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SERVICE DISTRIBUTION NETWORK AND TOOLS FOR INTEROPERABLE PROGRAMMABLE, AND UNIFIED PUBLIC CLOUD SERVICES

Deliverable D6.1b

Report on Pilot Incidents and Service Improvements

Workpackage	WP6 – Conduction of Pilot Operations
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Abstract:	This deliverable is the final periodic report on the status and evolution of the pilots, including incidents and improvements that have taken place. The deliverable is produced on the basis of the work of T6.1, T6.2, T6.3 and T6.4 of the project, while also reporting the fine-tuning realized as part of T6.5 as well.

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Definitions, Acronyms and Abbreviations

Acronym	Title
CAMDEN	London Borough of Camden
CBA	Cross Border Authentication
DMZ	Demilitarized Zone (in computer networks)
FP Federation Proxy	FP Federation Proxy
GENOA	City of Genoa
IaaS	Infrastructure as a Service
IDP	Identity Provider
IIS	Internet Information Services (Microsoft Server)
IPSEC	Internet Protocol Security
MAAS	Metal-as-a-Service
MDM	Master Data Management
MoSG	Municipality of Stari Grad
OIX	Open Identity Exchange
PSN	Public Services Network
RAM	Random access memory
RCA	Root Causes Analysis
SAN	Storage Area Network
SEMIRAMIS	Secure Management of Information across multiple Stakeholders
SP	Service Provider
STORK	Secure idenTity acrOss boRders linKed
VCPU	Virtual CPU
VLAN	Virtual Lan
VM	Virtual Machine
VPN	Virtual Private Network

Table 1: Definitions, Acronyms and Abbreviations

Executive Summary

This deliverable is a periodic report that documents the status and evolution of the pilots, including incidents happened and improvements introduced. The activities documented in this deliverable are based on all active tasks of work package 6 for the period of the last year of the project.

During the reporting period that D6.1b covers, all pilot services had been successfully deployed and have been used for piloting purposes. Throughout this period pilot partners have been supported by corresponding technical partners, for the fine-tuning, deployment and management of the applications. Moreover, technical support and reporting for the incidents has been provided in order to be able to improve both STRATEGIC as framework and the pilot applications in more precision. The incidents that have been reported during this period are provided in this document, and have been analysed in order to suggest solutions and improvements.

1 Introduction & Scope of the deliverable

1.1 Scope and purpose of the document

The main goal of the STRATEGIC project is to facilitate organisations and notably public bodies to leverage the benefits of public cloud services. Work package 6 focuses on the pilot operations of the e-government services developed or deployed using solutions and tools of the STRATEGIC framework by leveraging the preparatory steps undertaken in WP5.

The purpose of this deliverable is to serve as a report regarding pilot activities executed in the scope of evaluating STRATEGIC project during the last year of the project. This report congregates the pilot operations conducted, with focus on the creation, deployment and usage status of the e-government services. It also documents the technical support on incidents and preparation of pilot sites and any corrective actions that have been executed towards improving the effectiveness of the STRATEGIC pilot operation. These incidents were also valuable input for WP4 in order to apply Service Store enhancements.

1.2 Target audiences

This document is intended for both internal and external project stakeholders as it is a public document. Internally it can be used as a reporting deliverable for the use case and also a document that can provide any updates to the planned pilot activities. It is also useful internally for the documentation of the incidents and issues that have been raised in the period and it is especially important as this information can be also of interest of external stakeholders, especially public bodies as it can be used as an example of STRATEGIC platform usage.

1.3 Structure of the document

The document consists of six(6) main sections:

- Section 1 is the introduction.
- Section 2 is a short overview of the piloting activities in the scope of the project.
- Section 3 provides information about the infrastructure used for the piloting activities of each pilot partner.
- Section 4 provides information about the piloting activities of STRATEGIC during the third year of the project, by describing each use case.
- Section 5 collects the information about incidents, difficulties, issues and improvements during this last year of the project.
- Section 6 concludes the document.

2 Overview of Pilot Activities

As STRATEGIC goal is to offer a platform that can be used by public bodies in order to support the deployment and management of their services, the first objective of the piloting is to test and evaluate STRATEGIC platform under real life conditions. The second goal is to improve STRATEGIC as a whole platform in order to better suit the needs of public bodies

The pilot operations on STRATEGIC on this period have followed two main directions. This first was the deployment, fine-tuning and usage of the pilot services for the result of evaluating the services and the STRATEGIC outcomes. The second point was the setup of dedicated cloud infrastructure for the usage of the pilot partners, in order to have a complete scenario of cloud adoption by providers.

The management of the STRATEGIC pilot operations consists of eleven (11) use cases; three (3) conducted by London Borough of Camden, four (4) conducted by City of Genoa and four (4) by the Municipality of Stari Grad. For all the use cases, support on piloting and all the preparatory steps was provided by the technical partners participating in STRATEGIC. As this reporting document covers the final year of piloting activities, the results of this piloting period are the presented.

For this reason, the status of each pilot use case and the evolution of the governmental services so far are provided. Details are provided not only about the packaging of the application and the publishing of the application to STRATEGIC Service Store, but also about the actual deployment of the e-government service that has been deployed and used for piloting reasons.

During the period of the piloting activities, all the incidents, technical issues and suggestions for improvements are reported and analysed with the usage of specific tools in order to allow the consortium partners to track issues, suggest solutions and provide fixes. Improvements and fine-tuning was introduced not only to the STRATEGIC platform components but also to the e-government services that are offered to pilots.

The planning of the piloting activities was conducted in work package 5, and it has been documented in the STRATEGIC Deliverable D5.4[2]. Therefore, this document provides the actual execution timeline of the use cases, that includes slight delays and changes in relation to the initial planning, in order to support better the uses cases in the context of longevity and actual usage in real word environment.

For the better readability of the document we will present first the cloud infrastructures used or created for the usage of the pilot partners, and then the execution of the use cases in more details.

3 Cloud Infrastructures Created and Used by Pilots

The purpose of this section is to document all information regarding the cloud infrastructure that was used in for the piloting operations. It describes IaaS offerings that have been both created by Pilots and technical partners during the project or just used in by the pilot partners.

3.1 London Borough of Camden

For the deployment of its pilot applications, the technical team of Camden used the infrastructure offered by BT, the BT Research Cloud. This solution is perfectly suited for CAMDEN as it allowed to benefit from the technical expertise of BT and the integration with Service Store early in the project that allowed to deploy the application for piloting usage in a stable environment that supports the security requirements and as it is hosted in UK it also confirms the legal restrictions.

To achieve this however there was a need to establish a site-to-site Virtual Private Network (VPN) connectivity between the BT Research cloud network and the London Borough of Camden, in order allow BT that was the main technical partner of the consortium to support Camden's technical needs. This connection was available since the first pilot application that was created in early stages of the project, in order to easily proceed with the deployment of services and focus on the development to new service for CAMDEN.

3.2 City of Genoa

For the City of Genoa, there was a high interest to create a private cloud infrastructure in their own premises. Although this was not part of the contractual obligations, this was considered an important step towards the adoption of cloud and the successful execution of the pilot scenarios. As the IT literacy of the technical team of GENOA was already high but had not adopted any open source private cloud solutions, the possibility to create such a private IaaS to be used even after the end of the project was of great added value.

Technical teams of SILO and Genoa worked together for the creation of a dedicated cloud infrastructure that was used during the pilot operations of the project. After initial discussions, it has been decided to create an OpenStack based IaaS, that follows the setup described in deliverable D5.1[3] and followed the Ubuntu Cloud approach¹ that would lead on an IaaS having the following setup, comprised of 4 servers:

1. Canonical MaaS Server
2. OpenStack Core Services (UI, database, key server, VM images, etc)
3. OpenStack Networking Server
4. OpenStack Compute Server

¹ <http://www.ubuntu.com/cloud/tools>

Hardware acquisition

Based on the capacity planning and suggestions from SILO, a functional and technical specification of the hardware platform for OpenStack-based IaaS has been prepared. For the proposed private cloud, 4 physical servers were acquired. For the installation of the IaaS to its final form, many steps occurred, and even the architecture that was used was evolved in order to offer better results for the municipality.

In the following list, we provide a timeline of the installation procedure of the Genoa IaaS

IaaS preparation timeline

- Until Nov 2015: Genoa IT dept. has prepared the 4 servers to allow SILO to work remotely on them. Servers were already connected in a suitable sub-network. Maas was installed in one of the servers. Servers were reachable by VPN by SILO.
- Jan 2016: some scheduled bilateral telco/texting for Genoa personnel to eventually assist during the installation of OpenStack. The installation was agreed to be done mostly unattended by Genoa personnel unless something was needed
- Feb 2016: some bilateral with BT to clarify aspects of Service Store. Unable to delete “zombie” installations from Service Store.
- Mar-Apr-May 2016: some bilateral with SILO, on Genoa side VPN credential renewal and support with different clients/OS, granting of required permission to SILO user, on May 9th SILO created new skype group to ease the process of interchange of information between SILO and Genoa
- April 04: OpenStack Mitaka release²
- April 12: **OpenStack installation using MaaS was created (OpenStack Icehouse, Ubuntu 14.04). Tested the transfer of use case applications as VM snapshots from SILO IaaS.**
- April 21: Ubuntu 16.04 LTS release³. **Considering the fact that the new release of Ubuntu will be maintained until April 2021 that it is very important for security reasons, and OpenStack Icehouse was already 4 half-year releases behind, we concluded that it would be better to invest effort from both technical teams in order to create a IaaS setup with the latest versions of OS and OpenStack. This forced to go on a complete manual installation process (without using MaaS/Juju) but also allowed GENOA to utilize all servers as OpenStack resources.**
- May 10: SILO required to install Ubuntu on the other 3 servers (not Maas). Request to install Ubuntu 16.04 LTS instead of 14.04 (because 16.04 is fully integrated with system) on all the servers, need of internet connection for package downloads and testing purposes (allow passage through the firewall and user with sudo privileges), allocation of static ips from the already created subnet 192.168.145.0/28
- May 23: all of the above tasks completed by Genoa personnel
- May 24-26: support SILO with user credentials for the servers
- June 17: SILO signals apparent problem in accessing Internet from subnet and need for hard reboot

² <https://releases.openstack.org/mitaka/index.html>

³ <https://lists.ubuntu.com/archives/ubuntu-announce/2016-April/000207.html>

- June 21: above request fulfilled. New request from SILO to format and install Ubuntu 16.04 LTS also on server with Maas (erase MaaS not useful anymore because of new architectural choice), for homogeneity, security and performance purposes
- June 22: above request fulfilled
- June 23-29: modifications requested from SILO in order to be able to provide floating IPs to the OpenStack installation – opened subnet ips and NATing of internal addresses
- June 30: **OpenStack installation completed**. Work on VM's. Still to work on Service Store integration. Migration of cross-border applications to the new IaaS
- Jul 2016: Genoa notices calling <http://iaas.strategic.comune.genova.it/horizon> redirects to the internal IP – signaled to SILO
- Jul 20 2016: SILO OpenStack IaaS was discontinued. Use case 2 and use case 3 applications (cross border applications) had been migrated to the new IaaS. Use case 4 (open data application) has been deployed in AWS account of SILO. Use case 1 has been stopped in order to fix security issues of Drupal engine that was used
- Aug 2016: solved a few issues in rebooting machines
- Sept 1: request for additional hard drive for Cinder Block Storage in order to properly connect to STRATEGIC Service Store. This additional operation requires the formatting and re-installation of the most OpenStack services
- Sept 22-26: acquired new HD (connected to SAN) – made partitions to take Cinder into account as requested
- Oct 5: SILO fixed issue signaled on Jul 2016 because also critical to allow correct outside access- also requests some further NATing and opening of various IP:ports
- Oct 6-20: bilateral and internal meeting to decide on opening ports etc.
- Oct 20: opening ports and NATing done
- Nov 16: SILO suggests to use secondary NIC to allow Service Store access from BT machines– so both solutions: new IP opening for the secondary NIC or site-to-site vpn to be considered
- Dec 1st start fleshing out the Genoa Site to Site VPN
- January Technical configuration both from BT and Genoa to set up the site to site VPN gateways with all specifications
- Jan 25th Completion of the site to site VPN

The above written timeline shows there were many different stages and requirements changed during time. At first an installation of IaaS was created and tested shortly, but then it's been decided to use a different architecture, different OS version and different OpenStack version, so a totally new installation was created.

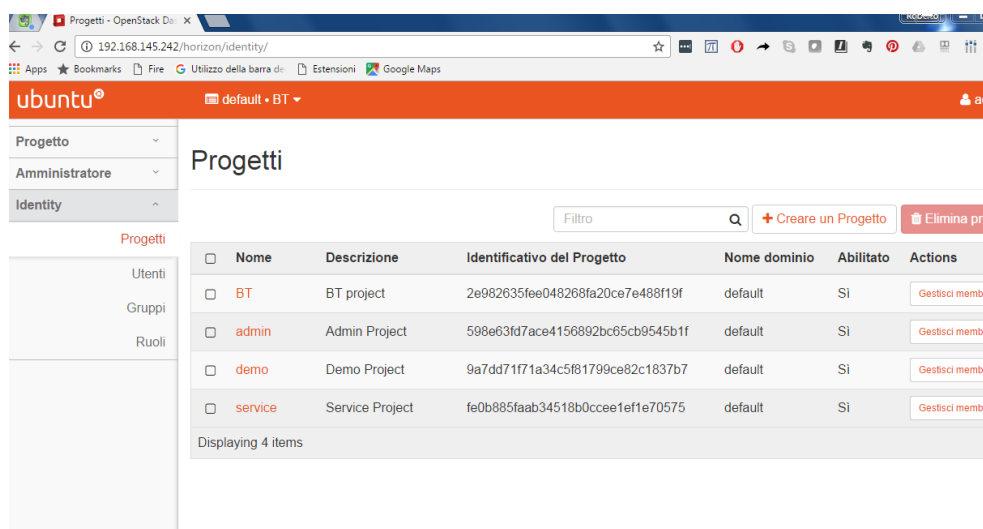


Figure 1: Genoa OpenStack dashboard

For the proper connection with the Service Store, configuration of network like opening of subnet port was needed. A point that created some delay was the addition of Cinder (block storage service of OpenStack) to the created installation. In order to allow the deployment of VMs through STRATEGIC Service Store, block storage is needed and for this reason GENOA technical team was asked to install a new hard drive that will be utilized by SILO in order to create the required new setup of the IaaS. Finally, when the IaaS was ready, in order to being capable to connect to Service Store two options were identified; either open new external IP address directly to second NIC of the OpenStack installation or to create a site-to-site VPN to BT subnet.

