SEVENTH FRAMEWORK PROGRAMME

CloudSpaces

(FP7-ICT-2011-8)

Open Service Platform for the Next Generation of Personal Clouds

D1.1 Management Plan

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Abstract	The present document provides the useful public management features of the CloudSpaces project. It describes the practical rules applicable within the consortium in such fields as strategy, financial and legal issues, innovation, project co-ordination, decision-making and risks management.
Keywords	Cloud storage, Management, Collaboration, Consortium, Reporting, Strategy, Innovation, Financial, Co-ordination, Decision making, schedule, User Group

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1 Executive summary

The CloudSpaces project advocates for a paradigm shift from application-centric to person-centric models where users will retake the control of their information. CloudSpaces aims to create the next generation of open Personal Clouds using three main building blocks: CloudSpaces Share, CloudSpaces Storage and CloudSpaces Services.

The present document provides the useful public management features of the CloudSpaces project. It describes the practical rules applicable within the consortium in such fields as strategy, financial and legal issues, innovation, project co-ordination, decision-making and risks management. It describes the way CloudSpaces collaborates with other research projects and communities in the Collaborative Working Environment. It also develops the CloudSpaces User Group composition and role in the project.

2 Project objectives

2.1 Introduction

In the next few years, users will require ubiquitous and massive network storage to handle their ever-growing digital lives. Every user will handle hundreds of gigabytes to store digital information including photos, videos, work documents and communication flows like emails or social communication.

To meet this demand, current trends show an increasing number of enterprises and users migrating their data to Cloud storage providers. A major selling point for Cloud computing is that it offers on-demand storage capacity that otherwise might not be affordable.

In this line, the **Personal Cloud model** is a user-centric solution to manage such massive amounts of digital information. Unlike application-centric models where data is tied to a specific application, user-centric models provide a personal storage service for user data.

The Personal Cloud model defines a ubiquitous storage facility enabling the unified and location-agnostic access to information flows from any device and application. Commercial providers such as Dropbox, SugarSync or Ubuntu One are offering very popular Personal Cloud solutions that keep "in sync" the information from the different user devices. These solutions also permit information sharing with other users within the same Personal Cloud provider.

The popularity of these killer applications lies behind their easy-to-use Software as a Service (SaaS) storage facade to ubiquitous Infrastructure as a Service (IaaS) storage resources like Amazon S3 and others. In a recent report, Forrester research [1] forecasts a market of $12 billion in the US in paid subscriptions to personal clouds by 2016. This growing popularity of Personal Clouds is also attracting the major players in the market, and Google, Microsoft, Amazon or Apple are offering integrated solutions in this field.

But Personal Clouds are in their infancy, and two major problems must be solved to facilitate their massive adoption by users and companies:

1. First, there is a big **privacy** problem that precludes the adoption of this model by many users, companies and public institutions. Most Personal Clouds follow a simple centralized synchronization model that stores all information in the Cloud as a remote file system. The entire **data management** process is in the hands of the Cloud providers, so the users really lose control of where their information is stored and who can access it. The problem is that traditional means of privacy preservation like the use of personal encryption keys is against the business model of many Personal Cloud providers. In October 2011, for instance, Forbes Magazine [2] published that Dropbox has 50 million users, of which 96% are employing a free account, which illustrates that Dropbox is subsidized by a minority of users who pay to obtain more than the free 2 GBs of storage space. To compete for the market share, many Personal Cloud providers, including Dropbox and the likes, offer value-added services that require the provider to retain a copy of the decryption keys. Reconciliation of privacy preservation and revenue growth rates is a big issue in today's Personal Cloud model.

2. Another important problem is the lack of **interoperability** between Personal Cloud services impeding information sharing, but also precluding information portability among them. This generates what is known as **vendor lock-in**: a best decision now may leave a customer trapped with an obsolete provider later, simply because the cost to switch from one provider to another is prohibitively expensive. This may lead to a kind of data inertia where the more data given to one provider, the more difficult it becomes to move. A clear example of **vendor lock-in** in the Personal Cloud is folder sharing. To join a shared folder, users need to have an account in the same Cloud provider, inciting users to inadvertently get stuck with the chosen Cloud vendor. In addition to the costs of switching data, the adoption of an alternative solution will require to set up a new account for every user and install software clients on their devices. This sunk cost may represent a major barrier to entry for small to mid-size businesses that cannot afford the redundancy that an enterprise-class infrastructure would cost.

We are now in a decisive turning point that will definitely influence how we interact with the information in the following years. If the major players dominate this market with vertical walled-garden solutions, there will be few space left for European Cloud providers, software solution providers and SMEs.

CloudSpaces aims to create the next generation of Personal Clouds, namely Personal Cloud 2.0, offering advanced issues like interoperability, advanced privacy and access control, and scalable data management of heterogeneous storage resources. Furthermore, it will offer an open service platform for third-party applications leveraging the capabilities of the Open Personal Cloud.

What are the main contributions of this proposal?

The CloudSpaces project presents an open approach for the next generation of Personal Clouds. First of all, the project aims to provide an open platform for massive and ubiquitous user-centric storage to citizens and business users. We outline two main objectives of this proposal:

1. **Privacy**: Users retaking control of their information implies that users can decide where their data is stored and how applications and users can access their information, so that users can benefit from value-added Cloud services when necessary. To reconcile privacy preservation and business revenue, CloudSpaces will manage privacy as a spectrum on which users can choose their place based on their preferences. At one end, it will be a Personal Cloud provider who has the right to read and work with user content, offering in return value-added services on top of Cloud storage. At the other end, it will be a Personal Cloud provider who gives businesses and users complete privacy over their data, providing no services other than pure storage. To that end, CloudSpaces will address the following two issues:

    - Scalable Data Management: In this scenario, home gateways, NAS devices, private company storage resources may play mediator roles with the Cloud resources. One can easily imagine the case where personal data on a mobile device is synced through a home gateway, and later with the Cloud provider depending on the sensitivity of the data and the nature of its use. This new distributed scenario clearly requires novel adaptive replication and synchronization schemes dealing with aspects like load, failures, network heterogeneity and desired consistency levels.
    - Privacy-Aware Data Sharing: The sharing infrastructure must ensure privacy-aware data sharing from other Personal Clouds. It must also guarantee controlled access to external users and applications of one's personal data. The platform will estimate privacy leakage and it will provide feedback to the users regarding their actions. Using trustworthiness assessment, we will also estimate the trustworthiness of the different resources, applications and users in the Personal Cloud.

2. **Interoperability**: CloudSpaces will overcome the vendor lock-in problem thanks to syntactic interoperability, and will enact richer forms of collaboration thanks to semantic interoperability. The former will define standard APIs for data sharing but also export/import formats to enable the portability of information between different providers. Regarding semantic interoperability, semantic models of data will provide a platform-independent data representation. Semantic transformations and mappings will provide richer forms of collaboration beyond folder sharing. Finally, we will offer a service front-end for third-party apps located in different platforms willing to access CloudSpaces advanced functionalities. Our novel application model will offer data management (3S: Store, Sync, Share), data-application interfaces, and a persistence service to heterogeneous applications with different degrees of consistency and synchronization.

As we can see in the following figure, the consortium is joining top research groups experts in distributed storage and semantic interoperability in the Cloud (EPFL, Eurecom, URV) with leading enterprise partners like Canonical (Ubuntu One Personal Cloud), TISSAT (European Cloud Provider) and eyeOS (Personal Web Desktop). CloudSpaces combines academic theory with solid proof. To ensure the validity of our design principles we shall develop operational proof-of-principle deliverables. Each year we will incrementally enhance our open source prototypes and test our assumption in the wild by asking thousands of Internet volunteers to try our prototypes. To this end we will leverage the massive communities of the open source projects involved in CloudSpaces: Ubuntu One [3], OpenStack [4] and eyeOS [5].

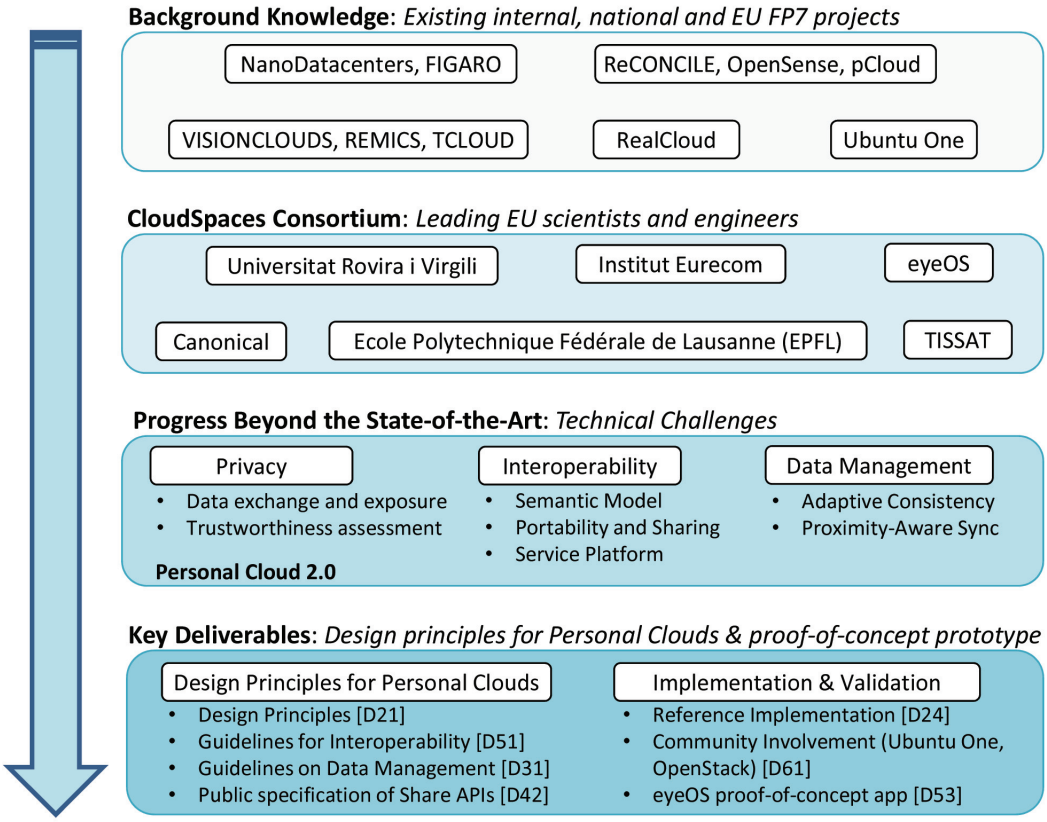


Figure 1: CloudSpaces overview

This project aims to have a relevant impact both in the society and in the industry. Our open platform will enable the creation of value-added services and applications around Personal Clouds for SMEs and for software-solution providers. Furthermore, we will also enable an ecosystem of resources where small and medium Cloud Providers in Europe will be integrated easily in those massive Personal Cloud platforms. To boost the adoption of our achievements we will publish all our contributions as open source software over three main projects: Ubuntu One Personal Cloud, eyeOS Personal Web Desktop, and OpenStack Swift open source Cloud storage solution. Finally, we outline the importance of Ubuntu's user base for the global impact of this project.

