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Abstract

This document contains the consolidated and final requirements that the OPEN Migration Service Platform must meet. The list of requirements was created by a process of reviewing, editing, classifying, merging and supplementing the requirements from D1.1, the initial requirements, and D5.1, the application-specific requirements. This document is the third deliverable of Work Package 1, D1.3: *Final Requirements for OPEN Service Platform*, and serves as the input to the final deliverable: the *Final OPEN Service Platform Architectural Framework*. It is also used to guide the on-going work to prototype and to demonstrate the Migration Service Platform.

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Introduction

This document forms part of Work Package 1 of the OPEN Service Platform Project. The aim of this deliverable, D1.3, *Final Requirements for Open Service Platform*, is to document the final requirements placed upon the OPEN Migration Service Platform, which enables migratory applications, where 'migration' is defined as follows:

Migration = Device Change + Adaptation + Continuity.

This formula means that users can change which devices are used to interact with an application, can have the interaction adapted to the features of the new set of devices, and can seamlessly continue their work, using their existing sessions with the application.

Migration is made possible by the MSP and the underlying networks, and may also involve reconfiguration, re-wiring or replacement of components of the application logic. Figure 1 presents a high-level view of the intent of the OPEN Migration Service Platform (MSP), which is to enable software developers to turn an application into a migratory application.

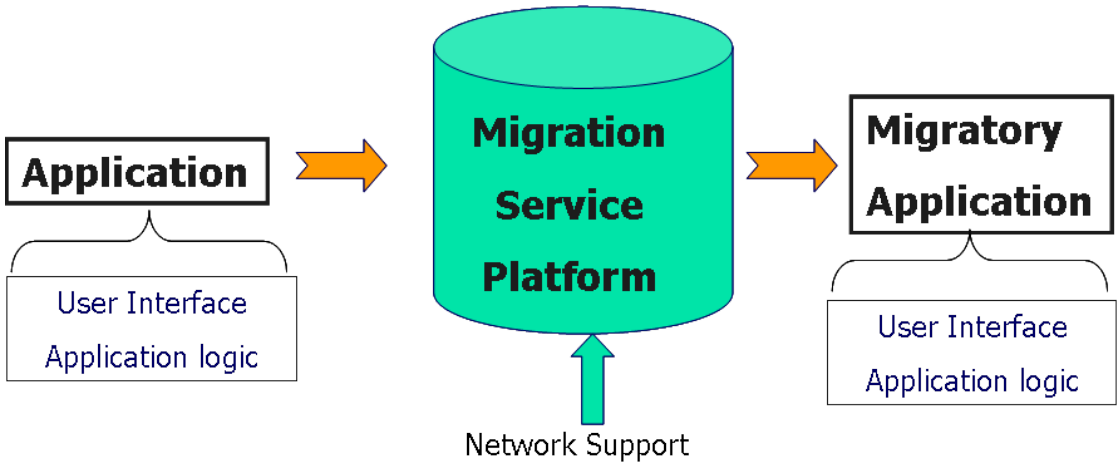

Figure 1. The Migration Service Platform.

This document is organized into 3 main sections: the 1st section is a glossary of terms used in this document, the 2nd section describes the classifications of the requirements and the 3rd section lists the actual requirements. The requirements herein make reference to the initial requirements detailed in the deliverables D1.1 – *Requirements for Open Service Platform*, deliverable D5.1, *Initial application requirements design* and the *Description of Work* document.

Definitions of project terms

Some important terms used in the requirements are defined in this section. First, general mobility terms are defined, then terms that are either specific to OPEN or that have a particular meaning in the OPEN context. Finally, the types of migration are defined.

Mobility terms

The source of these mobility terms is [1]. They are all defined from the point of view of the network operator who provides services to terminal owners, e.g., owners of PCs or mobile phones.

- **session mobility** refers to the user's ability to maintain an active session while switching between terminals. For example, a user may join a multi-party teleconference session using his PC while at work. When he leaves to go home, he can switch the session to his mobile phone without interruption, and can continue participating in the conference during his walk home. This type of mobility is a primary concern of OPEN.
- **terminal mobility** refers to the user's ability to take his terminal, move across heterogeneous networks, and continue to have access to the same set of subscribed services. The MSP is dependent upon the underlying networks to fully support this capability. A main goal of the MSP is to enable migratory applications that are capable of simultaneous session mobility and terminal mobility.
- **personal mobility** refers to the user's ability to transparently access services from anywhere, at anytime, using any terminal. Transparency is enabled by the fact that the user is able to use a single personal identifier on all occasions, regardless of the terminals used or their network locations. This could be used by OPEN, but is not a concern for the project.

OPEN terms

- **application migration** refers to the ability of an application to switch which devices are used to interact with it, while adapting the interaction methods and preserving the continuity of sessions. This last ability is called *session mobility* in the context of mobile networks. Migration may also involve reconfiguration of application logic.

  For example, a father starts up a video recorder from his laptop, which creates an active session involving the recorder and the laptop. He is watching a movie, while his children are watching broadcast cartoons on the big screen TV. When the children go outside to play, the father switches terminals, going from the laptop to the TV. In this process the TV and its remote control seamlessly takes the place of the laptop in the active session with the recorder. Also called **migration**.
- **OPEN Migration Service Platform (MSP)** - a middleware that is able to consider and integrate various aspects: migrate and adapt the software

application components dedicated to interacting with end users, including both UI elements and any application data which appears in them; preserve the state of those components; support mechanisms for application-logic reconfiguration; and take advantage of supporting mechanisms available in the underlying network layers. Also called: **OPEN platform** or just **platform**.

