

**Frost & Sullivan 2011 – Market Insight
by Arun Chandrasekaran & Mayank Kapoor**

**State of Cloud Computing in the Public Sector – A
Strategic analysis of the business case and
overview of initiatives across Asia Pacific**

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Introduction

The computing industry is witnessing a paradigm shift in the way computing is performed worldwide. There is a growing awareness among consumers and enterprises to access their information technology (IT) resources extensively through a "utility" model, a development broadly called "cloud computing." Over the recent past, the interest in cloud computing has grown exponentially in the Asia Pacific region and is increasingly being discussed in all major ICT-related board room discussions. Enterprises in the region are leveraging cloud computing to provide increased standardization of IT infrastructure and to lower the cost of delivering technology solutions. The private sector is clearly moving toward the cloud.

The increasing buzz around cloud computing has also prompted the governments to assess the new delivery model. With the governments of major countries, especially the United States, encouraging cloud adoption, governments of Asia Pacific countries too are gaining confidence and increasingly evaluating cloud computing. Although concerns, especially around privacy, security and sovereignty of data, do continue to inhibit adoption, the value proposition of moving to the cloud is too attractive for the governments to ignore. This strategic paper looks at the business case for cloud computing in the Government sector and offers an overview of the initiatives by governments across Asia Pacific.

Chart 1: Value proposition of Cloud computing in the public sector

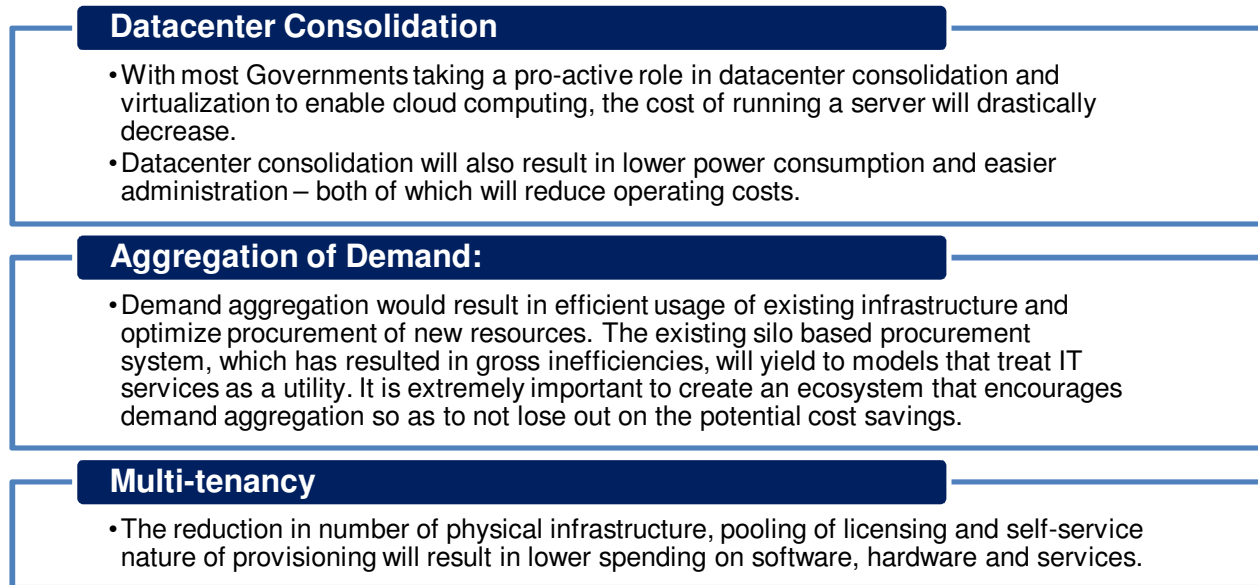
Reduction in ICT Spending	By adopting cloud computing, government agencies can create a central pool of shared resources – software and infrastructure. The consolidation of resources and the fact that cloud computing is more cost effective, leads to reduction in ICT spending.
Agility	Governments operate in a strict hierarchical manner and the process for approvals and purchase orders is a time consuming activity. Cloud computing provides the capability to eliminate these time consuming activities and provision resources on the fly.
Access to Most Updated Technology	Cloud computing offers the government the ability to constantly have access to the most updated software and hardware. The onus of upgrading technology is on the service provider in this delivery model who ensures access to the most up-to-date solutions.
Elimination of Procurement & Maintenance	Another key advantage is the elimination for the need to procure, monitor, and maintain IT resources. This too is the responsibility of the service provider under the delivery model. Apart from reducing the workload, this reduces the need for IT staff and allows the government/agencies to focus on their core areas of work.
Universal Resource Access	Cloud computing is delivered through the Internet enabling universal access to resources. Furthermore, it helps the government in establishing a common platform for all its eGovernance initiatives, one that is easily accessible by the citizens as well.

