

COMPETITIVENESS AND INNOVATION FRAMEWORK PROGRAMME

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

Deliverable D6.2

Final Report on the STRATEGIC pilot operations

Workpackage	WP6 – Conduction of Pilot Operations
Editor(s):	Giannis Ledakis (SILO), Kostas Kaloaboukas (SILO), Enric Pages (ATOS), Gery Ducatel (BT), Ilja Livenson (NICPB), Roberto Contri (GENOA), Ben Williams (CAMDEN), Milan Markovic (MoSG), Juan Carlos Pérez Baún (ATOS)
Responsible Partner:	SingularLogic Information Systems & Applications SA
Quality Reviewers	Ilja Livenson (NICPB), Milan Markovic (MoSG)
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Abstract:	The final report on the pilot operations including the evolution of the pilots, any particular problems and their remedy, as well as an evaluation from a pure operational point of view. The report is cumulative and holistic (i.e. covering the whole lifetime of pilot operations), and includes best practices and lessons learnt in relation to the operational (rather than e-governmental or technological) aspects of the STRATEGIC pilot operations. The final report is a consolidation of the main outcomes of task T6.5.

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Definitions, Acronyms and Abbreviations

Acronym	Title
API	Application Programming Interface
CAMDEN	London Borough of Camden
CBA	Cross Border Authentication
CBAE	Cross Border Authentication Engine
CSP	Cloud Service Provider
CRM	Customer Relationship Management
DCT	Data Correction Tool
FP	Federation Proxy
GENOA	City of Genoa
IaaS	Infrastructure as a Service
ICT	Information and Communications Technology
IDP	Identity Provider
IIS	Internet Information Services (Microsoft Server)
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
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 the final report of pilot operations 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 a period of twenty four (24) months, since M12 of the project.

During the piloting operations performed under WP6, pilot services have been successfully developed and deployed, and have been used for piloting purposes. Throughout the piloting 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 and infrastructure.

In addition to the use cases and the goals for each use case defined, this document tries to identify the standing of the project including additional goals, such as the porting and the adaptation of applications available in the STRATEGIC Service Store and also the creation of new added value services that can be used by public bodies.

Finally, the consortium partners experience regarding pilot execution has been collected and provided as part of this document and also served as input for WP7.

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 migrated and/or ported and/or adapted and/or developed and/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 the pilot activities executed in the scope of evaluating STRATEGIC project.

This report congregates the pilot operations conducted during project duration, with focus on the creation, deployment and usage status of the e-government services. It also provides information about the technical support for preparation and deployment of the use case applications, incidents and corrective actions that have been executed towards improving the effectiveness of the STRATEGIC pilot operation.

1.2 Target audiences

This document is intended for both internal and external project stakeholders as it is a public document. Internally it was used as an aggregated reporting deliverable for all the duration of the use cases execution. However, as the project ends this information can be beneficial for 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 provides the scope of piloting operations as part of STRATEGIC.
- Section 3 presents the status of each use case of the pilots.
- Section 4 describes how STRATEGIC accomplished some overall goals regarding the adaptation, porting and migration of e-government services.
- Section 5 provides high-level feedback from the pilot operations in the form of lessons learnt and best practices.
- Finally, section 6 summarizes the document and highlights outcomes of the pilot operations executed during STRATEGIC project duration.

2 Pilot Operations as Part of STRATEGIC

STRATEGIC goal was to deliver the necessary cloud-enabled infrastructure, associated tools and services to governmental bodies that let them to migrate existing public services to the cloud and easily extend their portfolio of services offered to the public. For this reason, specific pilot use cases had been defined early in order to cover all requirements of the pilot partners that represented public sector in the project. As presented in D2.2 [4], pilot use cases are based on scenarios that use applications from STRATEGIC partners. These applications and their requirements are used for the specification of STRATEGIC offered solutions and also they were used for validation of the created platform.

2.1 Platform Overview

The STRATEGIC Service Store is the entry point for all workload configurations and service deployments of STRATEGIC. The Service Store provides orchestration capabilities to the workloads defined within their application marketplace; in addition STRATEGIC allows associating each service with horizontal security mechanisms (i.e.: data protection, data encryption). At the same time, when a pilot application service is instantiated, monitoring agents are deployed together with the virtual resource instances in order to keep track of the availability and performance information of the service during the whole service lifecycle. Another key enabler for our deployments are the infrastructure providers that after being registered within the Service Store become target working nodes for pilot deployments. As it was mentioned before in previous STRATEGIC documentation, our approach is not limited to one provider. Several providers can be registered under our STRATEGIC multi-tenant environment allowing multi-cloud deployments over various types of IaaS providers [5].

The main components and systems that enable the operations in the cloud are listed below:

- Service Store

The Service Store allows injecting control points into the application stack, during the service creation phase, before the final deployment of the resources on top of an Infrastructure Provider. The application as well as the control points can be defined and configured using the STRATEGIC metadata model together with the applications already available in the application catalogue or registering new applications that can be included in the metadata as part of the definition of the cloud workload.

- Monitoring system

The monitoring system being used as part of the STRATEGIC is able to collect performance and availability information over various Cloud Service Providers (CSPs) built on top of different infrastructure providers. The backbone of the monitoring system has been configured to automatically retrieve information from the computational resources after the deployment of the aforementioned resources in private or public cloud infrastructure.

- Security mechanisms

STRATEGIC provides among other mechanisms application and host protection in addition to data encryption of data drives as a service which

can be consumed as horizontal services. Also, cross-border attributes exchange and cross-border authentication engine for pilots is applied at application level through STORK/SEMIRAMIS components.

➤ **IaaS Provider Environment**

Several IaaS environments have been used for the deployment of computing resources each of which might be managed by different cloud computing software (e.g. OpenStack, CloudStack). After being registered in the Services Store, the resources managed by the cloud computing software become target working nodes for our deployments from the marketplace.

2.2 Overview of Piloting

In total, 11 pilots use cases were planned for execution. Creation of the use cases and the selection of the exact pilot applications for each use case was done by consortium partners, both technical and pilots.

The pilot partners of STRATEGIC consortium are namely:

- The London Borough of Camden, London, UK
- City of Genoa, Italy
- Municipality of Stari Grad, Belgrade, Serbia

For all use cases, support on piloting and all the preparatory steps was provided by the technical partners participating in STRATEGIC. The overall plan of the pilot execution, along with specific timeline, milestones and contingency plans has been provided in deliverable D5.4 [3].

In the following table a summary of the scenarios per each Pilot is provided. For convenience, each scenario is assigned a code following the pattern ("municipality-number").

 Camden	Camden-1: Open data initiative for publishing data on the cloud Camden-2: Open systems for hosting a publicly available application Camden-3: Digital identity and authentication
 The City of Genoa	Genoa-1: Cloud-enabled service for business activities Genoa-2: Cross-border authentication for business activities Genoa-3: Cross-border issuance of resident certificate Genoa-4: Open data initiative

 Municipality of Stari Grad	Stari-Grad-1: Cloud-enabled certificate issuance service Stari-Grad-2: Cross-border issuance of resident certificate Stari-Grad-3: Cloud-enabled email service Stari-Grad-4: Open data initiative
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Table 2: Pilot Scenarios

As execution planning was performed in the scope of WP5, the execution of the pilot operations was part of WP6, with updates on the plans according to the issues faced. The initial focus was given by each pilot on one or two services, a fact that also allowed the first testing iteration of the STRATEGIC as a platform. This early period was focused on the baseline public cloud services, which served as a basis for piloting of the rest services of the STRATEGIC framework. After this initial selection and successful deployment of services, the other remaining services had followed. The separation was also done based on the different complexity of each use case scenario and the e-government services used by it. In section 3 the overall reporting of these use cases is provided in detail.

3 Final Reporting 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 were provided wherever this reflects the actual status.

3.1 London Borough of Camden

In the scope of STRATEGIC, Camden executed three pilot cases with different context but focus on the organization needs.

Use Case	Description	STRATEGIC Tools or Technologies Used
Camden-1: Camden Open Data Initiative	Publishing the already in production www.camdendata.info over the cloud. The site provides access to datasets allowing users to be able to use the information as they wish – via the open government licence and supporting compliance with Local Government Transparency code	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group) Windows Server 2008 R2, SharePoint 2010
Camden-2: Publish Scheme management workflow system (Tranzact.Net) over the cloud	Publishing and reselling the Camden developed application for managing the blue badge, freedom pass and other associated processes, to other London public bodies. This service also requires compliance with the Public Services Network (PSN) due to the sensitive nature of data	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group) Windows Server 2008 R2
Camden-3: Identity and attribute manager	Re-using work done via Open Identity Exchange (OIX) in the UK represented by Cabinet Office for an alpha project which includes managing identity of a blue badge customer using a UK based IDP and Gov.UK Verify services	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group)

Table 3: Camden Use Cases Overview

All applications currently deployed are using Security as a Service offered on STRATEGIC Service Store. Security as a Service is supported through a subscription mechanism that is documented in deliverable D5.1b [5]. Also the

configuration capabilities of STRATEGIC Service Store have been used for the initialization of applications and also the proper set up of the deployed application in terms of network.

3.1.1 Cloud Infrastructure

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 benefits from the technical expertise of BT and the integration with Service Store early in the project that allowed the deployment of 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 to 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.

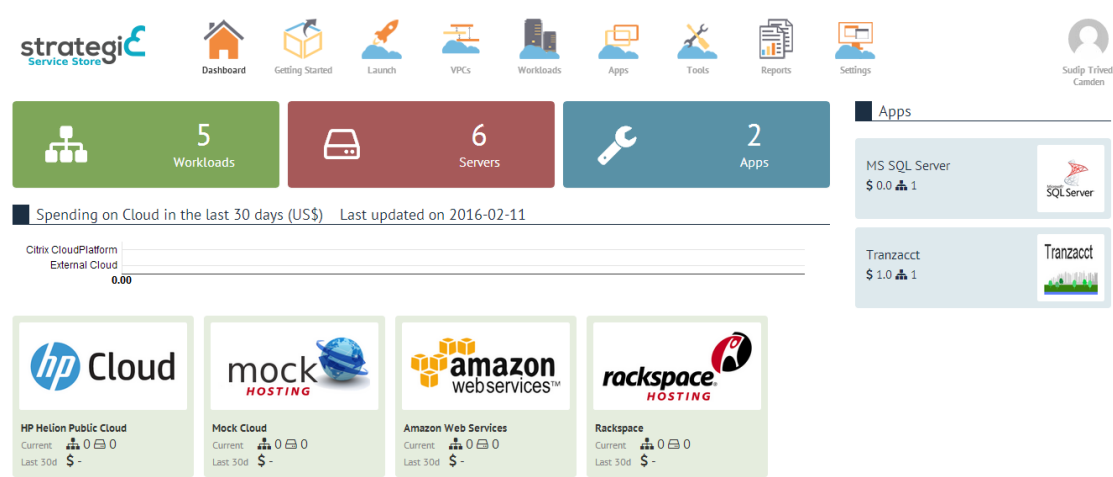


Figure 1: Camden Account in STRATEGIC Service Store

3.1.2 Use Case Status

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	Achievements	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 developed during Y2, application has been deployed through	BT Cloud Platform,

Use Case	Achievements	Cloud Infrastructure
application	the STRATEGIC Service Store, Pilot operations successfully executed	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 Research 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.

3.1.3 CAMDEN-1

For Camden use case 1 the (VPN) tunnel established between BT and Camden has enabled seamless use of services by the technical teams through a trusted network without losing any localized privileges or processes of Camden (for e.g. Active Directory authentication).

The migration/transfer of Camden Open Data Virtual Machine from Camden's private cloud to BT was a key first step to cloudification of Camden Open Data site. The original server containing the SharePoint installation, site configuration and site data was packaged and exported as an image. This image was migrated to target cloud location after creation of a secure file transfer server (SFTP). Upon transfer the migrated VM was uploaded to the BT Research cloud platform and tested by Camden Sharepoint architect and server engineer.

At the same time the Camden's Security team assessed the security policies that may be applicable to comply with the operational requirements of the migrated application. Camden's network support team was then called to create a secure channel to enable the communication of the migrated VM with the active directory of Camden. This enables single sign-on for Camden employees who act as data publishers and site administrators.

In addition, the Service Store agent has been installed in the migrated VM, and is it on-boarded as a workload on the STRATEGIC Service Store.

The use case 1 application is already in production and the domain www.camdendata.info redirected the users to this service for a period of time. 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.

3.1.4 CAMDEN-2

Use Case 2 of Camden aimed 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 was spent on the integration of PSN to the cloud infrastructure that Camden is using.

In collaboration with BT, Camden has been able to deploy a cloud version of the Tranzacct application that can be deployed onto Virtual machines automatically. The automated deployment can take up to around 1 hour which is remarkably shorter compared to the time it would take to set up and configure the application manually. This is because Tranzacct is a sophisticated application that uses complex algorithms to run its processes.

Tranzacct is evidence-based, Scheme Management Workflow System. It stores details about the members of various schemes such as when their membership is expiring or when they may have a mobility assessment appointment with one of Camden's Occupational Therapists. The system also sends out SMS reminders for appointments. Tranzacct also integrates with other systems via web services such as for automatically ordering permits or receiving online applications from third parties. Other examples include integration with an online payment gateway so payments made are recorded against the particular service user.

Current Features of Tranzacct

- Evidence based workflow system
- CRM
- Permit Management
- Work Queues
- Calendars
- Management Reporting
- SMS Reminders
- Online Payments
- Document Scanning
- Automatic Residency Checking
- Automatic Evidence/Criteria based workflow progression
- Full Audit Trail

Tranzacct application interacts with different government databases and the data correction application.

Purpose

- To **reduce timescales** in processing applications
- To provide a **better** and **more cost-effective** service to customers
- To provide a **more value-added** service to customers
- To improve the departments **reputation** in meeting demands/timescales

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. More details about the

technical workflow of cloudifying and adding this application on STRATEGIC Service Store are provided in APPENDIX C: Camden Tranzacct Cloudification.

In the following **Figure 2** the Tranzacct application in STRATEGIC Service Store is provided.

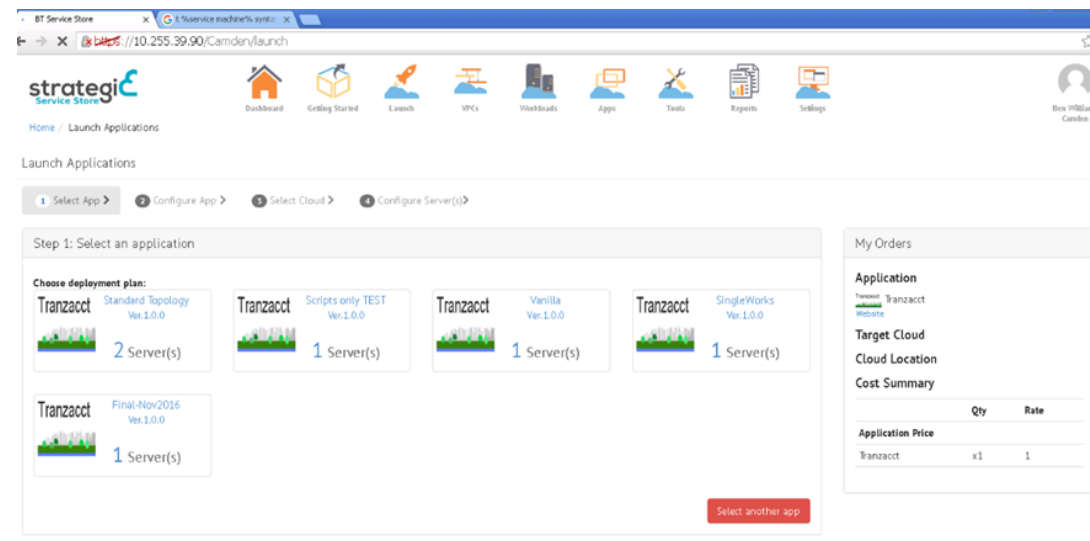


Figure 2: Tranzacct in STRATEGIC Service Store

The configuration parameters created allow the configuration of the service prior the deployment, as shown in **Figure 3**.

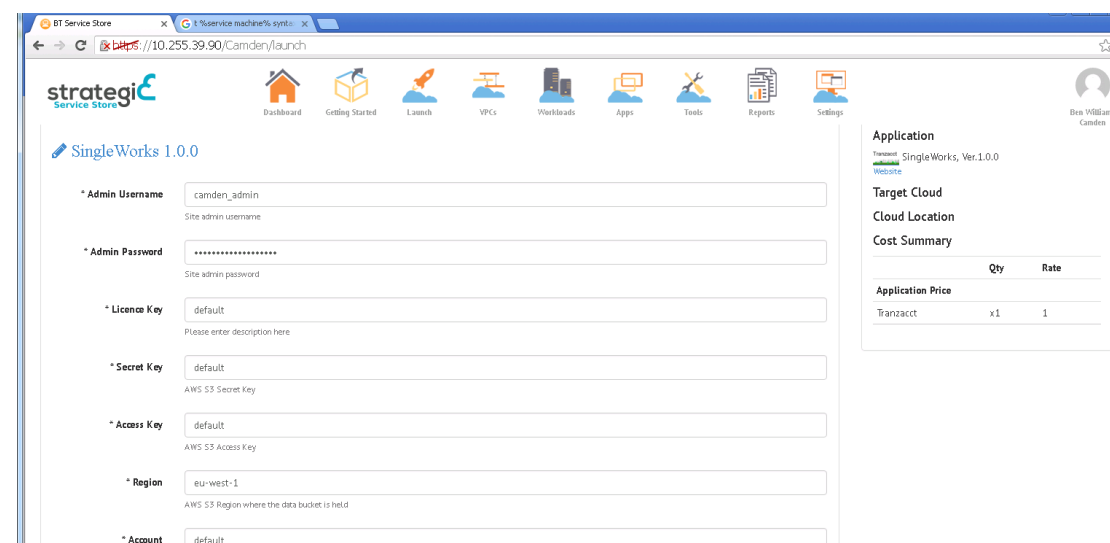


Figure 3: Configuration of Tranzacct through STRATEGIC Service Store

The application is currently running on the servers displayed in Figure 4. Once the BT server image of Tranzacct has been uploaded to the service store then users will be able to deploy Tranzacct to a virtual machine.

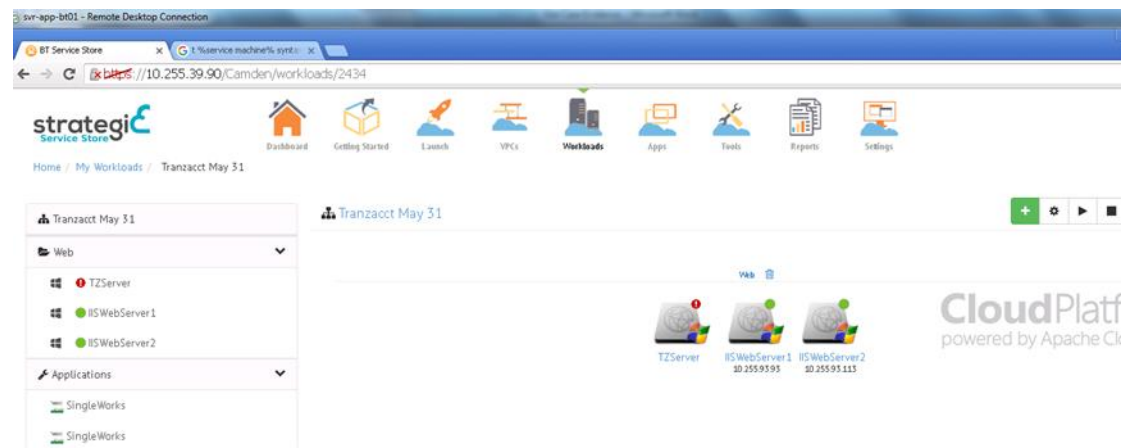


Figure 4: CAMDEN-2 Services

Figure 5 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.

