Connected Singapore

A new blueprint for infocomm development

iDA
SINGAPORE

Connected Singapore

unleashing potential, realizing possibilities,
through Infocomm.

Contents

CEO's Message

Infocomm has become an integral way of life in Singapore. Our people, businesses and government have harnessed its potential and reaped enormous benefits.

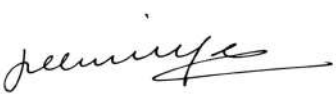
Infocomm is also a significant contributor to the Singapore economy, accounting for 7% of GDP. The sector and industries exploiting infocomm together provide 100,000 jobs.

Technological change and business innovations will continue to shape the growth and development of infocomm. Singapore needs to respond nimbly and flexibly.

While it is not possible to anticipate all new developments and prepare for each one, the *Infocomm Development Authority of Singapore (IDA)* will continue to focus on capability building, industry development and impactful adoption. *IDA* will be developing new industry initiatives to create new business opportunities and jobs.

The Connected Singapore vision and strategies outlined in this publication represent *IDA*'s efforts in conceptualizing an adaptable strategy to develop the infocomm sector and to encourage beneficial usage of infocomm. The ideas here have benefited from our discussions and collaborations with industry partners, partner agencies and user organizations.

I invite you to be part of an exciting journey to harness infocomm technology for growth and progress.



Tan Ching Yee

Chief Executive Officer
Infocomm Development Authority of Singapore

March 2003

Singapore's Infocomm Journey - From Computerization to Convergence

The *National Computer Board (NCB)* was set up in 1981 to implement the first National Computerization Plan. The three key components of the Plan were: computerization of the Civil Service, the growth of a local IT industry, and the development of a pool of IT manpower to support a thriving high-tech industry. The Civil Service Computerization Plan achieved a return of S$1.71 for each S$1 of investment.

In 1986, the National IT Plan was formulated to recognize the convergence of computing and communications, leading to the introduction of networking technologies, integrating computing and communications, and providing one-stop, fast and efficient services. The internationally acclaimed TradeNet was implemented under this plan to provide efficient and paperless processing of trade documents by a number of government departments via electronic data interchange (EDI). Other EDI systems implemented successfully under the National IT Plan were Lawnet and Medinet for the legal and healthcare communities respectively.

The next milestone was in 1992 when NCB launched the IT2000 blueprint to transform Singapore into an intelligent island with IT pervading every sphere of economic and social activity. One notable initiative was Singapore ONE, the world's first nationwide broadband infrastructure. A number of flagship projects were successfully implemented under IT2000, including an electronic network linking all public libraries, a secure infrastructure for electronic commerce, and an expert system for the checking of building plans.

By the turn of the millennium, the convergence of IT, telecommunications and content markets had become a reality and the Internet was opening up new opportunities across all sectors. The *Infocomm Development Authority of Singapore (IDA)* was formed from a merger between the *NCB and the Telecommunication Authority of Singapore (TAS)* to spearhead Singapore's drive into infocomm.

Infocomm 21 was unveiled in 2000 to develop Singapore into a vibrant and dynamic global infocomm capital, with a thriving and prosperous e-Economy and a pervasive and infocomm-savvy e-Society. The first major development under Infocomm 21 was the full liberalization of the telecommunications market to allow for full competition in the provision of telecommunication services, including basic fixed line telephony.

Within two years, Singapore's international telecommunications bandwidth has expanded by 400 times. Full liberalization has drastically reduced telecommunication costs for consumers and businesses, with international direct dial (IDD) rates to popular destinations falling by up to 60%. One in three Singaporeans uses broadband for online access from home, school or office. Foreign and local infocomm companies pilot new technologies, products and services in Singapore, making Singapore an ideal launch pad to Asia. About 90% of government services are available online, with Singapore's e-government ranked second in *Accenture's* study of e-government maturity in both 2001 and 2002.

The Future of Infocomm - Trends and Developments to Watch

The bursting of the dot.com bubble in mid 2000 and concerns over corporate governance and global economic uncertainties have adversely affected sentiments and confidence in the future of infocomm, both in Singapore and globally.

But a scan of technological and business developments worldwide suggests that there are still many untapped opportunities, new possibilities and dramatic improvements that infocomm technologies will bring.

Infocomm remains an engine of growth and a key enabler to other sectors of the economy, despite the global infocomm industry taking a beating over the past two years as a result of over-spending in IT, the dot-com crash, and over-investment in telecommunications. This view is held by expert sources such as those listed below.

- According to the *World Economic Forum* Global IT Report 2002-2003, infocomm is deemed to be a critical catalyst for social transformation and national progress. It has been and continues to be a powerful engine for economic development, and forms the "backbone" of several industries, such as banking, airlines, and publishing. Furthermore, it has become an important value-adding component of consumer products, such as TVs, cameras, cars, and mobile telephone sets. Infocomm is today a dominant force in enabling companies to exploit new distribution channels, create new products, and deliver differentiated value-added services to customers.

