Session Summary

The importance of attracting investment in submarine cables landing in Singapore and of securing high-speed connectivity to data centres based in Singapore is stressed in the *infocomm media in 2025: Consultation Document* \(^1\) issued by the Ministry of Information and Communications, 30\(^{th}\) March 2014.

“Companies such as data centres and cloud companies typically invest in infrastructure in places with excellent connectivity. This is because connectivity enables the movement of data quickly across the world. The presence of such companies influences sub-sea cable operators’ decisions to land sub-sea cables in Singapore. These cables further improve our connectivity to the world by providing more direct routes to other regions, reinforcing the “network effect”. Hence it is important to continually attract data, content and digital services into Singapore. This can also bring about more opportunities in areas such as regional content distribution, and grow capabilities in industries such as data analytics.” (p.25)

The programme of speakers was

1. **Ong Tong San**, Cluster Director (Competition and Resource Development), IDA
   *Singapore’s Approach to Broadband Connectivity*
2. **Simon Smith**, Director – Regulatory Affairs, PacNet
   *Submarine cables. Permissions, exemptions and the need for APAC Harmonization Policy*
3. **Dieter Sieber**, Vice President, Regional CTO, Telecom Services and Solutions, T-Systems
   *Connectivity Cost and Competition*
4. **Markku Lepisto**, Senior Technology Evangelist, APAC, Amazon Web Services
   *The Amazon Cloud Model in Singapore*
5. **Wong Ka Vin**, Managing Director, 1-Net
   *Next Generation Data Centres*

**Ong Tong San, Cluster Director (Competition and Resource Development), IDA**: set the scene by outlining the approach Singapore has taken to attracting investment in international bandwidth and developing a world-class domestic high speed optical fibre network to support both domestic users and the corporate sector, including data centres. More than 95% of Singapore’s international telecom traffic is carried via 16 submarine cables systems, with a total max capacity of 183.41 Tbps. As the regulator, IDA provides a one-stop-shop and periodically reviews possible landing sites for cable stations, taking the lead along with the Marine Port Authority MPA) to reduce unauthorized anchoring in one of the

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world’s busiest ports. For example, during the global financial crisis anchoring offshore to avoid port charges increased along with anchor damage to cables. Singapore law protects submarine cables from being damaged in Singapore waters (Telecommunications Act and the MPA Act). IDA recognizes the desirability of harmonizing of APEC and ASEAN policy making and regulations governing access to and repair of submarine cables, and participated in workshops in 2012 (ASEAN) and 2013 (APEC) as awareness-raising events.

To ensure an adequate competitive provision of backhaul services, in 2002 the incumbent telecom operators were required to provide both a backhaul service and a transit service to third parties from the submarine cable landing stations (SCLSs) and since 2011 these services must be available whether the operator has an ownership interest in the cable system or not. In 2001 and 2002 co-location and connection services were made mandatory at SingTel’s SCLSs at cost-based prices, and since 2006 SingTel has been required to provide tail-end services at cost. There are now 14 Facilities-based operators (FBOs) providing backhaul services, although it was pointed out in the discussion that most of these were only for internal use by communications service providers (CSPs) and that SingTel has been deemed non-dominant in the provision of backhaul services despite strenuous objections from other CSPs.

Singapore’s extensive and high-quality connectivity has helped attract investment in data centres, making the country a regional hub for both data and increasingly for analytics. Singapore’s proximity to ASEAN serves as natural points of presence, with a key advantage in having no earthquakes and other natural disasters. Currently there are 59 DCs registered in Singapore and more in the pipeline. An interesting question was whether future DCs could be built along the coast and connect directly to the SCLSs. Yet another suggestion that is raised in the infocomm masterplan 2025, which builds upon the success of infrastructure to take Singapore to the next level of becoming a smart city, is the idea of DCs below ground level, to add to security and to reduce the costs of cooling. (See above, p.27)

Simon Smith, Director – Regulatory Affairs, PacNet: PacNet owns the most extensive private submarine cable network in the Asia Pacific and repair and maintenance issues are a constant headache because the expense of keeping a repair ship on-hand while delays in paper work, issuing of permits and permissions, visas even in some cases where the crew is on-board ship and at sea, and exemptions from port charges, etc., push up costs and prolong the outage.