Source: Frost & Sullivan

Modes of Cost Savings

The fundamental driver for the move toward cloud is the huge potential cost savings. The reduction in ICT spending is manifold due to increased efficiency of Infrastructure usage and by pooling the aggregated demand. The primary savings would come from datacenter consolidation, aggregation of demand, and multi tenancy.

Chart 2: Modes of Cost Savings



Source: Frost & Sullivan

Migrating to the Cloud

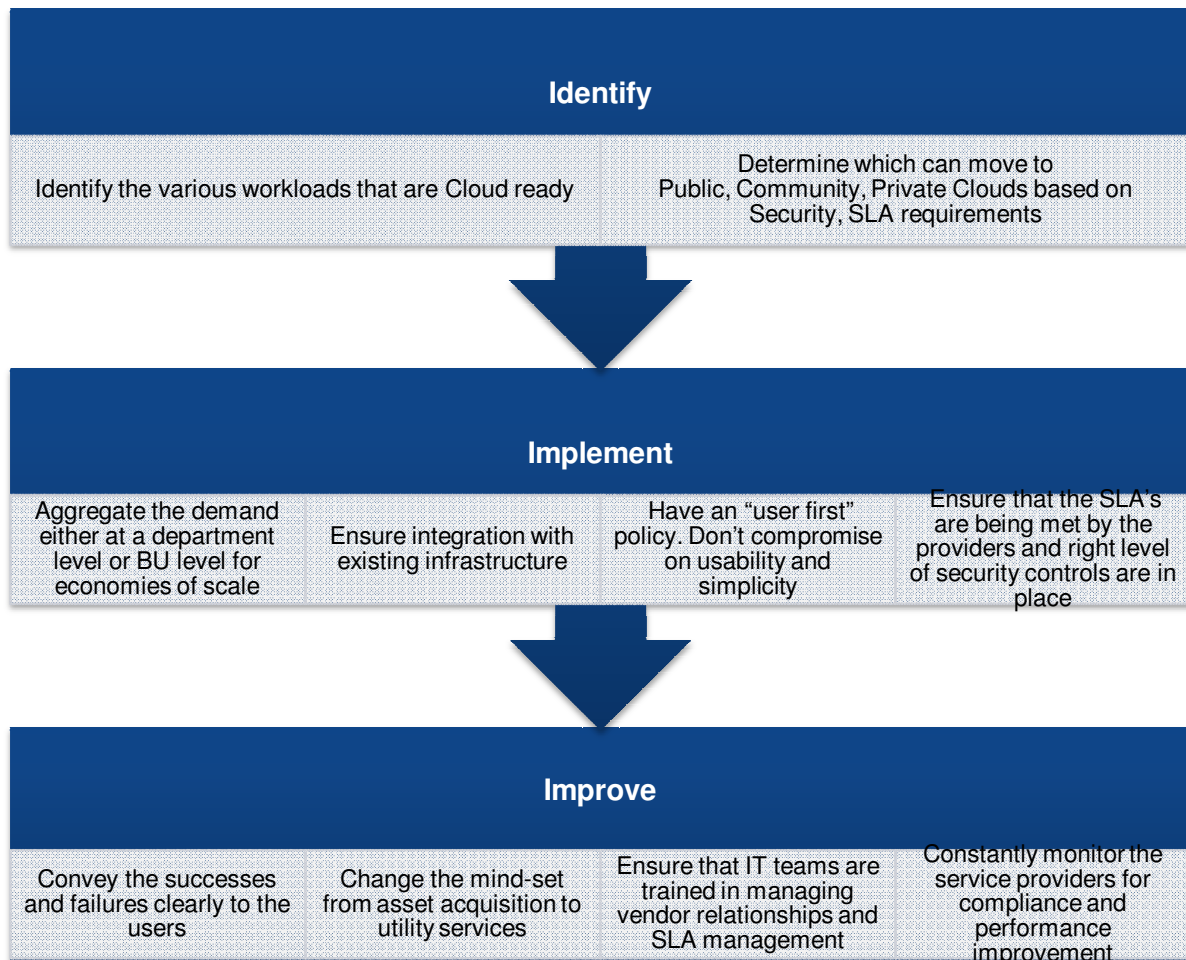
Migration towards Cloud computing is easier said than done. It requires a fundamental shift in the way people perceive IT. Rather than thinking about IT as an exercise in asset ownership, IT decision makers need to start thinking about IT as a utility. The over-riding focus on CAPEX needs to change as customers experience transition to an OPEX model where IT becomes a predictable monthly expenditure. While the private sector has taken a lead in transitioning to such a model, the existing procurement processes in governments need to change to move toward this model.