- Prospects for the infocomm industry remain strong and the sector will remain a leading player in industrial globalization. According to the *OECD* Information Technology Outlook 2002, markets for information and communications goods and services are equivalent to 8.3% of the total GDP of OECD countries in 2001, compared with less than 6.0% in 1992. Trade in goods in the information and communications technology sector has grown steadily at twice the rate of trade in all goods in OECD countries since1990, with exports of such goods representing more than 5% of GDP in several OECD countries, both growing at much higher rates than GDP.

- Analysts polled by the *The Business Times* in Feb 2003 expect infocomm services to grow at a robust pace in Singapore and Asia-Pacific for the next few years. Growing at 6.2% in 2002, Singapore's infocomm services revenue is expected to grow at 8.7% in 2003, and more than10% annually thereafter through 2006, according to *Gartner*.

The pace of technological development and innovation continues unabated. Processor speeds, communications bandwidth, storage capacity, and proliferation of digital content are expected to continue their exponential growth. When combined, these developments will bring about ubiquitous computing and pervasive intelligent devices with universal broadband connectivity, providing access to rich media content and services anywhere, anytime.

Where infocomm helped individual enterprises to increase efficiency and reduce costs, it will now help drive quantum leaps in efficiencies, cost savings and innovations at the cluster and industry levels. Infocomm will be a critical enabler for all economic sectors, such as manufacturing, logistics, education, healthcare, finance, biotechnology, and media.

Infocomm will move from being a productivity tool for the world of work to being a vital part of personal communications, entertainment and education.

In short, infocomm will become part of our way of life and our way of making a living.

Connected Singapore
– A Blueprint for Renewed Confidence and New Growth Opportunities

Connected Singapore - A Blueprint for Renewed Confidence and New Growth Opportunities

To maintain relevance in the face of change, *IDA* has initiated a re-visioning exercise of Infocomm 21 to fine-tune the plan and to take cognizance of the need for Singapore to develop new sources of growth, including new areas involving creative inputs, like design and the arts.

IDA's vision for infocomm is:

Connected Singapore
Unleashing potential, realizing possibilities, through Infocomm

This vision sees infocomm as a key enabler, unleashing the potential of individuals, organizations and businesses to become more productive and efficient, and to create new ideas that enrich lives and produce new value. Through realizing new possibilities, Singapore will be a showcase and lead the way in strategic infocomm areas, thereby creating new business opportunities that will inspire companies and talent to come to Singapore. Infocomm technology will be a true connector – bringing together the power of computing, communications and content, to create new business opportunities, consumer value and cultural experiences.

IDA will implement programs under four key strategies (see Figure 1) to bring about the realization of the Connected Singapore vision, and ensure that there is a firm foundation to support the growth of the sector.

While *IDA* adopts the role of master planner for the strategies and acts as catalyzing agent and facilitator for the initiatives, the success of each program is heavily dependent on the participation of industry and citizens. It is hoped that these programs will spur every sector of the economy and population to identify how infocomm can specifically fit in and benefit their lives and businesses.

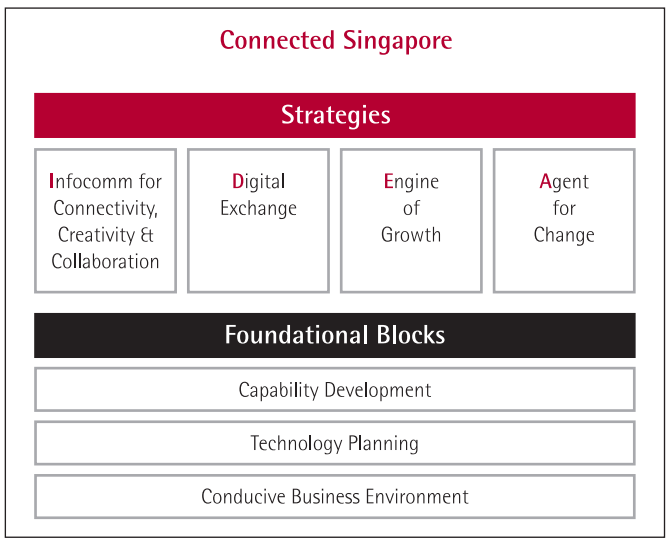


Figure 1: IDA's vision-strategy framework

Strategy 1: Infocomm for Connectivity, Creativity and Collaboration

This strategy aims to place infocomm products and services into the hands of everyone for more productive and enriching lives, by driving the development of an infocomm infrastructure for pervasive and secure access; promoting the development of useful applications for work, play, lifestyle and learning; encouraging usage of applications and services; and promoting infocomm literacy.

