European Commission

Software & Services, Cloud Computing Concertation Meeting

Shaping Europe's future for software, services and cloud

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This document gives an overview of the results emerging from the second Concertation meeting for the unit Software Services and Cloud computing which was organised by the CloudWATCH project. The document highlights the main outcomes of the event including recommendations for the H2020 LEIT ICT Work Programme 2016 -2017. The document also highlights clustering and collaboration by Call 8 and Call 10 projects.

About CloudWATCH

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.

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Disclaimer

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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.

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Executive Summary

The 2nd Concertation Meeting explored themes for LEIT 2016-2017 Programme through keynotes and break-out sessions dedicated to cloud computing research, software engineering and open source research.

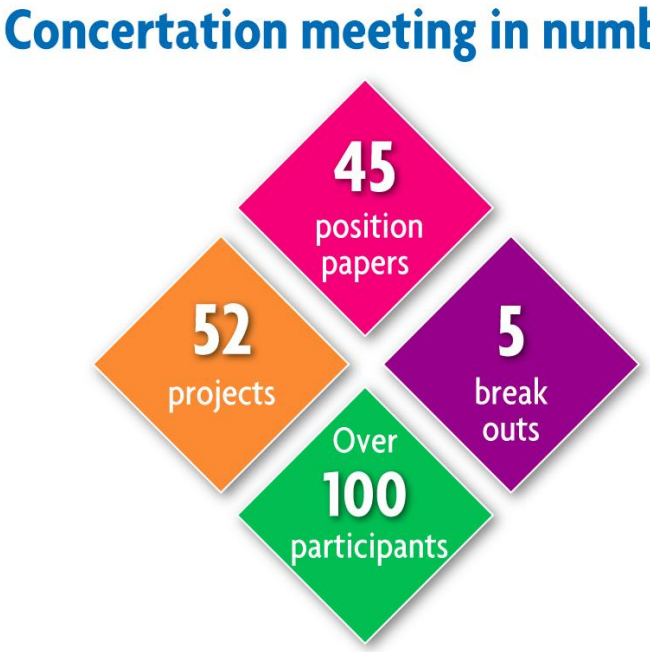

Figure 1 Concertation meeting in numbers

45 Position papers from participating projects	http://www.cloudwatchhub.eu/concertation-position-papers# http://www.cloudwatchhub.eu/sites/default/files/ConcertationMeeting_Sept2014_PostitionPapers_final_web.pdf
All presentations from the event	http://www.cloudwatchhub.eu/shaping-preparing-h2020-leit-ict-wp2016-2017-making-your-views-matter
Overview of all participating projects	http://www.cloudwatchhub.eu/showcasing-european-excellence

Table 1 Documents and related website contents

Creating a better cloud environment in Europe and building trust

The value of the cloud lies in developing new applications and the agility that comes with that. Cloud computing provides speed to market for businesses. The future is being able to manage diverse platforms. Businesses should not be told that they have to move onto a certain platform. Businesses

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should be helped to make informed decisions on how to manage diverse platforms. Mobile and social networks are driving this change, drastically shortening the time it takes to develop applications.

There are three core principles for this change towards dynamic cloud.

- Potentially disparate cloud offerings should act as one dynamically managed, secure environment.
- Flexible choice of delivery models.
- Interoperable delivery models through standards.

Priorities set by the European Commission for a trusted cloud in Europe cover best practices to consensus building. The move from formal to functional requirements as regards data location entails identifying what the users need exactly. It is important to identify user functional requirements based on data type and where it should be located. For example, certain data sets regarding eHealth, may have to remain in the country of origin whilst other data can be kept in a global cloud environment. Equal data sovereignty for providers: a competitive market place should be established based on trust and security provided.

Main conclusions from the interactive discussions

- Open source is the best vehicle for re-use and sharing results. Projects should not build everything but rather identify a small piece and focus all development efforts on this. Such an approach will lead to a decent set of software that people want to re-use or that is directly applicable to something else. High quality software is an important goal.
- Open source accelerates technology transfer and provides visibility to software fostering high quality software. High quality software not only means better uptake but also publication of results.
- Clustering can help in promoting usability and re-use. One approach could be to establish a set of consistent projects that work together on topics such as reference architecture. The projects should share work with outputs being consistent.
- It is important to note that there is no simple solution to re-use. Re-use depends on the motivation of individuals to drive potential re-use of software they have developed. New software needs to be pushed, marketed and put out to market for uptake. This requires full dedication and drive of individuals. The amount of effort this requires is often out of the scope of projects and needs to be picked up by individuals.
- It is important to support activities focused on maintaining and selling results. The projects that emerge from 2016-2017 will finish around 2020. Analysing the context and landscape within which projects will have to re-use, cluster or sell results should be a priority.
- More support to address misidentified opportunities. Research projects should identify good products and good markets if products are to have success in what is a competitive market.

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Construction, healthcare and banking are all markets that should be targeted as they have long tails of missed opportunities for SMEs.

- Focus not only of disruptive innovation, but also structural and evolutionary innovation.
- Research priorities should be forward looking and address areas that have not yet been on the radar, as well as improving on software and service development available but not mature enough or not sufficiently well-defined to respond to specific needs. It is important not only to build on successful developments but also on less successful ones, so they can be improved. Project officers and reviewers have a crucial role to play in that they have a clear understanding of prototypes that are functioning correctly. This could be an important channel for establishing an incremental effort to fix issues.
- A CSA on open source could play a key role in facilitating further clustering around common themes. It should set out a clear roadmap towards the foundation for the successful development and commercialisation of software and services. This would include an Open Source expert group and practical guidance on exploitation and sustainability.
- Complex security issues are commonly recognised. Monitoring: Potential tension lies in striking a balance between the levels of security that can be guaranteed and the compromise with data protection compliance. The EU legs behind on encryption. Definition of different personas is key for access from multiple devices and multiple clouds with a single set of identities and passwords.
- A CSA with a focus on security issues could promote a broad plan to raise awareness on privacy and security issues for both businesses and the general public. This would require analyses on the security landscape, e.g., including current and new project outcomes and with reference to the outputs of the C-SIGs and experts involved in supporting the European Cloud Strategy, and a strategic agenda on awareness raising.
- A CSA to promote clustering between projects and collaboration activities such as Concertation meetings which act as important support to establishing synergies between projects.

Summary of themes identified for LEIT 2016-2017.

Cloud computing: Summary of main findings

Recommendations for Work Programme	Increasing automation in both application deployment and operation of data centres running cloud platforms. The integration of physical hardware with virtualisation. Increase the understanding of the impact of various hardware properties on application performance and energy consumption.
Why this is a	Five main priorities

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priority	**Trust:** Enable increasing cloud adoption. **Disruptive Applications and usage patterns:** Drive the changes beyond resource sharing services, disparate data sources and sinks (IoT[1], Mobile, Gaming, data science ...) getting people to interact in any ways, e.g. Social networks, social interaction. **Dynamic real-time Heterogeneous clouds:** Hybrid, multi, federated, portability of data and applications. **Cloud Operations:** Providing large scale cloud is still restricted to small number of players. **Business models:** Engagement of new users.
What technological innovation is required	**Trust:** Automation and high-level tools for user guidance, tradeoffs between security and privacy/perf (client/host); Real-time threat analysis and presentation, accountability, dynamic/usable certification, data IPR **Disruptive Applications and usage patterns:** Customization, self-adaptation, responsiveness (highly), self, application driven cloud management (sensitivity), interoperability. **Dynamic real-time Hetergeneous clouds:** Dedicated design patterns, application deployment and management; data management and dependability; policy - based regulatory compliance; programming models and software engineering. **Cloud Operations:** Datacentre relevant customisation, self-adaptation, (highly), self, automation, equipment interoperability, monitoring, energy efficiency, responsibility **Business models:** Not only technology but models and processes to apply new apps and deliver new services.
Impact on market	Increased market growth and jobs through enhanced enabling power. More choice, better competition, clear gain for small players and engagement with new cloud consumers. Simplifying provision of cloud services, multiple layers from the same provider. Engagement with new cloud consumers (EU + local).
Main beneficiaries	All stakeholders can benefit from these recommendations. In particular, SMEs and public administrations in reference to dynamic real-time heterogeneous clouds. Provision of large-scale cloud will give consumers [users of cloud] more choice; and providers simplification and cost reduction of operations.

Table 2 Cloud computing: Summary of main findings

Software Engineering: Summary of main findings

Recommendations for Work Programme	Increasing automation in both application deployment and operation of data centres running cloud platforms. The integration of physical hardware with virtualisation. Increase the understanding of the impact of various hardware properties on application performance and energy consumption. Software Engineering principles with a focus on Communication, Sharing and Distribution.
Why this is a priority	Programming and software engineering is geared towards a traditional model of local, non-shared execution which generates an increasing amount of cost and effort to develop efficient software meeting the cloud requirements (sharing, distribution etc.). Lack of decision support for developers in selecting the right path in development choices. Importance of fostering re-use and other "n-bilities". Reducing the cost of making the "n-bilities" decision and trade-offs. Software is not currently context-aware. Supporting decisions at run-time. Lack of control of execution environment.
What technological innovation is	A whole new software engineering principle meeting the whole lifecycle of applications in the cloud – including models, metrics, design and testing patterns, as well as tools

[1] Internet of Things

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required	
Impact on market	Easier and cost-effective software development, operation and maintenance. Reduce risk in SW development decisions that meets the requirements for availability, resource utilisation, quality of service etc. Broader offering since it is not coupled anymore to infrastructure. The ultimate goal is to foster the development of a new paradigm for software engineering in Europe.
Main beneficiaries	End-users, software developers, service providers, SW developer companies or technology companies depending on the challenge.

Table 3 Software Engineering: Summary of main findings

Open source research: Summary of main findings

Recommendations for Work Programme	Foundation for successful SW development and uptake. Licensing. Sustainability and exploitation. Community Engagement (sustainability & exploitation). Productisation and adoption. Quality and Risk Assurance. Procurement. Software Patents.
Why this is a priority	**Foundation**: Need to attract interest and promote sustainability and exploitation (based on specific opportunities identified); need for curated, stable and evaluated projects. **Licensing**: Overcome complex interconnections with the business and exploitation. **Sustainability and exploitation:** Improve RoI for SW projects through 'go-to-market strategies"; overcome IPR issues. **Community engagement**: Strategies to identify and gain interest of target groups. **Productisation and adoption**: Focused development of quality software. **Quality and Risk Assurance**: Quality metrics for adoption and procurement; governance and responsibility (ownership, maintenance and support). **Procurement**: Helping stakeholders find and use quality software. **Software patents**: Overcome obstacles to uptake of results.
What technological innovation is required	Repository; marketplace; dashboard. Simpler frameworks and licences; interaction impacts between licences. Tools (e.g. software forge); recommendations on previous projects and related information; foundation; support tools and focussed CSAs; roles for managing software; metrics; centralised tools for evaluation; Cloud tools that support assessments; development hubs and curated project repositories; ratings and methodologies; policy and awareness on SW patents.
Impact on market	Facilitating access to quality curated projects coming from EU projects with improved exploitation and greater impact through SME uptake. Increased opportunities for market reach and improved efficiency. Quality "production" grade software, adoption is facilitated (e.g. Public Admin, SMEs); better go-to-market strategies. Simplified access and increased re-use.
Main beneficiaries	Open source community, SME software companies, public sector with open source policy.

