Annex Good Practice Guide for securely deploying Governmental Clouds

1 Introduction

Despite the considerable potential benefits offered by Cloud services, which were also recently highlighted in the European Cloud Strategy, few EU countries have so far developed a national Cloud computing strategy. The number of Member States (MS) with operational government Cloud infrastructures is even smaller. The diversity of Cloud adoption in the public sector in Europe is evident; in several countries local public administrators are developing Cloud strategies or launching test bed projects; in others, Cloud is not even considered an option.

Information on the lessons learnt and best practices of the "early adopters" is not readily available. Governmental bodies, national experts and policy makers from less advanced countries in the field of Cloud computing struggle to find case studies and, thus, cannot benefit from the valuable experience of other Member States.

In this study ENISA, aiming at "enabling and facilitating faster adoption of Cloud computing" collected information on Cloud services deployed (projects, initiatives, plans) in the public sector, collected the best practices and presents a list of recommendations, covering all aspects of Cloud computing. The goal is to help Member States in:

- the elaboration of a national Cloud strategy,
- the implementation of a national Cloud strategy and governmental Cloud infrastructure,
- understanding current barriers by suggesting solutions to overcome them,
- sharing the best practices and paving the way for a common set of requirements for all Member States.

This document is the separate Annex of the report: Good practice guide on how to securely deploy governmental clouds. It summarizes all the findings of the desk research, based on which the final deliverable was syhtesized. The material was updated February 2014.

Collection of evidence - methodology

This study and its outcome is based on desk research, an online survey and a set of interviews to subject matter experts: experts working in governmental agencies implementing Cloud services or being involved in the composition of the national Cloud strategy, experts from private sector who provide services to the public sector supporting private Clouds etc.

The interviews and the research activities focussed on the following topics:

- Governmental Cloud infrastructures that are currently operational, in the planning or in the implementation phase;
- Services (both "critical" and "non critical"[1]) currently deployed by the governmental sector using Cloud technologies and/or services that will be migrated to the Cloud using Cloud technologies;
- National strategies across the EU that take into account the intent to foster Cloud computing for governmental services;
- Cloud computing projects and initiatives focusing on the dissemination and delivery of governmental Cloud services;
- Risk assessment and security frameworks for Cloud Computing and public services.

[1] Critical are those assets/services whose loss would lead to "severe economic or social consequences" i.e. water, energy, transport, communications according to CPNI, UK: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/78902/section-a-natural-hazards-infrastructure.pdf

The interview templates and the questionnaire have been prepared according to the results from the survey on the state of the art and specifically designed for Cloud providers, governmental IT agencies, and public sector stakeholders. The questionnaires and the interviews covered quite a broad number of topics:

- Practices, orientations, expectations, initiatives, projects of the stakeholders in the deployment of public services with the adoption of Cloud technologies.
- Requirements, warranties, needs, expectations of the principal actors for enforcing security of the governmental Cloud services, the assets and the data of public institutions.
- Orientations, visions, views, positions on national Cloud computing strategies and on the guidelines for security of governmental Cloud services.

As a result, we collected information from a total of 23 European countries (20 EU countries), and specifically: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Malta, Republic of Moldova, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, Turkey, UK.

2 Classification of Governmental Clouds across EU

To be able to present the wide and heterogeneous landscape of the EU countries concerning governmental Cloud a classification is needed. The basic criteria for this classification are as follows:

- the existence of a policy background to support the implementation of Cloud computing in administrative systems, i.e. national Cloud strategy or digital agenda,
- and the phase of the governmental Cloud implementation (design, implementation, projects running etc).

In the following we describe the main characteristics of each group we have identified.