Pervasive National Infocomm Infrastructure

IDA will work on maintaining Singapore's world-class network readiness. In a report released by the *World Economic Forum (WEF)* in March 2003 titled "The Global Information Technology Report 2002 – 2003: Readiness for the Networked World", Singapore emerged as the third most IT-savvy country in the world, just behind Finland and the US.

IDA will extend the broadband capabilities of Singapore ONE to the wireless realm, thus providing users with the combined benefits of high-speed connectivity and mobility. An integrated network linking wireless LAN, mobile telephony, broadband Internet will bring Singaporeans closer to "anywhere, anytime" communications and computing. By 2006, *IDA* targets to achieve pervasive wireless connectivity, with 50% of households on broadband, and consumers enjoying a wide range of 3G services. Below are two examples on efforts to promote wireless connectivity.

Wired with Wireless

Wired With Wireless is a S$200 million (US$115 million) program launched by *IDA* in October 2000 to:

- Develop Singapore into a living lab for wireless research and development in Asia.
- Create a vibrant wireless industry for Singapore, with world-class wireless infrastructure, products and services.
- Promote and enable a wireless lifestyle for Singaporeans.
- Establish Singapore as a thought leader for wireless in the region.

Under the program, *IDA* collaborates with the industry to identify, develop and launch the development of wireless applications and services for retail, entertainment, transportation, healthcare, finance, manufacturing, trading and homes.

Calls for Collaboration (CFC) were issued to industry players to propose and trial applications that meet the needs of different user segments. To date, 30 projects have been successfully piloted, including those in mobile payments, wireless Java and mobile workforce.

Pervasive Wireless Connectivity - Early Successes

The three mobile operators in Singapore achieved interoperability for short messaging service in February 2000, and for multimedia messaging services (MMS) in November 2002, making this a first in Asia.

In September 2002, Wireless Internet Service Providers (WISPs) collaborated to create a national showcase demonstrating their solutions. With a single identity and password, subscribers are able to use hotspots operated by all participating WISPs and receive a consolidated bill from their own ISP. Singapore is expected to be the first reference site for local roaming by mid-2003.

In March 2003, *IDA* and *Intel* launched a year-long joint project to explore ways to bridge the communication between different Wireless LANs, Wireless WANs and Fixed Wide Area Networks. An inter-operability test will subsequently be conducted among various vendors and operators across networks and countries from the Asia Pacific region.

Attractive and Useful Content and Applications

A pervasive infocomm network is only as useful as the beneficial applications and attractive content that flow through it. The Creative Connections program is aimed at harnessing infocomm to give life to heritage and artistic resources, so that these can be transformed into new products, services and experiences which can be commercialized.

Common content exchange standards are expected to be set up by 2004 and pilots and trials will be implemented in up to three exhibition sites, including museums and galleries, by 2005. The distributed content management system will leverage on Singapore ONE in collaboration with other agencies e.g. the *National Arts Council, National Heritage Board* and *National Library Board*, by 2006.

Education is another promising area where there are boundless opportunities to exploit infocomm for a more enriching experience. The FastTrack@School Program is a successful example of leveraging on infocomm technologies to enhance education (see below).

FastTrack@School Program

The FastTrack@School Program was launched in 1999 to help schools explore and leverage on the power of broadband. Schools were encouraged to work with industry partners to jointly develop and test interactive multimedia content on broadband. The number of participating schools on the FastTrack@School Program has grown from an initial 27 in 1999 to 42 by 2002. To date, more than 120 schools have adopted interactive broadband multimedia content in their curricula.

The program benefits students by offering an enhanced learning process, particularly in the understanding of difficult concepts, via enabling features such as video-streaming, interactive animations, virtual simulations and online experiments. The use of broadband allows for interactive and media rich content, and students can enjoy the self-directed and self-paced learning process.

By working closely with the schools, industry players garner valuable experience and gain the opportunity to strengthen their product development capabilities, giving them a competitive edge in the global marketplace.

Infocomm Literacy and Access for All – "Got to Be Connected"

IDA will ensure that every Singaporean has the opportunity to acquire infocomm skills for the purpose of realizing the potential of infocomm for work, learning and play.

The Got to Be Connected program is an umbrella program that synergizes efforts through the National IT Literacy Program, the PC Reuse Scheme, the e-Ambassadors program and the TrustSG program to provide basic infocomm literacy training, improve access to PCs and the Internet for lower-income families, give continuing support to new infocomm users, and instill consumer confidence in online transactions respectively.

As at end February 2003, some 120,000 Singaporeans have been trained under the National IT Literacy Program. By 2006 *IDA* aims to increase PC ownership among the lower-income households from today's 37% to 45%.

