Progress Report

Grant Agreement number: 621089

Project Acronym: STORM CLOUDS

Project Title: STORM CLOUDS – Surfing Towards the Opportunity of Real Migration to cloud-based public Services

Project type: ☐ Pilot A ☒ Pilot B ☐ TN ☐ BPN ☐ PPI Pilot

Periodic report: ☐ 1st ☐ 2nd ☒ 3rd ☐ 4th

Period covered: From M25 (February 1st, 2016) to M38 (March 31st, 2017)

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DECLARATION BY THE PROJECT COORDINATOR

I, as coordinator of this project and in line with my obligations as stated in Article II.2 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):

  ☒ has fully achieved its objectives for the period;

  ☐ has achieved most of its objectives for the period with relatively minor deviations;

  ☐ has failed to achieve critical objectives and/or is deviating significantly from the schedule.
- The public Website is up to date;
- To my best knowledge, the information contained in the financial statement(s) submitted as part of this report is in line with the actual work carried out and consistent with the reported resources and if applicable with the certificates on financial statements.

Name and position of Coordinator: Agustín González-Quel. Project Manager. RTDI S.L.

Date: 01/03/2016

Signature:

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Publishable summary

As expressed in the Document of Work, the purpose of STORM CLOUDS was to define useful guidelines on how to address the needed shift to a cloud-based paradigm in service provisioning in order to accelerate it, for Public Authorities and policy makers.

At project completion, this main purpose has been achieved as well as other project objectives as the identification of barriers and levers for cloudification, creation of an application portfolio and a compilation of knowledge on the topic. STORM CLOUDS has already had an impact in the cities in the project: The four cities are adopting cloud based service provisioning schemas and applications as a consequence of the successful experience in the project.

In these pages we summarise the work done in the last year. We encourage the reader to access the project web site for additional information and material on the project.

The last year of the project has been used by the project consortium to consolidate the work done during the whole project, paying special attention to its sustainability after its completion. There are a number of specific results that can be remarked:

- The work with the stakeholders has concluded with relevant conclusions:
    - Really relevant stakeholders for the process are found among the personnel of the Municipality at all levels: technicians, financial team, administration, political management.
    - Change Management procedures are required to manage the impact of cloud migration.
    - Leadership at the top level is essential: the political direction of the Municipality must support and integrate the cloudification into the city agenda.
- The project cloud – STORM CLOUDS Platform (SCP) - kept evolving and improving. During the third year, a financial analysis on TCO of the SCP platform was carried out. The current architecture was expensive and improvement alternatives were identified. Using these alternative architectural design, the SCP v2.0 was created. This architecture uses alternative deployment methods/models to reduce the costs and streamline the application maintenance processes. At this moment, the SCP is a leading edge support at the same level that commercial offer of large players. The mechanism for migration to other cloud providers are already integrated in the SCP.
- The migration processes implemented eased the technical migration onto a the SCP. Automation scripts, security testing and all the suite of procedures created are very useful and reduce the technical burden. Applications migrated are included in the next table:

City	Application	Architecture
Valladolid	Urbanismo en Red	SCP v1.0 (distributed architecture)
	Live the City	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	Cloud Funding	SCP v2.0 (simplified all in one architeture)
Thessaloniki	Virtual City Market	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	City Branding	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	Cloud Funding	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	Live the City	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	Have Your Say	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)

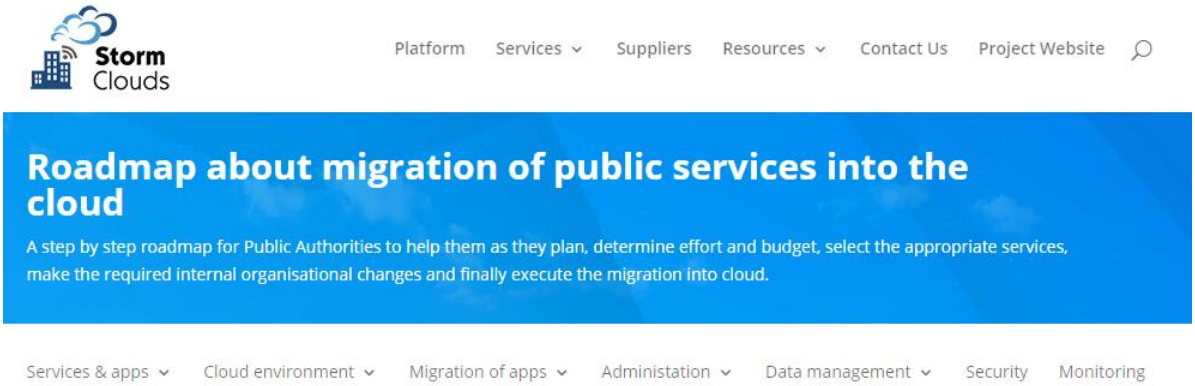
	Proxy	SCP v1.0 (distributed architecture)
Agueda	Have Your Say	SCP v1.0 (distributed architecture)
	Location Plans	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	Live the City (Vive)	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
Miskolc	TiMi	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
	OpenData	SCP v1.0 (distributed architecture) SCP v2.0 (simplified all in one architeture)
Veria	City Branding	SCP v2.0 (simplified all in one architeture)
	Cloud Funding	SCP v2.0 (simplified all in one architeture)
	Improve My City	SCP v2.0 (simplified all in one architeture)
	Virtual City Market	SCP v2.0 (simplified all in one architeture)
	Proxy	SCP v2.0 (simplified all in one architeture)
Athens	Improve My City	SCP v2.0 (simplified all in one architeture)
Guimaraes	Have Your Say	SCP v2.0 (simplified all in one architeture)

- Applications have been incorporated to the Project Catalogue and they are available for other cities not members of the project consortium. The catalogue is online at http://stormclouds.urenio.org/smart-city-services/ and it provides information on the seven applications already available for testing.
- Thanks to the Call for Cities, the experimentation of cloudification was carried out in seven cities: Valladolid, Thessaloniki, Agueda, Miskolc, Athens, Veria and Guimaraes.

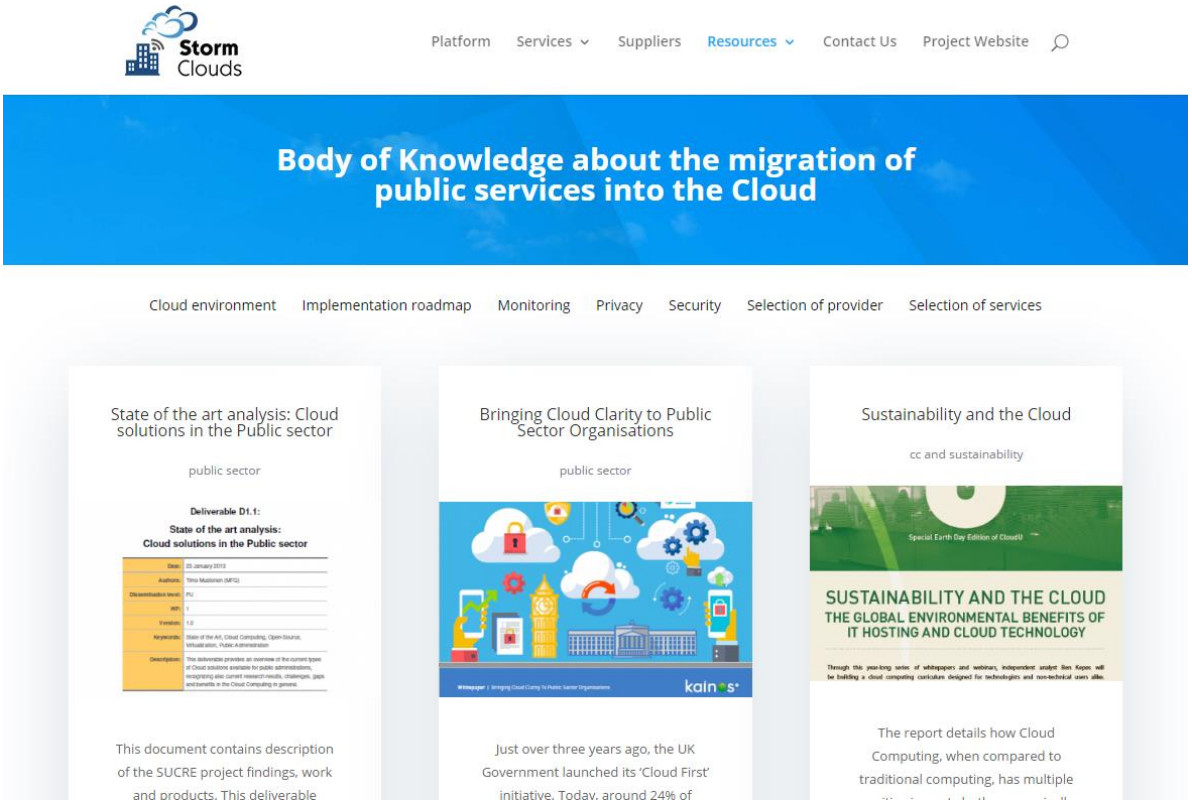
- A number of barriers and levers on the cloud migration process have been identified and the guidelines on how to prevent them are provided. These are included two main deliverable documents:
    - Body of knowledge about migration of public services to the cloud
    - Roadmap for the migration of public services.