Although there are many different causes of cut cables depending upon the location, fishing accounts for over 40% of PacNet’s problems, notably off the east coast of China. Unlike the case of S.Korea where there is agreement with the fishing union that nets can be cut and PacNet will offer compensation, there is no overarching agency for the many small fishing villages and towns along the China coast. Each village has to be visited to provide a learning process. All cable systems have built-in redundancy to allow re-routing pending repairs, but if repair-permission times are lengthy then incidents of damage stack-up and the incentive becomes to repair them all at the same time. This naturally raises the risk associated with damage to the back-up routing. The situation therefore urgently calls for a fast-track approach to the granting of rights to enter coastal territorial waters and exclusive economic zones with the minimum of bureaucracy.
Using a satellite-automatic identification system (AIS) PacNet can identify ships and predict the shipping route according to the ship’s speed. Ships entering cable zones or seemingly slow moving are contacted by email as a warning of the cable risk. The Singapore Straits are currently monitored 24/7 since April 2011 by Pacnet ANOC/Field Ops (Hong Kong, Singapore, Philippines), communicating with ship offices, port authorities and P&I club offices to keep ship anchoring at 500m safe distance from cables routes. By far the most difficult country for repairing cable failures is Indonesia where the cabotage law requires extensive paper work, refundable payments, and often lengthy waiting for permissions, etc. In theory the cabotage law gives priority to Indonesian-flagged vessels but currently Indonesia has no cable ships. In the event of Indonesia acquiring a cable ship it is expected that much of its time would be taken up with maintaining Indonesia’s domestic coastal cable network – e.g. [http://www.slideshare.net/mulimuljati/indonesia-domestic-fibre-optic](http://www.slideshare.net/mulimuljati/indonesia-domestic-fibre-optic). The harmonization issue across the region is important, and even if the industry is still at the stage of awareness raising, as the security of communications becomes ever more vital to digital economies everywhere the need for harmonization becomes ever more necessary.

**Dieter Sieber, Vice President, Regional CTO, Telecom Services and Solutions, T-Systems**: Dieter began by showing Singapore as the third highest user of Internet bandwidth in Asia after China and Japan, and that Hong Kong, Singapore and Tokyo are the key regional hubs. Although around 40% of traffic still goes to North America, and while trans-Pacific traffic grew by 32% in 2013, traffic to Europe grew by 42%, and intra-Asian traffic grew by 44%. A key reason behind the falling growth rate of traffic across the Pacific is the sourcing and caching of content closer to Asia. Also, the decline in the share of Asian international bandwidth connected to the US and Canada has been largely picked up by Europe, which has increased from 21% in 2009 to 28% in 2013.

With respect to the Asian region as a whole, the prices for intro-Asian traffic between Asian cities remain significantly higher than those within Europe or within North America, often by up to 400%.

Dieter’s main focus however was on Singapore’s provision of domestic backhaul where he argued there is little competition. He made the point that most of the FSO capacity, for example, was devoted by carriers for internal usage, not in the retail market. The shape of demand is changing. 10GB has replaced 2GB as the wholesale standard with an increasing number of 100GB deployments. The demand for SHD/SONET continues to decline while the demand for Ethernet increases. Several cable systems are now by-passing the SCLSs and connecting directly to a Telehouse or data centre, thus eliminating the need for backhaul. Hence the picture is growing more complex as often backhaul is used by CSPs for internal traffic and not retail, and business swap-deals are becoming more used.

Nevertheless, studies of price comparisons between Singapore and other Asian economies for local circuits show that while Singapore beats its immediate neighbours hands down on price and quality of service, it continues to trail behind Hong Kong and in some cases the gap has widened. Reports from international CSPs suggest the local access portion of international-domestic circuits can range from 40% up to 70%. As international circuits costs have fallen steadily this is evidence that local circuit costs have not fallen in tandem. The issue, therefore, should not be to compare Singapore with the regional average, but with the regional best. In this regard, Singapore still has a way to go and the lack of effective competition in the wholesale market for backhaul remains a problem. While Singapore has one
of the most technologically sophisticated telecommunication networks in Asia Pacific, in terms of broadband service provision domestic competition remains limited compared to most other comparable markets in the region.

