The HM shows the information requested by the user on the display selected (mirror, television, etc.): latest measurements taken, record, etc.
Initial conditions		The user must be identified in the AMIGO System.
		A series of measurements must be recorded in the AMIGO System, which will be considered to be the latest measurements taken by the user. The user's record must also be stored in the AMIGO System (a few data items will be sufficient).
		The tests are performed in the bathroom using the mirror, and in the lounge using the television.

Test	Description	Result	Observations
P8.1	The user enters the bathroom and selects the information they wish to consult using the remote control (PDA): the latest measurements they have taken. The supervisor checks that the HM is showing the latest measurements taken by the user in the mirror, and that the data coincide with the values recorded in the AMIGO System.	**Passed**	
P8.2	The user enters the lounge and selects the television as a display. They then select the information they wish to consult using the remote control (PDA): their record. The supervisor checks that the HM is displaying the user's record on the television and that the data coincide with the values recorded in the AMIGO System.	**Passed**	

Function	F9	The HM guarantees confidentiality of the data by checking the users' identity and permission before displaying the information.
Initial conditions		The users must be identified in the AMIGO System.
		Two users are required for this test: a user with permission to consult the information on any of the registered users (U1), and another user who only has permission to consult their own health information (U2).
		The record for both the users (U1, U2) must be registered in the AMIGO System. Just a few data items will be sufficient.
		The tests are performed in the lounge using the television.

Test	Description	Result	Observations
P9.1	User U1 (permission to view all) selects the television as a display. They select the information they wish to consult using the remote control (PDA): user U2's record. The supervisor checks that the HM is displaying user U2's record on the television and that the data coincide with the values recorded in the AMIGO System.	**Passed**	
P9.2	User U2 (restricted permission) selects the television as a display, and uses the remote control to select the information they wish to consult: user U1's record. The supervisor checks that the HM informs user U2 via a voice message that they do not have permission to consult the information requested, and that the HM does not display user U1's record on the television.	**Failed**	Following the normal steps to do it, user U2 was not allowed to see the information, but during the tests it was found that following some other steps to ask for the information, it was shown. To be corrected for user tests and the next version of the application.

Function	F10	The HM interacts with the user via voice messages and display.		
Initial conditions		The user must be identified in the AMIGO System.		
		The test is performed in the bathroom using the scales.		
Test		**Description**	**Result**	**Observations**
P10.1		The user weighs himself on the scales. The supervisor notes the weight shown on the scales. The supervisor checks that the HM notifies the user via a voice message of the weight shown on the scales and that the data coincide with the value noted.	**Passed**	
P10.2		The user weighs himself on the scales. The supervisor notes the weight shown on the scales. The supervisor checks that the HM displays the weight shown on the scales in the mirror, and that the data coincide with the value noted.	**Passed**	

Function	F11	The HM enables configuration of the health plan for each of the users.		
Initial conditions		The user must be identified in the AMIGO System.		
		The test is performed in the lounge, using the Tablet PC.		
Test	**Description**		**Result**	**Observations**
P11.1	The user configures their health plan using the Tablet PC. The supervisor notes the health plan defined by the user. The supervisor checks that the health plan recorded in the AMIGO System coincides with the plan defined by the user.		**Passed**	

4.1.3 Food Management

4.1.3.1 Brief application description

The Food Management application deals with food at home, the management of the goods in the fridge and the cupboards, the use-by date of the goods, a set of recipes.

It also deals with the profile of each family member related to food, ingredients liked/disliked, possible diseases, etc. Each family member sets his/her preferences and his/her height, weight and gender. Also, each family member specifies when she/he is going to have breakfast, lunch or dinner the following week.

Performing reasoning analysis on data related to each meal, Food Management suggests one suitable week menu for the whole family generating a shopping list by checking the household stock. If Food Management detects a product that needs to be used soon, the menu will be changed to include a recipe that uses that ingredient.

The Food Management as kitchen chef downloads recipes and cooking programs to the kitchen and displays them for easy food preparation, i.e., cooking along with the video. Moreover, the recipes always take the status of the provisions in the kitchen into account.

The Food Management maintains the overview of the food and household stock and generates shopping lists (fresh ingredients and non-perishable items) at predetermined time intervals. The shopping lists are personalized, but they take items that are on special offer, seasonal variations and nutritional balance into account.

The Food Management application consists of the following components:

- fridge with RFID infrastructure
- Tablet PC with WiFi
- a PC with communication resources for Power Line, WiFi and RF

4.1.3.2 Requirements for application

The requirements to be fulfilled by the Food Management application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R8	The system should support storage and archiving of data in diverse ways.
R9	The system should support having control over data and information for best performance.
R10	The system should reduce the time needed for household chores and where possible do cleaning jobs.
R13	The system should be cost saving.

4.1.3.3   Application components functions

The functions of the Food Management application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The user can configure his/her profile related to food, ingredients liked, those disliked, possible diseases like cholesterol, diabetes and so on and religious questions and his/her height, weight and gender.
F2	The FM enables the profile of a new non-family member user to be added.
F3	The FM enables the weekly agenda to be configured for each user (which days they have breakfast, lunch or dinner at home).
F4	The FM enables new recipes to be added or existing recipes to be changed.
F5	The user can change any suggestion manually. To do so, the user can search the recipes by ingredients or meat type (soup, meat, …).
F6	The FM allows the user to make consultations (recipes, shopping list, menu, weekly agenda, profiles), viewing them on different displays (Tablet PC, kitchen wall display).
F7	Performing reasoning analysis on data related to each meal, the FM suggests one suitable menu for the whole family and other diners for each meal and arranges the menu planning for the next week.
F8	If the FM detects a product that needs to be used soon, the menu will be changed to include a recipe that uses that ingredient.
F9	Generate a shopping list (fresh list and big list) taking into account the ingredients that are actually in the fridge and cupboards and the ingredients required to prepare the suggested recipes.
F10	The user can add or delete ingredients from both lists (fresh list and big list) using the Tablet PC or by voice command.
F11	The FM enables the shopping list it has generated to be downloaded to a PDA.

4.1.3.4   Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
R6						X					
R7						X				X	
R8						X	X				
R9	X	X	X	X	X					X	
R10						X	X		X		X
R13								X			

4.1.3.5 Verification plan

The scenario in which the tests are carried out is the kitchen.

The kitchen is equipped with all the usual domestic appliances: vitro-ceramic hob, oven, refrigerator, washing machine, etc. The refrigerator is equipped with a label reader to check the food items placed inside or taken out of it. Furthermore there are cupboards for storing the food.

There is also a Tablet PC for user interaction with the FM application, and a wall screen displaying the information provided by the different applications.

Function	F1	The user can configure his/her profile related to food, ingredients liked, those disliked, possible diseases like cholesterol, diabetes and so on and religious questions and his/her height, weight and gender.		
Initial conditions		The user must be identified in the AMIGO System.		
		The test is performed in the kitchen using the Tablet PC.		
Test		**Description**	**Result**	**Observations**
P1.1		The user configures their food profile using the Tablet PC. The supervisor notes the food profile defined by the user. The supervisor checks that the food profile recorded in the AMIGO System coincides with the profile defined by the user.	**Passed**	

Function	F2	The FM allows a profile to be added for a new non-family member user.		
Initial conditions	The user must be identified in the AMIGO System.			
	The test is performed in the kitchen using the Tablet PC.			
Test	**Description**		**Result**	**Observations**
P2.1	The user configures a food profile in the "non-family" category using the Tablet PC (a profile with the minimum data: preferences and diseases). The supervisor notes the food profile defined by the user. The supervisor checks that the food profile recorded in the AMIGO System coincides with the profile entered by the user.		**Passed**	Only sticking to the minimum data is fine, but entering the complete profile or at least some more fields could be interesting and not too tedious.

Function	F3	The FM enables the weekly agenda to be configured for each user (the days of the week they have breakfast, lunch or dinner at home).
Initial conditions		The user must be identified in the AMIGO System.
		The test is performed in the kitchen using the Tablet PC.

Test	Description	Result	Observations
P3.1	The user configures their weekly agenda using the Tablet PC. The supervisor notes the weekly agenda defined by the user. The supervisor checks that the weekly agenda recorded in the AMIGO System coincides with the agenda defined by the user.	**Passed**	

Function	F4	The FM enables new recipes to be added and existing recipes to be modified.		
Initial conditions		The user must be identified in the AMIGO System.		
		The test is performed in the kitchen using the Tablet PC.		
Test	**Description**		**Result**	**Observations**
P4.1	The user selects the option for adding a new recipe using the Tablet PC, and fills in the fields on the form. The supervisor notes the data for the recipe entered.		**Passed**	
	The supervisor checks that the recipe recorded in the AMIGO System coincides with the recipe entered by the user.			
P4.2	The user selects the option for modifying a recipe using the Tablet PC and changes one or more of the fields on the form. The supervisor notes the data modified by the user.		**Partially Passed**	There was one time that the changes were lost, but we were not able to repeat this situation again.
	The supervisor checks that the recipe recorded in the AMIGO System coincides with the recipe entered by the user.			

Function	F5	The user can change any suggestion manually. To do so, the user can search the recipes by ingredients or meat type (soup, meat, …).
Initial conditions		The user must be identified in the AMIGO System.
		The weekly menu must be defined on the FM. To carry out the test, a simplified menu is sufficient: breakfast, lunch and dinner for one day.
		The test is performed in the kitchen using the Tablet PC.

Test	Description	Result	Observations
P5.1	The user consults the menu on the Tablet PC and changes the suggested recipe for the first course of the evening meal. The user selects the new recipe from the recipes found by ingredients (chicken, bream, etc.) The supervisor checks that the FM has correctly changed the first course of the evening meal, and consults the weekly menu to check it has been reconfigured by the FM.	**Passed**	
P5.2	The user consults the menu on the Tablet PC and changes the suggested recipe for the first course of the evening meal. The user selects the new recipe from the recipes found by type of dish (soup, salad, etc.). The supervisor checks that the FM has correctly changed the first course of the evening meal, and consults the weekly menu to check it has been reconfigured by the FM.	**Passed**	

Function	F6	The FM enables the user to make consultations (recipes, shopping list, menu, weekly agenda, profiles), viewing them on different displays (Tablet PC, kitchen wall display).
Initial conditions		The user must be identified in the AMIGO System.
		Two recipes and a weekly menu must be recorded in the AMIGO System.
		The tests are carried out in the kitchen with the Tablet PC and the wall display.

Test	Description	Result	Observations
P6.1	The user selects the information they wish to consult using the Tablet PC, i.e. the weekly menu. The supervisor checks that the FM is displaying the weekly menu on the Tablet PC.	**Passed**	
P6.2	The user selects the information they wish to consult using the Tablet PC, i.e. a recipe. The supervisor checks that the FM is displaying the recipe selected by the user on the wall display.	**Passed**	Information shown in the wall display is much bigger and easier to see. It is suggested to use this medium for user tests.

Function	F7	Performing reasoning analysis on data related to each meal, the FM suggests one suitable menu for the whole family and other diners for each meal and arranges the menu planning for the next week.
Initial conditions		The user must be identified in the AMIGO System.
		The profile and agenda for two users must be recorded in the AMIGO System. On defining the profiles and agendas, remember that the user preferences must not be exactly the same, and that one of users must eat out on one or more days of the week.
		The tests are carried out in the kitchen on the Tablet PC.

Test	Description	Result	Observations
P7.1	The user requests the weekly menu from the FM using the Tablet PC. The supervisor checks that the FM is generating the correct weekly menu, checking that the menu recorded in the AMIGO System is taking into account the restrictions indicated.	**Partially Passed**	It did not work well in all the case of "vegetarian" dishes. Some recepies were not correctly categorized. Some recipies need to be corrected.

Function	F8	If the FM detects a product that needs to be used soon, the menu will be changed to include a recipe that uses that ingredient.		
Initial conditions		The tests are carried out in the kitchen using the Tablet PC and the fridge.		
Test	**Description**		**Result**	**Observations**
P8.1	The supervisor consults today's menu defined by the FM on the Tablet PC. The supervisor places a food item due to reach its use-by date the following day in the fridge. The user opens the fridge and the FM notifies them with a voice message that the food item is about to reach its use-by date. The supervisor consults the menu again on the Tablet PC to check that the FM has changed today's menu to include a recipe using this food item.		**Passed**	

Function	F9	Generate a shopping list (fresh list and big list) taking into account the ingredients that are actually in the fridge and the cupboards and the ingredients required to prepare the suggested recipes.
Initial conditions		The user must be identified in the AMIGO System.
		A weekly menu must be recorded in the AMIGO System.
		One of the food items that needs to be used for this weekly menu (e.g. tomato sauce) must be inside the cupboard.
		The tests are carried out in the kitchen using the Tablet PC and the cupboard.

Test	Description	Result	Observations
P9.1	The supervisor draws up the shopping list manually (fresh list and big list) corresponding to the weekly menu recorded in the AMIGO System. Tomato sauce does not appear on this list. The user tells the FM to make the shopping list using the Tablet PC. The supervisor checks that the shopping list generated by the FM coincides with the list they have made themselves.	**Passed**	

Function	F10	The user can add or delete ingredients from both lists (fresh list and big list) using the Tablet PC or by voice command.
Initial conditions		The user must be identified in the AMIGO System.
		A shopping list must be recorded in the AMIGO System (fresh list and big list), although a few food items will be sufficient.
		The tests are carried out in the kitchen on the Tablet PC.

Test	Description	Result	Observations
P10.1	The user consults the shopping list on the Tablet PC. The supervisor notes the food items on the list. The user selects the corresponding option on the Tablet PC and adds a new food item to the shopping list. The supervisor checks that the FM has added the food item indicated by the user to the shopping list.	**Passed**	
P10.2	The user consults the shopping list on the Tablet PC. The supervisor notes the food items on the list. The user deletes a food item from the shopping list by voice command. The supervisor checks that the FM has deleted the food item indicated by the user from the shopping list.	**Partially Passed**	The application works fine and it removes the item, but it does not always understand the voice command at the first time it is said. This may also be caused by background noise (not too loud tough) at the time of performing the tests. Not recommended for user tests.

Function		F11	The FM enables the shopping list it has generated be downloaded to a PDA.
Initial conditions			The user must be identified in the AMIGO System.
			A shopping list must be recorded in the AMIGO System (fresh list and big list). A few food items will be sufficient.
			The tests are carried out in the kitchen using the Tablet PC and the PDA.
Test	**Description**		**Result**	**Observations**
P11.1	The user consults the shopping list on the Tablet PC. The supervisor notes the food items on the list. The user selects the corresponding option on the Tablet PC, and the FM downloads the shopping list to the PDA. The supervisor checks that the FM has downloaded the shopping list to the PDA, checking that the list on the PDA coincides with the list on the Tablet PC.		**Passed**	

4.1.4 Appliances Management

4.1.4.1 Brief application description

The Appliances Management application manages the set of domestic appliances. The user has, regardless of where she/he is, absolute control over their domestic appliances to switch them on, turn them off or know what their status is. If there is any problem with how they are working, the appliances will inform to technical service.