2.2 Scientific and technological objectives

We outline five main objectives for the CloudSpaces project: scalable data management, privacy, interoperability, standard service front end, and validation and dissemination in open source projects. These objectives are clearly mapped to WPs in this project: WP3 CloudSpaces Storage maps to scalable data management, WP4 CloudSpaces Share maps to privacy and interoperability, WP5 CloudSpaces Services maps to the service front-end, and finally both WP2 Architecture and WP6 Dissemination deal with validation and dissemination in open source projects. Let us explain each of these five objectives:

1. **Scalable Data Management of heterogeneous resources**. We will develop a mediator data management agent offering advanced storage, sync and share mechanisms thanks to the interconnection of heterogeneous user resources and Cloud remote repositories. To this end, we will devise novel adaptive replication algorithms providing dynamic membership reconfiguration of untrusted repositories as well as advanced consistency mechanisms. Finally, we will also create new proximity-aware data synchronization and sharing techniques benefiting from device location awareness .

2. **Privacy-aware data sharing**. We will implement techniques ensuring secure, trustworthy and privacy friendly interactions within the CloudSpaces environment. To this end, we will propose a set of privacy-aware data sharing mechanisms that will employ hybrid technical approaches like obfuscation, anonymization, encryption, digital signatures, and information hiding. We will also introduce novel mechanisms for privacy-aware data exchange and exposure. In this line, we will estimate privacy leakage and provide feedback to the user regarding her/his actions. Building upon existing approaches on trustworthiness assessment, we will estimate the trustworthiness of the different resources, applications and users in the Cloud environment based on activity logging and data provenance.

3. **Interoperability of Personal Clouds**. We will avoid vendor lock-in thanks to both semantic and syntactic interoperability techniques. We will enable exchange of data and services between users and Personal Clouds with a new semantic framework for creating accurate and adaptive semantic mappings among entities as a negotiation process. We will define a semantic-enriched model that can capture all the metadata related to the various processes and data items in CloudSpaces, covering schema provisions for simple data lineage, declarative storage structures, and metadata enrichment. Finally, regarding syntactic interoperability, we will define and implement a standard way of exporting all data stored in a Personal Cloud. We will also enable data exchange and sharing among heterogeneous Personal Clouds.

4. **Standard Service front-end**. We will create a service framework with standard APIs enabling the interoperability of third-party applications with the data contained in Personal and shared Clouds. We will provide standard data management services (Store, Sync, Share) and an advanced persistence service offering Key/Value Store Semantics, advanced queries and consistency and synchronization with the Personal Cloud resources. All these services will be offered in a clear service framework promoting adoption and third-party development. Finally, we will demonstrate the capabilities of the aforementioned services with an advanced proof of concept: the eyeOS Personal Web Desktop.

5. **Validate and disseminate the platform contributing to open source projects**. CloudSpaces will mainly contribute to three open source projects. It will extend OpenStack Swift to include advanced scalable data management algorithms. It will extend Ubuntu One to incorporate interoperability and privacy mechanisms. And it will extend eyeOS to demonstrate the functionalities of CloudSpaces Services. We will also leverage the massive user communities of these open source projects like OpenStack, Ubuntu, and eyeOS to disseminate the results of the project and to validate the platform in real internet scenarios with thousands of users.

3 Organization

3.1 Composition of the consortium

Participant name	Short name	Address	Website
Universitat Rovira i Virgili	URV	Carrer de l'Escorxador S/N 43003 Tarragona Spain	www.urv.cat
École Polytechnique Fédérale de Lausanne	EPFL	Route Cantonale 1015 Lausanne Switzerland	www.epfl.ch
Institut Eurécom	EUR	450 Route des Chappes 06410 Biot France	www.eurecom.fr
Canonical Group Ltd	CNC	110 Southwark Street SE1 0SU London England	www.canonical.com
EyeOS S.L.	EOS	La Rambla 140 08002 Barcelona Spain	www.eyeos.com
Tecnología e Ingenierıa de Sistemas y Servicios Avanzados de Telecomunicaciones, S.A.	TST	Av. Leonardo Da Vinci, 5 46980 Paterna Spain	www.tissat.es

3.2 Authorized contact person / Team leader

This information is consistent with the Contract forms.

Short name	Name of the contact person	Email
URV	Pedro García-López	pedro.garcia@urv.cat
EPFL	Karl Aberer	karl.aberer@epfl.ch
EUR	Ernst Biersack	erbi@eurecom.fr
CNC	Stuart Langridge	stuart.langridge@canonical.com
EOS	Pol Watini	pol@eyeos.com
TST	Carlos Cebrian	ccebrian@tissat.es

4 Project management

The management will be organized according to the size and requirements of the project and it will be based on experience gained in previous European projects.

Furthermore, the small number of partners makes the management of the project easier and reduces risks associated to management overheads.

Nevertheless, rigorous project management procedures will be set up and followed for the entire duration of the project.

4.1 Management structure and responsibilities

A Project Coordination Committee (PCC) consisting of the participating group leaders and of the project manager will be established. All group leaders have ample management experience. The general and practical project management, including financial, contractual and administrative matters, will be carried out by the project manager from the coordinating partner. The committee will meet every six months to set the objectives and review progress. To encourage further interaction and exchange between the members of the consortium, the venue for these meetings will be rotated between the participating laboratories. Between these meetings, the management team will rely on intensive use of electronic mails and computer supported collaborative work tools (Wikis, version control). In case of delicate issues such as difficult technical steps or conflicts, any member of the Coordination Committee may require a formal meeting of the management team and the coordinator.

The Coordination Committee will be chaired by the coordinator. If non-unanimous decisions have to be taken, the chairperson will organize a vote. Each group leader has one vote while the project manager has no voting capacity. Before calling the members of the Coordination Committee to vote, the coordinator will intend to reach consensual decisions by hearing to each member of the Coordination Committee. A decision is voted on the basis of simple majority. At the final step, if the score is even, the coordinator can exceptionally use a quality vote to decide.

When a group leader cannot attend to a meeting of the Project Coordination Committee, she/he may grant a proxy to any other employee of her/his institute/company. This proxy must reach the coordinator or the project manager in written form or by email before the meeting of the Committee begins.

To every work package, a work package leader is assigned. The work package leader will be responsible for exchange of information between the work package members, for coordinating collaborative activities, and for reporting half yearly on the progress made in the work package to the Coordination Committee. In CloudSpaces, five partners (out of the six that make up the consortium) are work package leaders, thus balancing the responsibilities within the consortium.

The members of the Coordination Committee will also serve as partner contact points for the project manager and they are assumed to be responsible for the technical, organizational and administrative aspects of the project within their organization. On the technical side, the Project Manager will be assisted by Work Package Leaders, especially for the editing of deliverables and the annual and final reports and for the preparation of technical presentations. The exchange of information will take place at the meetings but also via emails and via a dedicated closed website for exchange of confidential information between the members of the consortium.

In the figure below we can see the overall structure of project management in the project. The Project Coordinator will be the contact point with the Project Officer to deal with budget, reporting and contract matters. The Project Manager will take care of daily management, action lists, and reporting with WP leaders. Finally, the Coordination Committee, leaded by the Project Coordinator will be responsible of the global scientific coordination of the project. It will prepare each annual project review and will take strategic decisions for steering the project. The Committee will also ensure the quality of deliverables and reporting of WP leaders through peer reviewing.

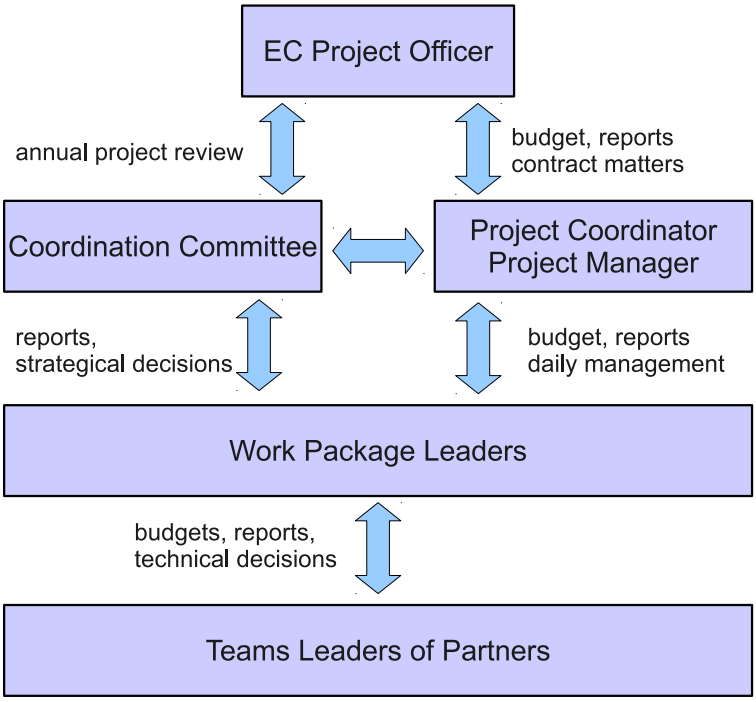


Figure 2: Structure of project management and monitoring flow

Following, we detail the roles and responsibilities of the Project Coordinator (Pedro García López) and the Project Manager (contracted by URV in M4).

The Project Coordinator will:

1. Pilot the engineering activities.
2. Organize and chair the project's technical meetings.
3. Define the quantitative and qualitative objectives of the technical activities and monitor their progress in cooperation with the WP leaders.
4. Control the compatibility between the different components of the demonstrator.
5. Support the Project Manager for the risk assessment.
6. Define action plans and oversee their execution.
7. Interface with the European Commission Services (deliverables, progress reviews).

