COMPETITIVENESS AND INNOVATION FRAMEWORK PROGRAMME

CIP-ICT-PSP-2013-7

strategi€

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

Deliverable D3.3

Use of the STRATEGIC Framework solutions by the Pilot Sites

Workpackage	WP3 – Detailed Analysis and Specification of Pilot Solutions and Services
Editor(s):	Kostas Kalaboukas, Panagiotis Gouvas, , Joshua Daniel, Sudip Trivedi, Roberto Contri, Milan Markovic
Responsible Partner:	SingularLogic Information Systems & Applications SA
Quality Reviewers	Fotis Karayannis, Milan Markovic
Status-Version:	Final – v1.0
Date:	09/02/2015
EC Distribution:	Public
Abstract:	Based on the outcomes of task T3.5, this deliverable is a detailed report on which solutions of the STRATEGIC framework will be used by each pilot site (along with their supporting technical partner / ISV).

European Commission

Document Revision History

Version	Date	Modifications Introduced	
		Modification Reason	**Modified by**
V1.0	09/02/2015	First version	SILO

Contents

List of Figures

List of Tables

Definitions, Acronyms and Abbreviations

Acronym	Title
API	Application programming interface
ASF	Apache Software Foundation
CAPEX	Capital Expenses
CAGR	Compound Annual Growth Rate
CMS	Content Management System
HTTP	Hypertext Transfer Protocol
IT	Information Technology
IP	Intellectual Property
IaaS	Infrastructure as a Service
ICT	Information and Communications Technology
IDC	International Data Corporation
MaaS	Metal as a Service
OS	Operating System
RBAC	Role-Based-Access-Control
RDBMS	Relational Database Management System
TCO	Total Cost of Ownership
VM	Virtual Machine
WP	Work Package

Table 1: Definitions, Acronyms and Abbreviations

Executive Summary

The purpose of this deliverable is to specify how applications provided by pilots will make use of the STRATEGIC framework and the specific solutions it provides.

The document initially provides an overview and tries to classify pilots' requirements that have been already identified in the scope of work package 2.

The main part of the deliverable classifies and presents solutions offered by STRATEGIC framework, and focuses on how these solutions can be used from pilot partner for the execution of pilot scenarios.

The deliverable also provides an analysis of the added value offered to public bodies and pilots by using STRATEGIC framework solutions. This is realized by considering the services that assembly the pilot applications and match them to the specified solutions, thereby producing a detailed report on how each of the pilot sites will take advantage of the project's solutions.

D3.3 also serves as input for the WP5, WP6 and WP7 activities by providing the starting point that ties together STRATEGIC Framework and pilots.

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, through boosting three complementary adoption directions: (a) the porting of existing on-line services to the Cloud, (b) the adaptation and localization of existing services, which have been successfully deployed by other organisations and (c) the composition of new public cloud services that use existing legacy services as basis.

D3.3 is the final deliverable of work package 3 that documents the results of the allocation of STRATEGIC framework solutions to specific use cases of pilot partners. The documented activities are mainly part of task T3.5 but also the solutions described have been specified during other tasks of work package 3 and also are under implementation on other work packages.

1.2 Target audiences

As this deliverable is a public document, it is intended for both internal and external project references. Internally, the primary targets of the document are both technical partners involved in the implementation of STRATEGIC framework and also the pilot partners of consortium. This document will allow technical users to realize what is needed to be created, and pilot users to realize how STRATEGIC framework will be used for their benefit. For external users the targets are technical audiences that are involved in the design and implementation of cloud based solutions for the public sector and who might benefit from the STRATEGIC offerings.

1.3 Structure of the document

The document consists of five (5) main sections. The first Section is the introduction. The second section provides an overview and a classification of the requirements of applications that are used for the pilot scenarios. Following, section 3 provides information about the solutions offered by STRATEGIC framework and the functionalities that each of these solutions offers. Section 4 describes the added value created for the pilot partners by using the STRATEGIC Framework and the provided solutions. Section 5 summarizes the main conclusions of the document.

2 Overview of pilots' requirements

STRATEGIC has the vision to deliver the necessary cloud-enabled infrastructure, associated tools and services to governmental bodies that will let them migrate existing public services to the cloud and easily extend their portfolio of services offered to the public. For this reason special focus is given to the use cases provided by pilot partners of the consortium.

As presented in D2.2[1], 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 will be used for validation of the created platform.

In total, there are 11 pilots use cases planned for execution. Creation of the use cases and the selection of the exact pilot applications for each use case were 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

One of the main interests of the use cases is porting existing application to the cloud. In addition, cross-municipality application deployment as well as integration with the horizontal services of Strategic is expected. 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

Table 2: Pilot Scenarios

Description of the applications of the use case as well as the requirements for their operations is covered in the following chapters.

2.1 Classification of pilot's requirements

Use case requirements for the use cases have been identified in the scope of Work Package 2 and have been documented in deliverable D2.2[1]. For the scope of this deliverable the requirements related to the applications used on each case will be identified. These requirements include requirements needed in order to deploy, and manage the applications, security and network access requirements and some upper level managerial requirements identified for some use cases. The requirements are classified and presented in Table 3 that follows and are used for the preparation of STRATEGIC Framework solutions and for the evaluation process that will take place during Work Package 7 activities.

Requirement Classification	Identified Requirements
Requirements to operate site	Deploy application Manage application Scale Application Storage Compute nodes Network Bandwidth
Requirements for data security	Security tools to protect VM and data. Support of Private Cloud IaaS for safe storage of the citizen private data. Compliance with local requirements and restrictions. Support for cross border authentication and data exchange.
Requirements for network access	Availability to deploy selected applications in private and protected networks accessible only via VPN connections. Advanced network configuration. Public availability for selected applications. Cryptographically secured connections for selected application
Managerial Requirements	Ability to deploy an application to a multitude of IaaS offerings, public or private. Ability to use an easy to manage interface/

Requirement Classification	Identified Requirements
	marketplace that allows the deployment of services. Ability to publish new applications or reuse already published applications.

Table 3: Identification and classification of requirements

2.2 Short overview of selected apps per Municipality

In the following table a summary of the application and the expected usage of the STRATEGIC framework for each scenario are provided.