The user interacts with Appliances Management application using a remote control (PDA).

The Appliances Management application consists of the following components:

- washing-machine
- dishwasher
- oven
- boiler
- fridge
- induction hob
- a PC with communication resources for Power Line, WiFi and RF

4.1.4.2 Requirements for application

The requirements to be fulfilled by the Appliances Management application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R10	The system should reduce the time needed for household chores and where possible do cleaning jobs.
R11	The system should integrate and combine functionality of appliances.
R12	The system should be energy saving.
R13	The system should be cost saving.

4.1.4.3 Application components functions

The functions of the Appliances Management application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The AM enables the different domestic appliances to be switched on and off by remote control (washing-machine, dishwasher, fridge, boiler, oven, induction hob).

F2	The AM enables the different domestic appliances to be programmed by remote control.
F3	The AM enables several refrigerator functions to be activated by remote control: quick cool, quick freeze, switching off of the holiday function.
F4	The user can consult the status (off, on, etc.) of the different domestic appliances.
F5	The AM allows a 'priority of use' order to be established for the domestic appliances, based on efficient management of the power available in the home.
F6	The AM enables remote maintenance of the different domestic appliances to be carried out (if an appliance breaks down, the domestic appliance in question informs the AMIGO System, which notifies the Technical Assistance Service). - washing-machine: overflowing, water heating fault, temperature sensor fault, fault in the programme selector, breakdown in the motor, door open, does not fill with water or empty it out, unbalanced load in the drum. - dishwasher: overflowing, water heating fault, temperature sensor fault, water pressure fault, door open, door safety locking fault, does not fill with water or empty it out, no salt, no rinse aid. - fridge: break in the cold chain in the freezer, breakdown in the sensors, refrigerator door open, freezer door open. - oven: fault in the temperature sensor. - boiler: no water and/or gas, fault in the safety thermostat, burner outlet water temperature too high, fault in the gas valve relay, fault in the temperature sensors, fault in the fume removal system, fault in the water circuit, fault in the control board, fault in the flame detection.

4.1.4.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6
R6				X		
R10	X	X	X			
R11	X	X			X	
R12					X	
R13					X	X

4.1.4.5 Verification plan

The scenario in which the testing for the Appliances Management application is carried out is the kitchen, where the domestic appliances are located: washing-machine, dishwasher, oven, boiler, fridge, induction hob.

Function	F1	The AM enables the different domestic appliances to be switched on and off by remote control (washing-machine, dishwasher, fridge, boiler, oven, induction hob).
Initial conditions		The tests are carried out in the kitchen, alternately using the washing machine, the dishwasher, the refrigerator, the boiler, the oven and the vitro-ceramic hob.

Test	Description	Result	Observations
P1.1	With the washing machine switched off, the user orders the AM to switch on the washing machine, using the PDA. The supervisor checks that the AM has started up the washing machine. With the washing machine switched on, the user orders the AM to switch off the washing machine, using the PDA. The supervisor checks that the AM has switched off the washing machine.	**Passed**	
P1.2	With the dishwasher switched off, the user orders the AM to switch on the dishwasher, using the PDA. The supervisor checks that the AM has started up the dishwasher. With the dishwasher switched on, the user orders the AM to switch off the dishwasher, using the PDA. The supervisor checks that the AM has switched off the dishwasher.	**Passed**	
P1.3	With the refrigerator switched off, the user orders the AM to switch on the refrigerator, using the PDA. The supervisor checks that the AM has started up the refrigerator. With the refrigerator switched on, the user orders the AM to switch off the refrigerator, using the PDA. The supervisor checks that the AM has switched off the refrigerator.	**Passed**	
P1.4	With the boiler switched off, the user orders the AM to switch on the boiler, using the PDA. The supervisor checks that the AM has started up the boiler. With the boiler switched on, the user orders the AM to switch off the boiler, using the PDA. The supervisor checks that the AM has switched off the boiler.	**Passed**	
P1.5	With the oven switched off, the user orders the AM to switch on the oven, using the PDA. The supervisor checks that the AM has started up the oven. With the oven switched on, the user orders the AM to switch off the oven, using the PDA. The supervisor checks that the AM has switched off the oven.	**Failed**	The oven did not react at all, it continued switched off. It must be checked whether it is a problem of the application or there is something wrong with the oven of the demonstrator. Domotic Kit wrong, Electronic board, wiring… Needs to be solved for user testing.
P1.6	With the vitro-ceramic hob switched off, the user orders the AM to switch on the vitro-ceramic hob, using the PDA. The supervisor checks that the AM has started up the vitro-ceramic hob. With the vitro-ceramic hob switched on, the user orders the AM to switch off the vitro-ceramic hob, using the PDA. The supervisor checks that the AM has switched off the vitro-ceramic hob.	**Passed**	

Function	F2	The AM enables the different domestic appliances to be programmed by remote control.		
Initial conditions		The tests are carried out in the kitchen, alternately using the washing machine, the dishwasher, the boiler, the oven and the vitro-ceramic hob.		
Test	**Description**		**Result**	**Observations**
P2.1	With the washing machine switched off, the user programmes the AM to switch on the washing machine in 2 minutes, using the PDA. The supervisor checks that the AM has started up the washing machine after 2 minutes.		**Passed**	
P2.2	With the dishwasher switched off, the user programmes the AM to switch on the dishwasher in 2 minutes, using the PDA. The supervisor checks that the AM has started up the dishwasher after 2 minutes.		**Passed**	
P2.3	With the boiler switched off, the user programmes the AM to switch on the boiler in 2 minutes, using the PDA. The supervisor checks that the AM has started up the boiler after 2 minutes.		**Passed**	
P2.4	With the oven switched off, the user programmes the AM to switch on the oven in 2 minutes, using the PDA. The supervisor checks that the AM has started up the oven after 2 minutes.		**Failed**	The oven did not react at all, it continued switched off. It must be checked whether it is a problem of the application or there is something wrong with the oven of the demonstrator. Domotic Kit wrong, Electronic board, wiring… Needs to be solved for user testing.
P2.5	With the vitro-ceramic hob switched off, the user programmes the AM to switch on the vitro-ceramic hob in 2 minutes, using the PDA. The supervisor checks that the AM has started up the vitro-ceramic hob after 2 minutes.		**Passed**	

Function	F3	The AM enables various refrigerator functions to be activated by remote control: quick cool, quick freeze, switching off of the holiday function.
Initial conditions		The refrigerator must be functioning.
		The tests are carried out in the kitchen using the refrigerator.

Test	Description	Result	Observations
P3.1	The user orders the AM to activate the refrigerator "quick cool" function, using the PDA. The supervisor checks that the AM has activated the "quick cool" function.	**Passed**	
P3.2	The user orders the AM to activate the refrigerator "quick freeze" function, using the PDA. The supervisor checks that the AM has activated the "quick freeze" function.	**Passed**	
P3.3	The user orders the AM to activate the "switching off of the holiday function" of the refrigerator, using the PDA. The supervisor checks that the AM has activated the "switching off of the holiday" function.	**Passed**	

Function	F4	The user can consult the status (off, on, etc.) of the different domestic appliances.		
Initial conditions		The refrigerator must be functioning with the "quick freeze" function activated. The washing machine must be switched off. The tests are carried out in the kitchen using the refrigerator and the washing machine.		
Test	**Description**		**Result**	**Observations**
P4.1	The user consults the status of the refrigerator, using the PDA. The supervisor checks that the AM shows that the refrigerator is switched on and that the "quick cool" function is activated.		**Passed**	
P4.2	The user consults the status of the washing machine, using the PDA. The supervisor checks that the AM is showing that the washing machine is not functioning.		**Passed**	

Function	F5	The AM allows a 'priority of use' order to be established for the domestic appliances, based on efficient management of the power available in the home.		
Initial conditions		The test is carried out in the kitchen using the washing machine and the oven.		
Test	**Description**		**Result**	**Observations**
P5.1	The user configures the priority of use between the washing machine and the oven, using the tablet-PC (when the oven is switched on the washing machine must be stopped as there is not sufficient electrical power). The supervisor notes the priority of use order for the domestic appliances defined by the user. The user firstly starts up the washing machine and then switches on the oven. The supervisor checks that the AM follows the priority of use order established for the domestic appliances, checking that when the oven is switched on the AM stops the washing machine.		**Passed**	As the oven is switched on by the user it worked perfectly well this time, so therefore the oven is working well. Therefore, the previous problems found with the oven must be related to the application or communication

Function	F6	The AM enables remote maintenance of the different domestic appliances to be carried out (if an appliance breaks down, the domestic appliance in question informs the AMIGO System, which notifies the Technical Assistance Service).
		- washing-machine: overflowing, water heating fault, temperature sensor fault, fault in the programme selector, breakdown in the motor, door open, does not fill with water or empty it out, unbalanced load in the drum.
		- dishwasher: overflowing, water heating fault, temperature sensor fault, water pressure fault, door open, door safety locking fault, does not fill with water or empty it out, no salt, no rinse aid.
		- fridge: break in the cold chain in the freezer, breakdown in the sensors, refrigerator door open, freezer door open.
		- oven: fault in the temperature sensor.
		- boiler: no water and/or gas, fault in the safety thermostat, burner outlet water temperature too high, fault in the gas valve relay, fault in the temperature sensors, fault in the fume removal system, fault in the water circuit, fault in the control board, fault in the flame detection.
Initial conditions		A PC is installed in another room to simulate the TAS server that controls the remote maintenance.
		The tests are carried out in the kitchen using the dishwasher, as this is a domestic appliance enabling easy breakdown simulation.

Test	Description	Result	Observations
P6.1	The supervisor closes the dishwasher stopcock to simulate a breakdown: insufficient water is reaching the appliance. The supervisor checks that the dishwasher notifies the AMIGO System of the breakdown and that the AMIGO System informs the TAS, also checking that the breakdown notification reaches the simulator PC.	**Passed**	

4.1.5 Entrance Manager

4.1.5.1 Brief application description

The Entrance Manager manages the front door events. The Entrance Manager is responsible for recognizing people at the front door of the house and opening the door for them depending on their authorization for such action.

Person is detected/identified by the face and voice recognition. If the person is known by the system a command is sent by Entrance Manager to the door to unlock and allow the person to enter.

If the person is a visitor, the person will be informed on non-availability of inhabitants, and will be asked to leave a message.

Special situations can affect the behaviour of the Entrance Manager, for example if AMIGO System has detected an emergency (like an elderly person has fallen and can't get up again), then the door should also be opened for e.g. ambulance personnel.

The Entrance Manager application consists of the following components:

- automatic door operator (lock and open/close)
- microphone and loudspeakers for speech input/output
- camera to be used by the face recognition

4.1.5.2 Requirements for application

The requirements to be fulfilled by the Entrance Manager application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R2	The system must be secure, safe and protect the privacy of all users.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R17	The system should provide controllable access and respect individual preferences and authorities.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.

4.1.5.3 Application components functions

The functions of the Entrance Manager application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The EM detects/identifies the user who is standing at the door of the house using its face recognition and voice recognition systems.
F2	If the user is identified, the EM opens the door and lets the user in.
F3	If there is an emergency (e.g. fire), the EM unblocks the door to allow the emergency services to enter.
F4	If a visitor arrives and no-one is at home, the EM allows them to leave a voice message.
F5	If a message has been recorded, the EM will play it back to the user as soon as they get home.

4.1.5.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5
R2	X				
R6					X
R7				X	
R17		X	X		
R19			X		

4.1.5.5 Verification plan

The tests are performed at the front door of the house.

There are two different detectors at the front door of the house for identifying the person standing at the door: a microphone for voice recognition, and a camera for face recognition.

Function	F1	The EM detects/identifies the user who is standing at the door of the house using its face recognition and voice recognition systems.
Initial conditions		The user must be identified in the AMIGO System.
		The test is performed at the front door of the house.

Test	Description	Result	Observations
P1.1	The user stands at the front door and repeats the code that serves as a pattern for voice recognition. The supervisor checks that the EM identifies the user.	**Passed**	It usually works fine but if there is some kind of background noise, the voice code must be repeated. However, this is not a big deal.

Function	F2	If the user is identified, the EM opens the door and lets them in.		
Initial conditions		Two users are required for the test: a user identified in the AMIGO System who has permission to enter the house (U1), and another user who is not identified in the AMIGO System and therefore does not have permission to enter (U2).		
		The test is performed at the front door of the house.		
Test	**Description**		**Result**	**Observations**
P2.1	User U1 (who has permission to enter) stands at the front door and repeats the code that serves as a pattern for voice recognition. The supervisor checks that the EM opens the door after having identified user U1.		**Passed**	
P2.2	User U2 (who does not have permission to enter) stands at the front door. The supervisor checks that the EM does not open the door as it does not identify user U2.		**Passed**	

Function	F3	If there is an emergency (e.g. fire), the EM unblocks the door to allow the emergency services to enter.		
Initial conditions	The test is performed at the front door of the house.			
Test		**Result**	**Observations**	
P3.1	The supervisor simulates a fire so that the AMIGO System detects an emergency situation. The supervisor checks that the EM unblocks the front door when the emergency occurs.	**Passed**		

Function	F4	If a visitor arrives and no-one is at home, the EM allows them to leave a voice message.		
Initial conditions		A user who is not identified in the AMIGO System and who therefore does not have permission to enter the house is required for this test.		
		The test is performed at the front door of the house.		
Test		**Description**	**Result**	**Observations**
P4.1		The user stands at the front door and repeats the code that serves as a pattern for voice recognition. The supervisor checks that the EM notifies the user via a voice message that they can leave a message, as it does not identify the user. The user leaves a message, speaking into the microphone. The supervisor notes the message. The supervisor checks that the message recorded by the EM coincides with the message left by the user.	**Passed**	

Function	F5	If a message has been left, the EM plays it back to the user when they arrive home.
Initial conditions	The user must be identified in the AMIGO System.	
	The EM must have recorded a message for this user.	
	The test is performed at the front door of the house.	

Test	Description	Result	Observations
P5.1	The user stands at the front door and repeats the code that serves as a pattern for voice recognition. When the EM identifies the user and opens the door, the user enters the house. The supervisor checks that the EM plays the message back to the user when they enter the house.	**Passed**	

4.1.6 Comfort System

4.1.6.1 Brief application description

The Comfort System application manages the environmental features of the home. The system should maintain the appropriate environmental conditions of the house (temperature, humidity, light, CO_2, etc.) adapting them to the user's preferences.