The Project Manager will:

1. Draw-out the Management Plan.
2. Monitor the activities against the planning.
3. Organize and chair the project´s management meetings.
4. Regularly update the risk assessment with the support of the Coordinator.
5. Provide the financial services, receiving the partners cost statements and giving them the appropriate feedback.
6. Provide support to the partners to satisfy to the administrative matters necessary for the European Commission Services.

4.2 Technical Committee

The Technical Committee includes one representative from each partner in the consortium. The role of the Technical Committee is to determine the technical direction of the project in order to fulfill its aims and those of the consortium members. This includes the development of a consensus on the technical contents of the project at the global as well as the detailed level and the recommendation of technical amendments to the project work programme to mitigate risks or to develop corrective actions. Any differences within the Technical Committee will be resolved by the PCC.

The responsibilities of the Technical Committee will include:

- Establishing and maintaining a technical plan of the project.
- Reporting to the PCC about the technical status of the project.
- Organizing the internal workshops of the project.
- Organizing the project reviews with the European Commission.

It is expected that the technical co-ordination will need frequent exchange of information and shared work. Consequently, the project will make use of modern communication techniques such as teleconferences, videoconferences and co-operative work.

4.3 Management Process

The day-by-day progress will be monitored through consortium meetings.

At the project kick-off meeting, all partners will reach consensus on all the different issues relative to the administrative and operational tasks for the entire duration of the project. Project representatives to the PCC will be appointed by all partners, giving their direct and indirect contacts with responsible individuals with email addresses and reference web sites. The project management board will also be set up and management rules agreed upon and explicated as much as practically possible in the consortium agreement.

Then consortium meetings will be organized at least every 6 months. All partners will host one meeting. Considering the importance of such meetings for the good progress of the project, their duration will be at least two days, possibly three if needed. The meeting may for instance begin at noon on the first day and end in the afternoon for the second or third day to ease transportation. In addition, partners who have common work will receive facilities to continue working together or to start their meeting earlier, thanks to the comprehensive hosting partner.

4.4 Conflict resolution procedures

If necessary, the Project Coordinator will organize a conflict resolution meeting within 30 days following the receipt of a written request transmitted by any of the project partners. Attempts at arbitration will be performed in increasing order of authority:

- Within the team of each work package under the management of the WP Leader.
- Within the Technical Committee.
- Within the PCC under management of the Project Coordinator.

If necessary, a meeting will be held with all representatives of the respective level. During the meeting, agreements are searched through dialogue and mutual concession. In case of failure, a meeting at upper level will be arranged. Requests for meetings must include hints for potential solutions; replies must be given within a stated time.

4.5 Reports and reviews

The milestones/deliverables described in Section 5 will be used to monitor progress for each work package. Each participating research team will report on their progress, problems and achievements at the half-yearly meetings of the Coordination Committee. The project leaders will submit a written report three weeks before the meeting. These will be distributed along with the agenda for the meeting by the project management two weeks before the meeting. Work package leaders will summarize the progress in their work package at the meeting. A list of decisions taken at the meetings and action points will be distributed within two weeks following the meeting of the Coordination Committee. Consolidated reports, action points and decisions will be posted on the web page of the project.

Reporting to the EC is one of the tasks that falls under the project coordinator's responsibility. The consortium will produce a report on the effort dissipated (person per month) on a quarterly basis, followed by a progress report covering every six-month period. The cost statements are scheduled in phase with the mid-term and final review. Interim review will be held subject to decision of the project officer. Those milestones appear in the detailed work plan below.

The coordinator is the only official contact with the Project Officer and all questions should be conveyed through him. It is expected, however, that the Project Officer will be invited to participate in one or more Consortium meetings, at least the first day when administrative issues are discussed.

The partners will receive forms to be completed to answer the need for reporting on their activity, compiled by the coordinator before sending it to the Project Officer and all partners. The coordinator will also be available to assist partners on those administrative tasks when needed.

4.6 Intellectual Property Rights (IPR) and Consortium agreement

First of all, CloudSpaces partners have unanimously agreed that the majority of project results will be released to the public as open source using the GPLv3 license. The consortium clearly bets on open source technologies as the most beneficial route to reach a wide use of the CloudSpaces results and to stimulate new business activities and spin-offs.

Intellectual Property Rights (IPR) issues in exploiting the results of the project are addressed in the Consortium Agreement. In this Consortium Agreement background Intellectual Property, foreground and follow-up exploitation are detailed. The background Intellectual Property lists the skills, know-how and software products brought by each partner to the project. In particular, specific components of Ubuntu One server and eyeOs Professional edition are proprietary source code. This identified background will remain the property of the partner stating it, after the end of the project.

Most of the CloudSpaces's achievements will be made publicly available (refer to deliverables list) and standardization will be sought with the appropriate standardization bodies. Furthermore, subject to agreement between all partners in the CloudSpaces consortium, software will be released to the public with a free license (GPLv3).

For the success of the project it is essential that all project partners agree on explicit rules concerning IP ownership, access rights to any Background and Foreground IP for the execution of the project and the protection of intellectual property rights (IPRs) and confidential information before the project starts. Therefore, such issues will be addressed in detail within the Consortium Agreement between all project partners.

In order to ensure a smooth execution of the project, the project partners agree to grant each other royalty-free access rights to their Background and Foreground IP for the execution of the project. Any details concerning the access rights to Background and Foreground IP for the duration of the project will be defined in the Consortium Agreement.

Foreground IP shall be owned by the project partner carrying out the work leading to such Foreground IP. If any Foreground IP is created jointly by at least two project partners and it is not possible to distinguish between the contribution of each of the project partners, such work will be jointly owned by the contributing project partners. The same shall apply if, in the course of carrying out work on the project, an invention is made having two or more contributing parties contributing to it, and it is not possible to separate the individual contributions. Any such joint inventions and

all related patent applications and patents shall be jointly owned by the contributing parties. Any details concerning the exposure to jointly owned Foreground IP, joint inventions and joint patent applications will be addressed in the Consortium Agreement.

CloudSpaces will develop a variety of software programs. The dissemination status of these will vary:

- Some code (and items such as the content of web sites) will be available only to the partners, and partners expected to maintain and benefit from it.
- Some code will be circulated freely among the partners, but will only be available outside the consortium under commercial license.
- Some source code will be released into the public domain using either LGPL or GPL.

These categories will be further defined in the Consortium Agreement, and decisions about the status of particular codes will be made during the project by the Project Coordination Committee. The default status, when no member of the PCC wishes to propose the consideration of an alternative, will be the first of these, that is, release as 'Open Source Software'. That is, the project partners are planning to apply an Open Source Software strategy, believing that this is the most beneficial route to reach a wide use of the CloudSpaces results and to stimulate new business activities and spin-offs.

5 Workplan

5.1 Overall Strategy and general description

CloudSpaces is structured in six work packages only. With the exception of WP1 — dealing with the overall management of the project, and WP6 dealing with the dissemination, exploitation and standardization activities — all other work packages have a technological and scientific justification.

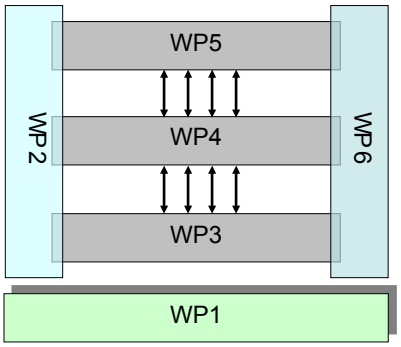


Figure 3: Work Package Structure Overview

As we see in Fig. 3, the structure of CloudSpaces follows a layered approach. There exist bidirectional dependencies between technical work packages (WP3, WP4, WP5) closing the feedback loop among layers. WP6, dealing with all the dissemination related issues, an WP2, ensuring the necessary consistent cross layer research are transverse to WP3, WP4 and WP5.

WP1 (Management) has three main tasks: Project Management, Scientific Coordination and Risk Assessment. This work package, led by URV, takes care of the overall management and reporting issues of the project, guarantees quality assurance and risk assessment, and it is the place for scientific coordination.

WP2 (Architecture) has three tasks: Architecture, prototyping and Validation. T2.1 (Architecture) will steer the requirements and specifications of the CloudSpaces Toolkit integrating the work of all WPs. T2.2 (Prototyping and open Internet trials) will create early prototypes to produce feedback on actual usage in the wild Internet. Finally, T2.3 (Validation) will define from the onset of the project the validation and benchmarking framework.

WP3 (CloudSpaces Storage) has three tasks: Personal Storage, Cloud storage, and Proximity-aware Sync & Share. T3.1 (Personal Storage) will develop a scalable data management platform efficiently aggregating the heterogeneous storage resources. T3.2 (Cloud Storage) will modify an open source Cloud storage solution (OpenStack Swift) in order to provide advanced storage services to Personal Cloud providers. Finally, T3.3 (Proximity-aware Sync & Share) will devise novel synchronization and content distribution mechanisms between CloudSpaces that can benefit from proximity of the involved resources.

WP4 (CloudSpaces Share) has three tasks: Privacy-aware data sharing, Semantic Interoperability and Syntactic Interoperability. T4.1 (Privacy-aware data sharing) must address user-centric security, trust, identity and privacy issues for assuring the controlled access to shared information from different applications and devices. T4.2 (Semantic Interoperability) must specify metadata and semantic interoperability models for data contained in different Personal and Shared Clouds. Finally, T4.3 (Syntactic Interoperability) will define open APIs and standard formats to share information between Personal Clouds but also to export and import data from heterogeneous providers.

WP5 (CloudSpaces Services) has three tasks: Data Services, Persistence service, and eyeOS Personal Web Desktop. T5.1 (Data Services) will create a Data API offering the underlying data management services (Store, Sync, Share) in a clear service framework promoting adoption and third-party development. T5.2 (Persistence) will offer a standard persistence service for applications willing to store, retrieve and query data from the Personal Cloud. Finally, T5.3 (eyeOS Personal Web Desktop) will adapt and extend the eyeOS platform to work with the underlying services of the CloudSpaces toolkit. eyeOS will be the proof of concept application of WP5.

WP6 (Dissemination) has three tasks: Communication plan, Dissemination, and Exploitation & standardization. T6.1 (Communication plan) will prepare a roadmap for project dissemination in order to achieve media exposure and reach big user communities. T6.2 (Dissemination) will take care of all dissemination activities during the project as detailed in the communication plan. Finally, T6.3 (Exploitation & Standardization) will try to push final project results in the third year in big user communities and standardization groups.