- **migratory application –** an application developed using the OPEN MSP, so that it is capable of migration. Also called just **application**.
- **user** - a person who uses a migratory application.
- **software developer** - someone who develops a migratory application. Also called **developer**.

OPEN Migration Types

In general, migration may mean a replication or a move, where *replication* means interactivity using the source device is still available, and *move* means it is not. In the definitions which follow *move*, *replication* and *migration* should be interpreted in these senses.

Various types of useful migration can be identified.

Total – all interaction with the application is moved from one source device to one target device.

Partial – some elements of the interaction with the application move from the source device to a target device. For example, input may move from a keyboard to an accelerometer.

Distributing – a migration where different interactive parts on one device move to different devices. This can also be seen as a collection of partial migrations.

Aggregating – a migration which involves multiple source devices and one target device.

Multiple – a migration which involves multiple sources and multiple targets.

OPEN demonstrators will be able to display all these types of mobility. The Emergency Scenario is intended to demonstrate aggregating migration, whereas the Social Game can demonstrate the others.

Classification of Requirements

The requirements in this document are classified into various categories, as per the Volere Requirements Resources [4], which have been referenced in the various other documents compiled in this project. The system requirements have been classified into the following categories:

- **Functional** - These requirements describe what the OPEN platform has to do and what processing actions have to be done by it. Functional requirements are divided into various sub-categories:

    - **Context and Discovery**: Requirements relating to the context information that is discovered and managed by the OPEN platform. This includes information about users, devices in the vicinity and other environmental information like available networks and services.

    - **Migration:** Requirements pertaining to the process of migrating applications, in particular the user interface elements, from source to target devices. This also includes **content adaptation** requirements pertaining to the sub-process of migration which transforms the user interface to adapt to device capabilities.

        - **Data Migration:** Requirements pertaining to the sub-process of migration concerned with migrating application data from source to target devices.

        - **Mobility Support:** Requirements concerning the support provided for the user to continue working while mobile, moving from one place to another. The *Session* subcategory of requirements enables session mobility. Requirements enabling terminal mobility are in the *Network* category.

        - **Session :** Requirements pertaining to the preservation of session continuity (session mobility) during and after a migration.

- **Development:** Requirements pertaining to the coding and development of migratory applications, applications that use the services of the OPEN platform.

- **Multi-core and other Device-related Requirements:** Requirements pertaining to the utilization of hardware like multiple independent cores in one device.

- **Multi Modal:** Requirements about providing the user with multiple modes of interfacing with a migratory application.

- **Multi-user:** Requirements about allowing concurrent access by multiple users to both migratory applications and the OPEN migration services for users of such applications, e.g., service initiation. http://en.wikipedia.org/wiki/Computer

- **Network:** Requirements pertaining to configuration and control of the underlying networks that provide connectivity to the OPEN platform and to migratory applications. This includes requirements to enable terminal mobility.

    - **Offline Mode:** Requirements on the OPEN platform to provide some services to migratory applications even when it is not connected to the network or other devices.

- **Policy:** Requirements that pertain to the ability of migratory applications or their users to specify rules and guidelines for migration, e.g. rules for automatic migration.

- **Application-Logic Reconfiguration:** Requirements pertaining to the reconfiguration, re-wiring or replacement of the collection of computational or functional elements of a migratory application, e.g. to adapt to new devices or different networks.

- **Look and Feel** – These requirements refer to the appearance of the product, considering corporate branding, colours, etc. (none)
- **Usability and Humanity** – These requirements specify the usability and ergonomic acceptability of the product to the hands-on users.

- **Maintainability and Support** – These requirements concern the time necessary to make specified changed to the product and they highlight the maintenance needs of the product.
- **Performance** – These requirements refer to the product response time and they also refer to the product's ability to operate at a speed suitable for the intended environment.
- **Operational** – These requirements ensure that the product is fit to be used in its intended environment, by highlighting conditions that might need special requirements, preparations or training. (none)
- **Security & Privacy** – These requirements specify who has authorized access to the product, both functionality and data, circumstances under which access is granted and to which parts of the product the access is granted.
- **Cultural and Political** – These requirements are specific to the sociological factors that affect the acceptability of the product. (none)
- **Legal** – These requirements specify the legal requirements for the product. (none)

OPEN Platform Requirements

All of these requirements apply to the OPEN Migration Service Platform (MSP), also called *OPEN platform* or just *platform* for short.

Process of creating the list

The process of creating the list of requirements was as follows. The main starting point for this work was the list of requirements from D1.1 and the continuing discussions around them. This initial list was generated during a two day workshop in which requirements were elicited by means of scenario analysis based on the RESCUE methodology of Maiden et. al [2]. Scenarios were documented according to the method of Ben Achour [1] for formally composing, checking and varying scenarios for requirements analysis.

The requirements from D1.1 were first reclassified into a more compact hierarchy. After which, redundancies became apparent and were removed by merging requirements.

The next very important step was to review the requirements from D5.1, the application-specific requirements, for possible addition to ensure that the platform meets the needs of these applications.

After this step, requirements were added, e.g., 5.1.3. The numbering from D5.1 was used to allow for traceability. Other D5.1 requirements were found to be redundant, and were merged with requirements from D1.1.