Scenario short code	Application	Usage of STRATEGIC Framework
Camden-1	Camden OpenData Platform	• Cloud Enable Application using the STRATEGIC Framework solutions • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Camden-2	Tranzact.net Application	• Cloud Enable Application using the STRATEGIC Framework solutions • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Camden-3	Identity and Attribute Manager	• Cloud Enable Application using the STRATEGIC Framework solutions • Deploy to selected IaaS
Genoa-1	Business Activities Service	• Cloud Enable Application using the STRATEGIC Framework solutions • Deploy to selected IaaS
Genoa-2	Cross-border Business Activities Service	• Integrate Cross-Border features offered by STRATEGIC(cross-border authentication engine) • Deploy to selected IaaS
Genoa-3	Cross-border Resident Certificate Issuance Service	• Integrate Cross-Border features offered by STRATEGIC (cross-border attribute exchange) • Deploy to selected IaaS
Genoa-4	Open data application	• Cloud Enable Application using the STRATEGIC Framework solutions • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Stari-Grad-1	Certificate	• Cloud Enable Application using the

Scenario short code	Application	Usage of STRATEGIC Framework
	Issuance Service	STRATEGIC Framework solutions • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Stari-Grad-2	Cross-border Certificate Issuance Service	• Integrate Cross-Border features offered by STRATEGIC (cross-border attribute exchange) • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Stari-Grad-3	Mail Service	• Cloud Enable Application using the STRATEGIC Framework solutions • Publish on the STRATEGIC Service Store for reselling applications • Deploy to selected IaaS
Stari-Grad-4	Open Data Application	• Configure an application that is already published in the STRATEGIC Service Store • Deploy to selected IaaS

Table 4: Applications per pilot use case and expected usage of STRATEGIC

SILO has setup and provides to the pilot partners of Genoa and MoSG a privately installed and controlled cloud installation in order to support the needs of private IaaS and also to help with usage of IaaS in general. This IaaS setup is based entirely on open source solutions (OpenStack, Ubuntu Juju, Ubuntu MaaS) and it's installation is described on deliverable D5.1[2]. Interested parties can use the methodology and a configuration file in order to replicate this private cloud environment. This approach enables the pilot partners to take advantage of the STRATEGIC Framework and start migrating to the cloud, while maintaining a high level of control of the underlying infrastructure.

2.3 Limitations & drawbacks of as-is situation

Public cloud infrastructures hold the promise to deliver a host of benefits to both the public sector and private enterprises, which include reduced CAPEX (Capital Expenses), improved Total Cost of Ownership (TCO) for ICT infrastructures and services, as well as increased reliability and highly elastic capacity. At the same time, the ability to combine existing public cloud services and create new service offerings, opens new horizons for the development of next generation of innovative cloud services that fully leverage existing services and APIs[3].

Pilot partners have an expanding set of services that needs to be hosted and for them major concerns are the cost, the performance, the high availability and elasticity. All these concerns are issues that cloud computing promises to address. Another option for pilot partners is the deployment of a private cloud infrastructure based on open source solutions. This approach requires a lot of resources (technical, human and financial), but provides more security as data remain under the private cloud.

However, the security issues and legal constrains are also a blocking factor for the wider adoption of cloud computing services by public bodies. Mixed offerings of public and private cloud environments can be utilised in order to overcome these constrains.

3 Use of the STRATEGIC Framework solutions by the pilot sites

The STRATEGIC Framework is composed of all solutions that provide the functionalities needed from public bodies for the secure and privacy friendly migration, adaptation, governance and development of cloud services.

The technical partners will also provide the necessary cloud infrastructure that is required by the pilot partners in order to migrate their legacy applications to the cloud. Camden is using BT Cloud for the deployment of its use cases, while Genoa and Stari Grad will use a private cloud based on open source solutions that has been set up for the project needs by SILO. The description of this cloud setup, configuration and replication is provided in deliverable D5.1[2].

The core of the STRATEGIC Framework is the STRATEGIC Service Store. The STRATEGIC Service Store is a portal which the pilot users of STRATEGIC can use in order to deploy existing applications on a multi cloud environment and make new applications available to the marketplace so that other users can deploy them and adapt them to their needs. The STRATEGIC Service Store gives to the pilots the freedom to use or integrate the STRATEGIC offered solutions when deploying an application based on the scenario needs.
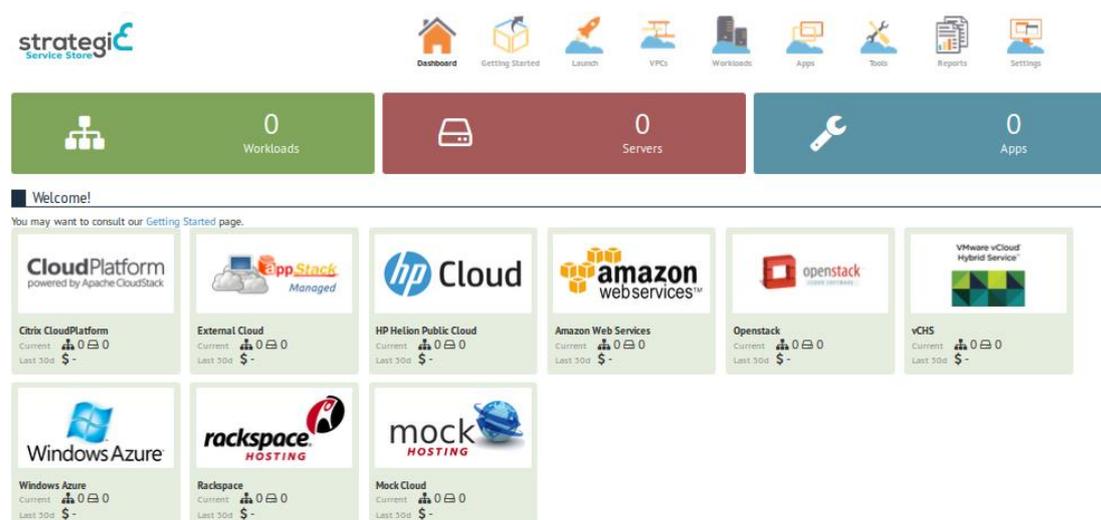
Figure 1: Main page of STRATEGIC Service Store

In the following sections we describe and classify the solutions, which will be used by in the scenarios of the pilots and we demonstrate the added value of the STRATEGIC Framework in these solutions.

3.1 Classification of developed solutions

The solutions of STRATEGIC that have been developed or will be developed throughout the project can be classified based on two different classification axes.