- **Early adopters:** the countries in this group are: **The United Kingdom, Spain and France**. They have a Cloud strategy and they have taken specific decisions on how to implement the governmental Cloud. A number of initiatives is already running based on Cloud solutions.
- **Well - Informed**: the countries in this group are: **The Netherlands, Germany, Republic of Moldova, Norway, Ireland, Finland, Slovak republic, Belgium, Greece, Sweden and Denmark**. They have a strategy but the implementation is still at design or prototype stage or they have only preliminary implementations of some governmental Cloud services. In all cases, they are planning to massively adopt the governmental Cloud in the future, after an in-depth evaluation and investigation of the risks and the benefits of the Cloud solutions they have identified for the implementation and after the analysis of the first results of the implemented Cloud services.
- **Innovators** : the countries in this group are: **Italy, Austria, Slovenia, Portugal and Turkey**. The "Innovators" do not have a high-level Cloud strategy with clear indications on the solutions for the governmental Cloud, they could have a digital agenda that considers the adoption of Cloud computing, but they already have some Cloud-based services running, mainly based on bottom-up initiatives. Cloud implementation is forthcoming, but will need to be supported by a national or European high-level regulation.
- **Hesitants**: the countries in this group are: **Malta[2], Romania, Cyprus, and Poland**. This group is composed by countries that do not have a governmental Cloud strategy in place, they

[2] Information based on individual interviews with public authorities

could have a digital agenda that considers the adoption of Cloud computing but do not have relevant Cloud initiatives or governmental Cloud experiences. They are planning to implement governmental Cloud in the future mainly to boost the country business and competitiveness and to attract investments.

2.1 Austria

Categorization: Innovators

Austria[3]has no cloud strategy or digital agenda, but has already some initiatives/services running at local level or in specific sectors. Austria has published its eGovernment and the decision to go ahead with a cooperative Digital Austria endeavour was made in Austria in 1998. A list of best practices for EGovernment services can be found here. EGovernment developed a position paper on cloud computing for public sector. It was a joint effort of stakeholders from various government levels, application owners, and solution providers. The paper addressed the diverse facets of cloud computing, such as economic aspects, legal aspects and technical aspects. The position paper covers further facts like organizational, business process, or strategic opportunities and risks. Among the main factors that can hinder cloud computing adoption in the public sector is security, data protection, vendor lock-in, or procurement risks. The concerns seem to be similar in many EU Member States.

EDM is an application for the EuroCloud Award 2013 and is an eGovernment tool that was developed by the Austrian Ministry of Life in cooperation with the federal provinces over a period of many years. EDM is one of the most extensive and complex eGovernment tools in the whole of Europe. It comprises a network of 22 applications with which reporting obligations (e.g. of emission data), applications for permits and verification requirements are processed uniformly in compliance with different environment-related laws. EDM is an extremely extensive and complex ''Software as a Service'' (SaaS) application and it is a cloud application in the classic sense of the NIST definition.

A strategy might come up during 2014, however so far no concrete actions have been made. From the governmental side there is the belief that cloud quality criteria and certification scheme to make governmental cloud trusty are missing.

2.2 Belgium

Categorization: Well-informed

Belgium is preparing its national cloud strategy under the Federal e-government strategy and develops a government cloud similar to the UK as Belgian governmental authorities continue to intensify their integrated e-government cooperation. Fedict is in charge of implementing the e-government strategy in Belgium. They launched in May 2013 a public procurement process for IaaS Cloud services (including a datacentre) to be implemented in Fedict.

Between 1 July and 31 December 2010, Belgium took on the rotating presidency of the European Union. During this period, The Belgian Federal Public Service of Health, Food Chain Safety and Environment used a cloud-based storage and collaboration environment to ensure that its own staff

[3] https://online.tugraz.at/tug_online/voe_main2.getvolltext?pCurrPk=71140, Bernd Zwattendorfer, Klaus Stranacher, Arne Tauber, Peter Reichstädter, ''Cloud Computing in E-Government across Europe, A Comparison''

as well as external users could jointly manage the European Presidency. The public cloud services was based on Microsoft cloud-based platform to access, edit and share documents.