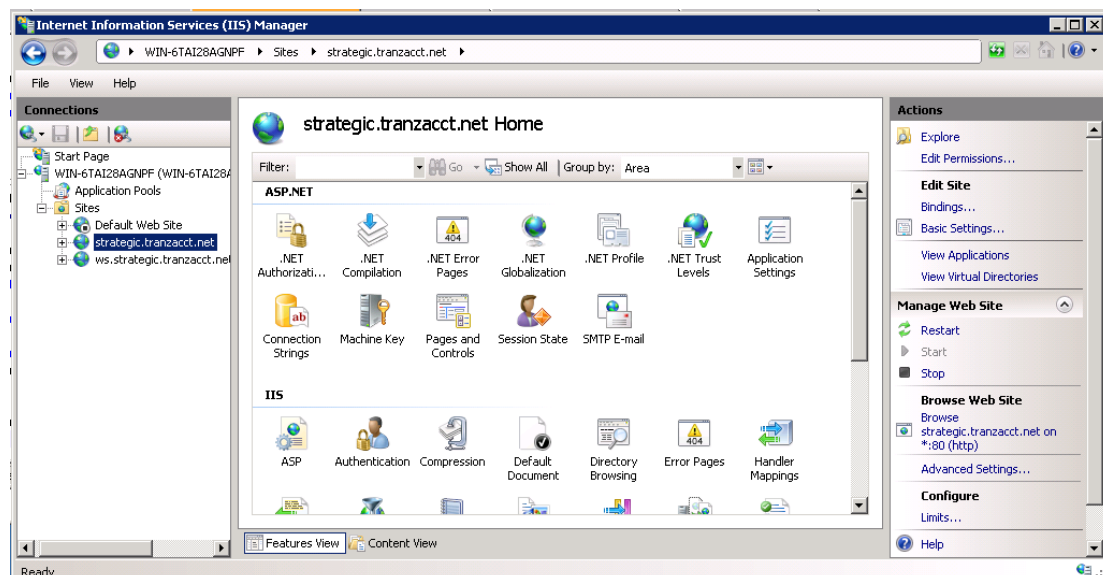


Figure 5: Strategic Tranzacct Server

The application will be accessible at the following URL: <http://strategic.tranzacct.net/login>. A screenshot of the service criteria management section is depicted in Figure 6 below.

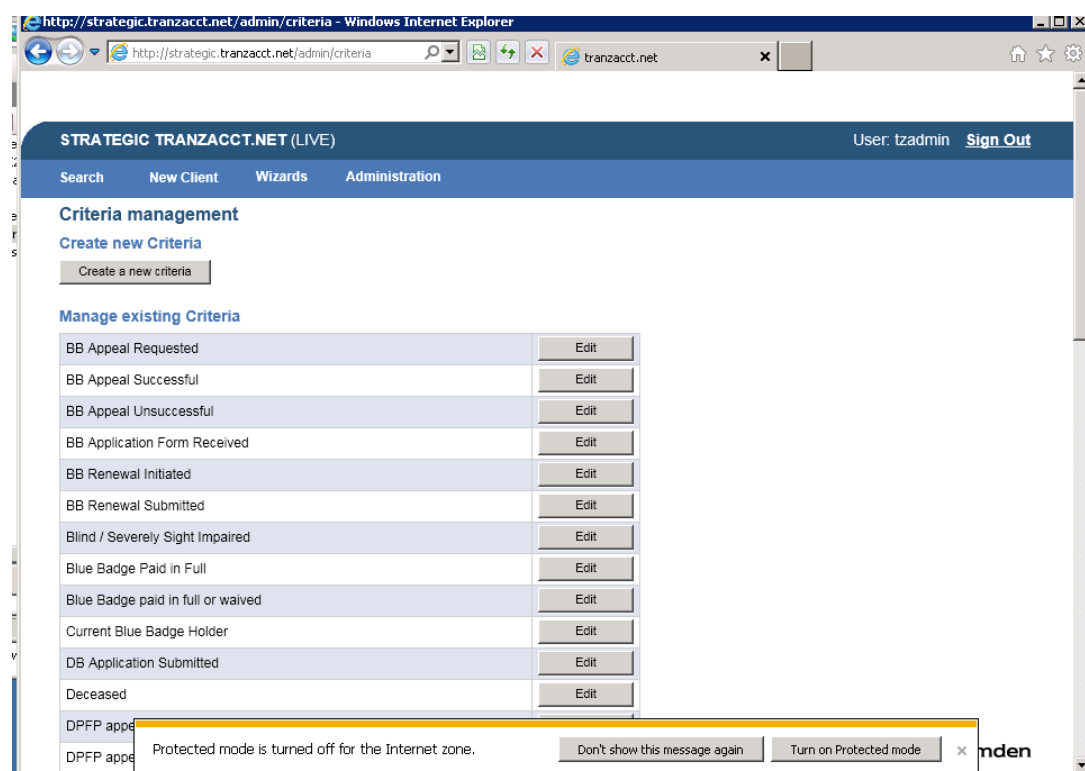


Figure 6: Screenshot of criteria management page

3.1.5 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. The outcome of this work is the Data Correction Tool (DCT). DCT is a tool that offers extra functionality around Tranzacct and allows working with batch processes and lists. For example, it can help to progress hundreds or even thousands of people to a subsequent stage, or send them letters. It also displays a traffic-light system to show which criteria has or has-not been satisfied in order to progress them to the selected stage on any scheme.

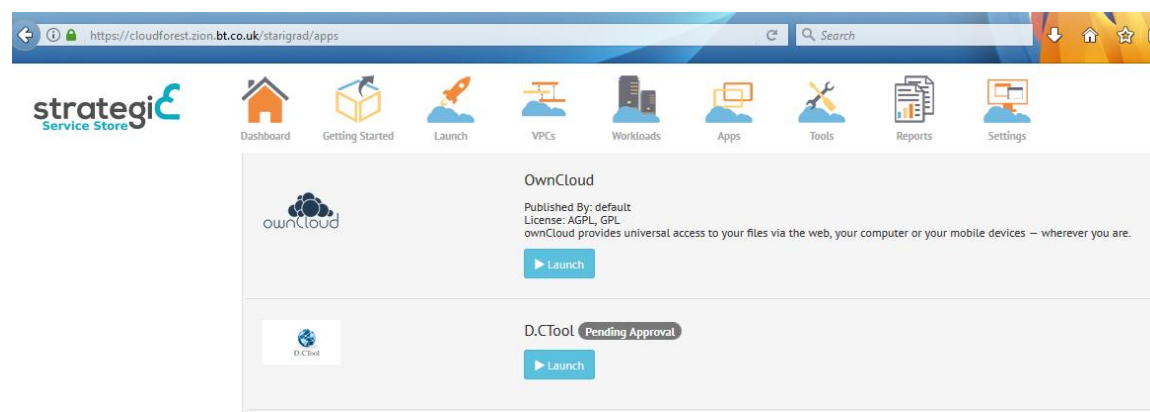


Figure 7: Use Case 3 application in STRATEGIC Service Store

For the integration of DCT with Master Data Management Service (MDM), 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 an internal IP of 10.255.93.93, using STRATEGIC Service Store.

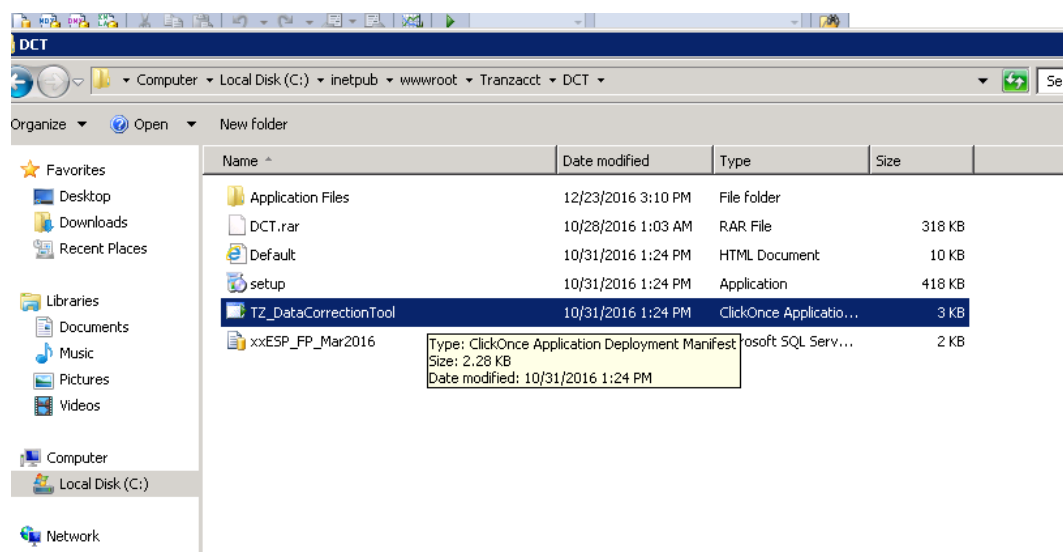


Figure 8: DCT application running in a VM created using STRATEGIC Service Store

Current Features of DCT include

- Allows for working with lists
- Quickly shows which people in a list are Members of the selected scheme
- Quickly shows which criteria have been satisfied and the criteria validity period
- Allows evidence to be assigned to a service user from the clipboard, textually or from a scanner
- Allows the user to perform batch processes (e.g. Progressions, add flags etc.)
- Allows the user to see the current print queues for letters being printed or about to be printed
- Performs on-demand residency checking using the MDM
- Shows all documents and their validity
- Traffic-light system to show which criteria have been satisfied or not, for the selected scheme and stage
- Quickly shows which service users in the list are living at a residence of multiple-occupancy

The specific page for contact management is provided in Figure 9 below.

The screenshot shows the 'STRATEGIC TRANZACCT.NET (LIVE)' interface. At the top, there's a header with 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). Below this, a message states 'Criteria valid for Ben Smith on Thursday, November 03, 2016'. A table titled 'Valid Criteria' shows a single entry: 'Photo Valid' with 'Valid From' 11/3/2016, 'Valid Until' 11/3/2021, 'Created By' tzadmin, 'Created Date' 11/3/2016 12:07..., 'Filename' 0405.jpg, and 'Evidence' Photo. The main section is 'Client Details' 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 labeled 'OUT OF BOROUGH' is visible. Contact details are listed as 'There are no contact details recorded for this client'.

Figure 9: Screenshot of contact management page

3.1.6 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].

Table 4 provided below depicts this information for each use case of Camden.

Use Case	Measurement of users	Definition of transaction	Measurement of transactions
Use case 1: OpenData Platform	Unique users metric that lead to .aspx pages that provide Open Data	Requests of .aspx pages that provide Open Data	Pageviews from Google Analytics that lead to .aspx pages that provide Open Data
Use case 2: Tranzact.net application	Unique users and Applications for a new blue badge or freedom pass or Renewals of an existing blue badge or freedom pass	Unique requests for a new blue badge or freedom pass or Renewals of an existing blue badge or freedom pass	All the information will be stored in the database and can be queried to assess number of applications or renewals
Use case 3:	Unique users that	Successful identity	The identity and

Use Case	Measurement of users	Definition of transaction	Measurement of transactions
Identity and Attribute manager	request a identity and attribute exchange for a blue badge customer	and attribute exchange for a blue badge customer	attribute manager service can confirm the number of requests

Table 5: Definition of measurement methods for Camden use cases

Camden tried to engage users to the platform with the organization of internal workshops in order to let users see live the results of the pilot cases, and demonstrate the added value of STRATEGIC. For the use case 1 open data application that was a public accessible application, user engagement was easy, as the traffic of the official open data application of the municipality was temporary forwarded to the application cloudified using STRATEGIC. It was 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. Table 6 presented below provides the planned and the actual metrics for each use case for the two KPIs; Users and Transactions.

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 6: KPIs of Camden

3.2 City of Genoa

City of Genoa has worked on updates, administrative use, add-ons and re-deployment of use case 1 and 4 applications to the STRATEGIC Service Store. 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. An intra-partner working group is currently working together on the last steps. As documented also in deliverable D5.2 [7], 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.

Use Case	Description	STRATEGIC Tools or Technologies Used
Genoa-1: Cloud enablement service for business activities	City of Genoa provides an Online Services Portal that allows the service for the issuance of registry certificates dematerialized, which can be e-mailed to the applicant and printable for the production of paper certificate.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group), Ubuntu, Drupal 7, Tomcat 7, MySQL, Apache
Genoa-2: Cross-border authentication for business activities	An extension of Genoa-1 use case functionalities to Spain citizens by using a STORK-based authentication service (leveraging STORK project results).	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group), Cross Border utilities, Java, Tomcat 7, MySQL
Genoa-3: Cross-border issuance of Certificate of Residence	Municipality of Genoa in cooperation with Municipality of Stari Grad created services that allow the exchange of citizens' data in a preproduction environment (with no real users data), leveraging SEMIRAMIS project results. This service allows a cross-border certification for residence and exchange of required attributes.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group), Cross Border utilities, Java, Tomcat 7, MySQL
Genoa-4: Open Data	Municipality of Genoa has set up a specific web platform (CKAN) for the publication of the available data, in the manner prescribed by the regulations on Open Data. The paradigm of the Open Data Strategy for the City is also to stimulate the entire municipal organization and its continuous review of working processes for the production and retrieval of complete and correct data.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group), (Tiers, Security Group) Ubuntu 12.04, CKAN

Table 7: Genoa Use Cases Overview

All applications currently deployed are using Security as a Service offered on STRATEGIC Service Store. Security as a Service is supported through a subscription mechanism that is documented in deliverable D5.1b [5]. Also the configuration capabilities of STRATEGIC Service Store have been used for the initialization of applications and also the proper set up of the deployed application in terms of network.

3.2.1 Cloud Infrastructure

For the City of Genoa, there was a high interest to create a private cloud infrastructure in its 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, comprised of 4 servers.

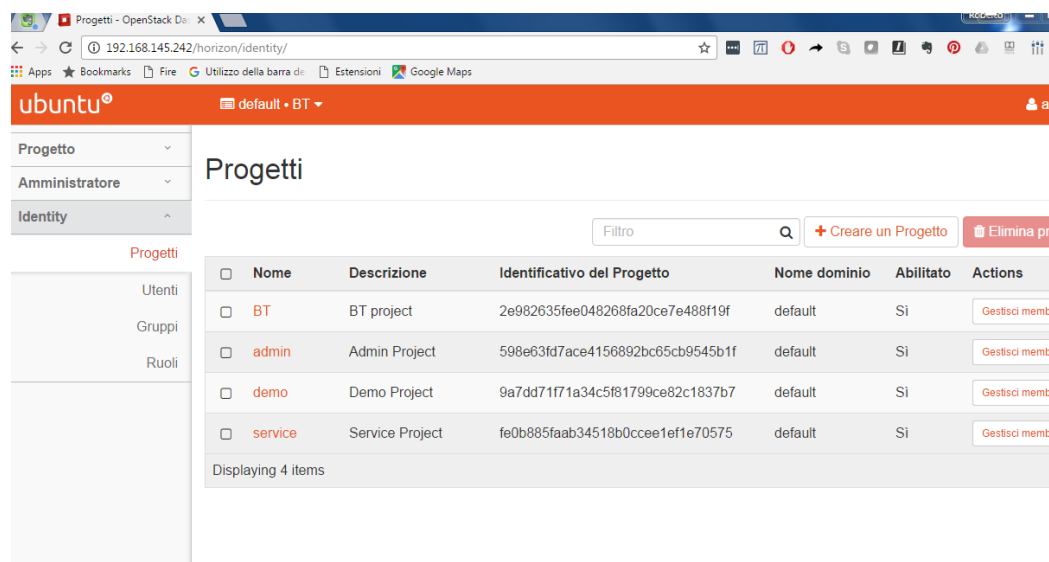


Figure 10: Genoa OpenStack dashboard

For the proper connection with the Service Store, configuration of network like opening of subnet port was needed. 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.

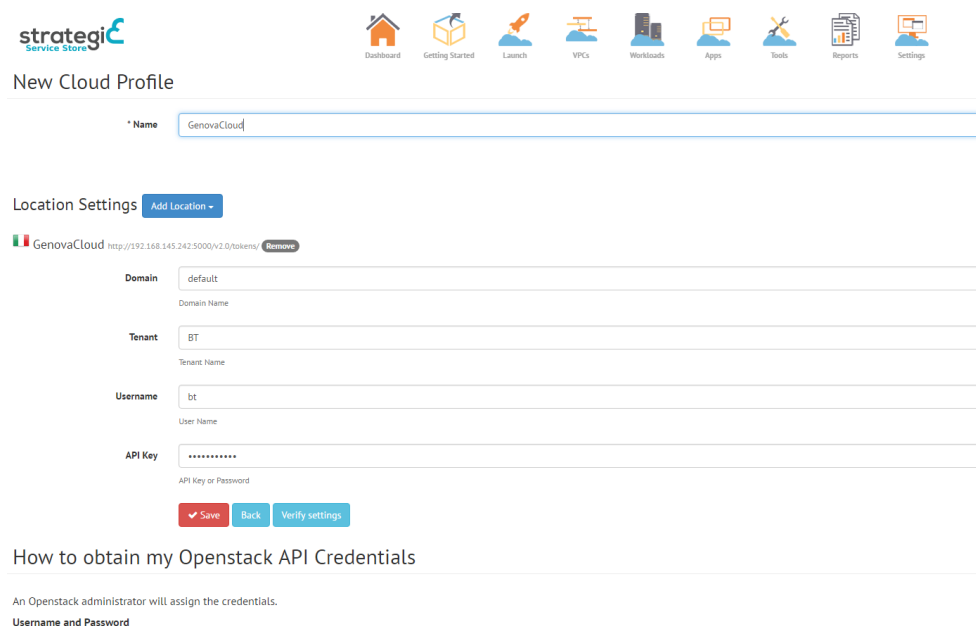


Figure 11: Genoa IaaS as appears on STRATEGIC Service Store

3.2.1 Use Cases Status

The status of the applications for the specific scenarios is provided in the following sub-sections.

Use Case	Achievements	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 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 8: Overview of Genoa Use Cases Status

In the following subsections more details about each use case are provided.

3.2.2 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 12 provides an overview of the STRATEGIC Service Store packaging script of Genoa-1 scenario.

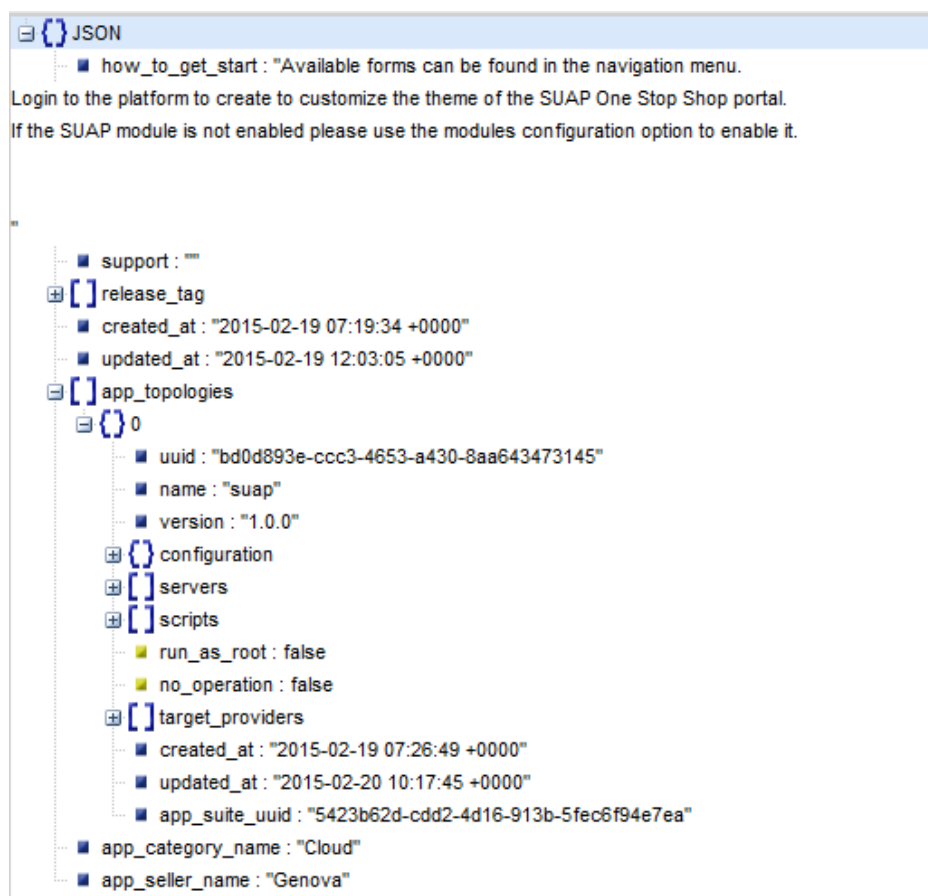


Figure 12: Company Registration Application script overview on STRATEGIC Service Store

The figure below illustrates how the application can be configured through STRATEGIC Service Store.

strategiC Service Store

Dashboard Getting Started Launch VPCs Workloads Apps Tools Reports Settings

suap 1.0.0

* Document root: /opt/drupal
Document root where application is installed

* Port: 80
The Port used for base URL

* Admin User: admin
Login name for admin user account

* Admin Password: *****
Password for admin

* Admin email: admin@mydrupal.com
The admin email for Drupal

* Database Host: Drupal
Database host

* Database Name: drupal
Database Name

* Database User: dbuser
Database User

* Database Password: *****
Database Password

Configure application components

Figure 13: Company Registration Application configuration through the STRATEGIC Service Store

Finally, Figure 14 displays a running instance of the application that is also used for testing with pilot users.