During this process edits were made to clarify the text, and to standardize the terminology.

Finally, the requirements were reviewed by the project team, prioritized and agreed upon.

Explanation of table headings

The requirements are listed in the tables under the following table headings:

ID	Requirement ID
Description	Short description of the requirement.
Owner	The person who raised the requirement
Status	Status of this requirement (e.g.: “Proposed”, “Agreed”, “Outside Project Scope”), Version and Phase numbers
Revision	Information about revision history *(e.g.: Created on* 16/6/2008. *Last modified on 4/7/2008).*
Type	One of the requirement categories (Functional, Look and Feel,

	Operational, etc.)
Rationale	The rationale behind this requirement.
Priority	Level of priority about the fulfilment of this requirement (Low, Medium, High). Low priority requirements have been removed.
Scenario, Beneficiary	The scenario and beneficiary linked to the requirement
Typology	The technological area of the project involved by potential implementation of the requirement

Typology Types

The technological area can be one or more of the following:

- **Migration Service Platform** (MSP) - the OPEN middleware that is able to consider and integrate various aspects: migrate and adapt the software application components dedicated to interacting with end users, including both UI elements and any application data which appears in them; preserve the state of those components; support mechanisms for application-logic reconfiguration; and take advantage of supporting mechanisms available in the underlying network layers. Also called: **OPEN platform** or just **platform**.
- **User Interface** – the input/output means by which the users of an application can interact with it. The User Interface of an OPEN migratory interactive application includes the means for supporting the interaction with the OPEN platform, e.g., to initiate or control a migration.
- **Application Logic** – the collection of computational or functional elements of an application. It can be adapted by reconfiguring the access to the functionalities in order to access different implementations of some of them or increase/decrease such functionalities because of a change of device or network.
- **Network** – networks provide the underlying connectivity needed by the OPEN platform. Examples of networks are: GSM/UMTS, xDSL/WiFi, (W)PAN, LAN.

Functional Requirements

Functional - These requirements describe what the OPEN platform has to do and what processing actions have to be done by it. Functional requirements are divided into various sub-categories.

Context and Discovery Requirements

These are requirements relating to the context information that is discovered and managed by the OPEN platform. This includes information about users, devices in the vicinity and other environmental information like available networks and services.

ID	**20**
Description	The OPEN platform must provide applications and users with information about devices in their vicinity.
Owner	Erno
Status	Agreed
Revision	25/05/2009 edit for clarity
Type	Context, Discovery
Rationale	A choice of devices needs to be offered to users who want to perform a migration, whether user-initiated or system-initiated.
Priority	**High**
Scenario, Beneficiary	Shopping Spree,
Typology	Migration Service Platform, User Interface
ID	**22**
Description	The OPEN platform must provide applications and users with context information like the user's location and the direction the user is facing.
Owner	Erno
Status	Agreed
Revision	25/05/2009 edit to generalize
Type	Context
Rationale	Context-awareness: the system should be able to recognise the environmental conditions for suggesting suitable migrations. This information may be used to decide which devices to offer as migration candidates. Also, it enables a

	simplified user-experience by enabling location-specific and direction-specific services (*e.g. navigation information and signs)*
Priority	**High**
Scenario, Beneficiary	Shopping Spree; User, Developer
Typology	Migration Service Platform, User Interface
ID	**135**
Description	The OPEN platform must make updated context information available to applications and users, e.g., so that new context information about a user can cause a change in other participants' capabilities (file accessibility, GPS positioning, WiFi localization, …)
Owner	Agnese, Giulio
Status	Agreed
Revision	25/05/2009 edited for clarity, merged with 25
Type	Context
Rationale	If the user migrates from a PDA to a mobile phone with GPS capability, other participants can obtain the user's position. Context also enables a notification service to be automatically triggered by a change in context, and to also use that context to choose an appropriate method of notification, e.g., device, modality, etc. In general, the availability of context information enables the configuration of an application or the network in ways that enrich the user's experience.
Priority	**High**
Scenario, Beneficiary	General
Typology	Migration Service Platform
ID	**136**
Description	The OPEN platform must collect environmental information, using all possible kinds of sources (*sensors, interaction panel, network parameters*)
Owner	Agnese, Giulio
Status	Agreed
Revision	25/05/2009 edited for clarity

Type	Context
Rationale	The content adaptation should take into consideration environmental information
Priority	**Medium**
Scenario, Beneficiary	General, Developer
Typology	Migration Service Platform

Migration Requirements: Overall and UI

These are requirements pertaining to the process of migrating applications, in particular the user interface elements, from source to target devices. This also includes **content adaptation** requirements pertaining to the sub-process of migration which transforms the user interface to adapt to device capabilities.