  These results are available as deliverable documents but also on-line as shown:

  http://www.storm-clouds.eu/services/roadmap-home/



http://www.storm-clouds.eu/services/resources/body-of-knowledge/



- About sustainability, the project partners have worked on two lines:
  - Companies have designed a business proposal that will bring to the market the experience in the cloud migration process and the applications launched during the project. The cloud market is very large and there is room for additional players, provided they are able to bring real experience and added value on cloud migration. STORM CLOUDS partners are ready to bring this knowledge.
  - On the other hand, the project has moved to participant cities towards Cloud Computing in the project have adopted applications based on cloud and, have taken strategic decisions to move IT infrastructure to public cloud – in the case of Agueda – and to private cloud, in the case of Valladolid.
    - **Valladolid** has started the process to migrate their whole infrastructure a private cloud that will interact with public clouds for punctual services.
    - **Thessaloniki** After experimenting with the Storm Clouds Platform, a public cloud platform has been hired for short-lived web applications and applications that expect to have significant variations.
    - **Agueda**, based on the STORM CLOUDS experience, has decided to migrate their own IT infrastructure to the cloud. The process has started by contracting a cloud to a Portuguese company.
    - **Miskolc** is implementing their first applications successfully. In particular, the Open Data application is expected to push ahead a number of start-ups in the city.

- All these activites have been disseminated on Internet: a new project web site was launched and the activity in the project was very intense in this last year. Each blog post was complemented with notes in the Facebook account of the project and in the Twitter account. The traffic results for the project are very satisfactory.

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As a conclusion, we firmly believe that the project has achieved the expected objectives and the basis to continue growing are already in place.

Project Progress

1 Project objectives for the period

Objectives for each WP in the project for this period:

Objectives of **Work Package 1** for the third year are:

- Complete the implementation of the open innovation process that supports the selection of applications for cloud migration and analyse its potential replicability after the project.
- Monitoring and Validation activities on the migration process, and cloud adoption at cities.

Objectives of **Work Package 2** for year 2 are:

- To continue improving the implementation of the STORM CLOUDS Platform, a cloud software platform for hosting partners' applications.
- Extending the templates and tools for easing the migration of applications.
- Maintaining the cloud to support project activities.

Objectives of the **Work Package 3** for the second year of the project are:

- To continue with the adaptation and migration of the cities' applications, which includes the deployment of applications in the SCP as well as the technical adaptations required.
- The updating of the cloud-based services portfolio as a showcase of applications.
- Advance on the creation of tools and procedures to facilitate services migration
- Extraction of best practises for the migration process.

Work Package 4 has no scheduled activities for period 3, although the results obtained from this WP in terms of security checking have been applied in the cloudification of applications.

Work Package 5 objective for third year is to complete the creation of the reference guide for Public Authorities to facilitate the planning and actual migration to cloud. During this period, the final version of migration guidelines are to be released.

Objectives of **Work Package 6** for this last project year are, on the one hand, to enforce the dissemination strategy that maximizes the impact of STORM CLOUDS and, on the other hand, to complete the business modelling and prepare the exploitation plans that will ensure the sustainability of results after the project's end.

Finally, **Work Package 7** is devoted to Project coordination and management.

2 Work progress and achievements during the period

2.1 WP1 STORM CLOUDS methodological Framework

WP leader: RTDI

Participants: ED, ASI, AUTH, VALLADOLID, THESSALONIKI, ÁGUEDA, MISKOLC

Activities in Period 3 in WP1 have completed the selection of applications for the catalogue to replicate the exercise in all the project cities. On the other hand, monitoring and validation on the process has been carried out. Deliverable documents produced in this WP summarise the activities done and, even more important, the lessons learnt and conclusions for the future replicability of activities.

In particular, the following activities have been carried out:

- Complete the selection of applications from the STORM CLOUDS Catalogue.

  From Milestone 2 on, the selection process evolved so Cities are to select applications from the catalogue. The stakeholders that have kept their involvement during the whole project are faced to

an easier task: select an application for the city when it can be seen up and running. However, it is still difficult that they fully understand the implications of a deployment in a cloud infrastructure or at the Municipality premises.

- Monitoring and Validation activities

  In this area, the work in WP1 has a three lines approach:

  - Validation of the services deployed, evaluating how the different applications cloudified are validated from the technical and deployment point of view. Each city has applied slightly different procedures. The reason for that is that deployment of applications and services must be coincident with the strategic and political agenda of the Municipality. This is a fact to be considered for similar processes in the future.
  - Validation of the Open Innovation process followed in STORM CLOUDS shows that the key stakeholders in a process like this are the personnel of the Municipality at the different levels: Political management, technical and financial. The cloudification process is mostly transparent to the user that is not concerned about the technical mechanism that hosts the services.
  - Last, the migration process has been considered particularly interesting in all Municipalities. We have extracted some technical conclusions and, specially, organisational conclusions: Having a realistic planning that considers all possible barriers in the process is the key tool for the process.

WP1 Achievements

- Consolidate the application of Open Innovation methodologies in a set of lessons learns and guidelines.
- Definition of best practises to implement Open Innovation methodologies for cloudification processes in the Public Administration bodies in Europe
- Communication activites to stakeholders for them to understand STORM CLOUDS Project and their role in it.
- The experience brings some conclusions summarised in section 5 under the title "barriers found and lessons learnt". We may extract, some of them
  - Cloud migration is transparent to the citizen so their involvement in the process is not particularly relevant, while it is essential to involve the technical, administrative and political/management stakeholders of the Municipality.
  - The leadership of the top management of the organisation is essential.
  - Change management policies must be foressen and put in practice from the very begining..
  - It is particularly important to have a detailed technical plan to be absolutely sure that all the required elements will be available prior to face the migration.
  - The availability of trained personnel for the new environment is to be ensured. Either by training the existing technical people or by hiring new personnel.
  - The ownership of applications to be migrated must be ensured before the process is to start. Existing applications may be locked in by legal agreements with vendors.
  - From the financial staff it is important to plan the actions to be taken:
  - Training sessions to Municipality personnel are required.
  - Political changes may stop, even drop, the whole process as, normally, they bring changes in the priorities of the City agenda.

Deliverables Produced in WP1

In this period, the following deliverable have been released:

- D1.3.3. Selection of services to be cloudified, deployed and transferred (Month 26 – March 2016)
- D1.3.4. Selection of services to be cloudified, deployed and transferred (Month 32 – September 2016)

- D1.4.2 Monitoring and Validation of Services (Month 38 – March 2017)

2.2 WP2 OSS IaaS Cloud Platform and Related Services

WP leader: HP

Participants: ED, VALLADOLID.

The main objectives of Work Package 2, OSS IaaS Cloud Platform and Related Services, are:

- designing and implementing a reference architecture for the **Storm Clouds Platform (SCP)**, a cloud software platform for hosting partners' applications;
- preparing a set of prefab Virtual Machines, Platform as a Services elements and Cloud Application Templates that can be used as building blocks for constructing cloud-enabled applications;
- implementing a set of tools for automating the deployment of cloud-enabled applications.

The Work Package is broken down in a list of tasks as reported in the DOW and Hewlett Packard Enterprise is the task leader of all the tasks.

As a summary, the following two paragraphs briefly report the major activities of the first two years.

- During the **first year**, the activities were mainly devoted to gather requirements (***T2.1 – IaaS Platform - Requirements and Specification***) and design the Storm Cloud Platform (***T2.2 – IaaS Platform – Architecture Design***). In this time frame, a first prototype of the platform was implemented providing only some basic Infrastructure as a Platform (IaaS) functionality.
- In the **second year**, the activities were focused on the implementation of advanced services, in order to deliver a production-ready environment. For these reasons, according to the DOW, the effort was mainly focused on SCP implementation (***T2.3 – Storm Clouds Platform – Software Construction***), SCP testing (***T2.4 – Storm Cloud Platform - Test and Validation***) and implementation of tools for the deployment of the applications (***T2.5 - Design and Implementation of Prefab Cloud-Application Templates***). In addition, WP2 executed some marginal activities in ***T2.1 – Storm Clouds Platform - Requirements and Specification*** and ***T2.2 – Storm Clouds Platform – Architecture Design***, in order to address issues raised during the first review of the European Commission.

According to the DOW, during the **third year** of the project (**the timeframe this document refers to**) WP2 has been focussed on ***T2.4 – Storm Cloud Platform - Test and Validation*** activities, aimed to verify that the Storm Clouds Platform fulfilled the requirements defined in the earlier stages of the project and to put in place corrective actions, if needed.

ED contributed on WP2 activities by working closely with HPE in updating the SCP platform architecture, following a financial analysis of the cost of owning the SCP platform and the applications on the public cloud infrastructure at Enter S.r.l. The most notable outcome was that with 10 hosted applications, the overhead of SCP (cost of SCP divided by the number of hosted applications) **doubles** the cost of a single application; 77% of the SCP cost is due to the data tier (shared DB and shared file system). As a result, and in cooperation with HPE, we have investigated alternative deployment methods/models, like preparing application appliances and using bootable disks for application instances. The resulted simplified SCP architecture allowed to reduce the costs and streamline the application maintenance processes.

Consequently all developed tools used for automating the deployment and configuration of selected services and the tools for performing operational data backups, were affected and thus updated accordingly. This resulted in self-contained applications that run on diskless VMs with an attached 25Gb volume (e2standard.x2 + 25Gb Disk). Moreover the installation scripts were simplified as there was no need to mount volumes (YAML and bash).

Additionally it was decided that all previously deployed applications should move to the simplified architecture. This resulted in intense data migration activities for already deployed applications that allowed to demonstrate the importance of a properly designed and implemented backup strategy.

Finally we investigated how Docker can be included in the SCP architecture. Experiments verified that it is possible to include this powerful software container platform.

As described in the previous Internal Progress Report, the architecture of the SCP has been extended for implementing unplanned but necessary features listed below:

- **File Sharing Service**: providing file server functionality;
- **HA/Proxy Service**: implementing a high/available HTTP traffic load balancer;
- **Administration Console**: for administering all the SCP modules.