The screenshot shows the SUAP2 application interface. At the top, there is a header with the text "SUAP2 Sportello unico attività produttive" on a dark blue background with a binary code pattern. Below the header, the page is divided into two main sections. On the left, there is a dark blue sidebar with a "Navigation" menu containing "Registrazione attività" and "Registrazione completata", and a "User login" section with fields for "Username" and "Password", and buttons for "Create new account", "Request new password", and "Log in". On the right, the main content area is titled "Registrazione attività" and includes a "Home" link. Below the title, there is a section for "1. Informativa privacy" with a paragraph of text. A scrollable box contains the "INFORMATIVA AI SENSI DELL'ART. 13 DEL DECRETO LEGISLATIVO N. 196/2003, CODICE IN MATERIA DI PROTEZIONE DEI DATI PERSONALI". Below this, there is a checkbox for "Preso visione informativa privacy" and a "Next" button.

Figure 14: Business Activities Service

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

3.2.3 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 (CBAE) 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 Genoa's IaaS.

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 possible 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.

The deployed VM is presented in Figure 15 below.

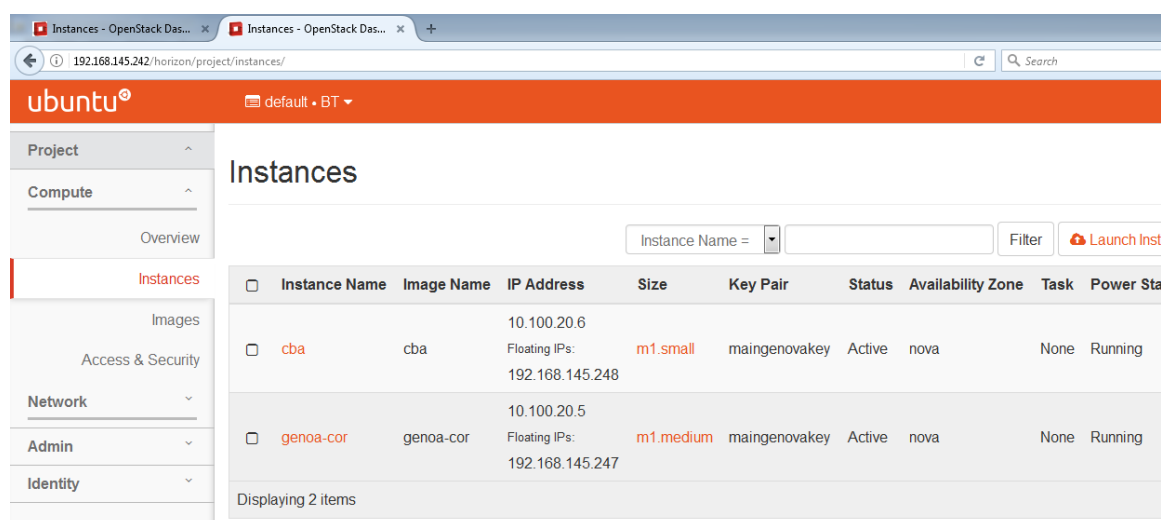


Figure 15: Genoa 2 VM deployment

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.

More details about the components needed for cross border authentication using STORK can be found in deliverable D4.3a [9] and in D4.3b [11] for the enhanced version.

The code structure of GenoaCB4BClient is presented in Figure 16 below.

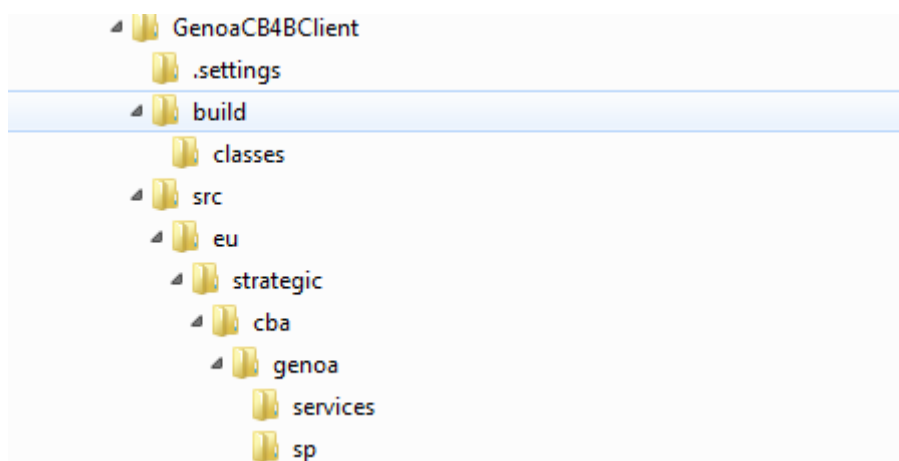


Figure 16: Code Structure of GenoaCB4BClient

More details about the integration of this Service are provided in APPENDIX B: Cross Border Business Activity Scenario.

Figure 17 shows the landing page of the initial application that is used for testing cross-border authentication for business activities use case Genoa-2 based on outputs of STORK project.

Richiesta Concessione Mercato Coperto

Dati Richiedente | Altri Ruoli | Dati REA | Dati Concessione | Concessione accessorie | Riepilogo

Dati Richiedente

Richiedente: * Titolare

Nome: *

Cognome: *

Codice Fiscale/Partita Iva: *

Indirizzo:

CAP:

Città:

Nazione:

Data Nascita

Città Nascita

Nazione Nascita:

Get personal data using Strategic → Next

Figure 17: Demo Application for cross-border authentication

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.

3.2.4 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 MoSG 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 MoSG 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 VM instance details are presented in **Figure 18** below.

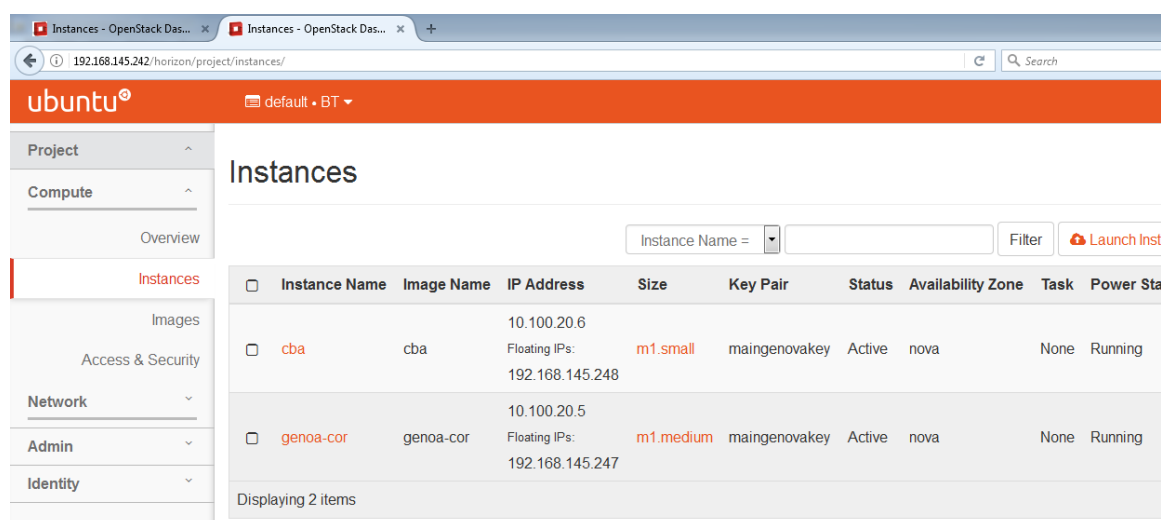


Figure 18: Genoa-3 VM deployment

In order to ease the collaboration of the evolved partners (Atos, SILO, Genoa, MoSG), a private Git repository ([git@github.com:singularlogic/strategicapps.git](https://github.com/singularlogic/strategicapps.git)) has been created.

For the development process of this use case, the development and customization of 3 components was needed, namely the Identity Aggregator, the Federation Proxy and the Genoa Service Provider. More details about the components needed for cross border attributes exchange using SEMIRAMIS are available in deliverable D4.3a [9] and in D4.3b [11] for the enhanced version.

The code structure the Genoa Identity Aggregator is presented in Figure 19 below.

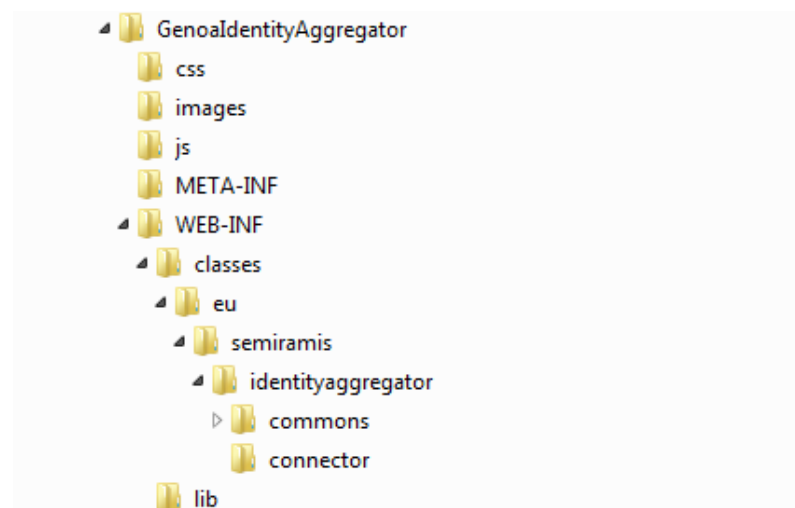


Figure 19: Code Structure of Identity Aggregator

The code structure the Federation Proxy is presented in Figure 20 below.

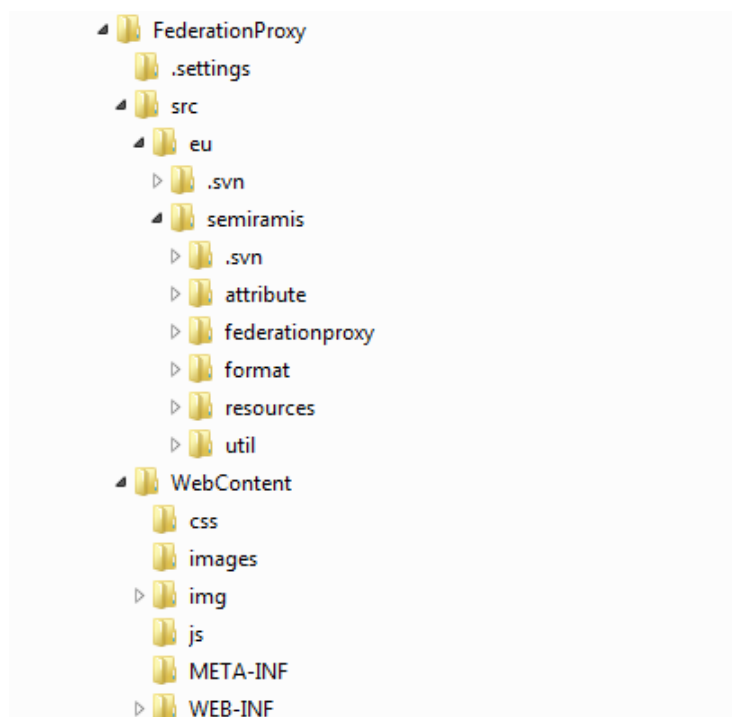


Figure 20: Code Structure of Federation Proxy

The code structure the Service Provider application is presented in Figure 21 below.

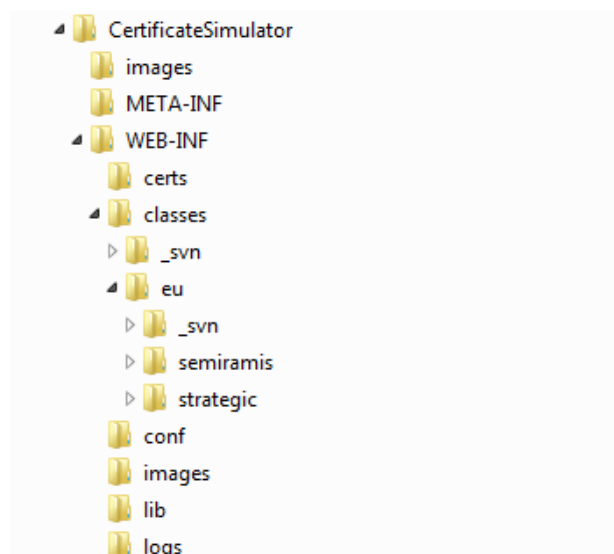


Figure 21: Code Structure of Genoa Service Provider

Figure 22 shows the first page of this initial application that has been created by ATOS and is used for cross-border attribute exchange on the use cases Stari-Grad-2/Genoa-3 based on outputs of SEMIRAMIS project

Figure 22: Demo Application for cross-border attributes exchange

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

More details about this Service and the workflow that allows working with MoSG is provided in APPENDIX A: Cross Border Certificate of Residence Scenario (Use Case Genoa 3 – MoSG 2).

3.2.5 Genoa-4

Genoa-4 is Genoa's Open Data CKAN cloud service that 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.

An overview of the packaging script of the application is this script is also presented in Figure 23.

```

JSON
{
  "uuid": "c8a54caf-ce84-4450-8ca0-eba1fecb1468",
  "name": "OpenData (CKAN)",
  "website_url": "http://ckan.org/",
  "license": "AGPL",
  "icon": "IVBORw0KGgoAAAAANSUheUgAAADwAAAA8CAYAAAA6NlyAAAAGXRFVHRtb2Z0 d2FyZQB6ZG9iZSBjbWFnZVJlYWR5ccllPAAAYJpVFh0WE1MOmNvbS5hZG9iZS54bXAAAA",
  "summary": "CKAN is a powerful data management system that makes data accessible – by providing tools to streamline publishing, sharing, finding and using data.",
  "description": "CKAN is aimed at data publishers (national and regional governments, companies and organizations) wanting to make their data open and available. - See more at: http://ckan.org/",
  "approval_state": "approved",
  "hourly_rate": 0,
  "accessibility": "public",
  "how_to_get_start": "** Supply database password, CKAN admin account password and valid admin user email"

* Select target cloud for CKAN server deployment
* Configure CKAN server VM for launch (requires Ubuntu 12.04 platform)

* Goto "Workloads" and open OpenData workload package for details
* Lookup instance network details and connection info
* Use VM instance public IP or DNS name for connecting to CKAN web service

"
  "support": "andres.toomsalu@kbfi.ee",
  "release_tag": {
    "created_at": "2015-06-22 08:31:16 +0100",
    "updated_at": "2015-06-30 12:32:24 +0100"
  },
  "app_topologies": {
    "app_category_name": "STRATEGIC EU Project",
    "app_seller_name": "NICPB"
  }
}

```

Figure 23: CKAN packaging script overview

The configuration of the service through STRATEGIC Service Store is presented in **Figure 24**.

Step 2: Configure Application

CKAN server 1.0.0

* Database password: dbpass
PostgreSQL database password

* Admin password: adminpass
CKAN admin user password

* Admin email: admin@ckan.int
CKAN admin user email

Configure application components

Server CKAN server

App Installer

Back Next

Figure 24: CKAN configuration

The deployed application is viewed and managed from STRATEGIC Service Store, as shown in **Figure 25**.

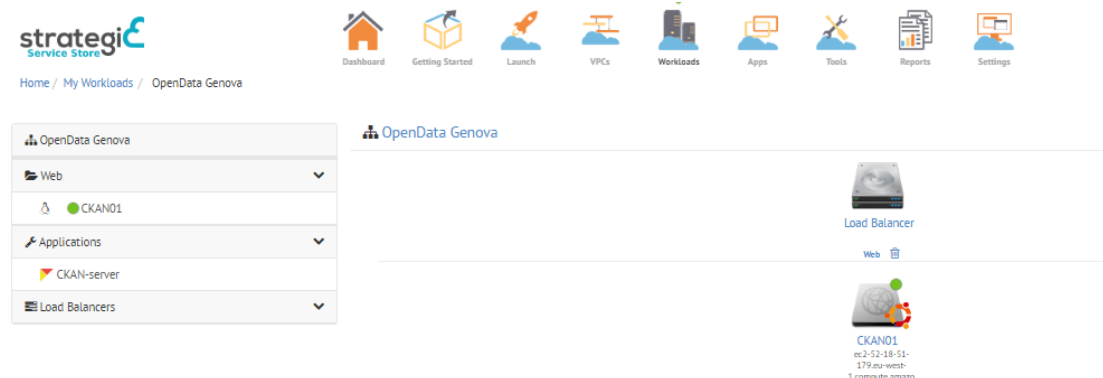


Figure 25: CKAN deployment in Service Store

The deployed CKAN application of Genoa CKAN is depicted in Figure 26.



Figure 26: CKAN application deployed

Finally, the created application is available on STRATEGIC Service Store as resellable application and is used also for the Stari-Grad-4 scenario. The open data application is deployed online on: <http://opendata.strategic.comune.genova.it/>

3.2.6 Pilot Cases Achievements

As presented already, 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].

Table 9 provided below depicts this information for each use case of City of Genoa.

Use Case	Measurement of users	Definition of transaction	Measurement of transactions
----------	----------------------	---------------------------	-----------------------------

Use Case	Measurement of users	Definition of transaction	Measurement of transactions
Genoa-1: Business Activities Service	Unique users that submitted a request about business activities	Requests for business activities received.	Requests are logged internally in the application
Genoa-2: Cross border Business Activities Service	Spanish citizens trying to register in the Cross border Business Activities Service with the aim to open a business in Genoa.	Cross-border connection for requests and responses between City of Genoa and the Spanish IdP. Transactions like document upload that are parts of multistep operations are also tracked.	The cross-border authentication engine can confirm the number of successful requests made by the Cross-border Business Activities Service. The Genoa cross-border business activities Service can confirm the number of successful responses coming from the cross-border authentication engine.
Genoa 3: Cross-border Certificate Issuance Service	Serbian citizens already registered in Stari Grad Municipality trying to register in the City of Genoa	Cross-border connection for requests or responses between City of Genoa and Stari Grad Municipality. Transactions like document upload that are parts of multistep operations are also tracked.	The cross-border certificate Issuance service can confirm the number of requests and responses received.
Genoa-4: Open Data Application	Unique users metric of pages that provide Open Data	Requests for downloads of datasets	Users and Pageviews from Google Analytics and internal tracking from CKAN

Table 9: Definition of measurement methods for Genoa use cases

In order to engage users to the pilot applications, Genoa created internal workshops and also contacted with other local organizations and companies. In the same time Genoa participated in the webinars with internal audience in order to explain easily to interested people the usage of the platform and the pilot scenarios. 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. For Genoa-4 that was public service that many citizens could show interest, user engagement was easier as people looking for open data could reach the application, but of course the target goal was much higher. Table 10 presented below provides the planned and the actual metrics for each use case for the two KPIs; Users and Transactions.

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 used the service but transactions have been achieved)
Genoa 3: Cross-border Certificate Issuance Service	15	150	9	280	Success (less users used the service but transactions have been achieved)
Genoa-4: Open Data Application	80	800	470	2121	Success

Table 10: 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.

3.3 Municipality of Stari Grad

Municipality of Stari Grad (MoSG) had used four scenarios for the evaluation of STRATEGIC. In Table 11 presented below, a description of each use case and the usage of STRATEGIC solutions is provided.

Use Case	Description	STRATEGIC Technologies Used
Stari-Grad-1	Cloudified version of already existing different certificate request services (birth, death, marriage, etc.).	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group) Ubuntu OS, Tomcat , MySQL
Stari-Grad-2	Development of the cross-border residence certificate issuance service based on outcomes of the SEMIRAMIS project. Related to Genoa-3 use case.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group), Cross Border utilities Ubuntu OS, Tomcat, MySQL
Stari-Grad-3	Development of the cloud based email service for internal users of MoSG.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group) Ubuntu OS, Email applications (iRedMail)
Stari-Grad-4	CKAN based Open Data cloud service. Development of the Open data sets relevant to MoSG.	Security tools to protect VM and data (Security as a Service), Network configuration (Tiers, Security Group) Ubuntu, CKAN Application

Table 11: MoSG Use Cases Overview

All applications currently deployed are using Security as a Service offered on STRATEGIC Service Store. Security as a Service is supported through a subscription mechanism that is documented in deliverable D5.1b [5]. Also the configuration capabilities of STRATEGIC Service Store have been used for the initialization of applications and also the proper set up of the deployed application in terms of network.

3.3.1 Cloud Infrastructure

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.

Due to the difficulty to access physical infrastructure for renting in Serbia, MoSG made few attempts on creating IaaS on top of virtualized infrastructure provided

by Orion Telekom¹. The IaaS on top of virtualized resources was established and tested through the deployed use cases' applications. In addition, the end MoSG managed to allocate physical resources for rent by Orion Telekom in Serbia and a totally new installation was created, that is able to host many services and make the usage of STRATEGIC Service Store much more convenient.