To promote the e-lifestyle among citizens, sustained activities such as e-Celebrations Singapore are organized (see below).

e-Celebrations Singapore

e-Celebrations Singapore is an annual e-lifestyle campaign aimed at heightening public awareness on the benefits of a connected lifestyle and shape infocomm adoption for work, learning and play. With strong support from more than 100 partners from the private, public and people sectors, the campaign offers a full year of activities and events that are organized thematically.

In 2003, five thematic fairs on security and trust, small office/home office, e-shopping, edutainment and infocomm accessibility will be organized to boost consumers' confidence and trust, accelerate the adoption of an online culture, and improve access for all. *IDA* will continue to work towards building Singapore into Asia's most e-inclusive nation.

Strategy 2: Digital Exchange

This strategy aims to develop Singapore as a leading global digital distribution and trading center to create a new source of growth and extend Singapore's hub status in the digital medium. It will leverage on Singapore's excellent international telecommunications connectivity, a pro-business environment, and established legal and financial sectors. This is achieved through developing end-to-end infrastructure that integrates the processes of digital production, management, localization, archival, distribution; the secure provisioning of digital content, as well as efficient treasury functions for copyright management and strong project management skills for systems integration.

The digital exchange in Singapore will support a wide spectrum of content, ranging from interactive media and entertainment to digital assets and software applications. One main focus area is the digitization of local, regional and international film distribution.

Another major area is in digital publishing and software distribution. *IDA* aims to attract three of the top ten digital publishing or software companies to hub their regional distribution operations in Singapore.

The target is to increase the value of digital transactions through Singapore from the current S$150 million (US$86 million) to S$500 million (US$287 million) by 2006.

Strategy 3: Engine of Growth

This strategy aims to grow new economic activities and create jobs in infocomm, emphasizing opportunities that leverage on Singapore's traditional hub status. This is done by seeding new activities, developing innovation capabilities and encouraging technology development, expanding access to overseas markets, and entrenching and capitalizing on Singapore's position as a telecommunications hub.

IDA will work towards the target set by the ICT Working Group (under the Services Sub-Committee of the Economic Review Committee) to increase the GDP contribution of the infocomm industry from 7% to 10% of GDP by 2012.

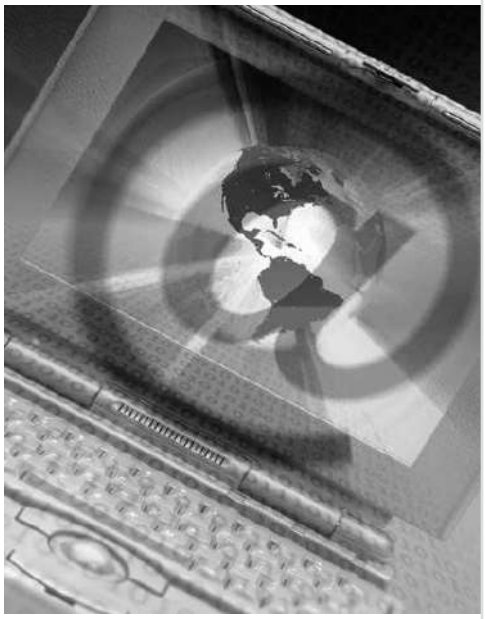
Potential New Growth Areas

IDA has identified five specific clusters in the infocomm sector that offer high growth potential, or 'good bets', for Singapore in the next one to three years. (Figures in brackets are *Gartner Consulting's estimated* global spending in these areas in 2005.)

The two areas with more immediate market opportunities create new services and applications on the wireless and wired networks. They are:

a) **Value Added Mobile Services (US$621 billion)** - Centers on technologies that support or allow ubiquitous connectivity to applications, devices or systems, such as location sensing and enterprise instant messaging.

b) **Infrastructure for Wireless and Wired Networks (US$428 billion)** – Focuses on hardware and software technologies required to support the flow and processing of information. Included in this cluster are wireless and wireline technologies, such as wireless LAN and peer-to-peer.



Beyond the more immediate areas, the other promising areas are:

c) **Multimedia Processing & Management (US$93 billion)** – Concentrates on technologies that enable the integrated presentation of text, graphics, video, animation and sound. These technologies allow services like e-learning and professional online services. Examples of technologies in this cluster include digital rights management, input (e.g. speech recognition) and data processing technologies (e.g. audio / data mining).

d) **Web Services & Portals (US$156 billion)** - Emphasizes new applications and services which arise from evolving web technologies. For commercial viability, there is a need for standardization and inter-operability. Key segments of this cluster include the technology providers, as well as applications and service providers.

e) **Security & Trust Infrastructure (US$96 billion)** - Focuses on aspects of security such as:

i. Firewalls,
ii. Encryption Software,
iii. Authentication, Authorization & Access,
iv. Anti-virus Software.

This cluster is still in an early stage of development. Fundamental enabling technologies such as biometrics and digital/privacy rights management are still being created and improved.

