

D3.2 EU Interoperable cloud services & solutions report



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This document gives an overview of the results emerging from the first Concertation meeting for the unit Software Services and Cloud computing. The document highlights the main outcomes of the event including an initial analysis of potential clustering themes and future collaborations. The document also examines the use of standards by Call 8 and Call 10 projects.

CloudWATCH Mission

The CloudWATCH mission is to accelerate the adoption of cloud computing across European private and public organisations. CloudWATCH offers independent, practical tips on why, when and how to move to the cloud, showcasing success stories that demonstrate real world benefits of cloud computing. CloudWATCH fosters interoperable services and solutions to broaden choice for consumers. CloudWATCH provides tips on legal and contractual issues. CloudWATCH offers insights on real issues like security, trust and data protection. CloudWATCH is driving focused work on common standards profiles with practical guidance on relevant standards and certification Schemes for trusted cloud services across the European Union.

The CloudWATCH partnership brings together experts on cloud computing; certification schemes; security; interoperability; standards implementation and roadmapping as well as legal professionals. The partners have a collective network spanning 24 European member states and 4 associate countries. This network includes: 80 corporate members representing 10,000 companies that employ 2 million citizens and generate 1 trillion in revenue; 100s of partnerships with SMEs and 60 global chapters pushing for standardisation, and a scientific user base of over 22,000.

Disclaimer

CloudWATCH (A European Cloud Observatory supporting cloud policies, standard profiles and services) is funded by the European Commission's Unit on Software and Services, Cloud Computing within DG Connect under the 7th Framework Programme.

The information, views and tips set out in this publication are those of the CloudWATCH Consortium and its pool of international experts and cannot be considered to reflect the views of the European Commission.

Executive Summary

Cloud computing is an important driver of change to boost productivity and efficiency in the economy. Not only has public administration seen up to 90% cost savings, cloud also has the potential to create 3.8 million cloud-related jobs¹.

In recent years, competitive calls have brought wide coverage of cloud computing related topics to the European research and innovation landscape. Funded initiatives focus on technologies specific to the networked, the distributed dimension of software applications and access to services and data. This includes long-term research and emphasis on enabling software developers in Europe to easily create interoperable services based on open standards. Another important goal is ensuring open source creates value in new strategic ways. Recent initiatives have also focussed on heterogeneous clouds and the Internet of Things (IoT), networking, reliability, agile software prototyping, big data and better quality of service of user experience.

This Concertation meeting took stock of the latest activities of all active projects that have received funding through Unit E2 (including projects funded under Calls 5, 8 & 10, CIP as well as EU-Japan representation), including selected success stories, present and discuss new ideas. The event focussed on the importance of clustering & convergence which will feed into future Concertation meetings. This will support and expand the clusters from the other units within the Work Programme to ensure European leadership and provide a European market landscape of products, services and applications. Thereby achieving the "Platformed Thinking" approach that Europe needs to adopt, covering the complete value-chain of the ecosystem to encompass: networks and computing infrastructure, the platforms and services and the new developments for user community building.

The dynamic and interactive event featured break-out sessions, lightning talks and flash presentations serving as a springboard for discussions on cross-cutting themes and challenges not yet addressed. The sharing of best practices on standards, interoperability and portability were complemented by external insights as part of the drive towards an interoperable and trusted ecosystem of services in Europe. The event saw excellent contributions from projects with 92 participants from 47 projects. Furthermore, eight projects showed demos at the event. The event also saw the co-location of the CloudWATCH Standards Profile workshop and Use Case workshop, which are outside the scope of the present report and will be reported as part of the WP2 & WP4 activities.

¹ Ken Ducatel, DG Connect speaking at Unit E2 Concertation meeting 12 March 2014

The Concertation Meeting in numbers



Figure 1 Concertation meeting in numbers

39 Position papers from participating projects	http://www.cloudwatchhub.eu/Position%20paper_Concertation-Meeting_March-2014.pdf
All presentations from the event	http://www.cloudwatchhub.eu/concertation_meeting_agenda
Overview of all participating projects	http://www.cloudwatchhub.eu/Projects
Overview of demos shown at event	http://www.cloudwatchhub.eu/demos

Table 1 Documents and related website contents

Table of Contents

1	Motivations for Cloud	7
1.1	Leveraging existing technologies and knowledge.....	8
1.1.1	Unifying Open Source services and managing complex cloud environments	8
1.1.2	Scalability	9
1.1.3	Privacy & Security	10
1.2	Encouraging clustering - Breakout sessions & collaborations	11
1.2.1	Break out group: Cloud Computing	13
1.2.2	Break out group “Internet of Services & heterogeneous clouds”	14
1.2.3	Break out group “Advanced Software Engineering, Open Source of Software Prototyping”	15
1.2.4	CIP Funded projects	17
1.2.5	Future collaboration	18
1.3	Learning from Call 5 success stories	20
2	Contributing to the Standards Landscape.....	22
2.1.1	CloudML: Contributing to the standards landscape	24
3	Conclusion and next steps.....	26
4	Annex 1 Project offerings, needs and future activities	28
5	Annex 2 - Participant list	31
6	Annex 3 - Concertation @ www.cloudwatchHUB.eu	33
7	Annex 4 – Document Log	Errore. Il segnalibro non è definito.

Table of Tables

Table 1 Documents and related website contents	4
Table 3 Coordination requirements for unifying Open Source services	9
Table 4 Cloud Computing break out group outcomes	14
Table 5 Internet of Services & heterogeneous clouds break out group outcomes	15
Table 6 Advanced Software Engineering, Open Source of Software Prototyping break out group outcomes	16
Table 7 Potential synergies between projects	19
Table 8 Projects' shared needs, general needs for the European marketplace and specific needs	20
Table 9 Call 5 success stories	22
Table 10 Most used standards by Call 8 & 10 projects	23
Table 11 Call 8 Projects: Standards used and contributions to the standards landscape	24
Table 12 Call 10 Projects: Standards used and contributions to the standards landscape	24
Table 8 Project offerings, needs and future activities	30

Table of Figures

Figure 1 Concertation meeting in numbers	4
Figure 2 Unifying Open Source services and managing complex cloud environments	9
Figure 3 Scalability clustering between Call 8 & 10 projects	10
Figure 4 Privacy & Security clustering between Call 8 & 10 projects	11

1 Motivations for Cloud

Cloud computing is already transforming providers of IT services and it will change the way other industrial sectors provision their IT needs, as well as the way citizens interact with their computers and mobile devices. Cloud computing, although in its early days, is already a commercial reality and the adoption rate of Cloud computing Services is growing. Businesses are already reporting savings of 10-20%. Cloud computing is a very important driver of change in the economy as it leads change and innovation.

The transformative effect of cloud in the public sector is also being seen with a claimed reduction of up to 90% in the costs to public administration and private companies. In the private sector, benefits and growth in adoption are also being seen with 10% of corporate IT spending dedicated to cloud computing, a significant increase on 24 months ago. Similarly, cloud is triggering a growth in businesses with the set up of 400,000 new SMEs in Europe and the potential for 3.8 million cloud-related jobs. The growth that is being seen in cloud adoption is most evident in private clouds with hosted private clouds and is expected to continue to grow in the future².

However, the following list prioritise the existing concerns regarding cloud computing:

- **Legal:** Where does legal jurisdiction of the service reside?
- **Security:** Who protects my data and/or backs it up? What if there are security breaches? Who takes responsibility when something goes wrong?
- **Trust:** How can I tell a service is trustworthy? Who guarantees data integrity and data availability?
- **Data access and portability:** tends to be higher in the minds of people already using the cloud: Can I interoperate with other systems? Move from one service to another?

Indeed, there is a need for greater trust, judicious use of regulatory changes, and openness. The European Cloud Computing Strategy calls for the unleashing the potential of cloud computing in Europe calling for action in:

Cutting through the jungle of technical standards - Standardisation is a strong enabler for cloud computing, bringing confidence to both customers and investors. The ETSI Cloud Standards Coordination Final Report³ concluded that although complex, the cloud standards landscape is by no means a jungle and a lot less fragmented than previously described.

Developing model 'safe and fair' contract terms and conditions: SLAs - Ensuring that cloud customers have a clearer understanding of SLAs that apply to a particular cloud service and how they will be managed, constitutes an important step towards achieving Europe's strategic goal. ETSI⁴, recommends

² IDC Western European Cloud Forecast 2014

³http://www.etsi.org/images/files/Events/2013/2013_CSC_Delivery_WS/CSC-Final_report-013-CSC_Final_report_v1_0_PDF_format-.PDF

⁴ http://www.etsi.org/images/files/Events/2013/2013_CSC_Delivery_WS/CSC-Final_report-013-CSC_Final_report_v1_0_PDF_format-.PDF

an essential step to making cloud SLA usable is through the adoption of common vocabularies and metrics/measurements. The Cloud Computing SLAs - Exploitation of research results⁵ report highlights research projects that have delivered SLA-related outcomes that cover different and complementary aspects in the SLA lifecycle.