ID	**44**
Description	The OPEN platform must enable users to copy the user interface to another device (fully or partially, with or without input-output consistency)
Owner	Erno
Status	Agreed
Revision	N/A
Type	User Interface
Rationale	Copy shopping list to family board
Priority	**High**
Scenario, Beneficiary	Migrations over platforms
Typology	MSP
ID	**82**
Description	The OPEN platform must provide four types of migration initiation: • Platform initiated: o the platform proposes the destination device and the UI components to migrate o the user can confirm or reject the migration o in case the user rejects the migration, she/he can eventually proceed with a user-initiated migration • User initiated: o upon user request, the OPEN platform proposes a list of available devices and the UI components to migrate o the user selects the destination devices and the UI components to migrate • Automatic platform-initiated o A platform-initiated migration that fulfils a user-specified policy for being performed automatically without user involvement • Third-party initiated o One user requests the platform to initiate

	migration for another user.
Owner	Anders
Status	Agreed
Revision	25/05/2009 merged with 75, 80, 86 and 5.1.2
Type	Migration
Rationale	The user should have control, but there may not be enough time or focus to manage manual migration triggers. Users must be able to accept or deny a migration from a source to a target device. It must be possible for some users to invite others to migrate. Users must be able to push and pull user interfaces, e.g., replicate an interface to someone else or pull a replica from them.
Priority	**High**
Scenario, Beneficiary	Racing Game, Developer
Typology	User Interface, Migration Service Platform
ID	**78 (very high-level requirement)**
Description	For some types of applications like gaming, the OPEN platform must enable application use anywhere, anytime, anyhow. The system provides the users playing games with the most effective/usable/comfortable interactive support regardless of the context in which users are, since game application users generally like to spend time on this activity whenever/wherever they are.
Owner	Fabio
Status	Agreed
Revision	25/05/2009 edited for clarity
Type	Functional/ application
Rationale	People like to spend time on games and similar applications.
Priority	**High**
Scenario, Beneficiary	Pac Man, User
Typology	Migration Service Platform, User Interface,
ID	**157**

Description	The OPEN platform must be aware of the availability of devices as migration sources or targets and must coordinate the migration between source and target devices.
Owner	Francesca & Stefano
Status	Agreed
Revision	N/A
Type	Migration, Context
Rationale	If the user wants to migrate the application from a device to another one, the other device must be ready to accept the migration
Priority	**High**
Scenario, Beneficiary	General, Developer
Typology	Migration Service Platform
ID	**5.1.3**
Description	The OPEN platform must provide for several types of migration of UI elements or data: • Total, all components of the application (i.e. betting, messaging, gaming or internet access option) migrate • Partial, only a part of the application migrates (i.e. the dashboard of the game application or the betting option) Migration can be from multiple source devices to multiple target devices. Furthermore, the components can continue to be accessible from the source devices. The user must also be able to select different input and output devices as sources or targets.
Owner	Francesca
Status	Agreed
Revision	25/05/2009 edited for clarity, merged with 70
Type	Functional
Rationale	Enable the use of multiple different devices over time for different purposes. For example, input control of a game might be migrated from a keyboard to an accelerometer.
Priority	**High**

Scenario, Beneficiary	Social gaming, User
Typology	Migration Service Platform
ID	**47**
Description	The OPEN platform must enable the adaptation of the UI according to the interaction capabilities and modalities of the target devices. It must enable the adaptation of the choice of the layout structure and interaction technique (widget) to the available resources of the device. For example, every element that cannot be migrated to the new device because of hardware constraints should be allowed to migrate in an alternative way. For instance, when a participant in a car-racing game leaves the room where the screen is, he might still receive information about laps through a vibration of his mobile phone for every lap that he is missing. Similarly, for applications that work with visualizations like maps, there should be support for some kind of zooming function which can migrate and work across various types of screens and modalities.
Owner	Fabio, Carmen
Status	Agreed
Revision	25/05/2009 edited and added information from 5.1.12 and 116
Type	User Interface Adaptation
Rationale	Improve usability of the various user interfaces
Priority	**High**
Scenario, Beneficiary	Migration over platforms, developer
Typology	MSP
ID	**90**
Description	The OPEN platform must give the user an easy way to control which UI elements and data are migrated, e.g. to a low-end device or a public device.
Owner	Francesca
Status	Agreed
Revision	Merged with 37
Type	Migration

Rationale	The limited resources of low-end devices must be taken into account. There might be output data the user does not want to be displayed on the public screen (for privacy reasons).
Priority	**High**
Scenario, Beneficiary	Mobility Support , User
Typology	Migration Service Platform

Data Migration Requirements

These are requirements pertaining to the sub-process of migration concerned with migrating application data from source to target devices.

ID	**126**
Description	Streaming and copying of large data volumes must be supported by the OPEN platform (*simulation data, video.)*, this is also essential when doing partial migration (*audio on mobile phone, video on set-top box*)
Owner	Armin, Clemens
Status	Agreed
Revision	N/A
Type	Data Migration
Rationale	Different devices involved in migration may need to share data
Priority	**High**
Scenario, Beneficiary	General
Typology	Migration Service Platform, Network
ID	**162**
Description	The OPEN platform should be able to maintain the data inserted by the user in the source device and show them in a consistent way after migration on the target device
Owner	Carmen & Fabio
Status	Agreed
Revision	N/A
Type	Data Migration
Rationale	The OPEN platform must be able to preserve the modifications the user has already done before migration
Priority	**High**
Scenario, Beneficiary	Shopping Spree
Typology	User Interface, Migration Service Platform
ID	**163**
Description	The OPEN platform must enable the presentation of the last data inserted by the user on the source device in the

	first presentation provided to the user in the target device.
Owner	Carmen & Fabio
Status	Agreed
Revision	N/A
Type	Data Migration, Usability
Rationale	The user should have the feeling of a continuous interaction
Priority	**High**
Scenario, Beneficiary	Shopping Spree,
Typology	User Interface, Migration Service Platform
ID	**108**
Description	The OPEN platform must be able to handle the migration of temporally changing information in a (in visual modality) 3-dimensional map
Owner	Manuel
Status	Agreed
Revision	N/A
Type	User Interface
Rationale	OPEN offers this opportunity in different modalities and devices for simulation data or real-world data in huge emergencies. In particular, this makes the evaluation of simulations and the comparison to real-world measurements possible
Priority	**High**
Scenario, Beneficiary	Emergency Flood, Developer
Typology	User Interface, Migration Service Platform, Network, Application Logic

Mobility Support Requirements

These are requirements concerning the support provided for the user to continue working while mobile, moving from one place to another. Other requirements related to going mobile are in the *Session* and *Network* categories. The *Session* requirements enable session mobility. The *Network* requirements enable terminal mobility.

