1. Definition

Broadband technology has become a more dominant choice among users for Internet access. The term 'Broadband' refers to 'always-on', higher speed access to the Internet.

2. Objectives of the National Broadband Blueprint

The main objectives of the National Broadband Blueprint are:-

To enhance Brunei Darussalam's national, regional and international competitiveness;

To bridge the digital divide in Brunei Darussalam by ensuring the whole population of Brunei Darussalam will be provided with broadband connection at competitive prices and according to industrial standards;

To develop an inclusive, knowledge-oriented and creative society which is able to access, share and use ICT to maximise their potentials;

To support the growth of the industry particularly, those dependable on high bandwidth capacity, such as multimedia applications, animated and graphics contents, as the spin-offs from broadband connection. Investment in higher broadband capacity will greatly nurture creativities and innovation among the users;

To support e-Government initiatives by providing the public with the necessary access infrastructure that will enable them to fully utilise the e-Government services and effectively interact at the platforms provided through e-Government;

To ensure the successful implementation of the Brunei Darussalam e-Strategy Paper which is a very comprehensive paper that includes strategies (e-Government, e-Business, e-Society, e-Education, e-Health, e-Industry, e-Employment, e-Environment, e-Science) that are to be implemented by the various stakeholders in the country towards realising the nation's Sophisticated Society vision.

To make high capacity broadband regarded as a utility. United Nations Conference on Trade and Development (UNCTAD) regards broadband as one of the necessary utilities comparable to water and electricity. This is due to the vitality of broadband to businesses and the competitive advantages which broadband offers. (International Economy Report 2006)

3. Present Situation

Currently, broadband services in Brunei Darussalam are available to the following sectors:-

a. Government sector
   Through the EG (E-Government) Bandwidth, the Government sector is provided with broadband services delivered via fibre optic lines.

b. Private sectors
   Some companies are able to access broadband services through leased line and wireless networks.

c. Private households
   Individuals can access broadband at their residences using their existing telephone lines. Fibre optic lines only go to the cabinet and copper wires are used to connect to the residences (the last mile). Speed can only go up to 1Mbps.

The implementation of the National Broadband Blueprint will enhance the broadband access and services in Brunei Darussalam. The importance of content development, affordable PCs, education and awareness should be highlighted. Access and improved broadband capability should be matched with easy access for the public as well as greater affordability on PCs as well as availability of online services for the public.