A European Cloud Partnership to drive innovation and growth from the public sector - The European Cloud Partnership (ECP) brings together industry and the public sector to establish a Digital Single Market for cloud computing in Europe and has been established as part of the European Cloud Strategy.

1.1 Leveraging existing technologies and knowledge

The European Commission has invested heavily in the development of software services and cloud computing. It is important that these efforts are consolidated and that full use is made by existing and future projects of the instruments that have been developed by building on software and knowledge already built.

Through the Concertation meeting CloudWATCH encouraged clustering activities and convergence between sector specific R&D initiatives. Bringing together the different projects from within and across EC funding calls and pushing for strategic alignment of the technical aspects of the projects can only bring benefits to the projects themselves and future activities that will be able reuse the outputs at a technical level. Already certain common themes are emerging between Call 8 and Call 10 projects and initial clustering of themes have emerged from the Concertation meeting. This section will highlight project clustering around the themes of scalability and privacy and security identified as a result of the Concertation meeting.

1.1.1 Unifying Open Source services and managing complex cloud environments

EC R&D projects are providing Open Source products and results. However, this is taking place in a disparate manner with clustering of efforts and reuse in the future for commercial exploitation in the EU ecosystem not currently managed well enough⁶. There is a growing need for more transparency about how the cloud is operating and information on Open Source Software adoption, such as models which aid transparency of performance of cloud: pricing, costs, IT resource management and use. Technological tools that help manage complex cloud environments are very important and CloudWATCH has identified a cluster of projects (CACTOS, MIDAS, MODAClouds, MONDO, OSSMETER, PROSE, RISCOSS) addressing this topic with the following areas for potential collaboration

<p>Provision of a Software “Repository” and “Collaboration” Space for open source software. PROSE already provides such a service.</p>	<p>Assessment and Selection of appropriate Licensing and Business Models addressing issues such as compatibility, choosing the right license, effect on business models.</p>
<p>Assessment Software Quality & Assessment of Service</p>	<p>Addressing platform, application and service</p>

⁵ <http://ec.europa.eu/digital-agenda/en/news/cloud-computing-service-level-agreements-exploitation-research-results>

⁶ Ken Ducatel, Head of Unit Software & Services & Cloud Computing E2 DG Connect speaking at Future Internet Assembly March 2014

Implementations. Due to the complex and distributed nature, testing is difficult to carry out.

behaviour variety. Services behave differently on different platforms/hardware. Testing and analysis is required.

Table 2 Coordination requirements for unifying Open Source services

Future cluster work could focus on unifying, connecting or providing a workflow between various platforms creating an ecosystem of open source services such as software repository (PROSE), Risk analysis support for using open source software (RISCOSS), service testing framework (MIDAS), Quality assessment (U-QASAR). Furthermore, through cross-unit collaboration there is also a need to build on existing software and services, encompassing test-bed facilities such as BonFIRE that validate new products and services and are already available under the remit of Unit E4 Experimental Platforms.

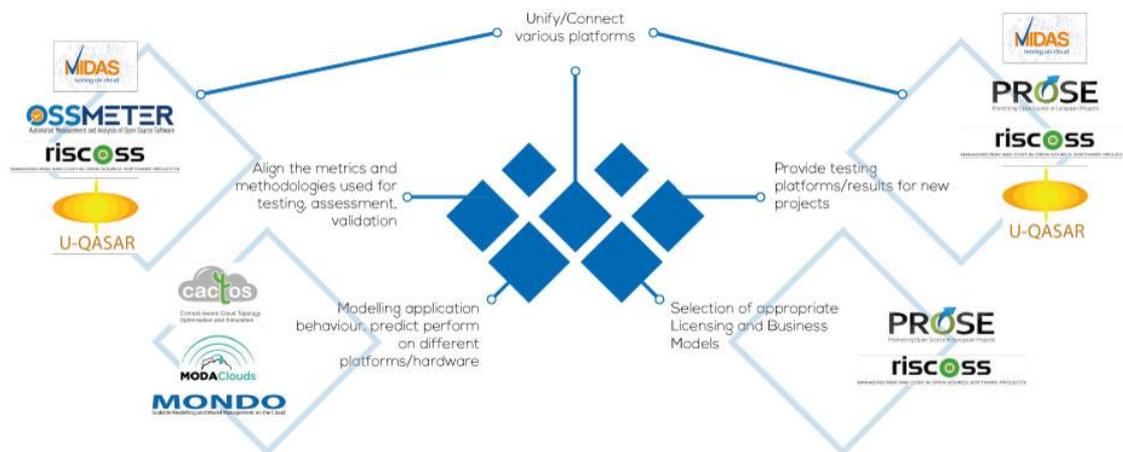


Figure 2 Unifying Open Source services and managing complex cloud environments

Each project delivers an important piece of a larger picture that could be unified into one single place or into a single workflow so that new projects can benefit

1.1.2 Scalability

Cloud provides a highly scalable platform for applications and device management systems that are either conventional software applications or cloud native applications. The following projects focus on aspects of scalability and may benefit from closer collaboration. The following projects address the issue of scalability and potential collaboration between these projects could take place as outlined in the figure below.

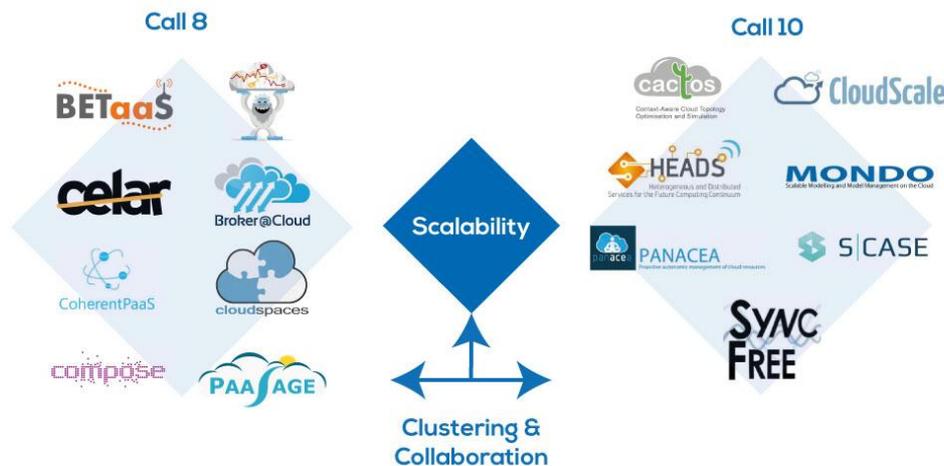


Figure 3 Scalability clustering between Call 8 & 10 projects

Spotlight on CELAR: Automatic, Multi-Grained Elastic Cloud Environment

CELAR focuses on the elastic resource management for cloud Applications in an automated and fully customisable manner. The outcome of the project is a set of open-source tools for the complete software stack that will allow the enhancement of a platform towards intelligent and automatic resource provisioning according to the needs of application users.

CELAR has so far set the foundations for a functional, efficient and fully customizable CELAR System. This will be a novel elasticity-provisioning system architecture, module design and development along three axes (elasticity, monitoring and application management). It will be open-source, and integrated with two IaaS providers (~Okeanos and Flexiant's Flexiscale). Privacy & security

1.1.3 Privacy & Security

The recent report, "Establishing a Trusted Cloud Europe"⁷ recognises that a number of uncertainties and challenges are hampering access to cloud services in Europe. One such concern is trust and security. Europe can become a leader in restoring trust and transparency of the cloud, with current projects addressing this issue. The following Call 8, 10 and CIP projects focus on privacy and security issues.

⁷ <http://ec.europa.eu/digital-agenda/en/news/trusted-cloud-europe>

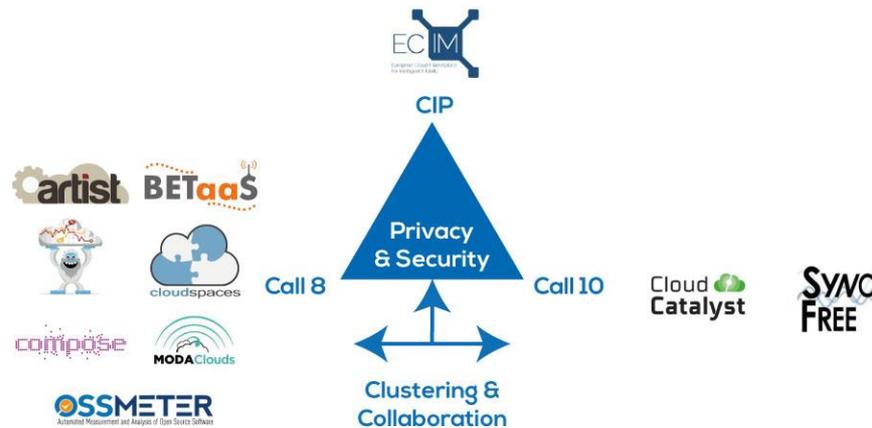


Figure 4 Privacy & Security clustering between Call 8 & 10 projects

Spotlight on PaaSage - Addressing privacy from private to public clouds

One project addressing privacy issues for their end-user, Lufthansa, is PaaSage. PaaSage⁸ is one example of cloud ecosystem participants involved in EU projects.