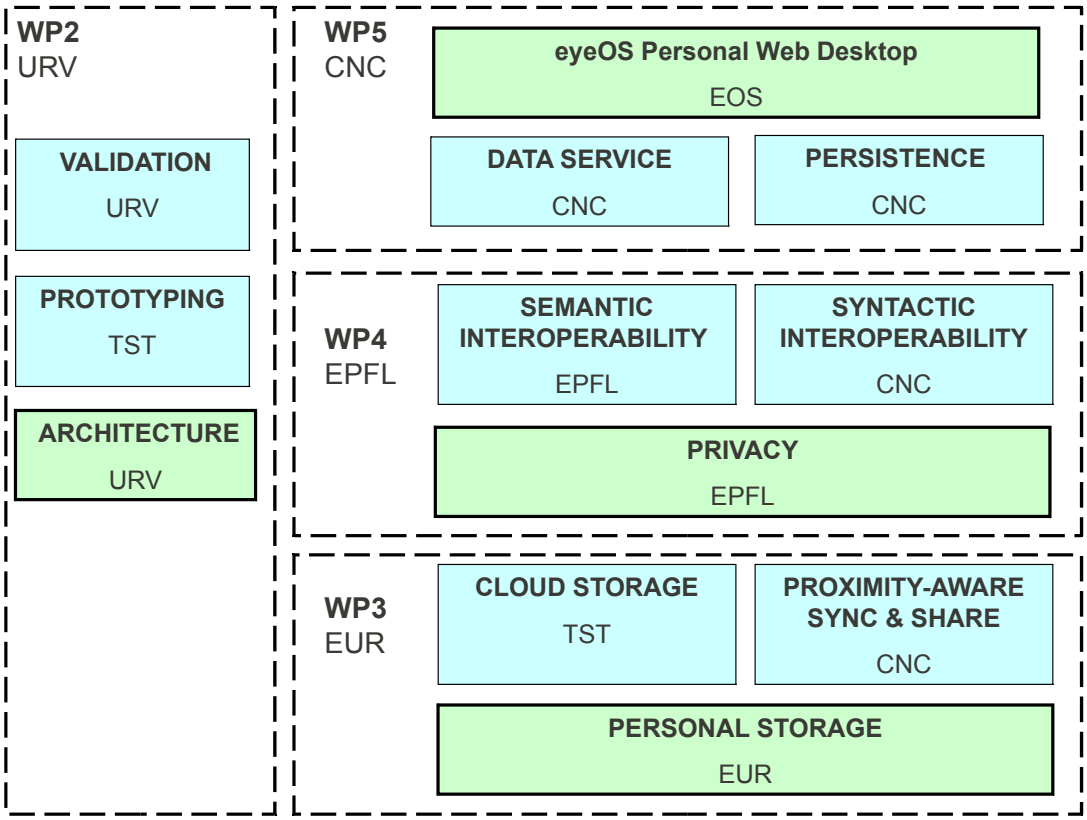
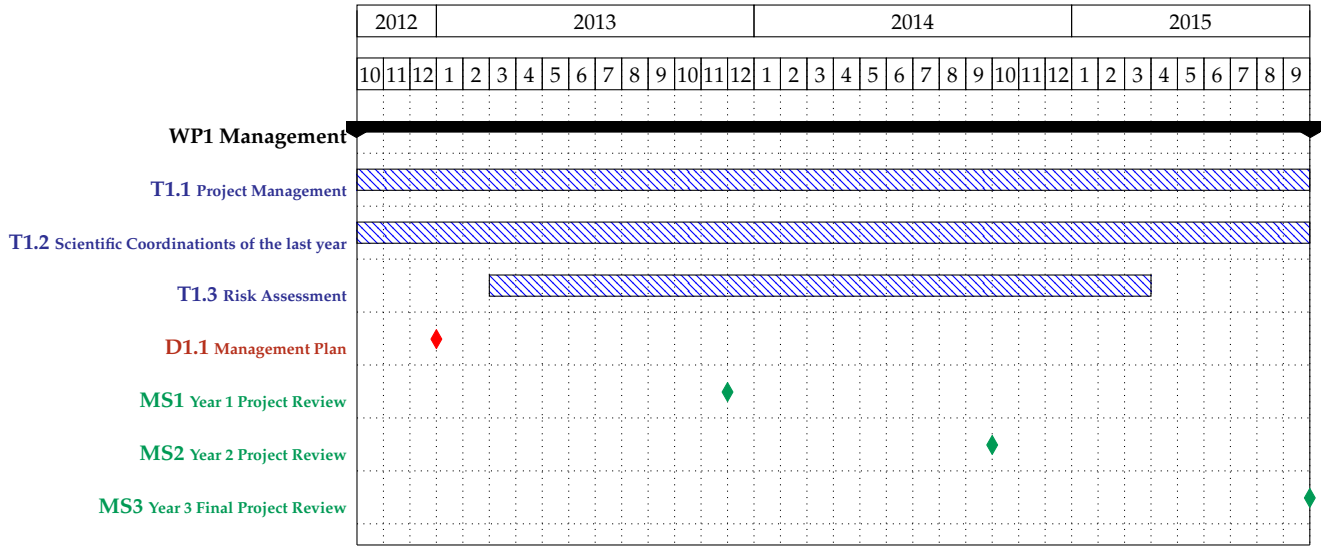


Figure 4: Work Package Structure

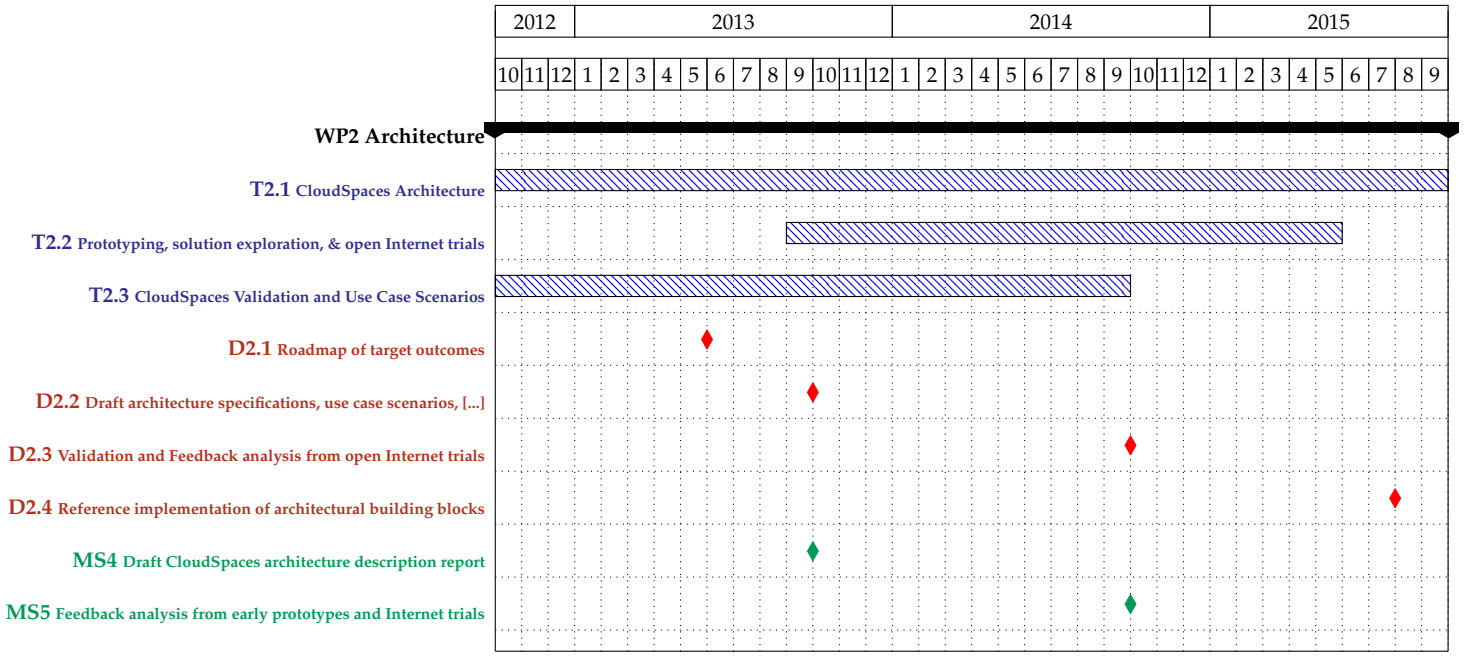
We can also see in Figure 4 the role of partners in every work package. Obviously, the role of each partner coincides with its expertise and knowledge. In this line, URV leads WP2 and cooperates with TST to design and implement prototypes. EUR leads WP3 and it mainly cooperates with TST in Cloud storage, and with CNC for the Proximity-Aware data services. EPFL leads WP4 and collaborates with CNC in the syntactic interoperability. EOS leads WP5 and collaborates with CNC and TST in the implementation of high level services for applications. And finally, CNC leads WP6 and collaborates with all partners to disseminate the results of the project.