2.3 Cyprus

Categorization: Hesitants

In 2012, the Ministry of Communications and Works Department of Electronic Communications of Nicosia published the E-government strategy, in the document entitled "Digital Strategy for Cyprus''. Therefore, the Department of Electronic Communications (DEC) with the guidance of the Advisory Committee for Information Society has developed a comprehensive plan (for the period 2012-2020) for the development of information society in Cyprus and the uptake of ICT entitled "Digital Strategy for Cyprus", that was approved by the Council of Ministers of Cyprus on 8 February 2012. This digital strategy is in line with the objectives and actions proposed in the Digital Agenda for Europe, one of the flagships of the strategy "Europe 2020", and will contribute substantially to economic growth, productivity increase and job creation.

One of the key objectives is "Modernize public administration and provide public electronic services". The strategy produces a set of concrete actions for the effective introduction of eGovernment Services, like the consolidation of data center, centralization of information management systems to serve all municipalities, the incentives to citizens to use eGovernment Services. No cloud initiative is currently taking place in Cyprus.

2.4 Denmark

Categorization: Well-informed

There are few experiences of governmental Cloud. At high level, an e-governmental strategy has been produced for the 2011-2015 period. The strategy specifically report about an initiative for Updated rules on Cloud computing by mentioning that Cloud computing can open new opportunities for more efficient IT operations and better access to IT services. Citizens' and companies' sensitive information must be protected, but outdated rules must not pose an unnecessary barrier to cloud computing.

There is great potential in utilising cloud computing in the public sector in the Nordic countries, Denmark, Finland, Iceland, Norway and Sweden. The Agency for Digitisation in collaboration with the Nordic Council of Ministers has focused on a sample of best practice cases, where public institutions across the Nordic region use cloud computing[4].

In July 2009, the Local Government Denmark (KL) along with the National IT and Telecom Agency launched a debate on the potential use of cloud computing services in the public sector. The public discussion will primarily focus on the benefits as well as the obstacles in implementing cloud computing in the Danish public sector. Moreover, according to recent study by Forbes Insights, in conjunction with KPMG, Denmark is one of the leading countries regarding the adoption of cloud computing in the public sector. For instance, in 2011 a Danish municipality planned to use Google Apps Services such as calendar or e-mail in their school systems. In addition, a Danish procurement organization of a Danish municipality moved procurement services into the cloud in 2011. Although Denmark still struggles with security and privacy issues, the Danish Data Protection Agency e.g. judged the cloud service of Microsoft - Office 365 - to be compliant with the EU and Danish legislations.

[4] http://www.eurocloudcongress.org/wp-content/uploads/2013/09/1145-Camilla-Gynerup.pdf

In addition, cloud.dk offers public cloud services fully compliant with the Danish data legislation. Cloud.dk is the leading IaaS public cloud provider in Denmark. The cloud infrastructure is hosted entirely in Danish data centers and it provides companies and organizations with a highly scalable and highly available cloud platform.

2.5 Finland

Categorization: Well-informed

The Finnish Government digital agenda (2011-2020), entitled "Productive and Innovative Finland – Digital agenda for the years 2011-2020", includes cloud computing among other initiatives. A report published by the Ministry of Transport and Communications outlines the possibilities of Finnish cloud services.

A unique initiative: Forge Service Lab, a cloud service development laboratory, where software and services can be tested with customers before the deployment in production within commercial cloud service providers' environments, under the coordination of Tieto and Tivit, a non-profit company founded in 2008 consisting private companies, universities and public bodies.

Although approximately 33% of Finnish companies use cloud computing and there are companies that offer cloud computing services in Finland, in Finnish, for example Tieto Oyj, Logica and HP, the public administration of Finland is not a pacemaker in this field[5]. The government has only started an explanatory research for centralizing ICT services where cloud computing could play a major role. Particularly, the aim of such centralized ICT infrastructure is bundling maintenance and sup-port tasks as well as monitoring and helpdesk services. However, the Finish Government particularly emphasizes cloud computing in its report "Productive and Innovative Finland – Digital agenda for the years 2011-2020".

Moreover, Finland and Estonia will collaborate to develop educational cloud services that will bring together electronic learning materials and learning applications, and will significantly step up both educational and technological cooperation.