The home is divided in different zones; each room could be a zone. The environmental features of each zone can be managed individually. The Comfort System sets the environment of each zone depending on the preferences of the people present at the zone, or the people that will be in the zone.

The user can set a temperature or profile for each zone, using the different interface available. A profile is a list of temperatures and timebands, so that a certain temperature can be programmed for a specific time of day, normally taking into account the times when there is no-one at home. These profiles can be different depending on whether the day is a holiday or a normal working day.

The Comfort System application consists of the following components:

- several temperature sensors with Bluetooth resources

- several actuators to activate and deactivate the electric heaters and the fans

- a lamp that lights up in different colours

- a PC with communication resources for Power Line, WiFi and RF

4.1.6.2 Requirements for application

The requirements to be fulfilled by the Comfort System application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	Description
R5	The home comfort should always be maintained and not be subservient to the system.
R7	The system should enable easy access and usage of information and data from different sources
R9	The system should support having control over data and information for best performance.
R14	The system should maintain the appropriate environmental conditions of the house (temperature, humidity, light, air, dust, mites, etc.).
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.

4.1.6.3 Application components functions

The functions of the Comfort System application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The CS maintains the appropriate environmental conditions of the house (temperature, light, etc.) adapting them to the user's preferences.
F2	The CS enables selection of predefined atmospheres (adapting the lighting and temperature to environments such as watching a film or reading).
F3	The CS manages the functioning of the different appliances involved in maintaining the environmental conditions (radiators, fans, lamps, etc.).
F4	The user interacts with the CS using the Tablet PC and by voice command.
F5	The CS enables a profile to be configured for each user (list of temperatures and timebands, light, etc.).

4.1.6.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5
R5	X		X		
R7				X	
R9				X	X
R14	X				
R19	X	X			

4.1.6.5 Verification plan

The scenario in which the tests are carried out is the lounge, where a temperature sensor, a fan and a lamp that can light up in different colours are installed.

Function	F1	The CS maintains the appropriate environmental conditions of the house (temperature, light, etc.) adapting them to the user's preferences.
Initial conditions	The user must be identified in the AMIGO System.	
	The user's environmental profile must be stored in the AMIGO System.	
	The test is carried out in the lounge, using the lighting.	

Test	Description	Result	Observations
P1.1	The user stays in the lounge for a certain length of time. The supervisor notes the user's environmental conditions. The supervisor checks that the CS has changed the light to the colour specified in the user's environmental profile recorded in the AMIGO System.	**Passed**	

Function	F2	The CS enables selection of predefined environments (adapting the lighting and temperature to environments such as watching a film or reading).		
Initial conditions		The user must be identified in the AMIGO System.		
		A predefined environment must be stored in the AMIGO System.		
		The test is carried out in the lounge.		
Test		**Description**	**Result**	**Observations**
P2.1		The user uses a voice command to ask the CS to adapt the atmosphere to the predefined environment.	**Passed**	
		The supervisor checks that the CS has modified the environmental conditions of the room and that they coincide with the data defining the selected environment recorded in the AMIGO System.		

Function	F3	The CS manages the functioning of the different appliances involved in maintaining the environmental conditions (radiators, fans, lamps, etc.).
Initial conditions		The user must be identified in the AMIGO System.
		The user's environmental profile and a predefined environment must be stored in the AMIGO System.
		The tests are carried out in the lounge using different appliances (radiator, fan and lamp).

Test	Description	Result	Observations
P3.1	The supervisor cools down the lounge until a temperature of 15 ºC (cold) is reached. The user stays in the lounge for a certain length of time. The supervisor checks that the CS switches on the radiator until the temperature indicated in the user's environmental profile recorded in the AMIGO System is reached.	**Passed**	
P3.2	The supervisor heats up the lounge until a temperature of 28 ºC (heat) is reached. The user stays in the lounge for a certain length of time. The supervisor checks that the CS switches on the fan until the temperature indicated in the user's environmental profile recorded in the AMIGO System is reached.	**Passed**	The temperature of 28ºC is too high and it lasts too long to reach it. The lounge was heat up to 25 ºC and the profile changed to 22ºC in order to do the test.
P3.3	By means of a voice command, the user tells the CS to adapt the atmosphere in the lounge to the predefined environment. The supervisor checks that the CS modifies the lighting in the room to achieve the environmental conditions defined in the selected environment recorded in the AMIGO System.	**Passed**	

Function	F4	The user interacts with the CS using the Tablet PC and by voice command.		
Initial conditions	The user must be identified in the AMIGO System.			
	The user's environmental profile and a predefined environment must be stored in the AMIGO System.			
	The tests are carried out in the lounge using the Tablet PC.			
Test	**Description**		**Result**	**Observations**
P4.1	The user modifies their environmental profile using the Tablet PC. The supervisor notes the changes made by the user.		**Passed**	
	The supervisor checks that the profile recorded in the AMIGO System has been modified in accordance with the changes made by the user.			
P4.2	By means of a voice command, the user asks the CS to create a predefined environment.		**Partially Passed**	The application does not always understand the voice command at the first time it is said. This may also be caused by background noise (not too loud tough) at the time of performing the tests. Not recommended for user tests.
	The supervisor checks that the CS modifies the environmental conditions of the room and that they coincide with the data defining the selected environment.			

Function	F5	The CS enables a profile to be configured for each user (list of temperatures and timebands, light, etc.).
Initial conditions	The user must be identified in the AMIGO System.	
	The test is carried out in the lounge using the Tablet PC.	

Test	Description	Result	Observations
P5.1	The user configures their environmental profile using the Tablet PC. The supervisor notes the profile defined by the user. The supervisor checks that the environmental conditions profile recorded in the AMIGO System coincides with the profile defined by the user.	**Passed**	

4.1.7 Technical Alarms Management

4.1.7.1 Brief application description

The Technical Alarms Management application is able to detect any gas or water leakage. If any incidence is detected, and to avoid bigger disasters, the system automatically cuts down the supply of water or gas, depending on the leakage. The user is notified as soon as any leakage is detected.

The Technical Alarms Management application interacts with the user in several ways to send messages: voice message, display, telephone call/SMS to the user.

The user interacts with the Technical Alarms Management application by voice command.

The Technical Alarms Management application consists of the following components:

- all the appliances connected to the Power Line

- sensors: water detectors, gas detectors

- actuators, valves

- a PC with communication resources for Power Line, WiFi and RF

4.1.7.2 Requirements for application

The requirements to be fulfilled by the Technical Alarms Management application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R10	The system should reduce the time needed for household chores and where possible do cleaning jobs.

4.1.7.3 Application components functions

The functions of the Technical Alarms Management application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The TAM detects any leaks that may occur (either water or gas leaks).
F2	The TAM shuts off the main valves controlling the water or gas flow when it detects an alarm situation.
F3	The TAM informs the user of the alarm situation using the different AMIGO System resources:

| F4 | When the TAM detects that the cause of the alarm situation has been eliminated, and when it has been authorised to do so by a user, the TAM sends down the order to open the electrically-operated valves that it had previously closed. |

- by voice message or display, if there is a user at home.
- by a telephone call or SMS, if there is no-one at home.

4.1.7.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4
R6			X	
R10	X	X		X

4.1.7.5 Verification plan

The scenario in which the tests for the Technical Alarms Management application are carried out is the kitchen, where the domestic appliances are located (washing-machine, dishwasher, boiler) and the water and gas sensors and actuators are installed. It also has a wall display on which the information appears.

Function	F1	The TAM detects any leaks that may occur (either water or gas leaks).		
Initial conditions	The test is carried out in the kitchen using the water supply, as using water is less dangerous than using gas.			
Test	Description		Result	Observations
P1.1	The supervisor simulates a water leak by manually making a contact in the water detector. The supervisor checks that the TAM has detected the water leak.		**Passed**	

Function	F2	The TAM shuts off the main valves controlling the water or gas flow when it detects an alarm situation.
Initial conditions	The test is carried out in the kitchen using the water supply, as using water is less dangerous than using gas.	

Test	Description	Result	Observations
P2.1	The supervisor turns on the tap at the sink, and simulates a water leak by manually making a contact in the water detector. The supervisor checks that when the TAM has detected the water leak it orders the actuator to shut off the main water valve, also checking that the tap is no longer running.	**Passed**	

Function	F3	The TAM informs the user of the alarm situation using the different AMIGO System resources: - by voice message or display, if there is a user at home. - by a telephone call or SMS, if there is no-one at home.
Initial conditions		The user must be identified in the AMIGO System. The tests are carried out in the kitchen using the water supply, as using water is less dangerous than using gas.

Test	Description	Result	Observations
P3.1	The user enters the kitchen (there is someone at home). The supervisor simulates a water leak by manually making a contact in the water detector. The supervisor checks that when the TAM has detected the alarm situation and it informs the user that there is a water leak via a voice message.	**Passed**	The voice message is not immediate it takes some seconds to inform the user, but it is not considered to be too long.
P3.2	The user goes out of the house (there is no-one at home). The supervisor simulates a water leak by manually making a contact in the water detector. The supervisor checks that when the TAM has detected the alarm situation it informs the user that there is a water leak via a call to their mobile phone.	**Passed**	

Function	F4	When the TAM detects that the cause of the alarm situation has been eliminated, and when it has been authorised to do so by a user, the TAM sends down the order to open the electrically-operated valves that it had previously closed.
Initial conditions		The user must be identified in the AMIGO System and must be authorised to turn the water or gas supply back on.
		The test is carried out in the kitchen using the water supply, as using water is less dangerous than using gas.

Test	Description	Result	Observations
P4.1	The user goes into the kitchen.	**Passed**	
	The supervisor turns on the tap at the sink, and simulates a water leak by manually making a contact in the water detector. The tap stops running, as when the TAM detects the leak it orders the actuator to shut off the main water valve.		
	The supervisor removes the water detector contact. The authorised user informs the TAM by voice message that the alarm situation has been rectified.		
	The supervisor checks that when the TAM has detected that there is no longer a water leak and when it has received the order from the user, it makes the actuator open the main water valve. The supervisor then checks that the tap is running again.		

4.1.8 Conclusions

The tests performed for the validation can not be treated as tests that are made to a product that is about to be launched to the market, where all the functionality and features are tested thoroughly. These validation tests should be seen as a way of making sure that the functionalities of the applications are correctly implemented in the demonstrators and that these functionalities give an answer to a user need identified at the beginning of the project.

The tests detailed in the previous chapters show that the functions implemented in the applications are generally working correctly. In a few cases, some details have been found that were not expected in the tests. Some of them do not affect to the overall performance of the application, others can be classified as possible improvements and finally the ones that were wrong have been solved.

As these functionalities that are implemented in the applications give response to the requirements gathered in the WP1, we can conclude that the developed applications fulfil the user requirements that were defined at the beginning of the project.

However, as the requirements listed in WP1 were quite generic, we can not guarantee that fulfilling them will be enough for the appeal or success of the applications. To close the development loop user tests will be needed.

4.2 Home Information and Entertainment

To validate the prototype implemented in WP6 a demonstrator has been installed. This demonstrator is formed by a set of applications that have been installed in the Telefónica I+D premises in the Walqa Technological Park in Huesca, Spain. It is a room that simulates a living room in a house.

The specific applications and features described in the Home Information and Entertainment scenario have been validated: more comfort and enjoying, user-friendliness, improved general efficiency, environment adaptability to users needs, anticipation and customisation, sharing of experiences, accessibility anytime anyplace of every services, information and features, infinite bandwidth, security and safety feeling and so on.

The applications that comprise the Home Information and Entertainment demonstrator are:

Information

- Home Agenda
- My News
- Monitor Manager

Entertainment

- Media Manager Core
- Privacy Enforcement
- Parental Control
- Context Dependent Personalization of Multimedia
- Board Game

4.2.1 Home Agenda

4.2.1.1 Brief application description

Home Agenda, is the main application where the rest of applications in Home Information will be integrated. The main functionality is to manage the user's agenda data. This is done using an ontology based on the iCalendar standard that models these data. The model created is exported as a context source, so then other applications can benefit from the information stored in Home Agenda.

A very important part of this agenda is managing events. Each user can store and organize notes together with a description, activity, time, and people involved. The scheduler will synchronize each user's agendas after checking for the availability of the people involved and alert them of possible overlapping.

But there is not only note and description what an Amigo personal event comprises. The event may be just the execution of a determined service, provided any device or machine in the interconnected home environment, with certain parameters.

4.2.1.2 Requirements for application

The requirements to be fulfilled by the Home Agenda application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R2	The system must be secure, safe and protect the privacy of all users.
R3	The system must provide an added value to existing systems.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R11	The system should integrate and combine functionality of appliances.
R17	The system should provide controllable access and respect individual preferences and authorities.
R18	The system should support alignment of individual and group planning, updates and notifications.

4.2.1.3 Application components functions

The functions of the Home Agenda application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	Users can create and store an event at any time.
F2	The user can select whether to show private and public events of the home users. Private events will only be shown if the user is inside the room.
F3	Home Agenda exports the information stored as a 'Context Source'.
F4	User can access to information about the usage of the services.
F5	User can manage/administer services usage definition files (IPDR schemas).

4.2.1.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5
R2		X			
R3				X	X
R6	X	X	X		
R7			X	X	X
R11			X	X	X
R17		X			
R18	X				

4.2.1.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function	F1	The user can create an event at any time.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P1.1	The user creates an event.		**Passed**	
P1.2	The system stores the event for the identified user taking in account the parameters provided by the user.		**Passed**	
P1.3	The system shows to the user the events. Specially 'Cycling' event.		**Passed**	

Function	F2	The user can select whether to show private and public events of the home users. Private event will only be shown if the user is inside the room.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P2.1	The user decides whether the even is public or private and saves it.		**Passed**	
P2.2	The system changes the privacy level to the event.		**Passed**	
P2.3	Only appropriate users will be able to see the event.		**Passed**	

Function	F3	Home Agenda exports the information stored as a 'Context Source'.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P3.1	When an event is introduced in Home Agenda or an Object in Monitor Manager, the system updates the context source information and exports it.		**Passed**	

Function	F4	User can access to information about the usage of the services.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P4.1	When a service or device is used and the system knows about it (IPDR Schema), the system will register the usage.		**Passed**	
P4.2	The user can check the use he did of different devices, the 'bill'.		**Passed**	

Function	F5	User can manage/administer services usage definition files (IPDR schemas).		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P5.1	User can invoke CRUD methods to administer the services that register their usage.		**Passed**	

4.2.2 My News

4.2.2.1 Brief application description

My News offers a personalized recommendation of news to users based on the user preferences and categorization of news. The application shows several pieces of news matching the user preferences.