Framework for Cloud Migration

Migrating to cloud often involves a mammoth evaluation exercise that looks at the readiness of applications and data and the business case for doing so. While the challenges in the government sector are no different from that of the private sector, the issues of procurement and security are more pronounced in this sector. The government has an onus to protect citizen data and ensure high availability of the critical national infrastructure such as power, water, health, communications, and banking.

Budgeting in the government sector works much differently from that of the private sector. IT budgets are planned well in advance, often a few years before, leaving agencies with little flexibility for last minute changes. Selection of vendors/service providers is a long drawn process that strives to minimize the suppliers and procure services at a lower price. Due to the nature of the process, the government runs a risk of being unable to procure IT services from niche service providers that can deliver innovative services at low prices. Hence, it is very important for government agencies to change the traditional procurement models if they are serious about procuring ICT resources from the cloud. The following chart provides a basic framework for agencies looking to migrate to cloud.

Chart 3: Framework for Cloud Migration

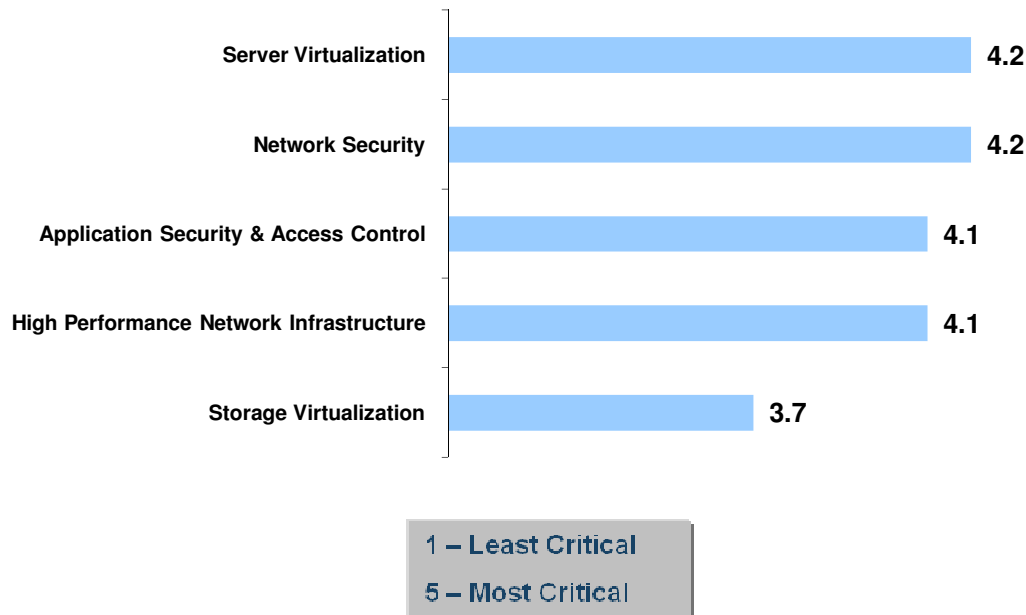


Service providers across the globe have been cognizant of the governments' interest in cloud computing and have been building federal clouds to suit the stringent requirements of the government agencies.

Critical ICT Components in Building a Cloud

While putting together a cloud, it is essential to understand the different components that are essential to build and maintain a cloud that performs as per government requirements. According to a recent Frost & Sullivan study in the Asia Pacific region, governments have allocated highest priority to server virtualization and network security. Server virtualization will help governments meet their resource consolidation objectives. Furthermore, security is paramount to government adoption. Governments will adopt cloud computing only if they are convinced that their data will remain secure and available. The following chart illustrates the priority attached to different ICT components in building a cloud.

Chart 4: Priority of ICT components in building a Private cloud



Global Adoption of Cloud Computing in the Public Sector

At present, cloud computing is witnessing increasing adoption in the public sector across the world. The United States is taking the lead and moving to a “Cloud First” strategy, the country’s transition has been rapid, starting from the use of Google Mail and Google Documents to the migration of Recovery.com, making it the first Government-wide system to move into the Cloud in April 2010. Furthermore, the U.S. Federal Budget for 2011 has

incorporated cloud computing as a major part of its strategy to achieve efficiency and reduce costs. It states that all agencies should evaluate cloud computing alternatives as part of their budget submissions for all major IT investments, where relevant. Specifically:

- By September 2011 – all newly planned or performing major IT investments acquisitions must complete an alternatives analysis that includes a cloud computing based alternative as part of their budget submissions.
- By September 2012 – all IT investments making enhancements to an existing investment must complete an alternatives analysis that includes a cloud computing based alternative as part of their budget submissions.
- By September 2013 – all IT investments in steady-state must complete an alternatives analysis that includes a cloud computing based alternative as part of their budget submissions.