Integration with the Service Store hosted by BT was achieved through a site to site VPN. BT set up an IPSEC link between Genoa's and BT's routers. This allowed secure access through the BT firewall and allowed OpenStack APIs to be accessible. BT configured the OpenStack API with the Service Store enabling Genoa to launch their services on demand.

strategici Service Store

Dashboard Getting Started Launch VPCs Workloads Apps Tools Reports Settings

New Cloud Profile

* Name:

Location Settings [Add Location](#)

GenovaCloud <http://192.168.145.242:5000/v2.0/tokens/> [Remove](#)

Domain
Domain Name

Tenant
Tenant Name

Username
User Name

API Key
API Key or Password

[Save](#) [Back](#) [Verify settings](#)

How to obtain my Openstack API Credentials

An Openstack administrator will assign the credentials.

Username and Password

Figure 2: Genoa IaaS as appears on STRATEGIC Service Store

Given the above it is apparent that in spite of Genoa and SILO have been working a lot, the continuous change in requirements and requests is detrimental to the process. Note that this is neither a lack in expertise on both sides nor a lack in effort on both sides. In dealing with Public Administrations of medium-size like Genoa it emerged that when possible a clear list of complete requirements (both in term of material resources and tasks to be accomplished) given in the least possible chunks instead of many little tasks is the preferred way. This is easily explained by considering that each task to be accomplished follows a first-in-first-out ticket queue processing by PA personnel. Also, regarding the material resources to acquire either a tender or some kind of internal agreement needs to be made and that requires time.

Description of the Infrastructure

All the four physical servers have the same characteristics already declared in old deliverables (100G storage). Except for one server that has 250 G for Cinder use.

Node	HW Configuration	SW Configuration
Node1	CPU: Intel(R) Xeon(R) CPU – 16 cores in total RAM: 12GB STORAGE: 68GB	Operating System Ubuntu 16.04 LTS OpenStack Components Controller node Neutron node
Network Controller	CPU: Intel(R) Xeon(R) CPU – 4 cores in total RAM: 8GB STORAGE: 68GB	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node
Computing Nodes	CPU: Intel(R) Xeon(R) CPU – 2 cores in total RAM: 5GB STORAGE: 608 total (68 GB (OS),250x2(storage))	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node
Dedicated Storage Nodes	CPU: Intel(R) Xeon(R) CPU – 4 cores in total RAM: 3GB STORAGE: 36GB	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node Block Storage

Table 2: Overview of Genoa infrastructure nodes

Also the following figure provides the overview of the network topology of Genoa IaaS.

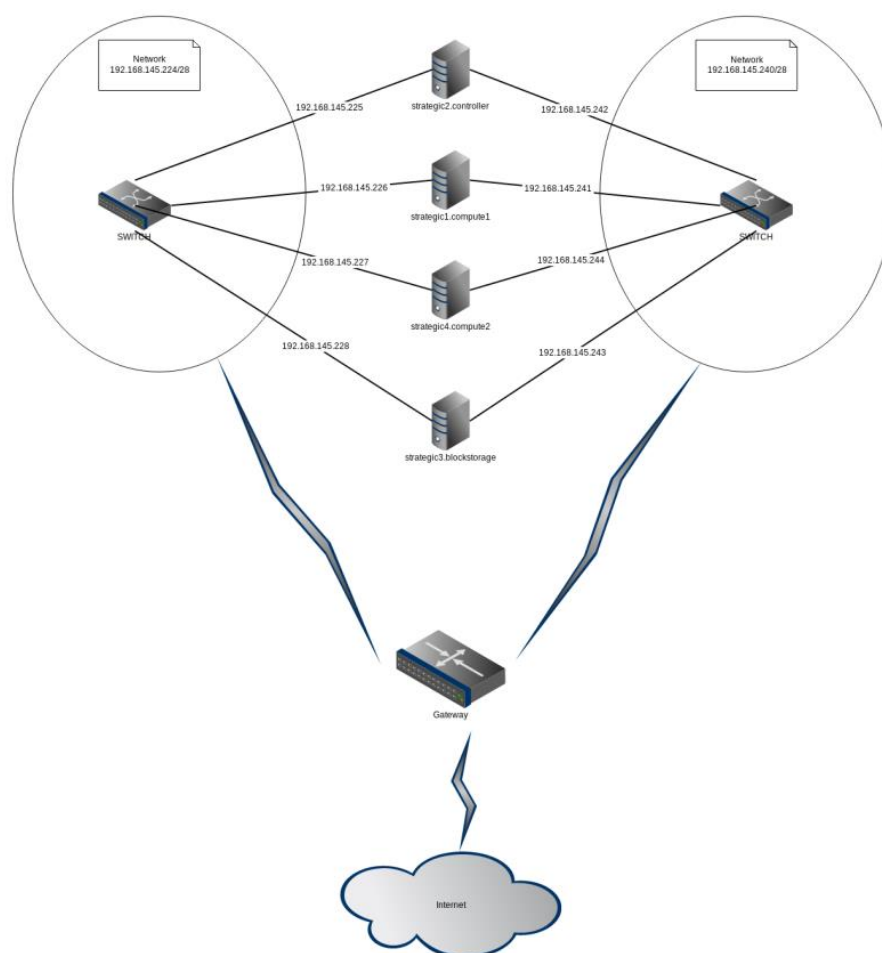


Figure 3: Genoa OpenStack network overview

3.3 Municipality of Stari Grad

For the Municipality of Stari Grad it was important to host applications in Serbia due to legislation issues. This initially planned to be achieved by utilizing a cloud provider in Serbia or by creating a private cloud. Unfortunately, a compatible Cloud provider was not found and MoSG decided to invest to a private cloud infrastructure, although this was not part of the contractual obligations on the project.

Hardware acquisition

Technical teams of SILO and MoSG worked together for the creation of a dedicated cloud infrastructure that was used during the pilot operations of the project. After initial discussions, it has been decided to create an OpenStack based IaaS, that follows the setup described in deliverable D5.1[3] and using 4 servers that would be identical to SILO's existing IaaS (1 Dell R730 and three R520) that was used in the first two years of the project. Therefore, a procurement process started by MoSG and concluded in May 2016 for the acquisition of the hardware. However, the procurement failed at the end and the solution suggested was to rent infrastructure instead. For renting the infrastructure in Serbia the options were quite limited and although hosting provider Orion has been used, no physical machines were available for rent, but

only VMs. In the following list a detailed timeline of the IaaS installation is provided.

IaaS preparation timeline

The following actions have been followed.

- IaaS characteristics definition
- January 2016: IaaS procurement
- March 2016: Searched for backup options
- May 2016: Procurement ended but failed
- May 2016: Searching for alternatives based on backup planning already conducted (contacted Orion Telecom since March for VM or physical machines provisioning)
- May 2016: Orion provides the VMs, as there was not possibility to provide physical servers for rent at that moment.
- June 15 2016: **first version of MoSG IaaS** was ready (with manual installation of Ubuntu 16.04 and OpenStack Mitaka). However, as the VMs that had been provided had not enough resources to host the use cases applications of MoSG, this IaaS has been only used to test the connection with STRATEGIC Service Store, as hosting capabilities were limited. Meanwhile the applications remained on SILO OpenStack account
- Jul 18 2016: After extended discussions between MoSG, SILO and Orion upgraded VMs had been provided by Orion. Renting of physical machines still not possible to be provided although it would preferable. Direct communication link between SILO and Orion has been established to accelerate the process.
- Jul 20 2016: SILO OpenStack IaaS was discontinued. Use case applications had to be paused and snapshots had been copied for usage on the migration to the new IaaS.
- August 26 2016: **Second version of MoSG IaaS is ready.** Deployment of use case 2 as VM has been performed in order to allow the cross-border scenario execution with GENOA, and allow fine tuning.
- August 30 2016: Connected with Service Store and tested the deployment of applications. Failed due to the need of having Cinder Block Storage
- Sept 1 2016: Request for additional hard drive for Cinder Block Storage in order to properly connect to STRATEGIC Service Store. This additional operation requires the formatting and re-installation of the most OpenStack services.
- Sept 22 2016: Acquired new HD (connected to SAN) – made partitions to take Cinder into account as requested
- September 29 2016: Connected with Service Store and tested the deployment of applications. Applications have been launched but there were networking issues raised due to the fact that the provided network was only public (all VMs were public). Applications kept live for 2 weeks and decision taken to re-create IaaS after the creation of an updated virtualized topology that would solve the existing issues.
- October 14 2016: Orion provided the updated virtual network that was requested
- October 24 2016: **Third version of MoSG IaaS is ready.** Re-deployment of use case 2 application
- October 25 2016: Connection to STRATEGIC Service Store and successful deployment of the applications through the marketplace
- October – December 2016: Applications were live, while final fixes on the deployed applications have been provided

- Mid December 2016: **Orion informed about the capability to provide physical infrastructure for rent.** Discussion between MoSG, Orion and SILO on the next steps. The usage of a physical machines instead of VMs would greatly benefit MoSG and would allow to spawn more applications the IaaS, with the same cost as before. The IaaS would gain longevity and both MoSG and Orion were positive on this change. SILO agreed to coordinate this last setup of the IaaS, even if it not contractually obligated. The decision was to keep the exiting version of the IaaS until end of December in order to reach the KPIs of the use cases and start of January to start on the implementation of the final setup of the IaaS, in physical machines.
- January 9 2017: The physical machines have been provided by Orion
- January 11 2017: The VM based IaaS of MoSG has been suspended in order to reduce cost (paying for both the physical servers and VMs had great cost and was rejected as option). Snapshots of the use case applications have been exported in order to be easily migrated to the new IaaS
- January 17 2017: A HDD has been added to one of the physical machines. Network setup has also been updated in order to support the virtualized private network that was also used in the IaaS created with VMs.
- January 17 2017: Finalized OpenStack integration with Service Store hosted by BT (access through firewall, API configuration)
- January 25 2017: Orion provided SILO with the server management interface in order to be able to fine tune, manage and maintain the servers remotely.
- January 31 2017: **Final version of MoSG IaaS is ready (physical servers have been used, Ubuntu 16.04, OpenStack Mitaka).** This IaaS is capable to host many applications depends on the selected OpenStack flavours, but easily more than 10 services can be hosted) for the municipality and support the long term plans for cloud adoption.
- February 1 2017: Connection to STRATEGIC Service Store and deployment of all the use case applications

The above written timeline shows there were many different stages and requirements changed during time. Due to the difficulty to access physical infrastructure, we made few attempts on creating IaaS on top of virtualized infrastructure. Although the IaaS on top of virtualized resources was established and tested through the deployed use cases' applications, at the end MoSG managed to allocate physical resources in Serbia and a totally new installation was created, that will be able to host many services and make the usage of STRATEGIC Service Store much more convenient.

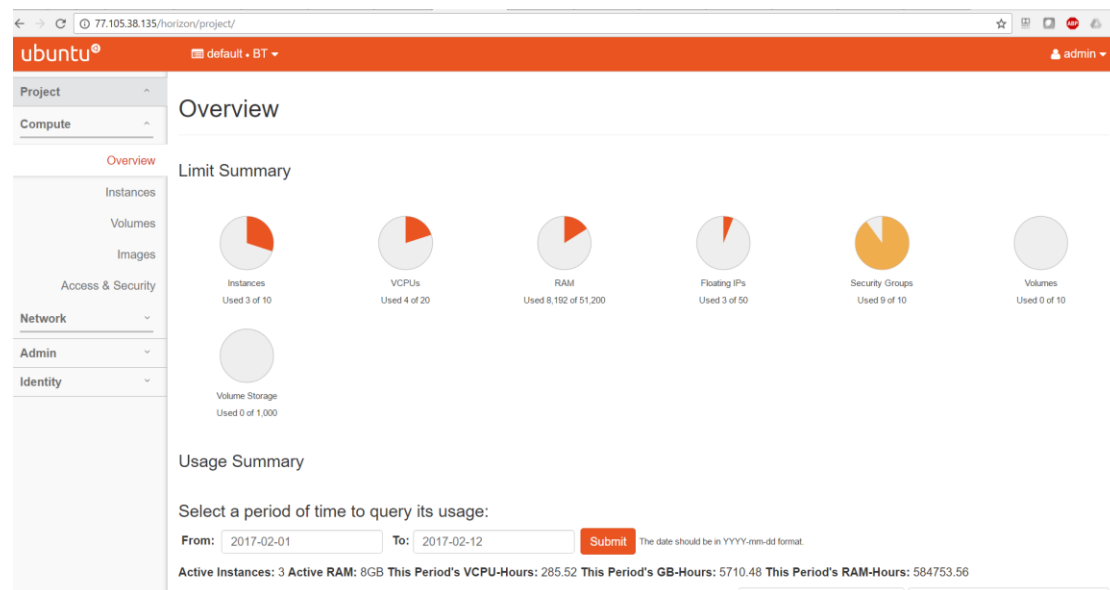


Figure 4: MoSG OpenStack dashboard

For integrating with the Service Store, as MoSG IaaS was deployed in a public network, so the connection was pretty straightforward. A point that created some delay was the addition of Cinder (block storage service of OpenStack) to the created installation. In order to allow the deployment of VMs through STRATEGIC Service Store, block storage is needed and for this reason Orion technical team was asked to install a new hard drive that will be utilized by SILO in order to create the required new setup of the IaaS.

The screenshot shows the STRATEGIC Service Store interface. The top navigation bar includes the 'strategi€ Service Store' logo and icons for Dashboard, Getting Started, Launch, VPCs, Workloads, Apps, Tools, Reports, and Settings. The user profile 'Joshua Daniel stariograd' is visible on the right. The main content area is titled 'Cloud Profile - stariCloudSerbia' and includes tabs for Settings, Regions, Flavors, Images, Key Pairs, Limits, and Networks. The 'Settings' tab is active, showing a form for 'stariCloudSerbia' with fields for Domain (default), Tenant (BT), Username (bt), and API Key (masked). Below the form are buttons for 'Pending', 'Back', and 'Verify settings'.

Figure 5: MoSG IaaS as appears on STRATEGIC Service Store

Description of the Final Infrastructure of MoSG

Node	HW Configuration	SW Configuration
Opstina-1	CPU: Intel(R) Xeon(R) CPU E5506 (2.13 GHz) – 4 cores RAM: 12GB STORAGE: 240.1GB	Operating System Ubuntu 16.04 LTS OpenStack Components Controller node Neutron node
Opstina-2	CPU: Intel(R) Xeon(R) CPU E5506 (2.13 GHz) – 4 cores RAM: 12GB STORAGE: 240.1GB	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node
Opstina-3	CPU: Intel(R) Xeon(R) CPU E5506 (2.13 GHz) – 4 cores RAM: 12GB STORAGE: 240.1GB	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node
Opstina-4	CPU: Intel(R) Xeon(R) CPU E5506 (2.13 GHz) – 4 cores RAM: 12GB STORAGE: 240.1GB	Operating System Ubuntu 16.04 LTS OpenStack Components Compute node Block Storage

Table 3: Overview of MoSG infrastructure nodes

The following figure demonstrates the network setup of MoSG IaaS.