Roles in PaaSage cover:

-Technology providers: Flexiant Ltd; Sysfera, EVRY, Lufthansa systems, IBS.

-Application developers: Automotive Simulation Centre, Lufthansa Systems, be.wan.

-Research providers: Science and Technology Facilities Council, GWDG, SINTEF, INRIA, FORTH, AGH.

-Technology transfer: ERCIM, CETIC

Flexiant Ltd, Sysfera, and be.wan are the SMEs involved. End-users include Lufthansa, which is federating from their private cloud to multiple public clouds but requires high-level security to address privacy issues (e.g. sensitive passenger and pilot data).

1.2 Encouraging clustering - Breakout sessions & collaborations

Three break-out sessions were organised at the event focussing on three themes: Cloud computing; Internet of Services & heterogeneous clouds, and Advanced Software Engineering; Open Source of Software Prototyping.

Project representatives gave lightning talks on their project followed by roundtable discussion to identify the following:

- Top 5 R&D Challenges
- Top 5 Cross cutting themes
- Top 5 New collaboration opportunities and new ideas

⁸ <http://www.paasage.eu/>

The following tables outline the outcomes of these discussions.

1.2.1 Break out group: Cloud Computing

Chairs: Ana M. Juan Ferrer (ASCETiC) & Lorenzo Accardo (Clouding SMEs)

Participants & lightning talks⁹from: BigFoot, CloudSpaces, CELAR, HARNESS, LEADS, OCEAN, OPENi, PaaSage, Ascetic, CloudCatalyst, Cloud4Europe, Clouding SMEs, CoherentPaaS and ClouT

Main R&D Challenges	Cross cutting themes	New collaboration opportunities
<p>Research should start from needs of society: society should be the driver for research</p> <p>Performance and availability guarantees need to be considered in Clouds</p> <p>How to make use of clouds invisible = transparent for developers. Transparency for developers so they don't have to make manual steps for application deployment configuration</p> <p>Security of cloud applications: how to securely deploy and use applications in the cloud and how to avoid threats in the cloud</p> <p>Scalability challenges associated to cloud developments and design taking scalability into account right at the design phase of clouds.</p> <p>Applications that expand multiple clouds such as geolocation of different applications.</p>	<p>Design and development of cloud applications</p> <p>Elasticity - including single elasticity from multiple views.</p> <p>Personal clouds: two projects focussing on this topic</p> <p>Focus on batch oriented applications in cloud environments: In the previous calls there was not a focus on this area.</p> <p>Standardisation mentioned by all projects mentioned this topic</p> <p>Model approaches to tackle heterogeneity of using multiple cloud environments at the same time</p> <p>Data privacy not as common as could</p>	<p>Organise focussed thematic workshops with projects presenting different work focussing on specific topics. Ocean plan to organise workshops</p> <p>Collaboration with EGI technical working groups</p> <p>Results of cloud computing research should be applied to set new goals for addressing societal challenges</p> <p>Common dissemination materials and opportunities for cloud computing projects. The CLOSER event will look at projects working on multi-clouds.</p> <p>Need for user involvement in future actions.</p>

⁹ http://www.cloudwatchhub.eu/sites/default/files/Cloud-Computing-Breakout_Presentations_Concertation_12-13March2014.pdf_0.pdf

<p>Increasing number of devices that access cloud applications. These raise issues regarding big data in cloud environments and how they are related to the Internet of Things</p>	<p>be expected and only covered by one project.</p>	
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Table 3 Cloud Computing break out group outcomes

1.2.2 Break out group “Internet of Services & heterogeneous clouds”

Chair: Franck Fleurey (HEADS) and Marc Shapiro (Syncfree)

Participants & lightning talks¹⁰: ARTIST, BETaaS, Broker@Cloud, COMPOSE, CloudScale, SUCRE, FELIX, HEADS, Panacea, SeaClouds, SyncFree, HTML5 and SOCIETIES.

Main R&D Challenges	Cross cutting themes	New collaboration opportunities & Vision for the future
<p>Data portability: Moving data around and not lose information. Cloud providers do not make this easy, e.g. importing data is easy with interfaces provided but exporting data is more complex.</p> <p>Security: This issue is being addressed. Users want to know data location, data flow and access rights.</p> <p>Making cloud systems clear to end users on issues such as data location, availability, information flow, costs is a major challenge</p> <p>There are two different approaches to deal with the</p>	<p>Portability: Avoiding vendor lock in</p> <p>Too many clouds. Each cloud has its own vendor or service specific APIs, which are being added to making the environment too complex. Such diversity and fragmentation makes the cloud hard to use.</p> <p>Transparency is required. There are two definitions of transparency:</p> <ul style="list-style-type: none"> • Transparency #1: The system should behave as if it was a centralized system. This is difficult to achieve in a distributed system as there are a lot more failure 	<p>Comparative platforms for service provider offerings based on user requirements</p> <p>State-of-the-art European providers</p> <p>State-of-the-art European experimental facilities</p> <p>Users can trust their data & computing to the cloud (like they trust their money to the</p>

¹⁰ http://www.cloudwatchhub.eu/sites/default/files/Internet-of-services-%26-heterogeneous-clouds_Presentations_Breakout_Concertation_12-13March2014.pdf.pdf#overlay-context=node/202

<p>variety of standards and APIs. It is unclear which is the right approach.</p> <ul style="list-style-type: none"> • Middleware approach: Creation of a layer above the standards that hides the differences. This however, may lead to slower service and reduced efficiencies due to this extra layer. The layer also hides some of the interesting differences between each system. • Adapting systems to platforms taking advantage of the features of individual clouds. <p>Heterogeneous infrastructures due to different layers of service. Heterogeneity increases as multiple clouds are used and interaction with different devices</p>	<p>modes and diversity than in a centralised system</p> <ul style="list-style-type: none"> • Transparency#2: Even though a centralised system is desired, users want to know what is happening in the system. Choice over where data is stored and to be sure that it is kept in a safe place, users want to know why they are being charged for certain services and transparent definition of reliability guarantees. Transformative: not just porting, re-think the way we do things. If the cloud is a transformative technology, you cannot do business as usual, moving from a centralised system to the cloud or moving systems to the cloud requires a re-think of how things are done and a change of mind-set. 	<p>bank): Greater trust in the cloud so that users trust the cloud as they would the bank.</p> <p>My cloud works with your cloud “transparently” 1+2: We have to live with the fact that there are many clouds and this should be</p>
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Table 4 Internet of Services & heterogeneous clouds break out group outcomes

1.2.3 Break out group “Advanced Software Engineering, Open Source of Software Prototyping”

Chairs: Andreas Menychtas (ORBIT) and Stefan Wesner (CACTOS)

Participants & lightning talks¹¹: MIDAS, MODACLOUDS, OSSMETER, PROSE, RISCOSS, U-QASAR, CACTOS, Mondo, S-Case and ORBIT.

Main R&D Challenges	Cross cutting themes	New collaboration opportunities & Vision for the future
<p>Methodologies, design and implementation approaches to develop for the Cloud from scratch rather than migration of legacy applications. There is potential for</p>	<p>Software “Repository” and “Collaboration” Space: There are a lot of projects dealing with open source so an</p>	<p>Align the metrics and methodologies used for testing, assessment, validation (MIDAS/U-QASAR/OSSMETER /RISCOSS) 4 projects look into</p>

¹¹ http://www.cloudwatchhub.eu/sites/default/files/Breakout3_Advanced-Software-Engineering-Open-Source-Software-Prototyping_Presentations_Concertation_12-13March2014.pdf#overlay-context=node/202