Table 4 Open source research: Summary of main findings

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1 Shaping Europe's future for software, Services & cloud

The 2nd Concertation Meeting was hosted by the Software & Services, Cloud Computing, DG Connect. The objective of the meeting was to contribute to the preparation of the H2020 LEIT ICT WP2016 -2017 in the area of cloud computing and software & services.

1.1 Preparation for the H2020 WP 2016-2017

As the figure below the process to establish the Work Programme has started with, both internal and public consultation already underway. Francisco Medeiros, Acting Head of Unit, Unit E2 Software & Services, Cloud Computing, DG CONNECT, European Commission, explained that the outcome of the Concertation meeting will feed into this process in order to establish what existing projects would like to see in the Work Programme.

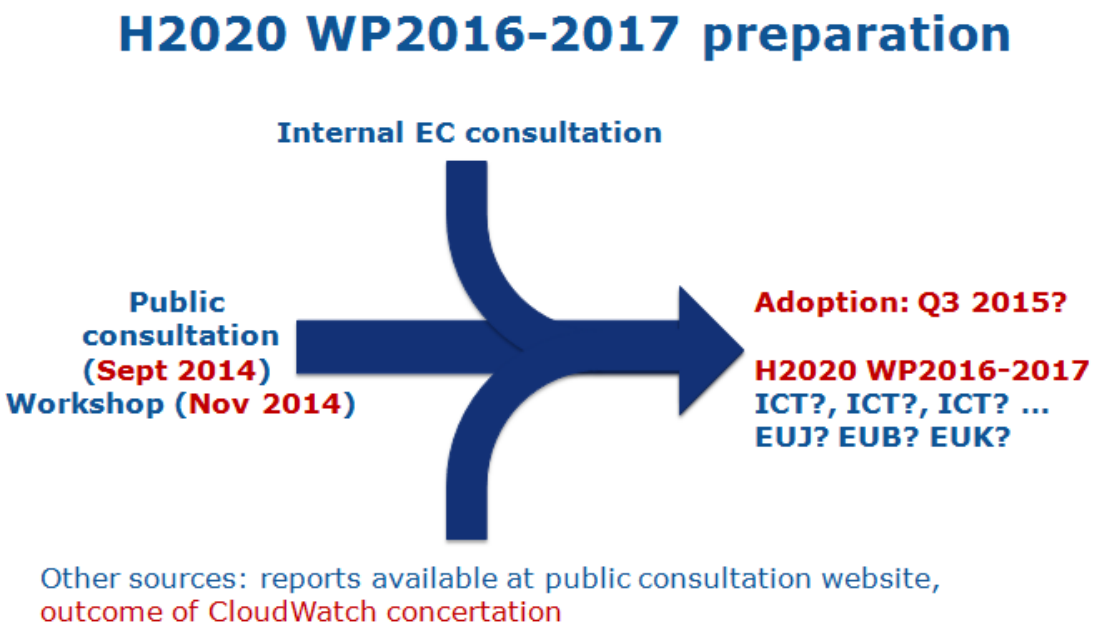

Figure 2 H2020 WP 2016-2017 preparation

Based on these outcomes, the Work Programme will go through a series of internal procedures before the 2016-17 calls are published in the 4th quarter of 2015.

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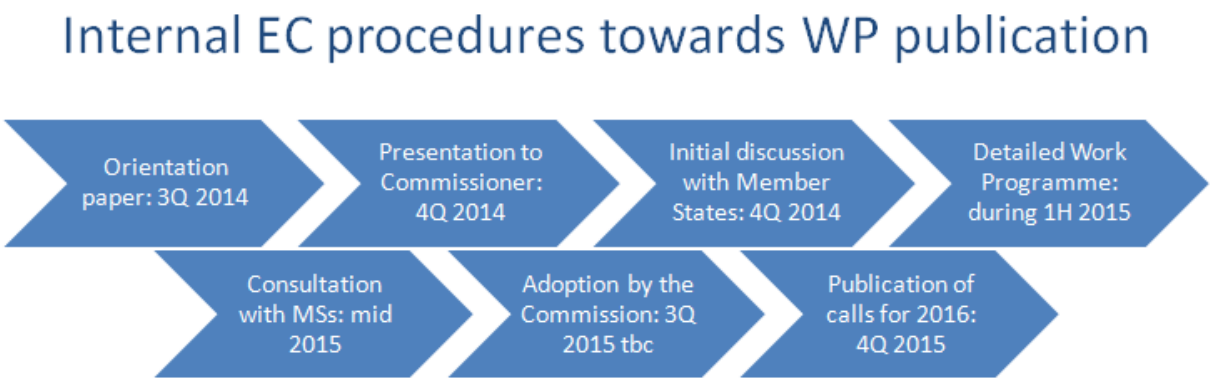

Figure 3 Internal EC procedures towards WP publication

The major outputs from the previous Concertation meeting back in March highlighted the importance of clustering & convergence between projects. This can ensure European leadership and provide a European market landscape of products, services and applications. The fruits of that meeting show in the position papers which describe clear, promising & tangible relations between a number of related projects.

A total of 45 position papers were provided by projects participating at the event and identified a set of recommendations to work from during the meeting.

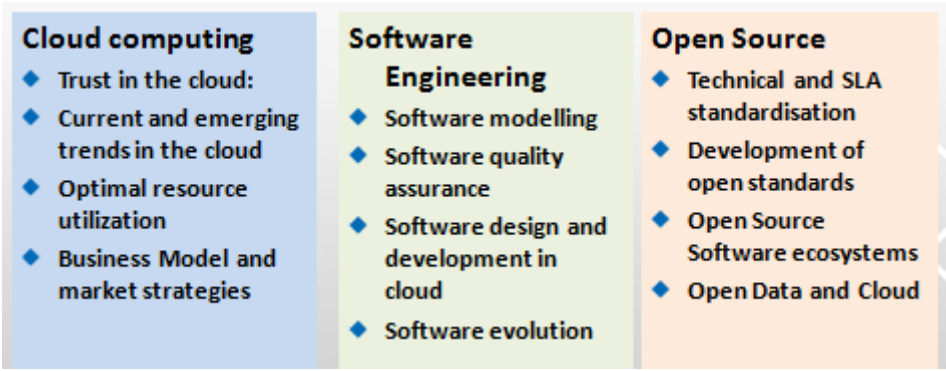

Figure 4 Recommendations emerging from the position papers

Through five break-out groups divided into three separate themes (cloud computing research, software engineering research and open source research) participants expanded on these points to establish a set of forward-looking recommendations for the WP 2016-2017. These are outlined in the sections below. Furthermore, representatives from NESSI (Valère Robin, Orange Labs Product and Services) and the Cloud Industry Select Group (Jonathan Sage, IBM Governmental Programmes) also provided key input into defining the recommendations that emerge in this report.

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2 Creating trust and perspectives from industry

2.1 Creating a trusted Europe

Cloud computing can bring real value to business and growth in Europe. The true value of the cloud is in the agility that it provides users in creating new applications and delivering them to the market quickly and efficiently. In simple terms cloud computing provides speed to market for businesses.

The future is changing and more and more businesses do not want to be told that they have to move onto a certain cloud platform. Instead, businesses should be helped to make informed decision on how to manage diverse platforms to their advantage. Mobile and social networks are driving this change and thus drastically shortening the time it takes to develop applications.

There are three core principles for this change towards dynamic cloud.

- Potentially disparate cloud offerings should act as one dynamically managed, secure environment
- Flexible choice of delivery models
- Interoperable delivery models through standards

2.1.1 Creating a better cloud environment in Europe

The European Commission has established three Cloud Select Industry Groups (C-SIG) on three key issues in order to establish a better cloud environment in Europe. The following section gives a brief update on each group.

The C-SIG on Certification Schemes: The C-SIG and ENISA are now developing a meta-model which will allow users can identify needs, applicable certification schemes and applicable standards.

The C-SIG on Code of conduct: Privacy is one of the key problems identified by users. The current data production legislation, directive 95/46/EC does not fit well with cloud computing as it is based on pre-cloud computing principles. The code of conduct will establish a voluntary code which is compliant with directive 95/46/EC. This is currently being developed with the Article 29 Working Party and the European Commission and may be complete by the end of 2014. If approved, Cloud service providers would state their adherence to the principles of the code and would be recognized as being compliant with data privacy and become a “trusted” cloud provider.

The C-SIG on Service Level Agreements: The group have recognized that consumer cloud and enterprise cloud differ. Consumer cloud services are very customized with little flexibility for customers. Enterprise clouds on the other hand, have a great deal of adherence to end-user needs. Guidance, such as check-lists are required for end users so that they can understand what can be found in a typical SLA.

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Priorities to consider for a Trusted cloud in Europe.

The European Commission have identified a key set of areas which should be priorities in future research programmes as illustrated below.

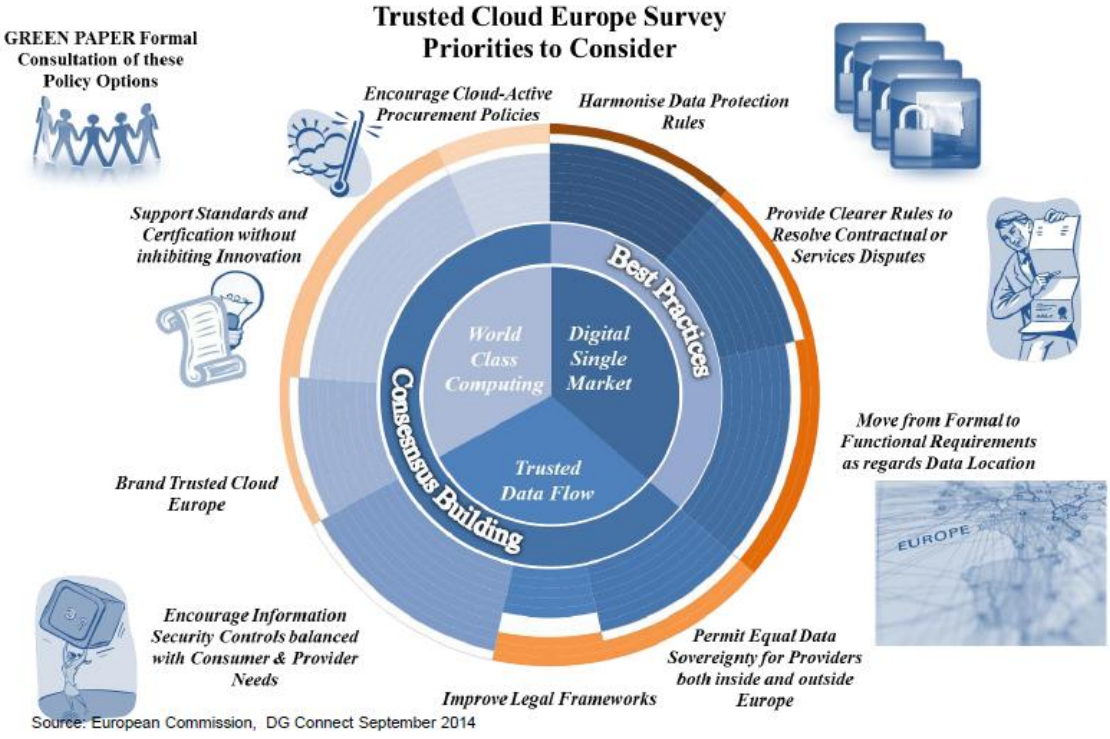

Figure 5 Trusted Cloud Europe survey: Priorities to consider

2.2 NESSI: Cloud computing research and Innovation

Services will drive the world industry and society and will be the focus of industry members. Sound infrastructures are required if good services are to be developed which meet society's needs.