4.2.2.2 Requirements for application

The requirements to be fulfilled by the My News application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R8	The system should support storage and archiving of data in diverse ways.
R17	The system should provide controllable access and respect individual preferences and authorities.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R30	Enable individual settings and preferences.

4.2.2.3 Application components functions

The functions of the My News application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	Users can edit the list of feeds, add or delete sources.
F2	Users can select a topic so the system can show topic related news.
F3	User can enable auto-training option.

4.2.2.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3
R8	X		X
R17		X	
R19		X	X
R30	X		

4.2.2.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function		F1	Users can edit the list of feeds, add or delete sources.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P1.1	The user accesses his feeds.			**Passed**	
P1.2	The user edits the list of feeds.			**Passed**	

Function		F2	Users can select a topic so the system can show topic related news.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P2.1	The user selects a topic. Only those topic related news will be shown.			**Passed**	

Function		F3	Users selects auto-training.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P3.1	The user selects auto-training.			**Passed**	
P3.2	The systems sets auto-training on.			**Passed**	

4.2.3 Monitor Manager

4.2.3.1 Brief application description

Monitor Manager, whose goal is to monitor entities such as objects or children and then to notify Amigo users in a relevant way by using a particular entities' location. The demonstrator is coupled with a user agenda to anticipate users' needs, based on Agenda events and rules defined by the user.

Actual uses are quite various: ensuring that each entity is in the right place (namely to avoid stealing, home disorder or dangers to a child), locating objects, etc. Another use is preventing users from forgetting objects when going outside their home to attend a home agenda event.

4.2.3.2 Requirements for application

The requirements to be fulfilled by the Monitor Manager application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R2	The system must be secure, safe and protect the privacy of all users.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R17	The system should provide controllable access and respect individual preferences and authorities.
R18	The system should support alignment of individual and group planning, updates and notifications.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.

4.2.3.3 Application components functions

The functions of the Monitor Manager application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	Monitor Manager consumes the information stored in 'Context Source'.
F2	Users can register any Object in the Monitor Manager to take account of them.
F3	Users can add rules for their objects.
F4	Monitor Manager will let users know if they are missing any object for an event that would need that object when they leave home. Or if anyone is stealing an object, moving it out of its predefined place.

4.2.3.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4
R2				X
R6	X			
R7	X	X		
R17				X
R18			X	X
R19		X	X	X

4.2.3.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function		F1	Monitor Manager exports the information stored as a 'Context Source'.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P1.1	When an Object is introduced in Monitor Manager, the system updates the context source information and exports it.			**Passed**	

Function		F2-F3	Users can register any Object in the Monitor Manager to take account of them. Users can add rules for their objects.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P2.1	The user creates an Object 'Bike'.			**Passed**	
P2.2	The system stores the object for the identified user.			**Passed**	
P2.3	The user assigns rules for the object.			**Passed**	

Function		F4	Monitor Manager will let users know if they are missing any object for an event that would need that object when they leave home. Or if anyone is stealing an object, moving it out of its predefined place.		
Initial conditions		The user must be identified in the AMIGO System.			
		No Home event before cycling.			
Test	**Description**			**Result**	**Observations**
P4.1	The user attempts to go out to the 'Cycling' event without her 'Bike'.			**Passed**	
P4.2	The system alerts the user via her PDA that she's forgetting her bike.			**Passed**	

4.2.4 Media Manager Core

4.2.4.1 Brief application description

Media Manger Core is the main application that hosts the rest of applications in Home Entertainment. MMC takes the responsibility for browsing the content desired by the users depending on their profiles and context, and for adapting and later serving and playing the content on the most suitable renderer, such as a TV or a PDA. Hence, the application manages all activities related to content, browsing, description, repository and playback options like play, forward or pause following user preferences and profile and context information. The application directly interacts with the voice and gesture support shared services as well as background applications like Context-Dependent Personalization of Multimedia, Parental Control and Privacy Enforcement, which will be running at the same time the content is about to be rendered. It may indirectly interact with any other application requiring playback of content.

4.2.4.2 Requirements for application

The requirements to be fulfilled by the Technical Alarms Management application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R3	The system must provide an added value to existing systems.
R7	The system should enable easy access and usage of information and data from different sources.
R11	The system should integrate and combine functionality of appliances.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R26	The system should support feeling of connectedness to family and friends.

4.2.4.3 Application components functions

The functions of the Multimedia Manager Core application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The user can play multimedia content in any selected portable device or tv, independently of the location.
F2	The user can control any multimedia session that was started.
F3	The system exports the multimedia sessions as 'Context Source'.
F4	The system discovers any new device and shares its multimedia contents.
F5	The user can interact with the system through hand gestures.
F6	The user can purchase contents from external servers using the sub module Accounting and Billing.

F7	Available auto-filling option to retrieve info and metadata of multimedia contents.

4.2.4.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	
R3	X			X	X		X
R7	X		X	X		X	X
R11						X	
R19	X		X	X	X		
R26	X	X		X	X		

4.2.4.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function	F1	The user can play multimedia content in any selected renderer, independently of the location.		
Initial conditions		The user must be identified in the AMIGO System.		
Test		**Description**	**Result**	**Observations**
P.1.1		The user browses the multimedia contents and selects one.	**Passed**	
P1.2		The user selects one of the available discovered renderers.	**Passed**	
P.1.3		The user starts the multimedia session by choosing 'Play'.	**Passed**	

Function	F2	The user can control any multimedia session that was started.		
Initial conditions		The user must be identified in the AMIGO System.		
Test		**Description**	**Result**	**Observations**
P2.1		The user goes to My Sessions.	**Passed**	
P2.2		The system shows all the ongoing sessions.	**Passed**	
P2.3		The users can stop/pause/restart the session using the available controls.	**Passed**	

Function	F3	The system exports the multimedia sessions as 'Context Source'.		
Initial conditions				
Test	**Description**		**Result**	**Observations**
P3.1	The system exports a multimedia context source, that is available for other applications, every time a new session is launched or there's a change in the status of the ongoing sessions.		**Passed**	

Function	F4	The system discovers any new device and shares its multimedia contents.		
Initial conditions				
Test	**Description**		**Result**	**Observations**
P4.1	A guest visits the user and enters in the house.		**Passed**	
P4.2	The user navigates to 'Browse devices and share multimedia contents'.		**Passed**	
P4.3	The guest takes a picture with his phone and makes it available in the network.		**Passed**	
P4.4	The system discovers the phone automatically and the multimedia content will be available in the multimedia library.		**Passed**	

Function	F5	The user can interact with the system through hand gestures.		
Initial conditions				
Test	**Description**		**Result**	**Observations**
P5.1	The user interacts with the system drawing figures in the air. The user can repeat the process of starting playing a movie and stopping it, this time using the associated gestures.		**Passed**	

Function	F6	The user can purchase contents using the sub module Accounting and Billing.		
Initial conditions				
Test	**Description**		**Result**	**Observations**
P6.1	The user can use his account to purchase multimedia content.		**Passed**	
P6.2	The system stores the purchased media, and shares for all the devices that will eventually use it.		**Passed**	
P6.3	The system offers information about billing and usage of the service.		**Passed**	

4.2.5 Privacy Enforcement

4.2.5.1 Brief application description

Privacy Enforcement application is in charge of applying user privacy rules whenever the presence of another person is detected in the same area.

Privacy Enforcement is introduced to ensure privacy aware personalized content provisioning. When an Amigo user views content and does not want others to be aware that he/she is being provided with the specific content under the current circumstances, the system is able to configure this content view based on the user context. Thus, the system detects the presence of other humans in the area where the content delivery service is used and adjusts the view of the provided content accordingly. When the user is alone, the selected devices simply display the content requested. Whenever the presence of another person is detected in the same area, the system applies the privacy rules specified by the user turning the devices to stand-by mode for example. This way, the Amigo user keeps the usage of the specified content delivery private.

4.2.5.2 Requirements for application

The requirements to be fulfilled by the Privacy Enforcement application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R2	The system must be secure, safe and protect the privacy of all users.
R8	The system should support storage and archiving of data in diverse ways.
R17	The system should provide controllable access and respect individual preferences and authorities.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.

4.2.5.3 Application components functions

The functions of the Privacy Enforcement application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The user can define Privacy Enforcement Rules.
F2	The system pauses/resume multimedia sessions when a rule is triggered.

4.2.5.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	**F2**
R2		X

R8	X	
R17		X
R19		X

4.2.5.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function	F2	The system pauses/resume multimedia sessions when a rule is triggered.		
Initial conditions		The user must be identified in the AMIGO System.		
Test		**Description**	**Result**	**Observations**
P2.1		A different user enters the room where the content is being displayed. Observe how the multimedia session is paused according to the privacy rules.	**Passed**	

4.2.6 Parental Control

4.2.6.1 Brief application description

Parental Control is responsible for checking whether an Amigo User is authorized to access media that is available only under parental permission. Parental control over content delivery services focuses on restricting a (usually juvenile) user's access to inappropriate content. This task is achieved by consulting the parents of the child on this matter. If the parents allow their child to access the specific content, then the Amigo system proceeds with the service delivery. Thus, the Amigo system initially retrieves information about the user (child) who wishes to access the specific content as well as information about the specific content. Content rating is modelled semantically with the content ontology. Rating is inferred with Parental Control rules and the movie genre present in the ontology.

If no rules have been established for the specific user and content or no explicit parental permission to access the content is in place, then the Amigo System attempts to reach one of his parents. Thus, it selects the device to be used in order to communicate with the parent and uses the selected device to send him/her a message requesting permission to deliver the specified content to the child. When the parent notices the message he/she replies to the system (they can approve or reject the playback from the PDA) which processes the reply and either starts the content delivery through the Media Manager Core or informs the Amigo User about not being authorized to access the specific content.

4.2.6.2 Requirements for application

The requirements to be fulfilled by the Parental Control application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	Description
R1	The user must always remain in control of the system and never the other way around.
R3	The system must provide an added value to existing systems.
R8	The system should support storage and archiving of data in diverse ways.
R17	The system should provide controllable access and respect individual preferences and authorities.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R30	Enable individual settings and preferences.

4.2.6.3 Application components functions

The functions of the Parental Control application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	User can consult, add and edit parental control rules.
F2	The system contacts the parents via PDA to ask for authorization to start the multimedia session when the child tries to watch the content, in case no rule allowing it was previously set.
F3	The system processes the parental response, and acts accordingly, playing the movie or stopping the multimedia session.

4.2.6.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3
R1	X		X
R3		X	
R8	X		
R17		X	X
R19		X	
R30	X		

4.2.6.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function		F1	User can consult, add and edit parental control rules.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P.1.1	'Father' user consults the current parental rules.			**Passed**	

Function		F2	The system contacts the parents via PDA to ask for authorization to start the multimedia session when the child tries to watch the content, in case no rule allowing it was previously set.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P2.1	'Child' user starts a multimedia session			**Passed**	
P2.2	System sends a notification to the 'Father' user, asking for authorization, after checking the parental rules that apply to the 'Child' user.			**Passed**	

Function		F3	The system processes the parental response, and acts accordingly, playing the movie or stopping the multimedia session.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P3.1	The 'Father' user responds to the system request.			**Passed**	
P3.2	The system process the 'father' user response, and resumes or stops the multimedia session accordingly.			**Passed**	

4.2.7 Context Dependent Personalization of Multimedia

4.2.7.1 Brief application description

Context Dependent Personalization of Multimedia shows personalized selection of multimedia and/or home media based on user context. Suggestions about what to watch are personalized by using user profile information and user context information. Several users are recognized by the application for suggestions based on a combined context.

For example: selection of photos and videos which people watch depends on whom with they watch the video and what are they currently interested in.

Ability of Amigo system to present personalized suggestions to the users depends on:

- Available user context.
- Multimedia preferences from the user profiles stored in UMPS.
- Home Agenda Context Source.

Recommendations change when the context changes, which is for example when a new user enters the room.

For example, if Amigo system is not capable to recognize some context type which affects user's interests (e.g., if Amigo system can not recognize which people are going to watch photos or videos together), it might provide wrong suggestions, e.g., to ignore somebody's interests.

Apart from ability to recognize users' contexts, Amigo system should be able to learn user preferences from the history of multimedia retrieval cases. This is a challenging task because users are not willing to explicitly rank the videos, that is, to express how did they like the actors, the video plot, how suitable they consider the video for watching together with children or with guests and so on. Thus, Amigo system should not only acquire user's preferences explicitly, but also infer them from indirect clues. For example, if users never watch some video together with children, or even switch off the playback when the children enter a room, this means that they consider this particular video as unsuitable for children.

The demonstrator will be aiming to show how an intelligent home system can personalize suggestions to the users, based on the available contextual information and on application history.

4.2.7.2 Requirements for application

The requirements to be fulfilled by the Context Dependent Personalization of Multimedia application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R3	The system must provide an added value to existing systems.
R7	The system should enable easy access and usage of information and data from different sources.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R22	The system should take implicit social rules of behaviour into account.

4.2.7.3 Application components functions

The functions of the Context Dependent Personalization of Multimedia application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	Recommendations based on agenda.
F2	Recommendations based on UMPS profiles and user preferences.
F3	Be able to recognize users or groups in order to make more accurate recommendations.
F4	Guess user preferences by his/her behavior.

4.2.7.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	**F2**	**F3**	**F4**
R2	X		X	X
R7	X	X		
R19	X	X	X	
R22				X

4.2.7.5 Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function	F1	Recommendations based on agenda.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P1.1	The system can make agenda based recommendations for multimedia content. Check the agenda and the recommendation.		**Passed**	

Function	F2	Recommendations based on UMPS profiles and user preferences.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P2.1	The system can make user profile based recommendations for multimedia content. Check the profile and the recommendation.		**Passed**	

Function	F3	Be able to recognize users or groups in order to make more accurate recommendations.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P3.1	The system recognizes present users to make recommendations. Confirm it may make different recommendation when a user leaves the group.		**Passed**	

Function	F4	Guess user preferences by his/her behavior.		
Initial conditions		The user must be identified in the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P4.1	The system can guess user preferences by his behaviour and context.		**Passed**	

4.2.8 Board Game

4.2.8.1 Brief application description

Board Game consists of a traditional, physical board game that uses ambient intelligence methods for enhancing the game experience. The board game can be controlled via physical figures, gestures, and speech and adapts the ambient atmosphere in the room (light, music, eventually wall displays) to the state of the game. The demonstrator uses and greatly simplifies the game mechanics of typical fantasy tabletop/role playing games. Figures representing fantasy creatures such as knights, ghosts, orcs etc. are placed on a physical game board and engage in a fierce battle. The goal of the game is to overcome the other players' figures and thus earn a higher score than the other figures that have lost. Figures are moved turn-wise and perform actions such as casting magic spells, attacking other figures, or using enchanted artifacts.