The implementation of these new features was finished during previous reporting period (second year) but the integration with the applications and the documentation were part of the third year activities.

- The integration resulted in WP2 supporting the partners for integrating their applications. Most notably, the integration with HA/Proxy Service module required the major effort involving several partners (HPE, AUTH, Ariadna, ED, Agueda and Thessaloniki). HPE, in addition to provide technical support, also coordinated the activities organizing regular and on-call remote conferences. In order to optimize the effort and streamline the communication, the phone call conferences were usually organized in collaboration with WP3 contributors.
- A new unplanned version of the SCP architecture document (D2.2.2 Storm Clouds Platform Architectural Design) has been delivered on 23/12/2016 in order to document the new implemented features. The document has been made publicly available on the related project web page.

Throughout the entire reporting period, some WP2 activities were devoted to constantly monitor the operating conditions of the platform and the applications running on top of it. For this purpose, the **SCP Monitoring Module** has been fully configured for implementing a **Control Dashboard** to check the application performances and for sending email **Alarm Messages** in case of major issues (e.g. service unavailability). In this way, WP2 participants have performed proactive and reactive actions aimed to address the issues. In other cases, when the issue couldn't be addressed autonomously, **HPE directly contacted the Cloud Provider** (i.e. Enter) making sure that the problem was fixed.

Starting from September 2016, WP2 activities were mainly focussed on the **handover of the platform and the cloudified applications** to partners. A cost of ownership study was conducted for understanding the benefits and the related costs of the SCP. At the end of the study the consortium decided to implement a new lightweight version of the architecture in order to reduce the cost of ownership at the price of less features implemented at platform level (e.g. non shared file system). This new architecture has been implemented and documented in the Storm Cloud Platform User Manual (unplanned deliverable).

During the latest part of the reporting period – from December 2016 and March 2017 - WP2 activities were focussed on migrating applications and SCP components from the shared workspace to private partners' cloud environment (when explicitly requested).

Deliverables Produced in WP2

No deliverable document was scheduled for WP2 in the period. However, two unplanned documents were produced in the period.

- Storm Clouds Platform Architectural Design: 23/12/2016 (Month 35). Updated version of D2.2.2 documenting the new implemented features.
- STORM CLOUDS Platform User Manual.: Under preparation, to be released after the project termination).

2.3 WP3 Cloud-based services deployment

WP leader: AUTH

Participants: RTDI, ED, ASI, VALLADOLID, THESSALONIKI, ÁGUEDA, MISKOLC.

During the third and final year, contribution towards WP3 included the adaptation of new services and their integration to the STORM CLOUDS Platform (SCP) infrastructure created in WP2, and the updating of the tools and procedures required to facilitate services migration to the cloud.

Using the WP4 suggested penetration testing tools and the OWASP web application penetration testing methodology, the STORM CLOUDS prototype applications were tested against the OWASP ten most critical web application security risks, resulting in services modifications. Furthermore, the procedure and tools

required to support multilingual content in the selected applications were identified and presented, including the actions performed by the applications to support multilingual content.

To address the applications sustainability after project end, a financial analysis of the cost of owning the SCP platform and the applications on the public cloud infrastructure at Enter S.r.l. was performed. This resulted in a simplified SCP platform architecture that allowed us to reduce the costs and streamline the application maintenance processes.

Consequently, all developed tools used for automating the deployment and configuration of selected services and the tools for performing operational data backups, were affected and thus updated accordingly. This resulted in self-contained applications that run on diskless VMs with an attached 25Gb volume (e2standard.x2 + 25Gb Disk). Moreover, the installation scripts were simplified as there was no need to mount volumes (YAML and bash).

Additionally, it was decided that all previously deployed applications should move to the simplified architecture. This resulted in intense data migration activities for already deployed applications that allowed to demonstrate the importance of a properly designed and implemented backup strategy.

Finally, we investigated how Docker can be included in the SCP architecture. Experiments verified that it is possible to include this powerful software container platform.

Once the services were validated and tested in the HP's development environment, they were simply "moved" from the HP's SCP to the SCP at Enter S.r.l., the selected public cloud provider (production environment).

Regarding the task T3.4. "Best practices for cloud-based public services deployment", the 10 best practices already included in D3.4.1 were complemented by five new that derived the 2nd stage of the cloudification process. In that stage, the pilot cities made use of public services that have already cloudified in other pilot cities. Moreover, other European Cities deployed the STORM Cloud services. The D3.4.2 is an accumulated document as the contents of D3.4.1 has been evaluated based on experiences gained during the 2nd stage of the cloudification process. Moreover, the existing best practices have enriched with new ones about interoperability, privacy, Cloud provider selection, application re-architecting for the Cloud and containerization. The best practices for cloud-based public services deployment were presented in the project's International Conference at Madrid, and are also available online at: http://www.storm-clouds.eu/services/resources/best-practices/

WP3 Achievements

To summarize significant results during this period include:

- Technical analysis of the new services to be cloudified;
- Customization, validation, testing (functional and vulnerability analysis) and replication of services into the HP's SCP development cloud infrastructure;
- Deployment and integration of new services into the production SCP public cloud infrastructure at Enter S.r.l.;
- Updated all tools used for automating the deployment and configuration of selected services and the tools for performing operational data backups;
- Tested the prototype applications against the OWASP ten most critical web application security risks;
- Proposed countermeasures to be implemented for each identified alerts per individual OWASP compliance/risk category;
- Creation of a set of 15 best practices for cloud-based public services deployment.

Deliverables produced in WP3

The following deliverables have been produced in this period:

- D3.1.3. Deployment of the services in the Cloud Infrastructure for Cloudification, customization and testing.
- D3.1.4. Deployment of the services in the Cloud Infrastructure for Cloudification, customization and testing
- D3.2.3. Production start of cloudified or transferred services

- D3.2.4. Production start of cloudified or transferred services.
- D3.3 Cloud-based public services portfolio
- D3.4.1 Best practices for cloud-based public services deployment
- D3.4.2 Best practices for cloud-based public services deployment

2.4 WP4 Horizontal issues

WP4 completed at month 18 and, therefore, there is no activity to report on period 3.

2.5 WP5 Definition of guidelines for a successful migration to cloud-based public services

WP leader: AUTH

Participants: HP, ED, ASI, VALLADOLID, THESSALONIKI, ÁGUEDA, MISKOLC.

During the third year AUTH has updated the literature review regarding the adoption of cloud computing by the public sector (Task 5.1). This body of knowledge about the migration of public services into the cloud (D5.1.2) has adopted the structure of the roadmap and its main sections: i) services and applications, ii) cloud environment, iii) migration of applications, iv) cloud administration, v) data management vi) security and vii) validation and monitoring. The content is mainly based on recent scientific papers in addition to about 100 relevant reports. A catalogue of these reports can be found in the project website (http://www.storm-clouds.eu/services/resources/body-of-knowledge/). In this catalogue reports are organized according to their content category (e.g. privacy, security, cloud environment etc.) and users may read a short summary of each report and/or download the report.

ED contribution towards WP5 included the publication of a paper on "Cloud Computing Security" in the "Journal of Smart Cities", vol.2(1): 66–77. The paper focused on the security issues that may arise when public sector organizations consider transitioning to an Open Source Software (OSS) Infrastructure as a Service (IaaS) Cloud Infrastructure (OpenStack). Legal implications; regulatory and standards compliance; new attack vectors resulting from vulnerabilities coming from virtualization technologies; data integrity issues, such as encryption and access controls; and security checks to be performed on the services prior to their movement to the cloud were examined.

In September 2015 (20M) an open call was announced by the Journal of Smart Cities for a special issue on 'Smart Cities and Cloud Computing' (Task 5.2) with guest editors three researchers of AUTH, Dr. Christina Kakderi, Prof. Nicos Komninos and Dr. Panagiotis Tsarchopoulos. The aim of this issue is to review challenges and solutions (both from the STORM experience and elsewhere) related to the use of cloud computing for the development or the migration of smart city services to the cloud, such as the use of cloud-based infrastructure and platforms, adaptation of applications to cloud environment, distributed organization of resources, business models, data security, analytics and other. The Special Issue was published on May 2016, including an editorial 'Smart Cities and Cloud Computing: Introduction to the special issue' and six papers, among which, four are related to the results of the STORM Clouds project.

Based on the previous two activities, AUTH has developed a list of key issues (and potential solutions) related to the migration process of public services to the cloud. These have been organized in a roadmap of five sequential steps (services and applications, cloud environment, migration of applications, cloud administration, data management) and two parallel procedures (security and validation/monitoring). The content of this roadmap is presented in an interactive, tree structured navigation tool, available through the STORM Clouds website (http://www.storm-clouds.eu/services/resources/roadmap/).

WP5 Achievements

To summarize significant results during this period include:

- Literature review on public sector adoption of cloud computing, giving emphasis to the role of cloud computing towards smart city strategies;
- Creation of compilation of Body of knowledge and roadmap in document form and also as an accessible web site.

- Integration of lessons learnt during the whole project across the different WPs.

Deliverables produced in WP5

During this period the seliverable Documents released in this WP were:

- D5.1.2 Body of knowledge about migration of public services into the cloud
- D5.2 Book about public services migration to the cloud …
- D5.3 Roadmap about migration of public services into the cloudD5.1.2 Body of knowledge about migration of public services into the cloud.

2.6 WP6 Scalability, dissemination, exploitation and sustainability

WP leader: RTDI

Participants: All Partners.

This WP has a two working lines: dissemination and exploitation

Exploitation activites are covered under Tasks 6.2 and 6.3 as:

Task 6.2. Business modeling.