<p>alignment as there are different approaches for this.</p> <p>Cover all aspects of requirements: functional, non-functional, security: Applications are often related to performance and how the applications act on functional performance. There are also non-functional requirements such as security and robustness which must be considered in the same way.</p> <p>Clear and cross-platform definition for “service quality”: What this means - A clear definition is required. Definition is also dependent on person and the application.</p> <p>Operating in heterogeneous environments: Heterogeneity can mean different things: heterogeneity of middleware, of hardware etc. Therefore H on different dimensions.</p> <p>Business Continuity / Fault Tolerance / Robustness: Very hard to predict, assess and guarantee.</p>	<p>open repository such as PROSE.</p> <p>Assessment and Selection of appropriate Licensing and Business Models: Are license models compatible, how do you choose the right license, and how does it affect business models: should be more coordinated across different projects</p> <p>Assessment Software Quality & Assessment of Service Implementations Quality: Difficult to carry out testing done due to its distributed nature and complexity</p> <p>Cope with the platform, application and service behaviour variety: Services behave differently on different platforms. There is no clear boundary between a bug, which is a mal-behaviour. It’s not clear that services are behaving in a deterministic way on different platforms</p>	<p>this and alignment is needed.</p> <p>Modelling application behaviour: understand how they will perform on different platforms/hardware (MONDO/CACTOS/MODAClouds) - How to predict performance, behaviour and establish some models on application behaviour in different environments</p> <p>New projects as potential test users of platforms/results e.g. for open source platforms/licensing & risk assessment platforms (Prose/RISCOSS/MIDAS/U-QASAR) Use platforms to test software and give platform projects feedback on their platforms</p> <p>Unify/Connect various platforms projects deliver pieces: software repository from PROSE, Risk analysis support for using open source software - RISCOSS, service testing framework - MIDAS, Quality assessment - U-QASAR. How can we make a structure that the results from these projects into a service so new projects really benefit from this. There is dedicated budget in this field.</p>
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Table 5 Advanced Software Engineering, Open Source of Software Prototyping break out group outcomes

1.2.4 CIP Funded projects

The event also provided initial contact and potential for collaboration between CIP (Competitiveness Innovation Programme) providing a cloud of public services and FP7 projects. The projects prepare the migration of public authorities to cloud-based solutions and establish a set of pilots to test and validate the use and the aggregation of innovative cloud-based services offered both by the public and the private sector. Collaboration identified is for CIP projects to carry out testing on FP7 testing facilities.

CLIPS general objective is to set up and to deploy a platform on which to run the virtual environment, to build the cloud solutions addressing the particular cases during the piloting phase of the project. Other administrations could benefit the results of the identified solution, looking at the cross domains, cross processes and cross borders approach. The final solution will be distributed through the specially created cloud platform dedicated to public administrations

<http://www.cloudwatchhub.eu/node/197>

[Presentation on CloudWatchHUB.eu](#)

CloudOpting increases the usage of cloud computing by public administrations by providing a “plug - and - play” platform where public institutions and government bodies can: migrate existing IT systems in order to deliver online public services to citizens and third parties; centrally manage operational data and citizen information within a controlled environment; allow citizens to develop innovative new services. The project will support the effective and efficient delivery of public administration services. The platform will accelerate service delivery enabling public administration to build cloud services from in a bottom - up approach, re-use public cloud services or transform existing infrastructure. It will provide consumer - oriented front - end interfaces and tools, which are quite intuitive to operate, resulting in an increased expectation and demand for complex services in ever reducing timescales. The project will allow public administrations and private companies to create new services capable of interacting and sharing information among each other.

[Presentation on CloudWatchHUB.eu](#)

ECIM aims to help three key audiences - service creators, city managers and service users – to benefit from the ability of cloud computing to make transportation and other city services more innovative, cost effective and accessible. ECIM will: Allow cities and businesses to easily migrate existing services to the cloud; Open cloud-based services to innovators for use as the basis for new applications and services; Publish these services in a catalogue (Marketplace), which will enable cities across Europe to easily access, combine and adopt them.

<https://www.linkedin.com/groups/ECIM-European-Cloud-Marketplace-Intelligent-7468726>

<http://www.cloudwatchhub.eu/node/194>

[Presentation on CloudWatchHUB.eu](#)

STORM CLOUDS aims to explore how the shift by public authorities to a cloud-based paradigm in service provisioning should be addressed. STORM CLOUDS will define useful guidelines on how to address the process in order to accelerate it, for public authorities and policy makers. These guidelines will be prepared based on direct experimentation in at least four European cities, creating a set of relevant use cases and best practices. By doing so, STORM CLOUDS will also deliver a consolidated cloud-based service portfolio validated by citizens and public authorities in different cities and, at the same time, general and interoperable enough to be deployed in other European cities not taking part in our project, as well as scaled up to wider geographical scopes. This portfolio will be mainly created from applications and technologies delivered by other CIP-PSP and FP7 projects, as well as resulting from innovation efforts from SMEs.

<http://www.cloudwatchhub.eu/node/196>

[Presentation on CloudWatchHUB.eu](#)

STRATEGIC's main goal is to enable, pilot and evaluate a radical shift in the way public cloud services (and existing on-line services) can be migrated, replicated and reused across different regions, as well

as in the way they can be used in the composition of novel services. To this end, the project will systematically study processes and needs associated with the secure and privacy-friendly replication, migration and extension of public cloud services and will accordingly integrate a cloud-based infrastructure (including various tools and techniques) that could successfully address these needs for a number of stakeholders including public bodies, cloud application developers, cloud service providers and ISVs. The main ICT infrastructure to be integrated in the scope of the project will be the STRATEGIC framework, which will combine/integrate a range of technical developments from background projects (FP7 OPTIMIS, FP7 VENUS-C, FP7 STORK and CIP-PSP SEMIRAMIS) in order to open new horizons in the secure and privacy friendly migration, adaptation, governance and development of public cloud services, notably in terms of e-government services operated and used by public bodies.

<http://www.strategic-project.eu/>
<http://www.cloudwatchhub.eu/node/182>
[Presentation on CloudWatchHUB.eu](#)

VIRGO's main outputs and results are: an overall knowledge on how infrastructures are managed and on the relevant legislation in each European country; a harmonized structure for a European virtual registry on cloud; guidelines to the various stakeholders on how to implement the virtual registry on cloud; white paper on legal framework to make the European virtual registry on cloud compulsory in all countries; implementation of virtual registry on cloud in 3 European countries (Italy, Portugal, Romania) through pilot project; defined and tested structure for a European virtual registry on cloud to be adopted in Europe.

<http://virgoregistry.eu/>
<http://www.cloudwatchhub.eu/node/195>
[Presentation on CloudWatchHUB.eu](#)

1.2.5 Future collaboration

The Concertation meeting also provided the opportunity for future collaboration between projects. The table below identifies projects that identified potential synergies between projects.

Project	Potential synergies with
ARTIST	MODAClouds, Paasage, CIP Projects
CACTOS	CloudSpaces(use of Palladio), MODAClouds (use of Palladio), MONDO (how their goals around application models fit in with CACTOS), ORBIT (methods to achieve robustness), PANACEA (to discuss autonomic management)
CELAR	U-QASAR (to integrate our tools to improve their runtime guarantees)
CLIPS	CIP Projects
CloudWATCH	MIDAS, PROSE
ECIM	HTML5Apps (for end-user apps), PROSE (as an infrastructure), RISCOSS (data analysis)
HEADS	BETAAS, COMPOSE, SyncFree, Bonfire (via ECO2 Clouds), Flexiant
OPENi	ASCETIC, PROSE (to support the development of service enablers and APIs), STRATEGIC (to support their data analysis for H2020 societal challenges), STORMCLOUDS (to support their data analysis for H2020 societal challenges), CIP Projects (in general to see how they can be supported)
ORBIT	CACTOS (investigate heterogeneity of various platforms), RISCOSS (analyse risk and cost assessment), U-QASAR (analyse software

	quality)
PaaSage	CLOUDSCALE (to extend the expert system), CIP Projects
PROSE	RISCOSS
RISCOSS	PROSE
SeaClouds	MODAClouds
SOCIETIES	PROSE
STRATEGIC	CLIPS, CloudOpting
U-QASAR	MIDAS, ORBIT, OSSMETER, RISCOSS

Table 6 Potential synergies between projects

The mutually suggested collaborations were:

- CACTOS & ORBIT
- ORBIT & U-QASAR
- PROSE & RISCOSS

The most popular suggested partners were PROSE and RISCOSS.

A number of projects identified the services that they offer and project requirements. The table below groups together both the shared needs of projects more general needs identified for the European marketplace and finally needs which are specific to individual projects. Finally, future ideas are also identified by each project for focus of future work. A full table detailing each project can be found in annex 1. Further analysis of this information will help support potential collaboration through a need - driven exercise.