Singapore as a Digital Living Lab

Singapore offers a unique combination of ingredients to be the digital living lab for the region and beyond. It is a base for 6,500 multinational companies (MNCs), a home to tech-savvy citizens, and a hub for high-speed international and regional connectivity. It is also located in the world's fastest-growing region. Its compact size and well-organized society provide the responsiveness, nimbleness and flexibility to be an ideal test bed.

IDA will position Singapore as the ideal digital living lab where innovative and new infocomm solutions are created, tested, commercialized and deployed. It will do so through its Pilot and Trial Hotspots Scheme (PATH) and the Call for Collaboration (CFC) mechanism. The PATH initiative supports proof-of-concept and proof-of-value pilots and trials to encourage the development of selected technologies. With co-funding from *IDA*, the PATH scheme attracts businesses to invest in emerging technologies for pilot usage by early adopters.

Calls for Collaboration – from the Workplace to the Home and the Community

IDA has successfully used its Call for Collaboration (CFC) mechanism to encourage the organizing of industry partners into consortia to develop useful solutions that meet the needs of the workforce and citizens. *IDA* launched the Mobile Workforce Solutions CFC in May 2002 to encourage businesses to take advantage of the mobility offered by wireless technologies. Twenty consortia were selected to pilot mobile workforce solutions in the various sectors, including sales force automation, field force automation, supply chain management, resource planning and remote monitoring. Participating enterprises have since testified to advantages like improved decision making, productivity gains, cost savings, responsiveness to customer demand and visibility over the processes and operations.

IDA launched the Connected Homes Program in April 2002 as a test bed for integrated, end-to-end solutions for the home and community. A CFC was conducted for the program's Connecting the Home thrust, which encourages the development of home networking solutions that connect intelligent home appliances and communication devices.

Connecting the Community will be the next phase and is expected to be launched in end-2003. It seeks to establish seamless connectivity within the community by connecting healthcare providers, educational institutions, community groups and businesses through the development of a range of services.

IDA targets to bring in S$30 million (US$17 million) worth of innovative projects annually. An example of such a project is .Net MySingapore (see below).

.NET MySingapore

.NET MySingapore (pronounced as "dot-net my Singapore") is a strategic partnership between *IDA* and *Microsoft*, which aims to bring Singapore to a higher level of Internet connectivity through first-of-its-kind services that will allow Singaporeans to take advantage of leading-edge technologies. The key focus areas are the creation of community web services for Singapore citizens, the development of a new training curriculum and certification program for web services professionals, access by Singaporean developers to new web services technologies developed by *Microsoft* in the US, and an emerging technologies exploration initiative to work with academia and industry.

The other partners include the *Institute of Systems Science (ISS)*, *National Computer Systems (NCS)* and *NTUC Income*.

Increasing Singapore's Export Revenue – "Made in Singapore and Proud of IT"

Under the "Made in Singapore and Proud of IT" program, *IDA* will work closely with industry partners to double the export revenue of Singapore-based infocomm companies within a decade.

To further facilitate Singapore's infocomm companies' efforts to expand overseas, *IDA*'s Overseas Development Program helps companies collaborate with leading Singapore infocomm companies or MNCs to accelerate their global competitiveness and gain inroads to overseas markets.

Connected Asia

First initiated in 2000, Connected Asia (formerly called the Asia Belt of IT Cities) was envisioned as a pan-Asian IT grouping that would harness the strengths of complementary pockets of IT excellence in the region, with the aim of enhancing Asia's competitiveness in the infocomm domain.

Through joint efforts between *IDA* and the *Singapore IT Federation*, several Asian IT industry associations have endorsed their support for Connected Asia. Examples of initiatives that will be developed and led by industry in the next two years include a database of regional opportunities to garner information on IT projects and tenders, as well as developments in the regional and global infocomm industries. Another effort is the development of a high quality certification process for infocomm talent, for the purpose of enhancing talent flow in the region.

Entrenching Singapore's Status as a Telecommunications Hub

To maintain price competitiveness of telecommunications services and pervasive international connectivity, *IDA* will continue to ensure fair competition in the telecommunications market and increase the density of telecoms connections. *IDA* strives for prices of key telecom services to be among the lowest in Asia.

To capitalize on the extensive international and regional connectivity, *IDA* will pursue opportunities to attract value-added services, like business continuity, disaster recovery and server consolidation services to hub out of Singapore. One of the key achievements is the selection of Singapore to be Asia's first GPRS Roaming Exchange Peering Point (see next page).

Singapore - Asia's first GPRS Roaming Exchange Peering Point

In October 2002, Singapore was chosen to be the first GPRS Roaming Exchange neutral peering point in Asia, and the second of such exchange points in the world. Supported by the *GSM Association (GSMA)*, this move positions Singapore as a key exchange point for the anticipated high growth in GPRS roaming services and traffic in the region.