**Markku Lepisto, Senior Technology Evangelist, APAC, Amazon Web Services**: Singapore’s success in attracting data centres will not be limited to numbers and volume, but if the market is able to follow the direction of service providers such as AWS and others, it will see an important shift in the model, away from paying for platforms and hardware, such as racks of server space, and towards a rental model. This movement is being accelerated with the development of cloud computing.

The advantages of an On-Demand, Pay-Per-Use approach include avoiding large upfront investments, avoiding the depreciation of assets, available infrastructure and services as and when required, low variable costs that track actual usage. And, from a planning point of view, no more forecasts or “guesstimates” of capacity required. It’s always there.

Making this possible is a shift towards “infrastructure as code” in which access is through an app using a code associated with different parts of the infrastructure. This allows users to experiment and test their data processing requirements in small batches with minimal risk. AWS introduces a new code to its over 10,000 servers once every 11 seconds! Data, as the saying now goes, is the new “oil” of industry, and it is changing the strategy-to-market of businesses. Some products are necessarily restricted by regulations, such as the need to clinically-test new drugs, but most commodities are not. Rather than spending years perfecting the design features of products the trend now is to release them early, let the market “test-drive” them, collect feedback through social media, redesign or re-jig them accordingly, come out with a new iteration, and so on in very short time spans. Data is key to this process, driving flexible production, distribution and marketing methods. Data centres that support programmable assets, from hardware to software, allow this to happen.

The key therefore is to have DCs based upon service-oriented architectures. This enables on-demand and self-service patterns of usage and charging. It offers new degrees of flexibility, so for example, a business can attach to a DC, for example by a VPN, and reach into the facilities and services of the DC as and when necessary to augment their own in-house databases and operations. In other words, when capacity demand requires it, a business can outsource some of its data-centric operations to rented DC capacity. Maarku ended his presentation with a live example of a forced outage in Singapore and a back-up in Taiwan, and then a restoration of the data processing in Singapore, all within a few minutes, and all done from his notebook computer.

**Wong Ka Vin, Managing Director, 1-Net**: Ka Vin spoke at the previous forum on data centres in 2011 – see [http://trpc.biz/singapore-as-a-data-hub/](http://trpc.biz/singapore-as-a-data-hub/) and his message was clear: it’s time for a change. He recognized the AWS model as a direction in which DCs must move, towards an on-demand and pay-per-use model. The problem was that the modular designs of contemporary DCs are about scaling up size, but not about scaling charges according to usage. The designs are based upon a choice of capacity to be used, whether it’s used or not.
The current parameters are the trinity of Space-Power-Cooling, which often do not permit much variation in coordinates. DCs have gone from Boxes such as shipping containers, to Customised Boxes built to economical sizes, and next what is needed is flexible “plug-and-play” deployments. These would include: varying scales to meet business needs, flexible rack deployment in size and density, dynamic rack loading (from 1kW to 30kW) deployable in existing white space, etc. Currently DCs are managed and charged according to availability, but the new generation will be by usage, charged by kW/Hour or compute time. The new service model for Data Centres will move towards gearing hardware as a utility service, from the past model of buying capacity. The key is to adopt a Uniform Cost Metric for the utility model in application.

Ka Vin’s conclusion was that modularity does not necessarily mean scalability suitable for this new environment. If the architecture is not right then modularity on its own will not be sufficient. He compared modularity with his childhood Lego set which had not one but two basic shapes and with these he could build almost anything. The key to the future for DCs is survivability and sustainability and that will require a much better understanding of usage of cooling and power. Most companies have adopted Cloud initiatives to some extent and clients pay by the KW/hr of compute time. His slide No.8 illustrates some of the permutations using different PUE-based costs per Mega Watt and kW/hour based costs.

Ka Vin compared the situation for DCs with a frog in hot water. If the water warms up slowly the frog doesn’t notice until it boils, but if it is put into boiling water the frog leaps out immediately. He would rather DCs make a leap first.

The Chairman reassured the audience that no live animals had been used in this presentation.

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