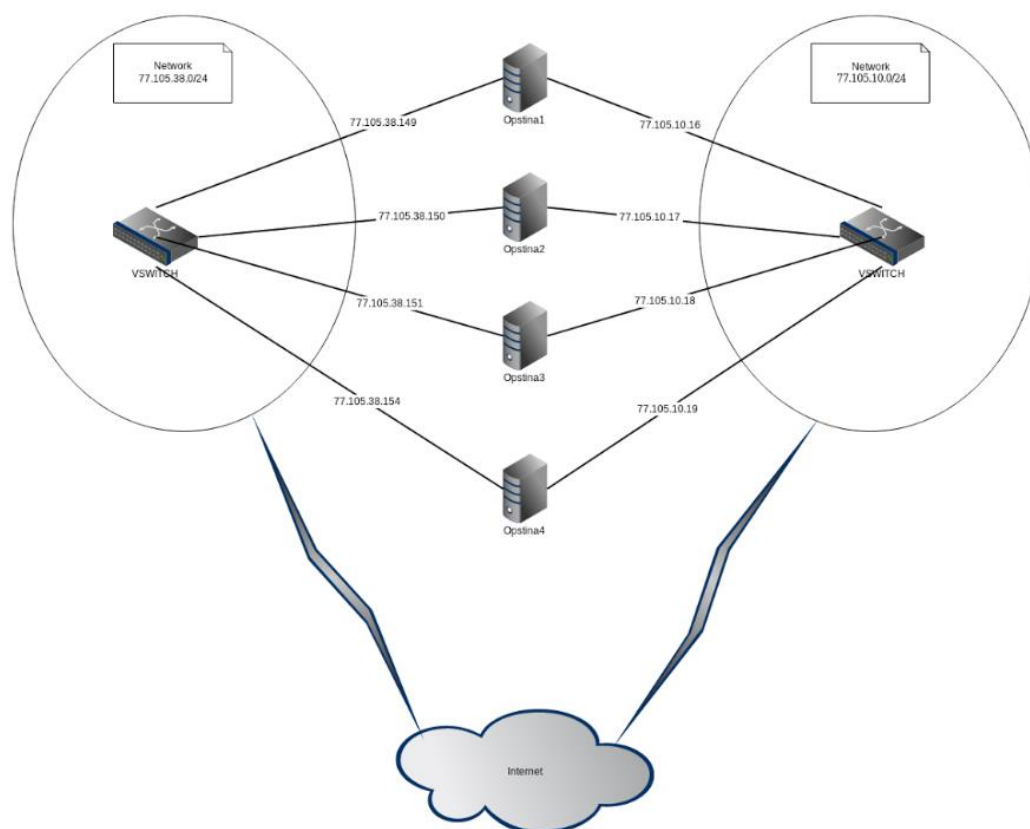


Figure 6: MoSG final OpenStack setup network overview

3.4 Cloud Infrastructure Provided by SILO

During the second year and first half of the third year, the OpenStack installation of SILO has been used for the deployment of the services of GENOA and MoSG. This setup has been described in deliverable D5.1[3] and used the Ubuntu MaaS and Juju approach. Ubuntu 14.04 and OpenStack Icehouse had been used for this IaaS setup. The IaaS was used for the pilot evaluation of the applications until mid of July 2016, and during this period most the applications reached most of their goals in terms of users and transactions. After this period the resources of this IaaS had been also upgraded to the latest version Ubuntu OS and an updated version of the IaaS with OpenStack Mitaka and new architecture has been created. This cloud of SILO is used for research purposes but also in order to offer support to local municipalities that can be targeted as potential customers.

As STRATEGIC Service Store allows the usage of multiple cloud providers, pilots could benefit from the federated cloud approach and deploy or manage their services in more than one cloud from the same centralized dashboard. Therefore, in addition to the local private infrastructure that has been used by the pilot partners of Genoa and MoSG, Amazon AWS has been used as well for the deployment of services that don't impose any security implications, like the Open Data applications or for easy testing of new applications (like LimeSurvey).

4 Reporting and Status of Pilot Operations

The purpose of this section is to document the status of the use cases, in terms of deployment and actual usage for the piloting operations. The plan of each use case is also provided.

The operation of the e-government services required for each use case has been prepared mostly during the work package 5 tasks. For this reason, some of the information provided in the document regarding use cases is based on deliverable D5.4[2], but updates are provided wherever this reflects the actual status.

4.1 London Borough of Camden

During this period the piloting activities of London Borough of Camden have focused on the development, testing, deployment of the services and evaluation as part of three different use cases.

For the deployment of these services BT Research cloud platform IaaS that is integrated with STRATEGIC Service Store has been used and as described in section 3.1 the technical team of Camden has established a site-to-site Virtual Private Network (VPN) connectivity between the BT Research cloud network and the London Borough of Camden.

In the Table 4 provided below, the pilot operation status of each Camden scenario and the details of the virtual resources used are documented.

Use Case	Current Status	Cloud Infrastructure
Use case 1: Open Data Platform	Pilot operations successfully executed, VM transferred during Y1 with help of BT, monitoring agent has been added, most KPIs reached during Y1 of the project	BT Cloud Platform, 2VCPU, 8GB RAM, 100GB Storage
Use case 2: Tranzact.net application	Application developed during Y2, application has been deployed through the STRATEGIC Service Store, Pilot operations successfully executed	BT Cloud Platform, 2VCPU, 16GB RAM, 100GB Storage
Use case 3: Identity and Attribute manager	Application developed during Y3, application has been deployed through the STRATEGIC Service Store, Pilot operations successfully executed	BT Cloud Platform, 2VCPU, 16GB RAM, 100GB Storage

Table 4: Status of Camden use cases

In the following subsections more details about each use case are provided along with the execution result during the last year of the project.

4.1.1 CAMDEN-1

The use case 1 application was in production since the first year of the project and the domain www.camdendata.info redirected the users to this service for a certain period. The site provides access to datasets allowing users to be able to use the information as they wish – via the open government license and supporting compliance with Local Government Transparency code.

4.1.1.1 Use case Timeline

Camden Use Case 1: Camden Open Data Initiative																																			
Activity Descriptive Title	Year 2													Year 3																					
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44	M45		
Pilot Preparation and Conduction																																			
Deployment on BT Research Cloud																																			
Secured migration of existing application assets to BT research Cloud																																			
Usage, restoration and testing from real users (test and/or real users)																																			
Applying security protocols and policies and network configuration																																			
Integrate on STRATEGIC Service Store																																			
Usage of deployment application from real users (test and/or real users)																																			
Monitoring of the application																																			
Milestones List																																			
Use Case Milestone UCM1: Deployment of updated version of the application					UCM1																														
Use Case Milestone UCM2: Deployment of final version of the application						UCM2																													
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and																																			
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning																																			
STRATEGIC Milestone M7: Pilot operation is concluded																																			M7
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																																			M8
STRATEGIC Milestone M9: Dissemination and business plan is concluded																																			M9

Figure 7: CAMDEN-1 timeline

Use case milestones for the reporting period:

- **No Milestones:** Application deployed already since M17

4.1.2 CAMDEN-2

Use Case 2 of Camden aims at publishing a Scheme management workflow system (Tranzact.Net) over the cloud. Camden has developed an in-house application for managing the blue badge, freedom pass and other associated processes, which is being currently packaged for the cloud and the STRATEGIC Service Store. The service also requires compliance with the Public Services Network (PSN) due to the sensitive nature of data and for this reason effort the integration of PSN to the cloud infrastructure has been achieved.

In order to deploy Tranzacct within a virtual machine on the BT service store with Internet Information Services and SQL studio management is required. The Strategic version of Tranzacct consists of 8 PowerShell scripts files broken down into steps that systematically complete each task silently using Command prompt. For configuring Tranzacct from STRATEGIC Service Store for single-server deployment the following actions were required;

1. Configuration of topology parameters using STRATEGIC Service Store
2. Testing of existing IIS and MSSQL with above parameters

The BT support team had to configure the STRATEGIC Service Store topology parameters in order to host Tranzacct on the service store.

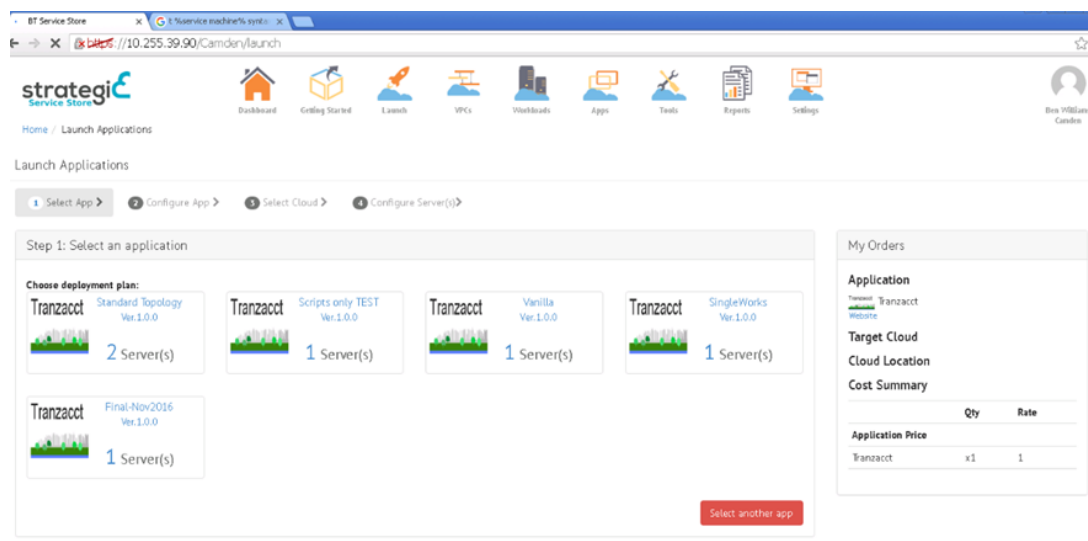


Figure 8: Tranzacct in STRATEGIC Service Store

Above figure shows how STRATEGIC Service Store and relevant application pools set up and configured within Internet Information Services running on a virtual machine within the service store. The application will be accessible through the following domain: <http://strategic.tranzacct.net/login>

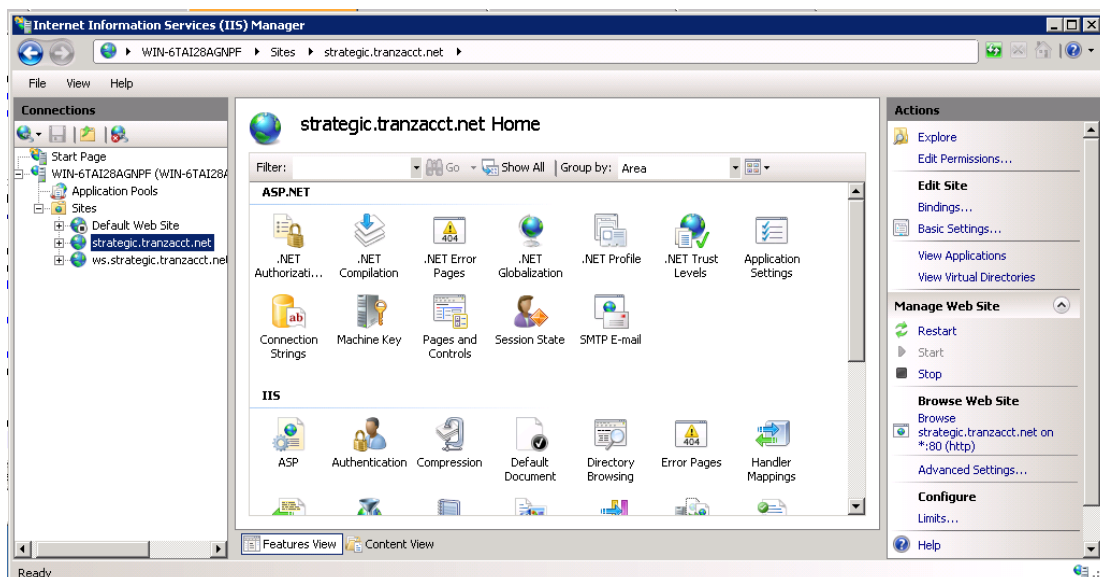


Figure 9: Strategic Tranzacct Server

A screenshot of the service regarding criteria management is depicted in Figure 10 below.