5.2 Planning and timetable

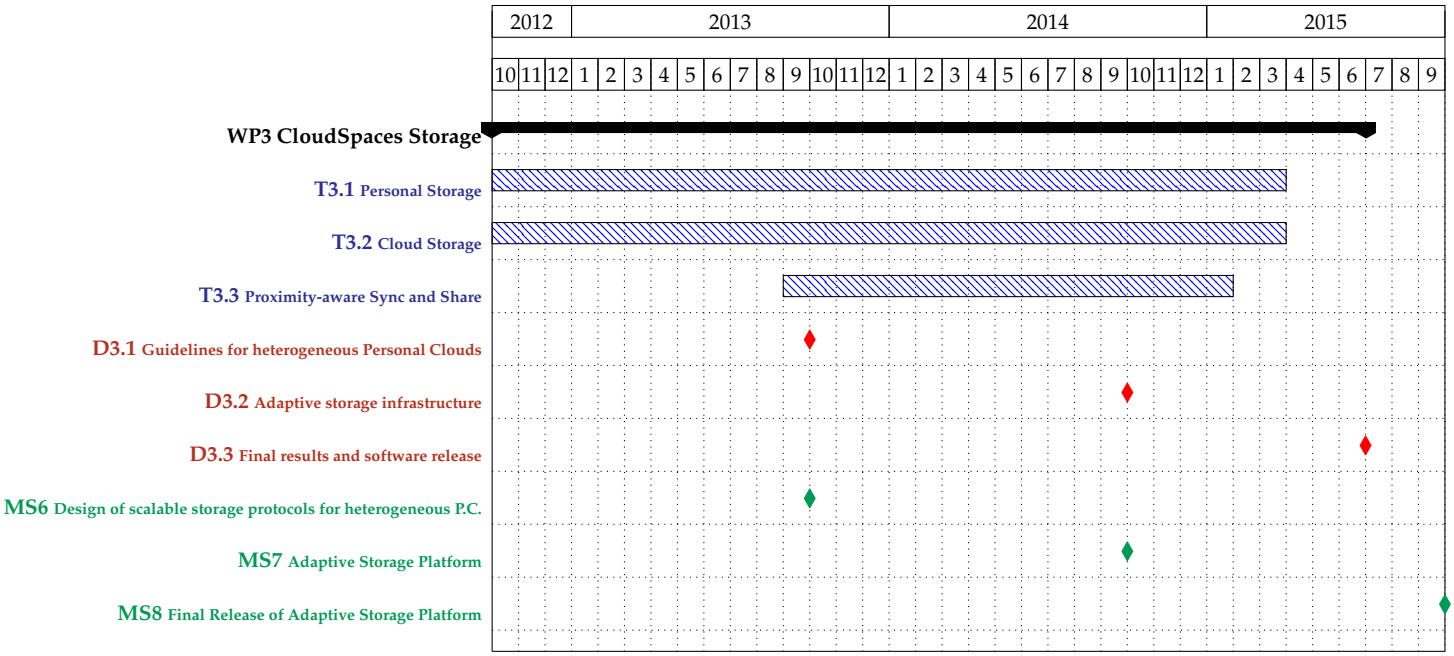
In this section, we shall present the corresponding planning for each work package. The planning is organized by months, starting in October 2012 and finishing in September 2015 as planned. For each work package, relevant events such as tasks, milestones and deliverables deadlines are marked on the chart.