ID	**91**
Description	OPEN should predict the data and applications needed when going mobile, so that the user can take them with him if desired.
Owner	Anders
Status	Agreed
Revision	N/A
Type	Mobility Support
Rationale	It cannot be expected that the user's mobile device contains all the applications and data that he will need in the near future, while he is on the go.
Priority	**Medium**
Scenario, Beneficiary	Mobility Support
Typology	Network, Migration Service Platform

Session Requirements

These are requirements pertaining to the preservation of session continuity (session mobility) during and after a migration.

ID	**54**
Description	The OPEN platform must make it possible to continue the user's current service seamlessly across multiple devices.
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Session, Usability
Rationale	The user does not want to log on/off from device a,b,c. He also wants to continue working from where he left off, without losing any work.
Priority	**High**
Scenario, Beneficiary	Migration over platform, User
Typology	Migration Service Platform

Development Requirements

These are requirements pertaining to the coding and development of migratory applications, applications that use the services of the OPEN platform.

ID	**161**
Description	The OPEN platform must be able to support migration amongst different implementation languages in order to exploit the interaction possibilities offered by the various environments.
Owner	Carmen, Fabio
Status	Agreed
Revision	N/A
Type	Development
Rationale	The OPEN platform should be able to offer the user new interaction possibilities amongst different environments
Priority	**High**
Scenario, Beneficiary	Shopping Spree, Developer
Typology	User Interface, Migration Service Platform
ID	**46**
Description	The OPEN Migration Platform must be able to access an application that can be dynamically implemented in different implementation languages (e.g. Web, Java, ..)
Owner	Fabio, Carmen
Status	Agreed
Revision	N/A
Type	Development
Rationale	Obtain a migration that is not limited to a particular implementation language
Priority	**High**
Scenario, Beneficiary	Migration over platform, Developer
Typology	User Interface, Migration Service Platform, Application Logic
ID	**100**

Description	OPEN should provide mechanisms for developers to easily write code for multiple platforms
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Development
Rationale	It must be easy to address the heterogeneous mobile market
Priority	**Medium**
Scenario, Beneficiary	General
Typology	User Interface, Migration Service Platform

Multi-core and other Device-related Requirements

These are requirements pertaining to the utilization of hardware like multiple independent cores in one device.

ID	**124**
Description	The OPEN platform must enable applications to leverage additional cores on multi-core CPUs to provide full performance to the user
Owner	Armin, Clemens
Status	Agreed
Revision	25/05/2009 merge with 105
Type	Multicore
Rationale	The user wants the best quality of service possible on his device
Priority	**High**
Scenario, Beneficiary	General
Typology	Migration Service Platform, Application Logic, User Interface
ID	**4**
Description	The OPEN platform must enable the user to split the display screen of a device and use the different parts for different applications.
Owner	Francesca
Status	Agreed
Revision	25/05/2009 edit to generalize
Type	Functional/ application
Rationale	It must be possible, e.g., to simultaneously play a game and watch a live race on the same TV.
Priority	**High**
Scenario, Beneficiary	IPTV Gaming
Typology	Migration Service Platform, User Interface
ID	**125**
Description	The OPEN platform must make it possible for the application developer to utilize dedicated hardware for

	video (de)coding and processing, 3D graphics and audio
Owner	Armin, Clemens
Status	Agreed
Revision	N/A
Type	User Interface
Rationale	The user expects that all features of his device are supported
Priority	**High**
Scenario, Beneficiary	Video Telephony, Emergency Flood , IPTV Gaming, Racing Game; Developer
Typology	Migration Service Platform

Multi Modal Requirements

These are requirements about providing the user with multiple modes of interfacing with a migratory application.

ID	**57**
Description	The user must be able to select which modality is migrated
Owner	Anders
Status	Agreed
Revision	N/A
Type	Multi Modal
Rationale	The user is in control of the application meaning that s/he has the decision
Priority	**Medium**
Scenario, Beneficiary	Social Game, Emergency Flood, User
Typology	User Interface
ID	**114**
Description	OPEN must enable the user to compare data sets in different ways.
Owner	Andreas F
Status	Agreed
Revision	N/A
Type	Multi Modal
Rationale	In the Emergency Scenario, a central task force might work on a huge screen and compare two sets of data by displaying them side-by-side; on smaller devices an alternative might be needed.
Priority	**Medium**
Scenario, Beneficiary	Emergency Flood, User
Typology	User Interface
ID	**40**
Description	OPEN must support multi-modal input and output For example, OPEN must enable the user to use a typical classification task (e.g. using a tree) in different modalities/devices