2.2.1 Recommendations for the 2016-2017 Work Programme

NESSI has identified the following areas that should be included in the next WP. Three are currently in the ICT 7 programme.

Recommendation	Sub-topics
Cloud federation and cooperation (ICT 7 Federated cloud networking)	◆ Independence with regard to cloud providers (public cloud) or technology providers (private cloud). ◆ Facilitating management and automation in hybrid use cases. ◆ Off-loading and migration support for data and services.
Service discovery and composition (ICT7 2014)	◆ Reduce the cost and delays to develop services (internally or within sectorial ecosystems). ◆ Automation of interoperability or of integration of legacy.

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Cloud Security	◆ Trust in infrastructures and services (integrity, confidentiality, privacy), location of data and processes. ◆ Transparency, compliance, certification. ◆ Secure-by-design systems. ◆ Traceability between requirements and implementations.
Cloud interworking with networks, IoT, CPS clouds at the core of complex architectures	◆ Services spanning cloud and heterogeneous systems (dedicated architectures, multiple devices). ◆ Cooperation of multi-layer autonomic system (cloud, core network, edge networks, applications). ◆ Dedicated IaaS or PaaS for specific domains. ◆ Network control for efficiency and reliability (network virtualisation, SDN, NaaS). ◆ Access to local and global contexts.
Cloud for critical large scale information systems: clouds at the core of interoperating information systems	◆ Fully distributed computing and data with sound design patterns. ◆ Automation of deployment and management of services and applications. ◆ Seamless and consistent management of the cloud stack.
Programming models for clouds : the cloud is the computer	◆ Languages or frameworks with distribution, resilience, parallelism, events built-in. ◆ High level abstractions and API, integrated in PaaS. ◆ DSL for cloud management and sectorial PaaS or SaaS.
Evolution of cloud architectures: keeping the cloud components up-to-date	◆ Evolution of the current stack (IaaS/PaaS/SaaS). ◆ Optimised hardware abstractions and low level resources management. ◆ Built-in energy efficiency control and optimisation. ◆ Co-evolution of databases and cloud computing.
Innovation & appropriation	◆ Standardisation: projects should apply standards so that at project end, results are compliant with state of the art industry. ◆ Education: Input is required for engineers, decision makers and all types of end-users so that they know what to expect from cloud computing. ◆ Organisations: Awareness of impact of cloud on dynamics of organizations. ◆ Market places: The economy of the future will be based on services that are exchanged in dedicated ecosystems. The link between technology and market enablers must be addressed.

Table 5 NESSI recommendations for the WP2016-2017

2.3 Increasing the competitiveness of European SMEs[2]

The European SME landscape of SMEs is very diverse and has very different needs in terms of IT and support. A "one-size-fits-all" is not a feasible option and cloud solutions need to be adapted to the specific needs of SMEs.

[2] Session contributors: Patrice Chezerand, DigitalEurope & CloudWATCH; Vladimir Bataev, EsperantoXL & MobiCloud; Dalibor Baškovč, EuroCloud & Cloud Catalyst; Luc Hendrickx, UEAPME & Clouding SMEs; Filip Gluszak, GridPocket & BigFoot

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- Of the 22 million SMEs in Europe provide three quarters of employment in Europe.
- 50% are one-person companies.
- 90% are small and micro-enterprises.
- The average enterprise in Europe has 5-6 employers.
- SMEs in Europe tend to be conservative when it comes to adopting new technologies.

Uncertainty over trust and security of cloud computing is a concern for businesses, large and small. SMEs are particularly keen to operate on safe grounds. What may be a small risk challenge for a large corporation, smaller firms are much more wary about taking risks for fear of going out of business.

"Security should be defined broadly, meaning not only technical security but including all aspects of security in the contract, with appropriate links to data protection. The contract is an appropriate vehicle to clarify the security obligation of the provider according to data protection law."[3] Expert group meeting on cloud computing contracts synthesis

Indeed, beyond cost-cutting, one of the beauties of the cloud in the eyes of small businesses is to allow them to match the computing resources of big players at will. Motivations for SMEs and start-ups moving to the cloud are similar: greater scalability, higher availability, faster access to infrastructure and faster time-to-market[4] Cloud computing also makes it easier for SMEs to build new products on cloud-based platforms as they facilitate distribution and deployment. Cloud makes web-entrepreneurship and IT SMEs very easy to start-up as most tooling is already in the cloud.

Barriers for SMEs and start-ups moving their data to the cloud are also similar: security, contracts and vendor lock-in, lack of awareness and data availability. Implications of potential conflict or bankruptcy of cloud providers also concern SMEs. 90% of European firms do not have legal departments therefore the implications of compliance issues can be huge.

2.3.1 Recommendations for the 2016-2017 Work Programme

- Tools such as the European Cloud Scout are initiating a move in Europe to raise awareness on security issues for SMEs. The Work Programme 2016-2017 should include provision of neutral targeted and tailored information and toolboxes to raise awareness among SMEs and start-ups on these issues and foster greater trust and transparency in the cloud.
- Open calls should be established for innovative ICT SMEs to implement and deliver cloud innovations for specific niche markets.
- 50% of new businesses fail in the first five years and most products fail in the first year. This is due to either misidentified opportunities or troublesome execution. The current Work Programme already addresses issues with execution such as finance, mentoring, entrepreneurship, academies & labs, Business idea contests. The 2016-2017 Work Programme should address support SMEs to address misidentified opportunities. Research projects should identify good products and good markets if products are to have success in what is a competitive market. Construction, healthcare and banking are all markets that should be targeted as they have long tails of missed opportunities for SMEs.

[3] http://ec.europa.eu/justice/contract/files/expert_groups/5_6_march_meeting__synthesis_final_en.pdf
[4] CloudCatalyst Preliminary Market Trends report 2014

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- The Work Programme should also encourage not only disruptive innovation, but also structural and evolutionary innovation.
- Further research into privacy by design is required. With deployment of IoT and cloud and future internet becoming more and more part of our daily lives, there is likely to be more and more resistance from end-users on issues of privacy and security in IoT.

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3 Project break out reports

3.1 Cloud Computing Research

Break-out Group A - Chair: Jörg Domaschka, University Ulm & CACTOS

Participants:

Family Name	First Name	Project
Accardo	Lorenzo	CloudingSMEs
Avresky	Dimiter	Panacea
Baškovč	Dalibor	CloudCatalyst
Brogi	Antonio	SEACLOUDS
Catteddu	Daniele	CloudWATCH
Crain	Tyler	SyncFree
Di Bernardo	Roberto	CLIPS
Domaschka	Jörg	CACTOS
Fabriani	Paolo	ClouT
Gienger	Michael	PaaSage
Hamadache	Kahina	Broker@Cloud
Jimenez-Peris	Ricardo	CoherentPaaS
Koziol	Katarzyna	CloudWATCH
marasso	Ianfranco	CLIPS
Modafferi	Stefano	SERSCIS
Petcu	Dana	MODAClouds
Podlewski	Stephanie	PROSE
Ponsard	Christophe	ASCETIC
Robin	Valère	NESSI
Sajeva	Giuseppe	ClouT, OCEAN, Artist
Spanoudakis	Georgios	CUMULUS
Thiran	Philippe	-
Wallom	David	CloudWATCH

Table 6 Cloud computing break-out group A

Break-out Group B - Chair: Karim Djemame, University of Leeds & ASCETIC

Participants:

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Family Name	First Name	Project
Asero	Carmela	CIRRUS & CloudWatchHub
Barreto	Oliver	MODAClouds
Bataev	Vladimir	MobiCloud
Castro	Laura M.	PROWESS
Chazerand	Patrice	CloudWATCH
Djemame	Karim	ASCETiC
Drescher	Michel	CloudWATCH
Ferreira	Rui	PROSE
González-Quel	Agustin	STORM CLOUDS
Hendrickx	Luc	Clouding SMEs
Konstantinou	Ioannis	CELAR
Massonet	Philippe	PaaSage
Pantazoglou	Michael	SUCRE
Plebani	Pierluigi	ECO2Clouds
Ponce de Leon	Miguel	PROSE
Rak	Massimiliano	SPECS
Strick	Linda	Cloud for Europe
Trujillo	Salvador	MONDO
WAHA	Stéphane Jules Yves G	PaaSage
Wallom	David	CloudWATCH
Wolf	Alexander	HARNESS
Jacinta	Townley	GENIC

Table 7 Cloud computing break-out group A

The sub-groups in the breakout session consisted of ~50% technical persons and ~50% exploitation-oriented persons. Indeed, the exploitation managers of multiple FP7 projects participated. There was agreement among participants that cloud research will not need a radical change of direction. Instead, a continuation of existing work was suggested. In particular, many niche topics were identified where the current state of the art is not sufficient and needs to be improved.

The group recommended that future research should focus on the followingOther overall conclusions of the breakout session identified:

Future research should focus on the following areas:

***Increasing automation in both application deployment and operation of data centres running cloud platforms**. This includes the run-time adaption of applications and data centres, but also the automatic application of existing security mechanisms. Future research should not repeat the errors of the 80's and 90's and strive for artificial intelligence and 'magic' adaption.*

***The integration of physical hardware with virtualisation has to be increased**. Underused potential is seen in two areas:*

(a) the network-infrastructure so far only provides very coarse grained mechanisms to adapt to the distribution of 'virtualised' resources such as, but not limited to, virtual machines.

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(b) The lack of comparability of cloud offerings in particular with respect to performance (performance-wise a dual core CPU with 8GB of memory on one provider may not be identical to the same configuration on another provider as the underlying hardware properties are different) is hindering user adoption and the formation of a true cloud market.

Increase the understanding of the ***impact of various hardware properties on application performance and energy consumption****.*

3.1.1 Recommendations for the 2016-2017 Work Programme

The considerations above can be distilled into 5 high-level research topics that shall be discussed individually in the following.

3.1.2 Trust

As identified at the previous Concertation meeting, lack of trust is a barrier to the adoption of cloud computing[5]. The recent leaking of intelligence activity in Europe has further increase the lack of trust. Research can address this issue on several levels:

(i) **Usability:** Currently, the security capabilities of cloud offerings are accessible only to security experts. In particular, the impact of various configuration options on the overall security/trust of a distributed application is hard to figure out for average DevOps. Also, the trade-off between security and privacy on the one hand and performance aspects on the other hand is widely unclear. **Automation and high-level tools for user guidance are desirable**.

(ii) **Feature set:** The set of features offered by cloud providers is not sufficient to satisfy all customer demands. In particular, every user has to surveil their virtual machines on their own. Here, the development of **real-time threat analysis with automated reaction** to threats and intrusions eases the life of cloud users and strengthens trust in cloud operators. Similar to this, is the establishment of a **comprehensive accountability mechanism** capable of tracking access and changes to data.

In summary, while all of the required mechanisms are available on a mathematical basis and for many of them software exists that can be operated stand-alone, many mechanisms are still to be provided by cloud operators. These are also often cumbersome to set up or do not support the dynamics required by today's and even tomorrow's cloud applications. In assessing the monitoring of systems, it's also important to strike a balance between levels of security that can be guaranteed and data protection compliance.