To fast track adoption, the U.S. General Services Administration has established a portal dedicated to cloud computing applications for the public sector. The portal – www.apps.gov – provides the public sector agencies with the common platform for the procurement of cloud services – SaaS and IaaS – from recommended services providers.

Chart 5: Case Study on adoption by the General Services Administration, USA

Case Study: General Services Administration (GSA)
<p>Project: USA.gov (Office of Citizen Services)</p> <p>USA.gov is the Federal Government’s primary information portal providing information on subjects that include benefits and grants, taxes, jobs, education, health, voting, technology, and business and nonprofit guides. The traffic to the website is highly unpredictable depending upon key issues that are being discussed in the national public forum, natural disasters, and elections. A Cloud-based solution represented the best choice to handle these spikes in traffic as a cloud infrastructure is much better able to deal with on-demand scalability than most traditional IT infrastructures. This has improved the site’s flexibility to meet emerging needs.</p> <p>The movement to the Cloud-based solution has helped GSA in reducing the site upgrade time to a maximum of one day, including procurement) from nine months earlier. Moreover, the downtime has been reduced drastically to a 99.9% availability from about two hours earlier with the traditional hosting setup.</p> <p>In terms of costs, GSA used to pay US\$2.35 million annually for USA.gov, in the legacy system. This included hardware refresh and software relicensing costs of US\$2 million and personnel costs of US\$350,000. By moving to a cloud service, GSA now pays an annual total of US\$650,000 for USA.gov and all associated costs, a cost saving of US\$1.7 million, or 72%.</p>

Source: “State of Public Sector Cloud Computing,” May 20, 2010, CIO Council

Cloud Adoption Trends in Asia Pacific

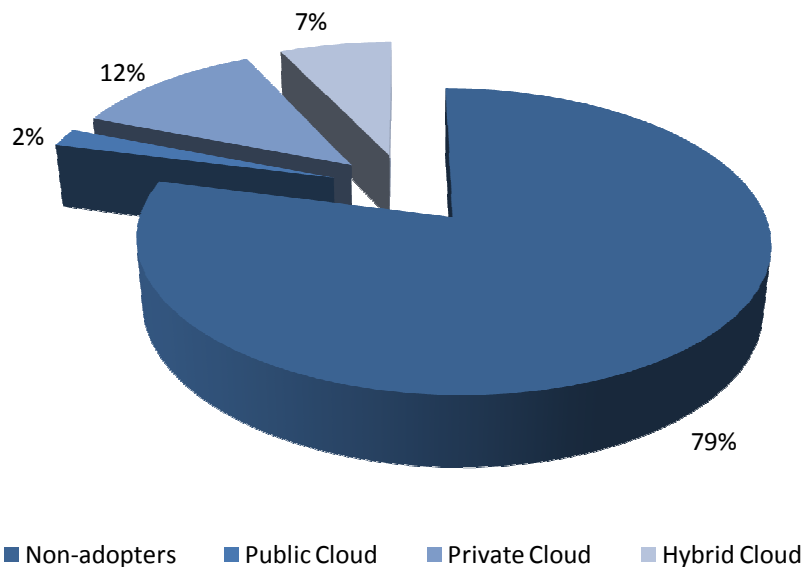
Apart from the United States, other countries too are making significant investments in the cloud and charting out a path for wide spread adoption across functions. Governments in Asia too are looking at cloud services to bring in efficiencies in their ICT usage. They are looking to enhance their own ICT infrastructure and reduce ICT spending while doing so. They also believe that by establishing a cloud computing ecosystem within the country, they will be

able to generate more business opportunities and even create export opportunities for these services. Furthermore, the governments are looking to promote acceptance of these services across multiple verticals.

According to a recent Frost & Sullivan study in the Asia Pacific region, 21 percent of the respondents in the government vertical have adopted cloud computing in one form or the other. Furthermore, it also revealed that given the governments concerns around security of data and location of data centers, private and hybrid clouds are witnessing significantly higher adoption in the region.

Chart 6: Adoption of Cloud Computing in Asia Pacific

Cloud Computing Adoption by APAC Governments by Type of Cloud



Source: Frost & Sullivan

Cloud Computing Initiatives in Asia Pacific

Countries in Asia Pacific are in different stages of forming a cloud strategy and implementing it. An overview of the major cloud computing initiatives across the Asia Pacific region is provided below.