Owner	Holger
Status	Agreed
Revision	25/05/2009 edit for clarity, merge with 109, 120
Type	Multi Modal
Rationale	Keyboard or PDA as input device, graphical or audio output. Trees used, e.g., to classify damages, to classify injured people. The user wants to get information about the area of emergency, and this may be directly in the endangered area or in the control centre. Some of the users' actions in the endangered area create the need for "hands and eyes free", i.e. this information must be reliably available in different modalities
Priority	**Medium**
Scenario, Beneficiary	Video Telephony
Typology	User Interface

Multi-user Requirements

These are requirements about allowing concurrent access by multiple users to both migratory applications and the OPEN migration services for users of such applications, e.g., service initiation. http://en.wikipedia.org/wiki/Computer

ID	**58**
Description	The OPEN platform must be able to handle (*co-ordinate and synchronise*) input from different users (multiplayer games).
Owner	Carmen, Agnese, Giulio
Status	Agreed
Revision	25/05/2009 merged with 144
Type	Multi-user
Rationale	The platform must handle multi-user applications, e.g., games with multiple players.
Priority	**Medium**
Scenario, Beneficiary	Pac Man, IPTV business; User
Typology	User Interface, Network, Migration Service Platform
ID	**26**
Description	The OPEN platform must enable users and application to share a device and to divide its resources amongst themselves, e.g., two users may split a large screen between them.
Owner	Erno
Status	Agreed
Revision	25/05/2009 edit for comprehension
Type	Multi-user, Device
Rationale	Multiple users may want to share a large screen device, each with their own space.
Priority	**High**
Scenario, Beneficiary	Shopping Spree, User
Typology	Migration Service Platform, User Interface
ID	**88**
Description	The OPEN platform must recognize conflicts, e.g., when multiple users try to use the same devices. It must provide mechanism to resolve such conflicts.

Owner	Manuel
Status	Agreed
Revision	N/A
Type	Multi-user, device
Rationale	Multiple users in a room might want to grab an input or output channel.
Priority	**High**
Scenario, Beneficiary	Mobility Support
Typology	Migration Service Platform, User Interface

Network Requirements

These are requirements pertaining to configuration and control of the underlying networks that provide connectivity to the OPEN platform and to migratory applications. To provide applications with *terminal mobility*, that is, the ability to move between different networks, the MSP has to meet these requirements.

ID	**127**
Description	The OPEN platform must auto-configure network settings but before the migration from a network to another, it must alert the user and wait for his authorization
Owner	Agnese, Giulio
Status	Agreed
Revision	merge with 2
Type	Network, Usability, Control
Rationale	User does not want to care about configuring. Changing network could mean different fee or delay
Priority	**Medium**
Scenario, Beneficiary	N/A, Network Provider
Typology	Network
ID	**132**
Description	For migration involving devices in a (W)PAN and network servers, OPEN platform must manage new communication among: • devices • devices and servers • servers
Owner	Agnese, Giulio
Status	Agreed
Revision	N/A
Type	Network, Usability
Rationale	The user does not want to set up connection, download files, install modules,...he wants to go on playing
Priority	**High**
Scenario, Beneficiary	IPTV Gaming, Network Provider
Typology	Network

Offline Mode Requirements

These are requirements on the OPEN platform to provide some services to migratory applications even when it is not connected to the network or other devices.

ID	**63**
Description	The OPEN platform should work with and without internet connection when the components necessary are locally available.
Owner	Holger
Status	Agreed
Revision	merge with 92, 16
Type	Offline Mode
Rationale	As an example, moving the UI from a PC to a mobile phone should work without internet connection, if all necessary components are available on the devices, and they can form an ad-hoc network.
Priority	**Medium**
Scenario, Beneficiary	Pac Man, User
Typology	Network

Policy Requirements

These are requirements that pertain to the ability of migratory applications or their users to specify rules and guidelines for migration, e.g. rules for automatic migration.

ID	**66**
Description	The user must be able to specify migration policies, e.g. automatic migration when switched off
Owner	Erno
Status	Agreed
Revision	N/A
Type	Policy
Rationale	Shut down PC, automatically continue on mobile phone
Priority	**Medium**
Scenario, Beneficiary	Pac Man; User
Typology	MSP
ID	**52**
Description	The OPEN platform should provide a policy setting for deciding who can edit data in a multi-user scenario
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Policy
Rationale	User wants to explicitly give rights to others
Priority	**Medium**
Scenario, Beneficiary	Migration over platforms, Developer
Typology	Migration Service Platform
ID	**98**
Description	The OPEN platform must ensure that a migration occurs only if either the user explicitly consents to it, or it conforms to a predefined policy that allows it.
Owner	Miquel
Status	Agreed
Revision	edited for clarity

Type	Policy
Rationale	I don't want my banking service migrated out of my device by passers-by
Priority	**Medium**
Scenario, Beneficiary	General, User
Typology	Migration Service Platform

Application-logic Reconfiguration Requirements

These are requirements pertaining to the reconfiguration, re-wiring or replacement of the collection of computational or functional elements of a migratory application, e.g. to adapt to new devices or different networks.