3.1.3 Disruptive Applications and Usage Patterns

Cloud computing emerged from the opportunity to open major distributed datacenters to end users to provide on-demand services, ranging from infrastructure as a service (IaaS) to software as a service (SaaS). **Emerging paradigms and technologies** (big data, the Internet of Things (IoT), social networks, personalized medicine) are having a major impact on society and industry. However, these trends

[5] CloudWATCH D3.2 EU Interoperable cloud services & solutions report

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usually have different requirements, e.g. from the perspective of Quality of Service (QoS). Also, driven by requirements in many application domains, **data and service mobility** lie among the most important challenges that need to be tackled. Such intercontinental-scale mobilisation of software and data entails both technical and policy issues.

Key challenges to be addressed: A new vision of how the future cloud should be to support these applications is therefore needed. The changes must be driven beyond resource sharing services (IoT, Mobile, Gaming, data science ...) getting people to interact in any ways, e.g. Social network and social interaction. Some of the key challenges to be addressed include **customization, self-adaptation, responsiveness (highly), self*, application driven cloud management (sensitivity), and interoperability**.

3.1.4 Dynamic Real-time Heterogeneous Clouds

Commercial or governmental entities will increasingly operate multiple cloud data centres. They will do this for various reasons, including to 1) Lower network access latency; 2) Improve fault resilience; 3) Increase available resources, and 4) Adhere to jurisdictional regulations. Such **support of dynamic provisioning and interconnection of resources belonging to independent heterogeneous Cloud infrastructures** are issues that should become the focus of extensive joint research. While multiple data centres are operated today by many vendors of cloud services, they are treated as independent enterprises for which there is little or no support for flexibly and dynamically deploying or executing applications across them. This prevents the portability of applications and data.

Key challenges to be addressed: There is a need for fundamental research into how this can be accomplished, along the following lines:

1) **Dedicated design patterns**.

2) **Application deployment and management:** physical placement and run‐time adaptation.

3) **Data management and dependability:** consistency models that can trade resiliency against scalability.

4) **Policy-based regulatory compliance:** multiple domains, flexible security, guaranteed disposal.

5) **Programming models and software engineering:** annotations, architectures, tools, and environments for heterogeneous clouds.

3.1.5 Cloud Operations

Currently, the cloud market is still limited to a comparatively small set of big players. This is particularly true for IaaS (Infrastructure as a Service) offerings, but only slightly better for PaaS (Platform as a Service) offerings. The reason for this is that the operation of a cloud data centre requires a huge upfront investment that is dependent on financial, and human resources. While this investment is obvious for IaaS offerings, it is less visible for PaaS, as these can build on existing IaaS platforms. Nevertheless, after having grown to a particular size, operating PaaS on public IaaS platforms can become too expensive and the infrastructure has to be in-housed by the operator.

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While future research can barely reduce the investments that have to be made with respect to hardware, it can help to reduce the dependency on highly skilled and educated personal for operating by providing the right tools that enable the necessary degree of automation. At the same time, the same tools can be used to lower the energy consumption, hence lowering the CO2 footprint, and also operation costs. Having such mechanisms available reduces the investments required to operate a cloud data centre which enables a simplified provisioning of cloud offerings and fosters the growth of a dynamic cloud market.

Key challenges to be addressed: Cloud operation and data centre require customisation of data centre functionality and policies. In particular, more automation is needed for self-adaptation including the resilience of individual software components, and strategies to deal with disasters. Here we also expect a huge impact of programming models.

In order to enable this sort of adaptation capabilities, the **monitoring of cloud and hardware platforms has to be simplified**. A **standardisation of monitoring data and monitoring sources** are key to decouple the gathering of monitoring data from their processing and consequently to avoid reinventing the wheel as it has been done several times in the past. This addressed interoperability is further key on all levels of the operation: steering of physical equipment, of virtual machines (through hypervisors), cloud operation software, or even network equipment. Only this interoperability ensures the re-usability of automation policies.

3.1.6 Business Models

On the economic side, the paradigm change brought by the cloud induces new business models, empowering small and medium-sized companies, as well as individuals, to operate worldwide businesses. These new business models, coupled with the opportunities of community funding, allow anyone to have a major impact. By engaging new cloud users, the innovation will not only be technological but will also include the emergence of new models and processes to apply new applications and deliver new services.

3.1.7 Impact of Open Source Software

While the existence of the respective tools alone will ease the start of new cloud offerings only the availability will lead to the necessary flexibility required to achieve a diversification of these offerings. Nevertheless, open source software should not be considered a silver bullet. Instead, additional further properties have to be fulfilled by the software in order to ensure an instant uptake and re-use:

- The software has to be well documented. This not only refers to the documentation of source code, but also includes the existence of tutorials, best practises, installation guidelines, etc.
- The primary purpose of the software has to be clear. In particular, software modules shall be available, accessible, and runnable independently from each other. Hence, documentation shall also be independent.
- Nevertheless, it should be made clear how the individual parts can be composed and play together.

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3.2 Sofware Engineering Research

Break-out Group A - Chair: Clara Pezuela, ATOS & ARTIST

Participants:

Family Name	First Name	Project
Brataas	Gunnar	CloudScale
Caithness	Neil	CloudWatch
Elorriaga	Aitor	U-QASAR
Fleurey	Franck	HEADS
Gluszak	Filip	BigFoot
Koller	Bastian	PaaSage
Koziol	Katarzyna	CloudWATCH
Kyriazis	Dimosthenis	ORBIT
Leon	Xavier	CloudSpaces
Massey	Beth	GENiC
Orue-Echevarria	Leire	ARTIST
Pezuela	Clara	ARTIST

Table 8 Software & Engineering break-out group A

Break-out Group B- Chair: Lutz Schubert, University of Ulm & PaaSage

Participants:

Family Name	First Name	Project
Chatzidimitriou	Kyriakos	S-Case
Deussen	Peter	CloudWATCH
Ferguson	Nicholas	CloudWATCH
Maesano	Libero	MIDAS
Manieri	Andrea	Artist
Meintel	Sven Holger	SUCRE
RIESTRA	Ruben	APARSEN
Riviere	Etienne	LEADS project
Salant	Eliot	CloudWave
Schubert	Lutz	PaaSage
Sobonski	Piotr	GENIC
Varvarigou	Theodora	ORBIT
Libero	Maesano	MIDAS

Table 9 Software & Engineering break-out group B

3.2.1 Main challenges

***The entire lifecycle of an application needs to be reassessed to meet the requirements of modern software execution environments, specifically the cloud*, its users and specific use cases.**

The advent of cloud computing has brought about new requirements for applications as it is no longer sufficient to treat an application as a single code instance that runs on an isolated machine with a

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single user and single, local data source. This approach however, is still the predominant design principle in all modern software that falls outside grid, service-oriented architecture and cloud computing.

During all phases of their lifetime, i.e. from design (engineering principles) over development to execution and runtime adaptation, new applications need to be capable of dealing with:

- Multiple users sharing data and resources.
- High distribution and partial replication of instances.
- Network and consistency induced delays.
- High heterogeneity of resources, software, users, devices etc.
- Dynamic usage conditions (number of users, instances, locations etc.)

The nature of cloud applications and their clear economic value means that any application developed and executed as such must allow for full controllability and for maintaining non-functional requirements as best as possible.

As a result, impact of design choices need to be better understood. Changes in behaviour and non-functional properties that arise from specific scaling behaviour and distribution of users must be foreseeable, i.e. the general usage context. This expertise and understanding needs to be encoded into the controllability of the application, reflected in the design principles etc. This also includes the impact from resource choices and their configuration, in particular as the degree of heterogeneous devices and things is increasing.

New software engineering principles and approaches: The new software engineering principles must be able to abstract away from the underlying environment in every respect, i.e. communication, resource heterogeneity, distribution etc. to allow development of applications that concentrate on the non-functional properties and are executable over a large scope of usage contexts (including resources etc.)

In the future, applications should no longer have to be designed on top of distributed infrastructures, enforcing distribution etc. onto the application, but as software directly designed for the cloud usage context. The primary goal should therefore be on ***defining the first generation of cloud-native applications.***

Any approach to defining future software engineering principles should thereby take the obvious next usage challenges over the internet / cloud into consideration, such as and in particular, concerns arising from **big data** and the **Internet of Things** (IoT). Whereas it is not up to software engineering to address, for example, specific algorithms for data mining, these nonetheless have specific requirements that impact on the design choices etc., such as communication needs, the degree of abstraction, form factors etc.

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3.2.2 Relevance of the challenges

The market relevance of cloud computing continues to increase. Future software will no longer be delivered via an installation medium (disk, DVD), and less and less as an installable package over the web, but **increasingly as a service directly over the web** [PWC14[6]], [COL12[7]], [JEF14[8]]. Software as a Service (SaaS) allows for the combination and re-usage of existing components and thus for increasing quality and richness of service offerings. With the specific capabilities of the cloud, resource utilisation can be increased considerably, thus increasing quality of experience (QoE) at low cost and reducing management overhead.

The increasing interest in cloud computing and SaaS is bringing about increasing pressure/customer, demand to provide cheap, immediately available, highly performant and interoperable applications accessible on any devices at anytime from anywhere. At the same time, the technological constraints are becoming increasingly difficult to overcome, first and foremost, insufficient bandwidth and high latency of all data access (cf. [JEF14]). This is leading to an ***exponential increase in effort and a reduction in benefit/return of investment.***

As a result, ***it is important to generate software that meets the new environment easily and at minimum cost to save investments***.

At the same time, ***more experience and expertise is needed to reduce the risk of wrong decisions and potential lock-ins as a consequence of this***. Given that the potential market value of a new cloud service is difficult to assess in the first instance, any unnecessary additional costs and uncertainties should be reduced. See also [SCH12a[9]], [SCH12b[10]], [JEF14].

3.2.3 Specific actions to be undertaken

Such a new software engineering paradigm cannot be developed within a single iteration and a single focussed research effort. Instead, this problem needs to be addressed through multiple sub-problems with a considerable set of obstacles.

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3.2.4 A roadmap towards a new software paradigm

The shift towards a new software paradigm requires a clearly defined roadmap as illustrated below.

Figure 6 A roadmap towards a new software paradigm

- **Data/communication-oriented programming model:** allowing the definition of dynamic behaviour, including scale, location distribution, consistency, sharing etc.
- **Mechanism to abstract away from the infrastructure and usage context**: to make applications and their development agnostic of the underlying environment
- **Software engineering principles**: for the development, migration and testing of completely cloud-oriented applications
- **Specify the mechanisms for adaptive execution and the impact on the overall behaviour**.

These objectives can roughly be aligned in form of a timeline based on dependencies and complexity.

Timeline 1 - Model-Driven Approaches and Data-Flow:
These are already being developed and trying to break down an application into a (modular) dependency model, which gives insight scaling behaviour, distribution, relationship to user etc. Impact on the non-functional properties at this time is mostly guess-work and constrained to specific, fully-defined problem cases.

Timeline 2 - Abstracting the Environment & Context:
Define methods to represent the full usage context and the infrastructure on which the distributed application is supposed to run. This includes the relationship between resource and service / model to identify the best distribution. This is underway but in itself a hard and long-lasting problem, especially because resources and application types change further.

Timeline 3 - Knowledge Development:
Knowledge and experience gained from the development and usage of the model-driven / data-flow approach will generate the necessary capabilities to identify the relationship between usage context, scaling behaviour and non-functional properties. This includes first design and testing patterns. This is already partially under way but not at a point where general statements could be made.