IDA facilitated leading international GRX providers in coming together in a Memorandum of Understanding (MOU) to establish Asia's neutral peering point in Singapore. GRX providers that have signed the MOU include *Aicent Inc., Belgacom SA, Reach Global Services Ltd and Sonera*. More players are expected to come on board.

Mobile operators benefit through faster time-to-market for their GPRS roaming services. Consumers are able to enjoy seamless access to mobile GPRS roaming both at home and abroad, with better data transmission quality and lower costs.

Strategy 4: Agent for Change

This strategy aims to help businesses and government agencies use infocomm to achieve higher efficiency, effectiveness and customer satisfaction. This involves leveraging on infocomm to re-engineer key business clusters and government services through architecting, deploying common infrastructure and standards, working with domain agencies to re-engineer business processes, and encouraging creation of services that improve linkages between companies, government and customers.

IDA will work closely with relevant agencies and industry partners to implement flagship programs.

e-Government

Building on the success of the first e-Government Action Plan, *IDA* will implement the next phase of the e-Government Action Plan for the period FY2003 - FY2005. The focus will be on the delivery of accessible, integrated and value-added public services to its customers, and ways to foster interaction and engagement between government and citizens. The Plan will also look at ways to network agencies towards achieving greater effectiveness and efficiency under the framework of "Many Agencies, One Government".

The Plan will focus on the following key areas to increase usage of e-services and to enhance service quality:

- Adopting new channels of service delivery (e.g. wireless).
- Gaining greater insight into customers' needs, and transforming service delivery accordingly.
- Re-engineering business processes across several government agencies to deliver customer-centric services with faster turnaround times and reduced need for repetitive interactions between customers and Government agencies.

Singapore - A Leading e-Government in the World

The vision of the e-Government Action Plan (FY 2000 – FY 2002) is to be a leading e-Government to better serve the nation in the digital economy. Since the launch of the Plan in June 2000, Singapore has become one of the most advanced e-Governments in the world, having e-enabled 1,570 public services, which account for about 90% of all services feasible for e-delivery.

Today, any citizen or business with PC-based Internet access enjoys the convenience of 24x7 access to such e-services. The eCitizen one-stop gateway to government services (www.ecitizen.gov.sg) has been popular with citizens, with more than 60% of respondents in a 2002 poll reporting to be very or extremely satisfied with the quality of its e-services. A network of eCitizen Help Centers around the island ensures that even those without personal PC access can transact electronically with the government.

Internationally, Singapore has been recognized as a leader in e-Government. It was ranked second in the world according to *Accenture's* e-Government studies for 2000-2002, and top in e-Government by the *World Economic Forum* two years in a row. It has also won various international awards, including the Stockholm Challenge (October 2002), Explorer award (June 2002) and CIO 100 CIO award (January 2002).

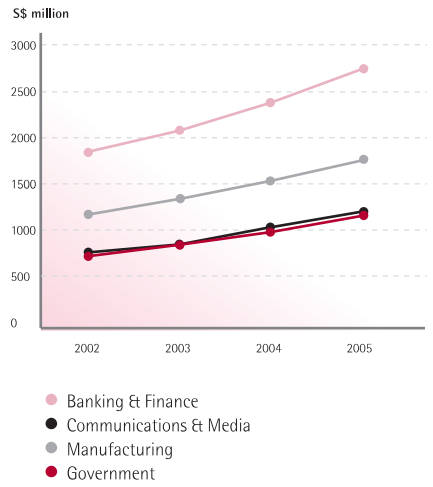
Cluster Based Projects

Business enterprises in Singapore are savvy users of technology. In 2002 the percentage of organizations using computers, laptops or workstations was 83%[1]. As infocomm usage becomes more pervasive, more companies are using electronic means to carry out their business transactions. Between 2000 and 2002, B2B transactions value increased from S$88 billion (US$51 billion) to S$106.5 billion (US$61 billion)[2].

The next frontier is to exploit opportunities for quantum gains in efficiency by combining infocomm technology and cluster-level business process re-engineering. *IDA* will work with partner organizations in the public and private sectors to identify flagship projects that will enhance the competitiveness of key sectors in the Singapore economy.

1 Source: ICT Usage in Businesses 2003, *IDA*

2 Source: Quarterly E-Commerce Survey 2002, *Gartner*



IT Spending by Major Sectors

Four major industries dominate IT spending in Singapore. Banking, communications & media, manufacturing and government sectors together account for 58% of total IT spending.

IT spending in many industries will grow at healthy rates from 2000-2006 but these top IT spenders are expected to remain the dominant players in the market.