The completion of this task resulted on the identification, assessment and validation of 7 exploitable assets that are exploitable project results. Fully constructed business models have been elaborated for each one of them, during a whole-day collaborative Business Model Generation Workshop moderated by RTDI. The workshop was based on the Business Model Lean Canvas methodology of Alex Osterwalder. Deliverable D6.3.1 shows the methodology and results of the work undertaken in this tasks, including the Lean Canvas and business models for each of the exploitable assets.

Task 6.3. Sustainability and exploitation plans.

Following on the results of Task 6.2. exploitation and sustainability plans were elaborated for each exploitable asset. These plans followed the Opportunity Assessment Plan methodology of Hisrich and have been elaborated during several iterative one-to-one mentoring sessions between each one of the exploitable assets owners and a RTDI mentor. Exploitation plans contained assessment of the idea, opportunity and market, and an elaborated step-by-step strategy for a successful exploitation and sustainability of each of the assets after the project's completion, including the calculation of the necessary investment and workforce.

On top of that, the exploitation plan elaborated for the main exploitable asset - being the one formed by the Storm Clouds Platform, plus the catalogue of cloudificable smart city services and the know-how for cloudification – has been discussed and assessed by all consortium members during a project meeting. For this joint asset an elaborated 5-year business plan was created, calculating the necessary investment, workforce and ROI. Additionally, complete exploitation risks management was performed for this asset. This included the celebration of two workshops: one face-to-face, for exploitation risks identification and assessment, and one online for exploitation risks management plan.

Deliverable D6.3.2 contains the methodology, results and conclusions of both of these tasks.

About dissemination, during this year there were activities in three areas: live events, online dissemination and awareness material.

Live Events

The main milestone was the **International Conference** held in Madrid, December the 14th 2016 with the presence of the project partners, other EC projects in the area of Cloud, Municipalities external to the project and representatives of the Spanish Ministry of Technology and the Agency for Innovation of Madrid Region.

The conference was complemented with an event related to the promotion of cloud computing at private companies the next day. All the events were presented as the "European Cloud Week" at the premises of the EOI, a business school dependent on the Spanish Ministry of Industry.

http://storm-clouds.eu/2016/11/23/european-cloud-week-storm-clouds-international-conference/

All the conference was recorded in video available at:

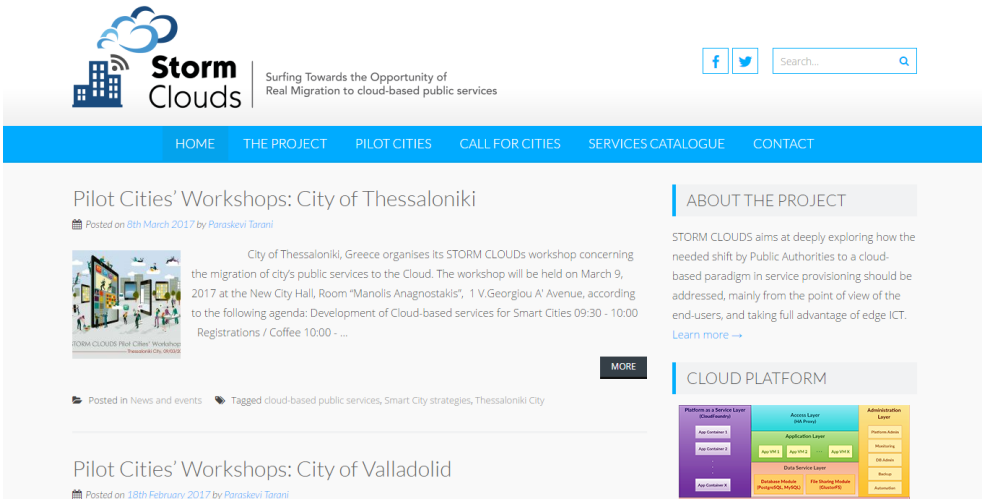
http://stormcloudsconference.eu/videos-storm-clouds-international-conference/

In addition, local events were organised at the four cities: presentations and workshops to access the applications and SCP, depending on the profile of the attendees.

Online Dissemination

The STORM CLOUDs digital dissemination activity includes three basic channels: the web site blog, the STORM CLOUDS twitter account and the STORM CLOUDS Facebook page.

A new project portal has been implemented and is currently available at: http://storm-clouds.eu/



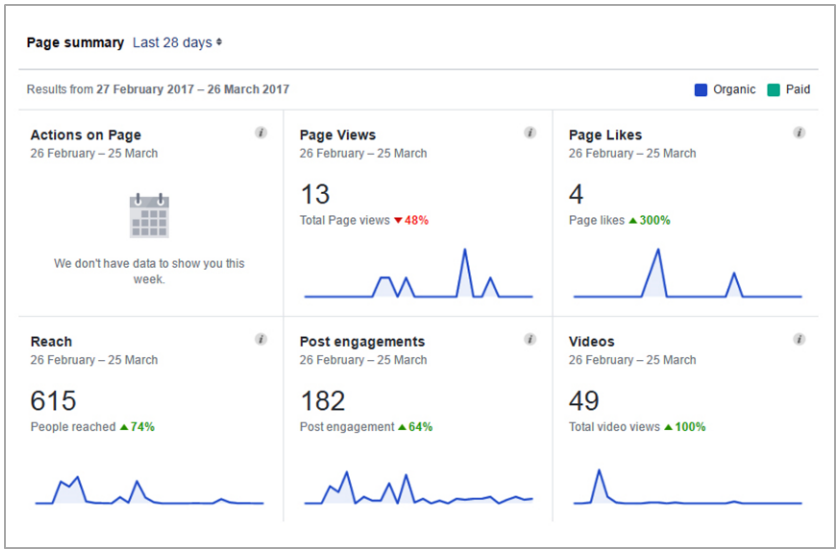
The project's portal includes direct links to the project's social media accounts (Facebook page and Twitter account) that have been used complementarily to the blog post.

The **web blog** is organized in three categories of articles

- News and events according the project agenda, the pilot cities activities but also news and events about relevant EU project, conferences and seminars within the field
- Storm Clouds watch included posts and collection of recent articles about cloud computing / smart cities / governance issues cloud migration for cities etc.
- Storm Clouds reports and deliverables include blog posts based on projects deliverables and reports in brief presentation and visual material for better sharing through social media.

All blog posts have been shared through project's BF page and Twitter.

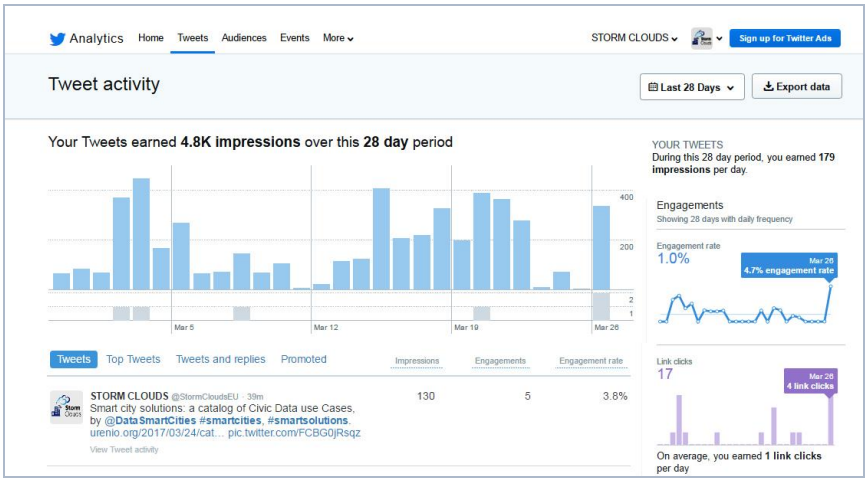
The Project's Facebook page changed on June 2016 because of difficulties with the Facebook account. The previous Facebook page (@stormclouds.eu) had 79 likes/followers. The new FB page was disseminated through the project web site and all the relevant references and links have been changed.



The Project's Twitter account has better performance than FB page. There is connection with all the Horizon H2020 relevant projects (i.e Cloud Opting, Strategic, ECIM, E-Sens etc) as well as with relevant accounts. By the middle of March 2017 the project's account has up to 130 tweets, up to 300 followers and 732 following accounts.

All Twitter posts promote the project deliverables, events and news, the pilot cities activities and also other's sites and blogs articles under the issues of cloud migration for cities services, smart cities, e-governance, cloud computing etc.