Timeline 4 - Decomposition and Composition of Services:
The modular approach and SOA primarily aims at distributing an application across a large scope

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distributed environment. Breaking an application into models and having them act separately implies breaking down (decomposing) properties, respectively combining them to identify the overarching properties. This is an intermediate step to breaking down functional *intentions* (i.e. abstracting over the application itself).

Timeline 5 - Abstracting the Intention:
Once the behaviour is known and controllable, as well as the impact understood, the actual programming model needs to be designed to re-design the complete way of specifying the operation and breaking them down to the actual models, their dependencies and their (combined) properties.

Timeline 5 - Design principles & Patterns:
With a new programming principle in place, the design principles and software engineering patterns need to be devised (including testing etc.) accordingly. This also includes the means for migration of existing legacy software.

Timeline 7 - Automation of Adaptation:
In parallel to the development steps above, the degree of adaptation of the application (including decomposition etc.) needs to be increased to the point where the abstract definition of the whole application is possible.

It is important to note that in this context, **many of these steps require more fundamental than iterative research and development in order to overcome the substantial problems inherent to the current software engineering principles**, i.e. to allow the shift from a local-compute-centric to a distributed-data-centric model.

3.2.5 Major obstacles to be taken into account

Unlike other technologies and problems, that can, once fully realised and taken up by the market, new programming models, software engineering principles etc. are not directly marketable and are also taken up very slowly. In general, new programming models, and even just changes to existing models take around 10 years to be taken up in the market / community. This is due, in part, to the general hesitation to take up new models, but also due to the fact that the current generation of programmers will be educated in the traditional models, and more importantly that legacy software, dominating a crucial part of the software & services market will have been developed (and maintained) in traditional models, as migration would be too costly.

Implicitly, any approach to bring about a new software paradigm will have to take into consideration the necessary timelines for generating impact and uptake, implying that the most relevant community is gathered, momentum maintained and expertise and tool development continuously improved. This includes, among others methods for migrating existing software, developing new software to replace legacy applications etc. In other words, new paradigms must co-exist and continuously develop / grow in parallel with existing software and development methods. The goal therefore is to achieve a smooth transition to such a new paradigm, to realise the new requirements.

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3.3 Open Source Research

Chairs: Sinead Queely, TSSG & OPENi and Alfredo Matos, Caixa Magica & PROSE

Participants:

Family Name	First Name	Project
Belter	Bartosz	FELIX
Brock	Amanda	PROSE
Dardailler	Daniel	HTML5Apps
doolin	kevin	ICT SOCIETIES
Gioppo	Luca	Open-DAI and CloudOpting
Glikman	Yury	OCEAN
Hoschka	Philipp	HTML5Apps
Koziris	Nectarios	CELAR
Matos	Alfredo	PROSE
Muscella	Silvana	CloudWATCH
Nicolai	Andrea	MARKOS
Quealy	Sinead	OPENi
Susi	Angelo	RISCOSS
Tavernier	Christophe	-
Teixeira	Tiago	OSSMETER
Sergio	Andreozzi	EGI-Inspire

Table 10 Open Source break-out group

There is a common thread around the different research items identified by each project: **openness**, **collaboration** between **projects and initiatives**, and **interoperability** between **trending technologies**.

Four pillars to support the "open cloud" goals going into **Horizon 2020** are: **open software, open data, open standards**, and **open processes.** The figure below illustrates the main concerns for projects and researchers that will shape new proposals and research topics.

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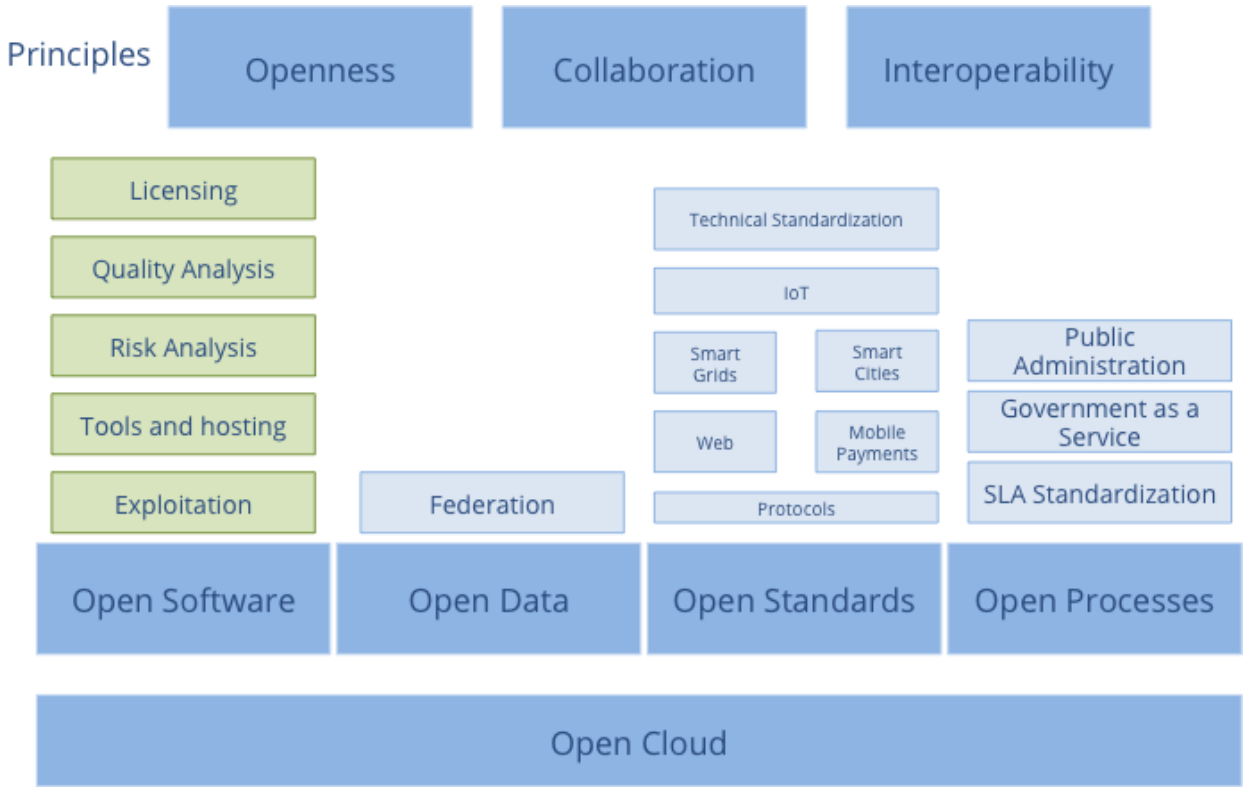

Figure 7 Pillars supporting the "open cloud" goals going into H2020

3.3.1 Recommendations for the 2016/2017 Work Programme.

3.3.2 A foundation for success

Roughly only 20% of research projects result in real commercial success. There are many reasons for the lack of commercialisation success. One of the reasons is the desire for partners and especially large corporations to retain and protect their IPR. The project representatives explored the most useful steps the EU commission can take to encourage SMEs to move to the cloud and ensure the commercialisation of research results.

Open Source licensing is a complicated space and while projects such as EU PROSE[11] have attempted to address the complexity of license selection, it is not enough. A comment from one participant summed it up as follows.

"Many open source software adopt Apache 2.0 from apache foundation; very simple/clear, 1 page; the EU-PL is very complex (https://joinup.ec.europa.eu/software/page/eupl) and there is no community around it."

Possible approach: a curated, stable and evaluated repository of projects, with an accessible dashboard for SMEs and new end-users to start their journey. Such a Foundation would facilitate

[11] http://www.ict-prose.eu/

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access to quality curated projects that grow out of EU projects. It would build something that endures and will benefit all stakeholders.

Open source is the best vehicle for re-use and sharing results. Open source accelerates technology transfer and **provides visibility to software.** It also **fosters high quality** in **software writing** with **results being published.**

Projects should not build everything, because the end result will be something that fits the project and a nice demo, but it will not be something that is re-usable. This focus does not necessarily have to be on successful software developments but should also be on addressing weaknesses and failures and transforming them into success stories.

Proposed best practice for open source projects:

To ensure re-use, projects should focus development on **a specific piece of software** in order to get **good quality software for re-use.**
Promote re-use through clustering: Establish a set of consistent projects that work together on topics such as reference architecture. The projects should share work with outputs being consistent.

It is important that results from EC funded projects can be easily re-used and exploited; guidelines may be needed on the most appropriate licenses to use depending on the exploration strategy; the problem is to find a balance between suggesting one default license and complying with existing licenses for software that need to be evolved.
There is a big difference between making a software code open source vs. productising it; there is the need to better understand needs for industrial adoption or public sector adoption. For open source software, it is also essential to identify a maintainer (community) and an adopter (community) for it to continue to evolve.
In many projects, people do not understand the impact of choosing a certain license; the main need is to build awareness; EC should have an approach similar to the Apache Foundation. In Israel/Scandinavia, etc., when you talk with **Angel investors** they ask: what kind of software you intend to use, what kind of license you want to use; if the license is restrictive, then they are not investing.
An interesting study would be to investigate how much open source is produced and how much software is re-used:

- Open source is a way to do and exploit.
- Community engagement is also a key aspect.

3.3.3 Relevance of the challenges

Licensing: As open source software sees wider adoption, the different licenses and models are creating complex interconnections that impact both business and exploitation decisions. This implies creating awareness and tools to allow different software pieces and stakeholders to co-exist. Many open source software projects adopt the Apache 2.0 licence from the Apache foundation, as it is very simple/clear, (1 page), as opposed to the EU-PL is very complex (https://joinup.ec.europa.eu/software/page/eupl) and there is **no community around it**.

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It is necessary to create a simple framework for EU-funded projects that leads to a simpler licence selection process and better uptake from SMEs. Simplifying interconnections and creating better understanding will influence exploitation and business models around open source results, and create better impact on the Open Source community.

The following areas were considered the most common causes of concern and current difficulties:

- Consortium agreements.
- Licensing problem is still valid (compliance to one licence).
- Licence selection (to force or not force to use a specific licence).
- Licensing decision (compatibility, selection) and support for those not aware of pitfalls, especially new entrants to research, such as SMEs.

Sustainability, exploitation: First of all, consortiums need to clearly define exploitation and sustainability in the context of the project, what exactly is being exploited or sustained, how it intends to pursue the goals set and the business model around it. Market demand and/or community engagement are key for sustainability. If you do not devote money to building the community, then you are not building the sustainability of the software.

Improving return on investment requires the successful outcome of project results, directly translating into open source software projects that are sustainable regardless of the lifetime for the initial projects, coupled with adequate marketing, which is not the same as dissemination.

Some suggestions on how to improve sustainability and exploitation include:

- Tools, such as a software forge, to creating a development hub.
- Documents, such as an Annex for the calls documents (recommendations on previous projects and related information).
- Supporting vehicles for project results, such as a foundation (see above).
- Building awareness to support and promote open software and an open cloud.

These solutions or similar can help create new opportunities for added value and improved efficiency for R&D funds.

Community Engagement: Projects need to clearly define target audiences (e.g. customers: developers, adopters, peers) and the scope (e.g. sector, geographical) of outreach and engagement based on clear plans.

For open source, the community is an important tool for exploitation. It is important to recruit champions of the community as an effective way of promoting it. A key action is helping existing projects to create better engagement, either through direct actions or through support activities.