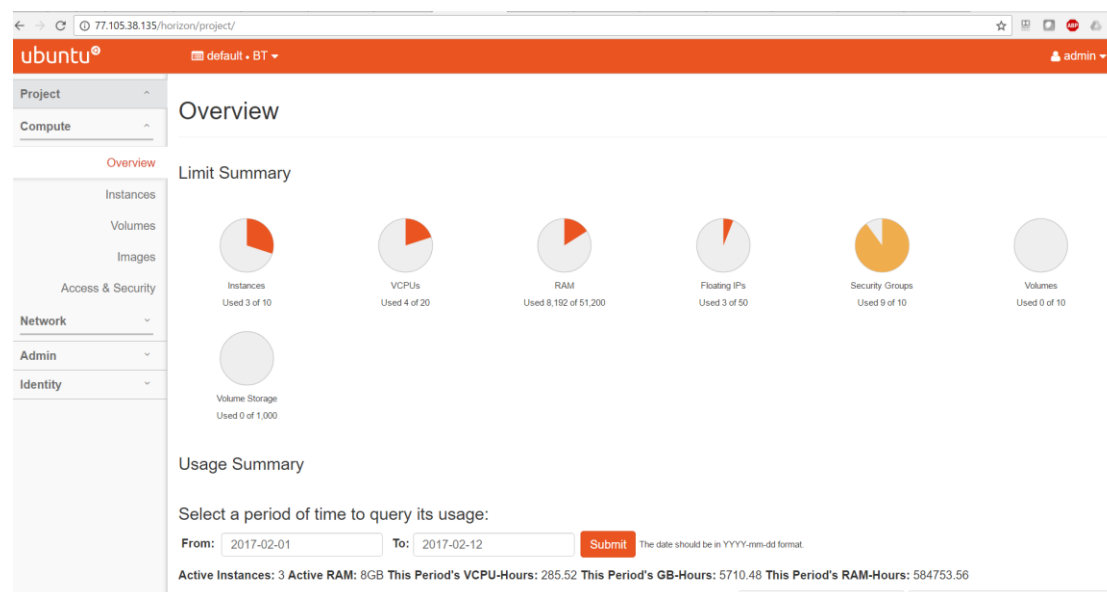


Figure 27: MoSG OpenStack dashboard

For integrating with the Service Store, as MoSG IaaS was deployed in a public network, 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 Telekom 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.

¹ <http://oriontelekom.rs/>

strategiC Service Store

Home / Settings / Cloud Profile / Edit Cloud Profile

Cloud Profile - stariCloudSerbia

* Name: stariCloudSerbia

Location Settings [Add Location](#)

StariGradCloud <http://77.105.38.135:5000/v2.0/tokens> [Remove](#)

Domain: default
Domain Name

Tenant: BT
Tenant Name

Username: bt
User Name

API Key: *****
API Key or Password

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

Figure 28: MoSG IaaS as appears on STRATEGIC Service Store

3.3.2 Use Cases Status

Activities related to the scenario use cases are provided in this section. Municipality of Stari Grad (MoSG) has 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 12 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 though 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 integrated with other SEMIRAMIS components (FP, IA). End-to-end transactions by internal	OpenStack IaaS hosted by Orion Telecom, 1x VM (m1.small 2GB RAM 1 VCPU 20.0GB Disk)

Use Case	Current Status	Cloud Infrastructure
	users of MoSG and Genoa have been successfully completed.	
Stari-Grad-3: Mail Service	Pilot successfully executed, application deployed through 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 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)

Table 12: Status of Stari Grad use cases

In the following subsections, more details about each use case are provided.

3.3.3 Stari-Grad-1

Stari-Grad-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, 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.

The application has been created as .war archive based on Java technology and is deployable to a Tomcat 7.2 application server. The description of these prerequisites and the compiled application archive create a workload that is described by a STRATEGIC packaging script. During the last year of the project the .war file of the application had been updated and the actual parameters that are available have been increased as well. Figure 29 provides an overview of the packaging script of Stari-Grad-1 scenario application.

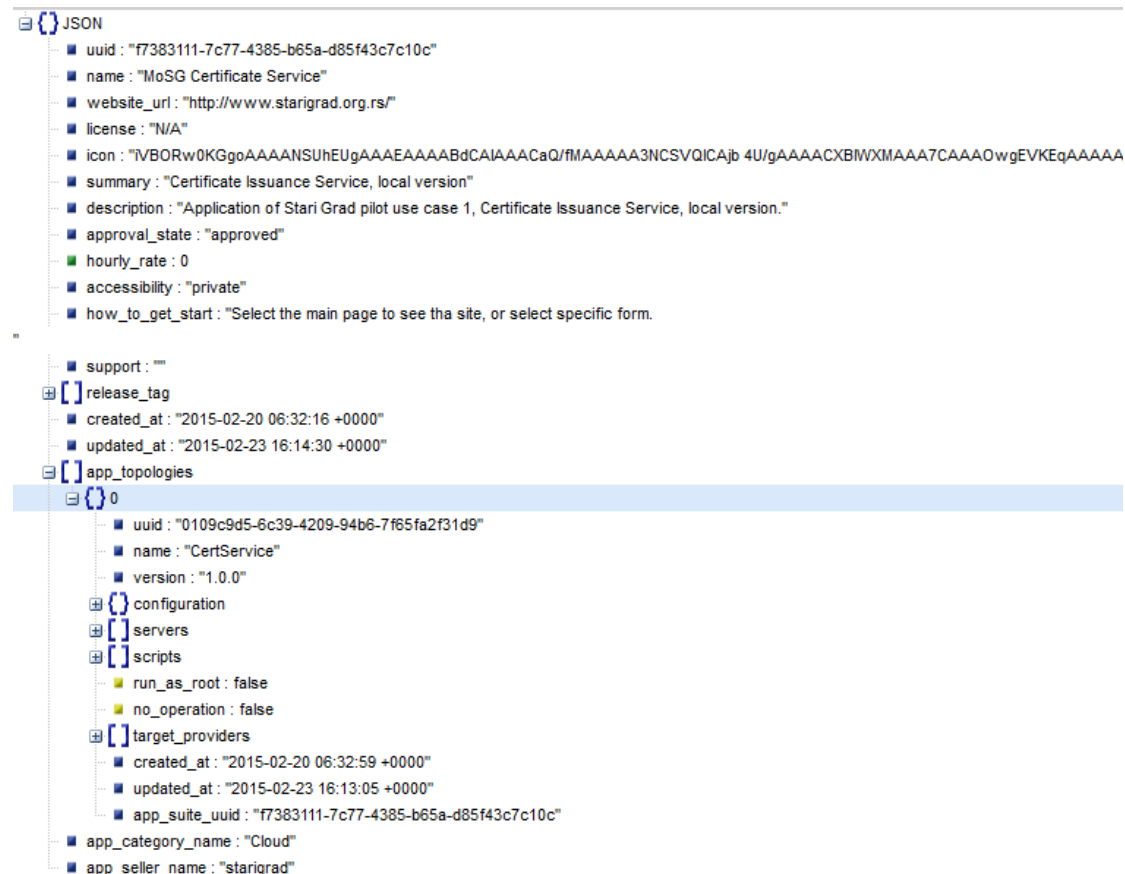


Figure 29: MoSG certificate service packaging script main parts

Figure 30 illustrates how the application can be configured through STRATEGIC Service Store.

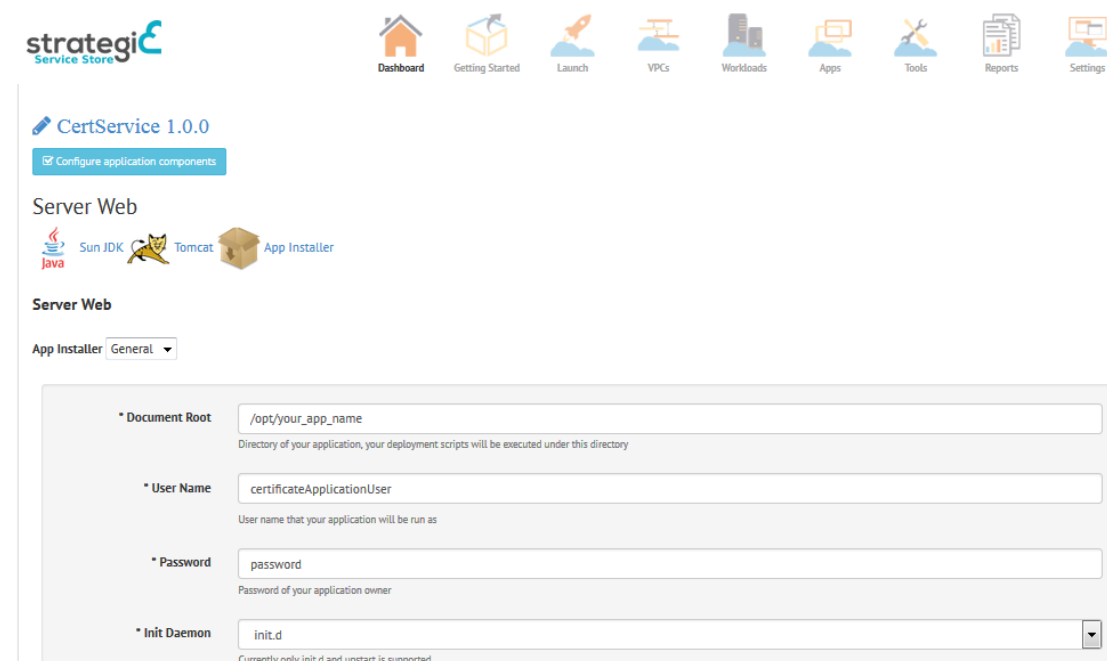


Figure 30: Municipality of Stari Grad certificate service configuration on STRATEGIC Service Store

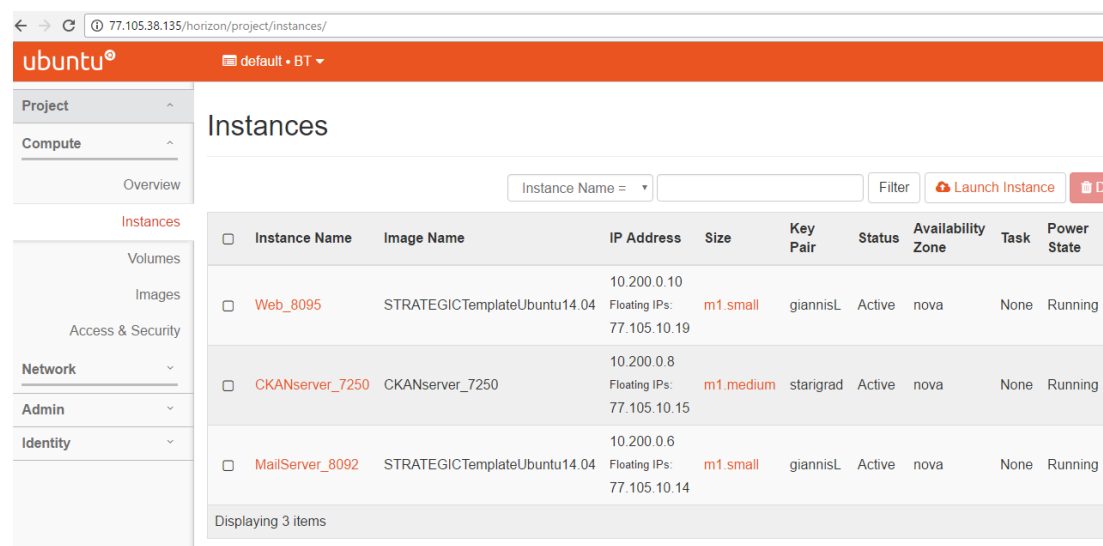


Figure 31: Municipality of Stari Grad certificate service configuration on STRATEGIC Service Store

Figure below is presenting a screenshot of the deployed application. 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.

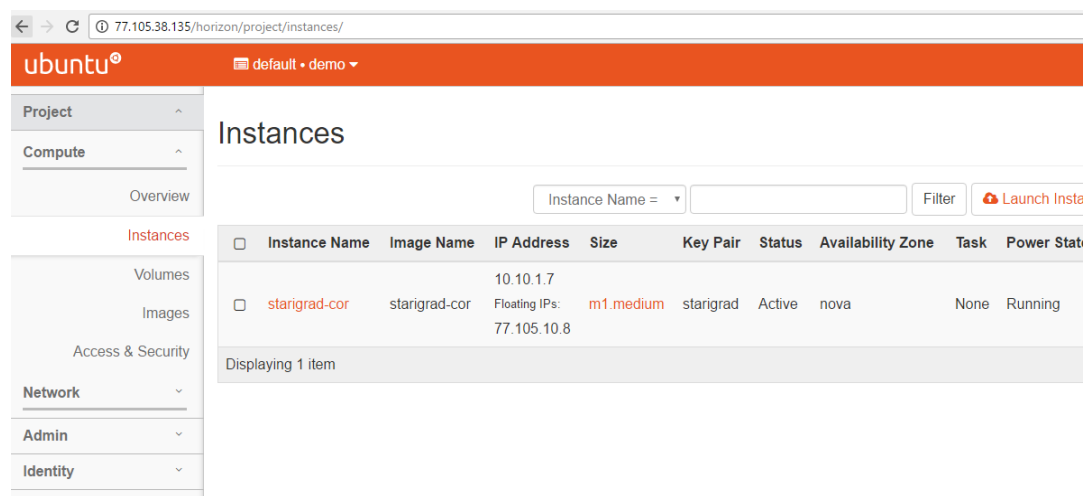


Figure 32: Stari-Grad-1 screenshot

3.3.4 Stari-Grad-2

Stari-Grad-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.



The screenshot shows the OpenStack Horizon interface for the 'default' project. The 'Instances' tab is selected, displaying a table with one instance. The table columns are: Instance Name, Image Name, IP Address, Size, Key Pair, Status, Availability Zone, Task, and Power State. The instance 'starigrad-cor' is shown with image 'starigrad-cor', IP addresses '10.10.1.7' and '77.105.10.8', size 'm1.medium', key pair 'starigrad', status 'Active', availability zone 'nova', and power state 'Running'.

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State
starigrad-cor	starigrad-cor	10.10.1.7 77.105.10.8	m1.medium	starigrad	Active	nova	None	Running

Figure 33: Deployed instance information

For the development of this application 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, MoSG). 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.

In addition to what was presented in section 3.2.4 and the development of use case Genoa-3, the development process of this use case required the development and customization of 2 different components, the Identity Aggregator and MoSG AuthNProvider that are both deployed in the VM instance presented in Figure 33. The code structure of the Identity Aggregator is presented in Figure 34 below.

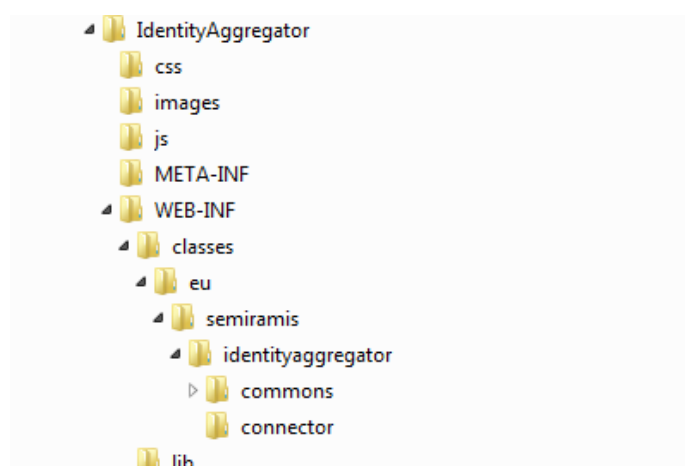


Figure 34: Code Structure of Identity Aggregator

The code structure of Stari Grad AuthNProvider is presented in Figure 35 below.

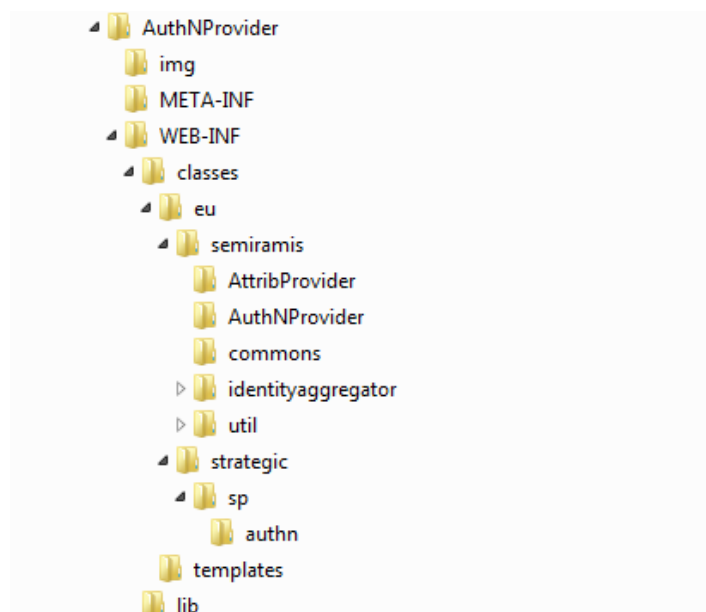


Figure 35: Code Structure of Stari Grad AuthNProvider

In deliverable D4.3a [9] more details about the components needed for cross border attributes exchange using SEMIRAMIS are provided. In D4.3b [11] additional details are provided for the enhanced version.

Figure 36 shows the page that allows starting the cross-border attribute exchange in order to sent required attributes to MoSG.



Figure 36: Screenshot from the Application for cross-border attributes exchange

More details about this Service and the workflow that allows working with MoSG is provided in APPENDIX A: Cross Border Certificate of Residence Scenario (Use Case Genoa 3 – MoSG 2).

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.

3.3.5 Stari-Grad-3

Stari-Grad-3 is a cloud based email service for internal users of MoSG. Upon a detailed analysis, the iRedMail mail server has been chosen. In Figure 37 the packaging script used for importing the application in STRATEGIC Service Store is provided.

```

Viewer  Text
JSON
{
  "uuid": "72a5373a-3bb7-4d1b-873c-007a0233cdf3",
  "name": "iRedMail",
  "website_url": "http://mynewapphomepage.com",
  "license": "GPLV2",
  "icon": "VBORw0KGgoAAAANSUHEUgAAAHsAAAA3CAYAAAsXTVoAAAABHNCSVQICAgI fAhkIAAAIABJREFUeJztnXm0ZVdd5z+vc85d3j3zTW9GLUvmQMkgSQEkDAo UzMISjeO4ACibWuLY7NYtuJCQXB",
  "summary": "A ZERO COST, fully fledged, full-featured mail server solution. All used packages are free and open source, provided by the Linux/BSD distribution vendors you trust.",
  "description": "A full pledged email solution using the following major open source packages: 1) Postfix: SMTP service 2) Dovecot: POP3/POP3S, IMAP/IMAPS, Managesieve service 3) Apache: Web server 4) N",
  "approval_state": "approved",
  "hourly_rate": 0,
  "accessibility": "public",
  "how_to_get_start": "1. Click on the Admin panel entry point to access the web interfaces Admin panel to manage the Mail server (creating users, virtual domains)

2. Log in with the following default credentials
Username: postmaster@
Password: secret

3. Click on the RoundCube web mail entry point to as a mail client to access email

4. Log in with the following default credentials
Username: postmaster@
Password: secret

5. Click on the phpAdmin panel entry point to access phpAdmin web interface to manage the MySQL database use to store account informations.

6. Log in with the following default credentials
Username: root
Password: secret
  "
  "support": "",
  "release_tag": "1",
  "created_at": "2014-04-14 11:37:06 +0100",
  "updated_at": "2014-12-31 03:30:16 +0000",
  "app_topologies": {
    "app_category_name": "Collaboration",
    "app_seller_name": "default"
  }
}
  
```

Figure 37: MoSG use case 3 (Stari-Grad-3) packaging script

For the deployment of this use case both SILO's and MoSG's private cloud infrastructures were used in different periods. This application is configured and parameterized by MoSG's technical team through the STRATEGIC Service Store.

☒ Configure application components

Server MailServer

 iRedMail

Server MailServer

iRedMail **General**

* iRedMail Version	0.8.7
This version of iRedMail will be installed	
* Port	443
The Port used by the iRedMail services	
Mail Host	testmailstarigrad.org.rs
Fully qualified domain name of the mail host	
First Virtual Domain(virtualdomain1)	starigrad.org.rs
Specify your first virtual domain name	
* Mail Admin Password	secret
The mail admin user (postmaster@) password	
* MySQL Root Password	secret
The MySQL database (used for storing accounts information) admin password	

Figure 38: Stari-Grad-3 configuration through Service Store

The application is successfully deployed and evaluated by users from MoSG.