The first axis describes the **type of deployment** of each solution, and is separated in **Horizontal** and **Vertical**. Horizontal solutions are services, applications or tools that can be offered on top of every deployed application but

are not part of the applications. Such an example is the "Security as a Service". Vertical solutions provide functionality that is required for the deployment of an application and as such, they are essential part of the application.

The second axis classifies the solutions based on the **type of integration with Service Store** and is separated to **Service Store Features** and **Services**. Service Store Features are integral part of the Service Store, like Load Balancers for applications. Services, on the other hand, although they are also offered by the Service store, they are not integral part of the Service Store and can be also offered by third parties. A third party application offered in the Service Store is an example of a Service.

Based on the two-axes of classification described above, the solutions offered by STRATEGIC can be categorized in 4 categories:

- Vertical Services

Vertical services are the applications, services or solutions provided in Service Store that a user can adapt, configure and deploy. Vertical Services can include many dependencies like Java or PHP that can also been configured based on application and scenario needs. However Vertical Services are not integral part of the Service Store and can also be provided by third party developers.

- Vertical Service Store Features

Vertical Service Store Features are solutions that are core part of the Service Store and offer the functionalities needed for the deployment of applications and are essential part of the application.

- Horizontal Service Store Features

Horizontal Service Store features are core elements of Service Store that can be offered to all deployments, not as part of the deployed application, but instead as an external service that the application can use.

- Horizontal Services

Horizontal services can be provided as add-on via the service store and aren't necessarily integral part of the service store.

These categories are depicted in **Figure 2** and the solutions described in section 3.2 follow this categorization.
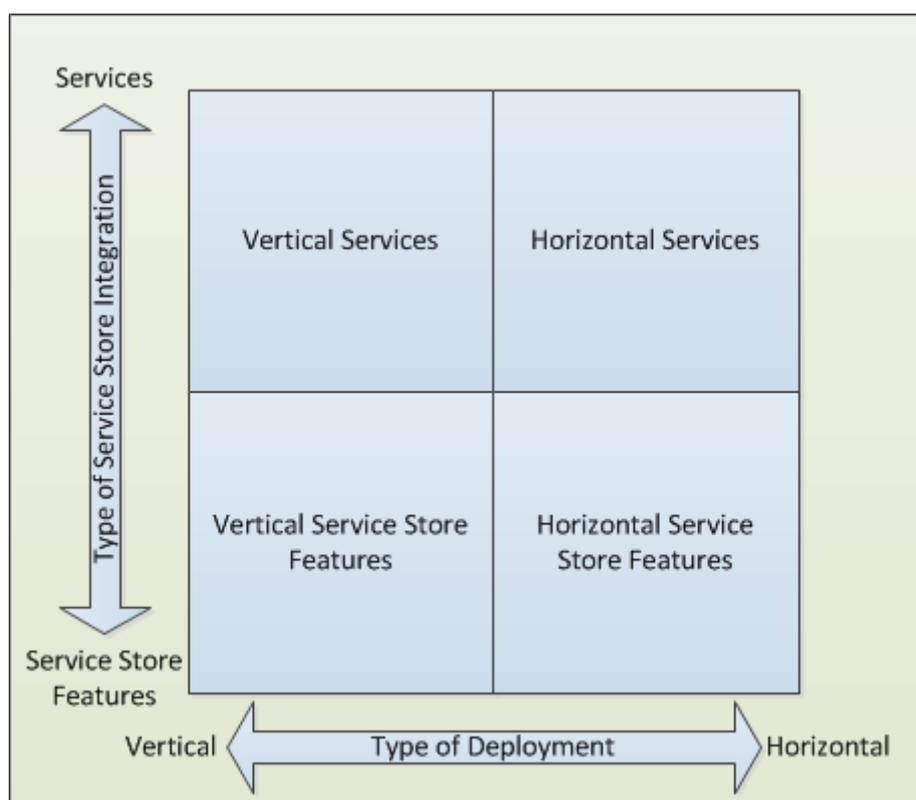
Figure 2: Classification of STRATEGIC offered Solutions

3.2 Description of solutions needed by pilots

Based on the analysis of the pilot scenarios the following tables provide the information of what solutions offered by STRATEGIC are needed for each use case. The solutions per each scenario are presented and categorized based on the type of deployment of the solutions, if this is horizontal or vertical. The horizontal solutions of Security as a Service and Monitoring as a Service are offered to all pilots but their use by the pilots is not obligatory.

In Table 5, the solutions needed for the Camden scenarios are presented.

Scenario	Cloud Infrastructure	Horizontal Solutions	Vertical Solutions
Camden-1	BT cloud	Security tools to protect VM and data (Security as a Service), Monitoring as a Service, Network configuration (Tiers, Security Group)	Windows Server 2008 R2, SharePoint 2010
Camden-2	BT cloud	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group)	Windows Server 2008 R2

Scenario	Cloud Infrastructure	Horizontal Solutions	Vertical Solutions
Camden-3	BT cloud	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group)	Windows Server 2008 R2

Table 5: Solutions needed for Camden scenarios

In **Table 6**, the solutions needed from Genoa scenarios are presented.

Scenario	Cloud Infrastructure	Horizontal Solutions	Vertical Solutions
Genoa-1	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group)	CentOS, Drupal 7, Tomcat 7, MySQL, Apache
Genoa-2	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group), Cross Border utilities	CentOS, Drupal 7, PHP5, Tomcat 7,MySQL, Apache
Genoa-3	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group), Cross Border utilities	Ubuntu, MySQL, PHP5
Genoa-4	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group), (Tiers, Security Group)	Ubuntu, MySQL, CKAN

Table 6: Solutions needed for Genoa scenarios

In **Table 7**, the solutions needed from Municipality of Stari Grad scenarios are presented.

Scenario	Cloud Infrastructure	Horizontal Solutions	Vertical Solutions
Stari-Grad-1	OpenStack based cloud provided by	Security tools to protect VM and data (Security as a Service) ,	Ubuntu, JBoss or Tomcat, MySQL

Scenario	Cloud Infrastructure	Horizontal Solutions	Vertical Solutions
	SILO	Monitoring as a Service, Network configuration (Tiers, Security Group)	
Stari-Grad-2	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group), Cross Border utilities	Ubuntu, JBoss or Tomcat, MySQL
Stari-Grad-3	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group)	Ubuntu, Email applications (iRedMail)
Stari-Grad-4	OpenStack based cloud provided by SILO	Security tools to protect VM and data (Security as a Service) , Monitoring as a Service, Network configuration (Tiers, Security Group)	Ubuntu, MySQL, CKAN

Table 7: Solutions needed for Stari Grad scenarios

The identified solutions are described in the following subchapters where solutions are distributed based on the classification described in section 3.1 and depicted in **Figure 2**.

