

**FACT SHEET
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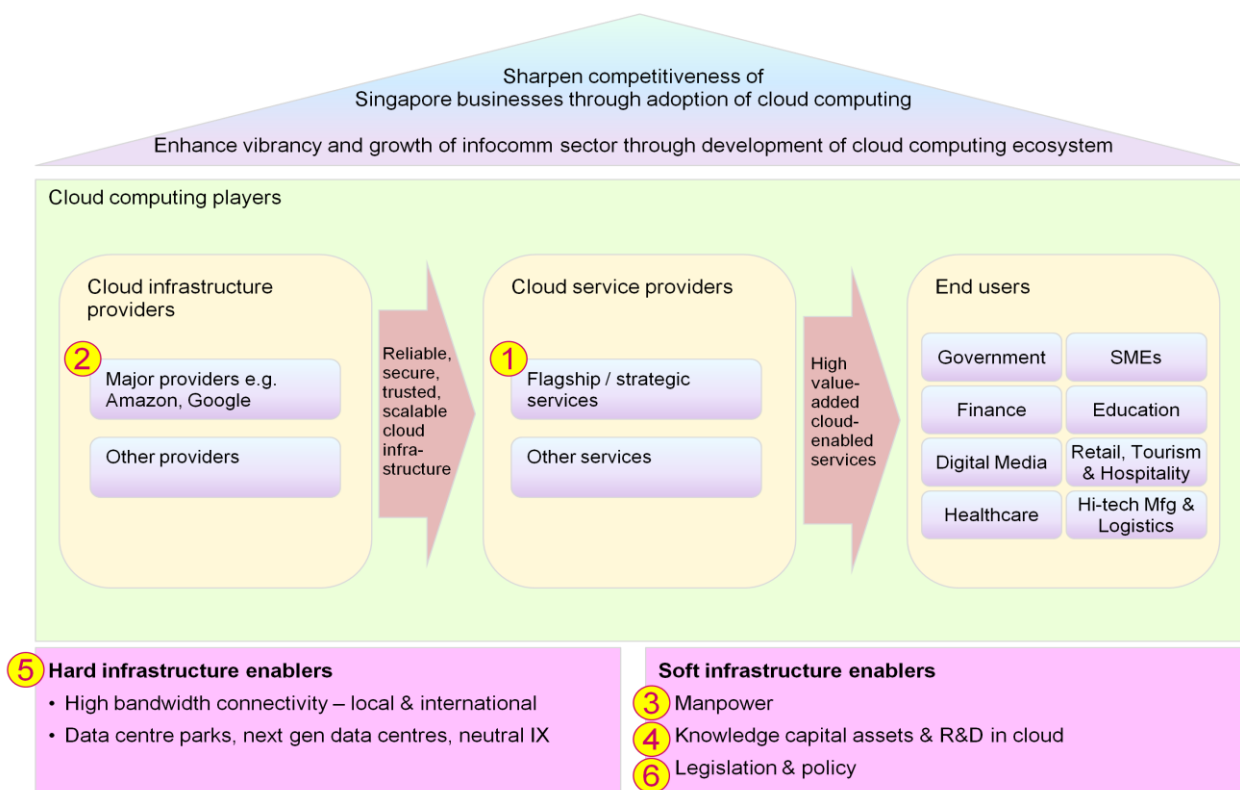
A New Paradigm in Cloud Computing

The Infocomm Development Authority of Singapore (IDA) notes that there is a paradigm shift in computing, where businesses and end-users will be accessing applications such as word processing, storage, and even compute power, through the Web. In short, the interwoven nature of Internet applications will be akin to a “cloud” of services that everyone can eventually access easily through a broadband connection. These services are also typically offered via a “pay-as-you-use” model. Cloud computing enables consumers and business users to consume infocomm services without the need for an IT support team..

With this paradigm shift, it is important for Singapore to remain competitive through the adoption of cloud computing and enhance the vibrancy and growth of the Singapore infocomm sector through the development of a cloud computing ecosystem. With the Next Generation Nationwide Broadband Network (Next Gen NBN) coming into place, Singaporeans will have even faster access, with cloud computing offerings being part of the exciting range of next generation services to come.