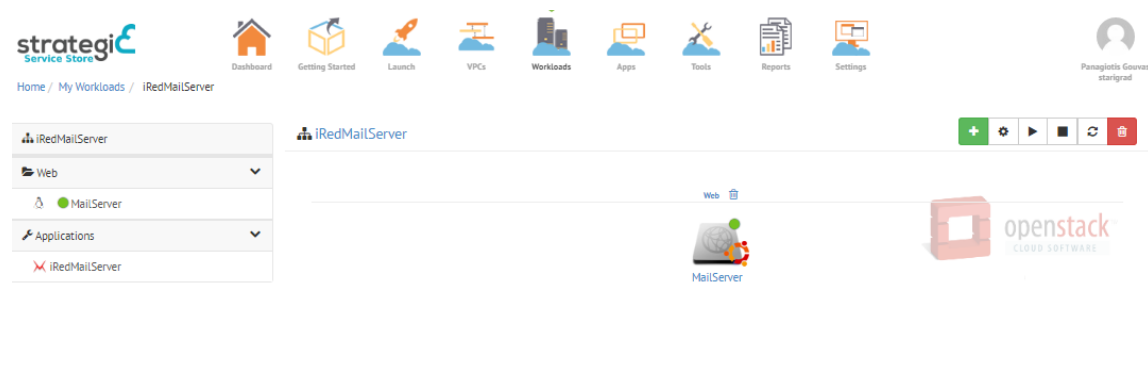


Figure 39: Deployment of iRedMail Server through STRATEGIC Service Store

Some email addresses defined in this application (a service one and for civil servants) are used for Stari-Grad-1 use case.

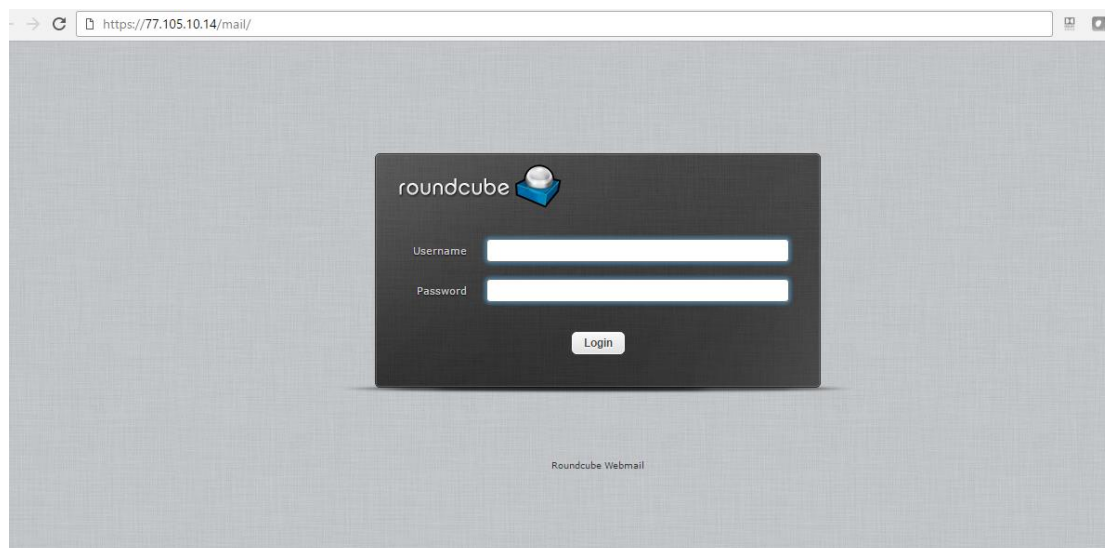


Figure 40: Stari-Grad-3 screenshot

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.

3.3.6 Stari-Grad-4

Stari-Grad-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.

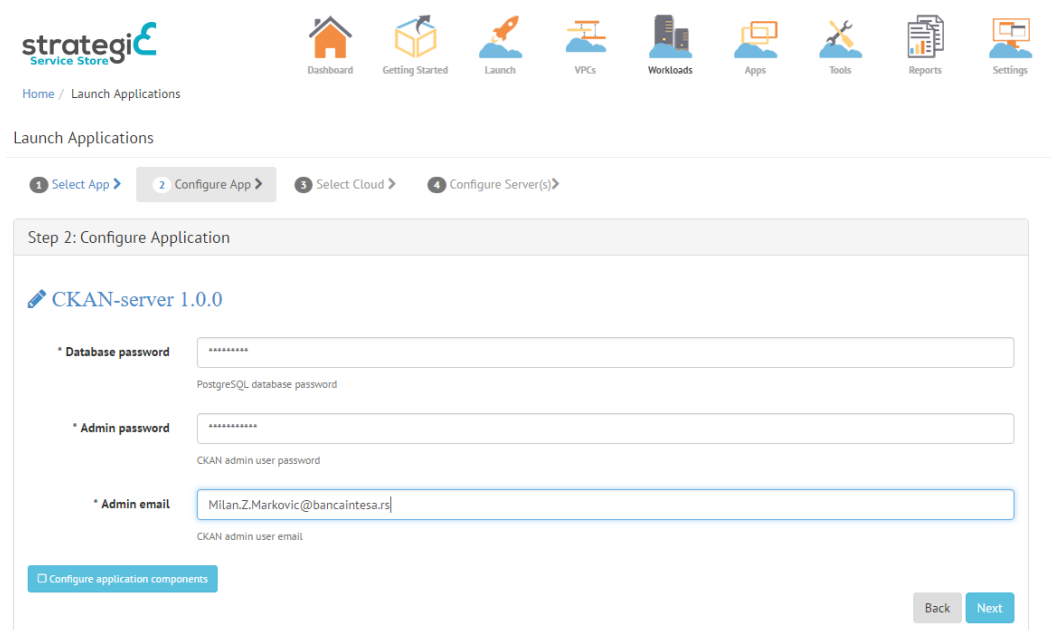


Figure 41: CKAN-based open data portal configuration.

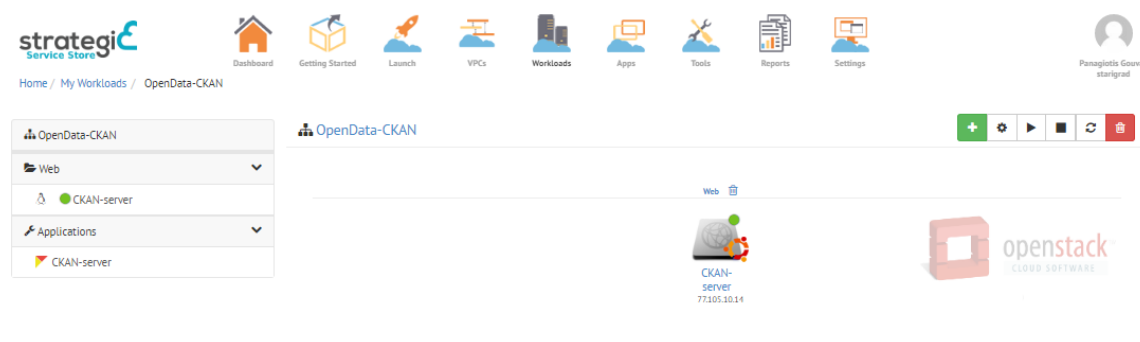


Figure 42: Deployment of CKAN Server through STRATEGIC Service Store

After the deployment of the application initial datasets have been uploaded and further customization has been done, as shown in Figure 43.

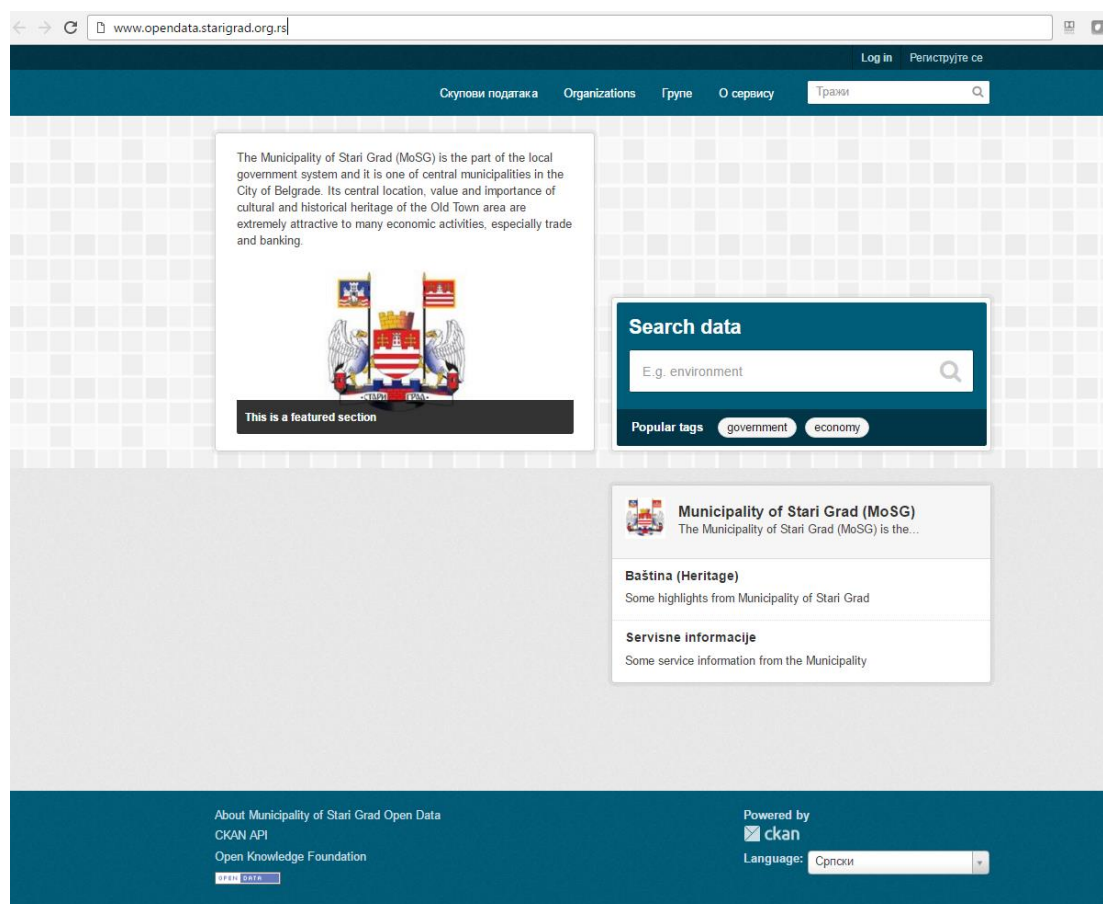


Figure 43: Stari-Grad-4 screenshot.

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

3.3.7 Pilot Cases Achievements

As presented already, 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 [8].

Table 13 provided below depicts this information for each use case of Municipality of Stari Grad.

Use Case	Measurement of users	Definition of transaction	Measurement of transactions
Stari-Grad-1: Certificate Issuance Service	Unique users that submitted certificate request and confirmed by the unique email	Certificate requests received.	Requests can be confirmed by the number received emails
Stari-Grad-2: Cross-border Certificate Issuance Service	Genoese citizens already registered in City of Genoa trying to register in Stari Grad Municipality	Cross-border connection for requests or responses between City of Genoa and Stari Grad Municipality. Transactions like document upload that are parts of multistep operations are also tracked.	The cross-border certificate Issuance service can confirm the number of requests and responses received.
Stari-Grad-3: Mail Service	User number available on iRedMail administrator panel	Emails sent, emails received, login requests and administrative actions	Information is available on iRedMail administrator panel
Stari-Grad-4: Open Data Application	Unique users metric of pages that provide Open Data	Requests for downloads of datasets	Users and Pageviews from Google Analytics and internal tracking from CKAN

Table 13: Definition of measurement methods for MoSG use cases

In order to engage users to the pilot applications, Municipality of Stari Grad organized internal workshops and also contacted with other local organizations and. This helped on collecting users for used cases Stari-Grad-1, Stari-Grad-3 and Stari-Grad-4. The users for the cross-border scenarios in Stari-Grad-2 were not easy to be found but the transactions were achieved due to many test transactions performed by internal people of the project. For MoSG the engagement of users was also helped by the webinars, as internal and external audience was invited to view STRATEGIC Service Store live and then use the pilot applications.

Table 14 presented below provides the planned and the actual metrics for each use case for the two KPIs; Users and Transactions.

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	15	280	Success (less users used the service but transactions have been achieved)
Stari-Grad-3: Mail Service	50	600	50	1220	Success
Stari-Grad-4: Open Data Application	80	800	690	1315	Success

Table 14: KPIs of MoSG

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

4 Additional Objectives of Pilot Operations

Successful deployment the of e-government services on cloud infrastructures through STRATEGIC Service Store and usage of these services by actual users are the main objectives to be achieved during piloting phase of the project. However, three additional goals have been set in order to demonstrate the added value that STRATEGIC can offer to public bodies. These goals are (a) the porting of services between different cloud providers to avoid the cloud lock-in, (b) the adaptation and localization of services available in marketplace usage from more than one pilot and finally (c) the creation of new services that public bodies could possibly use.

These goals are also aligned to some quantitative indicators proposed in the DoW of the project [1], in order to monitor the successful progress of STRATEGIC. These indicators are presented in **Table 15** below.

Indicat or No.	Objective/Expected Result	Indicator Name	Year 3 Planned	Achieved
2	Cloud-Enablement of the Public Bodies Services	Number of distinct on-line services to be cloud-enabled	9	10 -3 for CAMDEN -4 for GENOA -3 for MOSG
3	Adaptation, Localization, Replication of Public Cloud Services	Number of cloud-services to be localized/adapted	4	5 -CKAN for GENOA -CKAN for MoSG -Cross border attribute exchange of GENOA -Cross border attribute exchange of MoSG -Limesurvey
4	Development/Enhancement of Public Cloud Services	Number of new added-value public cloud services to be developed and/or services to be enhanced	9	9 -2 for CAMDEN (use cases 2 & 3) -3 for GENOA (use cases 2,3 & 4) -2 for MOSG (use cases 2 & 3) -2 generic apps (Limesurvey, MediaWiki)
5	Public Cloud Services Migration across Providers	Number of public cloud services to be migrated from one provider to another	2	8 (all applications of Genoa and MoSG -see 4.1)
6	Enabled Secure Cross-Border Deployment of Public Services	Number of Cross-Border Services Deployment	1	2
7	Conduct Pilot	Number of pilot users	550	1674

Indicat or No.	Objective/Expected Result	Indicator Name	Year 3 Planned	Achieved
	Operations of Public Cloud Services in a Real Context based on the participation of real users	to engage in the pilot operations of the STRATEGIC services		
8	Conduct Pilot Operations of Public Cloud Services in a Real Context based on businesses and citizens' transactions	Number of on-line transactions to be completed using the STRATEGIC infrastructure and services	5000	17356

Table 15: Project performance indicators as stated in STRATEGIC DOW

4.1 Migrating of Services Between Providers

One objective that is mapped to a quantitative indicator is the migration of services between different cloud providers. Although the goal of the migration between two cloud providers was initially to have two services ported, the actual achievement so far is that eight (8) services have been successfully redeployed to at least two different cloud providers. Stari Grad use cases 1, 3 and 4 initial deployment was executed to Amazon IaaS, as SILO OpenStack based IaaS was in the process of integration with STRATEGIC Service Store. However, the target during the second year was to use and pilot the deployed services through the SILO IaaS and also during the third year of the project to the MoSG owned IaaS. For this reason the e-government services utilized by the use cases have been configured to work properly for both Amazon IaaS and OpenStack when deployed from the STRATEGIC Service Store. With this functionality supported these three use cases have been migrated from Amazon IaaS to SILO OpenStack.

Furthermore, all the MoSG's use cases were migrated from the SiLO's IaaS used during the second year of the project to the MoSG's IaaS used during the last (third) year of the project.

Also GENOA use cases 1 and 4 were initially deployed to Amazon IaaS, as SILO OpenStack based IaaS was in the process of integration with the STRATEGIC Service Store. And again as in the case of MoSG, the target during the second year was to use and pilot the deployed services through the SILO IaaS and during the third year of the project to use the GENOA-owned IaaS. For this reason the e-government services utilized by these use cases have been configured to work properly for both Amazon IaaS and OpenStack when deployed from the STRATEGIC Service Store. With this functionality supported these two use cases have been migrated from Amazon IaaS to SILO OpenStack.

Furthermore, GENOA use cases were 1-3 migrated from the SiLO's IaaS that has been used during the second year of the project to the Genoa IaaS during the last (third) year of the project.

In conclusion, the migration of all services of Genoa and MoSG (8 in total different services) across at least two different cloud providers is an overachievement regarding the indicator for the project performance monitoring that was initially set in the DoW of STRATEGIC [1].

4.2 Adaptation and Localization

One of the supported capabilities of STRATEGIC is the adaptation of the e-government services that are available in the STRATEGIC Service Store. For this reason, during the piloting activities, the public cloud services have to be adapted, localized and deployed in such a way that satisfies each pilot partner needs.

The quantitative goal according to the DoW [1] and the **Table 15**, is to have two (4) adapted services deployed by pilot partners. This is achieved by the publishing of the CKAN² based Open Data application that has been prepared by NICPB and is currently adapted and used by both the City of Genoa and the Municipality of Stari Grad. The adaptation process applies to the parameters configuration from the STRATEGIC Service Store during the service provision but also to the post-provision modifications (e.g. in case of Genoa's Open Data, the installation of required but not packaged plugins, or in the case of MoSG Open Data case, the development of policies for the open data). Additionally, the adaptation of other services has been achieved, namely the LimeSurvey³ application that is published in the STRATEGIC Service Store. This application has been deployed by SILO and is used for the creation of the STRATEGIC evaluation questionnaires⁴, but it is also tested by MoSG for internal usage.

Localization is also referring to the deployment of services to the local cloud infrastructure of Genoa and Stari Grad.

² <http://ckan.org/>

³ <https://www.limesurvey.org/>

⁴ surveys.strategic-project.eu

5 Lessons Learnt and Best Practices

5.1 Lessons Learnt from the Operation of Pilot Operations

In this section the experiences and lessons learnt collected during the piloting of the platform is presented. This information is mainly origination from the pilot partners but also technical partners that were participating in the piloting activities as well, and has been also used as input on the evaluation tasks of WP7.

5.1.1 Pilot partners

For Camden one of the crucial lessons learnt from the project was the misjudgement of the depth and complexity of some of the use cases. During the planning stages of the last 3 use cases members of Camden had to decide their roles within the project and set deadlines for the proposed tasks. However, the complexity of the task seemed to be underestimated, hence some delays with the deliverables. For example, the scripts had to be adjusted several times due to the different results produced on each virtual machine. Furthermore, if we are involved in similar projects in the future we would allocate more resources and time to testing applications.

In anticipation of future projects Camden discussed which other applications should be deployed to the cloud. One of the technical lessons learnt from the project was that Tranzacct is a very complex that requires a lot of different software packages installed before be able to run successfully on a virtual machine. If we had known the extents of complexity beforehand then we may have selected an application with a small footprint and less technical requirements. Currently Tranzacct needs a minimum of SQL Server2008, Internet Information Services 6, .NET Framework, ASP Management and a MVC Windows update to be deployed and pre-installed before on running on a virtual machine in the cloud.

Camden also has created a new upgraded version of the currently deployed application (Tranzacct) that is undergone testing and that could possibly replace the existing version within the Service Store. In terms the most efficient ways to attract possible public administration bodies as customers we believe that Tranzacct is a good application to attract customers due to the nature of its administrative features and processes.

In regards to the usage of the STRATEGIC Service Store, it seems to be able to successfully host/deploy applications in the cloud and configure virtual machine with a cloud environment. However, based on user feedback there seems to be slight performance issues which will be detailed in the recommendations section. The automation process of deploying applications on a can be very complex due to the script behaving different in multiple virtual machine environments.

For Genoa, there are some aspects of this project that can be generalized and considered a valuable lesson learnt.

In terms of involvement of stakeholders we observed that it is easier when you can show something that has an appealing in one or more of the following aspects: depicts a scenario similar to those of the stakeholders, has some characteristics peculiar that differentiates what is shown from other product/services, it has a clear benefit in terms of costs compared to other product/services, it is inherently easy to understand, it is sufficiently widespread

(only few like to be “innovators”, most prefer a well-defined and already tested situation).

The above-mentioned aspects are not only common-sense requirements but emerge from what we collected on various activities.

Other lessons that emerged from our experience has to do with the work process that lead us to some delay especially with regard to the private IaaS implementation and integration with the Service Store.

Especially during the last year there were many different stages and requirements changing related to the implementation of the IaaS. The initial idea of an installation of OpenStack JuJu by means of MaaS has been subsequently switched to a new Ubuntu and OpenStack version with better features. That forced us and the technical partners to a restart.

Many little changes, adjustments and also new HW requirements have been asked among which, lately, the acquirement and installation of a new hard drive to take into account for the Cinder service and the acquirement of a new NIC in order to access the IaaS subnet from the Service Store that had to be integrated.