3.2.1 Vertical Services

The vertical services presented below are services that should be offered through the Service Store and be used from pilot scenarios. For some scenarios the usage simply refers on the configuration, adaptation and deployment of applications on specific IaaS. For example this is possible in iRedMail and CKAN services of scenarios Stari-Grad-3, Stari-Grad-4 and Genoa-4.

However, as some of the pilots applications are more complex the direct usage of the solutions might not be possible, but instead solutions can be used for testing and also as a basis for creating more complex applications. For example, although scenarios Genoa-1 and Genoa-2 use Drupal, the customizations that have been done are not able to be supported on a Drupal offered from Service Store. However this will become clearer as the technical teams of pilots with the help of STRATEGIC technical team will continue on the preparation of use cases.

3.2.1.1 Apache

The Apache HTTP Server, colloquially called Apache, is the world's most widely used web server software[1]. Apache is used by scenarios Genoa-1 and Genoa-2 as

---

[1] https://en.wikipedia.org/wiki/Apache_HTTP_Server

a reverse proxy and is commonly used along with application servers such us Tomcat or JBoss.

3.2.1.2 Drupal

Drupal is a free and open source Content Management System (CMS) that is used widely. Drupal is used in the scenarios Genoa-1 and Genoa-2.

3.2.1.3 Tomcat

Apache Tomcat is an open-source web server and Servlet container developed by the Apache Software Foundation (ASF). Tomcat can be used by Stari-Grad-1 and Stari-Grad-2 scenarios.

3.2.1.4 JBoss

JBoss is an application server developed by Red Hat that can be used instead of Tomcat in scenarios Stari-Grad-1 and Stari-Grad-2. After version 8, JBoss application server has been renamed to WildFly.

3.2.1.5 MySQL

MySQL is a widely used open-source relational database management system (RDBMS)[2]. MySQL is used in scenarios Genoa-1, Genoa-2, Stari-Grad-1 and Stari-Grad-2.

3.2.1.6 SharePoint

SharePoint is a web application framework and platform developed by Microsoft that integrates Intranet, content management, and document management functionalities and is mostly used by midsize businesses and large departments. SharePoint 2010 is a platform that is used from the scenario Camden-1. As Camden intends to publish their SharePoint based application to Service Store, it is possible to be used by other pilots use cases related to open data.

3.2.1.7 CKAN

The Comprehensive Knowledge Archive Network (CKAN)[3] is a web-based open source data management system for the storage and distribution of data, such as spreadsheets and the contents of databases. CKAN is the basis for the creation of scenario Genoa-4. As Genoa intends to publish their application to Service Store, scenario Stari-Grad-4 intends to reuse the application that Genoa will create.

3.2.1.8 iRedMail

iRedMail is an open source email Server that works in several Linux distributions. It is used in the scenario of Municipality of Stari Grad, Stari-Grad-3.

3.2.2 Vertical Service Store Features

Vertical Service Store Features offer the core functionalities needed for the deployment of all applications on STRATEGIC Service Store and are mostly related to infrastructure and virtual images management.

---

[2] https://en.wikipedia.org/wiki/MySQL
[3] http://ckan.org/

3.2.2.1 Selection of OS images

Different OS images can be selected when starting Virtual Machines through STRATEGIC Service Store. For the pilot scenarios the images that will be used are Linux based distributions (e.g.: Ubuntu for Stari Grad-1, Stari-Grad-2 and Centos for Genoa-1, Genoa-2) and Windows based (Windows Server 2008 R2 for Camden-1, Camden-2). The selection of OS images from STRATEGIC Service Store is illustrated in **Figure 3**. This ability is used by all pilot scenarios.
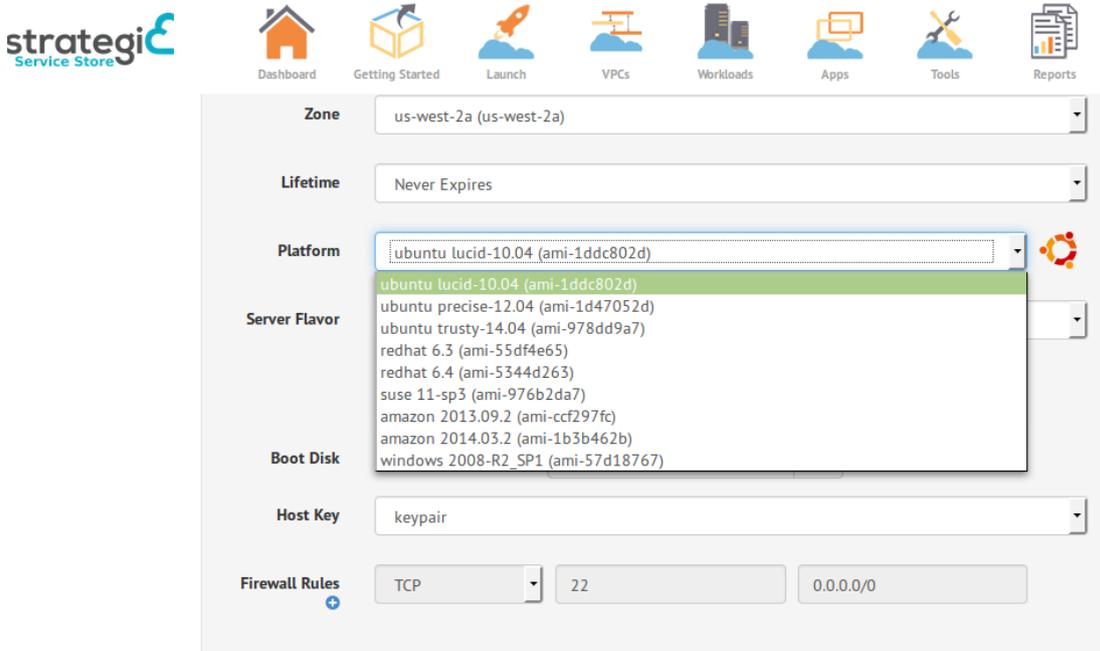