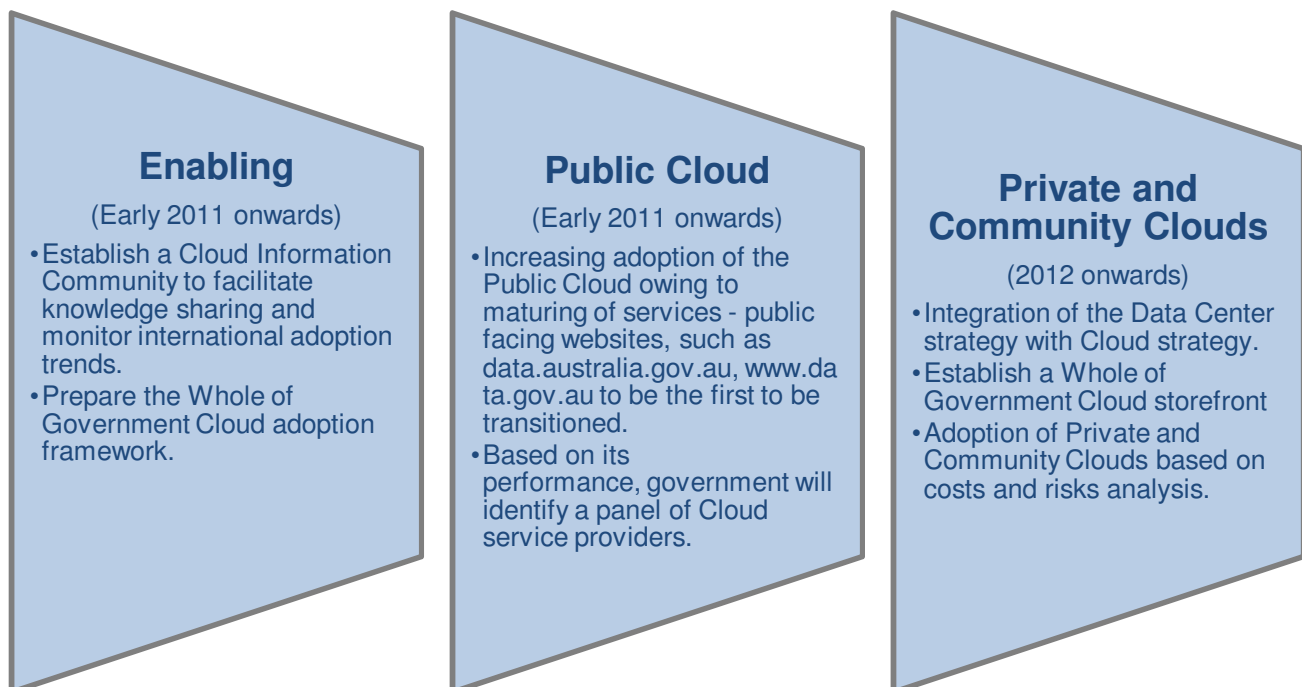
Australia Expanding the Whole of Government Approach to the Cloud

The Australian Government has been quite circumspect in its approach in adopting cloud computing, primarily due to their uncertainty over storing data in offshore data centers. Given the shrinking ICT budgets due to the economic crises, certain agencies did go ahead and try out cloud computing services. Some agencies that have taken the first step are:

- **Australian Taxation Office (ATO)** has moved eTax, Electronic Lodgement System (ELS) and Tax Agent Board administrative support systems into the cloud.
- **Australian Bureau of Statistics** has implemented a virtualization solution to enable transition to a private cloud environment.
- **Treasury / ATO** has migrated Standard Business Reporting (SBR) and Business Names projects into the Cloud.
- **Department of Immigration and Citizenship (IMMI)** initiated a proof of concept for the provisioning of an end-to-end online client lodgement process on a cloud platform.
- **Australian Maritime Safety Authority** has implemented a Public Cloud for SaaS and PaaS deployments from Salesforce.com.
- **Department of Immigration and Citizenship (DIAC)** has implemented a Hybrid Cloud for IaaS as a proof of concept.
- **West Australian Health** has adopted for a private cloud for the IaaS deployment. The data centers are expected to be completed in April and June 2011.

In terms of a more broad-based adoption, the government has recently put together a draft framework to guide its cloud computing strategy. The Australian Government has already adopted a Whole of Government approach toward data centers to consolidate all its data center requirements for the next 10-15 years, a move which is expected to save \$1 billion during that time period. The Government is looking to expand this approach to cloud computing. In the draft document, the Government has outlined its plans in the form of three streams – enabling, public cloud, and private and community clouds.

Chart 7: Australian Government's Phased Cloud Implementation Strategy



Source: Cloud Computing Strategic Direction Paper, Department of Finance and Deregulation, Australian Government

China Leveraging Cloud Computing to Transform City of Dongying

Cloud adoption in the public sector in China is being driven at a local level in cities such as Dongying and Wuxi. The Mayor of Dongying Municipal Government plans to transform the city of Dongying from a manufacturing-based economy to a high-tech services oriented economy. He aims to achieve this with the help of the cloud computing platform which is being developed for the city. The Yellow River Delta Cloud Computing Center, being built by IBM, will provide cloud-based platform for the petroleum industry to develop more innovative application services. Furthermore, the center will provide software development and test resources, through the Internet, to start ups and other companies that establish their presence in the city. In addition, this cloud will be expanded to also be an eGovernment Services Platform for the Dongying economic development zone.