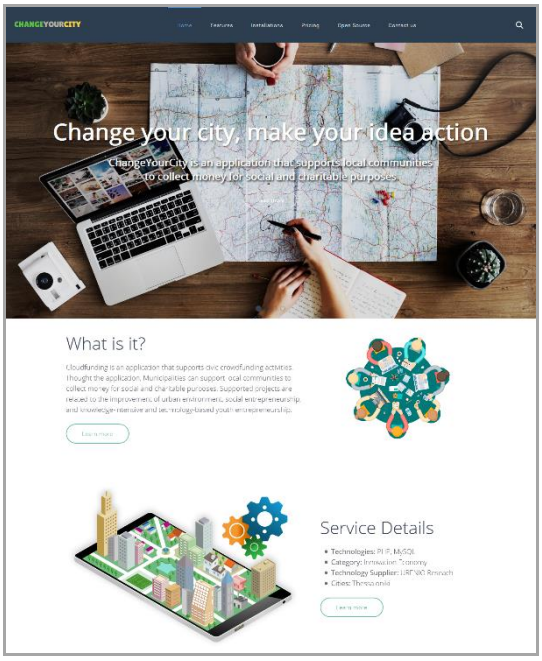
Home
Notifications
Messages
Search Twitter
Tweet
Storm Clouds
TWEETS 130
FOLLOWING 667
FOLLOWERS 298
LIKES 16
MOMENTS 0
Edit profile
STORM CLOUDS
@StormCloudsEU
Tweets
Tweets & replies
Media
Your Tweet activity
Your Tweets earned 1,227 impressions over the last week

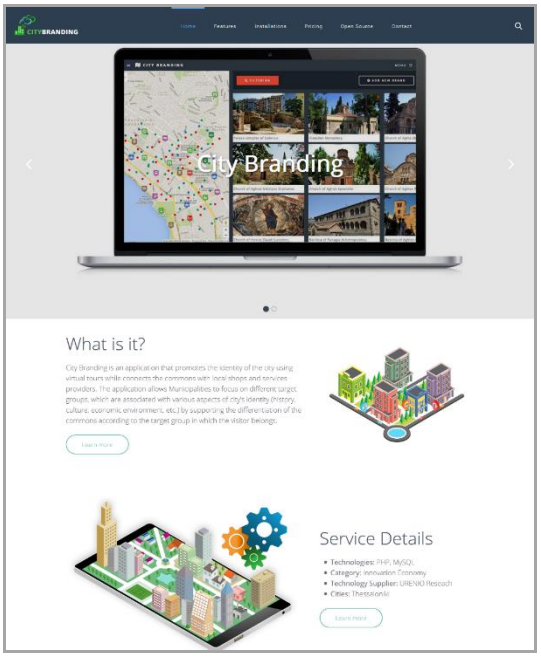

Analytics
Home
Tweets
Audiences
Events
More
STORM CLOUDS
Sign up for Twitter Ads
Tweet activity
Last 28 Days
Export data
Your Tweets earned 4.8K impressions over this 28 day period
YOUR TWEETS
During this 28 day period, you earned 179 impressions per day.
Engagements
Showing 28 days with daily frequency
Engagement rate
1.0%
Mar 26
4.7% engagement rate
400
200
2
1
Mar 5
Mar 12
Mar 19
Mar 26
Tweets
Top Tweets
Tweets and replies
Promoted
Impressions
Engagements
Engagement rate
STORM CLOUDS @StormCloudsEU · 39m
Smart city solutions: a catalog of Civic Data use Cases, by @DataSmartCities #smartcities, #smartsolutions. urenio.org/2017/03/24/cat… pic.twitter.com/FCBG0jRsqz
View Tweet activity
130
5
3.8%
Link clicks
17
Mar 26
4 link clicks
On average, you earned 1 link clicks per day

In addition, the Migration of the Services website, which was available at http://stormclouds.urenio.org, into the project's website (http://www.storm-clouds.eu/services/)

Finally, three dedicated sites for the promotion of the most prominent services. In particular, for Clowdfunding (application's name has changed to ChangeYourCity), CityBranding and Virtual City Market:

- ChangeYourCity: http://changeyour.city/
- CityBranding: http://www.urenio.org/citybranding/
- Virtual City Market: http://www.urenio.org/smartmarketplace/





Awareness material

In addition to the production of the website and social networks account, additional awarenesss material was created to support the live activities.

The main milestone was the project promotional video (See https://youtu.be/cbPgrSc4qvc)

Other material as the project brochures and/or leaflets for the specific applications at each city were prepared. We include here some examples. For a complete reference, the reader is refered to D6.5.2

The brochure is available under: http://storm-clouds.eu/wp-content/uploads/2017/02/STORM-Clouds_brochure.pdf

Leaflets of applications launched at Agueda:

Deliverables Produced in WP6

The following deliverables have been produced in this period:

- D6.3.2 STORM CLOUDS Business models and plans
- D6.5.2 STORM CLOUDS Awareness Tools

2.7 WP7. Project Management

Description of work and achievements in this WP is included in section 4 this document.

3 Deliverables and milestones tables

TABLE 1. DELIVERABLES

Del. no.	*Deliverable name*	*WP no.*	*Lead Partici-pant*	*Nature*	*Dissemi-nation level*	*Due delivery date from Annex I*	*Delivered Yes/No*	*Actual / Forecast delivery date*	*Comments*
D1.3.3	Selection of services to be cloudified, deployed and transferred	1	4	R	PU	26	Yes	26	
D1.3.4	Selection of services to be cloudified, deployed and transferred	1	4	R	PU	32	Yes	33	Minor delay due to coordination between editors and revisors.
D1.4.2	Monitoring and Validation of Services.	1	1	R	PU	38	Yes	38	
D3.1.3	Deployment of the services in the Cloud Infrastructure for Cloudification, customization and testing	3	3	O	PU	27	Yes	29	Delay due to the implementation of SCP non planned features and to the cloudification of more applications than expected.
D3.1.4	Deployment of the services in the Cloud Infrastructure for Cloudification, customization and testing	3	3	O	PU	36	Yes	36	
D3.2.3	Production start of cloudified or transferred services	3	3	P	PU	29	Yes	30	Delay due to the delay of D3.1.3.
D3.2.4	Production start of cloudified or transferred services	3	3	P	PU	36	Yes	36	
D3.4.2	Best Practises for cloud based services deployment	3	5	R	PU	27	Yes	32	Delayed due to willingness to cover the 2nd stage of the cloudification process
D5.1.2	Body of knowledge about migration of public services into the cloud.	5	5	R	PU	38	YES	38	
D5.2	Book about public services migration to the cloud and the use of cloud-based public services in four European cities	5	5	R	PU	38	YES	38	
D5.3	Roadmap about migration of public services into the cloud	5	5	O	PU	38	YES	38	
D6.3.2	STORM CLOUDS Business models and plans networking activities for scalability and sustainability	6	1	R	PU	38	Yes	38	

D6.5.2	STORM CLOUD Awareness Tools	6	3	R	PU	38	Yes	38	
D7.3	Final project Report and financial statements	7	1	R	CO	38	Yes	38	

TABLE 1-B. OTHER DOCUMENTS DELIVERED

Del. no.	*Deliverable name*	*WP no.*	*Lead Partici-pant*	*Nature*	*Dissemi-nation level*	*Due delivery date from Annex I*	*Delivered Yes/No*	*Actual / Forecast delivery date*	*Comments*
D2.2.2	STORM CLOUDS Platform Architectural design	2	2	R	PU	N/A	Yes	35	New version of the D2.2.2 document including the improvements included in the SCP during the last period of the project
N/A	STORM CLOUS Platform User Manual	2	2	R	PU	N/A	Yes		User Manual for the SCP.

TABLE 2. MILESTONES

Milestone no.	Milestone name	Due achievement date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
MS5	3rd innovation cycle	M27	Yes	M29 – April 2016	The milestone was achieved successfully with a delay of 2 months as a number of non foreseen features in the SCP where implemented. There were required to have a better implementation of applications
MS6	4th innovation cycle	M38	Yes	M38 – March 2017	
MS7	3rd year project review	M38	Yes	M38 – March 2017	

4 Project Management

The management of the project during the third period has been particularly challenging for the project manager and the consortium as two main issues had to be solved:

- The situation of Alfamicro: This partner, in charge of project dissemination, was undergoing internal problems that resulted in a poor performance and lack of reactiveness to the demands of the project manager.
- The property of Ariadna Servicios Informáticos S.L., the former project coordinator, decided to start a process for the liquidation of the company due the bad economic situation of the firm.

In the Progress Report for year 2, we presented the problem and a contingency plan that was agreed with the owner of Alfamicro. At the beginning of march in a Teleconference, Alfamicro owner commited to collaborate actively in the project and to recover dissemination activities

A plan, including control measures to verify the fulfilment of these commitments was elaborated with weekly teleconferences to discuss objectives for the week.

Already in April it was clear that Alfamicro was not going to fulfil their duties in the project. Therefore, an alternative plan was to be quickly put into place. During May the consortium agreed to start a contract amendment process to redistribute the duties and resources to other partners in the consortium. According to this, other project partners would get the responsibility over the dissemination activities and other aspects from Alfamicro. These partners were: Ariadna, ED, AUTH and RTDI.

When the Contract Amendment process started, there were some indications from the property of Ariadna about the bad situation of the company that could lead to bankruptcy. During June 2016, the property of the firm decided that in September 2016 a liquidation process for the company would start. In that month all employees would be leaving the company and the legal liquidation would start.

At this point the main concern was to protect the ongoing projects that involved third parties. In particular: STORM CLOUDS that had been running more than 2 years. In addition, the project technical partners and users were performing very well and the objectives were gradually achieved. Therefore, the main objective of the project manager was to protect this work done and to ensure a proper continuation of efforts.