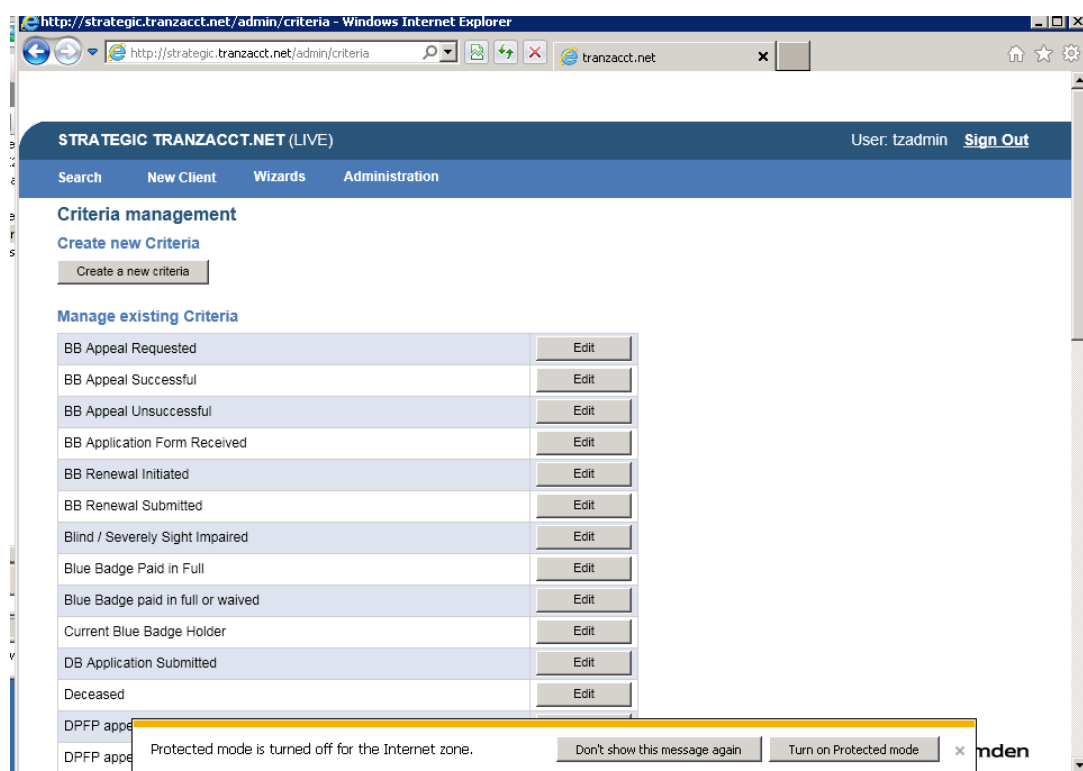


Figure 10: Screenshot of criteria management page

4.1.2.1 Use case Timeline

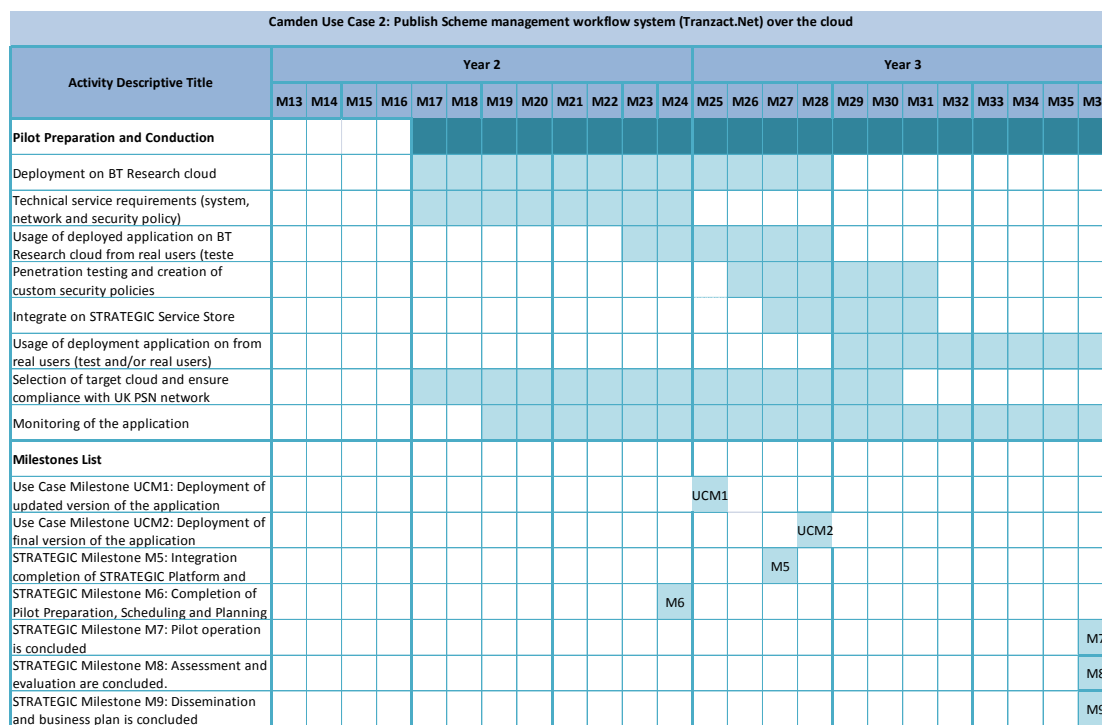


Figure 11: CAMDEN-2 timeline

Use case milestones for the reporting period:

- **UCM1:** Deployment of the updated version of the application

- **UCM2:** Deployment of the final version of the application

4.1.3 CAMDEN-3

Camden use case 3 reflects the deployment of an identity and attributes manager by Camden to the cloud. Camden re-used the work done via the Open Identity Exchange (OIX) in the UK represented by Cabinet Office for an alpha project, which included managing identity of a blue badge customer using a UK based IDP and Gov. This e-government application has been development and deployed yet during the third year of the project.

For the MDM integration, the following steps were followed;

1. Usage of external instance of MDM web service
2. Creation of a mock web service on the Tranzacct IIS Server
3. Deployment of application

The Tranzacct data correction tool application is running on a virtual machine with IP of 10.255.93.93, using STRATEGIC Service Store. The specific page for contact management is provided in Figure 12 below.

The screenshot displays the 'Client Details' page in the 'STRATEGIC TRANZACCT.NET (LIVE)' application. At the top, there are input fields for TZID (1), Date (11/3/2016), DoB (01/01/2000), Age on (03/11/2016), Forename (Ben), Middlename (Test), Surname (Smith), and Post Code (N9 7EN). A button 'Get Criteria for Client on Selected' is visible. Below these fields, a message states 'Criteria valid for Ben Smith on Thursday, November 03, 2016'. A table titled 'Valid Criteria' shows 'All Documents' with a single entry: 'Photo Valid' with valid dates from 11/3/2016 to 11/3/2021, created by 'tzadmin' on 11/3/2016 12:07, and filename '0405.jpg'. The main section 'Client Details' contains fields for ID (1), Title (Mr), Forename (Ben), Surname (Smith), DOB (01/01/2000), Main Address (2, Hazelberry, 42 Mad Rd, Crazy, N9 7EN), and Delivery Method (Postal). A red box highlights 'OUT OF BOROUGH' next to the address. A photo of the client is shown on the right. At the bottom, a message states 'There are no contact details recorded for this client'.

Criteria	Valid From	Valid Until	Created By	Created Date	Filename	Evidence
Photo Valid	11/3/2016	11/3/2021	tzadmin	11/3/2016 12:07...	0405.jpg	Photo

Figure 12: Figure 13: Screenshot of contact management page

4.1.3.1 Use case Timeline

Camden Use Case 3: Identity and attribute manager																										
Activity Descriptive Title	Year 2													Year 3												
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36		
Camden Use Case 3: Identity and attribute manager																										
Identification and specification of use case deployment scenario & model																										
Deployment on BT Research cloud																										
Technical service requirements (system, network and security policy)																										
Usage of deployed application on BT Research cloud from real users (test)																										
Penetration testing and creation of custom security policies																										
Integrate on STRATEGIC Service Store																										
Usage of deployment application on from real users (test and/or real users)																										
Selection of target cloud and ensure compliance with UK PSN network																										
Monitoring of the application																										
Milestones List																										
Use Case Milestone UCM1: Deployment of updated version of the application																										
Use Case Milestone UCM2: Deployment of final version of the application																										
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and																										
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning																										
STRATEGIC Milestone M7: Pilot operation is concluded																										
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																										
STRATEGIC Milestone M9: Dissemination and business plan is concluded																										

Figure 14: CAMDEN-3 timeline

Use case milestones for the reporting period:

- **UCM1:** Deployment of the updated version of the application
- **UCM2:** Deployment of the final version of the application

4.1.4 Pilot Cases Achievements

In order to evaluate the STRATEGIC results and the pilot cases success, we tried to create quantitative metrics and use them to measure the usage of the deployed services. For each pilot service the suggested measurement methods are defined differently with the overall objective to meet the KPIs suggested by the project DoW[1] and analysed further in D7.1[8].

On use case 1 of Camden, Open Data is provided by a web portal to anonymous users. This means that users are measured with the usage of a web analytics tool, like Google Analytics⁴. The Users metrics show how many users viewed or interacted with the deployed site/app⁵ and can be provided per specific page, so the number of users is calculated as the number of users that accessed the specific web page that is used to display Open Data sets to users. With the same

⁴ <https://www.google.com/analytics>

⁵ <https://support.google.com/analytics/answer/2992042>

sense, the Pageviews⁶ for the page that is used to display Open Data sets can reveal the number of transactions made.

For use case 2 the measurement of the users and transactions is retrieved by using the internal database, as the unique users and unique requests for new blue badge or freedom pass or Renewals is stored in the database.

For use case 3 the measurement of the unique users and transactions is confirmed by the identity and attribute manager service. More specifically the users and transactions of successful requests of attribute exchange for a blue badge are measured.

Based on the evaluation planning conducted in D7.1[8], Table 5 presented below provides the number that should be reached for each use case by the end of the year for the two KPIs; Users and Transactions. We found difficult to find many real users for use case 3 scenario, though the number of transactions was very high due to the number of records.

Use Case	Planned		Actual		Result
	Users until end of Y3	Transactions until end of Y3	Users	Transactions	
Use case 1: OpenData Platform	150	1500	300	2300	Success
Use case 2: Tranzact.net application	25	250	30	300	Success
Use case 3: Identity and Attribute manager	25	300	10	10,000(Based on 10,000 records)	Success

Table 5: KPIs of Camden

4.2 City of Genoa

During the reporting period, the City of Genoa has worked on providing updates, administrating and deploying the four use cases services. Since the procurement of four server blades most of the work has been done in collaboration with the consortium partners in order to start the IaaS platform in Genoa. As documented also in deliverable D5.2[4], the development, integration and testing have been done in collaboration with consortium partners and a working group for the realization of the cross-border applications of use cases 2 and 3 has been created.

In the Table 6 provided below, the pilot operation status of each Genoa scenario and the details of the virtual resources used are documented.

⁶ <https://developers.google.com/analytics/devguides/collection/analyticsjs/pages>

Use Case	Current Status	Cloud Infrastructure
Genoa-1: Business Activities Service	Pilot operations successfully executed, application deployed though STRATEGIC Service Store	Genoa private OpenStack IaaS, 1x VM (m1.medium 4GB RAM 2 VCPU 40.0GB Disk)- possible upgrade to large
Genoa-2: Cross border Business Activities Service	The Cross-Border Authentication (CBA) service has been deployed and configured on Genoa IaaS. End-to-end transactions by internal users of ATOS and Genoa have been successfully completed.	Genoa private OpenStack IaaS, 1x VM (m1.medium 4GB RAM 2 VCPU 40.0GB Disk)
Genoa 3: Cross-border Certificate Issuance Service	Cross-border certificate issuance service has been deployed and configured on Genoa IaaS. End-to-end transactions by internal users of ATOS, MOSG and GENOA have been successfully completed.	Genoa private OpenStack IaaS, 1x VM of SEMIRAMIS (m1.small 2GB RAM 1 VCPU 20.0GB Disk)
Genoa-4: Open Data Application	Pilot operations successfully executed, application deployed though STRATEGIC Service Store	Amazon AWS IaaS, 1x VM (t2.small 2GB RAM 1 VCPU Amazon EBS Storage)

Table 6: Status of Genoa use cases

In the following subsections, more details about each use case are provided, along with updated plans for the execution of the pilot operations for the remaining phases of the project duration. Additional information about each use case can also be found in deliverable D5.4[2], where the preparatory activities are provided.

4.2.1 Genoa-1

Genoa-1 is a cloudified version of startup registration for certain local business activities. The service, was implemented and deployed at the SILO's OpenStack-based infrastructure until the half of the third year of the Project, and then in Genoa's IaaS infrastructure.



Figure 15: Screenshot of GENOA-1

The application is available on the domain:
<http://suap2.strategic.comune.genova.it/>

4.2.1.1 Use case Timeline

Genoa-1: Business Activities Service																									
Activity Descriptive Title	Year 2												Year 3												
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	
Pilot Preparation and Conduction																									
Deployment on SingularLogic provided, OpenStack based IaaS																									
Creation of more adaptation variables on Business Activity Service																									
Usage of deployed application on SingularLogic IaaS from real users																									
Genoa's own OpenStack based IaaS creation																									
Integrate Genoa IaaS on STRATEGIC Service Store																									
Usage of deployed application on Genoa IaaS from real users																									
Testing of deployment through STRATEGIC Service Store in different IaaS and OS																									
Monitoring of the application																									
Milestones List																									
Use Case Milestone UCM1: Deployment of updated version of the application						UCM1																			
Use Case Milestone UCM2: Deployment of final version of the application															UCM2										
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and																M5									
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning												M6													
STRATEGIC Milestone M7: Pilot operation is concluded																								M7	
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																								M8	
STRATEGIC Milestone M9: Dissemination and business plan is concluded																								M9	

Figure 16: GENOA-1 timeline

Use case milestones for the reporting period:

- ✓ **UCM2:** Deployment of the final version of the application in Genoa IaaS– Milestone reached in M30

4.2.2 Genoa-2

Genoa-2 use case is a cloudified version of startup registration for some local business activities extended for cross-border use based on outcomes of the STORK project. With the co-ordination of ATOS, the STRATEGIC cross- border authentication engine based on STORK project was used by Genoa for the creation of the application. The STORK components are offered as part of the STRATEGIC framework and an updated version of the application, derived from the initial one has been already deployed on the SILO's IaaS.

A private Git repository has been created since the first year of the project and used for the collaboration between Genoa with the technical partners (ATOS and SILO). The application has been initially created by ATOS, named GenoaCB4BClient, and includes the STORK SP Client and the Genoa SP Mock. Based on this initial cross-border application provided by ATOS, configurations and modifications have been done and the code has been updated accordingly by Genoa with the collaboration of ATOS.

Currently, the applications required are deployed in an OpenStack of Genoa and the end-to-end transactions have been tested by real people but using test scenarios, as it was not to access people with the real need to create cross-border startup registration. The service, was implemented and deployed at the SILO's OpenStack-based infrastructure until the half of the third year of the Project, and then in Genoa's IaaS infrastructure.

Figure 17: Screenshot of GENOA-2

The application is available at <https://192.168.145.248:8443/powersas-primefaces-archetype/faces/RichiestaCoperto.xhtml> and will be mapped for public access on the domain cbauthn.strategic.comune.genova.it.

4.2.2.1 Use case Timeline

Genoa-2: Cross border Business Activities Service																																			
Activity Descriptive Title	Year 2												Year 3																						
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36											
Pilot Preparation and Conduction																																			
Creation of base application for Business Activities that is based on Java																																			
Work with Stork implementation offered by STRATEGIC																																			
Integrate Stork implementation offered by STRATEGIC with developed application																																			
Deployment on SingularLogic provided, OpenStack based IaaS, for testing																																			
Genoa's own OpenStack based IaaS creation																																			
Integrate Genoa IaaS on STRATEGIC Service Store																																			
Creation of more adaptation variables on Business Activity Service																																			
Usage of deployed application on Genoa IaaS from real users																																			
Testing of deployment through STRATEGIC Service Store in different IaaS and OS																																			
Creation of more adaptation variables on Business Activity Service																																			
Monitoring of the application																																			
Milestones List																																			
Use Case Milestone UCM1: Creation of first version of the application						UCM1																													
Use Case Milestone UCM2: Integration of Stork of the application										UCM2																									
Use Case Milestone UCM2: Deployment of final version of the application													UCM3																						
Use Case Milestone UCM2: Deployment of the application in Genoa's IaaS														UCM4																					
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and															M5																				
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning											M6																								
STRATEGIC Milestone M7: Pilot operation is concluded																																		M7	
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																																		M8	
STRATEGIC Milestone M9: Dissemination and business plan is concluded.																																		M9	

Figure 18: GENOA-2 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of the final version of the application
- ✓ **UCM4:** Deployment of application to Genoa's IaaS – Milestone reached in M30

4.2.3 Genoa-3

Genoa-3 use case is a development of the cross-border residence certificate issuance service based on outcomes of the SEMIRAMIS project. This is a bilateral use case scenario, which will be implemented with the collaboration of Stari Grad STRATEGIC cross-border attributes exchange components based on the SEMIRAMIS project results and demo application created by ATOS are used as a baseline template for the actual application. Genoa and Stari Grad with the coordination of ATOS, during the third year developed an updated version of the application. The service, was implemented and deployed at the SILO's

OpenStack-based infrastructure until the half of the third year of the Project, and then in Genoa's IaaS infrastructure.