Six Key Thrusts

IDA has taken a strategic approach to leverage this paradigm shift to sharpen the overall economic competitiveness of businesses in Singapore. The six key thrusts are detailed in the paragraphs below, and the related framework in Figure 1:



Thrust 1 - Flagship Users of Cloud Services

The attraction of flagship cloud users into Singapore would lend global credibility of Singapore's capability in this space.

Thrust 2 - Attraction of Cloud Players

Clouds require significant investment in the underlying infrastructure, such as data centres, broadband connectivity and servers, as well as in manpower resources for research and operations. Such investments are long-term and well considered business decisions.

Thrust 3 - Competency Development for Industry & Manpower

A pre-requisite to a vibrant cloud computing ecosystem is the capability of the local infocomm companies and workers exploit the new paradigm shift in order to develop innovative cloud-based services. There is a role for IDA to put in place the necessary framework and incentives for companies and workers to upgrade their competencies in this new space.

Thrust 4 – Forge R&D Relationships and Build Knowledge Capital Assets

Singapore seeks to harness its existing knowledge capital resources in IHLs and RIs to attract major corporate cloud R&D to set up in Singapore. Investing in cloud R&D is not enough where there is a need to bridge the gap and provide a conducive environment for the translation of R&D results into industry practice and product/services deployment.

Thrust 5 – Provide Enabling Infrastructure

For Singapore to be a cloud computing hub to the rest of the world and region, there would be a need for world-class high speed and seamless broadband connectivity within Singapore, as well as connecting Singapore with other major cities. Development of major infocomm infrastructures such as Next Gen NBN, Singapore Internet Exchange and Data Centre Park, provide a competitive environment in nurturing a vibrant cloud computing ecosystem.

Thrust 6 – Build a Trusted Environment through Policy and Legislations

Cloud computing investments would gravitate towards jurisdictions with stable, trusted business environment, especially when larger enterprises with mission-critical or data sensitive requirements move into the cloud.

Providing Enabling Infrastructure

1. Bulk Tender for Cloud Services

Three local consortia, led by SingTel, PTC System (S) Pte Ltd, and New Media Express Pte Ltd have been offering commercial services to the industry on a pay-per-use mode since November 2008. Businesses can enjoy these services as a utility, without upfront investment in hardware and software on their part. For Government users, such services can be procured under the Bulk Tender for Cloud Services. The Bulk Tender is aligned with Government's objective of achieving greater efficiency at the Whole-of-Government level to achieve fiscal prudence and greater efficiency by aggregating end users' demand and provide shared facilities to achieve economies of scale.

2. EnVision

This period bulk tender was called by IDA for the supply of video hosting and streaming services using the utility pricing model to Government ministries/departments, statutory boards, organs of state, and participating entities.

3. SaaS Enablement Programme
IDA has established a Software-as-a-Service (SaaS) Enablement Programme in October 2011. We support efforts to convert existing software operating on the traditional upfront software licensing model to one that is cloud-based on a utility pricing model. Under this programme, funding support will be provided for manpower, professional services and training expenses in relation to SaaS enablement efforts.
4. Central Government Cloud
IDA has plans for the Central Government Cloud (or G-Cloud), which will be the next generation Whole-of-Government hosting infrastructure. The G-Cloud tender, called in September 2011, will achieve cost synergies and provide a full spectrum of cloud offerings, in addition to a platform for developing new innovative services for public service applications.