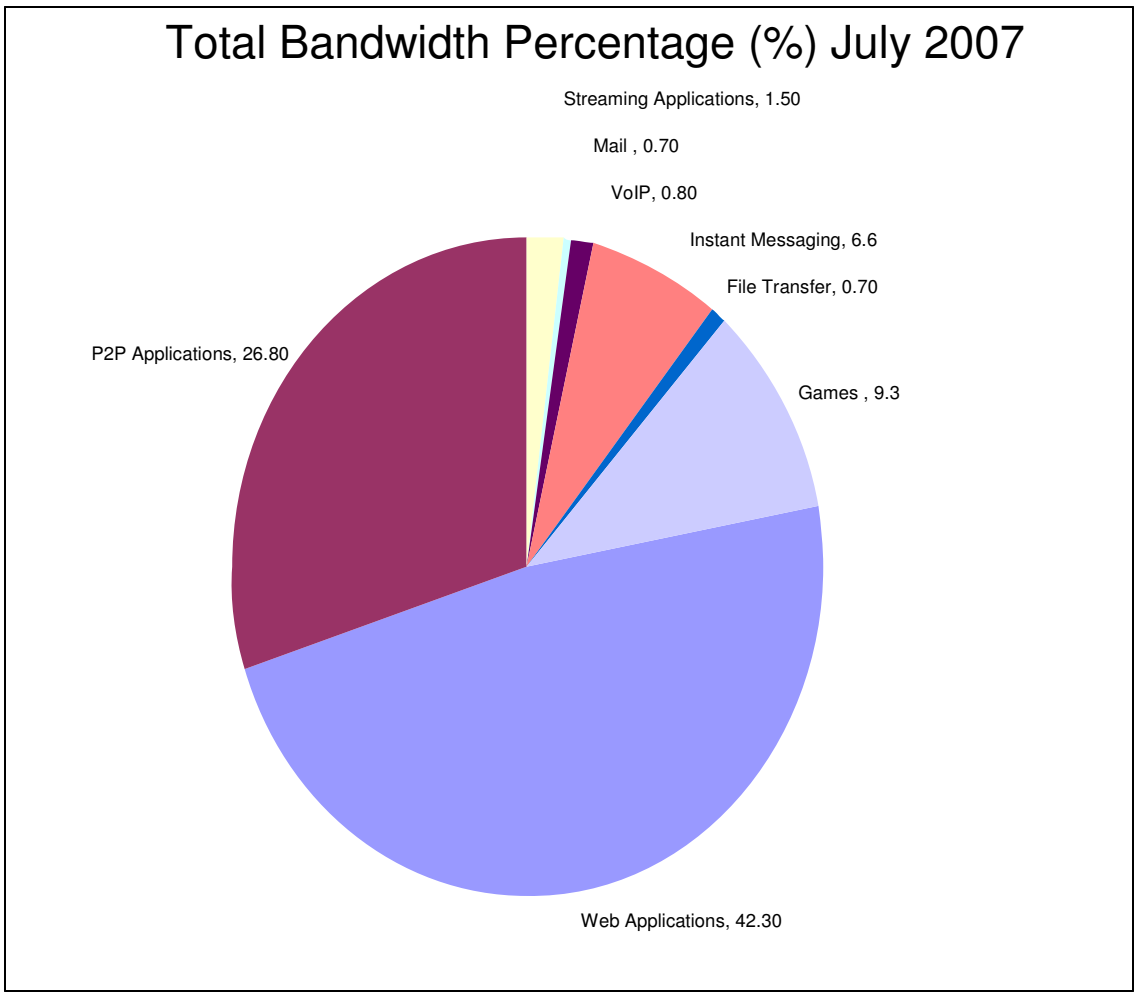

Figure 1. Source: Telbru, 2007

It should also be emphasised that there are a number of means for Internet access in Brunei Darussalam other than dial-up and broadband, such as through 3G services. The users of prepaid Internet cards can be included in the number of Internet users in Brunei Darussalam.