2.6 France

Categorization: Early adopters

France is currently one of those countries, which favor the development and installation of a nation-wide cloud for governments, a so-called G-Cloud (Governmental Cloud). France started its development of the G-Cloud named "Andromeda" in 2011. This G-Cloud, which is - in this particular case - an IaaS platform for governments, is currently set up and implemented by the two companies Orange and Thales (namely Numergy and Cloudwatt). The main aim for developing an own G-Cloud in France is data protection and legislative issues. A cloud especially developed for France can guarantee full compliance with national law in terms of data protection and security. Such compliance may not be achieved by e.g. adopting US-based services. Furthermore, Accenture is currently building up some kind of G-Cloud for the French Directorate of Legal and Administrative Information (DILA). This cloud shall offer French citizens fast and performing access to French public services.

The French government is so keen to encourage the development of cloud computing infrastructure in France that it is investing in two competing home-grown cloud providers through its sovereign

[5] https://publications.theseus.fi/bitstream/handle/10024/34651/Ylatupa_Tuomas.pdf?sequence=1

wealth fund, the Caisse des Dépôts. Moreover, according to a survey commissioned by Microsoft, investments in public- and private-sector cloud IT services are likely to generate nearly 14 million jobs worldwide between 2011 and 2015, including 189,000 in France.

Based on a survey on cloud computing conducted by the French Data Protection Agency (CNIL) at the end of 2011, the Agency issued 7 recommendations to help companies define an appropriate legal framework when using cloud computing services.

2.7 Germany

Categorization: Well informed

Cloud computing is one of the main pillars of the ICT strategy of the German Federal Government. This strategy has been published by the Federal Ministry of Economics and Technology in 2010 and aims on the digital future in Germany until 2015. Focusing on cloud computing, the objective is to facilitate and foster the development and installation of cloud computing services. In particular, both small- and medium-sized enterprises and the public sector should take advantage of cloud computing as fast as possible. The challenges (e.g. data security, quality assurance, easy integration, open standard, etc.), which need to be addressed for adopting cloud computing in Germany, are targeted in the so-called Cloud Computing Action Programme. These challenges particularly arise when adapting existing IT concepts to the specific requirements of cloud computing.

In Germany with the start-up of the goBerlin project, earlier with the Trusted Cloud initiative and Cloud Action Programme a high-level plan has been established for improving competitiveness of the industry, public sector and Health sector and for support the development and adoption of cloud basic technologies. Another initiative of the Trusted Cloud is the online marketplace for information and analysis (MIA) based on the data of the German Web. So use common analysis tools, e.g. to improve their market research and better customize products.

2.8 Greece

Categorization: Well informed

There is no centralized Cloud strategy in Greece but a governmental Cloud implementation plan is signed under the e-gov National Strategy. GRNET (responsible for providing a multitude of e-infrastructure services to the Greek Research and Academic community) is developing an IaaS solution which will be provided free of charge to the Greek Academia. It was decided to build this using open source software. Three “pilot” organizations have been selected for Cloud services, and the expectation is that they will be able to provide backup services. GRNET is developing its own Cloud solution named Okeanos. Okeanos is one of the two platforms that provide resources to EC-funded projects.

2.9 Ireland

Categorization: Well informed

In 2012, the Irish Government developed the Government Cloud Computing Strategy for the public service, which places Cloud computing in the heart of future government ICT strategy: providing an approach for the public service deploy Cloud Computing and to undertake a comprehensive program of Datacentre Consolidation. Examples of Cloud initiatives: Cloud services for research application is the EduStorage, a new network Cloud data storage service deployed by HEAnet (Ireland’s National Education and Research Network) providing advanced Internet and associated ICT and e-Infrastructure services to Educational and Research organizations.

ICT and cloud computing has been highlighted as key target areas within the Programme for Government as the Centre for Management and Organisation Development (CMOD) , a division of the Department of Public Expenditure and Reform (DPER), mandated to implement policies in the area of ICT and eGovernment.