Figure 3: Selection of OS image and on STRATEGIC Service Store

3.2.2.2 Multiple IaaS support

One of the most important tools that STRATEGIC Service Store offers is the ability to support different cloud offerings, both public and private. **Figure 4** displays the UI of selection the appropriate IaaS where virtual machines will be deployed. This ability is used by all pilot scenarios.
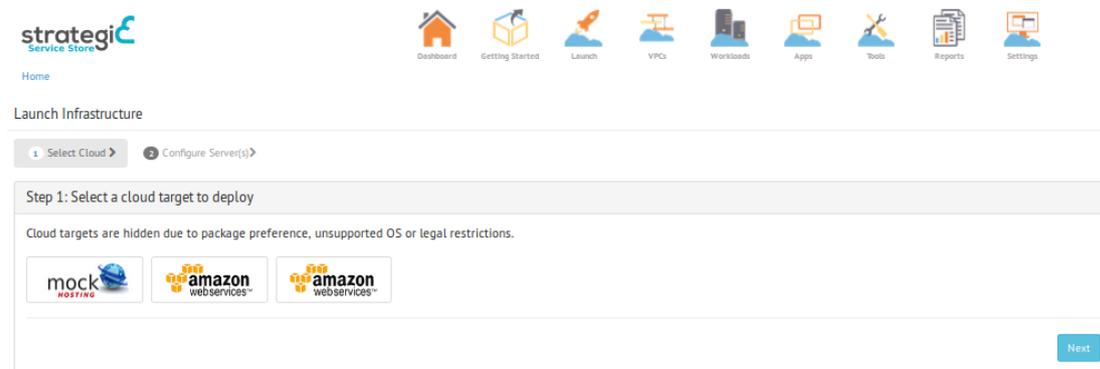

Figure 4: Multiple IaaS support on STRATEGIC Service Store

3.2.3 Horizontal Service Store Features

Horizontal Service Store features are core elements of STRATEGIC Service Store and are offered for the proper configuration of the deployed applications.

3.2.3.1 Network configuration

One of the common requirements identified for all the pilots is the ability to create advanced configurations of the network. For STRATEGIC Service Store this is possible with the usage of Tiers, Security Groups (Firewall Rules) and Load Balancers.

Tiers

A Tier represents a logical grouping of application services deployed in the same network.

Security Groups (Firewall Rules)

Firewall Rules configuration is provided by the STRATEGIC Service Store and allows the configuration of security parameters regarding network connectivity.

Figure 5: Configuration of network parameters on STRATEGIC Service Store

Load Balancers

A load balancer is a device that acts as a reverse proxy and distributes network or application traffic across a number of servers. Load balancers are used to increase capacity (concurrent users) and reliability of applications. They improve the overall performance of applications by decreasing the burden on servers associated with managing and maintaining application and network sessions, as well as by performing application-specific tasks.

STRATEGIC Service Store provides the concept of Workloads. Workloads make possible to manage not just simple (single server) apps, but also much more

complex multi-tier applications, by providing an easy-to-manage, virtual container managing for all application components, like servers instances and load balancers as a single entity.

Load Balancers can be provided as a Horizontal Service Store feature that can be easily added on a workload.

Figure 6: Load Balancer addition in STRATEGIC Service Store

3.2.3.2 Logging

Logging of the deployed application is possible with the STRATEGIC Service Store and **Figure 7** demonstrates an example of logs provided.
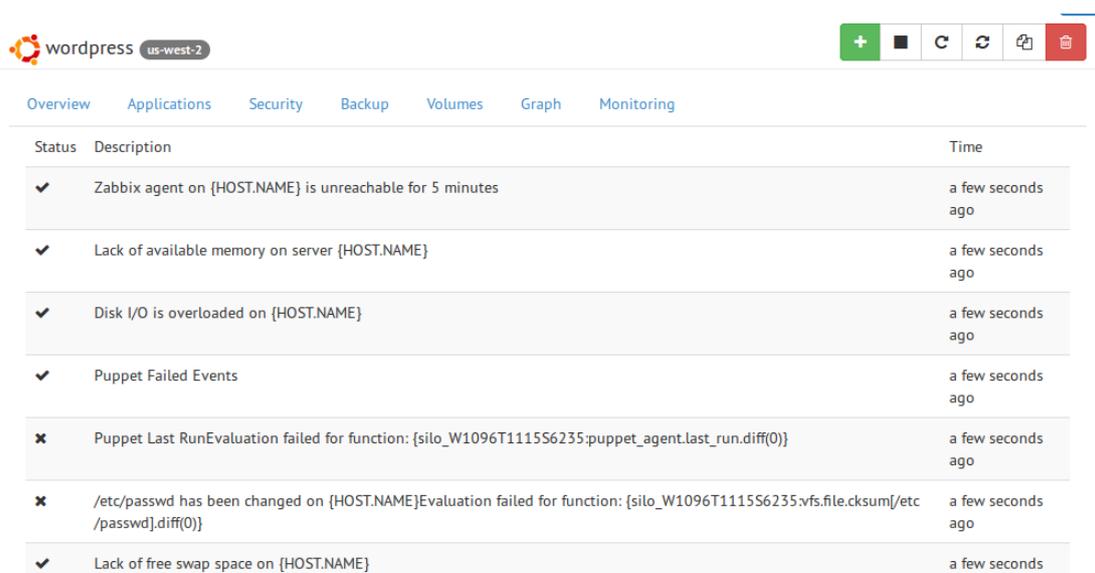
Figure 7: Logging on STRATEGIC Service Store

3.2.4 Horizontal Services

Horizontal services that are offered through the Service Store are the Security as a Service, Monitoring as a Service, Cross-border utilities and policy management.

3.2.4.1 Security as a Service

Protecting IT assets on a Cloud environment against cyber-threats and accounting for security incidents are prerequisites for the cloud adoption by businesses across the globe and a fundamental element of Europe's cyber-security and Cloud

strategies[4]. In STRATEGIC Service Store, this protection is offered as a Service from BT and is composed from two different services.

BT Intelligent Protection

BT Intelligent Protection enables the protection of VM's used across multiple cloud providers to be managed from a STRATEGIC Service Store. It is possible to use this service in all the virtual machines that are going to be deployed in the pilot scenarios. BT Intelligent is described in detail in deliverable D2.3[4].

BT Secure Cloud Storage

BT Secure Cloud Storage enables the encryption and protection of virtual disk drives across multiple cloud providers. It can to be used in all the pilot scenarios. BT Secure Cloud Storage is described in detail in deliverable D2.3[4].