Figures can be moved on the physical game board or on a graphical user interface as in a traditional video game. Gesture control is used for "magic wand" functionality, i.e. casting spells. The more powerful the magic spell is, the more complex becomes the gesture to perform. Therefore, it requires a bit of training with the gestures in order to use them most effectively.

The application integrates with the Media Manager Core (MMC) from which it can be started and terminated.

4.2.8.2 Requirements for application

The requirements to be fulfilled by the Board Game application have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R3	The system must provide an added value to existing systems.
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R8	The system should support storage and archiving of data in diverse ways.
R21	The system should support playing games and entertainment with multiple people in the same room or networked environment.

4.2.8.3   Application components functions

The functions of the Board Game application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The system represents individual character and private data in each player's PDA.
F2	The movements of the figures on the board game are taken into account by the application and the game engine.
F3	The system can recognize gestures from players that are associated to actions.

4.2.8.4   Requirements to functions mapping

This table shows the functions to requirements map:

	F1	**F2**	**F3**
R3	X	X	X
R6	X		
R8	X		
R21	X	X	X

4.2.8.5   Verification plan

The scenario in which the tests are carried out is anywhere inside the interconnected home environment.

Function		F1	The system represents individual character and private data in each player's PDA.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P1.1	The user can see his/her character information in his/her PDA.			**Passed**	

Function		F2	The movements of the figures on the board game are taken into account by the application and the game engine.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P2.1	The user moves a piece representing a character.			**Passed**	
P2.2	The systems update the information about it.			**Passed**	

Function		F3	The system can recognize gestures from players that are associated to actions.		
Initial conditions		The user must be identified in the AMIGO System.			
Test	**Description**			**Result**	**Observations**
P3.1	The user can interact with his/her character with gestures.			**Passed**	
P3.2	The system performs the associated action.			**Passed**	

4.2.9 Conclusions

All the applications developed for Home Information and Entertainment demonstrator passed all the performed tests confirming that the functionalities required have been accomplished. In some cases, some minor details gave unexpected results, however these slight issues were solved by carrying out a few modifications.

For the correct interpretation of these successful results, it should be taken into account that these applications are prototypes and not final market products ready to be sold. Therefore, the tests executed should be understood as a way of checking that the user requirements that were elicited from the field studies carried out during WP1 are directly reflected into home information and entertainment applications.

4.3 Extended Home

To validate the prototype implemented in WP7 three different sites have been used for demonstration. The demonstrator is formed by a set of applications that have been installed in these places:

- the Philips ExperienceLab emulates a home equipped with a high-tech infrastructure.

- the France Telecom VisionLab emulates a small apartment; it has a kitchen and living room equipped with TV and computer display.

- the Italdesign Lab equipped with large screen displays with touch screen options, wearable microphones for voice recognition and gesture interaction, etc.

The specific applications and features described in the Extended Home scenario have been validated: opening up a continuous spectrum between non-communication and communication, sharing multimedia content between persons in different homes in an easy way, dissolving the boundaries between push and pull communication, unobtrusive yet efficient user interfaces, automatic application and service configuration, context aware device self-setting and so on.

The applications that comprise the Extended Home demonstrator are:

- Palantir

- Activity Sharing

- Feeling@

- Ambience Sharing

- Social Radio

- Board Game

- Personal Amigo Device

4.3.1 Activity Sharing

4.3.1.1 Brief application description

Activity Sharing is a set of applications designed to run on a TV. They allow remote users to share photo albums and play arcade games while maintaining an audio-visual communication link.

Three separate information-gathering interviews were conducted with Philips stakeholders to obtain feedback and recommendations regarding the main expectations of the user test. Based on the results of these interviews, objectives for the user test were defined.

A user test was conducted (14 TU/e students and employees were recruited) to examine the above-mentioned two aspects of connectivity, i.e., between devices within the home, and between independent households. In this test, two households were connected over a network using the Amigo interface. In addition, within the test "home", three devices were connected together: a television set, an iCat, and an Atmosphere Lamp. These devices were used during a picture sharing activity and while playing games (i.e., Four-in-a-Row, poker, and a quiz game). A final goal of the test was to evaluate the users' experience while engaging in the picture sharing activity and game play.

A detailed description of the application and its functioning can be found in the document "D7.4 - Implementation the Extended Home Environment Prototype; §2.6".

4.3.1.2 Requirements for application

The requirements to be fulfilled by the Activity Sharing application have been taken from the general the AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R6	The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know).
R7	The system should enable easy access and usage of information and data from different sources.
R8	The system should support storage and archiving of data in diverse ways.
R20	To system should support the integration of playing computer games in family routine, and approved settings.
R21	To system should support playing games and entertainment with multiple people in the same room or networked environment.
R25	The system should support keeping in touch with select group of friends, no need to always be connected as "me"-time is just as important.
R26	The system should support feeling of connectedness to family and friends.

4.3.1.3 Application components functions

The functions of the 3 scenarios on the Activity Sharing application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	Connect to friend, and disconnect from friend.
F2	Start video chat.
F3	Interact with Amigo services/devices.
F4	Play games.
F5	Upload / Share / Discuss pictures.

4.3.1.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5
R6		X	X	X	X
R7					X
R8			X		X
R20			X		
R21			X		X
R25	X				
R26	X	X		X	X

4.3.1.5 Verification plan

Function	F1	Connect to friend, and disconnect from friend.		
Initial conditions	\"Friend codes\" have been exchanged.			
	Both friends are online.			
Test	**Description**	**Result**	**Observations**	
P1.1	Search friend in own community list.	Succeeded	• Most users did not fully understand the manner in which devices were connected	
P1.2	Invite a friend to start communicating.	Succeeded	• Privacy is a concern; users do not want to be logged onto the system automatically	
			Users were asked specifically whether they thought that the connection between the devices added to the experience. For the most part, users did not notice the light at all, or did not understand the connection between the light and the games. However, one user did comment that the \"light was cool because it can emphasize the atmosphere during the game.\"	
			Furthermore, although it was not included in the user test, participants were asked to give some feedback regarding a system that automatically detected a user's presence and would uniquely adapt to it. Three users said that they would prefer a system that is not always automatic, as sometimes users would like to have a manual control override. Furthermore, 8 users noted that privacy is an issue; in other words, they would prefer a system that does not automatically show the users as being \"online.\"	

Function	F2	Start video chat.		
Initial conditions	Friend has invited the other party to start communication.			
	The other party has accepted this invitation.			
Test	**Description**		**Result**	**Observations**
P2.1	Two friends are connected after inviting (and accepting) the opposite party. As a result automatically a live A/V connection is established.		Succeeded	• The majority of users liked the opportunity to interact with others at a remote location. • The interactivity feature reminded users of other platforms for communicating over distance, such as MSN or Skype. • Users want control over the system. With regard to the concept of interactivity with others in a remote location, some notable themes emerged. First, when asked what most participants liked about the entire system, the most common response was highly favorable towards the interactivity aspect of the Extended Home Environment (EHE). Specifically, six respondents said that they liked the interactivity feature when asked what they liked most about the system. Many participants noted the similarity between the EHE system and other systems that enable users to interact with individuals at a remote location, such as MSN or Skype. The main difference, however, is that this system is operated using a television rather than a personal computer—a notable difference commented upon by users. Some other noteworthy comments individuals made included the fact that the system allowed for interactivity that was "more fun than a simple phone call," and that it was "a nice concept which looks like Skype and has added value".

Function	F3	Interact with Amigo services/devices.		
Initial conditions	Friend is connected.			
	Amigo devices are recognized by system.			
Test	**Description**		**Result**	**Observations**
P3.1	Different interoperable devices were placed within the test room; these included a television, an iCat, and an Atmosphere Lamp.		Difficult to understand the role of devices.	• Specifically, almost all users did not understand the function of the light • Most users found the use of the iCat while playing games with another team to be confusing. Generally, users reported unfavorable feedback when asked specifically about the interconnection between the various devices. Although most users smiled or laughed when the iCat turned on, users found it confusing to interact with at the same time they were playing the game. For example, one user said that the "iCat is funny, but it and the other team were talking at the same time, and therefore it was difficult to understand both." Many users made similar comments regarding the use of the iCat. For example, another user stated that it was difficult to pay attention to the questions on the television and listen to the iCat at the same time. Thus, the majority of users found the added feature of the iCat to be more confusing than enjoyable.

Function	F4	Play games.
Initial conditions	Friends are connected.	
	Both have Poker & Quiz game installed as Amigo service.	
	Amigo services are found by TV application.	

Test	Description	Result	Observations
P4.1	The devices used in Function F3 were used during a picture sharing activity, and while playing the following games: • Four-in-a-Row • Poker • Quiz game	Prefer a real game console, but understand and like this "shared" concept	• Many users did not find the use of this system, and its use through a television to be an improvement over currently available systems (e.g., XBOX or Playstation) • However, many users liked the setting of the living room Many users did not think that the gaming feature was an improvement over other systems that are already available to users (such as when using PCs or another gaming system such as Microsoft's XBOX or the Sony Playstation.) However, some users mentioned that they liked the fact that this aspect of the system was located in the living room. Specifically, one user said that although she didn't like playing games, she found the "setting in a living room to be more relaxed and it feels natural." Another user also commented that she liked the setting in the living room because it is relaxed. Finally, one user suggested that such a set-up might be useful for families.

Function	F5	Upload / Share / Discuss pictures.		
Initial conditions	Friends are connected. At least one of this Amigo's has picture(s) to share/show.			
Test	**Description**		**Result**	**Observations**
P5.1 P5.2 P5.3	Upload pictures. Share pictures. Discuss pictures.		Succeeded Liked it Succeeded	• Many users liked the concept of picture sharing • The majority of users liked the idea of sharing pictures over the television and talking about them with others who were not present • Many users found the structure of the program difficult to use • Many users wanted more feedback because they did not know what pictures they were sharing at any given moment • More feedback regarding what is shared, needs to be included. The majority of users responded favorably to the sharing pictures feature. Comments users made about this concept included that it was "really fun to do over the television, and that real-time communication is fantastic" and therefore added to the experience. Another user responded that it was "nice" because "it is not necessary to start-up a PC." In sum, most users showed interest in the concept and remarked positively about it. Most of the negative comments that users made regarding the use of the sharing pictures feature had to do with the lack of feedback that users received regarding what they were sharing. In other words, it was not immediately apparent what pictures were being shared. One user said that he "enjoyed that you could share pictures, but it was poorly structured. It was a bit confusing because you did not know what the others could see, or if you were both looking at the same picture." Another key point that a user made was that the communications feature must be "easy and accessible." However, one problem that users experienced while interacting with remote users was the lack of feedback that they received regarding what they were sharing (e.g., pictures). For example, one user commented that it was "really difficult to have a good idea of what others could see and hear." Another user said that it was "sometimes not clear if there was a connection or not." During the test, several users asked the question to the individuals with whom they were communicating, "What can you see now?" Indeed, oftentimes users could not even tell if a remote connection had been established, and would ask "can you hear me?" or "are you there?" It was apparent that many users struggled with the lack of feedback that the system provided during communications.

4.3.2   Conclusions

Overall, the users were really positive about the functional concept of the Activity Sharing application within the Extended Home. Most of them automatically recognized relations with existing PC based Community application like e.g. MSN, Flickr, and Facebook, since e.g. the availability status is automatically updated throughout the whole Amigo environment, and video chat is enabled. These social services are very well received in the living room, especially the direct audio/video link, where friends and family can chat and see each other at the same time seems really attractive. This service, in combination with the Picture Sharing application was received very well. Also the fact that different services can be added and removed from the system was understood, and fancied. Some additional requirements were requested though, and can be summarized by:

- Add status online/offline option

- Add video on/off option

- Amigo extensions that are remotely connected to the TV (e.g. lamp, iCat) were not fully understood by the user

- Users did not understand why games were implemented, since PS3 and Xbox already support remote game play

- Users were not aware of the pictures that were visible on the remote TV, which means that this UI needs improvements

4.3.3   Feeling@

4.3.3.1   Brief application description

The Feeling@ application is composed by the following building blocks:
- The RFID Reader;
- The User Notification Messenger;
- The AV Conference Manager;
- The Sketch Presentation;
- The Shared Organizer.

Furthermore, Feeling@ application is integrated with the following modules from WP4, WP6 and WP7:
- WP4: Context Management Service, User Modelling and Profiling Service; User Interface Service;
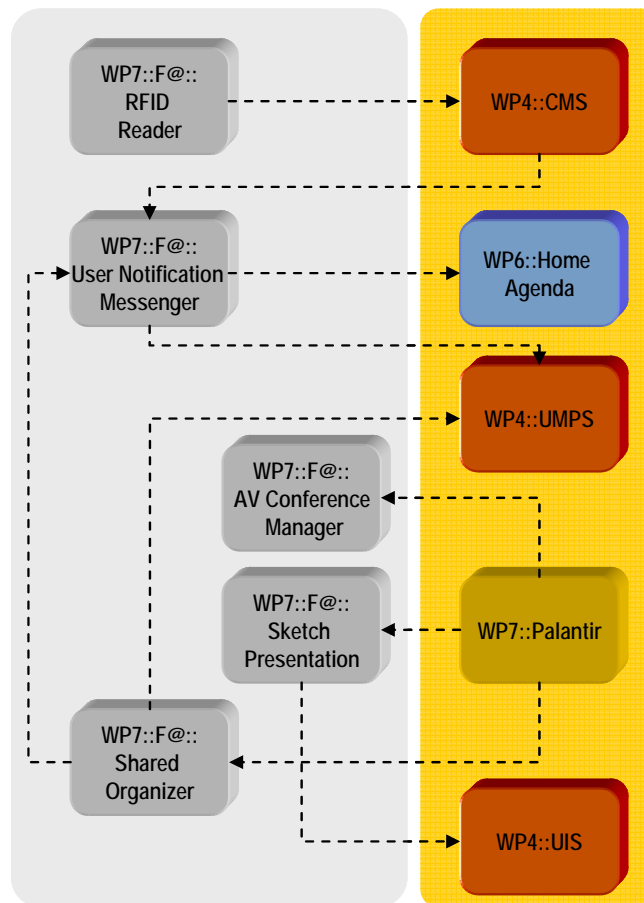- WP6: Home Agenda;
- WP7: Palantir.

Figure 1 - Feeling@ Architecture

The aim of the Feeling@ application is to enable ambient communication and content sharing between two different locations. Places involved include the Home, considered as a single location for the whole family, the Office as a generic workplace, the Privacy Bubble intended as an ambient location with privacy enhancements and the Study as a sub-location of the Home inherently characterized by work enabled devices.