Productisation and adoption: For the next call text, the group suggests a focus on Productisation and adoption. To this end, a focus on building quality software would be welcome. Developers should build what they are going to use (and not everything). Part of the work under the Expert Group could focus on

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the development process for projects, evaluating the competing approaches of implementing large amounts, as opposed to focusing on fewer, but "production grade" software projects.

3.3.4 Specific actions to be undertaken

Specific roles for managing software with sufficient resources, in terms of time, money and preparation would lead to quality "production" grade software, adoption is facilitated (e.g. Public Admin, SMEs); and better go-to-market strategies.

Quality and Risk Assurance:
Customers in general want to buy a service, they want to be assured that support will be available in the future, to evolve the software and fix problems.
Quality metrics are necessary to start adoption and evaluation (for adoption and procurement).
Governance and responsibility are requirements for established tools and processes to assure the community in terms of maintenance and support through long-term relationships.

Procurement:
A central repository of projects would help stakeholders find and use quality software.

Software Patents:
Implementation of open source projects face threats from patents (due to implementation restrictions); previous/pre-existing patents, hence actions are required to remove obstacles to the productisation of research outputs.

Coordinated and support actions:
A CSA should be established to set out a clear roadmap towards the foundation for the successful development and commercialisation of software and services. This would include an Open Source expert group and practical guidance on exploitation and sustainability. Its role should be to support forward looking research priorities and projects addressing expected future challenges. These include improving solutions that are currently available but not mature enough or sufficiently defined to respond to specific needs. An important role for project officers and reviewers is to establish an incremental effort towards these goals leveraging their understanding of prototypes that function correctly or otherwise.

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4 An update on Clustering and Collaboration

During the 1st Concertation Meeting, 16 projects identified potential collaborations with peer initiatives based on a clustering exercise. For the 2nd Concertation Meeting. Through the position papers and the one-minute madness held during the networking cocktail, most of these projects reported back on how they have moved towards concrete collaborative work (on-going or planned). A further 8 projects identified new collaborations considered of common interest. Furthermore, several projects pinpointed collaborations with relevant initiatives outside the Unit, including standards groups.

The table below provides a snapshot of current collaborative work across the Unit. Examples of specific collaborations are detailed in the following section: cross-project collaboration, collaboration with initiatives outside the unit and liaison with Coordination and Support Actions.

Project	Current concrete collaborations
ARTIST	MODAClouds, PaaSage
ASCETIC	CloudScale
Broker@Cloud	MODAClouds and PaaSage
CACTOS	CloudScale and PaaSage
CLIPS	ClouT
CloudCatalyst	SUCRE, OCEAN, CloudCatalyst, and CloudForEurope MODAClouds, PaaSage and ARTIST
CloudforEurope	SUCRE, CloudCatalyst, OPEN DAI; STORM CLOUDS and CloudWATCH
CloudScale	CACTOS
ClouT	OCEAN and SUCRE
CloudWATCH	ARTIST, BETaas, Broker@Cloud, CELAR, CloudCatalyst, CloudingSMEs, CloudWave, Cloud4SOA, ClouT, ENVISAGE, MODAClouds, OCEAN, ORBIT, PaaSage, PANACEA, RISCOSS, SeaClouds, SUCRE, U-QASAR,
LEADS	CloudSpace, BigFoot
MODAClouds	PaaSage and ARTIST
ORBIT	CACTOS
PaaSage	ARTIST, Broker@Cloud, CACTOS, CloudCatalyst
PROWESS	Broker@Cloud
RISCOSS	OSSMETER
S-CASE	MARKO, MODAClouds
SeaClouds	MODAClouds, ARTIST, and PaaSage
SOCIETIES	PROSE
STRATEGIC	Broker@Cloud
SUCRE	OCEAN and ClouT
U-QASAR	RISCOSS

Table 11 Current project collaboration status

4.1 Overview of Unit E2-project collaboration

ARTIST: Strengthening the collaboration with ModaClouds and PaaSage in the definition of a common cloud modelling language (CloudML), including several cross-project meetings and project representatives working on this joint task force. The development of the language is progressing by

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creating model transformations that enable an understanding of the three different instances of the language in the three projects, since each project is focused on different aspects of cloud modelling, that is at infrastructure, platform or application levels. A joint paper is planned once the work is completed in order to make public the work performed.

ASCETIC: Initial exchanges with CloudScale, which aims to make cloud systems scalable by design so that they can exploit the elasticity of the cloud. This is of interest to ASCETiC as it aims to enable the analysis of software in terms of energy efficiency at the various stages of the cloud service lifecycle: construction, deployment, and operation.

Broker@Cloud: analysing common concerns across relevant projects funded by DG Connect has led to the identification of new collaboration opportunities, namely MODAClouds and PaaSage, such as cloud service description, cloud service failure prevention and recovery, optimisation of cloud services. Interaction between these projects can be facilitated through a common partner (SINTEF). To this end, a shared workshop between PaaSage and Broker@Cloud will take place at Cloud Services Brokerage 2014, with the aim of further defining cooperation points and future actions.

CACTOS: cooperation including research and tools exchange with the CloudScale project has been established. CACTOS is also investigating the re-use of PaaSage tools for multi-cloud and cross-cloud deployments.

CLIPS: identified common points with ClouT in terms of cloud architecture and instruments to be provided to users. While CLIPS pays attention more on cross border aspects, ClouT centres on integration. However, both projects are addressing Public Administration as main the final user, and are therefore looking into possible synergies for collaboration.

CloudCatalyst: approached OpenNebula community in respect to bridging IaaS challenges, MODAClouds, PaaSage and ARTIST on possible collaboration activities between projects on building common eco system/community, develop combined sustainability strategy. A survey aimed at to establishing the extent to which existing European research meets encountered and envisioned technical challenges for using cloud technologies, to which responses have come from the coordinators of PROSE, ORBIT, STORMCLOUDS, CLOUDSCALE, COMPOSE, S-CASE, VENUS-C, CloudWATCH, CUMULONIMBO, ASCETiC, OPTIMIS, MO-BIZZ, U-QASAR, CloudSpaces, Broker@Cloud, HOST, SUCRE, ENVISAGE, CLOUD TM, CloudWave, BigFoot, ARTIST, BETAAS, PaaSage, PANACEA, MODAClouds, I2WEB, CloudingSMES, HTML5APPS. Based on this approach a deliverable was produced on critical success factors for cloud expansion.

CloudScale: interacting with FZI: ("Forschungszentrum Informatik"; German Technology-transfer Institute) is building on top of CloudScale's Analyser in the context of a European project related to energy-efficiency ("CACTOS – Context-Aware Cloud Topology Optimisation and Simulation").

CloudWATCH: Interaction with ARTIST, U-QASAR, CloudWave, CloudCatalyst, PANACEA on collection of data related to cloud use-case collection. Participation with Broker@Cloud, Cloud4SOA, PaaSage at pre-FIA workshop "From data services to cloud services: concepts, applications and visions', 17 March 2014. Collaboration in sharing and publishing results and augmenting joint impact with other

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CSAs such as SUCRE, CloudCatalyst and CloudingSMEs. Collaboration with CloudCatalyst and CloudingSMEs to greaten reach of CloudScout to European SMEs. Organisation of CloudWATCH-hosted webinar on cloud standards (November 2014) with CloudWave and other unit E2 projects. Invitation of projects using main cloud standards[12] to CloudWATCH plugfest events: BETaas, OCEAN, RISCOSS, ASCETiC, CloudWave, ENVISAGE, ORBIT, PANACEA, ClouT, CELAR, MODAClouds, SeaClouds.

LEADS: is seeking to establish collaboration activities with the CloudSpaces both technically and by means of joint events. CloudSpaces investigate innovative solutions for personal clouds and share technical challenges with LEADS in terms of service partitioning, elasticity and platform awareness. LEADS is also in contact with BigFoot in this context. It would also like to involve the HARNESS FP7 project that works on new generation cloud computing platforms.

MODAClouds: working with PaaSage and ARTIST teams on the CloudML development and improvement following the feedback from use cases. MODAClouds also takes part in various initiatives of other projects for common dissemination and training activities. The Cloud application portability is a topic that is relevant for MODAClouds as targeting the easy deployment in Multi-Clouds. In this direction the team is enhancing the facilities provided by the middleware developed in the frame of earlier projects mOSAIC, Cloud4SOA and REMICS. A particular direction of improvement is related to data models, communication and synchronisation for and between multiple Clouds.

OCEAN: working in collaboration with other projects to position their results in the OCEAN Cloud Interoperability Framework. There are 137 cloud assets registered within 70 projects, the OCEAN Open Cloud Directory is still growing.

Panacea: Portability and Interoperability in Clouds: contributions from the mOSAIC Project; CACTOS – Context-aware cloud typology optimisation and simulation Project – Leader University of ULM. In addition, positive discussions for the future collaboration have been held with the leader of the project “Okeanos IAAS”, GRNET's cloud service, for the Greek Research and Academic Community.

PROSE: promoting of Open Source, such as the PROSE Webinars on FLOSS, Solutions Linux, or the upcoming LinuxCon Europe. On the Open Source Projects platform, PROSE has been steadily growing the platform's adoption, and providing more tools that can directly create value. Over the past year, PROSE focused on providing meaningful metrics for hosted projects, so they can track their own progress and visibility, as well as the integration of FLOSS procurement methodologies and tools, so that project can undergo self-evaluation to understand the future direction of their contributions. These achievements strengthen the PROSE position towards promoting open source software, and provide a clear indication of the value that FLOSS can have for future iterations and Work Programmes.

PROWESS: cooperating with Broker@Cloud, sharing speakers and technical results, as well as a joint mini-workshop on common aspects related to testing of the web and cloud services.

[12] As identified in the first Concertation report (D3.2) - CDMI, OCCI, TOSCA, OVF

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RISCOSS: initial discussions with OSSmeter project which is developing OSS communities and project data gathering and analysis tools. This aspect is important for RISCOSS since the data can form the basis of the risk management approach it proposes. The objective is to pursue close interaction as the two projects evaluate their respective prototypes. For example, the first prototype of the RISCOSS platform, integrating some of the risk analysis techniques, has been released and is ready to be evaluated in coming months.

S-CASE: investigating work done in projects MARKOS, 4CaaSt, and MODAClouds. The MARKOS project could potentially facilitate S-CASE in developing the open source resource finder. Having established links, S-CASE has started working with the MARKOS API. This approach is expected to lead to close collaboration. S-CASE has also recently started collaboration with the project STORM CLOUDS, aiming to exchange know-how and expertise. S-CASE members have been participating in meetings and providing feedback whenever requested.

SeaClouds: started collaboration activities with relevant FP7 projects, particularly with Cloud4SOA, MODAClouds, Artist, and PaaSage, including joint meetings.

STRATEGIC: collaborations established with projects such as Broker@Cloud.

SUCRE: close collaboration with OCEAN and ClouT, including the joint organisation of an EU-Japan workshop to foster international dialogue on interoperability and collaboration between the two regions in the fields of Cloud Computing and Internet of Things. This was followed by a sister workshop in Tokyo. SUCRE also co-organised a workshop with the ARTIST, CELAR, and MODAClouds (FIA 2014), with a focus on cloud solutions by EU-funded projects that address problems related to elasticity, migration and interoperability. SUCRE has also collaborated with the CloudCatalyst, CloudforEurope, and OCEAN projects in the joint organisation of its final workshop during the CLASS 2014 conference.