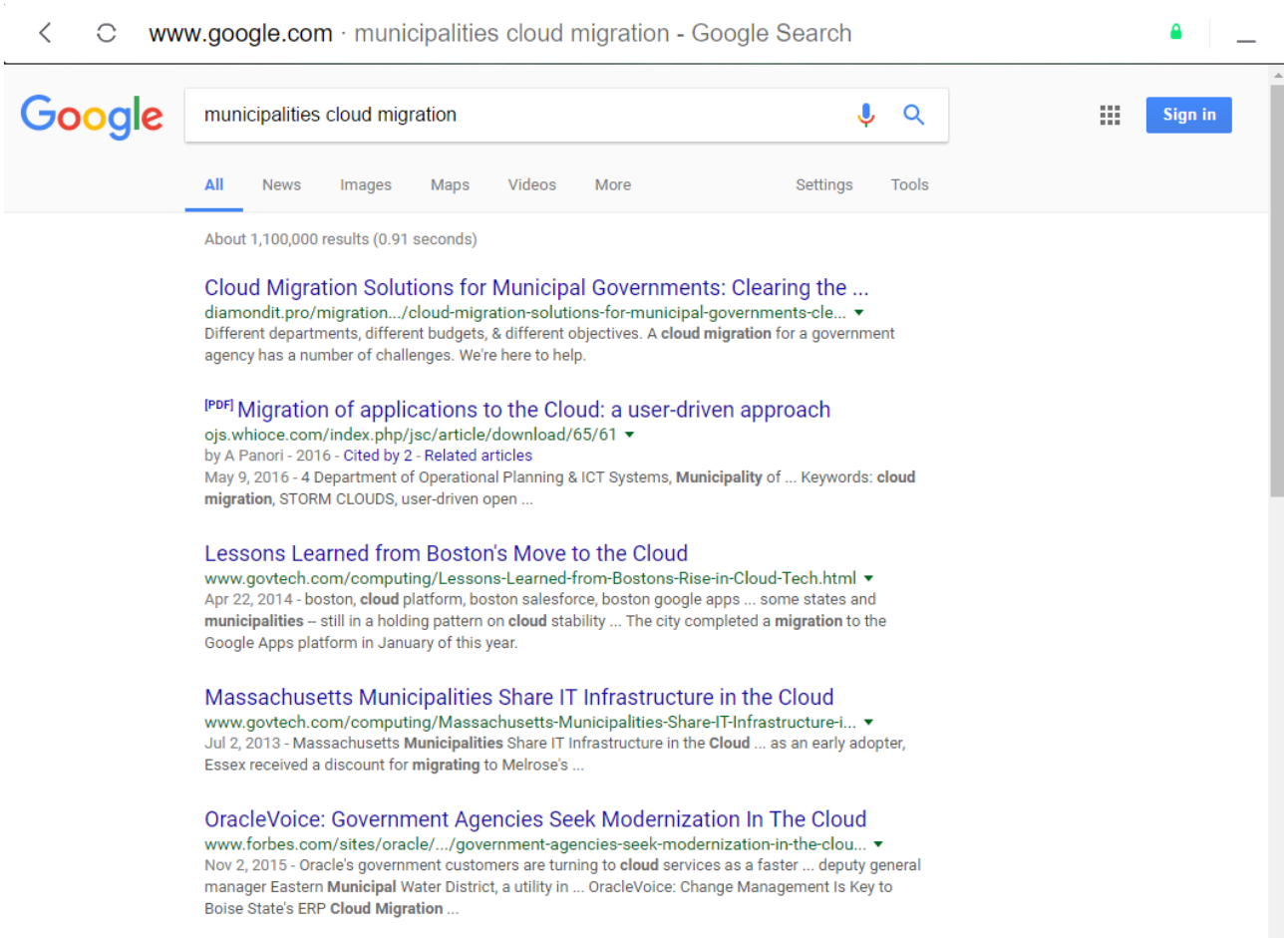
At this moment, unformal contacts with the partners were carried out by the project manager to design the best possible solution for the project that could also be accepted by the rest of the consortium. The strategy that was considered as having less impact to the project was that a project partner, in this case RTDI SL, was to take the project coordination. RTDI agreed to get the project leadership and hired as in-house consultant to Agustin González-Quel, the project manager from the beginning of the project, as soon as he would be leaving Ariadna.

This option was considered the best by the consortium in order to keep the continuity of the efforts carried out during the project.

As soon as the formal decision was made by Ariadna property. the consortium and the European Commission were officially informed.

The Contract Amendment process that had been started to reflect Alfamicro resources modifications was now to include the transfer of leadership from Ariadna to RTDI and Ariadna termination.

At the end of the project, we can express our satisfaction that the situation was correctly addressed. Thanks to the efforts and collaborative attitude of all project partners, STORM CLOUDS has achieved all the objectives. The project has also produced the expected effect to speed up cloud adoption in Municipalities in Europe. Dissemination activities were recovered. The live events proposed in the original DoW of the project were carried out. On the other hand, online dissemination is a success: Searching about “Cloud migration municipalities” in google.com search engine returns STORM CLOUDS related references in the 2nd place reported worldwide from 1.100.000 results.



The new Document of Work includes the following changes to the project:

- The participation of Ariadna Servicios Informáticos S.L. terminated the date October the 31st, 2016
- Extension on the project duration for 2 months with no cost extension having as new ending date March the 31st , 2017. According to this, the project duration is modified to 38 months.
- By agreement of the consortium, the completion of the following Tasks of the workplan are transferred from Alfamicro Sistemas de Computadores Lda as follows:
  - Activities in task 6.3 in WP6 were partially transferred to Research, Technology Development and Innovation S.L. (RTDI) for their completion.
  - Activities in task 6.6 in WP6 were partially transferred European Dynamics Advanced Systems of Telecommunications, Informatics and Telematics SA (ED) for their completion.
  - Activities in task 6.4 and 6.5 as well as WP6 leadership were transferred to Aristotelio Panepistimio Thessalonikis (AUTH) for their completion.
- The completion of the following Tasks of the workplan are transferred from Ariadna Servicios Informáticos S.L. (ASI) to Research, Technology Development and Innovation S.L. (RTDI)
  - Task 1.3 and 1.4 in WP1 were partially transferred for their completion.
  - Tasks 6.1 and 6.3 in WP6 were partially transferred for their completion.
  - Tasks in WP7 that correspond to Project Management were completely transferred from 1st September 2016 to project termination.

Consortium management tasks and achievements;

As explained hereafter, the management of the project has focused on two aspects:

- Tracking of project progress according to schedule.
- Solve all administrative issues, including the contract amendment and change of coordination in order to keep safe the project progress regardless the specific situation of companies.

All project participants have been particularly collaborative to make the project a success.

As explained below in this document, there was a minor delay in Milestone 5, already recovered.

Two deliverable document has been produced in this period:

- D7.2.3. Periodic project progress reports and financial statements, this document.
- D7.3. Project Final Report.

Problems which have occurred and how they were solved or envisaged solutions

As already explained the main problem reported during the project was the change of project coordinator due to the liquidation process of the former coordinator. This situation has been satisfactorily solved with a minor impact in the project. All expected objectives and results have been successfully achieved.

Changes in the consortium

At month 11 of the project Manchester City Council expressed their difficulties to fulfil their duties to the project, due to internal restructuration processes taking place in the Municipality.

At month 22 of the project Miskolc Holding officially joined the project to play the role of piloting city.

At month 32, RTDI SL got the role of Project Coordinator.

At month 33, Ariadna Servicios Informáticos SL terminated the participation to the project.

List of project meetings, dates and venues;

The following meetings have taken place:

- March 2nd , 2016: Progress meeting (Teleconference)
- March 4th , 2016: Meeting Ariadna – Miskolc (Teleconference)
- March 8th , 2016: Progress meeting (Teleconference)
- March 15th , 2016: Management meeting (Teleconference)
- March 16th , 2016: WP2-WP3 meeting (Teleconference)
- March 18nd , 2016: Meeting Ariadna – Miskolc (Teleconference)
- March 21nd , 2016: Meeting Ariadna – Agueda (Teleconference)
- March 23rd, 2016: WP2-WP3 meeting (Teleconference)
- April 6th, 2016: WP2-WP3 meeting (Teleconference)
- April 13th , 2016: Progress meeting (Teleconference)
- April 19th, 2015: Pre-review meeting. (Teleconference)
- April 20th, 2015: Project Remote Review meeting. (Teleconference)
- April 26th, 2015: Meeting Ariadna - Alfamicro (Teleconference)
- April 27th, 2015: Meeting Ariadna - Thessaloniki (Teleconference)
- April 26th, 2015: Meeting Ariadna – RTDI (Teleconference)
- May 4th, 2016: WP2-WP3 meeting (Teleconference)
- May 18th, 2016: WP2-WP3 meeting (Teleconference)

- May 20th, 2016: Progress meeting (Teleconference)
- May 23th, 2016: Exploitation Session (Teleconference)
- May 25th to May 27th, Project General Meeting at Thessaloniki, hosted by Thessaloniki Municipality.
- June 8th, 2016: WP2-WP3 meeting (Teleconference)
- June 15th, 2016: Progress meeting (Teleconference)
- June 16th, 2016: WP2-WP3 meeting (Teleconference)
- June 22th, 2016: WP2-WP3 meeting (Teleconference)
- June 24th, 2016: Meeting Ariadna – Miskolc (Teleconference)
- June 29th, 2016: WP2-WP3 meeting (Teleconference)
- July 13th, 2016: WP2-WP3 meeting (Teleconference)
- June 20th, 2016: Progress meeting (Teleconference)
- July 27th, 2016: WP2-WP3 meeting (Teleconference)
- July 29th, 2016: Management meeting (Teleconference)
- August 24th, 2016: Management meeting (Teleconference)
- August 31st , 2016: WP2-WP3 meeting (Teleconference)
- September 1st, 2016: Meeeting to prepare International Conference.
- September 7th, 2016: Management meeting (Teleconference)
- September 14th , 2016: WP2-WP3 meeting (Teleconference)
- October 11th , 2016: Management and Progress meeting (Teleconference)
- November 16th , 2016: Management and Progress meeting (Teleconference)
- December 13th, Project General Meeting at Madrid , hosted by RTDI SL
- January 11th , 2017: Management and Progress meeting (Teleconference)
- February 3rd, 2017: Exploitation and Risk Management meeting (Teleconference)
- February 8rd, 2017: Meeting RTDI - Thessaloniki (Teleconference)
- February 22nd, 2017. Progress Meeting RTDI – Valladolid Municipality, Valladolid.
- March 1st, Progress Meeting RTDI – Ageda Municipality, Agueda.