The Privacy Bubble, in particular, can be considered as a room inside the workplace defined as an extended home environment in office, a specific space dedicated to employees' private communication, having a feeling of being at home. In the same manner but in the opposite way, the Study is defined as an extended office environment inside the Home location. Just as the Privacy Bubble, the Study is a specific space dedicated to work activities that gives the feeling of being at the office.

Within this context we want to test the following applications:

<u>Notification system:</u>

Feeling@ provides the possibility of having an unobtrusive notification system, able to propose the user all the information he/she wants to be constantly notified of from the home when he is away, for example at work. In the scenario, the foreseen situation is the unobtrusive notification of an unexpected event happening at home.

<u>Privacy Bubble:</u>

The Privacy Bubble is a space within the workplace specifically dedicated to privacy which allows an ambient audio-video communication with the home.

<u>Shared Organizer</u>

The Shared Organizer is an application which allows users to create, share, manage activities and being notified of activity status change in distant locations.

<u>Sketch Presentation:</u>

The Sketch Presentation is an application which allows users to share, modify and compare contents from different locations in an easy and intuitive way. In particular, the interaction with the system is guaranteed by the voice and gesture recognition. Users will interact with the system by means of voice and gesture, sharing pictures and comparing them.

4.3.3.2 Requirements for application

The requirements relevant to the Feeling@ application have been extracted from the general AMIGO System requirements defined in the deliverable D1.2 "Report on user requirements, Summary and conclusions - Volume I".

TARGET APPLICATION REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around
R3	The system must provide an added value to existing systems
R7	The system should enable easy access and usage of information and data from different sources.
R15	The system should support the activity organization and planning for multiple persons at home, between homes and between home and work
R17	The system should provide controllable access and respect individual preferences and authorities
R18	The system should support alignment of individual and group planning, updates and notifications.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R23	The system should support increasing number of communication moments in multiple different contexts
R26	The system should support feeling of connectedness to family and friends
R28	Be easy to use and to configure – no need for programming by the user
R30	Enable individual settings and preferences
R31	Be configurable by the user or service provider
R33	Be extensible - easy to upgrade

TARGET APPLICATION REQUIREMENTS	
ID	**Description**
R36	Be modular
R37	Be maintenance free (i.e., no need for maintenance by the user)

4.3.3.3 Application components functions

The functions of the Feeling@ application are listed in the table below:

FUNCTIONS	
ID	**Description**
F1	The RFID Reader provides RFID sensor data as context information to the Amigo system;
F2	The RFID Reader allows the WP7::Palantir application to determine user presence in a local environment;
F3	The Shared Organizer handles user defined activities (create, modify, delete) storing them persistently;
F4	Activity information is accessed and aggregated from multiple service instances (distributed);
F5	The Shared Organizer leverages WP4::UMPS middleware to retrieve user profile information;
F6	The Shared Organizer is triggered by the WP7::Palantir based on user awareness;
F7	The Shared Organizer receives WP7::Palantir user presence events;
F8	The Shared Organizer exposes activity change events for other services to consume (WS-Eventing);
F9	The User Notification Messenger generates user notifications by reasoning on predefined context and application events (i.e. unexpected events happening at home; activity changes in the office);
F10	The User Notification Messenger consumes user location context events to generate notifications;
F11	The User Notification Messenger consumes WP7::F@::Shared Organizer activity events to generate notifications;
F12	The User Notification Messenger leverages the WP6::Home Agenda to determine user's scheduled location;
F13	The User Notification Messenger leverages WP4::UMPS middleware to retrieve user profile information;
F14	The AV Conference Manager will be able to establish communication between different environments and in different moments;
F15	The AV Conference Manager is triggered by the WP7::Palantir based on user awareness;
F16	The Sketch Presentation allows users to link with each other and share sketches between different locations;
F17	The Sketch Presentation is triggered by the WP7::Palantir based on user awareness;

FUNCTIONS	
F18	The Sketch Presentation receives WP7::Palantir user presence events;
F19	The Sketch Presentation leverages WP4::UMPS middleware to retrieve user profile information;
F20	The Sketch Presentation leverages WP4::UIS middleware advanced features such as voice and gesture services;
F21	Feeling@ application, wherever possible, uses XML mark up in simple configuration files;
F22	Feeling@ is built upon a modular and reusable framework (core library) and be extensible to support new functionalities (designed by contract approach);
F23	Feeling@ only needs initial configuration to run continuously.

Note that not all functions can or will be tested for practical reasons, as non noticeable results, already tested by other partners or just being enabled – not enabled conditions.

The excluded tests are:

F2 – Tests performed by FT. See F2 – P2.2 test of France Telecom's Technical and Functional Verification document.

F14 – Tests performed by FT. See F1 – P1.1 and P1.2 tests of France Telecom's Technical and Functional Verification document.

F7, F18, F19 – Cannot be tested as it won't provide any visible effect on the applications.

F21, F22, F23 – Cannot be tested as it can only be verified by code inspection.

4.3.3.4 Requirements to functions mapping

Each function can answer to several requirements, so we need to map functions and requirements in order to validate requirements by verifying functions.

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23
R1						X									X		X						
R3	X																						
R7				X												X							
R15			X	X																			
R17					X		X						X					X	X				
R18								X			X												
R19		X								X		X											
R23														X									
R26									X					X									
R28																				X	X		
R30				X															X				
R31																					X		
R33																						X	
R36																						X	
R37																							X

4.3.3.5 Verification plan

The aim of the technical and functional verification is to check whether the application developed meets the initially established requirements. As there is a direct relationship between the requirements and the application functions, the requirements can be verified by checking the functions.

The Validation Plan specifies how function fulfilment is to be checked. A series of test cases are defined and executed to demonstrate whether the system fulfils the established functions.

Tests presented below were performed by an employee of ITAL who is unfamiliar with Amigo under supervision of members of the Amigo consortium.

Function	F1	The RFID Reader provides RFID sensor data as context information to the Amigo system.		
Initial conditions		• The sensor is working properly and detecting at least one user tag. • The software is configured correctly and has started without giving any errors.		
Test	**Description**		**Result**	**Observations**
P.1	Start the RFID Reader as an OSGi bundle or as a .NET application. It will continuously receive sensor data and update the internal RDF model honouring subscriptions. Start the Context Source Tester module from WP4 CMS and start it. In the upper text box insert a typical "UserLocation" RDF fragment. Click on "Lookup CS". Select an entry of the list box and enter a SPARQL query in the lower text box. Press the "Execute Query" button. The output on the right hand box should report detected user information.		Approved	

Function	F3	The Shared Organizer handles user defined activities (create, modify, delete) storing them persistently.		
Initial conditions		• The Shared Organizer application (both front-end and back-end) is correctly configured and started.		
Test	**Description**		**Result**	**Observations**
P.3	Start up the Shared Organizer GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. From the GUI select the *New Activity* link in the upper left hand corner, insert a desired name and click on the *Add* button. A new activity will be created and displayed. Left click on any activity bar. Modify any value in the activity pane and click *Apply*. The changes will be saved and the list of activities refreshed. Left click again on any activity bar. Click on the *Delete* button shown on the activity pane. The list of activities will be refreshed and the activity gone.		Approved	

Function	F4	Activity information is accessed and aggregated from multiple service instances (distributed).		
Initial conditions		• Two Shared Organizer instances available.		
		• Both Shared Organizer applications (both front-end and back-end) are correctly configured and only one started.		
Test	**Description**		**Result**	**Observations**
P.4	Start up the Shared Organizer GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. The GUI will show activities from one of the available Shared Organizer instances. Start the second instance. The application will refresh automatically and display activities from both instances together.		Approved	

Function	F5	The Shared Organizer leverages WP4::UMPS middleware to retrieve user profile information.		
Initial conditions		• The Shared Organizer application (both front-end and back-end) is correctly configured and started.		
Test	**Description**		**Result**	**Observations**
P.5	Start up the Shared Organizer GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. From the GUI click on any activity bar. In the activity pane, both *owner* and *collaborator* widgets will list users defined and stored in the UMPS system.		Approved	

Function	F6	The Shared Organizer is triggered by the WP7::Palantir based on user awareness.		
Initial conditions		• The Shared Organizer application (both front-end and back-end) is correctly configured and started.		
		• The Palantir system is correctly configured and started for the user performing the tests.		
Test	**Description**		**Result**	**Observations**
P.6	From the Palantir GUI select the Shared Organizer application from the icons displayed on the right side, then select any person shown on the screen. The remote person will see the image of the caller vibrating. The web browser automatically starts and displays the application with user-relative information.		Approved	

Function	F8	The Shared Organizer exposes activity change events for other services to consume (WS-Eventing).
Initial conditions		• The Shared Organizer application (both front-end and back-end) is correctly configured and started. • The User Notification Messenger application is correctly configured and started.

Test	Description	Result	Observations
P.8	Start up the Shared Organizer GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. From the GUI click on any activity bar. In the activity pane change any value press the *Apply* button. An event will be fired and will result with an email sent to the owner of the activity.	Approved	

Function	F9	The User Notification Messenger generates user notifications by reasoning on predefined context and application events (i.e. unexpected events happening at home; activity changes in the office).
Initial conditions		• The Shared Organizer application (both front-end and back-end) is correctly configured and started. • The User Notification Messenger application is correctly configured and started. • At least one connected RFID Reader instance is configured and started. • The Home Agenda application is correctly configured and started. At least one VFREEBUSY schedule must be submitted.

Test	Description	Result	Observations
P.9	Enter a room which is supplied with RFID readers (active or passive). Let the RFID technology detect your presence (by drawing up your tag near the sensor or by getting into the antenna's range). Move to the active screen and select the first shown activity. On the screen select the apply button. Two emails should be received. One stating your presence is not scheduled into the room and another notifying that the activity has been updated.	Approved	

Function		F10	The User Notification Messenger consumes user location context events to generate notifications.
Initial conditions			• The Shared Organizer application (both front-end and back-end) is correctly configured and started.
			• The User Notification Messenger application is correctly configured and started.
			• At least one connected RFID Reader instance is configured and started.
			• The Home Agenda application is correctly configured and started. At least one VFREEBUSY schedule must be submitted.
Test	**Description**	**Result**	**Observations**
P.10	Trigger a context update by having a tag detected by a passive RFID reader or just being near an active RFID antenna. The contact person of the schedule information will receive an email message with the appropriate information.	Approved	

Function		F11	The User Notification Messenger consumes WP7::F@::Shared Organizer activity events to generate notifications.
Initial conditions			• The Shared Organizer application (both front-end and back-end) is correctly configured and started.
			• The User Notification Messenger application is correctly configured and started.
Test	**Description**	**Result**	**Observations**
P.11	From the Shared Organizer GUI, add, delete or modify any activity. The owner will receive an email message with the appropriate information.	Approved	

Function	F12	The User Notification Messenger leverages the WP6::Home Agenda to determine user's scheduled location.
Initial conditions		• The User Notification Messenger application is correctly configured and started.
		• The Home Agenda application is correctly configured and started. At least one VFREEBUSY schedule must be submitted.

Test	Description	Result	Observations
P.12	Trigger a context update by having a tag detected by a passive RFID reader or just being near an active RFID antenna. Only if the user scheduled location is not the same as the one reported by the RFID context information a notification is generated.	Approved	

Function	F13	The User Notification Messenger leverages WP4::UMPS middleware to retrieve user profile information.
Initial conditions		• The User Notification Messenger application is correctly configured and started.

Test	Description	Result	Observations
P.13	Trigger any notification (see functions F10 and F11). The User Notification Messenger will determine the correct email address stored in the UMPS system. In the generated email the user's first name and last name are correctly retrieved and displayed.	Approved	

Function	F15	The AV Conference Manager is triggered by the WP7::Palantir based on user awareness.		
Initial conditions		• The supervisor introduces the PalantiGUI and explains components of its graphical interface. • The user must be identified in the AMIGO System. • The test should be performed from all configured displays in the environment. • The test is performed on a touch sensitive display		
Test		**Description**	**Result**	**Observations**
P.15		The user is asked to start a communication with a remote contact. To perform this action, the user should select the Ambience Sharing application on the PalantirGUI service, then select the person to start a communication. The remote person can see the image of the caller vibrating. The communication starts when the remote person selects the caller's image.	Approved	

Function	F16	The Sketch Presentation allows users to link with each other and share sketches between different locations.		
Initial conditions		• The Sketch Presentation application (both front-end and back-end) is correctly configured and started.		
Test		**Description**	**Result**	**Observations**
P.16		Start up the Sketch Presentation GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. Let the application load both local and remote image galleries. When done open both thumbnail tabs located at page bottom to display available sketches. Start up another Sketch Presentation GUI in different location. When finished loading thumbnails, the galleries of both GUIs will show the same thumbnails in reversed tabs (local is remote for the other party and vice versa for the remote tab).	Approved	

Function	F17	The Sketch Presentation is triggered by the WP7::Palantir based on user awareness.
Initial conditions		• The Sketch Presentation application (both front-end and back-end) is correctly configured and started.
		• The Palantir system is correctly configured and started for the user performing the tests.

Test	Description	Result	Observations
P.17	From the Palantir GUI select the Sketch Presentation application from the icons displayed on the right side, then select any person shown on the screen. The remote person will see the image of the caller vibrating. The web browser automatically starts and displays the application with user-relative information.	Approved	

Function	F20	The Sketch Presentation leverages WP4::UIS middleware advanced features such as voice and gesture services.
Initial conditions		• The Sketch Presentation application (both front-end and back-end) is correctly configured and started.
		• VoiceIO and VoiceService services are configured and started.
		• GestureRecognizer and GestureManager services are configured and started.

Test	Description	Result	Observations
P.20	Start up the Sketch Presentation GUI in a web browser. In the URL field add a *userid* parameter with a valid username value. Let the application load both local and remote image galleries. When done open both thumbnail tabs located at page bottom to display available sketches. From the top *File* menu, select the "Start/Stop Gesture" or "Start/Stop Voice" items. Based on the choice, use gesture (with the SoapBox hardware) or voice (with a microphone) commands to drive the application.	Approved	

Note that the procedure need to be detailed enough to run the test. The detail will depend on the level of detail you put in the functional decomposition of each component.

4.3.4   Conclusions

The Feeling@ application, composed by different modules and based on the Palantir presence management system, supports users in sharing a feeling of presence between the home and other distant environments, that is, the home and the workplace, always maintaining the user in control of the system.

Feeling@ application allows users to take advantage of new communication moments and modalities with their family and colleagues (for example, the audio-video communication provided in the Privacy Bubble, that is, a private communication moment in a working context), taking always into account context conditions.

Feeling@ supports activity and content sharing (the Shared Organizer and Sketch Presentation modules). In particular, the Shared Organizer component supports the activity planning for multiple persons in different locations and helps in the activities planning, updates and notifications.

Feeling@ application is built upon the Amigo middleware and intelligent services (Context Management, User Interface and User Modeling and Profiling Services). It is modular, configurable and extensible.