U-QASAR: started collaboration with RISCOSS project, defining common needs. Furthermore, JIRA and SONARQube Wrappers developed within UQASAR are of interest for RISCOSS. For UQASAR, the risk management strategy identified in RISCOSS is also of big interest to be integrated in the monitoring of management stage, which is part of our Monitoring Services.

4.2 External Collaborations and exploitation of results

ARTIST: cooperating with the Modisco project in Eclipse about model discovery and with the cloud working group of SPEC RG about benchmarking cloud providers and profiling applications.

ASCETIC: initial cooperation with Eco2Clouds, which addresses the ecological implications of Cloud infrastructures. Communications are taking place to jointly investigate strategies that can ensure effective application deployment and execution on Cloud infrastructures while aiming to reducing energy consumption. More specifically, how Eco-metrics collection, cloud application deployment, and evaluation mechanisms/optimisation algorithms are considered in both projects.

CELAR: considered for utilisation in the cloud platform developed in the GR-funded Modissense project to handle unpredictable workload spikes. JCatascopia is currently modified and will be

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incorporated in the PaaSport project. COMOT is exploited together with Pacific Controls Lab to creating elastic machine-to-machine applications and with the Faculty of Electrical Engineering of Zagreb, Croatia for "elasticising" a SaaS cloud application used in Croatian market. Along with APICe research laboratory of University of Bologna we are exploiting rSYBL for coordination based elasticity control mechanisms. Together with ISA research group of University of Seville, we are exploiting rSYBL and MELA for SLA management through elasticity.

CLIPS: concentrating on the scenarios to be piloted within the projects together with architecture specifications be able to support those scenarios. With reference to the architecture CLIPS has been investigating on following technologies to be used/integrated: STORK as eID system, Talend as platform for services integration, CKAN as open data management system, OpenStack as cloud computing platform.

Cloud for Europe: Cooperation with ENISA for Cloud certification. Partnering with PCP projects, such as: CHARM, Silver, PRACE-IP3 in terms of lessons learned for the PCP process.

CloudScale: LIMBO by Universitat Wurzburg is used as part of our usage evolution tool. Open Cloud Directory where we have added CloudScale's showcase CloudStore. SPEC RG Cloud Group (with live demonstration of CloudStore at their annual meeting in March). The RG showed interest and considered using CloudStore as well. Palladio Community where CloudScale promotes its open source strategy using Git as well as CloudStore.

CloudSpaces: working with the Intertrust project in attribute-based encryption (ABE) and on the definition of privacy policies. There is also an ongoing partnership with the Leads project about elastic synchronisation and with the Confine project in decentralised network technologies and bitorrent. The project is also working with IBM Haifa on generating compressible workloads for storage benchmarks. The work resulted in a system that can generate data that is compressible to a prescribed extent and whose compression takes a certain amount of effort. There is also a collaboration with our partner NEC to implement the specifications of the CloudSpaces' interoperability protocol that would allow NEC's personal cloud and StackSync to share and exchange resources as a proof-of-concept.

ClouT: using cloud storage standards like CDMI (Cloud Data Management Interface). ClouT also follows SNIA (Storage Networking Industry Association) and is inspired by standard reference architectures defined by relevant international organisations like NIST (National Institute for Standards and Technology) and ETSI (European Telecommunications Standards Institute). The objective is of re-using existing standards and best practices, extending them when needed.

CoherentPaaS: has partnered with the LeanBigData project also led by UPM on an ultra-scalable big data platform. These two projects will integrate their results what will result in a cloud data management platform providing not only an integrated data management platform for OLTP with SQL and NoSQL data stores, but also with OLAP capabilities to perform analytics on top of it.

COMPOSE: a first successful meeting of the Web of Things Community Group (W3C Workshop on the Web of Things - Enablers and services for an open Web of Devices, June 2014, Berlin, Germany).

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Working with other EU projects on (1) maintaining large amounts of smart objects data to expose it via COMPOSE (COMPOSE as a data hub); (2) on architectural aspects of mutual interest and providing them with access to COMPOSE pilots data and (3) on having them use COMPOSE run-time.

FELIX: leverages on OFELIA and RISE projects, run in Europe and Japan, respectively. The project enhances the existing tools and infrastructures developed in these initiatives and deploy a new federation framework, targeting EU and JP research communities as potential users of the common infrastructure. FELIX is closely cooperating with the GÉANT project, which in one of its activities addresses the problem of federation of network and compute infrastructures to create dynamic experimental facilities for GÉANT users. FELIX is currently investigating possibilities of federating European and Japanese testing facilities with other regions of the world, i.e. other Asia countries and the United States.

HARNESS: fostering collaboration through common partners as the basis for its strategy for synergies. This provides significant benefits from collaboration under minimal overhead, which is important given the wide range of HARNESS technology areas. Results from such collaborations include: (1) Integration of HARNESS code within ConPaas and XtreemFS in conjunction with FP7 Contrail; (2) three patents filed by Maxeler as a result of joint HARNESS and SAVE project development; (3) collaboration with FP7 FASTER on one of the use case applications, where both Maxeler and Imperial are partners in both projects, providing enhanced use cases for study. Moving into the third year, the consortium is also considering developing collaborations with earlier-stage projects that may be interested in building upon some of the HARNESS outcomes. One example is with the FP7 POLCA project (where Maxeler is a partner), which may wish to build upon programming tools developed by Imperial during HARNESS.

HTML5: coordination for pre-standardisation coming from the Unit projects and updated our popular roadmap document on Standards for Web Applications on Mobile. We've also done a lot our outreach with the press and at conferences.

LEADS: organisation of the CloudDP 2014 workshop on key scientific interests, data management and cloud infrastructures at the EuroSys 2014 was part of the synergy with LinkedDesign FP7 project. LEADS will propose the organisation of the next edition of Cloud 2015 with the next edition of EuroSys, in April 2015 in Bordeaux.

MIDAS: collaboration has taken place in a number of different ways. EC funded projects: Contrail (Open computing infrastructure for elastic services); Cassandra (Common Assessment and analysis of risk in global supply chains); e-Freight (European e-Freight capabilities for Co-modal transport). Italian Smart City initiatives: ADAPT (Accessible Data for Accessible Proto-Types in Social Sector) and (SMART AGING (Personal mobile services platform for data acquisition and processing for prolongation of active life, wellness, disease prevention and care in aging population everywhere). Proposed as testing framework in two proposals: FOLLOWER - Proposal submitted to the call PHC 26 of Horizon 2020, proposal submitted to the call for Tender in the framework of the FP7 DECIPHER PCP Project.

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Open-DAI: becoming the starting point for the CloudOpting project as a model in the deployment of the platform. The project integrated with the HOMER project for the indexing of the metadata of API services.

ORBIT: Communication with QEMU community through distribution and RFC of initial project developments (i.e. post-copy live migration, and kernel user fault). Follow-up of relevant standards related to CIM profiles, Virtualisation Management (VMAN), and Open Cloud Computing Interface (OCCI).

PROWESS: Cross collaboration has started with several EU and national projects. These include the EU projects, such as FITTEST, MIDAS, IoT.est, Broker@Cloud, SafeCer and RELEASE.

S-CASE: regarding standards, S-CASE has already decided to adopt the WSDL and WADL standards to describe the web services produced and consumed by S-CASE, thus aiming to contribute in that direction. Additionally, S-CASE is working towards standardising work on UML profiles for RESTful application development.

SeaClouds: collaboration with industry is progressing through the close connection with the Brooklyn Project. SeaClouds is also establishing a mutually beneficial relationship with the standard bodies. Since SeaClouds will be developed based on emerging standards, it focuses on continuous feedback from adopters of these standards, while, at the same time, contributing to their dissemination and evolution. The main standards on which SeaClouds will rely are the OASIS CAMP (Cloud Application Management for Platforms) and TOSCA Topology and Orchestration Specification for Cloud Applications).

SPECS: collaboration with the A4Cloud project, organising a shared workshop and participation at the CIRRUS final event. SPECS shares technologies and innovative solution with other cloud-related projects like MODA-clouds and reusing results from closed projects like mOSAIC or SLA-at-SOI. SPECS members also participate to the EC's C-SIG on SLA and support standardisation activities on cloud and SLA by SLA and NIST.

4.3 Collaboration with Coordination and Support Actions

ARTIST: Fruitful collaboration is also happening with many support actions by defining cross-shared dissemination mechanisms (events, newsletters, social networks, etc.). These CSAs are: OCEAN, PROSE, CloudingSMEs, CloudWATCH, CloudCatalyst and SUCRE.

Cloud for Europe: Partnering with Cloud projects, such as: SUCRE; CloudCatalyst; OPEN DAI; STORM CLOUDS; COCO CLOUDS and CloudWATCH – the latter with common workshop on Legal issues in Cloud computing in June 2014 in London.

CloudCatalyst: joint workshop during Class 2014 conference with SUCRE, OCEAN, CloudCatalyst, and CloudForEurope projects, addressing topics related to the adoption of Cloud Computing in Europe and the challenges that still have to be addressed. Examining how Open Clouds can serve, or are already serving, the societal needs across Europe, through their uptake by key European sectors, such as public administration and the healthcare industry. The focus is on horizontal issues such as

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security, trust and privacy. In the same context, the workshop will also serve as a vehicle to deliver interesting opportunities to the new generation of European business start-ups and SMEs.

CloudWATCH: Collaboration with CSAs such as SUCRE, CloudCatalyst and CloudingSMEs.

ClouT: established a fruitful collaboration with OCEAN and SUCRE projects, where EU-Japan cooperation is a common theme (e.g. two EU-Japan workshops which took place on 16th May 2014 in Brussels and on 31st July 2014 in Tokyo). Sharing insights into cloud computing research projects and had the chance to compare results from the EU and Japan, paving the way for future opportunities between the two regions. The workshop outcomes will contribute to discussions between the EU and the Japanese National Institute of Information and Communications Technology and the Japanese Ministry of Internal Affairs and Communications. These discussions aim to identify future cloud research topics for the upcoming calls with Japan under Horizon 2020.

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5 Conclusion

The previous Concertation meeting left participants with the call to increase communication with both other projects and their possible audiences. This second meeting showed the fruits of that request. The event started with a high speed ice breaker with each project given 1 minute to outline achievements and inter-project communications. During this it was clear that many projects heeded the call and mentioned how they have reached out successfully to others they had met. With the immediately following networking reception this allowed the development of a number of sidebar conversations between projects that would otherwise not have happened and which were key also in the development of the outputs of the breakout sessions.

Examples of the communication that we see as essential between projects is the Cloudwave webinar series which will now include one organised by CloudWATCH. The webinar will focus on Standards within the cloud domain, reaching out to wider audiences than would possibly have happened with a CloudWATCH or CloudWave event only to their own spheres of influence.

From all the breakout sessions openness in one form or another was a key theme as we move forward at both an EC and national level. As expected, this was particularly highlighted during the open source software breakout session that identified essential issues that need to be addressed facing orbit OSS when utilised in areas outside of the academic or research world. Linking to the Software engineering research breakout, there is the need for trained and capable software engineers with whom we are able to trust the series developed, their quality reliability etc. This comes back to the need for stability and hosting of the software outputs of both EC and more general OSS projects. In turn, this brings us to an aspect also identified widely, trust. This may be trust in the product or trust in the community that supports it. This was also identified as an area where research is still very much needed within the cloud ecosystem: how do we trust the providers? how do certification systems that have been developed outside of the 'cloud enabled world' transition to one?