Requirements shared by projects	
<p>Support for raising awareness, target audience outreach and uptake</p> <ul style="list-style-type: none"> -Approaches and guidelines to encourage use of the cloud by public authorities (CLIPS) -Synergies between the CIP project (CLIPS) -Access to stakeholder interest in smart cities (COMPOSE). This could help drive possible convergence across units, e.g. FI-PPP and FIRE. -Support for project dissemination and collaborations (MODACLOUDS) -A book about the status of on-going EC-funded projects in cloud computing (MODACLOUDS) -Requirements, criteria and indicators of how the transition to the cloud is made (Storm Clouds) -Showcase of smart cities (Storm Clouds) -Repository of project needs/offerings to boost collaboration (U-QASAR) 	<p>Try and test" approach</p> <ul style="list-style-type: none"> -Test solutions with CIP projects (ARTIST) -Foster informal collaborations between projects (CloudCatalyst) -Monitoring and testing of services (ECIM) -Other projects testing and enriching the platform and methodology (PaaSage) -Technology, infrastructures and platforms for building and testing our tools (SyncFre <p>Open source repositories</p> <ul style="list-style-type: none"> -Repository for open source software (ASCETIC) -Best practice exchange of open source licensing models (Broker@Cloud) -Data sources and statistics related to code quality, OSS community behaviour and OSS business models (RISCOSS)
General needs for the European marketplace	Needs specific to individual projects
<ul style="list-style-type: none"> -Technical solutions provided by EC-funded projects (CloudCatalyst) -An understanding of how technical barriers are being addressed (CloudCatalyst) -Best practices related to government, healthcare, 	<ul style="list-style-type: none"> -Open source IDE and runtime environment for the high level design of applications (ASCETIC) -Application modelling tools (CELAR) -Scalable orchestration engine (COMPOSE) -Infrastructure for hosting (ECIM)

<p>ICT, education and others (CloudCatalyst). -User requirements to define standards profiles (CloudWATCH). This links to the acknowledgement of the importance of privacy and interoperability, e.g. OPENi. -Benchmarking of cloud providers and services (ARTIST) -Related need for pricing strategies (Broker@Cloud) -Templates for SLAs (Broker@Clouds)</p>	<p>-Guidelines for integration (ECIM) -Development guidelines (ECIM) -Cloud migration (FELIX) -Data management (FELIX) -Prioritisation of new HTML5 features to fill the gap with native OS AOIs (HTMLAPPS5) -Ideas for future R&D web apps (HTMLAPPS5) -Ultra large model management (MIDAS) -Effective elasticity (MIDAS) -More application and infrastructure related information (PaaSage)</p>
Future ideas	
<p>Project value and uptake -Integrate LEAN development to prove the value of the project to cloud users (CloudCatalyst) -Clustering of projects across the programme on themes for collaboration to maximise results (CloudWATCH) -Organise exploitation-focused workshops (PaaSage) -Gather information/contacts on public clouds used by public administrations (Sucre) -Investigate other project offers to understand how to be more competitive with Amazon (SyncFree) -Extend tools to work with the applications from other projects (SyncFree) -Form a consortium to implement the services developed by the project (VIRGO)</p>	<p>Non-technical issues and standards -Direct contact with projects involved with standards (HTML5APPS) -Discussion with unit staff on coordination of standards goals (HTML5APPS) -Investigate the issue of transparency in cloud-based systems (Storm Clouds)</p> <p>Cloud technology advances -Ultra-large model management (MIDAS) -Effective elasticity (MIDAS)</p> <p>SaaS -Software engineering for SaaS looking at elasticity, efficiency and scalability (ARTIST) -Interactive applications in the cloud, their functional and non-functional requirements and implications on current cloud solutions/architecture (ARTIST)</p>

Table 7 Projects' shared needs, general needs for the European marketplace and specific needs

1.3 Learning from Call 5 success stories

There is much to be learned from completed projects and a number of successful Call 5 projects highlighted how their projects were successful and in particular focused on best practices regarding the exploitation of project results and sustainability of services.

Call 5 Success stories	Exploitation best practice
<p>Cloud4SOA provided a set of tools to support Cloud-based application developers with multiplatform matchmaking, management, monitoring and migration by semantically interconnecting heterogeneous PaaS offerings across different providers that share the same technology. Cloud4SOA facilitates the access and lifecycle management for Cloud-based application developers to the PaaS offering that</p>	<p>To exploit the project results, the consortium re-branded and launched Cloud Pier: An open source multi-cloud application manager for PaaS for both the supply and demand side. http://www.opencloudpier.org/</p> <p>Business Value: User can contrast & compare different platforms for their application in a fragmented market of difficult-to-compare cloud solutions. Reduce operational overhead with</p>

<p>best matches their computational needs. http://www.cloud4soa.eu/ Presentation on CloudWatchHUB.eu</p>	<p>multi-cloud application management featuring simple governance, dashboard monitoring, unified metrics and user-defined SLA policies between platforms. Help alleviate vendor lock-in and lower switching costs in an ecosystem of “platform adapters”, that empower the developer to migrate applications between competing private and public PaaS.</p>
<p>CumuloNimbo solved the issue of scalability of transactional cloud databases. The state of the art previous to the project results was not able to scale transactional support in cloud databases and resorted to a technique called sharding that basically loses the transactional consistency. With CumuloNimbo results now a cloud database can scale seamlessly to 100s or even 1000s of nodes in a fully transparent manner to the applications. With this, now developing scalable applications for the cloud is as easy as writing traditional applications for a centralized database. http://www.cumulonimbo.eu/ Presentation on CloudWatchHUB.eu</p>	<p>A startup is being created by UPM (the project coordinator) to commercialize the core project results. In this startup at least another project partner will participate. The main innovation on the ultra-scalable transactions is protected by a patent from UPM. This patent will be transferred to the startup through a technology transfer contract from UPM to the startup. Work started with large client, one of top-10 banks in the world, as our first client for almost a year. A full product will be released in the next couple of months. Discussions underway with large companies potential partnerships to enable faster growth after the first few clients</p>
<p>Mosaic: Development of an open-source platform that enables application developers to select Cloud services according to their application needs. Using the Cloud Ontology, the Semantic Engine and the Semantic Service Discovery, the vendor-agnostic API and various tools, the application developers are able to specify their service requirements and communicate them to the platform. By using mOSAIC approach and software Cloud-application developers and maintainers are able to postpone their decision on the procurement of Cloud services from design time until runtime, while end-user applications are able to find best-fitting Cloud services to their actual needs and efficiently outsource computations and storage. http://mosaic-cloud.eu/ Presentation on CloudWatchHUB.eu</p>	<p>Taken into account that the PaaS market volume is relatively low, the mOSAIC consortium focus on a specific market niche in order to not to compete directly with those big companies that already exist in the PaaS market. SMEs are the main target market niche. The idea is to use the mOSAIC platform with some essential open source tools for any SME for free as a bait (just to capture a large number of customers), and then, charge a recurring amount (monthly payment) for some specific tools, custom developments or even for the consumed resources. The goal of this new business model is to provide to SMEs with a vertical solution which includes multiple open tools or resources that can be exploitable by any company. Offering vertical solutions to specific market niches is a hot new trend, and some big players like SAP are focusing on it.</p>
<p>REMICS develop advanced model-driven methodology and tools for Reuse and Migration of legacy applications to Interoperable Cloud Services. http://www.remics.eu Presentation on CloudWatchHUB.eu</p>	<p>Technical exploitation: Improve the feasibility analysis; Consider the application architectural implications of moving to the cloud; Support the business model and organizational process migration; mature the outcomes and jointly face the following target groups:</p>

	<ul style="list-style-type: none"> -Legacy system owners -Tool providers -IT consultancy professionals
<p>VISIONCloud Architect and implement an infrastructure for the reliable and effective delivery of data-intensive storage services, facilitating the convergence of ICT, media and telecommunications. Establishment of new fundamental and generic capabilities for cloud storage supported in the storage system.</p> <ul style="list-style-type: none"> -Rich metadata and storlets as fundamental enablers -Content centric approach to simplify the way objects are accessed -Data mobility and federation to avoid data lock-in -Enterprise capabilities to enable use for mainstream business activities such as compliance, secure access, flexible SLAs, etc. <p>http://www.visioncloud.eu/ Presentation on CloudWatchHUB.eu</p>	<p>The project placed a strong emphasis on partner exploitation from the very start of the project... In the final review, industrial partners presented their exploitation plans, with three closed door sessions involving executives from IBM, TID, SAP</p>

Table 8 Call 5 success stories

2 Contributing to the Standards Landscape

Standardisation is a strong enabler for cloud computing bringing confidence to both customers and investors. The ETSI Cloud Standards Coordination Final Report¹² concluded that although complex, the cloud standards landscape is by no means a jungle and a lot less fragmented than previously described. Enough standards already exist and the report predicts that cloud standardization is likely to mature in the next 12 months with interoperability in the cloud requiring standardization in “APIs, data models and vocabularies”. The report highlights the importance of greater flexibility in cloud standards to allow cloud providers to promote their unique selling points, which may result in greater adoption by them. It also warns that collaboration is still required to avoid future fragmentation.

The collection of position papers from the Concertation gives an overview of standards adoption both actual and planned by Call 8 and 10 projects. Information also included project contributions to standards development including engagement with Standards Development Organisations. A snapshot of this information can be seen from the table below which shows some of the most used standards: OGF-OCCI, OASIS-TOSCA, SNIA-CDMI and DMTF-OVF. Other standards are also used by projects but are not cited here.