(Source: *IDC* Singapore IT Spending and Industry Segmentation, 2000-2006)

The logistics industry will be a key area of focus, given its critical role in Singapore, both as an industry in its own right and as a source of competitive advantage for key sectors like manufacturing. *IDA* has initiated collaboration with partner agencies, conducting a joint study in FY 2003 towards the development of a blueprint on leveraging technological developments in open standards like XML to create an open and connected, end-to-end logistics system.

E-Business generates economic value and efficiency by helping to link every business node – from suppliers to manufacturers, sellers to buyers. *IDA* will continue to support companies that have an e-business strategy to develop and deploy new e-capabilities to improve productivity and penetrate new markets (see box below).

E-Business Innovation & Adoption

Forty e-Business innovation and adoption projects have been supported to date, which will collectively generate more than S$23 billion (US$13 billion) worth of e-Commerce transaction value in the manufacturing, logistics, wholesale & retail and finance & banking sectors. This has helped to advance each cluster in the following ways:

- Development of an electronic hub (E-HUB) with e-sourcing and e-procurement functions to strengthen Singapore's position as a major manufacturing hub.
- Improved competitiveness of Singapore's logistics sector through integrating Optimization Planning and Transport Management System, with development of 4th Party Logistics (4PL) capabilities and enhancement of smaller players' e-business adoption.
- Increased efficiency in wholesale & retail sector with e-Procurement Standardization, e-commerce capabilities development for regional markets and e-enablement of distribution networks for targeted segments.
- Strengthening Singapore's position as a financial services hub with the development of regional bonds trading and reinsurance exchanges.

In addition, *IDA* will work with other agencies to implement cluster-based e-transformation projects towards achieving cost savings and productivity gains. Some potential areas are high-tech manufacturing, retail, finance, healthcare, and education.

In Summary

Through the Connected Singapore vision and its four galvanizing strategies, IDA aims to unleash the potential of infocomm to create value, increase productivity and enhance lives. The programs under the strategies will help to realize new possibilities, and attract companies, talent and ideas to Singapore.

Building the Foundations

Supporting the strategies are three foundational blocks, namely Capability Development, Technology Planning and Conducive Business Environment (see Figure 1 on page 7).

Capability Development

IDA invests in capability development to bridge demand-supply gaps for infocomm manpower, and to build capabilities in emerging areas of growth. There is a special focus on development of capabilities among local enterprise, through manpower training programs, competency centers, and its Infocomm Local Industry Upgrading Program (iLIUP).

Manpower Training Programs

A host of manpower training programs are available to equip the local workforce with the necessary skills in critical and emerging infocomm areas.

- The Critical Infocomm Technology Resource Program (CITREP) enables infocomm professionals to upgrade their skills in the critical, emerging and specialized infocomm areas.
- The Infocomm Training and Attachment Program (iTA) provides individuals with hands-on experience through local and overseas attachment opportunities with selected infocomm organizations in the areas of hot and emerging technologies.
- The E-Business Savviness Program (EBSP) develops a pool of skilled manpower with e-business skills and knowledge, who are able to champion e-business transformations within companies, thereby benefiting the industry with enhanced infocomm expertise of the workforce.
- The Infocomm Competency Program (ICP) trains workers in the essential infocomm skills for today's competitive workplace.

Competency Centers

Situated at research centers and institutes of higher learning (IHLs), competency centers (CCs) help to accelerate the development of emerging infocomm technologies. CCs serve as platforms for global technology providers and Singapore infocomm enterprises to invest in trainers and developers, and develop new training programs and curriculum. This aims to create new intellectual property. Participating companies set up facilities, host infrastructure, transfer leading technologies and best practices, and pilot innovative ideas and emerging technologies.

Infocomm Local Industry Upgrading Program (iLIUP)

The Infocomm Local Industry Upgrading Program (iLIUP) facilitates the exchange of technology, expertise and domain knowledge by fostering relationships between MNCs and local enterprises. Singapore enterprises can gain exposure to cutting-edge technologies, tap on an established global network of technical expertise, and leverage on the MNCs' international marketing and distribution expertise, thereby enhancing their capabilities and penetration of global infocomm markets. MNCs can benefit by increasing their market share in adapting their technologies for locally developed products and services, and tap on Singapore enterprises' vertical domain expertise.

Technology Planning

Leadership in infocomm technologies will require forward planning and strategic investments in setting technology directions, undertaking technology trials and contributing to standards setting.

Technology Directions

The Infocomm Technology Roadmap (see table 1) charts the vision, trends and developments of the technology landscape in Singapore for the next five years. It aims to align Singapore's technological direction with worldwide infocomm developments and to paint a collective vision of future technologies. In this respect, the roadmap aims to help the industry keep abreast with future directions and trends, and to assist the industry in identifying business opportunities for competitive advantage. Early adoption of emerging infocomm technologies is essential to give Singapore a competitive edge in business and economic opportunities.