Brunei Darussalam's Broadband Take up

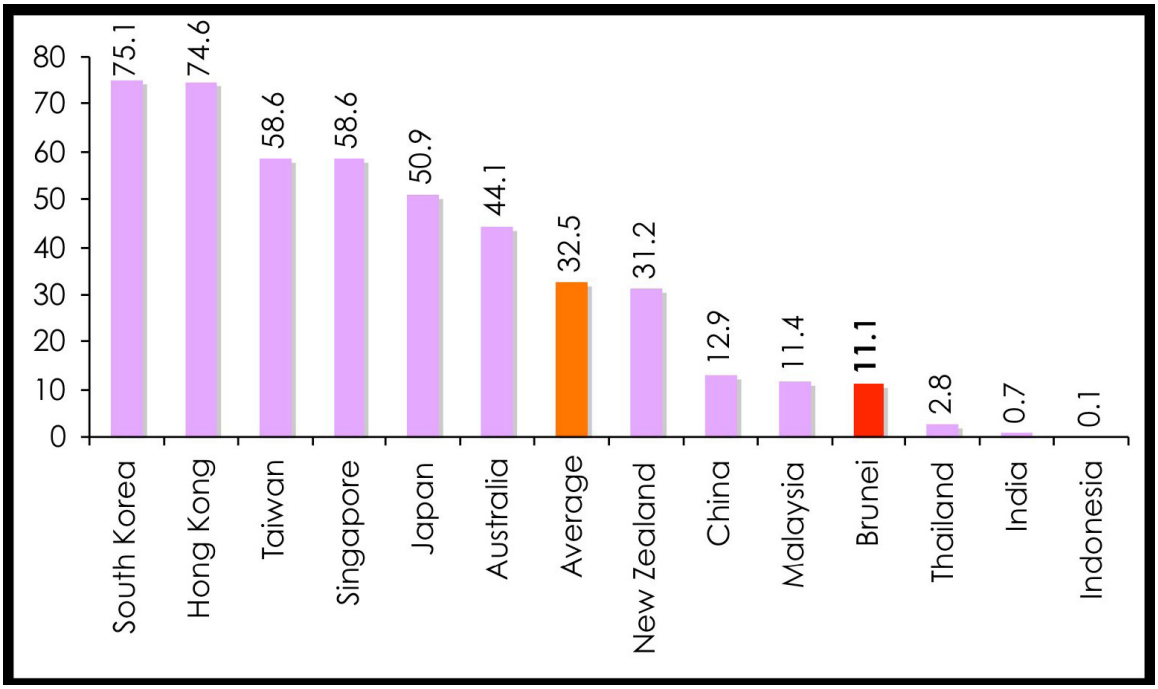

Figure 2. Broadband Penetration As % of Households in Asia Pacific Countries for Q2 2006 (Source: AsiaCom Newsletter, Volume 12)

In 2007, 90% out of about 10 000 broadband subscribers use 512kbps connections while less than 200 users on 1Mbps. Brunei Darussalam has demonstrated a willingness to rapidly adopt new technologies. However, the level of household broadband penetration is far below the average figure as compared to other developing countries in the Asia Pacific. (as shown in figure 2)

To date, Brunei Darussalam's broadband penetration rate as compared to the whole population is about 2.67%. (Source: Telbru's Telecom Data and information Q2 2007).