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Building a Trusted Environment

1. ITSC Cloud Computing Task Force
IDA worked with the Infocomm Standards Committee (ITSC) to set up a cloud computing standards coordinating task force in February 2011. The task force, which is comprised of representatives from IDA, ITSC, Singapore Computer Society, Singapore Infocomm Technology Federation and the Information Technology Management Association as well as industry verticals (e.g. healthcare) will work on guidelines on these issues with inputs from the industry. The current areas of focus are cloud security standards, best practices for virtualisation security and a checklist on Service Level Agreement for cloud adoption. The deliverables are ready as of 31 March 2012.
2. Data Protection Policy
MICA's proposed framework for data protection is a significant move in strengthening the soft enablers to establish a trusted environment for Cloud Computing in Singapore. Until then, the lack of an overarching law on data protection has often invited queries from potential cloud users from Asia Pacific on whether Singapore-based cloud data centres are able to provide adequate protection for them. Cloud service providers (CSPs) will definitely welcome the removal of ambiguity when servicing cloud users from within and outside Singapore.

Encouraging Cloud Adoption

1. Calls for Cloud Computing Proposals

IDA has launched four Calls for Cloud Computing Proposals since 2010, as part of its efforts to promote the adoption of Cloud Computing. Depending on the impact and scope of the project, selected projects (from industry, Government and R&D) receive support in terms of compute and storage resources based on the approved duration (of up to 6 months) and quantum of cloud services (compute core-hours and storage GB-months) from one of the participating CSPs which sponsor cloud resources. The four calls have seen 57 projects awarded cloud resources to undertake testbedding, proofs-of-concept and research.

2. SaaS Incubation Centres

To ensure that aspiring independent software vendors (ISVs) have access to help in adopting the Software-as-a-Service (SaaS) model, SaaS incubation centres (SICs) are needed to render business and technical consultancy services to these ISVs. In so doing, SICs equip industry and consumers with on-demand and pay-per-use access to cloud services to deliver new and innovative business models. The SICs also provide training and guidance in SaaS-enablement. Software that have been successfully ported are hosted by CSPs.

At each SIC, a staging platform is available for aspiring SaaS ISVs for:

- Testing and initial commercialisation for new SaaS providers
- Integration with SaaS provisioning – portal & billing system
- Technology augmentation
- Implementing proof-of-concepts
- Demonstration to end users

The AkSaaS Incubation Centre was appointed by IDA as a SIC in September 2008. This SIC is operated by AkSaaS Pte Ltd and was successfully developed by Exploit Technologies Pte Ltd. As of 1 September 2011, 53 ISVs have been SaaS-enabled at this SIC. These SaaS offerings include: enterprise resource planning, supply chain, business Intelligence, document management, property management, finance, workflow, performance management, inventory, marketing, medical diagnosis, maps and helpdesk.

3. Cloud Innovation Centre

The Cloud Innovation Centre (CIC), operated by Platform Computing Inc and with the support of IDA, enables Singapore enterprises, ISVs and start-ups to accelerate the adoption of cloud computing technologies in transforming their business for greater competitiveness and productivity. The CIC, which was established on 13 April 2009 and located at Fusionopolis, focuses on helping enterprises to build private clouds and address many of the challenges associated with using a private cloud. The CIC provides enterprises with the infrastructure and software expertise for consultation, development and testing of cloud computing applications or proofs-of-concept.

4. Inclusion of Cloud Computing under PIC
Cloud computing, specifically SaaS, Platform-as-a-Service and Infrastructure-as-a-Service, is now allowed under the Productivity and Innovation Credit (PIC) Scheme. The first \$400,000 in costs incurred to acquire cloud computing resources would qualify for a 400 per cent tax deduction. Businesses are strongly encouraged to make full use of the PIC Scheme to invest in productivity and innovation. To take advantage of this, no application is required; businesses can claim the tax benefits as part of their tax filing.

Forging R&D Relationships & Building Knowledge Capital Assets

1. Singapore Centre of Excellence for Open Cirrus Cloud Computing

On 30 July 2008, IDA joined hands with three technology giants (HP, Intel and Yahoo!) to set up a research initiative to study cloud computing. As a Centre of Excellence (COE) in this joint initiative, IDA creates opportunities for research and development in the area of cloud computing, enhances local capabilities and also allows users easy access to this service.