Event	Date	Themes
1st Infocomm Technology Roadmap	24 July 2000	• Mobile Wireless • Broadband Access
2nd Infocomm Technology Roadmap	20 March 2001	• The Connected Home • Infocomm Security Technologies in E-Commerce
3rd Infocomm Technology Roadmap	28 February 2002	• Optical Networking and Photonics • Next Generation Internet Applications
4th Infocomm Technology Roadmap	26 November 2002	• Mobile Wireless • Broadband Access • The Connected Home • Infocomm Security Technologies in E-Commerce *(Supersedes reports from 1st and 2nd Technology Roadmap)* • Free Space Optical • Next Generation Wireless LAN *(Trial Results Sharing)*

Table 1: Infocomm Technology Roadmaps

Technology Trials

Together with industry partners and other government agencies, *IDA* conducts technical trials in key emerging technologies identified as potentially strategic to Singapore. Such trials offer an independent assessment of new technologies for the benefit of the wider infocomm community, so as to provide a sound basis for well-informed decisions for adoption and deployment. Areas covered so far include Free Space Optics, Next Generation Wireless Local Area Network, and Ultra-Wideband (UWB).

Ultra-Wideband (UWB) Program

UWB is a wireless technology that utilizes very low power radio signals consisting of very short pulses, capable of transmitting large amounts of data. Potential applications include home multimedia networking, peer-to-peer mobile communication, radar imaging, asset tagging and tracking, and vehicle collision avoidance.

In February 2003, *IDA* launched the UWB Program consisting of three key thrusts:

- Introducing regulations to permit controlled UWB trials at Science Park 2, known as the UWB Friendly Zone.
- Building on existing pool of UWB knowledge by conducting a series of compatibility studies and emission limits.
- Promoting the growth of a vibrant ecosystem for UWB research and product development.

Through the UWB program, *IDA* will be working with partners worldwide to test the possibilities of UWB, provide a conducive framework for innovation, and seed new economic activities.

IDA will monitor closely key developments in areas like distributed computing (peer-to-peer and grid computing), mobile applications, open source interoperability, IPv6 and ad-hoc networking, and undertake trials where appropriate.

Technology Standards

Standards play an integral part in facilitating the development and adoption of new technologies. In Singapore, the Information Technology Standards Committee (ITSC) is chartered to promote the adoption of international standards as well as establish national infocomm standards. Supported by *SPRING Singapore* and *IDA*, ITSC is an industry partnership comprising more than 250 technical experts and representatives from 180 organizations. It provides a neutral and open platform for interested industry players, academia, research institutes and government agencies to come together to agree on technical standards.

IDA is working with ITSC to host the ISO/IEC Joint Technical Committee One (JTC1) Plenary Meeting in Singapore in November 2003, which will see the participation of international technology experts. The hosting will raise the profile of Singapore in the international standards forum and promote awareness of IT standards. Held in South East Asia for the first time, the annual meeting hopes to draw more active participation and collaboration from the region.

Also started under the umbrella of ITSC is Plugfest, an inter-operability activity for the infocomm industry. An annual event, Plugfest provides a common platform for the industry to test their products in selected technology domains, such as smartcard and e-learning. The effort synergizes different industry players to ensure that their products comply with international standards.

Conducive Business Environment

Political stability and a positive economic investment climate are key criteria for the creation of a business environment conducive to infocomm development and expansion.

Pro-Business Regulations and Policies in the Telecommunications Industry

IDA undertakes the regulatory role for the telecommunications industry in Singapore. Adopting a business-friendly and business-savvy stance, it responds to trends in the market environment in a timely and relevant manner.

IDA will continue to ensure fair competition in the telecommunications market and to increase the density of telecommunications connections, so that businesses and consumers will continue to enjoy competitively priced telecommunications services and pervasive international connectivity. There will be periodic reviews of the Telecommunications Act and Telecoms Competition Code in consultation with the industry to ensure continued relevance of the legislative framework and competition guidelines.

Market Access

To promote international business opportunities for Singapore's infocomm enterprises, *IDA* contributes extensively to Singapore's free trade negotiations with key infocomm markets to eliminate foreign investment restrictions and barriers to electronic commerce, and to decrease time and cost to export telecommunications equipment to foreign markets.

In addition, *IDA* advocates a rules-based international business environment through international forums like the *Asia Pacific Economic Forum (APEC), the International Telecommunications Union (ITU)* and *the World Trade Organization (WTO)* to ensure an open and predictable playing field for Singapore's infocomm enterprises.

In Summary

Capability Development, Technology Planning and Conducive Business Environment are the three foundational blocks supporting IDA's four strategies, namely Infocomm for Connectivity, Creativity and Collaboration; Engine of Growth; Digital Exchange and Agent for Change, which in turn help to realize the Connected Singapore vision.