Ireland anchored cloud computing in their national governmental strategy. This strategy of the Irish government with the name "Technology Actions to Support the Smart Economy" was introduced by the Ministry of Energy and Communications and the Ministry of State in 2009. In more detail, Ireland sees cloud computing as one of the key drivers for economic growth in Ireland. They estimate high reductions in server and energy costs by expecting high value job generation at the same time. Therefore, they released a separate "Cloud Computing Strategy" paper in 2012. They plan several governmental services based on cloud computing offered to their citizens, aiming on increased productivity by decreasing public expenditures at once. Finally, the Irish government provided some kind of guidance for businesses when adopting cloud computing. This guidance entitled "SWiFT 10: Adopting the Cloud – Decision Support for Cloud Computing" consists of a set of standards which shall help businesses to lower obstacles when moving services into the cloud.

2.10 Italy

Categorization: Innovators

Italy does not have a high-level Cloud strategy but on October 4th 2012 the Italian Digital Agenda has been approved. Italy has already some initiatives/services running at local level or in specific sectors; National Registry is an example of governmental Cloud established under the Italian authority and also the Federa Project (Emilia Romagna) that provides an integrated authentication systems to access all public online services of the region. Moreover, The Department of Treasury of the Minister of Economy and Finance has a Cloud platform providing services that can be used internally and by other public administrations. The Ministry of Foreign Affairs has developed a private Cloud to ensure service continuity for Italians residing abroad by strengthening active and passive security as well as ICT safety of diplomatic-consular offices located in areas of high conflict. The Region of Tuscany has inaugurated the new Cloud data centre for providing services to the local municipalities at the beginning IaaS and PaaS, in the next SaaS.

In 2012, the DigitPA (Agenzia per l'Italia Digitale) has published the document "Recommendations and proposals related to Cloud Computing adoption in the Public Administration" with the aim to increase the use of Cloud in the Italian public sector, proving policies, contracts and recommendations for public institutions. Under the coordination of the "Agenzia per l'Italia Digitale", the first preliminary steps for the implementation of a G-cloud infrastructure have been moved in July 2013: in parallel with the consultation table with ICT operators, charged with receiving reports, suggestions, templates for "G-Cloud", the survey of the infrastructure assets has started, entrusted to the Fondazione Ugo Bordoni, which must be completed within a few weeks. The Agenzia per l'Italia Digitale has focused now on a hierarchical model of federated data centres on two levels (national and regional) and a third level of service delivery represented by local portals (municipalities and provinces).

2.11 Republic of Moldova

Categorization: Well informed

In 2011 the Government of Republic of Moldova approved The Strategic Program for Governance Technological Modernization (E-Transformation) which specifies the use of shared government technology platform based on Cloud Computing as mean to achieve the Program objectives. In 2012

"First Cloud Policy" (Prime Minister Decision 21-d) was issued by the decision of Prime Minister which states that all government ministers and agencies will use

.M-Cloud platform to deliver e-Service to citizen, business and other government agencies. The first phase of the Government Cloud Platform (MCloud) was officially launched in February 2013.

In September 2011, the "Strategic Program for governance technological modernization" was published. One of the key objectives was the deployment of a private governmental cloud platform (the so called M-Cloud, a shared platform. The M-Cloud will deliver services (IaaS, PaaS and SaaS) for citizens and business, for internal governmental use and Reusable platform-level services (authentication, payment, etc.)

2.12 The Netherlands

Categorization: Well informed

On 15 November 2011, the Minister of the Interior presented the Dutch Government's "iStrategy" to the Dutch parliament**Error! Reference source not found.**. The general aim of the iStrategy is to replace the fragmented i-infrastructure with its many different internal service providers, with an infrastructure based on state-of-the-art, proven technologies. The new i-infrastructure should be based on the concept of "cloud computing" and subject to the necessary data security and data ownership requirements. After carried out a review of ICT facilities, the Dutch government published the Netherlands' Cloud Computing Strategy, promoting the implementation of cloud computing with certain caution. The main inhibitors considered were the relative immaturity of the cloud computing market and the Government's highly stringent requirements with respect to data protection.