ID	**128**
Description	For migration occurring between devices in a (W) PAN, the OPEN platform must enable application-logic reconfiguration between multiple devices.
Owner	Agnese, Giulio
Status	Agreed
Revision	N/A
Type	Reconfiguration
Rationale	The user does not want to set up connection, he wants to go on using the application, e.g., playing a game.
Priority	**High**
Scenario, Beneficiary	Pac Man, Racing Game; Developer
Typology	Application Logic, Network, Migration Service Platform
ID	**59**
Description	The OPEN platform must enable the application to adapt its behaviour to the context / user's needs.
Owner	Holger
Status	Agreed
Revision	N/A
Type	Context
Rationale	Not only the change of an interface-implementation is relevant, but also the change of behaviour of single components during runtime without replacing them.
Priority	**High**
Scenario, Beneficiary	Pac Man
Typology	Application Logic, Migration Service Platform
ID	**129**

Description	The OPEN platform must be able to perform application logic reconfiguration between multiple devices and verify the presence of all necessary modules. If one or more modules are missing on the target device, the platform must: • Set the connection to the modules repository • Download the required modules • Install and configure the modules on the device
Owner	Agnese, Giulio
Status	Agreed
Revision	N/A
Type	Reconfiguration
Rationale	The user does not want to set up connection, download files, install modules, he want to go on using the application, e.g., playing a game.
Priority	**High**
Scenario, Beneficiary	IPTV Gaming, Pac Man, Racing Game; Developer
Typology	Application Logic, Network, Migration Service Platform
ID	**74**
Description	The OPEN platform must enable users to migrate identified logical parts of the application to other devices. The user must be able to migrate more than the user interface (*i.e. codecs, computation tasks, etc*).
Owner	Erno
Status	Agreed
Revision	Merged with 87
Type	Reconfiguration is sometimes necessary, e.g., if there is a nice way of interfacing but no power or bandwidth, processing should be moved.
Rationale	User has control
Priority	**High**
Scenario, Beneficiary	Pac Man, User
Typology	Application Logic, MSP, User Interface

Usability and Humanity Requirements

Usability and Humanity – These requirements specify the usability and ergonomic acceptability of the product to the hands-on users.

ID	**159**
Description	The OPEN platform must ensure that the application user interface is as homogeneous as possible when migrating from one device to another.
Owner	Francesca & Stefano
Status	Agreed
Revision	edit for clarity
Type	User Interface
Rationale	The user should not be disoriented by a different UI
Priority	**High**
Scenario, Beneficiary	General, User
Typology	User Interface, Migration Service Platform
ID	**69**
Description	The OPEN platform must ensure that applications like games are migrated in such a way that the user does not experience any loss of continuity. Interruption of game continuity should be avoided, especially in real-time games.
Owner	Francesca
Status	Agreed
Revision	edit for clarity
Type	Usability
Rationale	The game experience must be preserved.
Priority	**Medium**
Scenario, Beneficiary	Pac-Man, User
Typology	Migration Service Platform
ID	**27**
Description	The OPEN platform must enable applications to clearly show who has control in a multi-user scenario.

Owner	Manuel
Status	Agreed
Revision	N/A
Type	Usability, Multi-user
Rationale	User wants to have feedback.
Priority	**High**
Scenario, Beneficiary	Shopping Spree, User
Typology	Migration Service Platform, User Interface
ID	**41**
Description	The OPEN platform must be able to learn the user's preferred modality for a given application and device.
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Usability
Rationale	User should not reconfigure the setting every time s/he uses the system
Priority	**Medium**
Scenario, Beneficiary	Video Telephony, User
Typology	Migration Service Platform
ID	**71**
Description	The interaction with migration phases must be as unobtrusive as possible
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Usability
Rationale	Users don't want to be disturbed in their work/game.
Priority	**Medium**
Scenario, Beneficiary	N/A, User
Typology	Migration Service Platform

ID	101
Description	The OPEN platform should provide the user with information like how much a migration would potentially cost
Owner	Manuel
Status	Agreed
Revision	N/A
Type	Usability
Rationale	There might be costs caused by licenses, if you want to have an application on multiple devices.
Priority	**Medium**
Scenario, Beneficiary	General, User
Typology	Migration Service Platform, Application Logic
ID	**24**
Description	Some graphical user interface or visual clue must be used to: • Trigger a partial migration • Recover a migration, so the application comes back to the device (pack your application and leave) • For intuitiveness sake, this cue must be consistent throughout devices
Owner	Miguel
Status	Agreed
Revision	N/A
Type	Usability
Rationale	Keep the user in control and ensure he understands what's going on.
Priority	**Medium**
Scenario, Beneficiary	Shopping Spree
Typology	Usability
ID	**94**
Description	The user must be able to set preferences (font size, colours, audio volume, brightness) and defaults for migration
Owner	Anders

Status	Agreed
Revision	N/A
Type	MSP, User Interface
Rationale	Doing the same thing over and over again (accepting/denying) is not satisfactory for the user
Priority	**High**
Scenario, Beneficiary	User Interface, Migration Service Platforms
Typology	General
ID	**93**
Description	The OPEN platform should remember previous migration settings, when it recognises that the conditions are the same (e.g. when the user comes to the office).
Owner	Carmen
Status	Agreed
Revision	N/A
Type	MSP
Rationale	We want to enable the user to make shortcuts for routine migrations (configurations)
Priority	**Medium**
Scenario, Beneficiary	Mobility Support
Typology	User Interface, Migration Service Platform
ID	**118**
Description	The OPEN platform must enable the user to know (*seamlessly over migrations*), which information is important and which is not.
Owner	Andreas F
Status	Agreed
Revision	N/A
Type	Usability
Rationale	Emergency staff must decide quickly
Priority	**Medium**
Scenario, Beneficiary	Emergency Flood; User

Typology	User Interface

Maintenance & Support Requirements

Maintainability and Support – These requirements concern the time necessary to make specified changed to the product and they highlight the maintenance needs of the product.