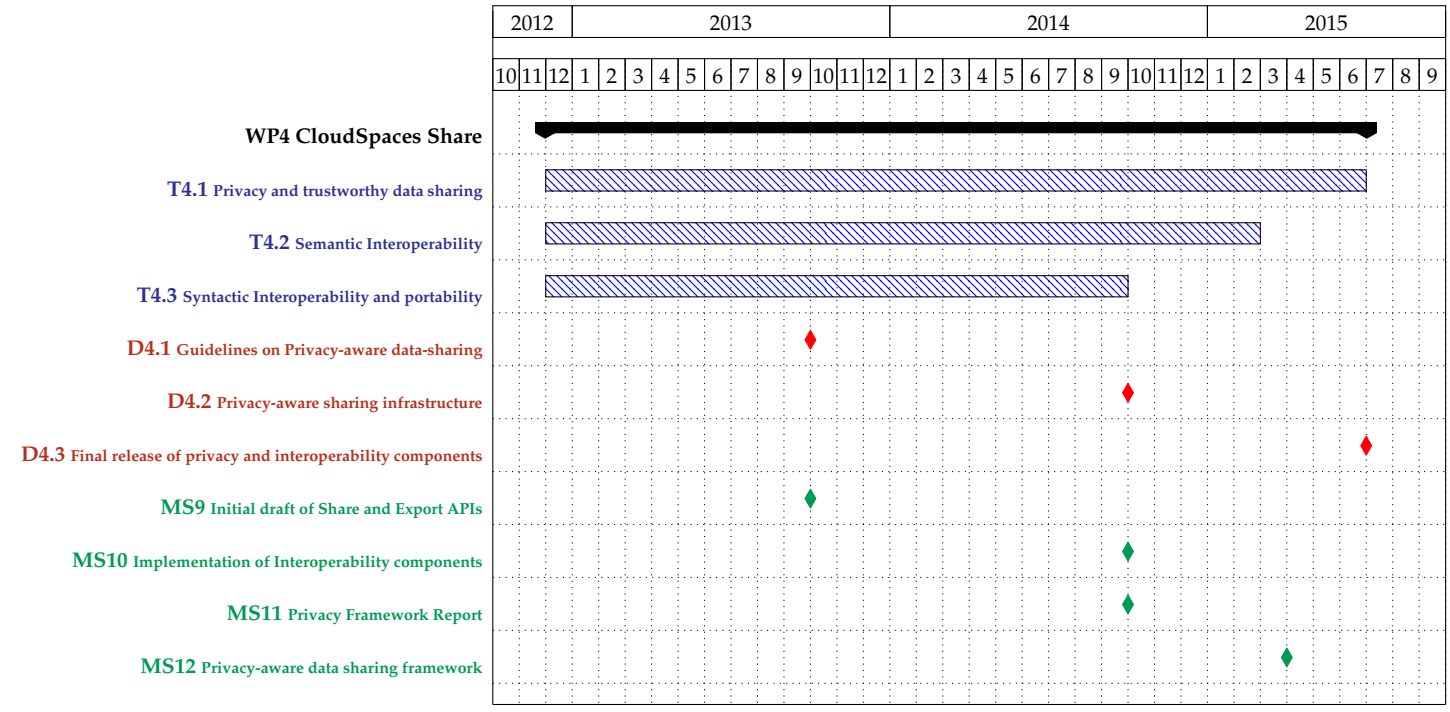
Work Package 1 planning



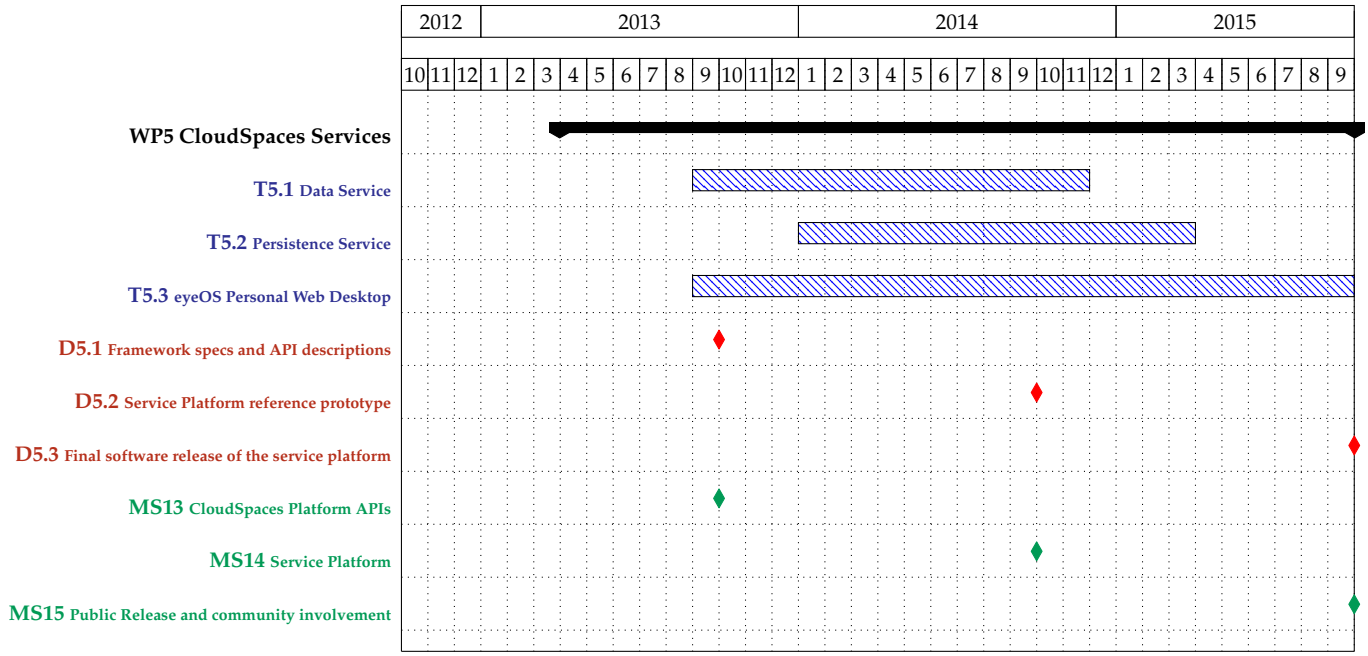
Work Package 2 planning



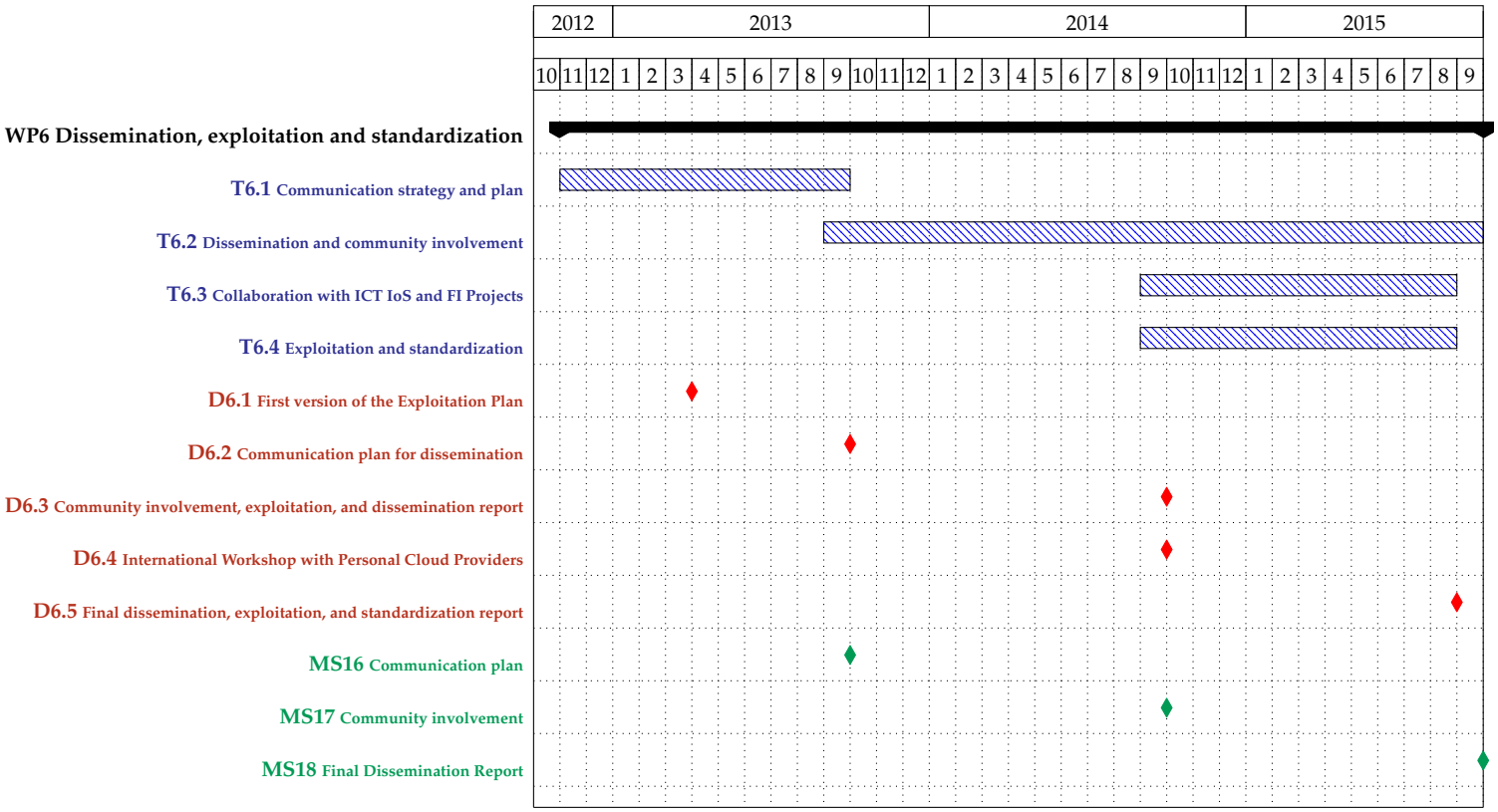
Work Package 3 planning



Work Package 4 planning



Work Package 5 planning



Work Package 6 planning

5.3 List of Work packages

WP No[1]	WP Title	Type of activity[2]	Lead beneficiary No[3]	Person-months[4]	Start month[5]	End month[6]
WP 1	Management	MGT	URV	12.00	1	36
WP 2	Architecture	RTD	URV	96.00	1	36
WP 3	CloudSpaces Storage	RTD	EUR	107.00	1	33
WP 4	CloudSpaces Share	RTD	EPFL	96.00	3	33
WP 5	CloudSpaces Services	RTD	EOS	96.00	6	36
WP 6	Dissemination, exploitation and standardization	RTD	CNC	39.00	2	36
	Total			**446.00**		

[1]Work package number: WP1, WP2, WP3, ..., WPn

[2]RTD/INNO = Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence; DEM = Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups; MGT = Management of the consortium - applicable for all funding schemes; OTHER = Other specific activities, applicable for all funding schemes; COORD = Coordination activities – applicable only for CAs; SUPP = Support activities – applicable only for SAs

[3]Number of the beneficiary leading the work in this work package.

[4]The total number of person-months allocated to each work package.

[5]Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

[6]Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

5.4 List of Deliverables

Deliverable No[7]	Deliverable Title	WP No[8]	Lead beneficiary name[9]	Estimated indicative person-months[10]	Nature[11]	Dissemination level[12]	Delivery date[13]
D1.1	Management Plan	1	URV	3.00	R	PU	3
D2.1	Roadmap of target outcomes	2	URV	6.00	R	PU	8
D2.2	Draft architecture specifications, use case scenarios and benchmarking framework	2	TST	12.00	R	PU	12
D2.3	Validation and Feedback analysis from open Internet trials	2	URV	24.00	R	PU	24
D2.4	Reference implementation of architectural building blocks	2	URV	35.00	P	PU	34
D3.1	Guidelines for heterogeneous Personal Clouds	3	EUR	20.00	R	PU	12
D3.2	Adaptive storage infrastructure	3	EUR	50.00	R	PU	24
D3.3	Final results and software release	3	EUR	37.00	P	PU	33
D4.1	Guidelines on Privacy-aware data-sharing	4	EPFL	16.00	R	PU	12
D4.2	Privacy-aware sharing infrastructure	4	EPFL	40.00	P	PU	24
D4.3	Final release of privacy and interoperability components	4	EPFL	40.00	P	PU	33
D5.1	Framework specs and API descriptions	5	CNC	12.00	R	PU	12
D5.2	Service Platform reference prototype	5	EOS	40.00	P	PU	24
D5.3	Final software release of the service platform	5	EOS	44.00	P	PU	36
D6.1	First version of the Exploitation Plan	6	CNC	7.00	R	PU	6
D6.2	Communication plan for dissemination	6	CNC	11.00	R	PU	12
D6.3	Community involvement, exploitation, and dissemination report	6	CNC	11.00	R	PU	24
D6.4	International Workshop with Personal Cloud Providers	6	CNC	1.00	O	PU	24
D6.5	Final dissemination, exploitation, and standardization report	6	CNC	8.00	R	PU	35
	Total			**417.00**			

[7]Deliverable numbers in order of delivery dates: D1 – Dn.
[8]Work package number: WP1, WP2, WP3, ..., WPn
[9]Short name of the beneficiary leading the work in this work package.
[10]The total number of person-month allocated to each deliverable.
[11]R = Report; P = Prototype; D = Demonstrator; O = Other
[12]PU = Public; PP = Restricted to other programme participants (including the Commission Services); RE = Restricted to a group specified by the consortium (including the Commission Services); CO = Confidential, only for members of the consortium (including the Commission Services)
[13]Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

5.5 List and Schedule of Milestones

Milestone No[14]	Milestone name	WP No[15]	Lead beneficiary name[16]	Delivery date[17]	Comments
MS1	Year 1 Project Review	WP1	URV	14	First year review accounting for the major achievements of this year.
MS2	Year 2 Project Review	WP1	URV	24	Second year review accounting for the major achievements of this year.
MS3	Year 3 Final Project Review	WP1	URV	36	Third year review accounting for the major achievements of the last year.
MS4	Draft CloudSpaces architecture description report	WP2	URV	12	First draft report of the CloudSpaces architecture including key building blocks and initial APIs.
MS5	Feedback analysis from early prototypes and Internet trials	WP2	TST	24	Description and evaluation of results obtained from open source prototypes in Internet trials.
MS6	Design of scalable storage protocols for heterogeneous Personal Clouds	WP3	EUR	12	Design of scalable storage protocols for heterogeneous Personal Clouds.
MS7	Adaptive Storage Platform	WP3	EUR	24	Prototype of adaptive storage platform.
MS8	Final Release of Adaptive Storage Platform	WP3	EUR	36	Final Release of the Adaptive Storage Platform.
MS9	Initial draft of Share	WP4	EPFL	12	Public API specifications and Export APIs for open Personal Clouds
MS10	Implementation of Interoperability components	WP4	EPFL	24	Prototype demonstrator for interoperability standards.
MS11	Privacy Framework Report	WP4	EPFL	24	Report describing the privacy framework for open Personal Clouds.
MS12	Privacy-aware data sharing framework	WP4	EPFL	30	Final release of the prototype and specifications of the privacy-aware sharing framework.
MS13	CloudSpaces Platform APIs	WP5	CNC	12	Public specifications of the Platform APIs.
MS14	Service Platform service	WP5	EOS	24	Public release of the platform including documentation and tutorials.
MS15	Public Release and community involvement	WP5	EOS	36	Release of tools and demonstrators in the three user communities.
MS16	Communication plan	WP6	CNC	12	Roadmap of dissemination activities.
MS17	Community involvement	WP6	CNC	24	Report about community involvement activities.
MS18	Final Dissemination Report	WP6	CNC	36	Final Report explaining dissemination and collaboration activities.

[14] Milestone number: MS1, MS2, ..., MSn
[15] Work package number: WP1, WP2, WP3, ..., WPn
[16] Short name of the beneficiary leading the work in this work package.
[17] Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

6 Cooperation procedures and tools

The management structure discussed in the previous section ensures communication from a work package level to a higher, more strategic, point of view so that these dependencies can successfully be met and take place in an efficient communication manner.

The Project Coordinator ensures that the consortium and key role players have the necessary tools and procedures to effectively communicate avoiding potential risks of lack of communication and/or over management.

Normal communication will be achieved using URV's Project repository, e-mail, fax, phone, instant messaging tools, IP telephone and face-to-face meetings.

6.1 Communication tools

In order to ensure fluent communication between the partners without incurring in a high traveling expense due to excessive number of meetings, the consortium agreed to schedule meetings, which would allow the participants communicating face-to-face only when necessary; providing an alternative and maintaining the communication during the whole project lifetime.

The following table provides a list of the communication and cooperation tools that the CloudSpaces project will use during its lifetime.

Tools	Usage
Project CMS	The project uses the content management system as a centralized knowledge repository in order to avoid the need of redundant communication. It also allows partners to cooperate in administrative and technical work by using forums. The CMS is hosted at URV servers.
Email	The consortium use email for the regular request or provision of information, which is not time critical. For this propose, the coordination has created a distribution list ensuring that if needed all project participants are reached. Additional distribution list will be created as needed. Direct emails are also used for bilateral communications. The email address of the project email distribution is: **cloudspaces@urv.cat**
Mail	The consortium will use ordinary mail, or package by courier, to exchange important documents, usually signed. These documents would mainly be of legal or financial issues.
Telephone	Direct telephone calls are used in case of time critical matters.
Instant messaging	The consortium will use an already available instant messaging solution, such as Skype, that will help short technical discussions and close collaboration; especially during the integration of components.
VoIP services	As an alternative to face-to-face meetings, the consortium will make use of IP telephone calls and video conferences.

Meetings	Face-to-Face meetings will be held to tackle discussions on important issues that require the participation and opinion of all partners. This is also an opportunity for partners to meet and solve small issues, doubts and requests that do not concern the whole project. Different kinds of meetings exist: • Kick-off meeting: The Kick-off meeting will be held in the beginning of the project activities. • Regular Meetings: Every 6 months the Steering Board will meet. These meetings will be held during the same set of days, to minimise travel expenses, but in clearly separated sessions, to avoid that purely technical issues will be mixed up with managerial ones. The meeting locations will rotate through partners' locations. • Extraordinary Meetings: Working groups meetings will be organized when necessary or upon request made by any of the parties involved. Extraordinary Steering Board meetings will be held upon request of one Board member and approval of the majority of Board members or upon the Project Manager's. • Reviews: reviews will be held upon EC request. • Review rehearsal: Immediately before each review, a General Meeting will be held for preparation of topics to be presented in the review request.
Software control	The consortium agreed in using a Subversion solution to manage the platform software. Subversion (SVN) is a version control system. It is used to maintain current and historical versions of files such as source code, web pages, and documentation. The SVN server is hosted at the URV.
Other	During the project, the consortium will evaluate if additional tools are required.