The Cloud Computing Strategy implementation has been outlined, considering the introduction of "close" Cloud set up under Central Government's management and control, to provide well-defined generic services throughout Central Government. If the implementation will be satisfactory, it should be proceed with further phased implementation steps.

Small projects have been realised at local level, by the municipalities by creating an autonomous and independent datacenters. SaaS solutions are used by agencies responsible for different type of policies, often for storing open data in the Cloud. The Dutch agency responsible for providing license plates for cars is using the Cloud platform for its open data.

The Netherlands plans to develop national cloud computing and there is also the Dutch Cloud offers Infrastructure as a Service with the following components. A complete IT infrastructure includes server, OS, network and storage capacity.

2.13 Norway

Categorization: Well informed

In the "Digital Agenda for Norway" published in 2012-2013, the Norwegian State included the Cloud Computing as one of the main key topics.

The Ministry of Government Administration, Reform and Church Affairs expressed explicitly to considering cloud computing services in procuring ICT operating services. For assisting the public and private institutions, it will produce guidelines to use cloud services, comprehending relevant regulations and developing specifications and standard agreements for use in procuring such services, as an alternative to the standard agreements currently used by cloud service providers.

Special attention has been posed to facilitate secure and predictable use of such services within the Norwegian statutory framework. In particular, one of most critical issue perceived by Norway is the data security and privacy requirement.

In 2012, the Data Protection Authority banned the use of cloud services in the municipalities of Narvik and Moss for violation of security and privacy on the sensitive data moving on the Google apps cloud services. Data protection Authority worried that local governments that use services like Google Apps have no idea where in the world their data is stored and who is able to access it. After a consultation, then the use of cloud computing services by the municipalities of Narvik, which uses Google Apps, and Moss, which uses Microsoft Office 365, have been reviewed. According to that experience, the Data Protection Authority subsequently published guidelines for using public cloud services.

There is strong growth in cloud computing in Norway as more than 35% of public sector bodies and private sector companies now use 'Software as a service' (SaaS), as compared to just 14% this time last year.

In 2012, the Nordic Council of Ministers (Denmark, Sweden, Finland, Iceland, and Norway) published a report, named the "*Nordic Public Sector Cloud Computing – a discussion paper*" in the attempt to launch a discussion on whether there should be a Nordic cooperation on cloud computing and what it could focus on. The main barriers mentioned in the paper are legal issues, about data protection *"The Nordic authorities (as well as private enterprises) will have to make sure that personal data (sensitive as well as non-sensitive) will not be handled in countries outside the EU/EES that do not comply with the Safe Harbor agreement (US companies) or similar."*, loss of governance, portability, difficult to integrate cloud solutions with existing applications. The document reported figures related to the diffusion of cloud computing in the Nordic countries, showing the percentage of penetration of cloud services of public sector.

2.14 Poland

Categorization: Hesitants

Although Poland does not have a national cloud strategy, Polish government is interested in the introduction of Governmental Cloud services. At the end of June 2013 was organized in Poland the congress "The Polish Approach to the EU Cloud Computing Strategy", organized by the European commission (EESC), the EuroCloud Polska, and the Polish government. The conference is going to examine the conditions and benefits of Cloud solutions for the Polish public and private sector as well as for the country's civil society at large.

2.15 Portugal

Categorization: Innovators

There isn't officially Cloud strategy in Portugal but Cloud initiative is one out of the 25 measures of the Portuguese global strategy. During the last two decades the Portuguese public administration was greatly modernized, using IT to increase some processes efficiency and scalability. Currently a strategic plan (GPTIC - Strategic plan by 2016) is in place mainly to increase the quality and usefulness of IT services and reduce the IT spending. Other initiatives:

- AMA (Agency for the Modernization of the Public Administration) coordinates the operational and technical level the development of ICT tools and structures for e-government and has also considered the implementation of the GO-Cloud (Governmental Open Cloud), a platform with shared Cloud services
- Portal services

IaaS, email, file sharing, storage, identity management, financial and human resources management, patrimony management and others.