Usually the blame for the delays or difficulties in deploying software for Public Administrations is put on the lack of expertise of the Public Administrations or even of the efforts made. But this can't be the case for Genoa. Generalizing it can be said the medium-large cities have skilled personnel to carry on the required tasks with the necessary professionalism.

What has been apparent to us is that in spite of Genoa and SILO (the tech partner) have been working a lot, the continuous change in requirements and requests has been detrimental to the IaaS/Service Store deployment process. Note that this is neither a lack in expertise on both sides nor a lack in effort on both sides. The main lesson learnt is that in dealing with Public Administrations of medium-size like Genoa is that it is surely preferable, at least when possible, to draft 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. 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.

For MoSG, the main lessons learnt from piloting were around the choice of corresponding IaaS and the usage of STRATEGIC service store.

During the second year of the STRATEGIC project, applications for MoSG have been deployed on the IaaS provided by the SingularLogic (SILO) – the technical partner of MoSG for the STRATEGIC project. In the third year, when the applications have been implemented in the production phase with real customer data, the IaaS has been provided by the corresponding provider from Serbia (Orion Telekom). However, during the implementation of the IaaS in the production phase (third year of the Project), there has been some difficulties that has to be resolved in order to make the applications properly installed and deployed. This process has raised an IaaS dilemma regarding which of the following options for the IaaS implementation is the most suitable for the public administration entity, such as Municipality of Stari Grad (MosG):

1. Purchasing own IaaS and maintaining it internally – in own premises

2. Purchasing own IaaS and maintaining it in the provider's premises
3. Renting VMs and install OpenStack and applications
4. Renting VMs with some cloud infrastructure and install applications
5. Renting physical machines and install OpenStack and applications

Based on experiences gained during the third year of the project, a prevalent opinion is that the options 2 and 5 are the most acceptable for some municipalities/public administration body like MoSG and should be further evaluated after the production phase.

Namely, it is experienced that, although it is very common that providers offer VMs, it is very difficult to establish cloud infrastructure based on them because of the lack of performances the VMs offer for establishing the IaaS which is powerful enough. Thus, providing physical machines or providing the already established cloud infrastructure is the most important requirement for the provider. A problem is that it is not so common especially in Serbia that hosting providers offer neither the cloud infrastructure nor physical machines. Thus, for municipalities/public administration bodies, possibly the most acceptable recommendation is the above-mentioned option 2.

Regarding the usage of the STRATEGIC Service Store, some feedbacks gained from the STRATEGIC project are: overall very general positive feedback, many applications could be chosen, easy to adapt and deploy applications, possible extensive configuration of security features, relatively slow UI, VPN connections could be more efficient, etc. However, a recommendation is that the Service Store should be the mandatory part of any cloud project for the public administration body no matter if this is implemented as the private, public or hybrid cloud. How exactly it should be deployed, whether in-house or outsourced and what technology should be used, should be further considered and evaluated. Also, possibly more efficient ways of secure connections to the service store, such as SSLVPN access or similar, should be further considered and evaluated.

5.1.1.1 Suggestions from pilot perspective

In order to alleviate the stress on the technical support there should be a FAQs page with links to documents that could assist on the platform use

In order to improve the user experience of the service store website the developers of the webpage could consider add an options to choose additional applications that can be deployed onto the selected virtual machine. Currently the only way to do this is by capturing a server image with the applications you want pre-installed.

This process was addressing an issue with one of the processes on the service store.

The performance speed and responsiveness can be improved; long loading speeds can cause users to re-click buttons with the webpage extending the overall loads time which results in a negative experience for the user.

The requirements of the Cloud Infrastructure were not totally clear from the beginning of the project, although in the end everything was properly documented. However this is critical for the connection of public bodies, as requests for changes can be very time consuming.

5.1.2 Technical partners

Partners demonstrated that the cross-border tools can be successfully implemented in cloud environments allowing the efficient and secure communication across borders. The reference implementation of the STRATEGIC platform has been carried out using a commercial solution, which provides a strong technology readiness level to the project; this has been quite positive and allowed us to incorporate the conduction of pilots earlier than expected within the project, but it has also brought some limitations to the consortium partners, which the use of open source solutions would have avoided, for example the usage of an API (originally planned but not yet provided within the commercial solution) to interact with the platform would have substantially helped technical partners to integrate assessment services at platform level.

The integration of cross-border tools has provided to the STRATEGIC platform an additional value in terms of security and trust, easing the interoperable authentication in cross-border scenarios.

The project associated technical partners with pilots in order to achieve a cloud migration experience. The technical partners were able to try application migration, and pilots were allowed to go through the migration and learn from the experience. This is considered a good approach as it was helpful for the project progress.

During the course of the project technology evolved. The industry introduced containers, and mobility became more prominent, and some major IT companies introduced landmark SaaS solutions which were impacting the IT landscape (e.g. Microsoft Azure, Oracle, SAP, Salesforce, etc.) and therefore the strategy of local governments. It is possible that more technology driven collaboration between the technical partners could have resulted in a better offer for pilots.

The Service Store was initially designed to fully support the Icehouse version of OpenStack. Over the last year of the STRATEGIC project, the Service Store has been tested with newer versions of the OpenStack APIs (namely Mitaka version) by relying on its backward compatibility to Icehouse. This method was successfully used in the pilot cases.

The technological solution of moving parts of the runtime (IaaS stacks) in-house to avoid regulatory blockers has turned out to be more of a burden and has consumed more resources than expected and delivered less of perceivable value. In our view the regulations at the moment are too protective when it comes to usage of cloud services running in a different EU country, which makes it close very difficult to deploy actual applications as part of the cloud project.

5.2 Best Practices from Pilot Operations

Based on the piloting operations we have collected the following best practices. More details on the best practices can be found in deliverable D7.4[10], and here we collected the most important outcomes of the pilot perspective.

Using the Cloud is suggested when there is lack of the IT resources needed for the maintenance and management of the underlying infrastructure. Setting up and maintaining on-premise solutions can be time-consuming, and require lots of resources, especially IT experts, resulting in substantial technical and management challenges. Cloud resources simplify all of

this by removing the on-site equipment, simultaneously making upgrades a less expensive, headache-free and more seamless experience⁵.

Using the Cloud can help reducing overhead costs. A crucial aspect for the public bodies that can push towards the usage of cloud is the possibility to remove the substantial upfront expense of installing an on-premise solution and eliminating the need for dedicated hardware. So apart from having no equipment and infrastructural services to maintain, monthly payments based on usage might be more appropriate to specific public bodies.

If the application/service that is about to be migrated is performing to expectations, there might be no need to migrate the application to a cloud environment. However, it has to be analysed if the solution is optimized for cost aspect as well, as a common issue with on-premise solutions is that the resources are heavily underutilized.

In public organization, specific security measures and/or unique regulatory compliance have to be taken under consideration, thus making the usage of public cloud providers difficult or not possible. The ideal solution in this case is to setup and utilize a private cloud. STRATEGIC supports public organizations in this difficulty as it provides regional information of the infrastructure, supports private installations and the consortium has made the exercise of investigating the regulatory compliance of the pilot cases in three European countries (UK, Italy, Serbia).

It is important to find the right balance between control and convenience. With public clouds, there is no need to worry about certain things like maintenance, but controllability is limited. With private clouds, more freedom is offered and a public administrator is responsible on how everything works.

Public cloud is better suited for applications that have more frequent peak times. A public cloud benefits on the decreased capital overheads that a service with spikes on the usages needs.

Private cloud is better suited for public organizations that may change their needs, organizations that have restricted management demands, host mission critical services, and in general **prefer to have fully control of their services and infrastructure.**

Hybrid cloud is ideal for utilizing the benefits of both the private and public deployment models. A typical example is increasing the capacity of the cloud by aggregating different cloud offerings or services.

In hybrid cloud solutions, **resources that are non-critical like development and test workloads can be housed in the public cloud that belongs to a third-party provider,** while the workloads that are critical or sensitive can be housed internally. During the piloting period of STRATEGIC, we utilized hybrid based scenarios, as applications were deployed initially in public cloud of Amazon.

For Virtual Private Clouds, the isolation of the organization can be achieved through allocation of a private IP subnet and a virtual communication construct such as a VLAN. This case was tested by STRATEGIC for the pilot of MoSG.

⁵ <http://www.manageforce.com/blog/to-cloud-or-not-to-cloud-in-2017>

There might be some **compromises to be made in order to find the ideal point between maturity and state of the art**. In our pilot examples, we had to invest to the latest version of Ubuntu OS (16.04) in order to benefit from the Long-Term Support and this also imposed a specific version of OpenStack.

When considering public administrations of medium-size, it is preferable at least when possible, to draft 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. 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.

We also found that **medium-large cities seem to have skilled personnel to carry on the required tasks** with the necessary professionalism in order to deploy software or even in some cases to prepare an IaaS environment.

The **decision of the IaaS to be used is an important step** for public bodies, regardless the size. Most public bodies preferred to use a private cloud for their services.

In some countries finding cloud hosting providers is not an easy task, and the **choices for public bodies interested to store their data with location based restrictions can be very limited** or non-existent. In one of our pilot cases, using a public cloud was preferred option but due to regulation rules that forced the storage of data to be within the country, a private cloud installation was created and used.

6 Conclusions

Work package 6 focuses on the pilot operations of the e-government services that use STRATEGIC framework, and this deliverable that is the final deliverable of the work package, provided an aggregated report regarding the pilot activities conducted in the WorkPackage. Reporting of pilot activities is provided per each use case and each pilot, and the documents approach was to offer an overview of what happened in the project without previous knowledge of project goals and outcomes.

During the project duration, 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 be taken under consideration that technical difficulties might require specific knowledge that is suggested to be offered by experts.

During this piloting involvement of the project incidents have been faced by the technical partners and pilots. This continuous monitoring of these issues and the evaluation in real scenarios offered improvements on STRATEGIC platform, the pilot applications and the IaaS infrastructures created in the scope of the project. This experience has been also collected in lessons learned and best practises, and furthermore made the consortium more confident into the ability to support STRATEGIC Service Store to future costumers.

7 References

- [1] STRATEGIC DoW (Description of Work), 2014
- [2] STRATEGIC Deliverable D6.1a - Report on Pilot Incidents and Service Improvements, 2015
- [3] STRATEGIC Deliverable D6.1b - Report on Pilot Incidents and Service Improvements, 2016
- [4] STRATEGIC Deliverable D2.2 - Pilot Scenarios, Use Cases and Pilot Operations Requirements, 2014
- [5] STRATEGIC Deliverable D5.1b - Cloud-Enablement of Distributed Services, 2015
- [6] STRATEGIC Deliverable D5.4 – Pilot Operations Plans, 2015
- [7] STRATEGIC Deliverable D5.2b - Report on Pilot Sites Preparation, 2015
- [8] STRATEGIC Deliverable D7.1 – Evaluation Framework, 2015
- [9] STRATEGIC Deliverable D4.3a - Trust and Security Components, 2015
- [10] STRATEGIC Deliverable D7.4 - Best Practices and Policy Development Guidelines for Public Cloud Services, 2016
- [11] STRATEGIC Deliverable D4.3b - Trust and Security Components, 2016

I. APPENDIX A: Cross Border Certificate of Residence Scenario (Use Case Genoa 3 – MoSG 2)

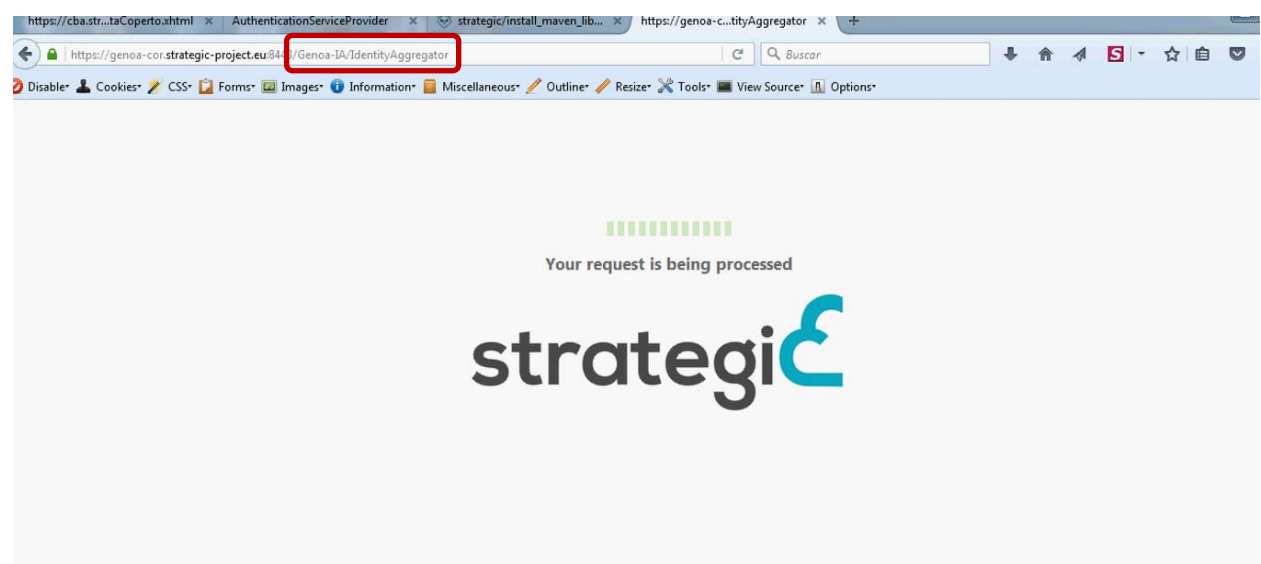
A Serbian citizen tries to use Genoa Certificate of Residence (COR) service for registering on the Municipality of Genoa. This is a complex process as follows:

- The city of Genoa asks to the citizen's origin municipality Serbian citizen data such as address or postal code;
- The origin municipality provides the citizen data to the city of Genoa.
- Then the city of Genoa asks the citizen to unregister from their origin municipality in Serbia.
- The origin municipality unregisters the citizen and sends the unregistration confirmation to the city of Genoa
- The city of Genoa confirms the citizen registration.

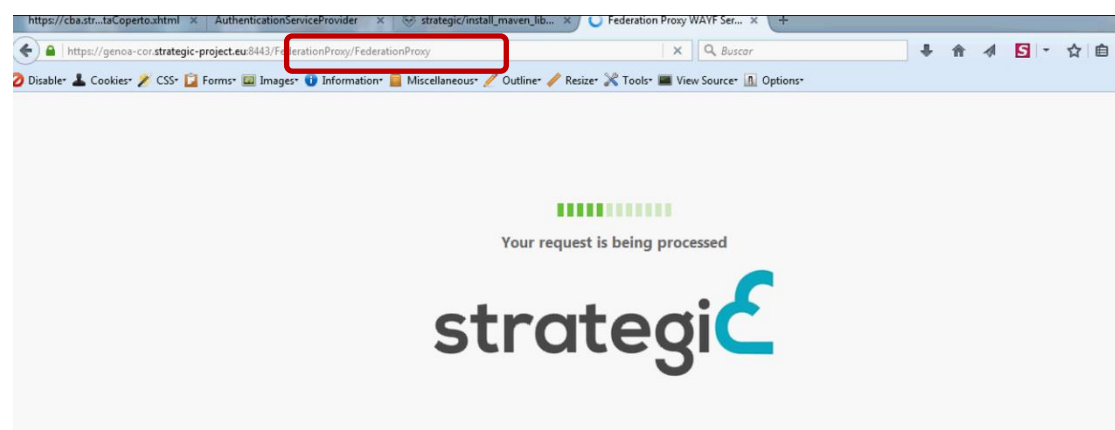
Some pictures detailing the process are provided next.

1. The Genoese service triggers the request of data when the Serbian citizen clicks on the STRATEGIC button.

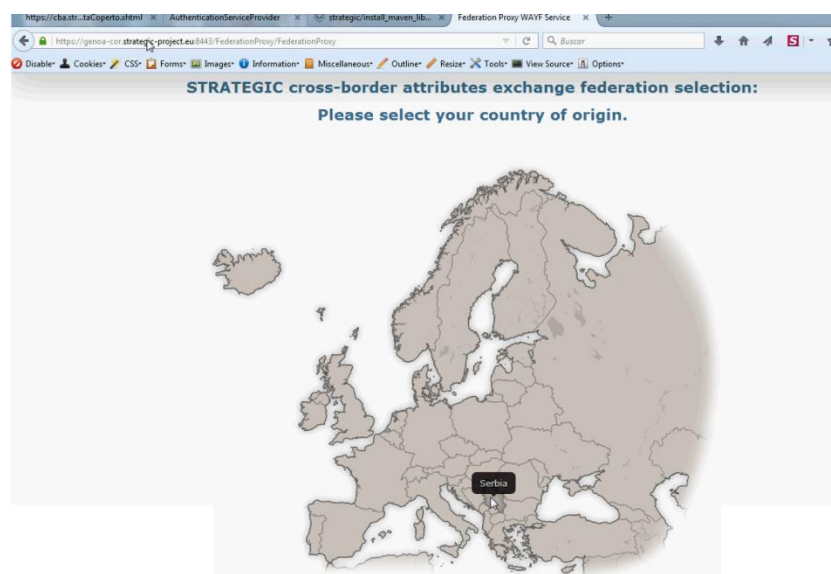
2. The Genoa COR service connects to the Genoese IA component as entry point to the STRATEGIC infrastructure to reach the municipality the Serbian citizen belongs to.



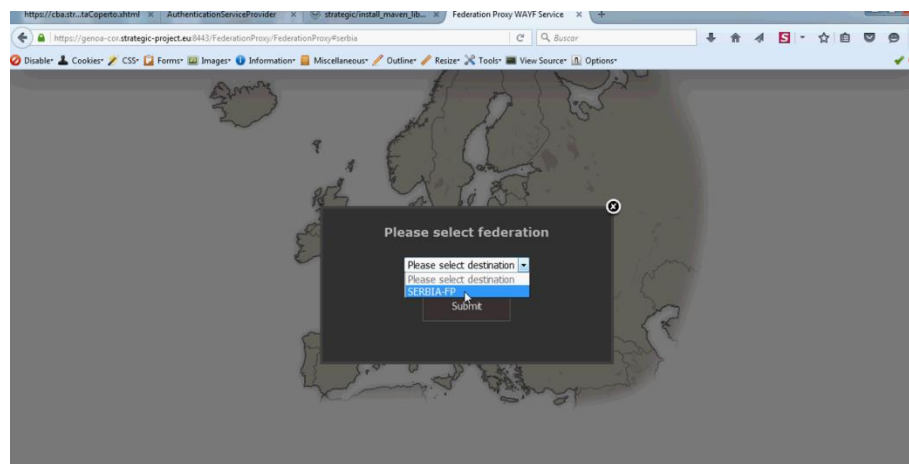
3. The Genoa-IA component connects to the Italian-FP component.



4. The Italian-FP component displays a European map where the citizen can select her origin country, Serbia in this particular case.



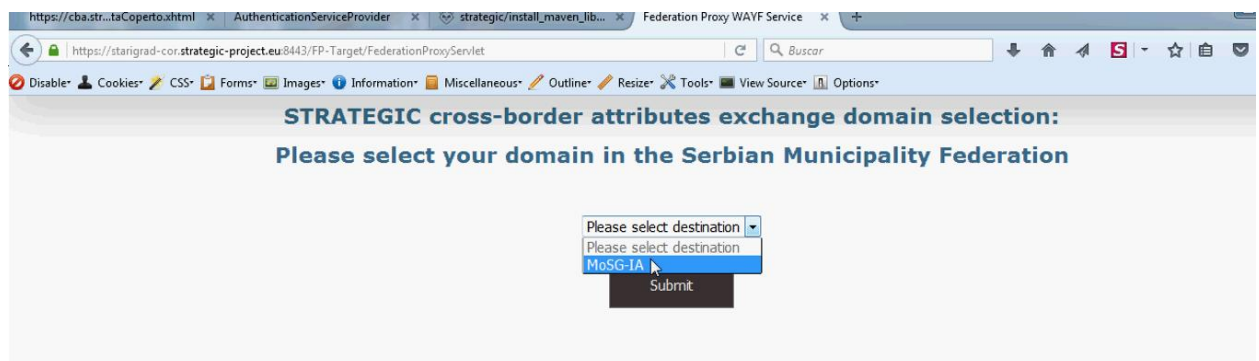
5. Once the country is selected a drop-down menu displaying the Serbian FPs which the Italian FP is trusting.