Project planning and status;

Due to the change of the coordinator partner, there was some delay during the second innovation cycle that affected Milestone 5. The project was extended 2 months from the originally planned duration to recover from this impact.

At the end of the project, all the objectives have been achieved.

Impact of possible deviations from the planned milestones and deliverables

Above mentioned deviation has been already recovered and the project has not been impacted in its objectives.

Impact of possible deviations from the planned resources;

The early termination of Ariadna and the redistribution of tasks and resources initially assigned to Alfamicro has motivated that the resources actually used by these partners for the project is less than initially planned.

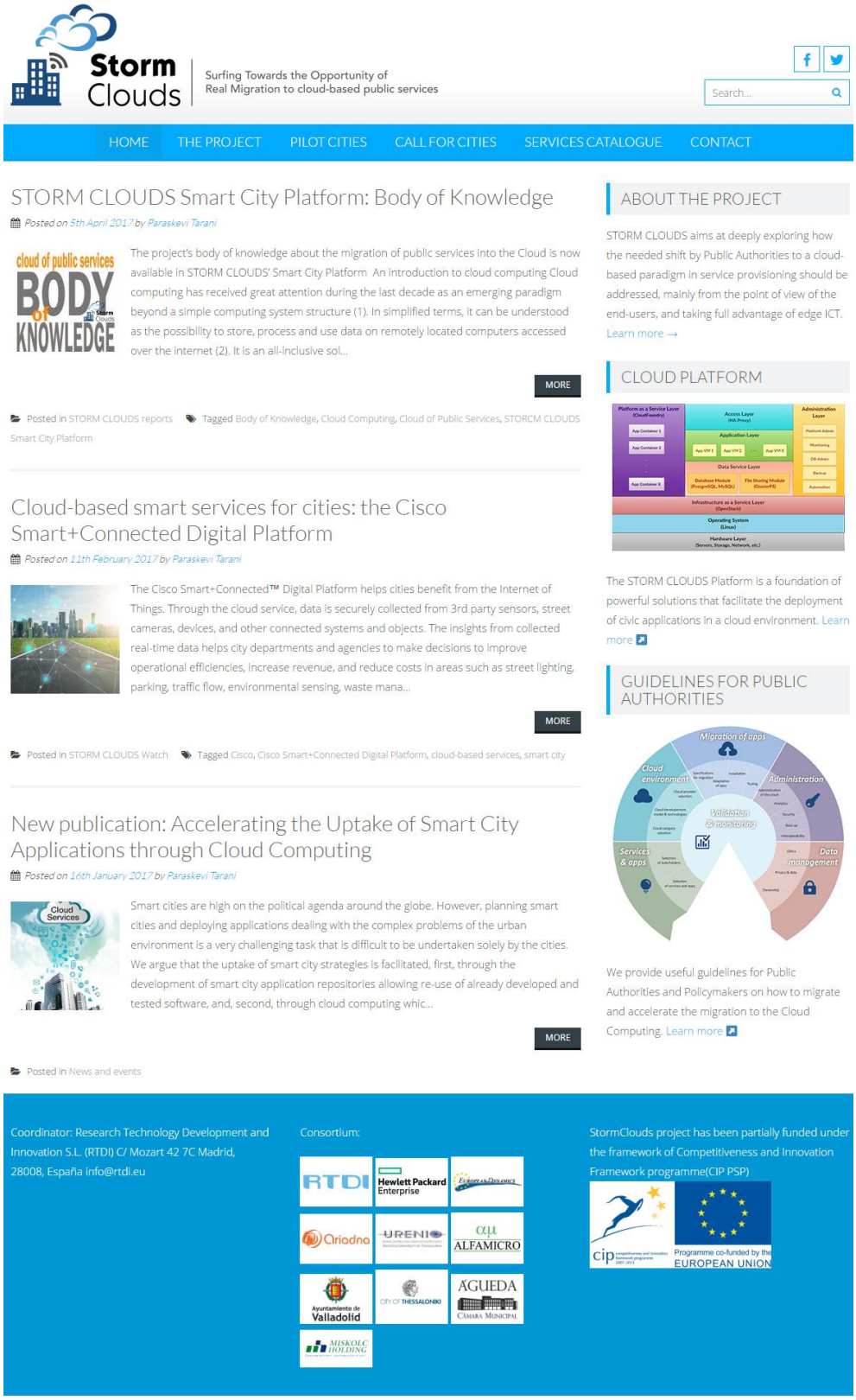
However, their duties and resources were taken over by other project partners and the activities carried out and resources spent are similar to those initially planned for the project as a whole.

Any changes to the legal status of any of the beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs status;

Ariadna Servicios Informáticos SL started the liquidation phase but for the time the company belonged to the consortium there were no legal change in its status.

Development and use of the Project website

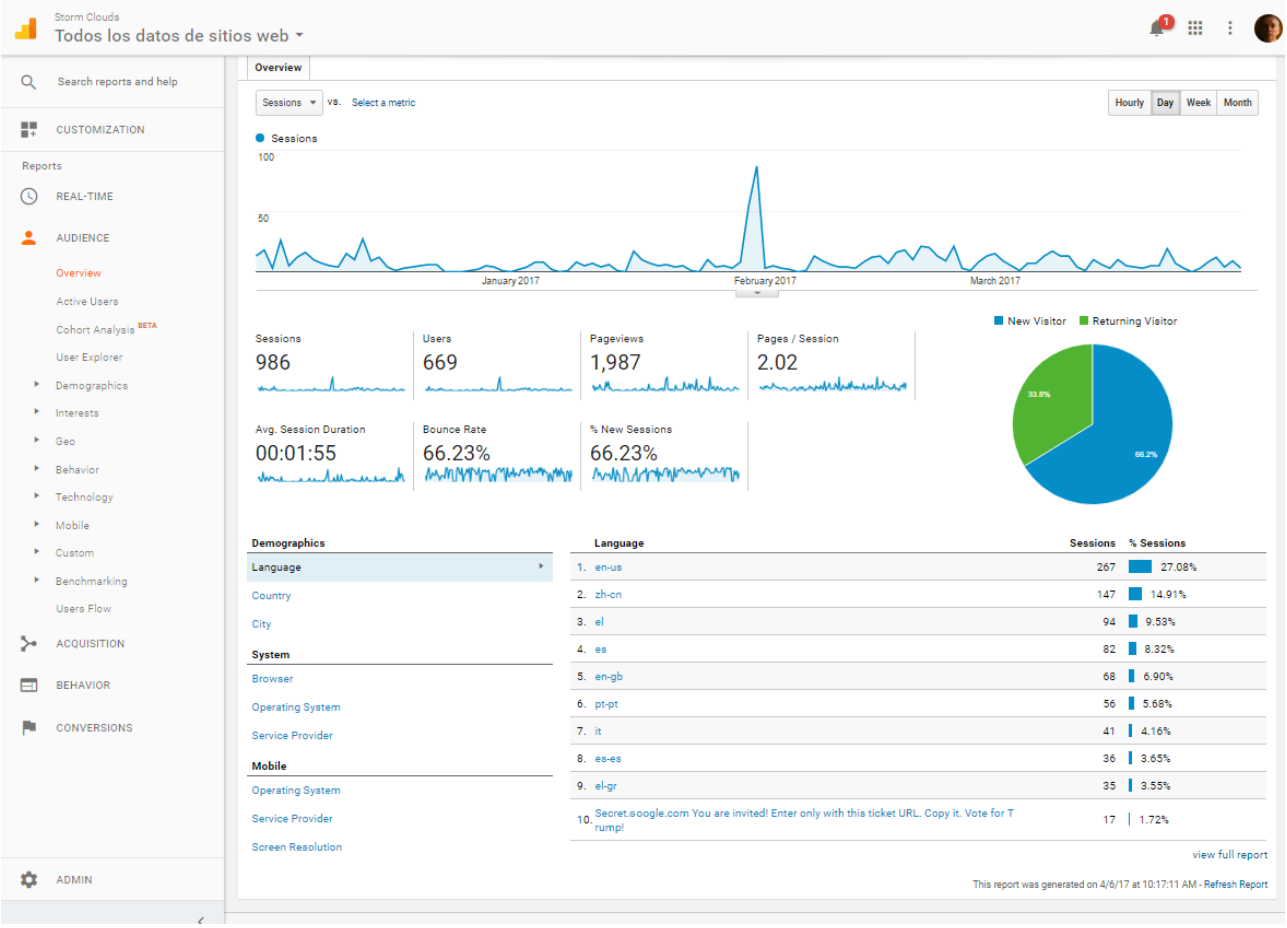
A project portal has been redesigned and it is currently available at: http://storm-clouds.eu/



The new project's portal structure includes the following pages:

- **Home** – the web site's blog
- **The Project** – brief description of the project
- **Consortium** – brief description of all the partnership and links to their pages
- **Deliverables** – all the project deliverable per each work package are available to download from the project's web site
- **Related Projects –** brief description of the related Horizon2020 EU projects in the field of e-governance, cloud services for cities
- **Pilot Cities** – brief description of project's pilot cities and the brief presentation of the adopted cloud services and applications.
    - The Águeda Scenario
    - The Miskolc Scenario
    - The Thessaloniki Scenario
    - The Valladolid Scenario
- **Call for Cities –** the open call for the replication pilot cities
- **Services Catalogue –** link to the website where the project's assets (platform, tools, applications and methodologies) are presented in detail.
- **Contact** – the project's contact details

The project's portal includes direct links to the project's social media accounts (Facebook page and Twitter account). Project website traffics is summarised in the figure:



As explained before, the blog posts were related to posts in the social accounts of the project. For better reach the audience, the posts create or contribute to specific hashtags in the target field such as:

#cloudcomputing, #cloudstrategies, #citiesinthecloud, #smartcities, #SmartCitiesApps, #smartgovernance and other.