3.2.4.2 Monitoring as a Service

Monitoring as a Service is an approach for monitoring of application and services that is easier to set up and maintain than an on premise monitoring solution. Aiming to collect performance and availability information about the virtual resources deployed over a variety of Cloud Infrastructures Providers, the common monitoring setup offered in STRATEGIC will need to operate in multi-cloud environments. This means that on one hand the deployed services may run in a cloud computing platform that is implemented in the underlying pool of physical computing resources, operated solely for a single organization (Private Cloud) or on the other hand rendering the resources using Public Clouds which are often offered on a pay-per-usage model.

More details about Monitoring as a Service are available in deliverable D4.1[5].

3.2.4.3 Cross-border utilities

STRATEGIC Service Store offers cross-border utilities by leveraging the results of ICT-PSP projects STORK[6] and SEMIRAMIS[7]. Based on these project's results, a set of security/trust components that enable cross-border authentication and exchange of attributes on applications deployed through STRATEGIC Service Store, will be created.

Cross-border utilities of STRATEGIC Service Store are based on 2 different solutions.

STRATEGIC cross-border attribute exchange

The cross-border attribute exchange solution is based on the results of SEMIRAMIS project and will be used in use cases Stari-Grad-2 and Genoa-3

STRATEGIC cross-border authentication engine

The cross-border authentication engine solution provided through STRATEGIC Service Store is based on STORK project results and will be used in use case Genoa-2.

More details about the cross border utilities and the scenarios that can be supported are available in deliverable D2.3[4].

3.2.4.4 Policy management

A solution that aims to provide country specific adaptation on STRATEGIC Service Store can be provided to all pilots that have specific requirements for compliance with national legislations. This solution is based on the Intellectual Property (IP) registry tool, which has been released as part of the Optimis toolkit[8]. This way Service Store will gain the ability to filter the target providers to guarantee that the infrastructures provided to public bodies comply with their legal constraints and their key data protection considerations.

4 Benefit analysis

As already mentioned, the STRATEGIC project aims to deliver a platform that will facilitate the cloud-enabling of legacy applications, reusability of cloud-enabled applications, localization and orchestration of underlying resources. This functionality generates an added-value for the STRATEGIC adopters that we will try to describe in the next chapter.

4.1 STRATEGIC added-value in a nutshell

The primary incentive for an organization/public body to adopt the STRATEGIC platform is to increase the automation though the orchestration capabilities that are offered. Orchestration can be one of those ambiguous concepts in cloud computing, with varying definitions on when cloud capabilities truly advance into the orchestration realm. As public bodies move from managing their virtualized environment, they need to aggregate capabilities for a private cloud to work effectively. The automation of storage, network, performance and provisioning are all aspects handled in most cases by various solutions that have been added on over time as needs increase. Even for organizations that take a transformational approach, jumping to an advanced cloud to optimize their data centers, the management of heterogeneous environments with disparate systems can be a challenge not simply addressed by automation alone[4].

The need to orchestrate really becomes clear when various aspects of cloud management are brought together. The value of an orchestrator-adoption derives from the convergence of multiple hypervisors, need for efficient resource usage, availability, scalability, performance and more. Through the STRATEGIC Service Store the pieces are woven together and can be managed more effectively to ensure smooth and rapid service delivery -- and delivered in a user-friendly catalogue of services easily accessible through a single pane. In essence, STRATEGIC orchestration implies simultaneously speed of automation, ease of integration and clear adoption of best practices.

In addition to rapid service delivery, the benefit of STRATEGIC Service store adoption is that there can be significant cost savings associated with labour and resources by eliminating manual intervention and management of varied IT resources or services. A summary of the STRATEGIC-adoption added-value is listed below:

- Integration of cloud capabilities across heterogeneous environments and infrastructures to simplify, automate and optimize service deployment

- Self-service portal for selection of cloud services, including storage and networking, from a predefined menu of offerings

- Reduced need for intervention to allow lower ratio of administrators to physical and virtual servers

- Automated high-scale provisioning and de-provisioning of resources with policy-based tools to manage virtual machine sprawl by reclaiming resources automatically

---

[4] IBM Cloud Orchestrator: http://www-03.ibm.com/software/products/en/ibm-cloud-orchestrator

- Ability to integrate workflows and approval chains across technology silos to improve collaboration and reduce delays

- Real-time monitoring of physical and virtual cloud resources, as well as usage and accounting chargeback capabilities to track and optimize system usage

- Pre-packaged automation templates and workflows for most common resource types to ease adoption of best practices and minimize transition time

- Ability to create cross-Authentication applications and share them in a re-usable manner through an app-store

In short, many of the capabilities that we associate with cloud computing are in essence elements of orchestration. Using the STRATEGIC framework, public bodies can manage their cloud workloads through a single interface, providing greater efficiency, control and scalability. As cloud environments become more complex and organizations seek greater benefit from their computing resources, the need for sophisticated management solutions that can orchestrate across the entire environment will become ever clearer.

4.2 Benefits from orchestration

Although the aforementioned benefits are straightforward, it would be useful to evaluate the added-value in a broader scope. To do so we will rely on a consolidated report of IDC[9] that tries to assess how Orchestration technologies simplify and streamline cloud environments. According to IDC, IT is in the midst of a highly disruptive transition away from client/server-based architectures toward much more dynamic and agile environments enabled by cloud, big data, social technologies, and mobility. IDC's research indicates that "*IT decision maker expects the combined cost of buying and managing public and private cloud resources will consume approximately half of his or her IT budget by 2016. The average number of virtual machines (VMs) per physical server doubled from 5–6 VMs in 2008 to 9–10 VMs in 2012 in mature customer accounts. In addition multi-hypervisor infrastructures are becoming more common.*" Simultaneously, converged systems that combine servers, storage, networks, and software are gaining traction. IDC expects the market for converged systems to grow at a compound annual growth rate (CAGR) of 54.7% from $2.0 billion in 2011 to $17.8 billion in 2016. The software-defined network ecosystem, including the associated network infrastructure, will grow at an exponential pace as well.

As a result, the data centers of public bodies and organizations in general will be not only more agile and dynamic but also more complex and challenging to manage as mainframe and client/server-based applications sit side by side with workloads running on virtual servers, converged systems, and dynamic public, private, and hybrid clouds. The same report denotes that in response to this complexity, the drive to improve IT staff productivity and operational efficiency will be the number 1 IT management software priority in 2013 (see Figure below). Implementing common processes and tools across cloud and non-cloud environments and reducing the number of disconnected management tools in use are also high priorities. Collectively, these drivers point to IT environments under pressure to make dramatic improvements in staff productivity, time to value, cost control, and business risk management.