2.16 Romania

Categorization: Hesitants

Romania does not have a national cloud strategy and governmental clouds are not really developed. However 61% of Romanian big companies are investing in cloud.

2.17 Slovak Republic

Categorization: Well informed

The Slovak Republic has already prepared the Strategic Document for Digital Growth and Next Generation Access Infrastructure for the 2014-2020 periods. One of the strategic objectives and priorities, to be accomplished by 2020, proposed under the strategic document is for the Slovak Republic to introduce a common Cloud platform to share public administration services and information.

A project entitled "Datacentre for Towns and Municipalities" is now at its implementation stage, with its target outcome being Cloud platform based electronic services for local government authorities. Cloud computing is a relatively new phenomenon in Slovakia, arriving on the heels of mobile devices which are rapidly gaining in popularity.

2.18 Slovenia

Categorization: Innovators

No official Cloud strategy is defined however is under study the modernization of eGovernment services using Cloud computing, in the specific a solution customized for the government requirements in term of legislation on security and privacy. A portal for e-procurement is in development phase, infrastructure registry, and portal for citizens' services. The Slovenian Ministry for Higher Education has partnered with the European Commission and industry to develop the KC Class-Cloud Assisted Services project. The CLASS Conference is the conference about Cloud Assisted Services in Europe from the perspective of government, business, academics, technology and venture capital. KC Class goal is to develop services and products in the area of Cloud computing for local adoption. Also there have been some discussion about a "unique" cloud solution (the GOV-NET), but this is not in place at the moment.

Slovenia also won EuroCloud Award 2013 in the best startup category.

2.19 Spain

Categorization: Early adopters

The operation of SARA (Spanish Public Administrations Network) platform for delivering cloud services for the Public Sector started in 2010. Upgrades and full implementations have been made in 2011 and later in 2013. The infrastructure for governmental public services will adopt a private cloud implementation model and will use its own technology infrastructure resources, consisting in the SARA network, which is connected to the TESTA Network deployed by the European Commission. SARA provides the interconnection between all the government layers (National, Regional and Local). 90% of the population lives in a city or village connected to SARA. Several shared services are provided to the administrative units connected to SARA, the platform for eID validation and the

eDelivery system stand among the most used. One example of public cloud services already provided in the municipalities of the Regional Government of Madrid is ORVE, a service of the Ministry of Finance and Public Administration that facilitates the integration of the face-to-face applications of the Public Administration into the eDelivery. Spanish Government will be encouraging the adoption of cloud computing by government institutions, providing future legislative actions.

Applications and services considered are e-invoice services, delivery system, and validation of electronic signature. The current services are SaaS. Future plans include IaaS but a more flexible architecture of server/storage/network will be needed. There are also plans for providing cloud based services also for the citizens (similarly to the ones provided in SARA to the private companies). The Spanish government prefers to maintain and have a centralized, state own, system. Investments for the platform and infrastructure have been already made (data centers, network, and applications).

The idea of teleworking in the public sector has long been debated. With nearly 3 million civil servants altogether, teleworking could bring important cost-cutting in public buildings. Electronic medical records are another public sector area in which the cloud could have a major impact.

2.20 Sweden

Categorization: Well informed

In 2011, the Ministry of Enterprise, Energy and Communications published the document "ICT for Everyone – A Digital Agenda for Sweden"[6] included the cloud computing in the strategic challenges for the soft infrastructure needed and it is mentioned that Cloud computing could drive growth in the ICT industry, at the same time as lowering administrative costs.

There are several solutions at the moment. Also there have been some discussion about a "unique" cloud solution (the GOV-NET), but this is not in place at the moment. Given the Increasing number of municipalities, authorities and businesses that considered using of cloud services, the Swedish Data Inspection Board published guidelines for the use of Cloud services. In a landmark ruling, Sweden's data protection authority (the Swedish Data Inspection Board) this week issued a decision that prohibits the nation's public sector bodies from using the cloud service *Google Apps.* The Swedish Data Protection Authority ("DPA") published a review of the use of cloud services, informed by the practices of three Swedish municipalities' use of services from leading cloud providers.