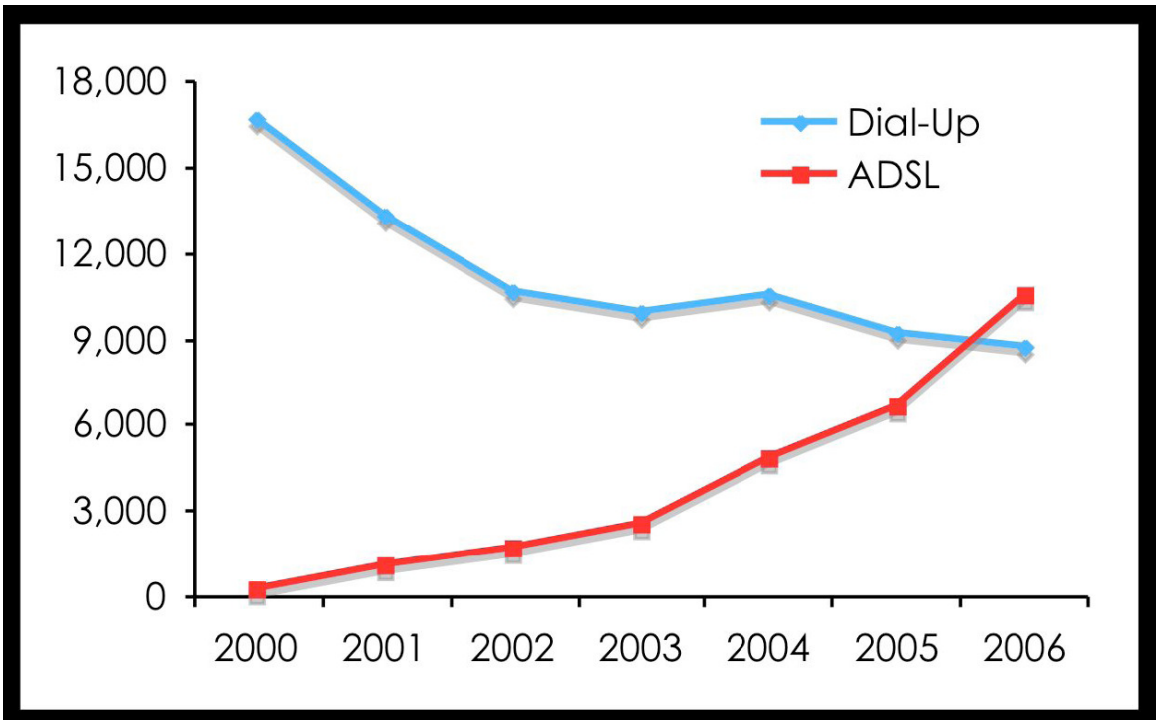

Figure 3. Internet Dial-Up vs ADSL Broadband Subscribers. Source: *Special Project: Brunei Darussalam's National Broadband Network, 2007*

The migration from dial-up (as shown in Figure 3) has been substantial and there is significant increase in the number of broadband users than dial-up users.

4. The Main Issues

The National Broadband Blueprint will address the main issues identified as follows:-

Accessibility

The National Broadband Blueprint will set out directives that ensure broadband services are accessible to the people of Brunei Darussalam regardless of their locations, be it at rural or urban areas. Broadband will connect Brunei Darussalam nationally and globally providing economic opportunities for government and businesses.

The physical infrastructure supporting Brunei Darussalam's broadband Internet connectivity is underpinned by the two following distinct components:

4.1.1 Backbone Networks (national broadband highways)

On the national level, a wide optical backbone network known as RAGAM 21 has been deployed. This high bandwidth and high performance network is designed to meet the high bandwidth demand for applications such as broadcasting, multimedia services and electronic commerce activities.

4.1.2 Customer Access Networks (the last mile)

The infrastructure connects businesses and households to the nearest exchange via either fixed line or wireless connections. The last mile connection plays a crucial role in determining the speed and service characteristics the customer experiences. The last mile connection making use of ADSL technology poses limitations on the extent to which the technology can reach customers beyond a certain distance from exchanges.

Affordability

The National Broadband Blueprint will also ensure that broadband services are available at competitive and affordable prices and according to industrial standards.

Growth Areas

It has been observed that there is a need for particular focus to be developed alongside the infrastructural development invested by the Government. These foci will support the take up of the broadband technology in Brunei Darussalam and eventually leads to full utilisation of the network capacity. With the deployment of high-capacity broadband to be established with the National Broadband Blueprint, the following focus will be developed:-

a. Development of content and killer applications in order to fully utilise the network capacity;

b. Identifying the niche areas to be developed, for example the RFID (Radio Frequency Identification) technology as has been identified by the Ministry of Communications to be the technology to be pursued further; and

c. Identifying a particular industry, such as content industry, that will be supported by the network. Therefore, the National Broadband Blueprint will give a policy direction which would be taken further by the industries.

d. Example would be developing media, entertainment and content industries, such as animation, that will require high capacity broadband. With the availability of high capacity broadband in Brunei Darussalam, the growth and development of these industries will be supported.

5. Addressing the Main Issues

Broadband access will be provided throughout the country in phases through the deployment of a mixture of technologies. This will address the 'last mile' issue and thus will provide users with faster and higher capacity broadband.

Areas will be identified by population density as well as the needs and requirement for higher capacity. In this regards, urban areas as well as areas of higher concentration of activities may be prioritised to be provided with higher capacity broadband delivered by fibre optic technologies, as well as for those who are willing to pay for the higher capacity. Fibre optic technologies will also eventually be extended to other areas with high potential of growth and density, in terms of population and activities.

Such implementation will also include rural areas where broadband services will also be provided.

With the phased implementation of broadband technologies throughout the country, the main and important issues identified as follows will be addressed:-

5.1 Accessibility

The deployment is already progressing towards wireless broadband. These technologies provide the broadband capacity to satisfy demand for current and most emerging applications and uses.