The screenshot shows a web browser window with the URL <http://localhost:8080/powersas-richieste-anagrafe-archetype/faces/RichiestaAnagrafe.xhtml>. The page features a header with a banner image and the text "GENOVA servizi online". Below the header, the title "Richiesta Cambio Residenza" is displayed. A navigation bar contains four tabs: "Dati Richiedente" (selected), "Dati Indirizzo", "Dati Cambio", and "Riepilogo". The "Dati Richiedente" tab is active, showing a form with the following fields: "Nome: *" (text input), "Cognome: *" (text input), "Codice Fiscale:" (text input), "Data Nascita" (text input), "Codice ISTAT" (text input), "Nascita:" (text input), "Codice parentela:" (text input), and "Nazione Nascita:" (dropdown menu). The "Nazione Nascita:" dropdown is currently set to "strategiC". At the bottom of the form, there are "Back" and "Next" buttons.

Figure 19: Screenshot of GENOA-3

The application is available at the URL <https://192.168.145.247:8443/GenoaCor/faces/RichiestaAnagrafe.xhtml> and will be mapped for public access on the domain cbaresidence.strategic.comune.genova.it.

4.2.3.1 Use case Timeline

Genoa-3: Cross-border Certificate Issuance Service																																			
Activity Descriptive Title	Year 2												Year 3																						
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36											
Pilot Preparation and Conduction																																			
Work with Stork implementation offered by STRATEGIC																																			
Collaboration with Municipality of Stari Grad for creation of real cross border																																			
Creation of application that will be used for the cross-border certificate issuance																																			
Add Semiramis functionalities to the application																																			
Deployment on SingularLogic provided, OpenStack based IaaS																																			
Usage of deployed application on SingularLogic IaaS from real users																																			
Genoa's own OpenStack based IaaS creation																																			
Integrate Genoa IaaS on STRATEGIC Service Store																																			
Usage of deployed application on Genoa IaaS from real users																																			
Testing of deployment through STRATEGIC Service Store in different IaaS and OS																																			
Monitoring of the application																																			
Milestones List																																			
Use Case Milestone UCM1: Creation of first version of application, without																																			
Use Case Milestone UCM1: Integration of Semiramis capabilities to the application																																			
Use Case Milestone UCM3: Deployment of first version of the application																																			
Use Case Milestone UCM2: Deployment of the application in Genoa's IaaS																																			
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and																																			
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning																																			
STRATEGIC Milestone M7: Pilot operation is concluded																																		M7	
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																																		M8	
STRATEGIC Milestone M9: Dissemination and business plan is concluded.																																		M9	

Figure 20: GENOA-3 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of the final version of the application
- ✓ **UCM4:** Deployment of application to Genoa's IaaS – Milestone reached in M30

4.2.4 Genoa-4

Genoa-4 is Genoa's Open Data CKAN cloud service was implemented and hosted on the SILO's cloud infrastructure during the second year of the project and transferred to the AWS hosted cloud during the third year in order to avoid downtime. Genoa during this period made customization on the CKAN application, not only in terms of added content but also with CSS and template changes. The application has been widely used for testing purposes. The official app has been transferred and DNS address changed a few times in order to evaluate the impact on service time and transparency of operations.

The open data application is available online on:
<http://opendata.strategic.comune.genova.it/>



Figure 21: GENOA-4 screenshot

4.2.4.1 Use case Timeline

Genoa-4: Open Data Application																																				
Activity Descriptive Title	Year 2												Year 3																							
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44	M45	M46		
Pilot Preparation and Conduction																																				
Testing of open source solutions for Open Data																																				
Creation of Ckan based application for Genoa Open Data Application																																				
Packaging created application for usage in Service Store																																				
Usage of deployed application on SingularLogic IaaS from real users																																				
Genoa's own OpenStack based IaaS creation																																				
Integrate Genoa IaaS on STRATEGIC Service Store																																				
Usage of deployed application on Genoa IaaS from real users																																				
Testing of deployment through STRATEGIC Service Store in different IaaS																																				
Monitoring of the application																																				
Milestones List																																				
Use Case Milestone UCM1: Creation of Open Data Application																																				
Use Case Milestone UCM2: Deployment of first version of the application																																				
Use Case Milestone UCM2: Deployment of final version of the application																																				
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and																																				
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning																																				
STRATEGIC Milestone M7: Pilot operation is concluded																																				M
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																																				M
STRATEGIC Milestone M9: Dissemination and business plan is concluded																																				M

Figure 22: GENOA-4 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of the final version of the application
- ✓ **UCM4:** Deployment of application to Genoa's IaaS – Actually AWS account was used instead of Genoa IaaS

4.2.5 Achievement of Pilot Cases

In order to evaluate the STRATEGIC results and the pilot cases success, we tried to create quantitative metrics and use them to measure the usage of the deployed services. For each pilot service the suggested measurement methods are defined differently with the overall objective to meet the KPIs suggested by the project DoW[1] and analyzed further in D7.1[7].

On use case 1 of City of Genoa, the transaction for each request and the users that made the requests by using the application forms are logged internally to the application database, and for this reason the database has been used for the measurement.

On use case 2 of Cross-Border Business Activities Service, when a Spanish citizen tries to interact with this service provided by the City of Genoa, an exchange of data is performed between the Cross-border business activities service and the Spanish Identity Provider. Thus, we consider that two different transactions are involved for a successfully registration of the Spanish citizen into the business activity Genoa platform:

- On one hand the first transaction is made when the Genoa Business activities service is requesting to the IdP the attributes needed through the cross-border authentication engine;
- On the other hand the second transaction comprises the response from the IdP to the Business activities service providing the value of the requested data, this is also made through the cross-border authentication engine.

Please note that more transactions are actually executed, as multistep operations like uploading a document before the cross-border transaction are needed. The transactions and the users have been measured with the internal logs of the application.

Regarding the use case 3 of Cross-border Certificate Issuance Service (shared with StariGrad-2 use case), an exchange of data is performed between the Genoa cross-border certificate of issuance service and the StariGrad Cross-border Certificate Issuance Service, when a Serbian citizen tries to register in Genoa through this service provided by the City of Genoa. In this case, we consider that four different transactions are involved for a successfully registration of the Serbian citizen in the Genoa Municipality registration service:

- First transaction will be performed when the Genoa registration service makes a request to Serbian cross-border certificate issuance service, requesting for the Serbian citizen registration data;
- The second transaction implies the response of the Serbian cross-border certificate issuance service to the Genoa Municipality, providing the requested data;
- The third transaction starts when the Genoa Municipality asks for an unsubscribe request to the Stari Grad Municipality for the Serbian citizen;
- The final transaction will be the Stari Grad Municipality response to the Genoa Municipality that provides the proof of unsubscription process for the Serbian citizen.

Please note that more transactions might be actually executed, as multistep

operations like uploading a document before the cross-border transaction might be needed. The transactions and the users have been measured with the internal logs of the application.

Regarding use case 4 that is the Open Data Application, the usage of CKAN⁷ leads to a web application where anonymous users can use to download open data. This means that users can be measured with the usage of a web analytics tool, like Google Analytics⁸. The Users metrics show how many users viewed or interacted with the deployed site/app⁹ and the Pageviews¹⁰ for the views that have been made to the pages that display Open Data sets can reveal the number of transactions made. In order to enable Google Analytics to the dynamically created pages of CKAN a specific plugin has been used¹¹. However in order to have better measurement of the number of transactions and avoid counting views of the website that have not led to download of dataset, another plugin has of CKAN has been enabled in order to also count the datasets downloads¹².

4.2.5.1 Defining KPIs

Table shown below provides the numbers that should be reached for each use case by the end of the year for the two KPIs; Users and Transactions. The users for the cross-border scenarios in use cases 2 and 3 of Genoa were not easy to be found but the transactions were achieved due to many test transactions performed by internal people of the project.

Use Case	Planned		Actual		Result
	Users until end of Y3	Transactions until end of Y3	Users	Transactions	
Genoa-1: Business Activities Service	15	60	15	68	Success
Genoa-2: Cross border Business Activities Service	15	90	9	244	Success (less users had used the service but transactions have been achieved)
Genoa 3: Cross-border	15	150	9	280	Success (less users had used

⁷ <http://ckan.org/>

⁸ <https://www.google.com/analytics>

⁹ <https://support.google.com/analytics/answer/2992042>

¹⁰ <https://developers.google.com/analytics/devguides/collection/analyticsjs/pages>

¹¹ <https://github.com/ckan/ckanext-googleanalytics>

¹² <http://docs.ckan.org/en/latest/maintaining/tracking.html>

Use Case	Planned		Actual		Result
	Users until end of Y3	Transactions until end of Y3	Users	Transactions	
Certificate Issuance Service					the service but transactions have been achieved)
Genoa-4: Open Data Application	80	800	470	2121	Success

Table 7: KPIs of City of Genoa

Furthermore, Genoa tested the deployment of two additional applications during this period; MediaWiki and Limesurvey. However, these are not used currently on the final IaaS deployment of Genoa.

4.3 Municipality of Stari Grad

Activities related to the scenario use cases are provided in this section. In this period of the Project, the Municipality of Stari Grad (MoSG) has already deployed and evaluated e-government services through the STRATEGIC Service Store. Until July of 2016, the applications were deployed on the IaaS offered by SILO, and afterwards the private IaaS of MoSG has been used.

Table 6 below provides the status of the pilot operation in each MOSG scenario as well as details of the virtual resources used.

Use Case	Current Status	Cloud Infrastructure
Stari-Grad-1: Certificate Issuance Service	Pilot operations successfully executed, application deployed through STRATEGIC Service Store	OpenStack IaaS hosted by Orion Telecom, 1x VM (m1.medium 4GB RAM 2 VCPU 40.0GB Disk)
Stari-Grad-2: Cross-border Certificate Issuance Service	Cross-border certificate issuance service has been deployed and configured on MOSG IaaS. Modifications on look and feel on user interface have been made. The MoSG's customized Service Provider (SP) component has been development and	OpenStack IaaS hosted by Orion Telecom, 1x VM (m1.small 2GB RAM 1 VCPU 20.0GB Disk)

Use Case	Current Status	Cloud Infrastructure
	integrated with other SEMIRAMIS components (FP, IA). End-to-end transactions by internal users of ATOS, MOSG and GENOA have been successfully completed.	
Stari-Grad-3: Mail Service	Pilot operations are successfully executed, application deployed though STRATEGIC Service Store	OpenStack IaaS hosted by Orion Telecom, 1x VM (m1.small 2GB RAM 1 VCPU 20.0GB Disk)
Stari-Grad-4: Open Data Application	Pilot operations successfully executed, application deployed though STRATEGIC Service Store.	OpenStack IaaS hosted by Orion Telecom, 1x VM (m1.medium 4GB RAM 2 VCPU 40.0GB Disk)

Table 8: Status of Stari Grad use cases

In the following subsections, more details about each use case are provided, along with updated plans for the execution of the pilot operations during the remaining project periods. Additional information about each use case can also be found in deliverable D5.4[2], where the preparatory activities are provided.

4.3.1 Stari-Grad-1

StariGrad-1 use case is using a cloudified version of the certificate request service of the Municipality of Stari Grad. The application is used for sending requests for some certificates (birth, death, marriage) for some citizen. The application has a form that should be filled in order to send a request. When a proper request is sent and received and validated by the application, the application will automatically send an email to the predefined email address of the civil servant responsible for issuing the requested certificate. When the civil servant receives the request he issues the actual certificate by calling another application which is not in the scope of the project. The part of the process for requesting the certificate and sending the email with corresponding data to the civil servant is in the scope of this cloudified certificate issuance application and thus in the scope of the STRATEGIC project. During this last period, the application was deployed in SILO IaaS until the IaaS of MoSG was created.



Figure 23: Stari-Grad-1 screenshot

The application is accessible on the URL <http://77.105.10.18:8080/starigradcloud/> and also mapped to the domain www.certificates.starigrad.org.rs.

4.3.1.1 Use case Timeline

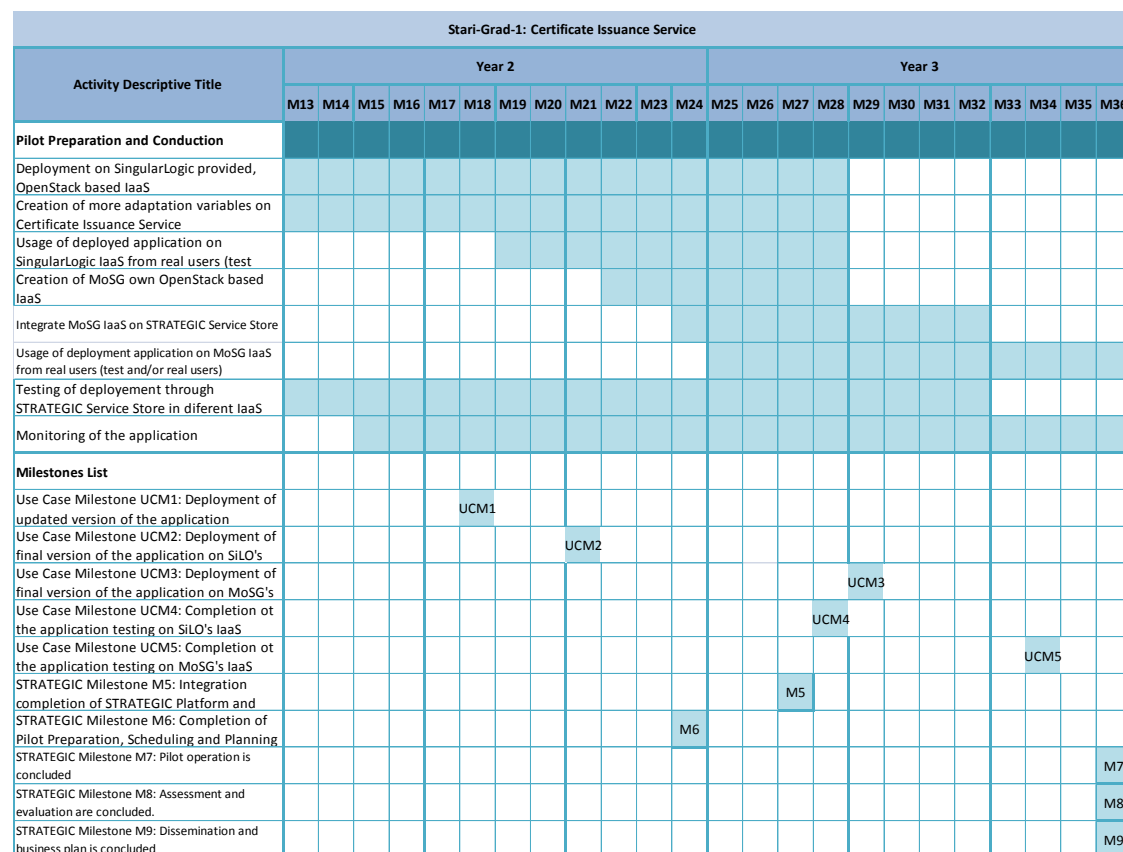


Figure 24: Stari-Grad-1 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of the final version of the application on MoSG IaaS – Milestone achieved in M30
- ✓ **UCM4:** Deployment of application testing in SILO IaaS
- ✓ **UCM5:** Completion of the application testing on MoSG's IaaS

4.3.2 Stari-Grad-2

StariGrad-2 is the use case for cross-border attribute exchange service (cross-border residence certificate) based on the outputs of SEMIRAMIS project and is a joint use case with Genoa-3. The SEMIRAMIS components are offered as part of the STRATEGIC framework and the application has been already deployed on the MoSG's IaaS with the technical help of ATOS and SILO.