As part of future phases, there are plans to implement a solution that will enable “Smart Roads” and a “Smart Airport” based on data analytics. This will be followed by the addition of healthcare services to the cloud as part of the plan to centralize patients’ records and make them available to doctors online. The Government is observing this project with keen interest to identify what works for its services and to replicate these learning across the country.

In the city of Wuxi, the Government has developed a Cloud Services Factory to provide adequate computing resources to the enterprises located in the Software Park. These enterprises, primarily start ups, did not have the financial bandwidth to acquire the required IT assets to compete effectively. The Cloud Services Factory is also expected to attract more enterprises to the city, as it reduces the financial resources required to set up the IT infrastructure.

Hong Kong Government’s New IT Strategy for 2011 to Focus on Cloud Computing

The Hong Kong Government will roll out its new IT strategy in 2011. The strategy, according to the Government CIO Jeremy Godfrey, will have cloud computing as a major focus area. The Government is evaluating the use of cloud computing for sharing infrastructure, software components and data. Moreover, the Government believes that collaboration and communication – internally, between departments and with citizens – hold the maximum potential with a shift to cloud technologies and this will be one of the focus areas of the cloud strategy. This will be followed by adoption of services that facilitate information management such as record keeping.

However, the Hong Kong Government will take a cautious approach toward deciding the areas where cloud computing will be implemented in order to ensure that data security and privacy are maintained. Hence, before implementing the public cloud, the Government plans to use private clouds in the initial phase to augment Government capabilities. The private cloud may not be hosted in a government data center, but be an outsourced private cloud, where the Government has complete knowledge of the location of its data.

The cloud strategy, which is still a work in progress, will focus on adoption over a period of time rather than a big band transformation, the time frame for which has also not been planned. Currently, the Government is evaluating the different cloud applications and deciding on which ones to adopt first.

According to initial reports, one of the first services to be adopted can be the Directory and HR Management services, which are very similar across departments. Moreover, the Office of Government Chief Information Officer (OGCIO) will develop the central cloud capabilities and in a way act as a service provider to the different departments.

Security Concerns Hindering Adoption by Indian Public Sector

The Indian Government is yet to announce a formal cloud strategy and there has been very limited adoption of cloud computing even at state level. This is primarily due to the security and privacy concerns of letting go of control of their critical data to third party service providers. The Jammu & Kashmir state government is the first to adopt cloud computing for its eGovernance services. The Government, using the State Data Centers based out of Madhya Pradesh, is provisioning eGovernance services such as issuing death or birth certificates and trade licenses through the cloud. The Jammu & Kashmir Government uses Microsoft's solution to implement cloud computing. The governments of Himachal Pradesh and Uttaranchal are also in discussions with Microsoft to roll out eGovernment services based on the cloud platform.

Despite low adoption levels, there is significant interest among agencies and the Department of IT in India to promote cloud computing across the country. This increasing traction is expected to result in increasing adoption in the near future, as governments/agencies look to adopt private clouds to reduce ICT spending and bring in efficiencies.

Lack of Infrastructure and Low Awareness Levels Inhibiting Adoption in Indonesia

The availability of high-speed reliable Internet continues to be low in Indonesia. As this is a primary requisite for cloud computing, it is a major inhibiting factor in the adoption of cloud computing in the public sector of the country. Another issue is the low awareness levels about Cloud and hence, the true advantages of the delivery model are still not clear to most. These two factors together have discouraged the government of Indonesia from investing in cloud computing.

Japan to Tap Government Potential through the Kasumigaseki Cloud

In 2009, the Japanese Government embarked on a significant cloud initiative as part of its Digital Japan Creation Project, dubbed the ICT Hatoyama Plan. As per the Japan's Ministry of Internal Affairs and Communications, the cloud initiative, Kasumigaseki Cloud, aims to establish a large cloud computing infrastructure to meet the increasing requirements of the Government's IT systems and bring in greater efficiencies through a shared pool of resources, thereby eliminating the need to maintain separate IT systems for different ministries.

As part of the project, a new National Digital Archive will also be developed to digitize government document and other popular information, and introduce standardized formats and metadata to improve public access. The standardization will also reduce the number of documents required with each filing and hence, reduce the workloads for the private sector.

The Kasumigaseki Cloud is expected to be completed in phases by 2015, and apart from resulting in cost savings, consolidation of the IT infrastructure is expected to make the IT operations more environment friendly. The Japanese Government is highly focused on Green IT in three key areas - high functionality and performance data centers which have smaller footprints; the innovative use of citizen information by integrating the data use platform; and data portability and revising the legal system.