It is crucial that STRATEGIC framework provides a concrete tool-suite that satisfies the requirements that derive from the emerging priorities. Using these tools, governmental IT teams can standardize, streamline, and optimize resource provisioning, workload placement, real-time resource scaling, and capacity utilization across the development, test, release, and production life cycles of mission-critical applications. However, in order to effectively address the complex requirements of today's data centers, IT organizations need orchestration solutions that can consistently implement service models, governance, and policies across complex, heterogeneous environments — including cloud, virtual, and legacy infrastructure. STRATEGIC satisfies also this need.
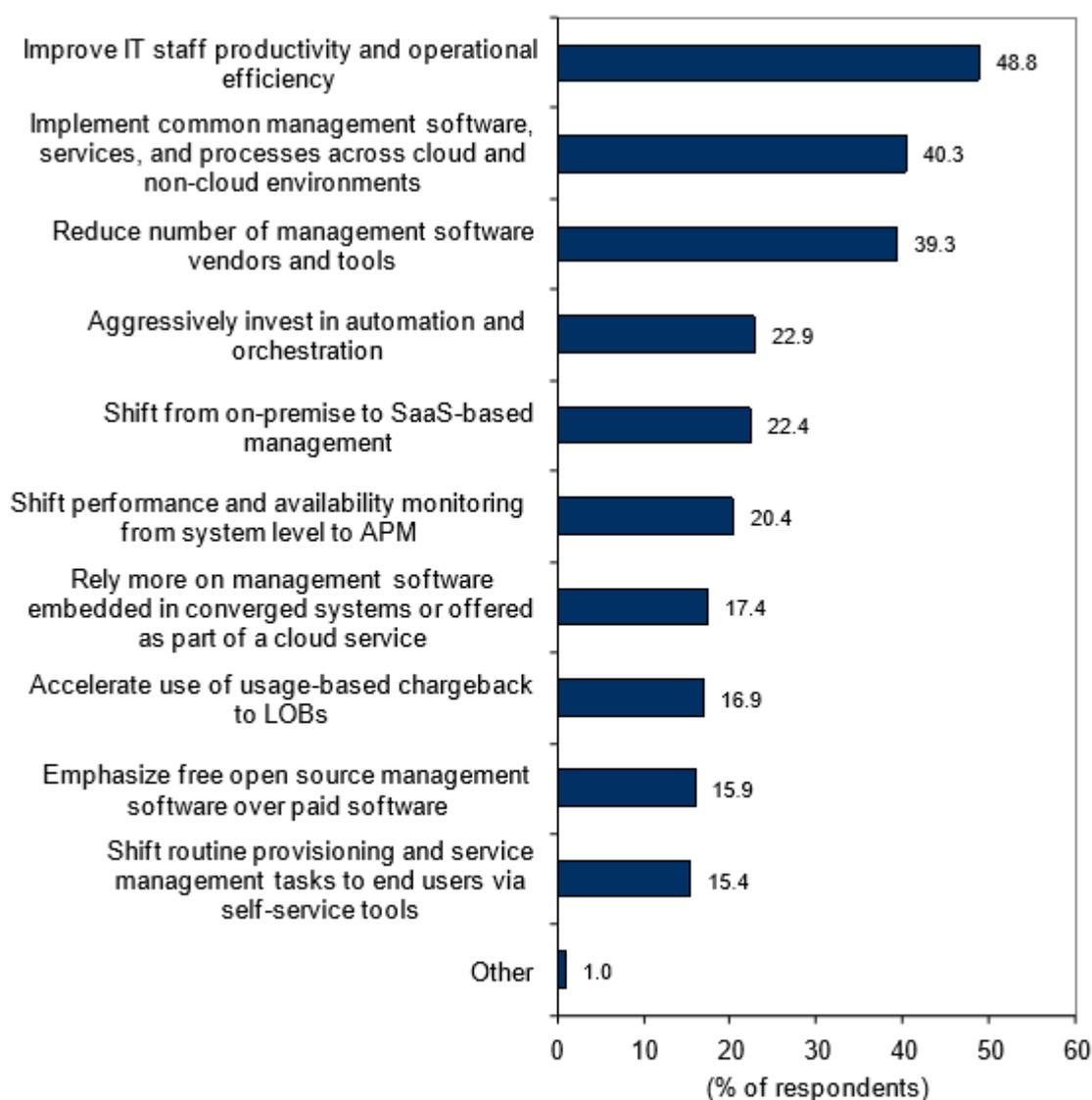
n = 201

Note: Multiple responses were allowed.

Source: IDC's *IT Management Quickpoll Survey*, January 2013

Figure 8: IT Management Software Priorities after 2013

Unlike earlier-generation tools that enabled task-based server configuration automation or self-service VM provisioning, emerging data centers need automation tools that can react rapidly to real-time performance and capacity requirements, scale resources on the fly, and integrate across applications,

infrastructure, and management resources. Rather than rely on traditional, brittle script-based automation linked to specific hardware and application resource configurations, tools that are optimized for dynamic virtual and cloud data centers rely on templates or patterns to define service configuration and policies that can be consistently applied across heterogeneous platforms. By taking an approach that uses open standards or APIs to abstract service provisioning and management automation from infrastructure configuration control, advanced orchestration solutions can more easily scale and adapt to changing infrastructure and applications.