Project repository

The CloudSpaces project knowledge repository has been deployed using the open source solution Joomla (http://www.joomla.org/). Furthermore, the consortium agreed in using Google Drive to collaboratively work on deliverable and technical documents. The consortium has established a formal basic structure that allows all participants of the project to collaborate and share information.

Admin	In this workspace the consortium has both the contractual documentation and the financial information, which includes the 6 monthly budget and transfer information. Only those appointed by each partner have access to this folder. There is a folder with the budget information of each partner to which only the coordinator and those appointed by each partner have access.

Deliverables	In this workspace the consortium stores all deliverables in the different stages of the Deliverable lifecycle. There is a subspace for the three basic stages; Draft, Pending Approval and Submitted. Since the first subspace is a high demanding working space, the consortium has decided to divide it into separate subspaces, one for each WP.
Dissemination	This workspace provides quick access to the dissemination material and to the dissemination events.
Meetings	This workspace allows partners to share information regarding project meetings and related documentation such as agenda, presentation, minutes, etc. The workspace is organized by having one subspace for each meeting using the date as part of the subspace name.
Other	In this workspace, the consortium shares tools and resources besides the formal and structure documentation defined in the other workspaces.
Papers	Includes a structure related to the work flow of papers, having a subspace for Drafts, Pending, Approved and Submitted or Published.
Quality Assurance	In this workspace, the Quality Manager shares and recollects from partners information related to quality.
Technical	This workspace is for technical discussions, Software documentation, information regarding UI and other technical issues.
Work Packages	This workspace has been created to allow the WP teams to have a room to share information. This workspace is divided in one subspaces per WP.

6.2 Meetings

Each party will appoint a partner representative which will become a member of the Steering Board. Each representative can designate a deputy. Each Steering Board member shall be deemed to be duly authorized to deliberate, negotiate and decide on all matters listed in the Consortium Agreement.

- The coordinator shall chair all meetings of the Steering Board.
- The parties agree to abide by all decisions of the Steering Board.

Preparation and organization of meetings: The coordinator, as the chairperson, shall convene meetings of the Steering Board:

Ordinary meeting	**Extraordinary meeting**
At least twice a year	At any time upon written request of 1/3 of the body members.

Notice of a meeting: The chairperson of the Steering Board shall give notice in writing of a meeting to each member of the Steering Board as soon as possible and within the minimum number of days preceding the meeting.

Ordinary meeting	Extraordinary meeting
45 calendar days	15 calendar days

Sending the agenda: The chairperson of the Steering Board shall prepare and send each member of that Steering Board a written (original) agenda within 7 calendar days preceding the meeting.

Adding agenda items: Any agenda item requiring a decision by the members of the consortium must be identified as such on the agenda. Any member of the consortium may add an item to the original agenda by written notification to all of the other members within the 2 calendar days preceding the meeting.

During a meeting the members of the Steering Board present or represented can unanimously agree to add a new item to the original agenda.

Any decision may also be taken without a meeting by circulating to all members of the Steering Board a written document, which is then signed by the defined majority (see Consortium Agreement) of all members of the consortium. Meetings of each Steering Board can also be held by teleconference or other telecommunication means. Decisions may only be executed once the relevant part of the Minutes is accepted.

6.3 Deliverables

Format, style and structure

All project's deliverables are created using the project available deliverable template, all meta-information requested in the template should be filled and all basic sections should be used. The document has three main sections of meta-information: "Summary of the document", "Document Control Page" and "Change history".

Each deliverable should contain the following sections:

1. Executive summary
   (a) Scope
   (b) Audience
   (c) Summary
   (d) Structure
2. Introduction
3. Different sections of the deliverable
4. Conclusions
5. Bibliography and references
6. Annexes

Procedure

The deliverables are officially approved by the Technical and Quality Managers. The Technical Manager is responsible for the quality of technical reports, and should review the deliverable documents in the draft state in order to generate the necessary correcting actions. The Quality Manager is responsible for the formal presentation of the deliverables, including format, sections and non-technical information.

The following table shows the different roles involved in the process of quality assurance of a deliverable.

Role	Responsibilities
Deliverable leader	• Responsible of the document. • Requests and collects contributions. • Integrates contributions. • Principal editor. • Manages the quality feedback.
WP Leader	• Assigns the leadership of the report. • Aligns with the work carried out in the WP. • Technical supervisor.
Technical Manager	• Reviews the report content. • Reports to the Quality Manager and to the Project Coordinator. • Responsible of the technical quality. • Aligns with the project's objectives.
Quality Manager	• Responsible for coordinating the quality review of each report. • Asserts that the structure of the report follows the format agreed by the consortium.
Steering Board	• Solves any conflict between the parties involved in the report workflow.

The Project Coordinator will request to the Quality Manager to review activity reports, project publications and other deliverables before being submitted to the EC or being considered for publication. The Quality Manager compiles and produces the final version of the reports. In order to produce this final version, the Quality Manager may request a partner who has not been involved in the production of the deliverable to review the document and report directly to the Quality Manager.

Storage

Approved documents are stored on the CloudSpaces CMS (http://www.cloudspaces.com) accordingly to their respective dissemination level:

Draft and other unstable versions may be temporarily stored on the CloudSpaces CMS but must be removed as soon as the approved version is available.

All deliverables are stored using the following name structure:

CLOUDSPACES_DocumentName_yymmdd_DissLevel_status.FileExtension

where:

- **DocumentName** is the code name of the document (e.g. Dx.y for a contractual deliverable, Mx.y for a milestone, MB-minutes for minutes of a Management Board, WPx-minutes for minutes of a WP, etc.).
- **yymmdd** is the date of last edition of the document (e.g. 121130).
- **DissLevel** provides the dissemination level of the document (i.e. PU for public, RE for restricted). This field is omitted for documents that are for internal use in the consortium (minutes of Management Board meeting, Milestone, etc.).
- **status** provides the status of the document (e.g. draft, for-review, etc.). This is for internal use in the consortium. Approved documents do not have the status indicator.
- **FileExtension** is the extension of the document.

6.4 Software

Software documentation

In order to facilitate the collaboration and integration of the platform it is requested that all software modules are formally documented in the Project´ s repository.

There should be one document with the following structure for each component of the project's platform:

- Brief description of the component
- Specifications (API)
- Interfaces with other components
- Installation guidelines

The following table should be filled before the first section of the documentation in order to allow readers to establish a relation between the software stored at the SVN repository and the documentation.

Component Name	
Module Name	
Application Name	
Version	
Contact information of the person responsible of the software	
SVN Path	

Storage

In order to facilitate the collaboration and integration of the components, the consortium has deployed a SVN repository, where both the source code of each component and the binaries should be stored, except if there are legal issues that prevent to share the source code and/or the software between the partners. In this case, the coordinator will check the workspace access rights to warranty that only those allowed to access to the software have the corresponding access rights.

The software components are stored in the project's Software Repository in three folders.

Source code

The source code should be uploaded in subfolders indicating the software component, the module and the version.

The path to a specific source code should look like this:

SVN/software/componentName/moduleName/1.0.0/

The version directory has to include all required files to build the project.

If a partner wants to continue working on the code but does not want other partners to use that version he should write a **–draft** after the version number:

For example, the last valid version for the partners is 2.4.5 and he is working on the 2.5.0 version. The 2.5.0 should be called 2.5.0-draft, and should be renamed once it is valid.

Release

Software releases should be uploaded in the "release" folder. Each module is upload it following the next pattern:

SVN/releases/componentName/moduleName_release_1.0.0.extension

Each component and/or application release is integrated into just one compressed file. Each of this released should be documented as described in section 6.4.

Prototype

Another copy from the software release should be uploaded to the "prototype" folder. The integration team should create the prototype version number directory. Once it is created, each partner, should upload there the required release following the next pattern:

SVN/prototype/1.0.0/componentName/moduleName_release_1.0.0.extension

Please, make sure that you just upload the release that you want to be used in the prototype. It should not be a historical repository.

Note: Before any software is uploaded to the SVN, the responsible of the development of the software should ensure that the software does not generate errors when it is compiled and can be used by another software developer to work with the code and/or the release.

7 Risk Management

The specific procedures and provisions for CloudSpaces are straightforward to implement, simple to maintain and effective in meeting the required objectives. The purpose of these processes is to identify, track and manage risks in such a way that Project objectives are met despite problems that will inevitably occur. The control of risk will have a beneficial effect on cost, schedule and achievements.

A preliminary risk assessment has already been performed.

7.1 Overview

It is unrealistic to suppose that the development of a complex demonstrator as CloudSpaces, involving the integration of software, hardware and high-tech applications can be risk free even when expert practitioners are involved. There exists the possibility that:

- The demonstrator will not be available on time.
- The demonstrator will not meet the user requirements.

The practice of Risk Management aims to mitigate these issues and places the Project Manager in a more proactive role where he needs:

- To have an awareness of all pertinent factors.
- To anticipate the possible effects.
- To share that knowledge.
- To act in such a way as to minimise the chances of failure.

7.2 Objectives

The purpose of Risk Management is to alleviate, as far as is practical, any critical factors within the project, so as to minimise any adverse effect on the achievement. This is a complex process and it is important to define the terminology that will be used to describe how this can be achieved.

- Risk Management is the process of reviewing the status of a project and then instigating positive action to reduce risks, which have been identified as a threat. It comprises the following two main elements:
- Risk assessment is the process that enables qualified statements to be made about the risks pertaining to a project (such statements are based on facts which are accepted by all parties).
- Risk containment is the process, which comprises bringing the status to the attention of interested parties and initiating appropriate actions.

Each of these elements should be thought of as having discrete sub-processes. Risk Assessment consists of:

- Situation appraisal being the process of ascertaining and recording the facts that describe the status of a project.
- Risk analysis being the process of examining the status factors and determining their cumulative effect on the risks to the project.