The South Korean Government Investing in Cloud to Drive ICT Industry Competitiveness

South Korea's Communication Commission has allocated about \$500 million for the development of Korean Cloud Computing (KCC) facilities. KCC has partnered with Ministry of Knowledge Economy and the Ministry of Public Administration and Security for the creation of Cloud-based IT infrastructure that supports the Government as well as the ICT industry. The initiative is expected to boost cloud computing services in the South Korean market to promote local participants to enter the market. As these participants gain expertise, they are expected to play an increasing role in the export of cloud services in the global market. Moreover, Government agencies, which have been cautious in adopting cloud services, can currently leverage local service providers. This is aimed toward garnering a 10 percent of the global cloud computing market as well as a reduction of 50 percent in public sector's ICT spending by 2014.

South Korea has also been involved in the Electronics and Telecommunications Research Institute in the OpenCirrus collaborative cloud computing research program. The experience of participating in the research program is expected to help the country achieve the above mentioned goals.

The Malaysian Government Creating the Right Environment to Push Cloud Services

In mid 2009, MIMOS took the first step toward public sector cloud computing by joining the open source cloud computing test bed called Open Cirrus, created by HP, Intel, and Yahoo. This was aimed at learning from the global adoption of the delivery model and establishing a platform for the same in the country. Furthermore, MYEG and the National Archives database use certain elements of the private cloud platform. However, there is significant room for the expansion of cloud services in the country.

More recently, the Malaysian Government has identified cloud computing as a major focus area and had earmarked cloud computing as the foremost strategic technology for 2010 under the MSC Malaysia program. The Malaysian Information System Officer Association expects cloud computing to lead to increased transparency and reduced ICT expenditure by up to 50 percent, while improving efficiencies. Furthermore, as part of the 10th Malaysia Plan, the cloud computing services are expected to be developed to provide SMEs with software applications for ERP, CRM, SCM, HRM, and financial and accounting management.

Lack of a Central Authority to Develop Standards Affecting Cloud Adoption in the Philippines

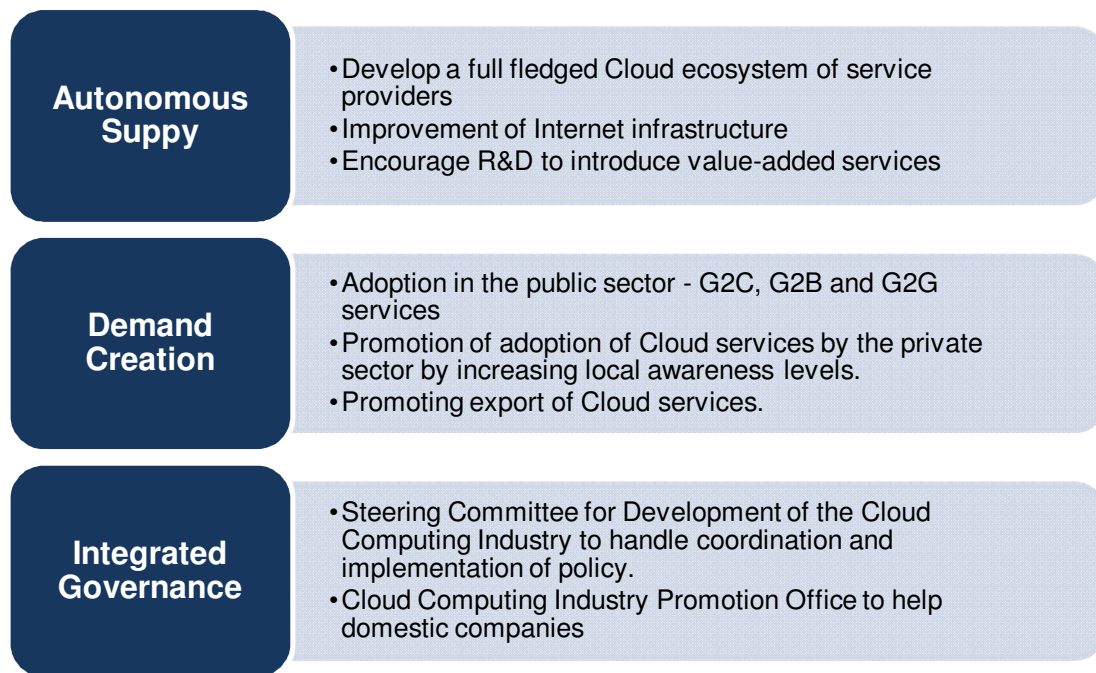
The Philippines lacks standards for ICT, security, and information exchange and handling. This is due to the absence of a central ICT agency to take up this role is a major inhibitor for cloud adoption by the Government. Different Government agencies have developed their own standards of using information. This lack of standardization, clubbed with the issues around security and infrastructure problems, makes implementing cloud solutions a big challenge in the public sector.