Researchers from HP Labs, Intel, Yahoo Research and Singapore jointly identified the research and development focus for the testbed. However, the main aim is to build up a core group of people who have the skill set to undertake and develop cloud computing innovations. The objectives for the Singapore COE are (a) promoting research and development, and (b) building competency.

Progress was made in promoting cloud computing and Internet-scale data intensive research and applications among the local research and developer communities. This has heightened interest among the academic research community in undertaking cloud R&D, a vast contrast to earlier sentiments that cloud computing addressed no new research areas and was purely an implementation approach that was the purview of the ICT industry.

IDA's participation in Open Cirrus was made possible by tapping on the cloud resources made available by Alatum under the terms and conditions of the Grid Service Provider (GSP) Call-for-Collaboration. It entailed no additional funding from IDA. The joint initiative resulted in a three-year memorandum of understanding that expired in July 2011 and was not renewed as Alatum cloud resources available to IDA will expire in November 2012.

2. IBM Cloud Lab

This collaboration between IDA and IBM seeks to promote and accelerate the adoption of cloud computing and associated business models through conducting applied R&D to tackle challenges and issues identified by users from Government and industry. IBM Cloud Lab provides an integrative capability that creates prototypes of innovative solutions required by the industry, facilitating the harnessing of research results and deployment, and shortening the timeframe to adoption.

The IBM Cloud Lab in Singapore was officially launched on 4 May 2010 and is hosted at IBM Changi Business Park Building with required hardware, software and resources. The first result of the IBM Cloud Lab is the High Performance Computing (or HPC) cloud platform at the Nanyang Technological University (NTU) – a first-of-its-kind in the world – which will offer a combination of the best of high performance computing from HPC infrastructure, and the flexibility, self-services, scalability and virtualisation from cloud computing. This is currently being developed as a production pilot for use by NTU researchers. One of the first set of users to benefit is from NTU's School of Art, Design and Media which will use the new HPC cloud platform for rendering digital animation media to create rich content for their media and entertainment projects. After the initial cases have been validated, this HPC cloud environment will be opened up to the wider pool of researchers and students at NTU, and potentially to commercial users as well.

3. IDA-A*STAR Partnership

IDA is partnering with the Agency for Science, Technology and Research (A*STAR) on a technology evaluation programme where ICT companies can develop cloud computing solutions based on technologies made available by the Institute for Infocomm Research and Exploit Technologies Pte Ltd through a short-term no-fee evaluation licence grant that also gives these companies an option to take on a commercial licence if their trial deployment proves to be successful and of value.

Facilitating Competency Development for Industry & Manpower

1. CITREP funding for cloud computing courses

IDA has been working with industry and educational institutes partners to put in place the necessary framework and support for companies and workers to upgrade their competencies in the new cloud space. The NTUC Learning Hub together with the University of California at Berkeley launched a series of cloud computing courses in February 2011. Attendees of these courses enjoy funding support under IDA's Critical Infocomm Technology Resource Programme (CITREP). CITREP provides up to 50 per cent of the nett payable course and certification/assessment fees, capped at \$2,500 per trainee. To be eligible for funding support under CITREP, a trainee must (a) be a Singapore Citizen or Singapore Permanent Resident; (b) fulfill the admission criteria set by the Course Provider or Certificate Awarding Body; and (c) be enrolled by the endorsed course providers or testing centres for intended courses or certifications prior to commencement of the training courses or certifications. As of Dec 2011, a total of 73 people have been trained on Cloud Computing under CITREP.

Attracting Cloud Players

Cloud requires significant investment in underlying infrastructure such as data centres, broadband connectivity and servers, as well as manpower resources for research and operations. IDA works closely with other Government agencies to attract cloud players into Singapore. Global CSPs that have established their cloud data centres in Singapore for local and Asia Pacific market include Amazon Web Services, Atos, Fujitsu, IBM, Microsoft Azure, Savvis, Salesforce.com, and Tata Communications. Local established CSPs include Alatum (SingTel), nGrid, ClearManage (CrimsonLogic), M1, PTC, ReadySpace, and StarHub.

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