The Swedish Environmental Protection Authority uses cloud computing services to ensure a flexible, secure, interoperable and cost-effective IT service in order to be able to house the systems that the agency uses to serve the public.

Due to the emerging trend in using cloud services also in the government, the Swedish Data Inspection Board has been called several times to express positions on agreement between local municipality and cloud provider. Examples of cases (Sept. 2011) are: the Salem Municipality, that used Google App (a SaaS service); the Enköpings Municipality, that used Dropbox (a file storage/sharing SaaS service built on Amazon Web Services IaaS); Brevo used an electronic mailbox SaaS service built on Microsoft Windows Azure PaaS.

[6] http://www.government.se/sb/d/2025/a/181914

Sweden is a country that does not adopt central government cloud solutions but uses largely outsourcing and has evaluated the issues related to the adoption of cloud computing in governmental services. In Sweden there are private companies (national and international) providing private/public cloud solutions.

2.21 Turkey

Categorization: Innovators

There is no national Cloud strategy in Turkey, but there is a datacentre consolidation strategy encompassing Cloud. E-government services are provided by communications provider Turksat. In the education sector there are plans to replace all books by tablets, and to provide all schools with smart boards. The budget for this has been allocated and the hardware is being rolled out. Some of the hardware would have to be manufactured in Turkey. Academia Cloud is the biggest Cloud project in the country.

In a conference, organised by Microsoft, the Information Society Department, the Ministry of Development and Bogazici University Center of Innovation and Competition based Development Studies there were identified perceptions, expectations and practices of Cloud Computing in Turkey and presented efficient and realistic policy recommendations on future cloud policies and strategies that will foster competitiveness in Turkey.

Cloudturk is in the largest data centre of Turkey Cloudturk has made the greatest infrastructure as a service (IaaS) investment in the largest data centre of Turkey.

A study conducted by LSE Tech on the labour market and general economic effects of cloud computing for Turkey showed that the analysis of the economic effects of cloud services in Turkey has focused on two exemplary sectors, one a mature but growing manufacturing industry (automobile) and the other a new, cloud-dependent area of business (smartphone services).

2.22 United Kingdom

Categorization: Early adopters

In March 2011, the Cabinet Office published the Government ICT Strategy. This document recognised that Government has a requirement to deliver innovative services built around information and communications technology (ICT).

The Government ICT Strategy made clear that Government ICT could be better. And one of the means of achieving better and more flexible ICT based services is cloud computing.

"Cloud computing delivers infrastructure, platform or software as a utility service, giving Government the capability to respond to changing operational needs. The standardised cloud platform will also allow developers, especially SMEs, to generate innovative solutions." Cabinet Office ICT Strategy, March 2011.

Cloud-based Government ICT creates the opportunity to deliver public services more rapidly and more flexibly than has been possible in the past. And successful delivery is about having the right cloud infrastructure in place - the standardised cloud or G-Cloud. The G-Cloud Programme is a cross-government initiative led by the Ministry of Justice, and supported by the Home Office, under the direction of the Chief Information Officer Delivery Board as part of the UK Government ICT Strategy.

The project has undertaken a G-Cloud procurement framework for introducing Cloud ICT services into government departments, local authorities and the wider public sector. These services can be reviewed and purchased through the CloudStore platform provided by the project. At present, there are four categories of services: Infrastructure, Software, Platform and Specialist Services. The innovative aspect of G-Cloud is that services in the G-Cloud market are supposed to be certified by the UK government. Until June 2013 only a small part of the services in the market had been certified.

A recent report produced by MPA about the audit on the status of progress of G-Cloud revealed not a satisfactory successful delivery of the project. The MPA audit reported as may cause the resistance to change, evidencing that “G-Cloud still has a significant number of challenges to overcome" if the government wants it to reach its savings objectives, including a change in "culture in terms of approach to ICT as old ways of doing things are so deeply engrained"