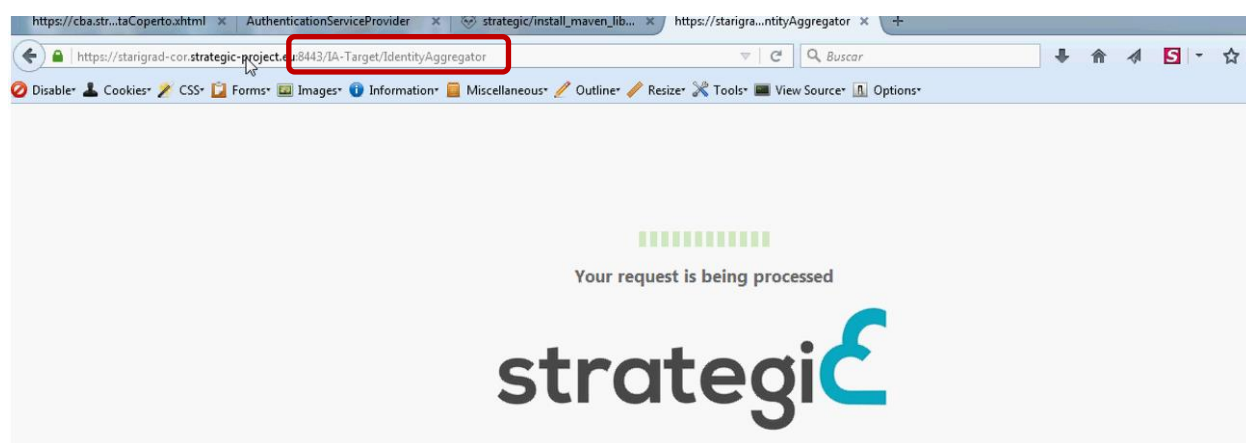
6. The Italian-FP connects to the Serbian-FP.



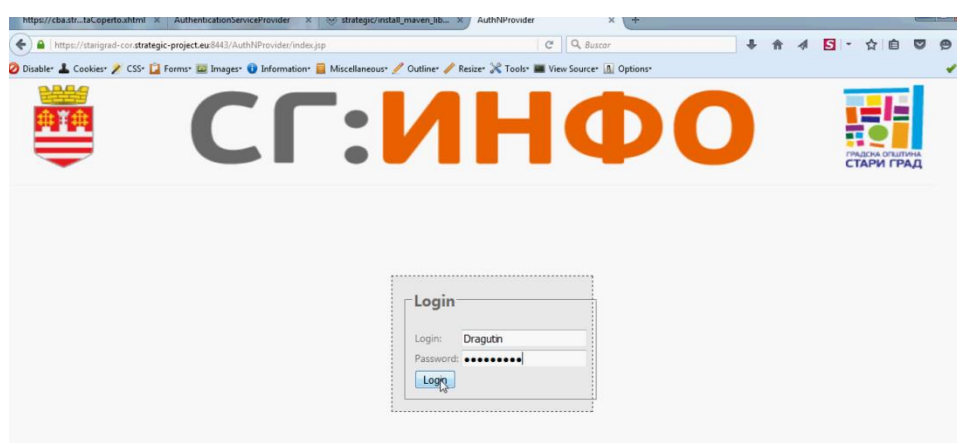
7. The Serbian-FP shows to the Serbian citizen a drop-down menu with the list of Serbian-IAs trusted and connected, and the Serbian citizen selects the Municipality of Stari Grad.



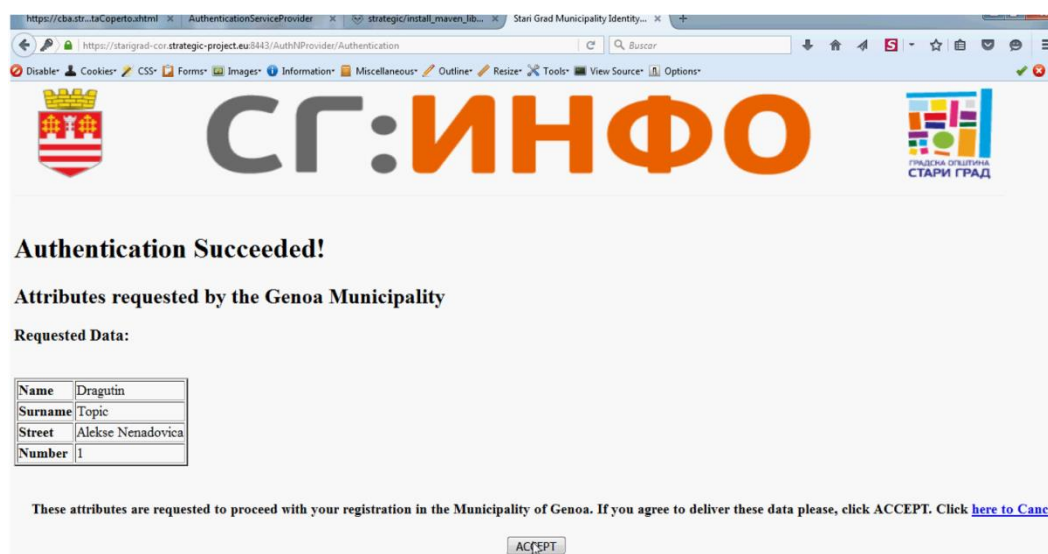
8. The Serbian-FP connects to the Municipality of Stari Grad IA.



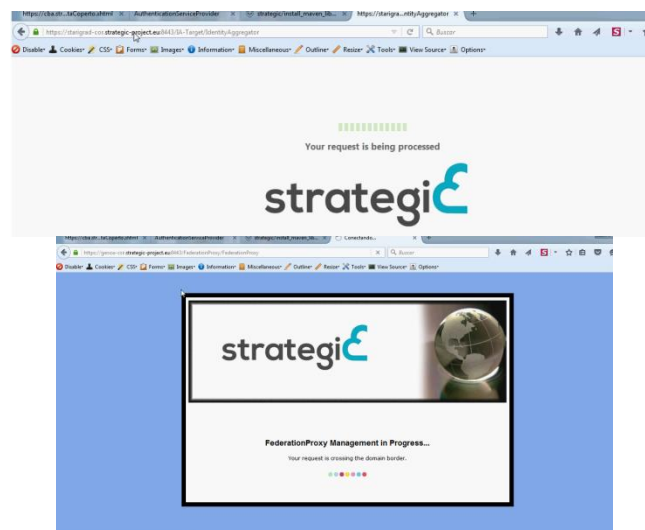
9. The MoSG IA connects to the MoSG Authentication Provider (this service receives the data request) and the Serbian citizen provides her credentials to the authentication service.



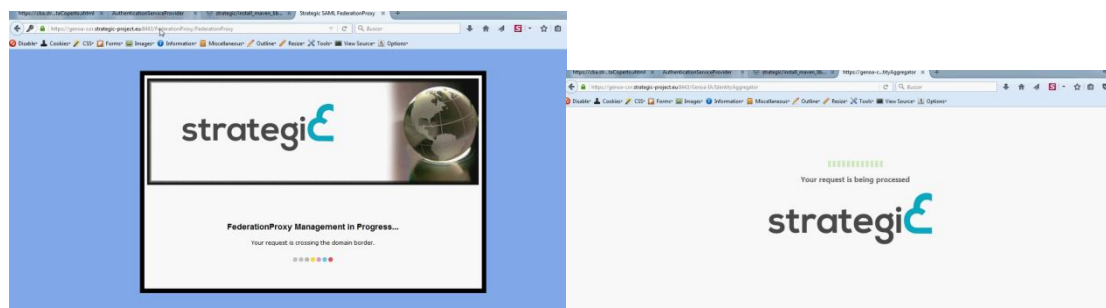
10. The Authentication Provider authenticates the user, and then redirects the user to the service in charge for providing citizen data. The Serbian data service shows to the user the requested data by the Genoese COR service.



11. Once the Serbian citizen accepts for disclosing her data to the Genoese service the citizen information is sent back to the Genoese service as a response.



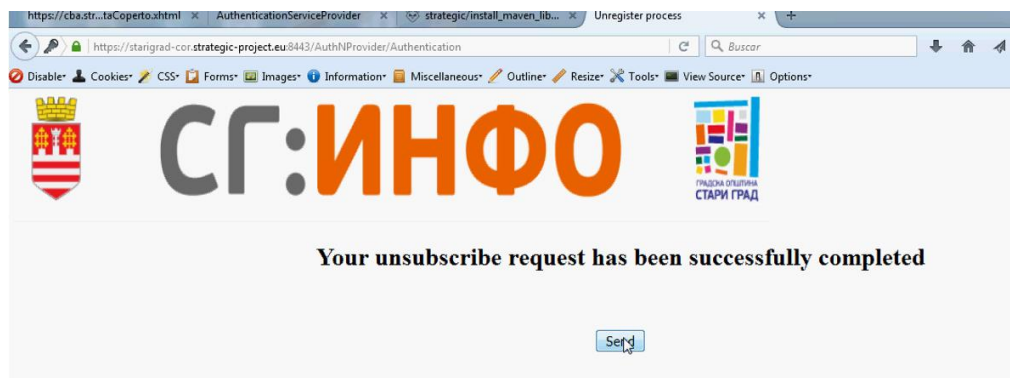
12. The response is crossing the Serbian border to the Italian border.



13. Finally the data reach the Genoese Certificate of Residence service.

At this moment the Genoese service ask the Serbian citizen to unregister from her origin municipality to proceed with the final registration in Genoa.

14. The unsubscription request is crossing again the Italian border to the Municipality of Stari Grad following the described steps from step 2 to step 9.



15. The unregister confirmation response is sent back to the Genoese service following the already described steps 11 and 12.

16. Finally the COR service of Genoa can proceed with the final registration of the citizen in Genoa.

GENOVA
MORE THAN THIS

Richiesta Cambio Residenza

Dati Richiedente Dati Indirizzo Dati Cambio Riepilogo

Dati Richiedente

Nome: * Dragutin

Cognome: * Topic

Codice Fiscale:

Data Nascita

Codice ISTAT

Nascita:

Codice parentela:

Nazione Nascita: strategic

Register

← Back → Next

II. APPENDIX B: Cross Border Business Activity Scenario

1- A Spanish citizen accesses the Genoa Cross-Border Business Activity (CBA) service with the aim to apply for a business activity license in the City of Genoa. The process is detailed in the following figures.

The screenshot shows a web browser window with the URL <https://cbs.strategic-project.eu:8443/powersas-primefaces-archetype/faces/RichiestaCoperto.xhtml>. The page title is "Richiesta Concessione Mercato Coperto". Below the title are several tabs: "Dati Richiedente" (selected), "Altri Ruoli", "Dati REA", "Dati Concessione", "Concessione accessorie", and "Riepilogo". The "Dati Richiedente" section contains the following fields:

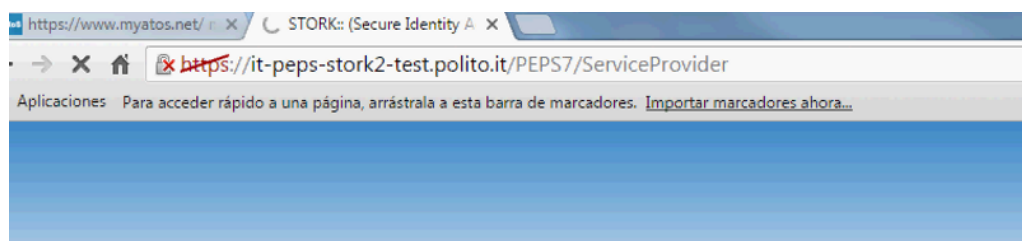
- Richiedente: * (Dropdown menu with "Titolare" selected)
- Nome: *
- Cognome: *
- Codice Fiscale/Partita Iva:
- Indirizzo:
- CAP:
- Città:
- Nazione:
- Data Nascita
- Città Nascita
- Nazione Nascita:

The "strategiE" logo is visible at the bottom left of the form.

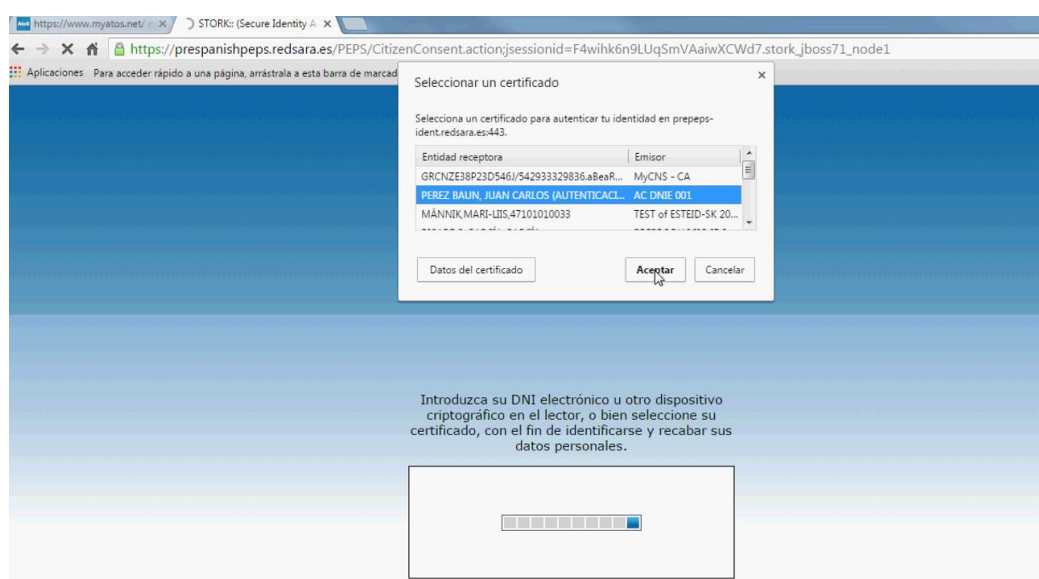
2- Once the Spanish citizen clicks on the Strategic button the Genoese CBA service connects to the CBA Engine (CBAE), where the Spanish citizen selects the country of origin.

The screenshot shows a web browser window with the URL <https://cbs.strategic-project.eu:8443/CBAAuthn4B/populateInitPage#ES>. The page displays a map of Europe with the country of Spain highlighted in yellow and labeled "ES". Below the map, there is a text input field labeled "countrySelectorId:" with the value "ES" entered, and a red "Submit >" button.

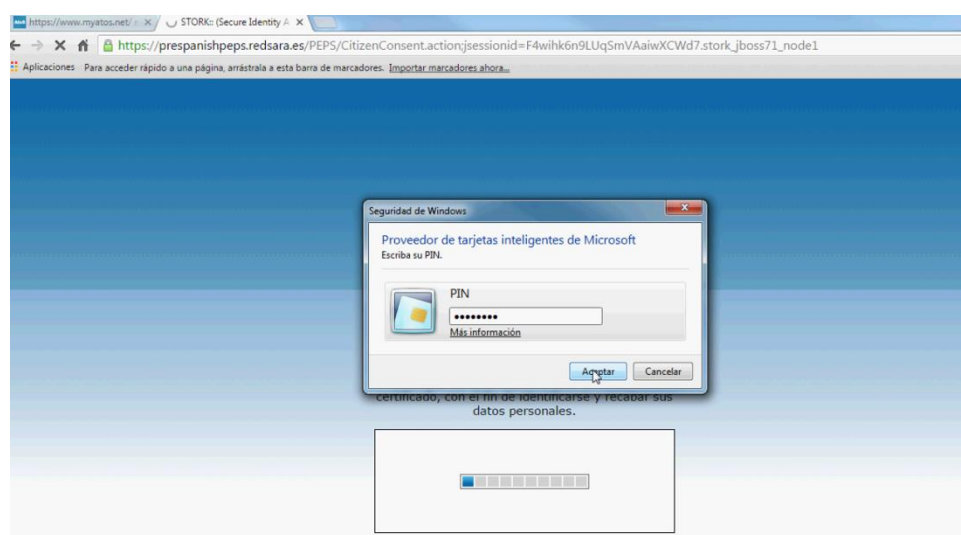
3- After the citizen clicks on the submit button the CBAE connects to the Italian PEPS, the entry point for the STORK network, in order to proceed with a cross-border authentication.



5- The Italian PEPS connects to the Spanish PEPS, which ask the Spanish citizen to enter the eID or select the certificate for authentication purposes.



6- The Spanish citizen enters the PIN associated to the eID.



7- The Spanish PEPS connects to the Spanish IdP for validating the credentials provided by the Spanish citizen.



8- The Spanish IdP authenticates the citizen and sends citizen data to the Spanish PEPS. The citizen must give permission to disclosure her data.



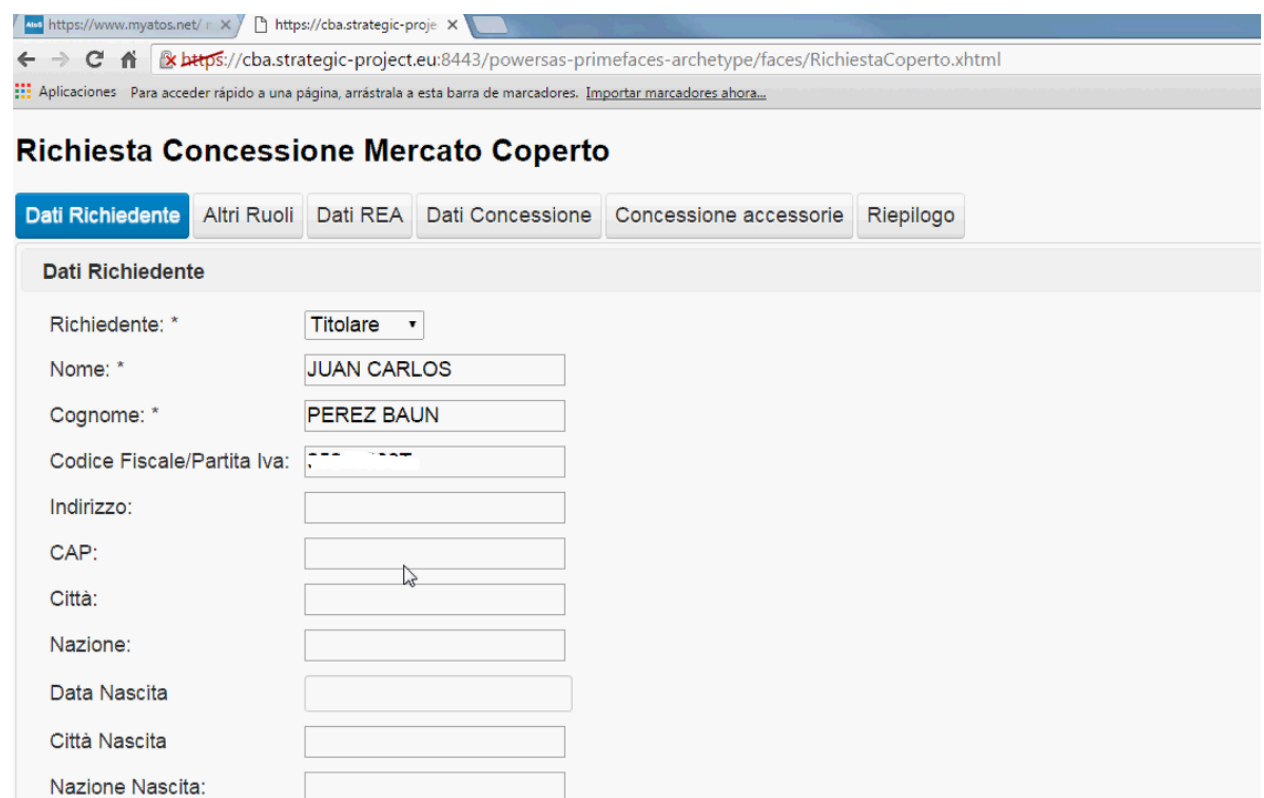
9- The Spanish citizen data are sent to the Italian PEPS, and the citizen accepts to disclosure her data.



10- Italian PEPS sends citizen data to the CBA engine, and the citizen accepts to disclosure her data.



11- Finally the Spanish citizen data reaches the CBA service, which proceeds with the citizen registration.



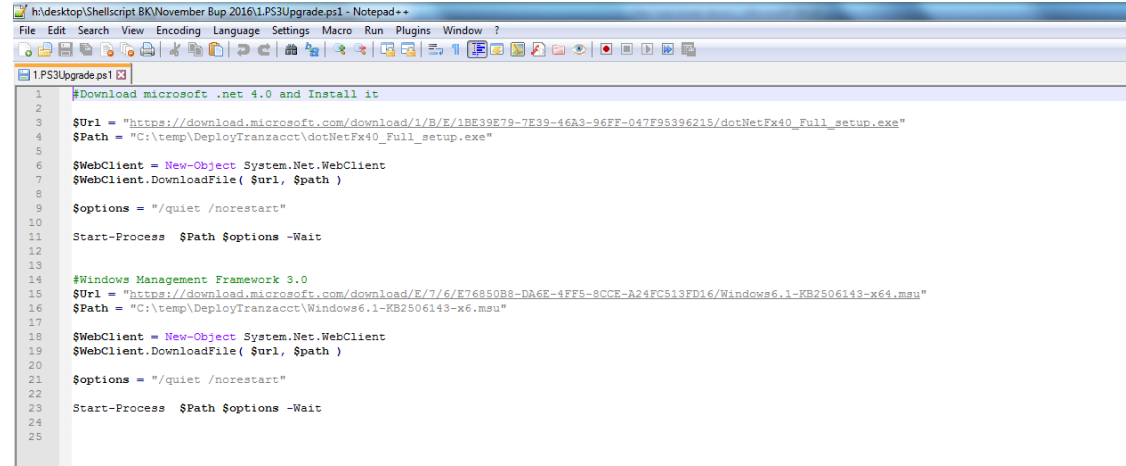
III. APPENDIX C: Camden Tranzacct Cloudification

This document will display the details of the technical deployment process for the Tranzacct application. In order to deploy Tranzacct within the a virtual machine on the STRATEGIC 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 completes each task silently using Command prompt.