For this reason a private Git repository was been created since year 1 of the project in order to be used for the collaboration of the involved partners (ATOS, SILO, Genoa, Stari Grad). Based on the initial cross-border application provided by ATOS, configurations and modifications on the code have been done by MoSG and with collaboration of ATOS. The Service Provider component of the MoSG is available on the URL <https://77.105.10.8:8443> that is mapped to the domain crossborderresidence.starigrad.org.rs.

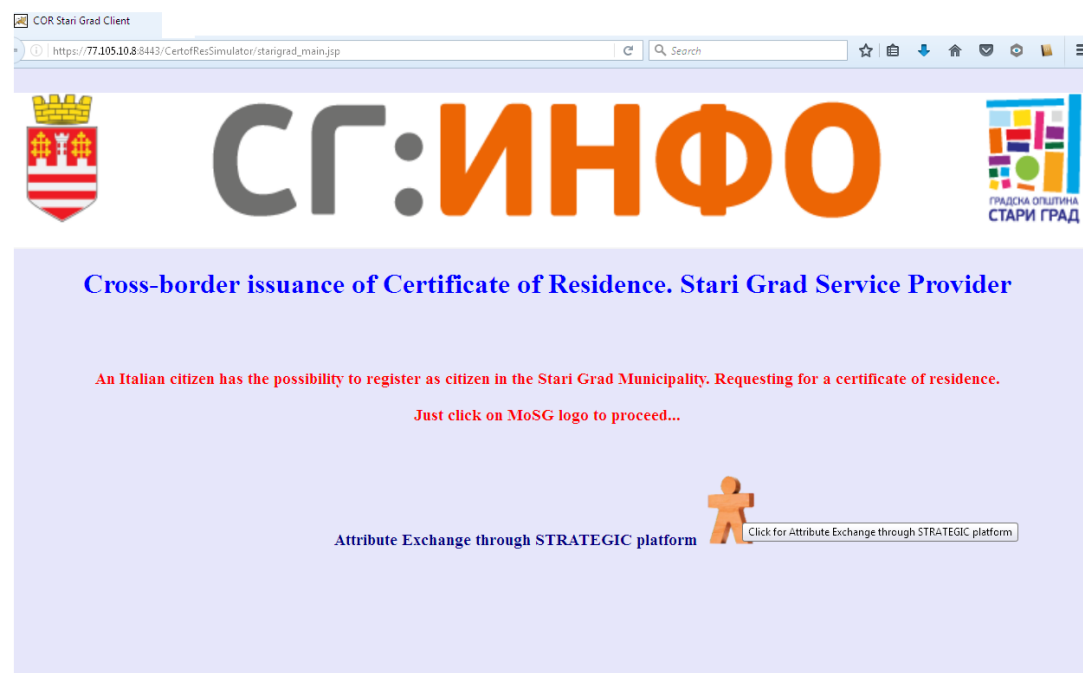


Figure 25: Stari-Grad-2 screenshot

4.3.2.1 Use case Timeline

Activity Descriptive Title		Stari-Grad-2: Cross-Border Certificate Issuance Service																									
		Year 2												Year 3													
		M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36		
Pilot Preparation and Conduction																											
Deployment on SingularLogic provided, OpenStack based IaaS																											
Creation of more adaptation variables on Cross-Border Attribute Exchange Service																											
Usage of deployed application on SingularLogic IaaS from real users (teste and/or real users)																											
Creation of MoSG own OpenStack based IaaS creation																											
Integrate MoSG IaaS on STRATEGIC Service Store																											
Usage of deployment application on MoSG IaaS from real users (test and/or real users)																											
Testing of deployment through STRATEGIC Service Store in diferent IaaS and OS																											
Monitoring of the application																											
Milestones List																											
Use Case Milestone UCM1: Deployment of SEMIRAMIS components with sample application on SILO's IaaS							UCM1																				
Use Case Milestone UCM2: Development of the MoSG components							UCM2																				
Use Case Milestone UCM3: Deployment of										UCM3																	
Use Case Milestone UCM4: Completion of the application testing on SILO's IaaS																		UCM4									
Use Case Milestone UCM5: Deployment of																			UCM5								
Use Case Milestone UCM6: Completion of the application testing on SILO's IaaS																								UCM6			
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and Services																											
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning													M6														
STRATEGIC Milestone M7: Pilot operation is concluded																										M7	
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																										M8	
STRATEGIC Milestone M9: Dissemination and business plan is concluded																										M9	

Figure 26: Stari-Grad-2 timeline

Use case milestones for the reporting period:

- ✓ **UCM4:** Completion of the application testing on SiLO's IaaS
 - Testing of end-to-end transactions with internal users is still active
- ✓ **UCM5:** Deployment of SEMIRAMIS and MoSG components on MoSG's IaaS
- ✓ **UCM6:** Completion of the application testing on SiLO's IaaS

4.3.3 Stari-Grad-3

StariGrad-3 is a cloud based email service for internal users of MoSG. Upon a detailed analysis, the iRedMail mail server has been chosen. During the final year of the project, both SILO's and MoSG's private cloud infrastructure were used. This application is configured and parameterized by MoSG's technical team through the SRATEGIC Service Store and was used internally by MoSG in order to evaluate this solution.

The iRedMail cloud webmail service is available on the IP address 77.105.10.14 that is also mapped to the domain [iredmail.starigrad.org.rs](https://77.105.10.14/mail/). The application is successfully evaluated by users from MoSG. Some email addresses defined in this application (a service one and for civil servants) are used for StariGrad-1 use case.

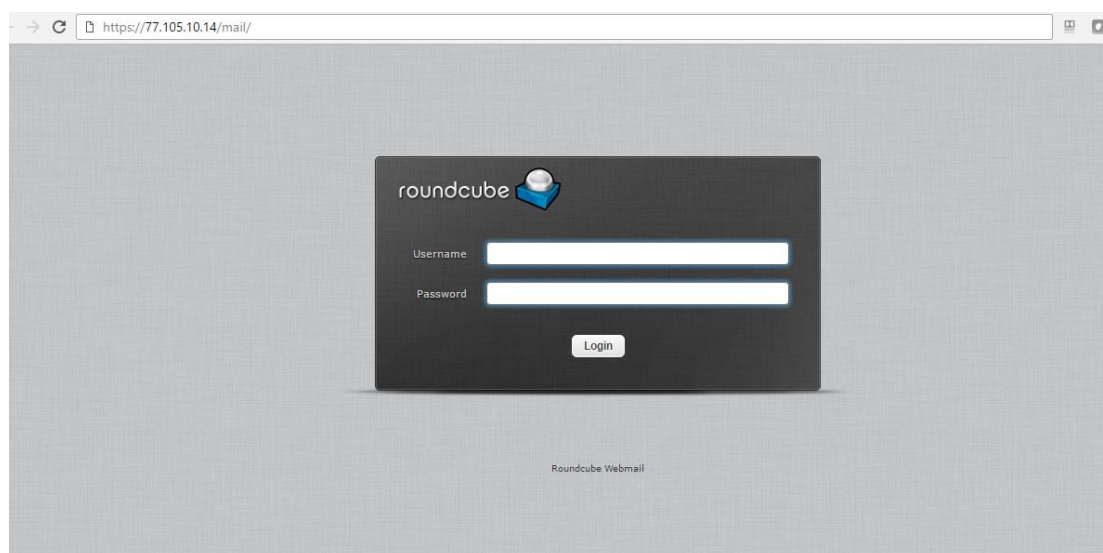


Figure 27: Stari-Grad-3 screenshot

4.3.3.1 Use case Timeline

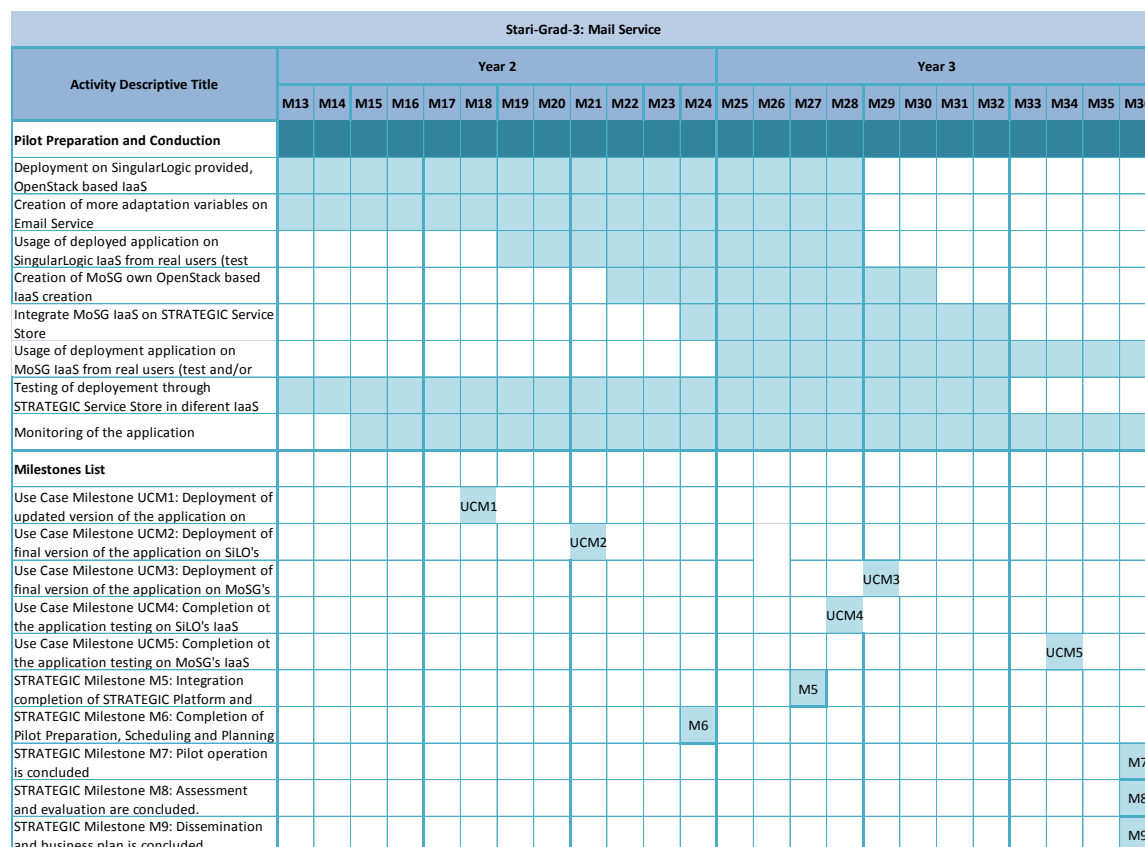


Figure 28: Stari-Grad-3 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of final version of the application on MoSG's IaaS
- ✓ **UCM4:** Completion of the application testing on SiLO's IaaS
- ✓ **UCM5:** Completion of the application testing on MoSG's IaaS

4.3.4 Stari-Grad-4

StariGrad-4 is open data use case that reuses the CKAN-based open data application has been published on STRATEGIC Service Store. After the deployment of the application open data datasets have been uploaded and further customization has been done.

The application is published on the public IP address <http://77.105.10.15/> and is mapped to the domain opendata.starigrad.org.rs.

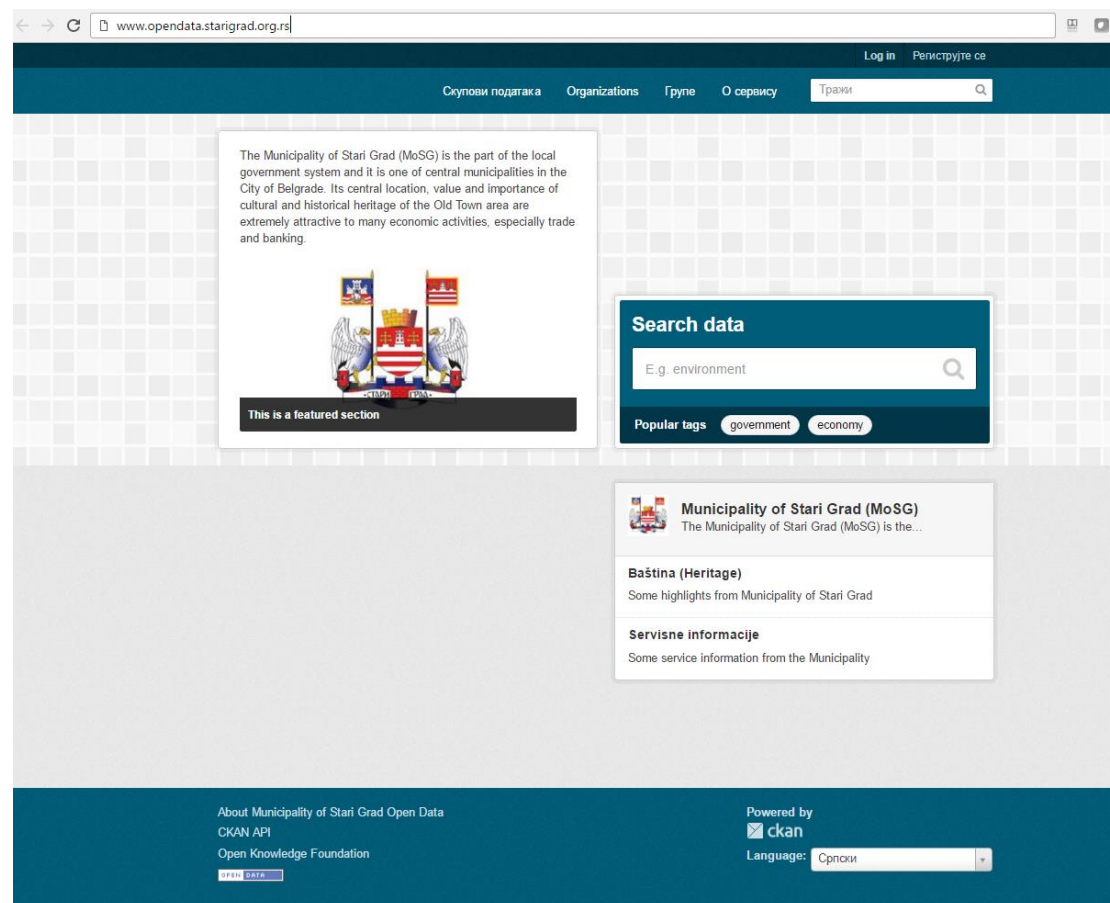


Figure 29: Stari-Grad-4 screenshot

4.3.4.1 Use case Timeline

Stari-Grad-4: Open Data Application																								
Activity Descriptive Title	Year 2												Year 3											
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36
Pilot Preparation and Conduction																								
Deployment on SingularLogic provided, OpenStack based IaaS																								
Creation of more adaptation variables on Open Data Application																								
Usage of deployed application on SingularLogic IaaS from real users (test)																								
Creation of MoSG own OpenStack based IaaS creation																								
Integrate MoSG IaaS on STRATEGIC Service Store																								
Usage of deployment application on MoSG IaaS from real users (test and/or real)																								
Testing of deployment through STRATEGIC Service Store in diferent IaaS																								
Monitoring of the application																								
Milestones List																								
Use Case Milestone UCM1: Deployment of CKAN based application without datasets						UCM1																		
Use Case Milestone UCM2: Preparation of MoSG Open datasets							UCM2																	
Use Case Milestone UCM3: Deployment of final version of the application with MoSG												UCM3												
Use Case Milestone UCM4: Deployment of final version of the application with MoSG											UCM4													
Use Case Milestone UCM5: Completion of the application testing on SILO's IaaS																UCM5								
Use Case Milestone UCM6: Completion of the application testing on MoSG's IaaS															UCM6									
STRATEGIC Milestone M5: Integration completion of STRATEGIC Platform and															M5									
STRATEGIC Milestone M6: Completion of Pilot Preparation, Scheduling and Planning											M6													
STRATEGIC Milestone M7: Pilot operation is concluded																								M7
STRATEGIC Milestone M8: Assessment and evaluation are concluded.																								M8
STRATEGIC Milestone M9: Dissemination and business plan is concluded.																								M9