Overall, the direction of travel for cloud research was found to be very good, though it was widely agreed that we need to move up the service levels but also allow communities access to many of these levels concurrently. This may be through the Platform as a Service aims in current work programs. It may also more keenly be through the Software and everything as a Service that we are heading towards.

Finally communication, which has been described in previous points keenly relates both to the activities within a particular work program. For example, gaining a high level overview of projects through activities such as CloudWATCH. It also concerns getting information generated within projects out through activities such as CloudScout[13], targeting different communities who will find value in the outputs of projects. It is clear. that there is a need to have a way of clearly supporting communication of deliverables and outputs from projects beyond the 'EC sphere' if we are to get clear and unambiguous

[13] http://www.cloudwatchhub.eu/cloudscout

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impact from the EC projects, both from participants but also in the world of open science and open research from wider beneficiaries who may otherwise not have know this work occurred.

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6 Annex 1 - Participant list

Title	First Name	Family Name	Name of organisation	Organization Type	Project
Mr	lorenzo	Accardo	union européenne des petites et moyenne entreprises et de l(artisanat	Small or medium-sized enterprise	CloudingSMEs
Dr (PhD)	Sergio	Andreozzi	EGI.eu	Other	EGI-InSPIRE
Ms	Carmela	Asero	Cloud Security Alliance	Policy group/association	CIRRUS & CloudWatchHub
Prof	Dimiter	Avresky	International Research Institute on AutonomicNetwork Computing -IRIANC-Munich	Institution of higher education and research	Panacea
Mr	Oliver	Barreto	ATOS	Large Enterprise	MODAClouds
Mr	Dalibor	Baškovč	EuroCloud Europe	Policy group/association	CloudCatalyst
Mr	Vladimir	Bataev	Product portfolio manager	EsperantoXL	MobiCloud
Mr	Bartosz	Belter	Poznan Supercomputing and Networking Center	Institution of higher education and research	FELIX
Dr (PhD)	Gunnar	Brataas	SINTEF ICT	Consultancy	CloudScale
Dr (PhD)	Gunnar	Brataas	SINTEF ICT	Consultancy	CloudScale
Prof	Antonio	Brogi	University of Pisa	Institution of higher education and research	SEACLOUDS
Dr (PhD)	Neil	Caithness	University of Oxford	Institution of higher education and research	CloudWatch
Dr (PhD)	Laura M.	Castro	Universidade da Coruña	Institution of higher education and research	PROWESS
Mr	Daniele	Catteddu	Cloud Security Alliance	Standards Group	CloudWATCH
Dr (PhD)	Kyriakos	Chatzidimitriou	Aristotle University of Thessaloniki	Institution of higher education and research	S-CASE
Mr	Patrice	Chazerand	DIGITALEUROPE	IT or Trade Association	CloudWATCH
Ms	Andrada	Coos	Microsoft Europe	Large Enterprise	-
Dr (PhD)	Tyler	Crain	INRIA - Institut national de recherche en informatique et en automatique	Institution of higher education and research	SyncFree
Dr (PhD)	Daniel	Dardailler	World Wide Web Consortium	Standards Group	HTML5Apps
Dr (PhD)	Peter	Deussen	Senior Researcher	Fraunhofer Institute for Open Communication Systems	Institution of higher education and research
Mr	Roberto	Di Bernardo	Engineering Ingegneria Informatica SpA	Large Enterprise	CLIPS
Dr (PhD)	Karim	Djemame	University of Leeds	Institution of higher education and research	ASCETiC
Mr	Jörg	Domaschka	University of Ulm	Institution of higher education and research	CACTOS
Mr	Kevin	Doolin	TSSG, Waterford Insttute of Technology	Institution of higher education and research	ICT SOCIETIES
Mr	Michel	Drescher	Stichting European Grid Infrastructure	Policy group/association	CloudWATCH
Mr	Aitor	Elorriaga	INNOPOLE	Small or medium-sized enterprise	U-QASAR
Mr	Paolo	Fabriani	Engineering Ingegneria Informatica	Large Enterprise	ClouT
Mr	Nicholas	Ferguson	Trust-IT Services	Small or medium-sized enterprise	CloudWATCH
Mr	Rui	Ferreira	Instituto de Telecomunicações	Institution of higher education and research	PROSE
Mr	Franck	Fleurey	SINTEF	Institution of higher education and research	HEADS
Mr	Jorge	Gasos	European Commission	European Commission	-
Mr	Michael	Gienger	High Performance Computing Center Stuttgart	Institution of higher education and research	PaaSage
Dr (PhD)	Luca	Gioppo	CSI-Piemonte	Large Enterprise	Open-DAI & CloudOpting
Dr (PhD)	Yury	Glikman	Fraunhofer FOKUS	Institution of higher education and research	OCEAN
Mr	Filip	Gluszak	GridPocket	Small or medium-sized enterprise	BigFoot
Mr	Agustin	González-Quel	Ariadna Servicios Informáticos	Small or medium-sized enterprise	STORM CLOUDS
Dr (PhD)	Kahina	Hamadache	Singular Logic S.A.	Small or medium-sized enterprise	Broker@Cloud
Mr	Luc	Hendrickx	UEAPME, Union Européenne de l'Artisanat et des PMEs	IT or Trade Association	Clouding SMEs
Dr (PhD)	Philipp	Hoschka	W3C	Standards Group	HTML5Apps
Prof	Ricardo	Jimenez-Peris	Universidad Politenica de Madrid	Institution of higher education and research	CoherentPaaS
Dr (PhD)	Bastian	Koller	High Performance Computing Center Stuttgart	Institution of higher education and research	PaaSage
Dr (PhD)	Ioannis	Konstantinou	IMIS/ATHENA	Institution of higher education and research	CELAR
Ms	Katarzyna	Koziol	DIGITALEUROPE	IT or Trade Association	CloudWATCH
Prof	Nectarios	Koziris	Professor	Nationa Technical University of Athens & IMIS-ATHENA R.C.	CELAR
Dr (PhD)	Dimosthenis	Kyriazis	National Technical University of Athens	Institution of higher education and research	ORBIT
Mr	Michel	Lacroix	project officer	European Commission	-
Mr	mark	lange	Microsoft	Large Enterprise	CloudWATCH
Dr (PhD)	Xavier	Leon	Universitat Rovira i Virgili	Institution of higher education and research	CloudSpaces

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Title	First Name	Family Name	Name of organisation	Organization Type	Project
Mr	Libero	Maesano	Simple Engineering France sarl	Small or medium-sized enterprise	MIDAS
Mr	Libero	Maesano	Simple Engineering	Small or medium-sized enterprise	MIDAS
Mr	Andrea	Manieri	Engineering Ingegneria Informatica spa	Large Enterprise	Ocean, ClouT & Artist
Dr (PhD)	lanfranco	marasso	engineering ingegneria informatica spa	Large Enterprise	CLIPS
Dr (PhD)	Beth	Massey	United Technologies Research Center Ireland	Large Enterprise	GENiC
Mr	Philippe	Massonet	CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication	Institution of higher education and research	PaaSage
Dr (PhD)	Alfredo	Matos	Caixa Mágica Software	Small or medium-sized enterprise	PROSE
Mr	Francisco	Medeiros	European Commission	Policy group/association	
Mr	Sven Holger	Meintel	MFG Innovation Agency for ICT and Media Baden-Württemberg	Other	SUCRE
Mr	Dan	Mihai Chirila	European Commission	Policy group/association	
Dr (PhD)	Stefano	Modafferi	University of Southampton It Innovation Centre	Institution of higher education and research	SERSCIS
Mrs	Silvana	Muscella	Trust-IT Services	Small or medium-sized enterprise	CLoudWATCH
Mr	Andrea	Nicolai	T6 Ecosystems	Small or medium-sized enterprise	MARKOS
Ms	Leire	Orue-Echevarria	TECNALIA Research & Innovation	Institution of higher education and research	ARTIST
Dr (PhD)	Michael	Pantazoglou	University of Athens	Institution of higher education and research	SUCRE
Prof	Dana	Petcu	Institute e-Austria Timisoara (IeAT) & West University of Timisoara (UVT)	Institution of higher education and research	MODAClouds
Mrs	Clara	Pezuela	Atos	Large Enterprise	ARTIST
Dr (PhD)	Pierluigi	Plebani	Politecnico di Milano	Institution of higher education and research	ECO2Clouds
Ms	Stephanie	Podlewski	MFG Innovation Agency for ICT and Media Baden-Württemberg	Other	PROSE
Mr	Miguel	Ponce de Leon	TSSG - Waterford Institute of Technology	Institution of higher education and research	PROSE
Mr	Christophe	Ponsard	CETIC	IT or Trade Association	ASCETIC
Ms	Sabine	Posdziech	European Commission	European Commission	-
Ms	Sinead	Quealy	Waterford Institute of Technology	Institution of higher education and research	OPENi
Dr (PhD)	Massimiliano	Rak	Second University of Naples	Institution of higher education and research	SPECS
Mr	Ruben	RIESTRA	Director - Innovation Management Unit	INMARK	APARSEN
Dr (PhD)	Etienne	Riviere	University of Neuchatel	Institution of higher education and research	LEADS
Ms	Valère	Robin	Orange Labs Product and Services	Large Enterprise	NESSI
Mr	Jonathan	Sage	IBM	Large Enterprise	Cloud Select Industry Group (C-SIG)
Mr	Giuseppe	Sajeva	Engineering Ingegneria Informatica spa	Large Enterprise	ClouT, OCEAN, Artist
Mr	Eliot	Salant	IBM Haifa Research	Large Enterprise	CloudWave
Mr	Lutz	Schubert	IOMI, University of Ulm	Institution of higher education and research	PaaSage
Mr	Piotr	Sobonski	NIMBUS Research Centre	Institution of higher education and research	FP7 GENIC project
Mr	Arnaud	Sonnet	EurActiv	Other	.
Prof	Georgios	Spanoudakis	City University London	Institution of higher education and research	CUMULUS
Ms	Linda	Strick	Fraunhofer FOKUS	Institution of higher education and research	Cloud for Europe
Mr	Karl	Stumwoehrer-	Austrian Standards	Standards Group	CIRRUS Project
Mr	Angelo	Susi	Fondazione Bruno Kessler	Institution of higher education and research	RISCOSS
Mr	Christophe	Tavernier	Euronixa	Small or medium-sized enterprise	-
Mr	Tiago	Teixeira	UNPARALLEL	Small or medium-sized enterprise	OSSMETER
Prof	Philippe	Thiran	Sirris	Institution of higher education and research	-
Dr (PhD)	Jacinta	Townley	United Technologies Research Centre Ireland	Institution of higher education and research	GENiC
Dr (PhD)	Salvador	Trujillo	IKERLAN Research Centre	Institution of higher education and research	MONDO
Ms	Maria	Tsakali	Project Officer	European Commission	N/A
Prof	Theodora	Varvarigou	National Technical University of Athens	Institution of higher education and research	ORBIT
Mr	Stéphane Jules Yves G	WAHA	CETIC	Small or medium-sized enterprise	PaaSage
Dr (PhD)	David	Wallom	University of Oxford	Institution of higher education and research	CloudWATCH
Prof	Alexander	Wolf	Imperial College London	Institution of higher education and research	HARNESS

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