Priority Areas of development and technology deployment is in accordance with:

5.1.1 Demand Requirement

a. Commercially-viable Areas
   Advanced broadband is rolled out first in the most commercially viable areas. This is due to the uncertainty of investing in new, advanced infrastructure in markets where the densities are lower and return on investment less certain.

b. General Public
Areas with higher density of population would bring in a bigger market and thus emerging as economically viable areas. Such residences like housing schemes would be ideal locations where technology such as optical fibre could be installed. In cases where the market is scarce and uneven, wireless technology such as WiMAX among others would suffice to meet the demand of the broadband services.

c. SME
Depending on the scale and type of operation of the SMEs, there is a wide range of varying needs of broadband capabilities. A small scale home-based SME would find ADSL sufficient while a company specialising in content and software needs high capacity Optical Fibre.

d. Growth of the industry
With the availability of high capacity broadband, the spin-offs of the investment are anticipated, such as the growth of the content, media and entertainment industries. As applications and usage of these services will be supported by the network, certainly the supply of these services will be available. The provision of access to utilities' facilities will act as a catalyst for private sector investment.

5.2 Affordability

In order to ensure that broadband services are provided at competitive rates and industrial standards, competition will be opened up. The Government of His Majesty the Sultan of Brunei has a crucial role in fostering a competitive environment for the delivery of broadband which includes facilitating an open regulatory environment, encouraging private sector investment, providing direction through strong leadership and, where necessary, strategic and well-targeted Government financial support. Related policies will be pursued, such as infrastructure sharing, liberalisation of the Internet market so that the environment will be very conducive for competition and growth. Hence, shaping a market supported by a regulatory regime that is technology-neutral and encourages market-driven solutions. It is intended that broadband services will be available to the users at minimal price and complying with industrial standards.

5.3 Growth Areas

5.3.1 Content Development

The focus is on the development of local content for education, entertainment, games, e-services and businesses. Interactive and rich media content for TV, radio, Internet and the Communications industry will provide business opportunities and vast contribution to the economy.

The promotion of awareness that anyone can be a creator will result in the emergence of new content, new business model and new players. This is especially evident in the online game space, where consumers are increasingly becoming co-creators of the online experience as part of the game design offering.

Bandwidth requirement will also increase with the emergence of new developments brought about by the New media, e.g. Broadcasting, over the Internet, Mobile TV, interactive broadcasting among others.

5.3.2 ICT Educational Hub

The formation of an ICT education hub will encourage the harnessing of creativity and opportunity for the production of rich multimedia teaching content. Educational institutions are moving towards interactive multimedia technology and web-based teaching. This enrichment will not only provide innovative learning tools for students but will also create wave for the research of new technology areas progressing towards high quality learning products to address the emergence of new technologies in the communications and multimedia industry.

5.3.3 RFID

RFID is the short range wireless communications which has large market potential with broad applications in supply chain management, sensors-surveillance systems, inventory management, transportation and logistics. The Ministry of Communications has identified the technology as a niche area to be pursued further. The RFID software industry can be nurtured through strategic alliances with regional partners.

6. Policy Directions

The Ministry of Communications has identified the following policy directions:-

6.1 Mixture of broadband technologies

The deployment is consisting of a mix of technologies from fixed lines such as ADSL and FTTH to wireless broadband (WiMAX, WiFi). These technologies provide the broadband capacity to satisfy demand for current and most emerging applications and uses.

6.2 Public-private partnership

The deployment of a mixture of broadband technologies will be implemented according to the needs and requirement as well as full utilisation of the high capacity broadband. Areas identified with high concentration of activities and population density, particularly urban areas, will be provided with fibre optic technology as these areas will fully utilise the capacity. Meanwhile, other areas will be provided broadband services delivered via other broadband technologies, such as WiMAX.

As a necessary utility, infrastructural investment may partly be contributed by the Government. This role will be supported by industry players, including the private sector. Public-private partnership in developing the industry should be encouraged.