When completed, they will supply intermediate deliverables to the Risk Containment element, which in itself has:

- Awareness recognition as a process whereby those who need to know, are made aware of the information and take cognisance of the situation.
- Risk avoidance as the process wherein decisions are made and actions are taken to reduce the recognised risks.

The results of these latter processes are fed back through continuous monitoring to a reappraisal of the situation.

7.3 Risk Analysis

In this section we present 12 potential risks along with their respective contingency plans in the form of planned actions. Risks are structured in three blocks: organizational, legal, and technical.

Table 7.3a: Risk analysis (Organizational risks)

Organizational Risks	Prob. (1-5)	Impact. (1-5)	Action to Prevent/Manage Risk
Lack of organizational coherence	2	3	A1
Lack of consensus with community on direction	2	4	A2
Difficulty in coordinating the consortium	1	4	A3
Loss of focus or departure from original aims	2	3	A4
Failure to get a critical mass of users	2	4	A5
Failure to get good use cases	2	4	A6

Action List:

A1: Could be caused by one or more specific underlying reasons ranging from communication difficulties to particular staffing difficulties. Subsequently this can be minimized by ensuring the use of consensual values within the project like (i) A strong management structure Effective use of communications technology (iii) Frequent planning and review

A2: The success of the CloudSpaces will depend heavily upon the level of community participation and acceptance. This will reflect the fact that the deliverables reflect the needs of the preservation community. For this reason the process to organize and put in place the CloudSpaces community will be started immediately and many efforts will be dedicated to the dissemination of results and to the aggregation of associate partners.

A3: CloudSpaces will use modern tools for communicating at a distance. All work material will be available in CloudSpaces portal. This system provides easy access to project files, contact information and meeting scheduling.

A4: Strong management structure, with regular planning reviews. Ensure that appropriate evaluation and QA procedures are in place.

A5: The existence of wide user communities around Ubuntu, eyeOS and OpenStack should prevent this problem. Study carefully good community involvement and communication tools to engage these communities. Monitor progress as part of regular management meetings.

A6: Identify good examples focused on demonstration of cloud based storage. eyeOS web tools are our critical proof of concept of the service platform. So that complete demonstration of platform capabilities should be shown. Demonstrations must be engaging for user communities and early adopters. Use social tools and community involvement to obtain feedback from the proposed scenarios and use cases.

Table 7.3b: Risk analysis (Legal Risks)

Legal Risks	Prob. (1-5)	Impact. (1-5)	Action to Prevent/Manage Risk
Failure to establish agreement over IPR issues	1	4	A7
Serious disputes between consortium members	2	4	A8

Action List:

A7: Ensure IPR is addressed within CA agreement discussions.

A8: Aim to minimize the chances of disputes occurring by ensuring regular and clear communication between consortium members. Lead member and directors of work package should aim to build and nurture a culture of openness and trust, wherever possible. Where pre-dispute areas are suspected, offline discussions should be initiated. Where disputes become unavoidable, ensure a clearly agreed dispute management process is built into the Consortium agreement, and that this is followed. For more details, please refer "Conflict Resolution Procedures stated in point 2.1.4

Table 7.3c: Risk analysis (Technical Risks)

Technical Risks	Prob. (1-5)	Impact. (1-5)	Action to Prevent/Manage Risk
Failure to deliver adequate online infrastructure	2	4	A9
Business models not in line with market	1	4	A10
Standards ignored by major players	3	3	A11
Major vertical solutions dominate the market	3	3	A12

Action List:

A9: Ensure adequate resource allocation. Ensure clear ownership. Build services from existing technical resources to get the service kick started. Populate with content from existing resources.

A10: Since the whole personal cloud storage sector is now evolving, the development of business models should take into account the advances and trends in the market and the society (e.g. on smart metering) by means of refinements of the models accordingly. The planned participation of the project industrial partners in this process will ensure that the project is up-to-date on these issues.

A11: The major risk of this project is the adoption of the open standards proposed by CloudSpaces. The market is very fragmented now, with several innovative start-ups (Dropbox, SugarSync) and major players entering the field (Apple iCloud, Microsoft, Google, Amazon). Since all players are

fighting for the market share, they could simply ignore this initiative and wait for a *de facto* standard (winner vendor).

The global role of Ubuntu with its Ubuntu One product can change this. Canonical is a major open source provider in the world, so the promotion of an open standard in this setting cannot be completely ignored. Our dissemination plan already planned joint activities and workshops with other providers (Dropbox, SugarSync) to promote the adoption of open standards. So the main contingency plan is to be inclusive with other products and leverage the global role of Canonical in this field.

Another driving force for the massive adoption of CloudSpaces is its bet on open source projects. The contribution to OpenStack Swift will deliver the first open source Personal Cloud solution to the market. Cloud providers and software providers can leverage this infrastructure to provide value-added services. Furthermore, the interoperability with Ubuntu One and the enhanced privacy model will give CloudSpaces a step forward for reaching the masses. In this line, TISSAT includes in its exploitation plan the massive commercialization of the CloudSpaces Personal Cloud platform on top of their data centers. To conclude, another contingency plan is to push our developments to a massive audiences following OpenStack. This will ensure worldwide attention and adoption in many cases.

A12: The major players in the industry are positioning themselves to offer integrated solutions to users and companies. In this line, Google, Apple or Microsoft offer complete Cloud solutions where storage is just another service used from their application stacks. A major risk is that 'pure play' Personal Cloud storage providers become irrelevant if the main public massively embrace these platforms. This scenario dominated by the major players could leave small niche markets to European Cloud providers, SMEs and software solution providers in Europe.

To avoid that, CloudSpaces advocates for open source Personal Cloud Solutions combined with interoperable standards. The OpenStack, Ubuntu One, and eyeOs communities will be key to reaching a massive audience. We will also disseminate results among European Cloud infrastructure providers to push the adoption of our open model.

First of all, open source will enable European Cloud providers to offer Personal Storage solutions to their customers opening local markets with SMEs and the public sector. They can adapt these solutions to their needs to provide for example increased privacy for government agencies.

Finally, interoperability has a two-fold contribution: (i) interoperability among Personal Clouds can help reach critical mass if many solutions can share and export data. This will avoid vendor lock-in and thus attracting more users and companies to the platform. (ii) interoperability with third-party applications can boost the creation of value-added services on top of the platform. Such value-added services (like eyeOS) are critical to compete with the vertical solutions offered by major players. An ecosystem of services and applications working on top of Personal Clouds can be an attractive alternative to major integrated solutions.

8 External collaboration

8.1 Collaboration with research projects

The coordinator is seeking cooperation agreements with the other on-going research projects related to the CloudSpaces strategic objective and technology areas:

- Cloud Storage.
- Personal Clouds.
- Privacy-aware data sharing.
- Cloud interoperability.

Initially identified candidates are:

- OPENi, Eric Robson.
- Bigfoot, Pietro Michiardi.
- Vision Cloud, Eliot Salant.
- TClouds, Klaus-Michael Koch.

CloudSpaces is considering cooperation on grounds of reciprocal benefit. Nevertheless, CloudSpaces will not undertake collaboration during the first year. We will wait to the first prototypes and results to contact other project coordinators.

8.2 Collaboration with communities

The coordinator is seeking participation with the active communities related to the CloudSpaces strategic objective and technology areas:

- Cloud Storage.
- Personal Clouds.
- Privacy-aware data sharing.
- Cloud interoperability.

In particular, Canonical will proactively seek interactions with other Personal Cloud Providers in an international workshop about this topic in the second year of the project.

9 User group

9.1 Role

The role of the CloudSpaces User Group is to improve the relevance of the CloudSpaces research achievements to the greater possible range of user communities and functional applications.

The CloudSpaces User Group will achieve this objective by means of:

- Review of the CloudSpaces collaboration scenarios.
- Participation to the CloudSpaces proof of concept and demonstration activities.

9.2 Composition

The CloudSpaces User Group is primarily composed of the CloudSpaces consortium members themselves throughout the duration of the project as they will be the first community to experiment. In fact, the major target user communities are Ubuntu One users, eyeOS users, TISSAT clients, and URV students.

It will be further reinforced with:

- Experts belonging to the entities in the CloudSpaces consortium but not directly involved in the CloudSpaces research work.
- Experts belonging to other project consortiums where a cooperation agreement exists.
- Experts belonging to the communities where CloudSpaces is involved under an External Collaboration scheme.

9.3 Specific activity

A Personal Cloud workshop will be collocated with a major conference with the objective of attracting the major players in the industry (Dropbox, SugarSync) and academy (European projects such as Vision Cloud). Canonical will play an important role in the collaboration with other Personal Cloud providers in this workshop. Ubuntu developer conferences will also be used to disseminate project results in the open source community.

10 Conclusions

This deliverable has dealt with two very important aspects of the project management work associated with the CloudSpaces project, namely quality management and risk management.

In particular, it has elaborated the project's quality management and risk management methodologies. Quality management procedures have been provided in relation to the main deliverables of the project including both software and paper-based deliverables. These procedures must be faithfully followed in order to ensure the quality of project's results, while also boosting the project's continuous improvement strategy. As part of this strategy, this deliverable will be released in an iterative fashion, where future iterations will report on additional or revised quality management and risk management issues and plans.

In the area of risk management the project has introduced its risk management methodology, along with the main risks foreseen at the time of writing this deliverable. The risks can be classified as general management risks (applicable to most international collaborative projects like CloudSpaces), but also as more specific technical risks that relate to the technical work carried out in CloudSpaces.

For both types of risks, the deliverable illustrates mitigation strategies (aiming at minimizing the potential impact of these risks), as well as contingency plans (to be activated in order to recover the impacts of the specified risk). In the case of CloudSpaces specific risks, this deliverable has provided detailed mitigation/contingency plans associated with limitations stemming from: (a) ethical implications and the legal environment of the CloudSpaces project and more specifically of the CloudSpaces validating scenarios and (b) complexities surrounding the CloudSpaces technical developments, including issues associated with the robustness of signal processing systems and complexities associated with the CloudSpaces architecture and integration efforts.

For all these risks, CloudSpaces has provided insights on how they could be confronted, based on knowledge available at the time when this deliverable is released. We expect these insights to be extended/updated in future versions of this deliverable, as those risks will arise and will be confronted during the project. In such future releases, the project could also provide a level of risk clearance for all main risks.

As the project reaches/surpasses important milestones of its work plan, we expect that several of the anticipated risks will be cleared.

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