The Singapore Government Promoting Cloud Computing through Subsidies

Singapore, the data center hub of the Asia Pacific region, is well positioned to leverage the current investments of market participants, the large presence of MNCs and a strong network infrastructure to establish a dominant position in the global cloud computing market. In order to promote cloud computing in the country, the Info-communications Development Authority (IDA) of Singapore has taken up the development of relevant infrastructure as a primary focus area. IDA has been calling proposals to identify service providers to take up specific infrastructure development projects. Furthermore, the IDA is also offering subsidies in the range of 50 to 100 percent to further boost industry participation.

The Taiwanese Government Investing Significantly in Cloud Services

In 2010, the Taiwanese Government announced its Cloud Computing Industry Development Program with the aim of maintaining its ICT industry's competitiveness in the global market. The Government plans to spend \$744 million over the next five years to establish cloud computing technology and services in the country. The Ministry of Economic Affairs (MEA) has developed a three pronged strategy to achieve these objectives:



Source: Council for Economic Planning and Development, Taiwan

The Thai Government is Starting to Test-out Cloud Services for Long-term Use

In Thailand, the Government Information Technology Service (GITS) is putting together a private cloud infrastructure for Government agencies. It has already started offering an e-mail service through the cloud and plans to add software-as-a-service offerings in the near future.

Vietnam Government Collaborating with IBM to Promote Adoption

In Vietnam, the Government has collaborated with IBM and educational universities to promote greater adoption of cloud-based services by public and private sectors. The Vietnamese Government is also of the view that cloud computing has the potential to lead the economy to a services lead economy.

Cloud Provider Initiatives are also Driving Public Sector Adoption

The government's objectives while migrating to the cloud are to meet its operational needs, while reducing costs and increasing agility and efficiency. As highlighted before, security and ROI are the key factors during government's evaluation of cloud service providers. Service providers are responding to these requirements by creating special federal clouds to service these demands.

Service providers are adding another layer of security in their datacenters and focused on enhancing the value proposition for the public sector. Added security is being provided through bio-metric scanners, locked racks, and separate caging for government servers. Service providers are increasingly looking at third-party security audits

and certifications such as SAS 70 and ISO 27001 to validate their claims and assuage concerns. To offer more value, service providers are provisioning government clouds in a community cloud model dedicated for government customers. This allows government departments and agencies to leverage shared resource pool and drive cost efficiencies. Furthermore, the network infrastructure is also dedicated and offers one of the most stringent SLAs and guarantees to meet the high availability requirements of government agencies.

Selecting the Right Federal Cloud Provider

Given the special considerations for federal clouds, it is important for the public sector to consider various factors in selecting the right cloud service provider. It is essential to look beyond the cost savings of moving into the cloud to factors such as data center location, security features, data handling policies and others. A checklist guide which may be useful in selecting the right federal cloud provider is illustrated below.

Chart 8: Checklist for Selecting the Right Federal Cloud Provider

✓	SLAs or SLGs that Ensure High Availability and factors such as disaster recovery and incident handling
✓	Data Handling Guidelines – Storage, Access, Retrieval and Retirement
✓	Security Best Practices – separate cages, adherence to ISO 27001 and SAS 70, encryption, etc.
✓	Regular Third-party Assessments – to drive transparency and trust
✓	Migration handling capability and integration experience
✓	Adherence to local regulatory compliance requirements
✓	Strong Service and Support team
✓	Carrier neutrality to support multiple network providers
✓	Strong micro-billing capabilities to accurately track and bill consumption

Source: Frost & Sullivan

Striking the Right Regulatory Balance

Despite the increasing interest and adoption of cloud computing in the public sector, certain factors continue to slow down the adoption of cloud services in the sector. For the public sector, the decision to move to the cloud is not just based on the cost savings expected or access to latest technologies. Instead, clouds are associated with multiple issues – such as reliability concerns, security and privacy, data governance, and protection of intellectual property.

These, clubbed with a lack of clarity over jurisdiction issues due to free flow of data across state and national borders, complicate the decision to move into the cloud, especially for the public sector.

In order to overcome these issues, governments in the region need to put in place plans to improve local internet infrastructure, promote entry of local participants in the market and bring in standardization.

Unlike the United States and European Union (EU) which are largely homogenous regions from a jurisdiction standpoint, Asia Pacific is an extremely heterogeneous region. In the absence of international cloud computing legal and governance frameworks, cross-border data interchange will be nearly impossible in the government sector. Datacenters hosting the cloud infrastructure have to be largely local and preferably closer to the Federal agencies.

It is also essential for policy makers to strike the right regulatory balance in ensuring flexibility, regulatory compliance and jurisdiction issues. The right balance between these three components will allow cloud computing to perform in an efficient manner driven by trust and confidence, and inspire innovation.

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