The Provision of Universal Services Fund in expediting the nationwide broadband infrastructure deployment is essential with the support of the Government.

6.3 Broadband as a necessary utility

The increasing demand and importance of broadband should be accommodated and it is only right that broadband should be regarded as a necessary utility alongside water and electricity. A concerted effort in this direction by various and relevant agencies will greatly support the growth of broadband services in the country.

6.4 Competition in the Internet market

It is anticipated that with the liberalisation of the Internet market, internet service providers will grow and competition of services will take off. When this happens, prices will be reasonable and quality of services will be highly improved. Competition in products and services will be promoted while infrastructure development will be led by the Government with the roles and contributions of the industry players.

Competition Policy	Implementation
Infrastructure	Facilitated by the Government, Consortium approach Public-private partnership
Services	Open to multiple operators

The above policies are set to encourage more players by removing all the barriers to growth of broadband such as through the unbundling of the local loop in Brunei Darussalam. A clear example of such policies is that of WBA (Wireless Broadband Access) policy directives that open up WBA licenses applications via beauty contest.

6.5 Complementing the international gateway

Brunei Darussalam makes a big investment in diversifying and improving the international connectivity of the country with the AAG (Asia America Gateway) Submarine Cable. Such investment is expected to greatly improve the connectivity of the country which cannot be impeded by a bottleneck created by the national network infrastructure. Therefore, the national infrastructure should be able to complement and support the international gateway.

6.6 Encouraging the development and hosting of local content

One of the main drivers for the promotion of broadband growth is the hosting of websites within this country. It is important to encourage both domestic and foreign operators to host their websites within Brunei Darussalam. Hence, there will be reduction of reliance on the international IP bandwidth.

7. Targets

Both the e-Strategy Paper and Broadband Blueprint are hoped to bring clearly-defined national approach and strategy to the broadband infrastructure deployment in pursuing the country's vision of becoming an Information Society. While the e-Strategy sets the vision towards the transformation into the Information Society, the broadband blueprint provides the action plan to provide the broadband connectivity as the key enabler towards realising the vision. In addition, the set up of the 'broadband stakeholder group' headed by Ministry of Communications will preside over the implementation of the deployment of the broadband infrastructure.

The key performance indicators are :

1. Broadband household penetration of 40% by 2010 and 75% by 2015.
2. Mobile phone penetration of 100% by 2015.
3. FTTH contributes to 60% of broadband penetration rate in 2015.
4. All schools with broadband access by 2015.
5. B$10 of monthly broadband subscription per 1 Mbps by 2015.
6. 1000 local domain websites by 2015.
7. Increasing ICT industry contribution to GDP of 6% by 2015.

Glossary

Bandwidth – The rate at which data may be transmitted through telecommunication system. Bandwidth is defined in bits per second.

Broadband infrastructure – The physical network (e.g. cable, wireless transmitters, exchanges) that together create a telecommunications facility for the delivery of a broadband service.

Creative Society - People who invent, take out patents and thereby drive the economic and technological development.

Digital divide - A term used to describe the perceived gap between those who can access and make effective use of ICT and those who cannot, due to linguistic, economic, educational, social or geographical reasons.

Inclusive society – The participation of everyone without anyone left behind.

Knowledge based society - An innovative and life-long learning society, which possesses a community of scholars, researchers, engineers, technicians, research networks, and firms engaged in research and in production of high-technology goods and service provision.

Last mile - A term used for any telecommunications technology that carries signals along the short distance between the main public telecommunications network and the home or business premise i.e. the infrastructure at the neighbourhood level, or local loop.

P2P – "Peer to peer" is a network of two or more computers that communicate with each other without using a central server. Peer to peer networks are often used by people to share files, such as music or videos over the internet.

Radio Frequency Identification (RFID) – The technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal or person. It does not require direct contact or line-of-sight scanning.