According to the aforementioned IDC Report, important attributes that help deliver value quickly while ensuring long-term agility and flexibility include:

- Sophisticated multi-tier template and service design tools to enable IT staff to create and maintain infrastructure, middleware, and application patterns that best support specific workloads across a range of in-house and public cloud infrastructure options
    o STRATEGIC provides the ability of pattern creation through a workload definition and customization toolset
- Built-in discovery and dependency mapping capabilities to streamline service design and provisioning activities and to support real-time migration and optimization activities
    o STRATEGIC provides dependency management at the workload-definition level
- Integrated monitoring and analytics to support real-time capacity optimization, provisioning, and workload management automation across heterogeneous hardware platforms, multi-hypervisor environments, and hybrid public/private clouds
    o STRATEGIC's horizontal monitoring functionality integrates Zabbix Monitoring-as-a-Service system transparently to any running VM
- Role-based service catalogs and self-service provisioning capabilities that manage and enforce business and configuration compliance and utilization policies while enabling both IT staff and end-users to execute routine tasks more quickly and efficiently
    o STRATEGIC supports RBAC (Role-Based-Access-Control) regarding the catalogue-related functionality
- The ability to consistently define and apply policies and governance across groups, users, workloads, and platforms
    o STRATEGIC supports RBAC also regarding the workload-management
- Scalable plug-and-play architecture that can expand as needed over time
    o STRATEGIC can support multiple IaaS providers
- Ease of integration with existing management tools, processes, and workflows
    o STRATEGIC supports emerging DevOps tools (e.g. Puppet)
- The ability to implement increasingly sophisticated levels of automation and orchestration over time as the organization becomes comfortable with this type of highly integrated approach to day-to-day configuration, deployment, migration, and optimization activities
    o STRATEGIC offers the ability to create complex/reusable templates that can be configured prior-to-instantiation. These templates can contain highly complex configuration scripts.

4.3 Mapping pilot requirements to STRATEGIC added value

In the frames of this chapter we will ground the added-value that was analysed above. For each of the use cases partners we have also analysed what will be the benefit of STRATEGIC framework along with the distinct limitations that will be tackled. This analysis is grouped in the table below.

Scenario	Added value aspect	Requirements Addressed
Camden-1	- Ability to protect the computing resources with Cloud based security solutions. - Ability to use and manage public resources effectively from the Strategic platform. - Publishing of the data is secure aware step. STRATEGIC's Security-as-a-Service will be used to encrypt the communication while publishing data. Encryption is required to assure that the origins of the data could be tracked.	- Transparent horizontal security to any on-boarded service - IaaS diversity
Camden-2	- Ability to scale the service as and when required. - Frees up internal Camden's internal computing resources for further internal innovation. - Ability to publish and resell the application through STRATEGIC platform. - Ability to protect the computing resources with Cloud based security solutions. - Ability to use and manage public resources effectively from the Strategic platform.	- Lack of auto-bursting capabilities - Limited in-house resources - Re-usability - Manageability
Camden-3	- Provides centralised homogenous capability management. - Ability to Scale the portal as the number, size and download rate of datasets increases. - Frees up internal Camden's internal computing resources for further internal innovation. - Dedicated identity software maintenance and management. - Ability to protect the computing resources with Cloud based security solutions. - Ability to use public resources	- Lack of Centralized control - Elasticity - Identity Management - Cost-efficiency

Scenario	Added value aspect	Requirements Addressed
	effectively from the Strategic platform.	
Genoa-1	• Increased service efficiency • Better control over infrastructure • Unified authorization service • Integration of central authorization service • Ability to protect the computing resources with Cloud based security solutions.	• Cost-efficiency • Unified Authorization
Genoa-2	• Increased service efficiency • Better control over infrastructure • Unified authorization service • Ability to protect the computing resources with Cloud based security solutions.	• Lack of secure information exchange mechanism
Genoa-3	• Unified authorization service • Integration of unified data exchange mechanism • Offering citizens a secure and privacy aware mechanism of cross-border attributes exchange • Ability to protect the computing resources with Cloud based security solutions.	• Lack of secure information exchange mechanism
Genoa-4	• Efficient strategy & tools for compliance with the Local Government Transparency code. • Easy deployment of an innovative service • Ability to publish and resell the application through STRATEGIC platform. • Ability to protect the computing resources with Cloud based security solutions.	• Shorten the Develop-to-deploy cycle
Stari-Grad-1	• Cutting costs for infrastructure and applications • Increase effectiveness of current services • Getting experience of cloud services' usage • Ability to publish and resell the application through STRATEGIC platform to other Serbian public bodies.	• Cost optimization • Optimization of resource utilization • Limited in-house resources

Scenario	Added value aspect	Requirements Addressed
	• Ability to protect the computing resources with Cloud based security solutions.	
Stari-Grad-2	• Increase effectiveness of current services • Ability to protect the computing resources with Cloud based security solutions. • Offering citizens a secure and privacy aware mechanism of cross-border attributes exchange • Ability to publish and resell the application through STRATEGIC platform to other Serbian public bodies.	• Lack of secure information exchange mechanism
Stari-Grad-3	• Cutting costs for infrastructure and applications • Get experience of cloud services' usage • Ability to publish and resell the application through STRATEGIC platform. • Ability to protect the computing resources with Cloud based security solutions.	• Cost optimization • Optimization of resource utilization • Limited in-house resources
Stari-Grad-4	• Cutting costs for infrastructure and applications • Get experience of cloud services' usage • Ability to protect the computing resources with Cloud based security solutions.	• Limited in-house resources • Re-usability

Table 8: Added value aspects provided by STRATEGIC platform

5 Conclusions

The purpose of this deliverable that is reporting of task T3.5 and also the final deliverable of work package 3 is to document the results of the allocation of STRATEGIC framework solutions to specific use cases of pilot partners.

The document initially provided an overview and classification of pilots' requirements and then tried to present how these requirements will be fulfilled by using the solutions offered by the STRATEGIC framework.

Finally, an analysis of the added value offered by STRATEGIC to public bodies in general and in pilot's scenarios in specific, is provided.

It should be highlighted, that the deliverable serves as input for the WP5, WP6 and WP7 activities by providing a basis for the pilot sites preparation, execution and evaluation.

References

[1] STRATEGIC D2.2 - Pilot Scenarios, Use Cases and Pilot Operations Requirements, 2014

[2] STRATEGIC D5.1 - Cloud-Enablement of Distributed Services, 2014

[3] STRATEGIC Annex I - "Description of Work", 2014

[4] STRATEGIC D2.3 – STRATEGIC Framework Architecture and Technical Specifications, 2014

[5] STRATEGIC D4.1 – STRATEGIC Cloud Broker and Marketplace, 2014

[6] SEMIRAMIS project. 2013. URL: www.semiramis-cip.eu

[7] STORK Secure Identity Across Borders Linked, Secure electronic identity across Europe,https://www.eid-stork.eu/pilots/index.htm

[8] Optimis D7.2.1.3 Cloud Legal Guidelines, 2012, http://www.optimis-project.eu/sites/default/files/content-files/document/d7213-cloud-legal-guidelines.pdf

[9] http://public.dhe.ibm.com/common/ssi/ecm/en/til14057usen/TIL14057USEN.PDF