¹²http://www.etsi.org/images/files/Events/2013/2013_CSC_Delivery_WS/CSC-Final_report-013-CSC_Final_report_v1_0_PDF_format-.PDF

Standard	Usage in Call 8 & 10 projects
OCCI - Open Cloud Computing Interface (OGF)	Call 8: BETaaS, OCEAN (Interoperability testing) RISCOSS (Risk Analysis) Call 10: ASCETiC, CloudWave, ENVISAGE, ORBIT, PANACEA
CDMI - Cloud Data Management Interface (SNIA)	Call 8: OCEAN (Interoperability testing), RISCOSS (Risk Analysis) Call 10: ASCETiC, ClouT
OVF - Open Virtualization Format (DMTF)	Call 8: OCEAN (Interoperability testing), RISCOSS (Risk Analysis) Call 10: ENVISAGE, ORBIT, PANACEA
TOSCA - Topology and Orchestration Specification for Cloud Applications (OASIS)	Call 8: ARTIST, CELAR, MODAClouds, Call 10: SeaClouds

Table 9 Most used standards by Call 8 & 10 projects

Furthermore, projects are addressing issues requiring further focus above and beyond the current iteration of ETSI Cloud Standards Coordination report. It is clear that though the focus of these activities has been on the management interfaces that there are a number of different services that need to utilize standardized interfaces, for example accounting, monitoring and service description.

A snapshot of information has been gathered focusing on adoption of standards by current Call 8 & 10 consortia and their contribution to the standards landscape.

Call 8 Projects: Standards used and contributions to the standards landscape	
ARTIST - an end-to-end assisted migration solution for non-cloud software	Standards: OMG UML2, SPEM2.0, KDM, fUML, ISO27000 series, OASIS TOSCA, upcoming ISO Cloud Computing Reference Architecture and best practices such as ITIL. Contribution: ARTIST is building a CloudML upon REMICS's Cloud Modelling Language with the main aim of modelling the most important characteristics of platform providers from the infrastructure point of view and the application point of view, in order to foster easier portability of the application from one platform to another. ARTIST partners are active members of OMG and ISO JT/SC38.
BETaaS - Building the Environment for the Things as a Service	Standards: ETSI, to allow interoperability of heterogeneous M2M systems/applications. OCCI that defines the entities and relationships in a cloud model and provides high level protocol to manage resources. WSAG4J, an implementation of the OGF WS-Agreement standard, to manage the negotiation of M2M application requirements
CELAR - Automatic, Multi-Grained elasticity provisioning for the cloud	Standards: TOSCA, the de-facto standard for job submission and configuration over different cloud management platforms in order to support application description and submission. The TOSCA specification is extended to define elasticity requirements descriptions, which will be processed and enforced by CELAR's decision module during elastic scaling. Standards regarding the cloud IaaS management API: OpenStack API cloud connector libraries using JClouds and libcloud [10], state of the art cloud management libraries, are being implemented.
MODAClouds - Model-Driven Approach for design	Standards: TOSCA for enhancing the portability and management of Cloud applications and services across their lifecycle. CAMP for standardizing Cloud PaaS

and execution of applications on multiple Clouds	management API. SMI ¹³ to support users in assessing the risks and advantages of selecting a certain cloud provider.
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Table 10 Call 8 Projects: Standards used and contributions to the standards landscape

Call 10 Projects: Standards used and contributions to the standards landscape	
ASCETiC - Adapting Service lifecycle towards Efficient Clouds	Standards: ISO/IEC JTC1-SC7 on Software and Systems Engineering (SSE), and ISO JTC1-SC38 on Distributed Application Platforms and Services (DAPS); OGF-OCCE on the delivery of APIs specification for remote management of cloud computing infrastructure, allowing for the development of interoperable tools for common tasks including deployment, autonomic scaling and monitoring; SNIA-CDMI: on the adoption by the programming model COMPSs of the cloud storage reference implementation and the Green Storage Energy Measurement Specification. Contribution: DMTF ¹⁴ on developing specifications for cloud service portability and management consistency across cloud and enterprise platforms, working closely with the Open Cloud Standards Incubator (OCSI) group.
ClouT - Cloud of Things for empowering the citizen cloud in smart cities	Standards: CDMI to ensure seamless access to very different data sources and provide syntactic interoperability of data. Contribution: ClouT closely follows the SNIA and is inspired by standard reference architectures defined by relevant international organizations like NIST (National Institute for Standards and Technology) and ETSI (European Telecommunications Standards Institute) with the main objective of re-using existing standards and best practices, extending them when needed.
ENVISAGE - Engineering Virtualized Services	Standards: OVF and OCCl. Contribution: Influence the evolution of OVF & OCCl
HEADS - Heterogenous and Distributed Services for the Future Computing Continuum	Standards: Eclipse Modeling Framework (EMF) for the definition and implementation the HEADS modeling languages. Contribution: HEADS seeks to use technologies currently being standardized, such as the emerging OASIS standard MQTT (SoftwareAG is actively participating) or CoAP (at IETF) for the communication between resource-constrained devices.
ORBIT - Business Continuity as a Service	Standards: OVF with respect to CIM profiles, VMAN ¹⁵ , and OCCl extensions, developed through the integration of ORBIT outcomes in cloud-related software such as OpenStack.

Table 11 Call 10 Projects: Standards used and contributions to the standards landscape

Open Source projects are now contributing to the cloud standards landscape by creating interoperable, portable and safe APIs, protocols and environments that are tried and tested. Therefore, CloudWATCH2 will engage with projects using OpenSource solutions in order to monitor uptake and usage. Open Source is a tool for developers & identification of new strategically game-changing forms of organisations and innovative business models should be identified.

2.1.1 CloudML: Contributing to the standards landscape

Projects are also making active contributions to the standards landscape and clustering of activities can also be found in addressing. An excellent example of this, and of leveraging the results of past project is seen in the collaboration between projects to further develop, test and make into a standard

¹³ Service Measurement Index

¹⁴ Distributed Management Task Force

¹⁵ DMTF - Virtualization Management

CloudML¹⁶ (Model-based provisioning and deployment of cloud-based systems) which fosters easier portability of the application from one platform to another. CloudML emerged from the Call 5 project REMICS. CloudML is developed by SINTEF and supported by Call 8 projects PaaSage and MODAClouds which provides a concrete and enhanced implementation for this standard and tests it on real applications. It provides a domain-specific modelling language along with a run-time environment that facilitate the specification of provisioning, deployment, and adaptation concerns of multi-cloud systems at design-time and their enactment at run-time. ARTIST (Call 8) is building a CloudModelling Language upon CloudML with the main aim of modelling the most important characteristics of platform providers from the infrastructure point of view and the application point of view, in order to foster easier portability of the application from one platform to another. HEADS (Call 10) may contribute to the standardization of the CloudML language by extending the concept of CloudML to the computing continuum, from cloud to mobile and resource-constrained platforms.

¹⁶ <http://cloudml.org/>

3 Conclusion and next steps

One of the main findings of the Concertation Meeting is that the projects all have similar concerns and views on the current and potential future state of cloud computing in Europe. These include portability, security and the ability to advance cloud technologies in a highly competitive marketplace. Underlying these shared concerns however is the common belief in the need for standards, transparency and assessment of services at all levels of a cloud infrastructure.

Participating projects cover the entire life cycle of cloud research, from development and testing to implementation, dissemination and sustainability. Closer collaboration and networking across all these projects is important for several reasons. Firstly, projects can identify providers for their applications etc., they can adopt a “test and try” approach to validate re-usability and value; build on results already available, further work on standards and move to implementation more quickly.

One of the main values of the meeting was the opportunity to quickly identify various collaborations, which can be clustered around specific themes, such as elasticity, portability and transparency. Potential synergies include:

- Selecting licensing and business models - PROSE and RISCOSS
- Testing, assessment and validation of applications – MIDAS, U-QASAR, OSSMETER and RISCOSS
- Modelling application behaviours – MONDO, CACTOS and MODAClouds
- Testing results of projects – PROSE, RISCOSS, MIDAS, U-QASAR

The projects that both identified each other as potential collaborators were:

- CACTOS & ORBIT
- ORBIT & U-QASAR
- PROSE & RISCOSS

The successful format of the event has helped transform the way Concertation Meetings are organised with opportunities for each participant to actively contribute through lightning talks, discussions, polarised break-out sessions, position papers and feedback forms. The aim of the next Concertation Meeting in September 2014 is to offer a platform to take forward and build on current achievements. Its format, focus and the work of CloudWATCH in coming months will take on board the following recommendations, which come directly from the projects through a collaborative process.