PowerShell Scripts

Name ^	Date modified	Type	Size
1.PS3Upgrade	12/23/2016 3:01 PM	Windows PowerShell...	1 KB
2.DownloadInstallAWSToolkit	12/23/2016 3:01 PM	Windows PowerShell...	1 KB
3.Install_ASP_Net	12/23/2016 3:01 PM	Windows PowerShell...	1 KB
4.Downloadbucketfiles	1/19/2017 1:53 PM	Windows PowerShell...	2 KB
5.SQL_Components	1/19/2017 3:46 PM	Windows PowerShell...	1 KB
6.InstallTZGAC	12/23/2016 3:01 PM	Windows PowerShell...	1 KB
7.UnzipTranzacctIISFiles	12/23/2016 3:01 PM	Windows PowerShell...	1 KB
8.ConfigureIIS	1/27/2017 3:06 PM	Windows PowerShell...	2 KB



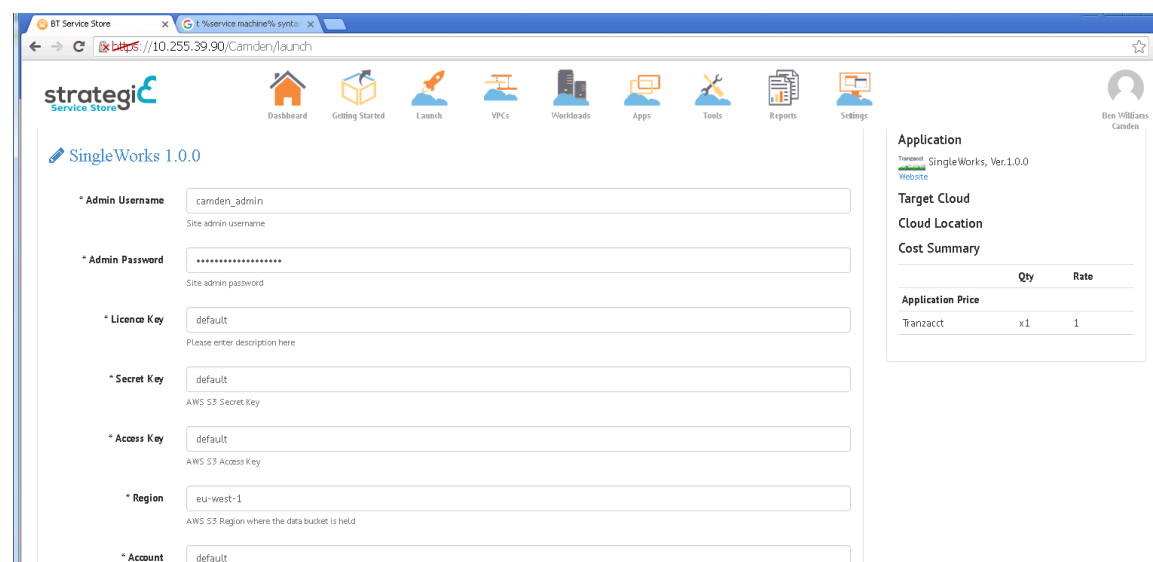
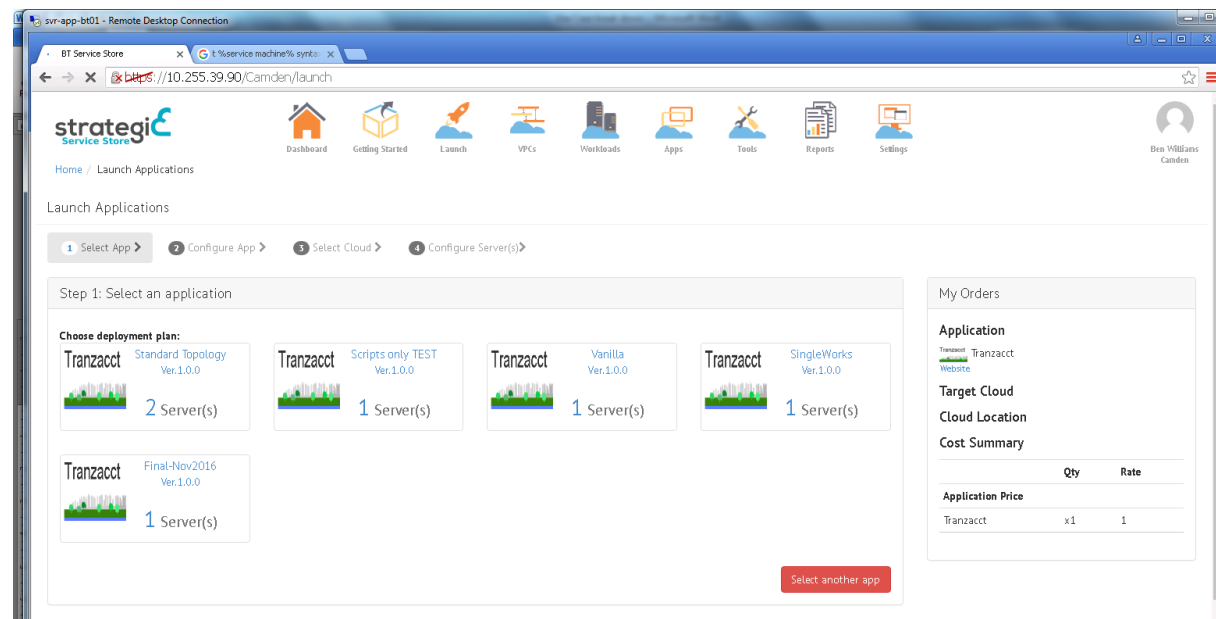
```

1 #Download microsoft .net 4.0 and Install it
2
3 $Url = "https://download.microsoft.com/download/1/B/E/1BE39E79-7E39-46A3-96FF-047F95396215/dotNetFx40_Full_setup.exe"
4 $Path = "C:\temp\DeployTranzacct\dotNetFx40_Full_setup.exe"
5
6 $WebClient = New-Object System.Net.WebClient
7 $WebClient.DownloadFile( $Url, $Path )
8
9 $Options = "/quiet /norestart"
10
11 Start-Process $Path $Options -Wait
12
13
14 #Windows Management Framework 3.0
15 $Url = "https://download.microsoft.com/download/E/7/6/E76850B8-DA6E-4FF5-8CCE-A24FC513FD16/Windows6.1-KB2506143-x64.msu"
16 $Path = "C:\temp\DeployTranzacct\Windows6.1-KB2506143-x64.msu"
17
18 $WebClient = New-Object System.Net.WebClient
19 $WebClient.DownloadFile( $Url, $Path )
20
21 $Options = "/quiet /norestart"
22
23 Start-Process $Path $Options -Wait
24
25
  
```

2. Configure CloudForest for single-server deployment of Tranzacct

- Configure service store topology parameters
- Test existing IIS and MSSQL with above parameters

The BT support team had to configure the cloud forest topology parameters in order to host Tranzacct on the service store.

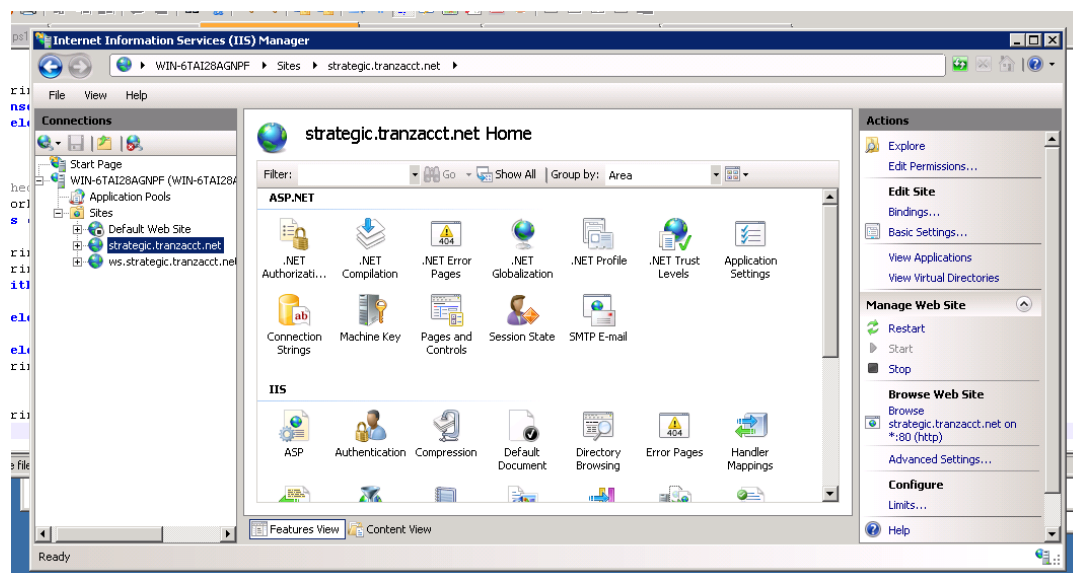


3.Create deployment Shell scripts for IIS Server

- a) Download and deploy
 - i. Tranzacct WebApp files
 - ii. Tranzacct WebService files
- b) Configure in IIS
 - i. Tranzacct Application Pool
 - ii. Tranzacct-WebApp
 - iii. Tranzacct-WebService

Fig1 shows the strategic website and relevant application pools set up and configured within Internet information Services running on a virtual machine within the service store.

Fig1:



The script in fig2 shows the powershell scrip that completes all the tasks detailed in section 3 - **Create deployment Shell scripts for IIS Server**

Fig2:

```

PS3Upgrade.ps1 8.ConfigureIIS.ps1
Import-Module WebAdministration
$pool1 = New-WebAppPool -Name TranzacctApp_AppPool
$pool1.processModel.userName = "$env:userdomain\svcTranzacct"
$pool1.processModel.password = "1234abcd!"
$pool1.processModel.identityType = "SpecificUser"
$pool1.managedRuntimeVersion = "v4.0"
$pool1 | Set-Item

$pool2 = New-WebAppPool -Name TranzacctWS_AppPool
$pool2.processModel.userName = "$env:userdomain\svcTranzacct"
$pool2.processModel.password = "1234abcd!"
$pool2.processModel.identityType = "SpecificUser"
$pool2.managedRuntimeVersion = "v4.0"
$pool2 | Set-Item

Set-ItemProperty "IIS:\AppPools\TranzacctApp_AppPool" -Name managedRuntimeVersion -V
Set-ItemProperty "IIS:\AppPools\TranzacctWS_AppPool" -Name managedRuntimeVersion -V

Stop-Website -Name 'Default Web Site'
New-Website -Name 'strategic.tranzacct.net' -Port 80 -HostHeader strategic.tranzacct.net
New-Website -Name 'ws.strategic.tranzacct.net' -Port 80 -HostHeader ws.strategic.tranzacct.net

ConvertTo-WebApplication -PSPath "IIS:\Sites\ws.strategic.tranzacct.net\TZ_WebService"
ConvertTo-WebApplication -PSPath "IIS:\Sites\ws.strategic.tranzacct.net\WCFListener"

```

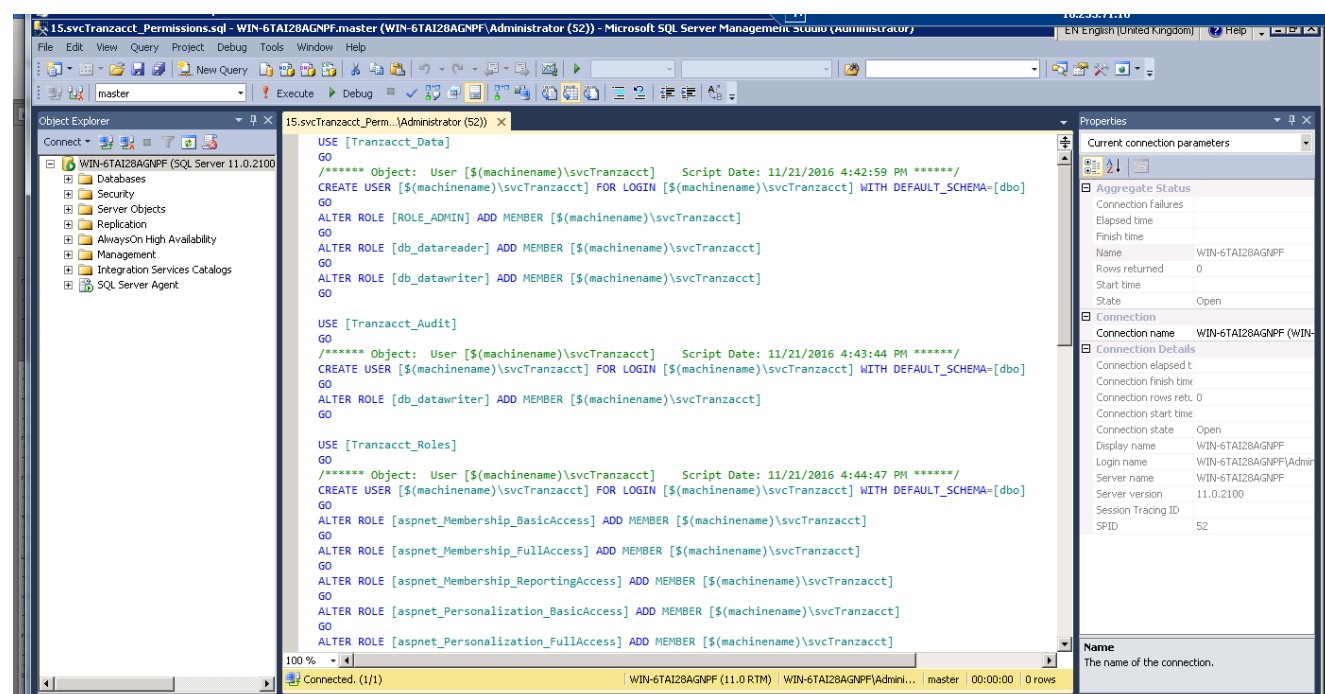
4. Create deployment Shell scripts for SQL Server

- a. Create database schemas
 - i. Tranzacct
 - ii. JaroWinkler fuzzy searching
 - ii. Tranzacct Roles
 - iii. Tranzacct Audit
- b. Configure users and permissions

Fig 3 displays all the SQL scripts used to create the database and configure all the components withing Tranzacct, which will connect it to the . Fig 4 displays an example of the SQL script that configures the Tranzacct server permissions.

Name	Date modified	Type	Size
9.0.SQL_Create_DataDB	4/29/2016 1:24 PM	Microsoft SQL Serv...	5 KB
9.1.SQL_Create_AuditDB	5/6/2016 5:03 PM	Microsoft SQL Serv...	3 KB
9.2.SQL_Create_RolesDB	5/6/2016 5:08 PM	Microsoft SQL Serv...	3 KB
9.3.Tranzacct_Create_Data_Tables	6/15/2016 10:32 AM	Microsoft SQL Serv...	7,436 KB
9.4.Tranzacct_Create_Roles_Tables	6/15/2016 10:34 AM	Microsoft SQL Serv...	277 KB
9.5.Tranzacct_Create_Audit_Tables	11/24/2015 10:58 AM	Microsoft SQL Serv...	251 KB
9.6.Configure_App Pool_UserDB_Access	9/22/2016 11:56 AM	Microsoft SQL Serv...	3 KB
9.7.TranzacctUsers	6/17/2016 4:51 PM	Microsoft SQL Serv...	3 KB
10.Add_Assemblies	5/9/2016 4:26 PM	Microsoft SQL Serv...	177 KB
11.Tranzacct_Authentication	7/3/2016 10:20 AM	Microsoft SQL Serv...	2 KB
12.UserPermissionsW	9/22/2016 12:03 PM	Microsoft SQL Serv...	5 KB
13.FixLogin_Script1	7/4/2016 3:53 PM	Microsoft SQL Serv...	1 KB
14.FixLogin_Script2	1/6/2017 4:48 PM	Microsoft SQL Serv...	1 KB
15.svcTranzacct_Permissions	11/21/2016 4:52 PM	Microsoft SQL Serv...	5 KB
16.SQL_Scriptcheck	1/20/2017 11:39 AM	Microsoft SQL Serv...	8 KB

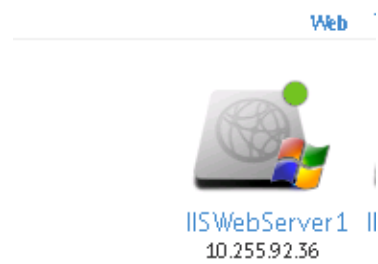
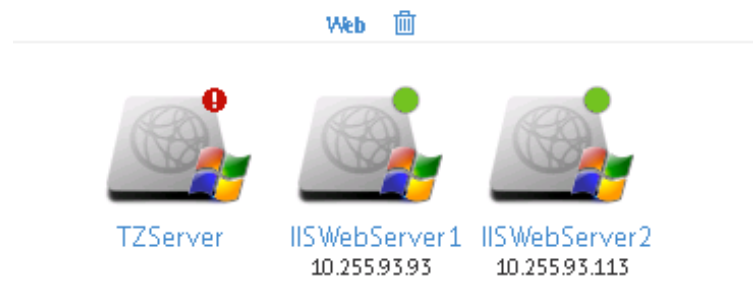
Fig 4:



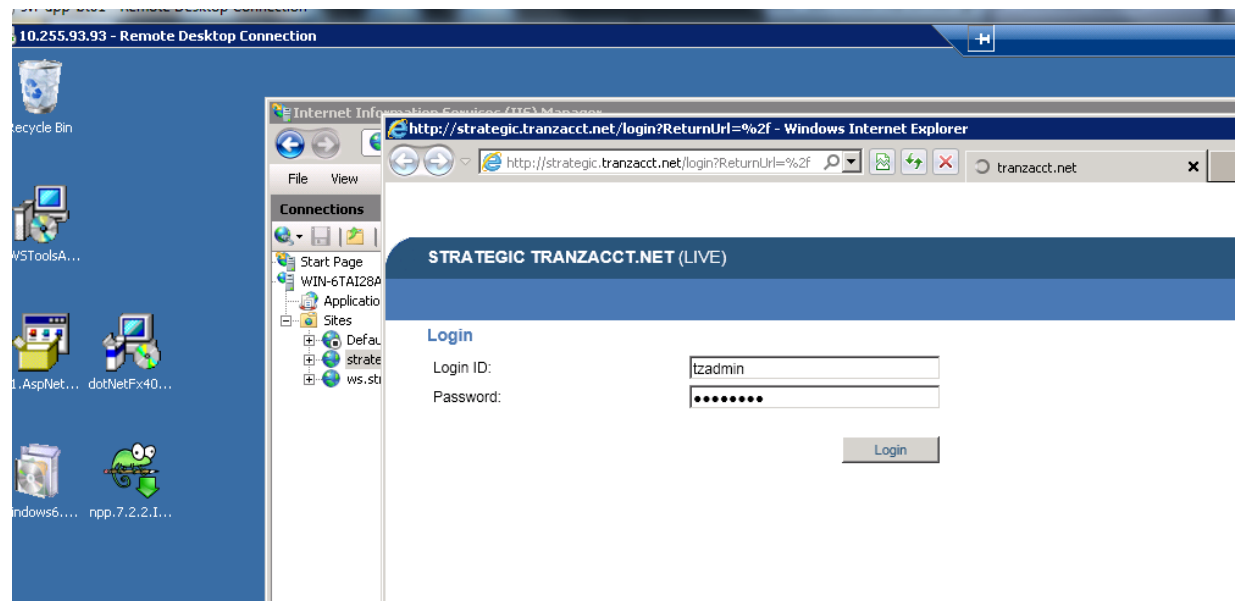
Tranzacct Live on the Service store

Below displays screenshots of Tranzacct working within server 10.22.93.93. The application is currently running on the servers displayed in figs 8 & 9. Once the BT server image of Trazacct has been uploaded to the service store then users will be able to deploy Tranzacct to a virtual machine. The link to tranzacct is here :

<http://strategic.tranzacct.net/login?ReturnUrl=%2f>



Figs 9 & 10 display Tranzacct running on server 10.255.93.93 with the log in



page and the criteria management page.