The account's performance has been improved during the reporting period according the number of the followers, the posts' impressions, audience engagement, likes etc., as it is shown in the following table.

	Period	Impressions per day	Engangement rate (%)	Link clicks	Retweets	Likes
1	August 2015 - September 2015	34	0,2	3	2	0
2	October 2015 - November 2015	29	0,2	21	6	1
3	December 2015 - January 2016	68	0,3	8	2	2
4	February 2016 - March 2016	22	1,1	8	0	5
5	April 2016 - May 2016	25	0,2	3	1	1
6	June 2016 - July 2016	96	0,7	31	15	12
7	August 2016 - September 2016	74	0,6	23	4	7
8	October 2016 - November 2016	100	1,1	22	24	25
9	December 2016 - January 2017	82	0,5	15	11	10
10	February 2017 - March 2017	226	1,1	46	30	43

Use and dissemination activities during this period

In addition to on-line dissemination, the project has been presented at a number of events:

- Feb 3rd, 2016, Presentation of STORM CLOUDS Project at Fi@ 2016. Coimbra, Portugal
- June 1st, Presentation of STORM CLOUDS at CLIPS project conference. Firenze, Italy.
- June 7st, Presentation of STORM CLOUDS. RTDI. Madrid, Italy.
- June 21th, 2016: Promotional action with Cloud28+ network (Teleconference)
- September 18th to 20th, Presentations at CloudForward Event. Madrid.
- November 11th, 2016. CLASS 2016 Conference: Clouds towards Smart Cities, Smart Energy, Intelligent Transport Systems, Advanced Manufacturing and eHealth (http://www.cloudconference.eu/). Uptaking Smart City Applications through Cloud Computing: The STORM CLOUDS experience
- November 17th, 2016. Virtual Conference: Digital Cities - Communities and Connectivity in the 21st Century, Temple University, Tokyo, Japan (URL: https://www.vconferenceonline.com/microsite/html/event.aspx?id=1250&offset=-2). Accelerating the Uptake of Digital City Applications through Cloud Computing
- December 14th, Project International Conference at Madrid.
- January 23rd-24th, 2017. ICEGSCDS 2017: 19th International Conference on e-Government, Smart Cities, and Digital Societies, January 23 - 24, 2017, Paris, France (https://www.waset.org/conference/2017/01/paris/ICEGSCDS),. Accelerating the Uptake of Smart City Applications through Cloud Computing
- February 22th, Local Workshop at Valladolid.
- March 1st, Project Public presentation at Agueda and Workshop.

About publications, the following one can be mentioned:

- Journal of Cities. **Special Issue on Smart Cities and Cloud Computing**. Several authors from the project. June 2016. http://ojs.whioce.com/index.php/jsc/issue/view/12

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Volume 2 Issue 1

SPECIAL ISSUE: Smart Cities and Cloud Computing

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Smart cities and cloud computing: Introduction to the special issue PDF
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Christina Kakderi, Nicos Komninos, Panagiotis Tsarchopoulos

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Smart cities and cloud computing: lessons from the STORM CLOUDS experiment PDF
181 Views (Abstract)
Christina Kakderi, Nicos Komninos, Panagiotis Tsarchopoulos

Storm Clouds Platform: a cloud computing platform for smart city applications PDF
179 Views (Abstract)
Marco Battarra, Marco Consonni, Samuele De Domenico, Andrea Milani

Social network services for innovative smart cities: the RADICAL platform approach PDF
217 Views (Abstract)
Fotis Aisopos, Antonios Litke, Magdalini Kardara, Konstantinos Tserpes, Pablo Martínez Campo, Theodora Varvarigou

Migration of applications to the Cloud: a user-driven approach PDF
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Cloud-based architectures for geo-located blogosphere dynamics detection PDF
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Athena Vakali, Stefanos Antaris, Maria Giatsoglou

Cloud computing security: protecting cloud-based smart city applications PDF
243 Views (Abstract)
Alkiviadis Giannakoulias

- Tsarchopoulos, P., Komninos, N., and Kakderi, C. (2017), "**Accelerating the Uptake of Smart City Applications through Cloud Computing**", World Academy of Science, Engineering and Technology, International Science Index 121, International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, 11(1), 129 – 138. http://waset.org/publications/10006171.

Use of Resources

5 Overview Person-Month Status

We hereby provide two tables informing of resources:

Period 3

Effort spent in the period compared to the effort planned for this period project. Split per partner and WP.

Consortium		WP1		WP2		WP3		WP4		WP5		WP6		WP7		TOTAL	
Nr	short name	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned
1	RTDI	10,7	18,0	0,0	0,0	5,0	8,0	0,0	3,0	0,0	0,0	15,2	23,0	10,1	12,0	41,0	**64,0**
2	HP	0,0	0,0	21,0	47,5	0,0	4,0	0,0	0,0	1,5	2,0	1,0	5,5	1,1	2,0	24,6	**61,0**
3	ED	1,1	4,0	0,3	8,0	11,2	26,0	0,0	14,0	0,3	2,0	18,4	17,0	0,7	2,0	32,0	**73,0**
4	ASI	3,2	33,0	0,0	0,0	6,9	18,0	0,0	0,0	6,4	7,0	4,2	10,0	4,4	13,0	25,1	**81,0**
5	AUTH	0,9	4,0	0,0	6,0	10,0	29,0	0,0	4,0	10,0	14,0	15,2	19,0	1,2	3,0	37,2	**79,0**
6	ALFAMICRO	0,0	6,0	0,0	0,0	0,0	13,0	0,0	2,0	0,0	0,0	2,1	2,0	1,5	2,0	3,6	**25,0**
7	MANCHESTER	0,0	5,0	0,0	0,0	0,0	2,0	0,0	2,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**9,7**
8	VALLADOLID	5,0	16,0	0,5	2,0	2,0	4,0	0,0	3,0	3,0	5,0	4,5	8,0	1,0	2,0	16,0	**40,0**
9	THESSALONIKI	6,2	18,0	0,0	2,0	2,2	9,0	0,0	3,0	4,9	9,0	2,6	9,0	0,6	2,0	16,5	**52,0**
10	AGUEDA	4,0	16,0	0,0	2,0	1,5	4,0	0,0	3,0	3,5	5,0	6,0	8,0	0,5	2,0	15,5	**40,0**
11	MISKOLC	9,8	13,0	0,0	0,0	18,4	13,0	0,0	0,0	1,3	6,0	2,8	6,0	1,7	2,0	34,0	**40,0**
TOTAL		**40,9**	**133,0**	**21,8**	**67,5**	**57,2**	**130,0**	**0,0**	**34,7**	**31,0**	**50,0**	**71,9**	**107,5**	**22,7**	**42,0**	**245,4**	**564,7**

Cumulative Effort

Effort spent compared to the total effort planned for the project. Split per partner and WP.

Consortium		WP1		WP2		WP3		WP4		WP5		WP6		WP7		TOTAL	
Nr	short name	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned
1	RTDI	19,7	18,0	0,0	0,0	11,0	8,0	3,0	3,0	0,0	0,0	23,7	23,0	11,2	12,0	68,6	**64,0**
2	HP	0,0	0,0	63,6	47,5	5,7	4,0	0,0	0,0	1,5	2,0	5,3	5,5	2,4	2,0	78,5	**61,0**
3	ED	3,8	4,0	8,2	8,0	29,4	26,0	14,6	14,0	1,8	2,0	20,8	17,0	1,9	2,0	80,5	**73,0**
4	ASI	33,7	33,0	0,0	0,0	21,5	18,0	0,0	0,0	8,7	7,0	12,6	10,0	21,2	13,0	97,7	**81,0**
5	AUTH	3,7	4,0	5,6	6,0	24,4	29,0	3,4	4,0	12,7	14,0	17,7	19,0	3,0	3,0	70,4	**79,0**
6	ALFAMICRO	3,0	6,0	0,0	0,0	2,5	13,0	0,0	2,0	0,0	0,0	19,4	2,0	2,0	2,0	26,9	**25,0**
7	MANCHESTER	4,6	5,0	0,0	0,0	1,9	2,0	2,7	2,7	0,0	0,0	0,0	0,0	0,0	0,0	9,2	**9,7**
8	VALLADOLID	17,0	16,0	2,0	2,0	4,0	4,0	2,0	3,0	5,0	5,0	9,0	8,0	3,0	2,0	42,0	**40,0**
9	THESSALONIKI	18,0	18,0	2,1	2,0	8,9	9,0	3,0	3,0	8,9	9,0	8,9	9,0	2,1	2,0	51,9	**52,0**
10	AGUEDA	16,0	16,0	2,0	2,0	4,0	4,0	2,5	3,0	5,0	5,0	10,0	8,0	2,0	2,0	41,5	**40,0**
11	MISKOLC	12,8	13,0	0,0	0,0	18,4	13,0	0,0	0,0	1,7	6,0	3,3	6,0	2,2	2,0	38,4	**40,0**
TOTAL		**132,3**	**133,0**	**83,5**	**67,5**	**131,7**	**130,0**	**31,2**	**34,7**	**45,4**	**50,0**	**130,6**	**107,5**	**50,9**	**42,0**	**605,5**	**564,7**

5.1 Explanation of the use of resources

The usage of resources in the third year has suffered minor deviations with respect to the amounts initially planned in the DoW.

- Ariadna has deviated more effort than expected in management due to the contract amendment and coordination transfer process
- The final effort in WP6 has been higher than expected but the impact achieved has been beneficial for the project.