Recommendations from Concertation Meeting 12-13 March 2014	
Recommendations	CloudWATCH Actions
<i>Clustering of like-minded projects together in smaller groups. Cross- project collaboration & showcasing on common topics</i>	Initial mapping of technologies emerging from and potential clustering of projects for second Concertation meeting.
<i>Direct f2f with other projects & unit staff on standard coordination goals has been key</i>	Future Concertation meetings to provide a platform for project representatives and EC to gather together and take stock of progress and reassess goals in evolving landscape.
<i>Share needs/offerings of all ongoing projects to boost collaboration amongst projects</i>	The EU R&D Innovation Hub on CloudWATCHhub.eu provides a snapshot of European excellence to a broad audience for potential uptake. Pragmatic follow-up charged with showcasing projects progress.
<i>Organise Shared exploitation focused workshops and activities</i>	CloudWATCH has already provided exploitation opportunities for over 20 projects through a targeted networking session and exhibition stand during ICT2013 ¹⁷ . CloudWATCH will build on synergies with unit projects.
<i>Data & Statistics from other projects to be used to foster informal collaboration between projects and units to enable testing of results. A "Test & try Approach" so EU Projects feel less isolated. Other projects (including CIP) to test & enrich those Call 8 & 10 project "platforms"</i>	Clustering activities will encourage the re-use of existing software and services. CloudWATCH has identified clustering and actions to connect or creating a workflow between Open Source services including risk analysis and service testing framework (D3.2) Foundations for collaboration with recently funded (early 2014) CIP projects also established for testing. A number of Call 8 and 10 projects have earmarked collaboration with CIP projects.

¹⁷ <http://www.cloudwatchhub.eu/node/75>

4 Annex 1 Project offerings, needs and future activities

<p>ARTIST: Tool supported methodology for migrating applications to the cloud; Certification model for software compliance with cloud requirements</p> <p>Needs: Test solutions with CIP projects Benchmarking of cloud providers</p>
<p>ASCETIC: Energy-aware, software design and programming integrated environment; Service energy measurement and modelling tool; QoS energy-aware framework; Cloud service deployment tool; Cloud service operation tool</p> <p>Needs: Open source IDE and runtime environment for high level design of applications Repository for open source software</p> <p>Future: Software engineering for SaaS looking at elasticity, efficiency and scalability Interactive applications on the cloud, their functional and non-functional requirements and the implications on current cloud solutions/architecture</p>
<p>Broker@Cloud: Information on the use of linked USDL</p> <p>Needs: Best practice exchange of open source licencing models</p> <p>Future: Use of linked USDL for pricing Templates for SLA</p>
<p>CELAR: A generic approach to achieving elasticity in cloud environments using both general and application specific metrics to define elasticity rules</p> <p>Needs: Application modelling tools</p>
<p>CLIPS: Web-based service matching tool to export to Micro-proxy access for public administrators to confidential data</p> <p>Needs: Approaches and guideline to encourage public authorities use of the cloud Synergies between the CIP projects</p>
<p>CloudCatalyst: Repository environment; Open ecosystem of service providers with cross- selling/up selling methodologies</p> <p>Needs: Technical solutions provided by other EC projects Technical barriers tackled by other EC projects Best practices related to government, healthcare, information technology, education and others</p> <p>Future: Integrate LEAN development to prove value of project to cloud user Foster informal collaborations between projects to test each others results</p>
<p>CloudWATCH: Showcase project results on the Cloudwatchhub; Support defining interoperability issues</p> <p>Needs: User requirements to define standards profiles</p> <p>Future: Clustering projects together across work programme based on themes for collaboration maximising results of these projects</p>
<p>COMPOSE: Cloud platform for hosting IoT applications; Semantic registry; Sensor data; Participation in standardization and dissemination activities</p> <p>Needs: Scalable orchestration engine Access to stakeholders interest in smarter cities solutions</p> <p>Future: Take cloud operational transparency when designing and implementing our IoT cloud-based monitoring</p>

<p>ECIM: Guidelines on integrating public services to the cloud; Service testing on the ECIM platform Needs: Infrastructure for hosting Guidelines for integration Monitoring and testing of services Development guidelines</p>
<p>FELIX: Federation of SDN testbeds; Network services; Multi-domain networking; Network infrastructure Needs: Cloud migration Data management</p>
<p>HEADS: The technology, tools and knowledge to develop heterogeneous and distributed services to link the physical world through sensors and activators</p>
<p>HTML5APPS: Understanding of the Standards landscape; Starting pre-standardisation instrument activities; Knowledge of the HTML5/web platform standardisation roadmap Needs: Prioritisation of new HTML5 features to fill the gap with native OS AOIs Ideas for future R&D web apps Future: Direct contact with projects involved with standards Discussion with unit staff on coordination of standards goals</p>
<p>MIDAS: Service Oriented Architecture testing facilities; SOA infrastructure as a marketplace Needs: Ultra large model management Effective elasticity</p>
<p>MODACLOUDS: Open source code for monitoring services; Open source code for quality of service measurements; Open source code for model driven engineering of clouds Needs: Support for project dissemination and collaborations</p>
<p>OPENi: Data driven services; Data analysis; Cloud architectures; Personal clouds</p>
<p>ORBIT: A cost effective, fault tolerant, application agnostic infrastructure</p>
<p>PaaSage: Cloud modelling, deployment and management language; Monitoring, deployment and management extensions for Cloudify and OpenStack; Expert system and information database for cloud application behaviour Needs: More applications and infrastructure related information Future: Organise exploitation-focussed workshops Have other projects to test and enrich the PaaSage platform and methodology</p>
<p>PANACEA: Autonomic management of cloud resources</p>
<p>REMICS: Tool supported methodology for migrating applications to the cloud</p>
<p>RISCOSS: Assessment of technical and business/management risks Needs: Data sources and statistics related to code quality, OSS community behaviour and OSS business models</p>
<p>Storm Clouds: Guidelines for cities to move services into the cloud Needs: Requirements, criteria and indicators of how the transition to the cloud is to be made Future: Showcase of smart-cities Investigate the issue of transparency in cloud-based systems</p>
<p>SUCRE: Support in disseminating and exploiting results; Facilitating dialogue and collaboration Future: Gather contacts/information on public clouds/hosted by public administrators</p>

<p>SyncFree: Tools to build applications and services to scale to the cloud</p> <p>Needs: Technology, infrastructures and platforms for building and testing our tools</p> <p>Future: Investigate other projects/providers to move away from Amazon Extend our tools to work with the applications from other projects</p>
<p>U-QASAR: Identify and measure the quality objectives of any software development process</p>

Table 12 Project offerings, needs and future activities

5 Annex 2 - Participant list

Project	Name	Surname	Organisation
ARTIST	Clara	Pezuela	ATOS
ARTIST	Leire	Orue-Echevarria	TECNALIA Research & Innovation
ASCETiC	Ana	Juan Ferrer	Atos
ASCETiC	Karim	Djemame	University of Leeds
ASCETiC	Jean-Christophe	Deprez	Centre d'Excellence en Technologies de l'Information et de la Communication
BETaaS	Luca	Cucchi	Intecs S.p.A.
BIGFOOT	Marko	Vukolic	EURECOM
Biobanks Cloud & Community	Seif	Haridi	Swedish Institute of Computer Science
Broker@Cloud	Ewald	Quak	SINTEF
Broker@Cloud	Andreas	Friesen	SAP AG
CACTOS	Henning	Groenda	FZI Forschungszentrum Informatik
CACTOS	Stefan	Wesner	Universität Ulm
CELAR	Ioannis	Konstantinou	ATHENA/IMIS
CLIPS	Roberto	Di Bernardo	Engineering Ingegneria Informatica
CLIPS	Davide	Storelli	Engineering
Cloud Catalyst	Dalibor	Baskovic	EuroCloud
Cloud for Europe	Frank	van Dam	Ministry of Economic Affairs
Cloud for Europe	Linda	Strick	Fraunhofer FOKUS
Cloud4SOA & SeaClouds	Francesco	D'Andria	ATOS Spain SA
CloudingSMEs	Iorenzo	accardo	union européenne des petites et moyenne entreprises et de l'artisanat
CloudScale	Sebastian	Lehrig	Software Engineering Group & Heinz Nixdorf Institute, University of Paderborn
CloudScale	Richard	Sanders	SINTEF
CloudWATCH	Nicholas	Ferguson	Trust-IT Services
CloudWATCH	Carmela	Asero	European Grid Infrastructure - EGI.eu
CloudWATCH	Neil	Caithness	Oxford e-Research Centre, University of Oxford
CloudWATCH	Silvana	Muscella	Trust-IT Services
CloudWATCH	Peter	Deussen	Fraunhofer FOKUS
CloudWATCH	Daniele	Cattedu	Cloud Security Alliance
CloudWATCH	David	Wallom	Oxford University
CloudWATCH	Patrice	Chezard	DIGITALEUROPE
CloudWATCH & EGI-InSPIRE	Michel	Drescher	European Grid Infrastructure
ClouT, OCEAN, S-Case	Andrea	Manieri	Engineering Ingegneria Informatica spa
CoherentPaaS	Rui	Oliveira	Universidade do Minho / INESC TEC
COMPOSE	Benny	Mandler	IBM - Haifa Research Lab
CumuloNimbo & CoherentPaaS	Ricardo	Jimenez-Peris	Universidad Politecnica de Madrid
ECIM	Hugo	Kerschot	IS-practice
ECIM	Gorazd	Marinič	iMinds
EGI-InSPIRE	Neasan	O'Neill	EGI.eu
FELIX	Bartosz	Belter	Poznan Supercomputing and Networking Center