Figure 30: Stari-Grad-4 timeline

Use case milestones for the reporting period:

- ✓ **UCM3:** Deployment of the application with MoSG datasets on SiLO's IaaS
 - <http://www.opendata.starigrad.org.rs/>
- ✓ **UCM4:** Deployment of final version of the application with MoSG datasets on MoSG's IaaS– Milestone achieved in M30
- ✓ **UCM5:** Completion of the application testing on SiLO's IaaS
- ✓ **UCM6:** Completion of the application testing on MoSG's IaaS

4.3.5 Pilot Cases Achievements

In order to evaluate the STRATEGIC results and the pilot cases success, we tried to create quantitative metrics and use them to measure the usage of the deployed services. For each pilot service the suggested measurement methods are defined differently with the overall objective to meet the KPIs suggested by the project DoW[1] and analyzed further in D7.1[7].

For StariGrad-1 use case which is the local version of Certificate Issuance Service, the deployed service works so that when a user fill in form on the web site with the needed fields, the form is checked for completeness of data structure and an email is send to a predefined email addresses of the public servants who will perform the actual issuance. Based on this fact the actual measurement of the users and transactions of this use case can be easily done with the tracking of the emails statistics.

For StariGrad-2 use case which is the cross-Border residence certificate issuance, the measurement of KPIs will be the same as the one defined for Genoa-3 use case, as an exchange of data is performed between the MoSG cross-border certificate of issuance service and the Genoa cross-border certificate issuance service. So as defined in Genoa-3 we consider that four different transactions are involved for a successfully registration of the Serbian citizen in the Genoa Municipality registration service:

- First transaction will be performed when the MoSG registration service makes a request to Genoa cross-border certificate issuance service, requesting for the Genoese citizen registration data;
- The second transaction implies the response of the Genoa cross-border certificate issuance service to the Stari Grad Municipality, providing the requested data;
- The third transaction starts when the Stari Grad Municipality asks for an unsubscribe request to the Genoa Municipality for the Genoese citizen;
- The final transaction will be the Genoa Municipality response to the Stari Grad Municipality providing the proof of unsubscription process for the Genoese citizen.

Please note that more transactions might be actually executed, as multistep operations like uploading a document before the cross-border transaction might be needed.

For use case StariGrad-3 that is an internal email service for MoSG the measurement of users and transactions is easy to be executed by using the logs of the deployed email service of iRedMail¹³. Based on the logged activities of iRedMail transactions can be emails sent and received, and also some administrative actions like the creation or deletion email users, etc. Unique users of this service are the users of iRedMail, which will be the employees of Municipality of Stari Grad that use this email service.

Regarding use case 4 that is the Open Data Application, the same approach with Genoa-4 scenario will be used, as the same application prepared from Genoa will be used for MoSG. This means that users can be measured with the usage of a web analytics tool, like Google Analytics¹⁴. The Users metrics show how many users viewed or interacted with the deployed site/app¹⁵ and the Pageviews¹⁶ for the views that have been made to the pages that display Open Data sets can reveal the number of transactions made. In order to enable Google Analytics to the dynamically created pages of CKAN a specific plugin has been used¹⁷. However in order to have better measurement of the number of transactions and avoid counting views of the website that have not leaded to download of dataset, another plugin has of CKAN has been enabled in order to also count the datasets downloads¹⁸.

¹³ www.iredmail.org/

¹⁴ <https://www.google.com/analytics>

¹⁵ <https://support.google.com/analytics/answer/2992042>

¹⁶ <https://developers.google.com/analytics/devguides/collection/analyticsjs/pages>

¹⁷ <https://github.com/ckan/ckanext-googleanalytics>

¹⁸ <http://docs.ckan.org/en/latest/maintaining/tracking.html>

4.3.5.1 Defining KPIs

Table below provides the numbers that should be reached for each use case by the end of the year for the two KPIs; Users and Transactions. The users for the cross-border scenario in use case 2 were not easy to be found but the transactions were achieved due to many test transactions performed by internal people of the project.

Use Case	Planned		Actual		Result
	Users until end of Y3	Transactions until end of Y3	Users	Transactions	
Stari-Grad-1: Certificate Issuance Service	80	320	82	326	Success
Stari-Grad-2: Cross-border Certificate Issuance Service	15	150	9	280	Success (less users had used the service but transactions have been achieved)
Stari-Grad-3: Mail Service	50	600	50	122	Success
Stari-Grad-4: Open Data Application	80	800	690	1315	Success

Table 9: KPIs of MoSG

Furthermore, MoSG tested the deployment of Limesurvey using STRATEGIC Service Store.

5 Technical support, Incidents and Improvements

The work carried out during the conduction of pilot operations of the e-government services which in some cases were migrated, adapted or deployed using STRATEGIC framework solutions. This task is not simple and during the last year of the project technical support was needed for fixes, updates and improvements of both the pilot case services and the cloud infrastructure. The collection of the issues during the piloting period of the project helped into improving STRATEGIC Service Store and also to make the consortium more experienced in order to be able to tackle issues that could happen with public bodies that are real customers.

5.1 Technical support

The technical support was provided to the pilots in many different ways. BT provided technical support on the requirement analysis, creation, testing and deployment of CAMDEN e-government services. SILO provided support to GENOA and MoSG on the creation, deployment and testing of their applications. Moreover, SILO led the installation of the IaaS infrastructure for both GENOA and MoSG in order to let them benefit from the long term benefits of acquiring a private cloud.

During this last year of the project technical team of GENOA and SILO worked together for the requirements definition, deployment of OpenStack services and configuration of the IaaS of the City of Genoa. For the Municipality of Stari Grad SILO was also in direct contact with Orion the host that MoSG used for the IaaS deployment.

For the integration of the Service Store hosted by BT into private cloud, BT enabled access through the DMZ and set up some site to site VPN access over IPSEC with all Camden and Genoa. Over the last year of the STRATEGIC project, the Service Store has been tested with newer versions of the OpenStack APIs by relying on its backward compatibility to Icehouse. The latest version tested is the Mitaka version and we were able to use it by configuring properly the Identity Service of OpenStack. At the same time the security services, BT Intelligent Protection and BT Data Protection, have been tested with workloads launched to the new infrastructures.

Furthermore, for a great part of this reporting period SILO also provided own resources for the actual deployment of the pilot cases. For the first half of the reporting period, applications were deployed mainly in SILO OpenStack IaaS, while the pilots' IaaS installation were configured and tested. Even after the most changes, SILO provided credits in AWS Amazon for hosting the Genoa Open Data use case, as it was an application that many users in order to avoid downtime.

5.2 Incidents reporting and analysis

Incident reporting is the first step towards identifying the root cause of problems that may arise during the conduction of pilot operations, after its identification an analysis process is established between pilot and technical partners to replicate and analyse the incident towards abating and preventing a recurrence. When an

incident occurs, technical partners are engaged to perform an investigation of the root causes (Root Causes Analysis -- RCA) to identify the primary causes that contribute to the occurrence of the incident and understand why it occurred. The purpose behind the aforementioned process is to minimize the risk of an incidence by eliminating cause that contributes to the risk. Afterwards a reactive procedure is performed to correct the problem; it is important to state that during the conduction of pilot operations, a proactive approach has been also put in place aiming to prevent incidents from happening in the first place as well as respond to the pilot requirements in the most time sensitive fashion.

Pilot partners' involvement

Pilot partners' involvement is critical for the early identification of incidents and guarantee that the framework provided satisfy the public bodies needs depicted during the requirements gathering process.

According to the current consortium, 3 partners are in charge of the identification of incidents during the conduction of pilot operations. CAMDEN, GENOA and MoSG as public bodies take care of the execution of the e-government services deployed through the Service Store and are able to identify and report incidents to technical partners when something unexpected occurs. The aforementioned incidents are going to be captured during the executions of the use cases previously documented within the STRATEGIC deliverables.

Technical partners' involvement

In order to support pilot partners during the conduction of the pilot operations each public body has one technical partners assigned to facilitate the adoption use of the Service Store provided by STRATEGIC, guiding pilots during the creation of the cloud based services, its deployment as well as during pilot operation.

The assignment between technical and pilots partners looks as follows:

- CAMDEN pilot operations are supported by BT technical team.
- GENOA pilot operations are supported by SILO technical team.
- MoSG pilot operations are supported by SILO technical team.
- In case of identification of an incident, it should be reported to the ATOS technical team which leads WP4, in order to analyse the primary causes together with all the technical partners. If it applies, it may require an enhancement of the Service Store, the re-definition of the cloud based service or both.

During the conduction of pilot operations, the incidents reported have been collected in a spreadsheet already described in previous iterations of this document, together with the remedial actions performed.

In the third year of the project, the incidents collected are not only associated to the lifecycle management of the applications deployed over the cloud or the interactions of the public administrations with the STRATEGIC Service Store, but also considering new challenges emerged when the public administration wants to bring their own IaaS providers into STRATEGIC. The incidents occurred during the procurement process necessary to acquire new servers used by public administration to build their own IaaS are documented in this report. In the following subsections the most important incidents of the pilot operations are

presented per pilot partner, while in the APPENDIX: Complete List of Incidents, the incidents as reported in the spreadsheet are presented.

5.2.1 CAMDEN pilot incidents and enhancements

After the first set of cloud services deployed using Amazon AWS as public cloud provider, the public bodies' use cases were moved to private providers. In case of the CAMDEN's virtual appliances, those were deployed on top of the BT Cloud which is a private cloud provider located in U.K. based on Cloud Stack. The aforementioned setup has been maintained during the whole project lifetime, as opposed to the other public administrations within the project, CAMDEN does not require the installation and setup of their own cloud provider in the third year.

The incidents/solutions reported during the third year for CAMDEN are associated with their specific cloud appliances configured within the Service Store. Below you can find some of the solutions applied to improve the automation of the configuration of the applications instantiated.

Incident:

Configure STRATEGIC Service Store for single-server deployment of Tranzacct

The main batch script that deploys the Tranzacct application from the service store couldn't run any of the Amazon Web Services - PowerShell commandlets without the AWS tool programme installed on a virtual machine, which kept causing the script to fail.

Action:

The main Tranzacct deployment batch file will access the internet first in and install the AWS tools prior to any application deployment.

Incident:

Create deployment Shell scripts for IIS Server

While testing the IIS scripts it became evident that the access to site within the web application was restricted. The IIS server required special authentication rules before allowing users to access to the Tranzacct website,

Action:

To resolve this issue the web administration module within PowerShell had to be activated in order to access the web commandlets that allow the web restrictions to be disabled.

E.g enables anonymous users.

Incident:

Create deployment Shell scripts for SQL Server

SQL commandments will have to be executed via a combination of PowerShell and command prompt.

Action:

In order to resolve this issue SQL was loaded within command prompt using special syntax that launches SQL script commands within a batch file.

Incident:**Configure shell scripts in Strategic Service Store**

Configuring different shell scripts for different virtual machines proved to be quite challenging because the SQL scripts will have to adjust to the specific computer administrator and its specific computer name.

However each virtual machine will have a different computer which will cause an error in the SQL and PowerShell script

Action:

In order to tackle this issue the scripts were set to access the administrator account and locate the machine name. Then deploy the files via the machine name instead of a specific computer name instead. This will allow the script to be accessible to practically all virtual machines.

5.2.2 GENOA pilot incidents and enhancements

For the case of GENOA most incidents had to do with the installation of OpenStack IaaS on GENOA premises and connect to STRATEGIC Service Store. The complete timeline of this installation has been provided in section 3.2, however we highlight here the most important incidents and points of this process.

Incident:**1st version of Genoa IaaS installation deprecation**

Ubuntu 16.04 LTS release and OpenStack Mitaka were released in April, at the time that the IaaS of Genoa was completed. Considering the fact that the new release of Ubuntu will be maintained until April 2021 that it is very important for security reasons and OpenStack Icehouse was already 4 half-year releases behind, we had to decide the ideal solution for Genoa.

Action:

We decided it would be better to invest effort from both technical teams in order to create an IaaS setup with the latest versions of OS and OpenStack. This forced to go on a complete manual installation process (without using MaaS/Juju) but also allowed GENOA to utilize all servers as OpenStack resources.

Incident:**Installation of additional hardware components**

When tried to establish the connection to STRATEGIC Service Store we identified that we had to provide an addition OpenStack Service in order to allow the deployment of applications. This OpenStack Service was the block storage service of Cinder¹⁹ and the installation of this service required extra hard disk on one of the IaaS nodes.

Action:

The extra drive has been requested from the IT department of City of Genoa and it was provided. This process however induced some delays.

¹⁹ <https://wiki.openstack.org/wiki/Cinder>

Incident:**Issues with OpenStack Mitaka and Ubuntu 16.04 repositories**

As we decided to invest on the latest versions of Ubuntu and Openstack, we had some issues on both documentation availability and the availability of appropriate repositories in Ubuntu 16.04

Action:

Many research issues had to be tackled in the process and some services that were not available on the repositories had to be installed manually. This situation however was until September 2016, as after that the availability of OpenStack services in Ubuntu repositories was fixed.