ID	**84**
Description	The OPEN platform must allow automatic updates of components.
Owner	Manuel
Status	Proposed
Revision	N/A
Type	Maintenance
Rationale	User does not want to search for updates
Priority	**High**
Scenario, Beneficiary	Racing Game, Developer
Typology	Application Logic, Migration Service Platform
ID	**123**
Description	The OPEN platform must collect data, e.g., create a Log file, with the purpose of measuring the framework and application execution as well as migration events.
Owner	N/A
Status	Proposed
Revision	*Created on* 29/9/2008. *Last modified on 29/9/2008*.
Type	Operational
Rationale	The OPEN platform must enable the users to have a complete ex-post analysis, e.g., emergency analysis.
Priority	**High**
Scenario, Beneficiary	General
Typology	N/A

Performance Requirements

Performance – These requirements refer to the product response time and they also refer to the product's ability to operate at a speed suitable for the intended environment.

Although performance goals are very important, the focus of the project is on functionality. Therefore, more theoretical, as opposed to actual, performance assessments are planned.

ID	**18**
Description	Open must be extremely reliable
Owner	Miquel
Status	Proposed
Revision	N/A
Type	Quality of Service
Rationale	It's used in life threatening situations
Priority	**High**
Scenario, Beneficiary	Emergency Flood
Typology	MSP
ID	**102**
Description	Waiting time during migration process should be minimized
Owner	Stefano
Status	Proposed
Revision	N/A
Type	Quality of Service
Rationale	Users do not want to wait
Priority	**High**
Scenario, Beneficiary	General; Developer
Typology	MSP

Security & Privacy Requirements

Security & Privacy – These requirements specify who has authorized access to the product, both functionality and data, the circumstances under which access is granted and to which parts of the product the access is granted.

The focus of OPEN is on functionality related to migration. So, although these security requirements are very important, they will not be implemented in the context of the project.

ID	**140**
Description	Personal data stored on any OPEN platform public database must be protected
Owner	Agnese, Giulio
Status	Proposed
Revision	Merge with 23
Type	Privacy
Rationale	Open must ensure privacy regarding personal information such as location, name, address, preferences, habits etc.
Priority	**High**
Scenario, Beneficiary	General, Users
Typology	Migration Service Platform
ID	**36**
Description	The OPEN platform must enable users to define privacy policies, e.g., for application migration to shared/public displays, and it must ensure those policies are honoured. Each time a migration occurs, OPEN must adhere to privacy policies and settings for files/directories and applications.
Owner	Erno
Status	Proposed
Revision	Merged with 39 and 138
Type	Privacy
Rationale	User privacy must be preserved during migration, e.g., when migrating to shared/public devices.
Priority	**High**
Scenario,	Shopping Spree, Users

Beneficiary	
Typology	Migration Service Platform, User Interface
ID	**141**
Description	Any personal data transferring (device-device, device-platform, and platform-platform) should be safe.
Owner	Agnese, Giulio
Status	Proposed
Revision	N/A
Type	Security
Rationale	The user privacy must be preserved
Priority	**High**
Scenario, Beneficiary	General
Typology	MSP
ID	**15**
Description	Wireless communication should be encrypted.
Owner	Anders
Status	Proposed
Revision	N/A
Type	Security
Rationale	Eavesdropping is easy in unencrypted air
Priority	**High**
Scenario, Beneficiary	Emergency Flooding, User
Typology	Network
ID	**48**
Description	The OPEN platform must enable users to control the access rights to application data displayed in a migrated UI. For example, if output data could be partially displayed on a public screen because of privacy settings, each data should be associated with a privacy metadata.
Owner	Erno
Status	Proposed
Revision	Merged with 139

Type	Security, Control
Rationale	An example use is to migrate a shopping list which is being edited onto a family board, and to disallow editing on the board.
Priority	**High**
Scenario, Beneficiary	Migration over platforms
Typology	MSP, User Interface
ID	**143**
Description	The User Interface of the migratory application has to allow to manage permission settings
Owner	Agnese, Giulio
Status	Proposed
Revision	edit for clarity
Type	User Interface
Rationale	The user could set permission settings during the migration
Priority	**Medium**
Scenario, Beneficiary	Migration over platforms, User
Typology	User Interface, Migration Service Platform

Conclusion

This deliverable is the second to last of the Work Package 1 deliverables. WP1 describes the Requirements and Scenarios for the OPEN Service Platform project. This deliverable will become input into the next deliverable of Work Package 1 – the *Final OPEN Service Platform Architectural Framework*.

These requirements reflect and will drive forward the on-going work in WP4 and WP5. The first is prototyping the MSP. The second is implementing demonstration applications that use the MSP. Results from WP4 and WP5 will also serve as input to the *Final OPEN Service Platform Architectural Framework.*

Abbreviations

- GPS – Global Positioning System
- IPTV – Internet Protocol Television
- MSP – (OPEN) Migration Service Platform
- OPEN – Open Pervasive Environments for migratory iNteractive services
- PDA – Personal Digital Assistant
- UI - User Interface

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