To conclude, the Feeling@ application is a valuable example of the Amigo middleware and services potentialities in the context of the Extended Home application domain (Home-Office environments).

4.3.5   Social Radio

4.3.5.1   Brief application description

Social Radio is a novel approach for mediating awareness in small intimate groups. Instead of traditional communication media, music is used to inform users about the presence and mood of multiple remote peers. The system consists of several smart artifacts and an underlying multi-user communication infrastructure.

Each user has several artifacts at home that represent their personal circle of friends. Each artifact represents one remote individual and displays awareness information about that person. The presence of a remote person is indicated using ambient light. In addition, an artifact communicates the mood of a remote user by re-playing the music the person is currently listening to.

In order to provide users with lightweight interaction mechanisms the artifacts are controlled via a tangible user interface. Depending on the position, an artifact is switched off or in different operating modes.

The Social Radio demonstrator is build of the following components:

- *Artifacts* the physical devices used to control the application state.

- The *ArtifactController* (Social Radio driver) is a low level application, that is used to turn the light on and off, and to determine and propagate the current lie position of each artifact

- *Social Radio Demonstrator* encapsulates the whole logic of the application and provides a simple GUI to observe the current state*.

- *Social Radio Amigo service.* The service warps and forward the state messages from Palatir presence management service to the Social Radio Demonstrator and vice versa.

- *Music Player and its binding.* As a music player we took the jlGui 3.0[1]. We extend the player for translation of the music streams over the network. The receiving of the stream on the other side is done by the JMF[2] receiver. The receiver itself is controlled from the Social Radio Demonstrator.

These rely on the following components that are common for the WP7 applications:

- Resource Manager service (which relies on the WP4 Context Management Service)
- Scheduler service

4.3.5.2 Requirements for application

The requirements to be fulfilled by the Social Radio demonstrator have been taken from the general the AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around.
R3	The system must provide an added value to existing systems.
R18	The system should provide controllable access and respect individual preferences and authorities.
R20	The system should take context/environment conditions into account and be aware at any time of the local situation.
R24	The system should enable communication with multiple people at the same time, e.g. broadcasting, democratic group planning.
R26	The system should support keeping in touch with select group of friends, no need to always be connected as "me"-time is just as important.
R27	The system should support feeling of connectedness to family and friends.
R29	Be easy to use and to configure – no need for programming by the user.
R30	Not be used for surveillance.
R31	Enable individual settings and preferences.
R32	Be configurable by the user or service provider.
R33	Be movable, in case of moving house.
R34	Be extensible - easy to upgrade.
R37	Be modular.

4.3.5.3 Application components functions

The functions of the Social Radio demonstrator combined with the Palantir presence management system are listed in the table below:

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[1] MP3 Player for the Java Java ™ platform: http://www.javazoom.net/jlgui/jlgui.html

[2] Java Media Framework API (JMF): http://java.sun.com/products/java-media/jmf/

	FUNCTIONS
ID	**Description**
F1	The user can turn an artefact on/off.
F2	The system estimates the lie position of an artefact automatically.
F3	Is the controller artefact in lie position, the user presence information is set to 0 (User is unable to communicate).
F4	Is the controller artefact in moon position, the user presence information is set to 2 (User is able to receive information).
F5	Is the controller artefact in bridge position, the user presence information is set to 3 (User is able to receive and share information).
F6	The represent artefact is in the lie position and shines, if the user presence status is 2 or 3.
F7	The represent artefact is in the moon position and shines, if the user presence status is 3.
F8	The represent artefact is in the bridge position, shines and plays music, if the user presence status 3 and he listens to music.
F9	The user can stop the forwarding of music or presence information

4.3.5.4 Requirements to functions mapping

The following table shows the mapping between functions and requirements for the Social Radio demonstrator:

	F1	F2	F3	F4	F5	F6	F7	F8	F9
R1	X								X
R3			X	X	X				
R18			X	X	X	X	X	X	
R20		X							
R24									
R26						X	X	X	
R27						X	X	X	
R29			X	X	X				
R30	X								X
R31			X	X	X				
R32									
R33									
R34									
R37									

Requirement R33 is only partly fulfilled, because of the fact that the artefacts are hand made, and thus not easy to produce new ones. But the software part isn't limited in handling a multiple artefacts at once.

4.3.5.5 Verification plan

Tests presented below aim at verifying the technical and functional aspects of the Social Radio demonstrator. Explicit user tests haven't been done. This is mainly because of the fragile nature of the artefacts. But nevertheless the first-generation artefacts have been sent to the InHaus lab of IMS for further evaluation.

Function	F1	The user can turn an artefact on/off		
Initial conditions		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs		
		The artefacts are initial on and the AritifactConrtroller has all artefacts detected		
Test	**Description**		**Result**	**Observations**
P1.1	The user is asked to turn off a artefact		Partly positive	After the user was shown, where the turn off switch is and what cables have to be removed, he could turn off.
P1.2	The user is asked to turn on the artefact again		Positive	The user is able to turn on the artefact.

Function	F2	The system estimates the lie position of an artefact		
Initial conditions		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs		
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.		
Test	**Description**		**Result**	**Observations**
P2.1	The user is asked to position the artefacts in various positions		Positive	The users were able positioning the artefacts in various way
				The ArtifactController receives the events, with some short delays.

Function	F3	Is the controller artefact in lie position, the user presence information is set to 0 (User is unable to communicate)		
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.		
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs		
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.		
		The Social Radio Demonstrator and Amigo service installed and configured.		
Test		**Description**	**Result**	**Observations**
P3.1		The user is asked to set is controller artefact to the position, where he doesn't want to share his presence information, nor willing to share his music.	Partly positive	The user was able to put the artefact in the correct position, after he was explained what position are available for controlling his presence information. The Palantir GUI reflected the changes.

Function	F4	Is the controller artefact in moon position, the user presence information is set to 2 (User is able to receive information)		
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.		
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs		
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.		
		The Social Radio Demonstrator and Amigo service installed and configured.		
Test		**Description**	**Result**	**Observations**
P4.1		The user is asked to set is controller artefact to the position, where he want to set his presence information to be at home.	Positive	The user was able to put the artefact in the correct position, the moon position.. The Palantir GUI reflected the changes.

Function	F5	Is the controller artefact in bridge position, the user presence information is set to 3 (User is able to receive and share information)
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.
		The Social Radio Demonstrator and Amigo service installed and configured.

Test	Description	Result	Observations
P5.1	The user is asked to set is controller artefact to the position, where he wants to share the music he listens to.	Partly	The user was able to put the artefact .in the correct position, the bridge position
			The Palantir GUI reflected the changes.

Function	F6	The represent artefact is in the lie position and shines, if the user presence status is 2 or 3
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.
		The Social Radio Demonstrator and Amigo service installed and configured.
		The controller artefact is in the moon or bridge position.
		The representing artefact isn't in the lie position.

Test	Description	Result	Observations
P6.1	The user is asked to set the representing artefact in the lie position.	Positive	The user was able to put the artefact .in the correct position, the lie position.
			The representing artefact starts to shine.

Function	F7	The represent artefact is in the moon position and shines, if the user presence status is 3
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.
		The Social Radio Demonstrator and Amigo service installed and configured.
		The controller artefact is in the bridge position.
		The representing artefact isn't in the moon position.

Test	Description	Result	Observations
P7.1	The user is asked to set the representing artefact in the moon position.	Positive	The user was able to put the artefact .in the correct position, the moon position.
			The representing artefact starts to shine

Function	F8	The represent artefact is in the bridge position, shines and plays music, if the user presence status is 3 and he listens to music.
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.
		The Social Radio Demonstrator and Amigo service installed and configured.
		The controller artefact is in the bridge position and corresponding user listen to music with adapted jlGui music player.
		The representing artefact isn't in the bridge position.

Test	Description	Result	Observations
P8.1	The user is asked to set the representing artefact in the bridge position.	Positive	The user was able to put the artefact .in the correct position, the bridge position.
			The representing artefact starts to shine, because it plays the music the user of the controller artefact listens to.

Function	F9	The user can stop the forwarding of music or presence information		
Initial conditions		The Palantir service and its PalantirGUI are started and the artefacts have been mapped to users.		
		The Social Radio ArtifactController is installed at the computer, which controls the artefacts and runs		
		The artefacts are initially on and the AritifactConrtroller has all artefacts detected.		
		The Social Radio Demonstrator and Amigo service installed and configured.		
		The controller artefact is in the bridge position and corresponding user listen to music with adapted jlGui music player.		
		The representing artefact is in the bridge position.		
Test		**Description**	**Result**	**Observations**
P0.1		The user of the controller artefact is asked to stop the sharing of music and his presence information.	Positive	The user was able to put the artefact in a position, where his information isn't shared anymore, the lie position.
				The representing artefact stops to shine and doesn't play anymore the music, after a short delay.
				The Palantir GUI reflected the changes.

4.3.6 Board Game

4.3.6.1 Brief application description

The Board Game is a hybrid board game that uses ambient intelligence methods for enhancing the experience of a traditional tabletop/role playing game. A tangible interface can be controlled via physical figures and gestures, PDAs and RFID tokens. The demonstrator features a working setup of various input and output devices, such as a physical board, a 3D visualization, a 3D gesture recognition device (VTT „soap box"), sound output as well as RFID and PDA support. Multi-device and multi-modality interfaces are facilitated by synchronizing all these devices with the game play by using the PEGASUS framework.

4.3.6.2 Requirements for application

The requirements to be fulfilled by the Board Game have been taken from the general AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around.
R3	The system must provide an added value to existing systems.
R4	The system should never unnecessarily replace direct interaction between people.
R7	The system should enable easy access and usage of information and data from different sources.
R11	The system should integrate and combine functionality of appliances.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R20	The system should support the integration of playing computer games in family routine, and approved settings.
R21	The system should support playing games and entertainment with multiple people in the same room or networked environment.
R22	The system should take implicit social rules of behaviour into account.
R32	Be movable, in case of moving house.
R34	Be flexible.
R35	Enable turning off individual features.
R36	Be modular.

4.3.6.3   Application components functions

The functions of the Board Game application are summed up in the table below:

FUNCTIONS	
ID	**Description**
F1	The game is always responsive to each player regardless who is on the turn.
F2	The PEGASUS framework provides functionality for multi-device and multi-modal interfaces.
F3	The hybrid design of the Board Game is focused implicitly on social interaction between the players.
F4	The game combines data from different hardware input devices and enables the game for easy accessing the virtual components.
F5	The application integrates the VTT 3D gesture recognition device.
F6	The application allows remote invocation by the Palantir service to play it from distributed Amigo Homes as well.
F7	The application integrates into the WP6 scenario by providing a real time video stream that can be displayed by arbitrary Amigo applications thereby providing their hardware as a "public display" for the game.
F8	The game application is always aware to the current game state taking all available context/game state conditions into account to be able to react on all possible user input by the user's device of choice.
F9	The architecture of the PEGASUS framework allows starting and stopping of software components for each input device separately.
F10	The set of options for possible input device can be changed to fit individual requirements.
F11	In case of new devices being developed, they can be easily integrated to the game as modules registering to the PEGASUS framework.

4.3.6.4 Requirements to functions mapping

This table shows the functions to requirements map:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
R1	X									
R3		X								
R4	X		X							
R7				X						
R11		X			X					
R19								X		
R20							X			
R21						X				
R22			X							
R32				X						
R34		X							X	X
R35										X
R36					X					

4.3.6.5 Verification plan

The aim of the technical and functional verification is to check whether the application developed meets the initially established requirements. As there is a direct relationship between the requirements and the application functions, the requirements can be verified by checking the functions.

The Validation Plan specifies how function fulfilment is to be checked. A series of test cases are defined and executed to demonstrate whether the system fulfils the established functions.

Tests presented below were performed by an employee of SIT who is unfamiliar with Amigo under supervision of members of the Amigo consortium.

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Function	F1	The game is always responsive to each player regardless who is on the turn.		
Initial conditions		A game session has already been initiated and all players are registered.		
Test	**Description**		**Result**	**Observations**
P1.1	Within the game play each pawn on the physical board can be moved at any time and the 3D visualization responds by moving the appropriate avatar immediately. In case a move was rejected by the rule set, the Board Game draws a status message and activates the speech synthesizer to announce a rule violation.		passed	
P1.2	Using the 3D gesture recognition device, the virtual dices can be rolled at any time. A sound is played that indicates a new roll. The same applies to magic spells.		passed	
P1.3	It's also possible to move figures on the board by using the graphical (public) display. But as long as the physical board is connected to the PC (via USB) the physical setting of the figures on the board overrides the conflicting moves on the virtual board. This is a logical conflict and is therefore only resolvable by changing the game design.		failed.	

Function	F2	The PEGASUS framework provides functionality for multi-device and multi-modal interfaces.		
Initial conditions		N/A		
Test	**Description**		**Result**	**Observations**
P1.1	During our tests all input and output devices were fully responsive during the game play. This applies to physical board, the 3D visualization, the VTT gesture device and the private display on a PDA.		passed	

Function	F3	The hybrid design of the Board Game is focused implicitly on social interaction between the players.
Initial conditions	N/A	

Test	Description	Result	Observations
P1.1	We found no qualified measurement for the level of social interaction while playing the game. It is indeed a high level of interaction necessary to play the game locally while sitting around the board like in conventional games. Even more social interaction is facilitated by playing over the network by connecting two Amigo homes together.	non-testable	

Function	F4	The game combines data from different hardware input devices and enables the game for easy accessing the virtual components.
Initial conditions	All input/output devices connected, powered on and the corresponding services are online.	

Test	Description	Result	Observations
P1.1	Players can interact with the game by using physical input devices like the board or the soap box and getting information about the game state from the public and private displays. Played in the usual way there is no direct interaction necessary with software components, as the game provides a tangible interface for moving the pawns (physical board), rolling dices (soap box) and picking up items (RFID reader). The design of private displays implemented as separate PDAs per player guarantees that confidential information will be kept secret in a natural way. Players can not see what is displayed on a private display of another player when held like a conventional card set (e.g. poker game).	passed	

Function	F5	The application integrates the VTT 3D gesture recognition device.		
Initial conditions		VTT soap box is available and not occupied by other applications.		
		Gesture recognition service is running.		
Test		**Description**	**Result**	**Observations**
P1.1		Gestures required to play the game (magic spells, rolling the dices) were trained in the usual way (VTT gesture training software).	passed	
P1.2		During the game play all possible inputs (trained gestures) have been tested and succeeded.	passed	

Function	F6	The application allows remote invocation by the Palantir service to play it from distributed Amigo Homes as well.		
Initial conditions		Two setups of the Board Game without physical boards connected.		
		At least two registered users for the Palantir service.		
Test		**Description**	**Result**	**Observations**
P1.1		Since physical boards would overwrite positions of the pawn written by virtual components (remote players), it is not possible to play the game via network and having physical boards connected.	passed	
		When playing with the virtual boards only, a network game session can be initiated by clicking the appropriate remote player in the Palantir UI. If the Amigo Board Game service is running on both sides, both 3D visualizations will synchronize their boards instantly.		