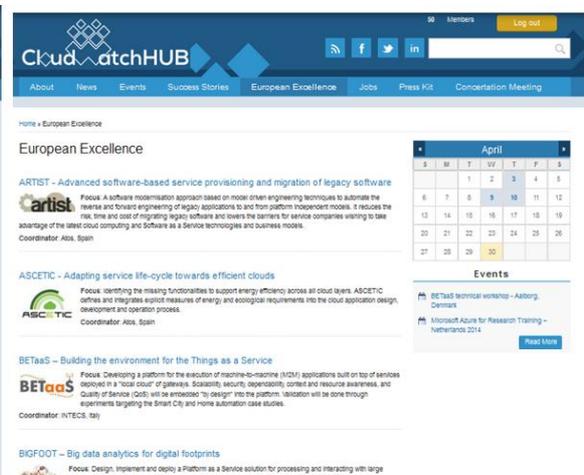
Project	Name	Surname	Organisation
HARNESS	Alexander	Wolf	Imperial College London
HEADS	Franck	Fleurey	SINTEF
HTML5Apps	Daniel	Dardailler	World Wide Web Consortium
LEADS	Anja	Strunk	AoTerra GmbH
MIDAS	Libero	Maesano	Simple Engineering France sarl
MODAClouds	Elisabetta	Di Nitto	Politecnico di Milano
MODAClouds	Dana	Petcu	Institute e-Austria Timisoara (IeAT) & West University of Timisoara (UVT)
MONDO	Salvador	Trujillo	IKERLAN Research Centre
Mosaic	Beniamino	Di Martino	Second University of Naples
OCEAN	Yury	Glikman	Fraunhofer FOKUS
OPENi	Sinead	Quealy	Waterford Institute of Technology
ORBIT	Andreas	Menychtas	National Technical University of Athens (NTUA)
ORBIT	Andreas	Menychtas	ICCS/NTUA
OSSMETER & MONDO	Dimitris	Kolovos	University of York
OSSMETER & MONDO	Nicholas	Matragkas	University of York
PaaSage	Pierre	Guisset	ERCIM
PaaSage	Lutz	Schubert	IOMI, University of Ulm
PaaSage	Bastian	Koller	High Performance Computing Center Stuttgart
Paasage	Michael	Gienger	High Performance Computing Center Stuttgart
PANACEA	Dimiter	Avresky	International Research Institute for Autonomic Network Computing - IRIANC
PROSE	Amanda	Brock	Origin Ltd
PROSE	Alfredo	Matos	Caixa Mágica Software
PROSE	Alfredo	Matos	Caixa Mágica Software
PROSE	Rui	Ferreira	Instituto de Telecomunicações
PROSE	Miguel	Ponce de Leon	TSSG - Waterford Institute of Technology
PROSE	Rui	Aguiar	Instituto de Telecomunicações
PROSE & SUCRE	Sven Holger	Meintel	MFG Innovation Agency for ICT and Media Baden-Württemberg
PROSE & SUCRE	Stephanie	Podlewski	MFG Medien- und Filmgesellschaft Baden-Württemberg mbH
RISCOSS	David	Ameller	Universitat Politècnica de Catalunya
RISCOSS	Angelo	Susi	Fondazione Bruno Kessler
S-CASE & ClouT	Isabel	Matranga	Engineering Ingegneria Informatica SpA
SOCIETIES	Bruno	Jean-Bart	TRIALOG
SOCIETIES	Micheal	Crotty	TSSG, Waterford Institute of Technology
STORM CLOUDS	Agustin	González-Quel	Ariadna S.I.
SUCRE	Eleni	Toli	University of Athens
SyncFree	Marc	Shapiro	INRIA & LIP6
SyncFree	Tyler	Crain	INRIA
U-QASAR	Aitor	Elorriga	INNOPOLE, S.L.
Virgo	Lombardo	Salvatore	Infratel Italia Spa, Rome
VIRGO	MARINA	VARVESI	INFRADEL ITALIA
Virgo	Ciarlo	Marisa	Infratel Italia Spa
-	Francisco	Medeiros	European Commission
-	Ken	Ducatel	European Commission
-	Dan	Mihai Chirila	European Commission
-	Wolfgang	Ziegler	Fraunhofer SCAI
-	Mario	Scillia	European Commission
-	Augusto	Burgueño Arjona	DG CNECT - European Commission
-	Abdellatif	Benjelloun Touimi	Huawei Technologies (UK) Co., Ltd.

6 Annex 3 - Concertation @ www.cloudwatchHUB.eu



The screenshot shows the CloudWatchHUB homepage. The main navigation bar includes 'About', 'News', 'Events', 'Success Stories', 'European Excellence', 'Jobs', 'Press Kit', and 'Concertation Meeting'. A central banner features the 'PROSE' logo with the text 'Promoting Open Source in European Projects' and a 'Read more' button. Below the banner are several smaller promotional tiles for 'Cloud Legal Tips', 'Accelerating the use of cloud computing', 'Promote your Open Cloud', '8 reasons to join the CloudWatchHUB.com', 'Why use the cloud? The case for research', and 'How to use the cloud? Spotlight on research'.

Homepage focussing on Concertation meeting & PROSE to promote open



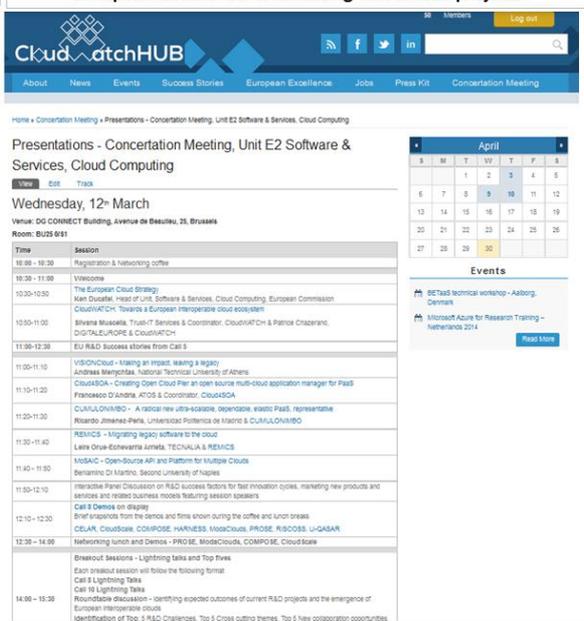
The screenshot shows the 'European Excellence' page on CloudWatchHUB. It features a calendar for April and several project highlights: 'ARTIST - Advanced software-based service provisioning and migration of legacy software', 'ASCETIC - Adapting service life-cycle towards efficient clouds', 'BETAaaS - Building the environment for the Things as a Service', and 'BIGFOOT - Big data analytics for digital footprints'. Each project includes a brief description and the name of its coordinator.

European Excellence -showcasing Call 8 & 10 projects



The screenshot shows the 'Demos' page on CloudWatchHUB. It lists several demonstration projects: 'U-QASAR - Universal quality assurance and control services for internet applications with volatile requirements and contexts', 'RISCOSS - Managing risks and costs in open source software adoption', 'PROSE - Promoting open source in European projects', and 'MODAClouds - Model-Driven Approach for design and execution of applications on multiple clouds'. Each entry includes a brief description and a 'Read more' button. A calendar for April is visible on the right side of the page.

Demos at Concertation meeting



The screenshot shows the 'Concertation agenda & presentations' page on CloudWatchHUB. It features a detailed agenda for Wednesday, 12th March, starting with registration and networking at 10:00. The agenda includes sessions for 'The European Cloud Strategy', 'CloudWatchHUB - Towards a European interoperable cloud ecosystem', 'EU R&D success stories from Call 5', 'VISIONCloud - Making an impact, making a legacy', 'CloudSOA - Creating Open Cloud Plan an open source multi-cloud application manager for PaaS', 'CUNIA/DONARBO - A tactical new ultra-scalable, dependable, elastic PaaS', 'REINVO - Integrating legacy software to the cloud', 'INSAC - Open-Source API and Platform for Multiple Clouds', 'Interactive Panel Discussion on R&D success factors for fast innovation cycles, marketing new products and services and related business models featuring session sponsors', 'Call 5 Demos on display', 'Brief snapshots from the demos and films shown during the coffee and lunch breaks', 'Call 8 Lightning Talks', 'Roundtable discussion - identifying expected outcomes of current R&D projects and the emergence of European interoperable clouds', and 'Breakout sessions - Lightning talks and Top Three'. A calendar for April is also visible on the right side of the page.

Concertation agenda & presentations