Incident:**Issues with OpenStack installation in a private only environment**

Typically case for OpenStack installation suggests the usage of two networks. Usually one is the private and the other the public network that OpenStack uses floating IPs to associate with the deployed services. In the latest versions of OpenStack (e.g.: Mitaka) the usage of both networks is a requirement.

Action:

Extra effort was needed in order to define the appropriate networking connection, both in the physical world but also in the virtual networking of OpenStack.

Incident:**Issues on connection a private only IaaS on STRATEGIC Service Store**

As Genoa IaaS was private, the connection to STRATEGIC Service Store was not straightforward; however it was a very beneficial achievement as many public bodies would be interested in a similar situation.

Action:

Different solutions were proposed. The basic two were; a) provide access on the controller node only directly to the public network with a dedicated IP. b) use VPN connection to connect to STRATEGIC Service Store. The second solution was suggested as more viable for the case of Genoa and was implemented

Incident:**Genoa SUAP security issues**

Use case 1 application of Genoa was created using Drupal open source CRM. However, as the version of Drupal was outdated it was easy to be exploited. This has happened twice in the deployed version of the use case service.

Action:

Drupal engine was updated to latest. This required also effort in terms of updating the components of SUAP as well.

5.2.3 STARI-GRAD pilot incidents and enhancements

For the case of MoSG most incidents had to do with the installation of a private OpenStack. The complete timeline of this installation has been provided in section 3.3, however we highlight here the most important incidents and points of this process.

Incident:**Procurement delay and failure**

In order to host a private IaaS that will enable MoSG to deploy applications with private data, procurement was initiated with hardware requirements similar to the ones that SILO IaaS had. However, the procurement failed and it was not possible for MoSG to acquire physical infrastructure.

Action:

MoSG had to rent IaaS or the infrastructure needed to create an IaaS. In Serbia compatible IaaS provider was not found, so MoSG agreed with Orion Telecom on the provision of machines that would be used for the OpenStack IaaS installation.

Incident:**Installation of additional hardware components**

When tried to establish the connection to STRATEGIC Service Store we identified that we had to provide an addition OpenStack Service in order to allow the deployment of applications. This OpenStack Service was the block storage service of Cinder²⁰ and the installation of this service required extra hard disk on one of the IaaS nodes.

Action:

The extra drive has been requested from Orion and it was provided. This process however induced some delays.

Incident:**Issues with OpenStack Mitaka and Ubuntu 16.04 repositories**

In common, with the Genoa installation, we had some issues on both documentation availability and the availability of appropriate repositories for OpenStack Mitaka in Ubuntu 16.04.

Action:

Many research issues had to be tackled in the process and some services that were not available on the repositories had to be installed manually. This situation however was until September 2016, as after that the availability of OpenStack services in Ubuntu repositories was fixed.

Incident:**Issues with OpenStack installation in a public only environment**

Typically case for OpenStack installation suggests the usage of two networks. Usually one is the private and the other the public network that OpenStack uses floating IPs to associate with the deployed services. The machines(virtual or physical) provided by Orion were only available on a single public network, without any internal network between them.

Action:

Extra effort was needed in order to define the appropriate networking connection. When VMs were provided, an addition NIC had to be added in all VMs and a dedicated VLAN had to be created. When physical machines were provided, an

²⁰ <https://wiki.openstack.org/wiki/Cinder>

additional router was needed in order to implement the second network.

5.3 Improvements and fine tuning of STRATEGIC Service Store

Over the last year of the STRATEGIC project, the Service Store has been tested with newer versions of the OpenStack APIs by relying on its backward compatibility to Icehouse. As such the latest version tested is the Mitaka version. The Service Store was initially designed to fully support the Icehouse version of OpenStack. The pace of release of new OpenStack versions is difficult to catch-up with, and hence, the method was to use the backward compatibility of the OpenStack APIs. At the same time the security services, BT Intelligent Protection and BT Data Protection, have been tested with workloads launched to the new infrastructures.

6 Conclusions

Work package 6 focuses on the pilot operations of the e-government services that use STRATEGIC framework. This document provides reporting information for the operations conducted during the last year of the project. Reporting of pilot activities is provided per each use case and each pilot.

During this last year, technical support was provided to the pilots, with main focus on the deployment of services and also on the installation of IaaS for the pilots of City of Genoa and Municipality of Stari Grad. It is highly recommended to public bodies to invest in an open source private IaaS, but as dealing with leading technologies is not always a trivial task, it has to be taken under consideration that technical difficulties might require specific knowledge that is suggested to be offered by experts.

Creating a private IaaS is important for cloud adoption of public bodies that don't want to rely on big cloud hosting companies (like Amazon or RackSpace), as level of access that hosting companies provides is usually not at IaaS level but at VM or physical host level.

The piloting and pilot supporting tasks of this period had difficulties and incidents that have been faced by the technical partners and pilots, and this document provides reporting of incidents. This continuous monitoring and evaluation in real scenarios offered improvements on both STRATEGIC platform and the pilot applications, and also made the consortium able to support a mature solution to possible costumers interested.

7 References

- [1] STRATEGIC DoW (Description of Work), 2014
- [2] STRATEGIC Deliverable D5.4 – Pilot Operations Plans, 2015
- [3] STRATEGIC Deliverable D5.1b - Cloud-Enablement of Distributed Services, 2015
- [4] STRATEGIC Deliverable D5.2b - Report on Pilot Sites Preparation, 2015
- [5] STRATEGIC Deliverable D4.3a - Trust and Security Components, 2015
- [6] STRATEGIC Deliverable D4.2a - Migration, Adaptation, Localization and Governance Tools, 2014
- [7] STRATEGIC Deliverable D6.1a - Report on Pilot Incidents and Service Improvements, 2015
- [8] STRATEGIC Deliverable D7.1 – Evaluation Framework, 2015

I. APPENDIX: Complete List of Incidents

<i>Affected Goal</i>	<i>Incident</i>	<i>Metric</i>	<i>Stakeholder</i>	<i>Action</i>
Service Store Platform				
Performance efficiency : Time Behaviour	Response time of platform (for administrator use) longer than 20 seconds	Reponse time of platform	Technical partner, Public Sector Organizations	Frequency of log management increased.
Maintainability: Modifiability	Issues in showing workload (see Screenshot 2015-12-16 16.41.44.png)	Ability to show and edit workloads	Public Sector Organizations	UI bug fixed
Usability: Learnability	Lacking of help on platform	Amount of hours needed for training	Independent Software Vendors, Public Sector Organizations	Service Store offers an intuitive user interface to build cloud based applications and deploy them over different cloud providers. Despite this, the platform did not offer comprehensive online documentation at the start of the project to help newcomers to the platform. The aforementioned documentation can now be found offline. There has been documentation provided with the deliverables regarding every admin and end user functionalities. Video tutorials have been provided on-line for key functionalities of the Service Store.
Usability: Learnability	Lacking of help on platform	Amount of hours needed for training	Independent Software Vendors, Public Sector Organizations	Service Store offers an intuitive user interface to build cloud based applications and deploy them over different cloud providers. Despite this, the platform did not offer comprehensive online documentation at the start of the project to help newcomers to the platform. The aforementioned documentation can now be found offline. There has been documentation provided with the deliverables regarding every admin and end user functionalities. Video tutorials have been provided on-line for key functionalities of the Service Store.
Usability: Accessibility	Accessibility of the GUI	Ability to access the dashboard and amount of roles supported	Technical partner, Public Sector Organizations	Several partners report problems accessing the Service Store, the RCA of the incident shows that those partners were not previously granted by ServiceStore admins. Firewall rules prevent that users not granted access the ServiceStore platform. After the access is granted users can adopt different roles to interact with the platform. Provided the administrator with elevated super admin role.

Usability: User Interface aesthetics	Responsiveness of the website	Rating in 1 to 10	Technical partner, Public Sector Organizations	No major incidents found. Network hardware capacity and resilience improvements including switches and routers on the BT Research Platform.
Performance efficiency : Time Behaviour	Service Store Downtime	Amount of hours for server unreachable	Technical partner, Public Sector Organizations	During the project lifetime the platform has been upgraded a couple of times to support new functionalities required for pilot operations, specially IceHouse OpenStack support as a provider. Despite this the downtime of the platform has been minimized by running legacy platforms during upgrades. In addition there has been a development environment setup to protect and eliminate the possibility of downtimes due to development issues.
Goal	Incident	Metric	Stakeholder	Action
Functional suitability	The application does not work properly		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
	The applications is not fully functional		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
Performance efficiency	The applications works slowly		MoSG	Try to improve performances. Holds for all use cases
	The application uses too much resources		MoSG	Try to improve performances. Holds for all use cases
Usability	Input validation is not done		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
	Output validation is not done		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
	Data integrity in the application is not verified.		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
	User interface aesthetics are not satisfactory		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
	User error protection is not implemented in a satisfactory way		MoSG	Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.
Reliability	The application is not available for some time		MoSG	Improve the availability of the application. Holds for all four use cases.
Security	User authentication procedure is not implemented satisfactorily			Improve the authentication procedure. StariGrad-.2 use case.
	The applications are not immune from DDoS attacks			Implement some IPS services or configure personal FW on the VMs to block some IP addresses or ranges of them.
Maintainability	It is not easy to detect what is wrong in the applications			Modify the application accordingly. Holds for StariGrad-1 and StariGrad-2 use cases.

Cloud Based Applications & Cloud Infrastructure Providers				
N/A	Debugging deployment problems on SILO OpenStack	N/A	Technical partner (SILO), Public Sector Organizations (MoSG, GENOA)	This incident was related to the incorrect image used for CKAN deployment. The incident was solved using the right image template.
N/A	Extended customization of home page	N/A		
N/A	Lacking preview for pdf	N/A		
N/A	Lacking preview for geojson	N/A		
N/A		N/A	Technical partner	
CAMDEN UC1: OpenData Platform				
N/A	Secure migration of OVA file and volume drives from Camden's infrastructure to BT cloud infrastructure and methodology due to security restrictions both at Camden and BT	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	Setup of secured migration for Camden to securely transfer the files across using an SFTP server on BT Research Platform.
N/A	VM Name and Domain settings need to be agreed between BT and Camden so that the open data site can be accessible via public IP address	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	A camden subdomain URL was created which diverted traffic via the secured VPN tunnel to the new open data sharepoint site, this allowed for the site to be tested by "real users" as replicated production site
CAMDEN UC2: Tranzact.net application				
N/A	Camden technical team unable to access BT research platform via the browser, Ip addresses and details were provided and network policies were correctly set	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	RDP was blocked, a public IP was created and standard RDP port 3389 had to be opened via change process at Camden end
N/A	Issue around VPN (persistent or similar) connectivity required to enable AD authentication and Sharepoint specific configuration	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	Agreed to setup and provide a site to site VPN tunnel to resolve this - this was a major piece of work and milestone for Camden and BT. This solves network access for all future use cases.
N/A	Missing volume drives from OVA file for the server	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	Additional back up and re-transfer of the OVA file via secured FTP, change control was required and followed at Camden.

CAMDEN UC3: Identity and Attribute manager				
N/A	Camden technical team unable to access BT research platform via the browser, Ip addresses and details were provided and network policies were correctly set	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	RDP was blocked, a public IP was created and standard RDP port 3389 had to be opened via change process at Camden end
N/A	Issue around VPN (persistent or similar) connectivity required to enable AD authentication and Sharepoint specific configuration	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	Agreed to setup and provide a site to site VPN tunnel to resolve this - this was a major piece of work and milestone for Camden and BT. This solves network access for all future use cases.
N/A	Missing volume drives from OVA file for the server	N/A	Technical partner (BT), Public Sector Organizations (CAMDEN)	Additional back up and re-transfer of the OVA file via secured FTP, change control was required and followed at Camden.
GENOA UC2: Cross border Bussiness Activities Services				
N/A	Dummy applications provided to test cross-border functionality not mavenized	N/A	Technical partner, Public Sector Organizations	The applications has been mavenized to facilitate their usage by pilot partners. Extra efforts were required to mavenize those applications with complex dependency paths.
N/A	Issues with the Italian Pan European Proxy Service (PEPS)	N/A	Public Sector Organizations (GENOA)	To solve the issue we have to register and activate the cross-border authentication engine component to get access the Italian PEPS
N/A	Issues with the Italian Pan European Proxy Service (2) (PEPS)	N/A	Public Sector Organizations (GENOA)	Initially we are requested to interact with one of Italian PEPS. This PEPS located in a testing environment was not working as expected. In order to resolve the problems that we were experimenting with this testing environment, we re-configure the system to interact with a different Italian PEPS, this one running in a pre-production environment.
GENOA UC3: Cross-border Certificate Issuance Service				
N/A	Issues with localization and use of certificates	N/A	Public Sector Organizations (GENOA)	Reconfiguration of the certificates to point the appropriate path solves the issues reported. For testing purposes the certificates used were self-signed.
GENOA UC4: OpenData Application				
N/A	Data preview in CKAN use case doesn't work correctly (see preview .png)	N/A	Cloud Application Developers (NICPB), Public Sector Organizations (GENOA, MoSG)	
N/A	Analysis of integration of custom CKAN extensions into CKAN deployment	N/A	Public Sector Organizations (GENOA)	

STARI-GRAD UC1: Certificate Issuance Service				
N/A	Issues with localization and use of certificates	N/A	Public Sector Organizations (MoSG)	Reconfiguration of the certificates to point the appropriate path solves the issues reported. For testing purposes the certificates used were self-signed.
N/A	Vulnerability on service deployed	N/A	Public Sector Organizations (MoSG)	All the services deployed on the provider affected was stopped. Technical partners from SILO team make test to find the malfunctioning services and redeploy the rest of services.
STARI-GRAD UC2: Cross-border Certificate Issuance Service				
N/A	Issues with localization and use of certificates	N/A	Public Sector Organizations (MoSG)	Reconfiguration of the certificates to point the appropriate path solves the issues reported. For testing purposes the certificates used were self-signed.
N/A	Dummy applications provided to test cross-border functionality not mavenized	N/A	Technical partner, Public Sector Organizations	The applications has been mavenized to facilitate their usage by pilot partners. Extra efforts were required to mavenize those applications with complex dependency paths. The cross-border component projects (Federation Proxy and Identity Aggregator) were also mavenized due to the dummy applications has some dependencies with these components, thus additional extra efforts were required.
STARI-GRAD UC3: Mail Service				
STARI-GRAD UC4: OpenData Application				
N/A	Data preview in CKAN use case doesn't work correctly (see preview .png)	N/A	Cloud Application Developers (NICPB), Public Sector Organizations (GENOA, MoSG)	
N/A	Conflict with name mapping when using site_url with CKAN extensions	N/A	Public Sector Organizations (MoSG)	