Function	F7	The application integrates into the WP6 scenario by providing a real time video stream that can be displayed by arbitrary Amigo applications thereby providing their hardware as a "public display" for the game.
Initial conditions		The Board Game is running.
		Amigo Board Game service has been registered.

Test	Description	Result	Observations
P1.1	To watch the game, people can join around a large "public display" within the Amigo Home. Additional public displays are supported by the Board Game by providing a real time video stream. The video picture reflects the current display of the 3D visualisation including display of textual status messages. Audio streaming is currently not supported. Since only TID has implemented a working video streaming client for the Amigo environment and this software was not available to the testers, the streaming capabilities had to be tested under laboratorial conditions. When using the VLC player as a streaming client, this worked fine. The URL for the stream can be retrieved by discovering the Amigo Board Game service and reading the corresponding property (URL string).	Passed (under lab conditions)	

Function	F8	The game application is always aware to the current game state taking all available context/game state conditions into account to be able to react on all possible user input by the user's device of choice.
Initial conditions		All gaming components online.
		All players registered.

Test	Description	Result	Observations
P1.1	During game play no context situations occurred in that any input conflicted with the game state. It occurs to the testers that in each possible game state, only legal input are processed. E.g. moving the pawns on the board will be processed even in case of an illegal move conflicting with the rule set.	passed	The game tries to advice players in case of a rule violation but does not block further movements.

Function	F9	The architecture of the PEGASUS framework allows starting and stopping of software components for each input device separately.
Initial conditions		Game Server (PEGASUS core component) is running

Test	Description	Result	Observations
P1.1	Due to the modular/flexible design of PEGASUS the testers were able to start and stop software components randomly. The game always responds accordingly by the corresponding game components being available for play. E.g. only those input/output devices were available for playing which were currently running.	passed	

Function	F10	The set of options for possible input devices can be changed to fit individual requirements.
Initial conditions		Partly deployed Board Game installation

Test	Description	Result	Observations
P1.1	Due to the modular/flexible design of PEGASUS any combination of components can be connected to the game server (PEGASUS core component) by simply starting the according software component. E.g. a missing physical board or soap box can be substituted by virtual components providing according fake devices. (compare to test of F9)	passed	Not every combination of game components allows a reasonable gaming experience, because of the experimental rule set implies a minimal set of available fake/real devices.

Function	F11	In case of new devices being developed, they can be easily integrated to the game as modules registering to the PEGASUS framework.
Initial conditions		N/A

Test	Description	Result	Observations
P1.1	Since the testers did not implement their own components to extend the game play and available set of hardware devices, this feature could not been tested.	Not tested	

4.3.7 Palentir & Ambience Sharing

4.3.7.1 Brief application description

The Ambience Sharing application together with the Palantir presence management system and the SAInt audio service offer a context-adaptive extension of traditional person to person visual communication services such as videoconference. In the following, we will call it the Ambience Sharing application. This is done only for the purpose of this document, please note that the Palantir system and the SAInt service can be both used as part of other WP7 applications such as the Activity Sharing or the Feeling@.

The Ambience Sharing application allows the user to see the presence status of her/his contact and to control the status presented to remote people. The user can enter a communication at any time by selecting the interlocutor from a patchwork of photos showing her/his contacts.

The communication is adapted to user context and can follow the user in the environment by switching video and audio devices. In order to enforce user's privacy and to cope with social rules inherent to face to face communication, the video stream is additionally adapted to user's distance to the video devices, and to the number of users.

The Ambience Sharing application is build of the following components:

- Ambience Sharing application composition service called AmSharingApp
- Adaptive Video Transmission (AVT) modules
- SAInt service for hands-free audio communication
- Palantir presence management service
- PalantirGUI presence visualization and control services
- Palantir composition service

These rely on the following components that are common for the WP7 applications:

- Resource Manager service (which relies on the WP4::Context Management Service)
- Scheduler service

A detailed description of the application and its functioning can be found in the deliverable "D7.4 - Implementation of the Extended Home Environment Prototype".

4.3.7.2 Requirements for application

The requirements to be fulfilled by the Ambience Sharing application have been taken from the general the AMIGO System requirements figuring in section 3 "General user requirements".

REQUIREMENTS	
ID	**Description**
R1	The user must always remain in control of the system and never the other way around.
R3	The system must provide an added value to existing systems.
R4	The system should never unnecessarily replace direct interaction between people.
R15	The system should support the activity organization and planning for multiple

REQUIREMENTS	
ID	**Description**
	persons at home, between homes and between home and work.
R19	The system should take context/environment conditions into account and be aware at any time of the local situation.
R22	The system should take implicit social rules of behaviour into account.
R24	The system should enable communication with multiple people at the same time, e.g. broadcasting, democratic group planning.
R25	The system should support keeping in touch with select group of friends, no need to always be connected as "me"-time is just as important.
R26	The system should support feeling of connectedness to family and friends.
R29	Not be used for surveillance.
R33	Be extensible - easy to upgrade.
R36	Be modular.

4.3.7.3 Application components functions

The functions of the Ambience Sharing application combined with the Palantir presence management system are listed in the table below:

FUNCTIONS	
ID	**Description**
F1	The user can initiate an audio-visual communication with a contact.
F2	The system estimates user presence automatically.
F3	The user can set presence status shown to her/his contacts.
F4	The system implements audio-visual follow-me function.
F5	The communication is adapted based on user's distance and on number of people present in front of the camera.
F6	The system can integrate conventional SIP-based clients as end-points for video communication.

4.3.7.4 Requirements to functions mapping

The following table shows the mapping between functions and requirements for the Ambience Sharing application:

	F1	F2	F3	F4	F5	F6
R1	X		X			
R3		X		X	X	
R4					X	
R15						
R19					X	
R22					X	
R24						
R25	X					
R26	X					
R29					X	
R33						X
R36						X

Requirements R15 and R24 are not fulfilled. Both these requirements concern communication with multiple contacts, potentially at the same time. We did not address these requirements as the multi-endpoint communication is subject of intensive studies in the fields of teleconferencing and collaborative work. For the Ambience Sharing application we focused on the architectural aspects and on supporting a feeling of presence between users. In the following we do not consider requirements R15 and R24.

4.3.7.5 Verification plan

Tests presented below aim at verifying the technical and functional features of the Ambience Sharing application. Test related to the mechanics of the application were performed by members of the Amigo consortium,.whereas tests concerning usage concepts promoted by Ambience Sharing were performed by three employees of FT unfamiliar with the Amigo project under the supervision of Amigo consortium members. These tests should not be considered as user tests validating the concepts or user interfaces. Their purpose is to validate the implementation of proposed functions. Nevertheless, they also offer feedback from users that can be taken into account to improve the prototype after the end of Amigo.

Note that the Palantir presence management service and elements of the Ambience Sharing application supporting video communication are part of the Feeling@ applications that were evaluated by end-users (see "D8.3 - End user tests").

Function	F1	The user can initiate an audio-visual communication with a contact
Initial conditions	The supervisor introduces the PalantirGUI and explains components of its graphical interface. The user must be identified in the AMIGO System. The test should be performed from all configured displays in the environment. The test is performed on a touch sensitive display.	

Test	Description	Result	Observations
P1.1	The user is asked to start a communication with a remote contact. To perform this action, the user should select the Ambience Sharing application on the PalantirGUI service, then select the person to start a communication. The remote person can see the image of the caller vibrating. The communication starts when the remote person selects the caller's image.	Partly positive	The users were able to initiate the communication with a remote contact, but only after a briefing from the supervisor. Some of the users (two out of the three) considered the interaction path to long, they also wished to be able to inverse the order of the interaction and start by selecting a person and select the application afterwards. One user asked how to start a communication with multiple users; this feature is not implemented.
P1.2	The supervisor selects on the PalantirGUI the picture of the user with whom he wants to start a communication. The user is asked to accept the invitation from her/his PalantirGUI.	Positive	Users had no particular problems with accepting an incoming invitation.

Function	F2	The system estimates user presence automatically.		
Initial conditions		The user must be identified and localised by the AMIGO System.		
Test	**Description**		**Result**	**Observations**
P2.1	The supervisor generates context data corresponding to a user present in a room. The presence management system should retrieve this data from the WP4::CMS and inform the Jabber server that the user is present. To do that the supervisor can use any context source providing "UserLocation" context type.		Passed	When the user enters a room, the user location is published as context data and is recovered by the Palantir service. The Palantir discovers all services available in the room and compares them with services required by applications (submitted in presence models). If requested services are present in the room, the Palantir sets user presence accordingly and sends this information to the Jabber server.
P2.2	When the user approaches a display running services required by applications (e.g. Ambience Sharing or Feeling@), the awareness level of the presence status is increased. When the user moves away the presence status is decreased.		Passed	The WP7::ResourceManager service subscribes to WP4::CMS for user location data. When the user approaches a device, the resource manager service of this device estimates if the user is in one of the predefined interaction zones and publishes this information through the CMS (see D7.4 for more details on the Resource Manager). The Palantir service subscribes for user relative position context data (produced by the resource managers), and is notified when the user approaches a device. If services required by applications are running on the device, the Palantir re-evaluates user status and sets the awareness level accordingly.

Note: To locate the user or to generate equivalent context data, we used the RFIDreader from ITAL, HarpUserLocator from FT providing user location data from a vision-based system, and the WP3::Vantage Point.

Function	F3	The user can set presence status shown to her/his contacts.		
Initial conditions		The user must be identified and localised by the AMIGO System. The test is performed using a touch sensitive display.		
Test	**Description**		**Result**	**Observations**
P3.1	As the user approaches a display, a popup pane shows the newly estimated user status, she/he is asked to keep the old status. To do so, the user should press the cancel button.		Passed	Though users had no difficulties in finding and pressing the cancel button, they pointed out that this action may be annoying and difficult if presence status is re-estimated while the user is far from the device.
P3.2	The user is asked to modify her/his presence status. To do so the user should select the application for which the status should be changed, than click on the GUI to trigger the pop-up user status pane and use sliders to modify her/his image colours and size.		Partly Passed	Users were able to set their status, but only after a briefing from the supervisor. Similarly to P1.1, some users pointed out that the interaction is long and immutable. One user found it unsatisfactory to set presence equally for all contacts registered for an application. The support for setting user presence separately for chosen contacts or groups of contacts is not implemented.

Function	F4	The system implements audio-visual follow-me function.
Initial conditions	A communication is started with a remote site. The user must be identified and localised by the AMIGO System. At least two displays with cameras must be available in at least one of the communicating sites.	

Test	Description	Result	Observations
P4.1	The user is asked to walk freely in the environment while being engaged in a communication with a remote person (the supervisor).	Passed	The communication media were correctly directed to devices closest to the user. The location system provided user location data to the resource manager services deployed in the environment, which in turn notified the Ambience Sharing composition service which video service is closest to the user, i.e. where the video stream should be redirected. While the video is redirected between devices, the visual communication is interrupted. However the SAInt service maintains the audio communication continually and users did not complain about the communication quality.

Note: to perform this test we used a vision based tracking system that published user location as context data through the WP4::CMS.

Function	F5	The communication is adapted based on user's distance and on number of people present in front of the camera in order to enforce privacy protection and to allow always-on usage mode.
Initial conditions		A communication is started with a remote site.
		The user must be identified and localised by the AMIGO System.
		Lighting conditions must be stable to ensure proper image segmentation.

Test	Description	Result	Observations
P5.1	When the user is far from the camera her/his image is rendered semitransparent. The image is made progressively more opaque as the user approaches.	Passed	The image filter and the distance estimation worked properly.
			Users were intrigued by their transparent appearance and found rather natural approaching to start a more engaged communication.
			Users didn't perceive the camera as a surveillance system, as the application provides feedback on the information transmitted to the remote site.
P5.2	When a use is engaged in a conversation with a remote person, her/his image and the image of the background environment is rendered in full colour. If a second person enters the camera's field of view, the image of the remote person is hidden by an almost completely opaque "curtain". At the same time the image of the two people seen by the camera is rendered semi-transparent. The communication is thus "suspended".	Failed	Though the filters for hiding user identities function and where applied when the second person appeared, users were not satisfied with the system's behaviour. In particular, they didn't feel that the system protects their privacy.
			When the third person entered the camera's field of view the communication was "suspended" too late, i.e. both the newcomer and the remote party already saw each other. This happened because the face detection algorithm used for detecting newcomers is unable detecting faces that are occluded, or that are seen from the side (it has a 15 degree tolerance). A more reliable person detection mechanism should be used.

Function	F6	The system can integrate conventional SIP-based clients as end-points for video communication.
Initial conditions	A SIP registrar must be deployed	

Test	Description	Result	Observations
P6.1	The supervisor adds a new video device to the system.	Passed	We have successfully tested the following conventional soft-phone clients: - eConf - Wengophone In general any SIP-enabled soft-phone with fixed video port number can be used as communication endpoint for the Ambience Sharing application. Additionally it is useful it the client has an auto reply mode. Otherwise, the follow me function (F4) becomes unusable, as the user must accept incoming calls on all devices she/he approaches. Soft-phones that change the video streaming port at each call, e.g. X-Lite, are not compatible with Ambience Sharing application.

4.3.8 Conclusions

The Ambience Sharing application, composed of the Palantir presence management system, the SAInt audio service and the video streaming modules, supports users in staying in touch with remote people through hands free audio-visual communication. The above tests show that the application fulfils most of the relevant requirements listed in appendix.

Users had a feeling of remaining in control of the application. They were able to start and stop a communication and to control their presence status exposed to remote contacts. On the other hand, they complained that the application supports communication only between two end-points and that the user interface of the Palantir service did not allow them to set their status differently for different contacts.

The application offers three major functions that differentiate it from conventional teleconferencing software; it can automatically estimate user presence, it supports hands-free audio-visual communication distributed over devices in the environment, and it adapts the communication to user context. While the two first functions were judged valuable by users, the context adaptation (excluding location-adaptation) was only partly liked. In particular, the privacy enforcement by content hiding was considered unsatisfying as the implementation did not ensure the protection of user identities.

The application is build upon the Amigo middleware, it leverages its flexibility and generic data management provided by the WP4 context management service. It is modular and can integrate a number of video communication clients, including conventional soft phones.

To conclude, the Ambience Sharing application is a good illustration of the power of Amigo middleware and services in the context of the Extended Home application domain, but it requires further refinement and development before being exposed to end-users.