## Research Brief

### Asia/Pacific: Pathways to Public Ethernet

**Abstract:** As carriers in Asia/Pacific deploy Ethernet as a public service, differences in deployment strategies emerge.

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**Recommendations**

- Ethernet offers capital expenditure and operational savings that are hard to ignore; carriers should consider a strategic move to use it in additional areas of metropolitan fiber rollout.

- Carriers that want to leverage their IP core metropolitan investments should deploying Ethernet in their access and aggregation networks, in which its bandwidth flexibility will be a key selling point to end users.

- Carriers investing in Layer 2 Ethernet equipment should take care that it is easily upgradable to Layer 3.

- Carriers must pay close attention to the pricing of their competitors’ Ethernet services, as without easily comparable benchmarks, carriers can risk pricing their services too low.

- Recognize that large enterprises will not be the target of applications for several years and that the near-term opportunity is with small and midsize businesses (SMBs) and residential customers.

- The timing of the introduction of Ethernet applications must be gauged according to local factors, such as the size of the SMB market, the level of IT maturity and pace of development of relevant applications.
Ethernet's role outside the LAN is growing quickly — with many of the region's carriers now introducing it in some way in their metropolitan area network (MAN). But on examination, deployment is far from standardized, tending to reflect the competitive environment at a local level, rather than a move to reap the underlying cost and potential operational advantages that Ethernet can offer to carriers.

Proponents of extending Ethernet from the LAN to the MAN point to its ease of use and, most of all, the capital cost savings of using Gigabit Ethernet over fiber against a traditional synchronous optical network/synchronous digital hierarchy (SONET/SDH) and asynchronous transfer mode (ATM) over fiber architecture. In greenfield locations, capital expenditure savings are calculated in excess of 70 percent against what would be spent on SONET/SDH and ATM. The operational savings brought by the ease of provisioning services using Ethernet can be large — a 75 percent reduction by some estimates when measured against time division multiplexing (TDM).

With these advantages in mind, we consider how carriers in Asia/Pacific are approaching Ethernet deployment — and what lessons can be drawn for additional deployment of this technology.

Deployment

In general, Ethernet deployment fits the following patterns:

- Ethernet in access/aggregation networks — This comprises in-building Ethernet and Ethernet from the building to central office or wherever it meets a carrier’s core network. In this case Gigabit Ethernet aggregates Ethernet traffic from several buildings or districts before uploading, usually to an IP over SONET/SDH MAN core network.

- End-to-end Ethernet across access, aggregation and in the MAN core — This could either be as a native Ethernet over fiber network, an Ethernet overlay network on SONET/SDH MAN infrastructure or both, with Ethernet over fiber mainly at the edge. Another option is to use Ethernet as a MAN core and aggregate data traffic from access such as DSL.

Deployment — From the Carrier View

Looking across the region we see Ethernet deployed in several ways.

Alternative Carriers

Generally, alternative carriers are the ones that initially champion the use of Ethernet. For those with fiber-rich networks and devoid of legacy TDM equipment, Ethernet seems to be an obvious choice. The focus of these in most cases is a basic Layer 2 transport service giving point-to-point connectivity or offering virtual private network (VPN) services using the virtual LAN technology embedded in Ethernet. End users are offered
bandwidth increments running from 500 Kbps to 1 Gbps, with most at the 1 Mbps to 2 Mbps level. In general, the aim is to pick off more lucrative enterprise customers from the incumbent carrier, using price and Ethernet’s bandwidth flexibility as the main attraction. Uecomm in Australia is an excellent example of this. The carrier targets larger corporations, government, business parks and larger educational establishments in Australia’s key metropolitan areas, offering Layer 2 VPN or point-to-point Ethernet up to 1 Gbps in speed. In Hong Kong, Hutchison Global Communications (HGC) has built a citywide MAN based initially on Layer 2 Ethernet. Its customer focus is business and residential, with point-to-point Ethernet and VPN for business, and broadband Internet access for residential blocks and schools.

HGC and Uecomm’s approach to Ethernet is different, however. Uecomm is aimed at low-cost Layer 2 transport to enterprises, with its abundant fiber capacity in the metropolitan area and use of Ethernet spanning tree protocol taking care, it says, of any concerns over quality of service (QOS). HGC sees a much more diverse customer base of residential and business users with different service needs. It has built its network as a Layer 2 over multiprotocol label switching (MPLS) network, ready to serve a more diverse set of QOS and class of service requirements that its target customer base will have. However, as its customer base remains relatively small and its selection of applications remain small as well, it has not yet found the need to turn on the MPLS functionality.

In South Korea, Powercomm, a wholesale access provider, has built one of the world’s largest Ethernet deployments in metropolitan Seoul. It has a network of access local rings that give it fiber-to-the-building access, which connect to larger Ethernet access backbone rings that eventually connect to its core IP network. Powercomm sells its access connectivity to other carriers and Internet service providers. DACOM, another alternative carrier that recently bought a controlling in Powercomm, is aggressively migrating its base of 9,700 leased-line dedicated Internet access customers to Internet access over the Ethernet. As of the end of 2002, it had moved 65 percent of these in less than a year. Moving to Ethernet transport allowed it to lower its reliance on the former incumbent KT’s leased lines. The end user is enticed by more bandwidth at the same price.

Incumbent Carriers

In general, incumbents have not been in a hurry to offer public Ethernet services, as it presents them with an initial set of problems as well as opportunities. Paramount among these is the issue of cannibalization of profitable corporate data services such as leased-line and frame relay services. Looking around the region at established incumbents in competitive markets, it’s clear that, in many cases, the deployment of Ethernet is brought in to help a carrier defend itself against competition from other players. In this case, the services have a similar look and feel to those of the competition. Most of the competition is focused on Layer 2 transport or point-to-point alternatives for leased lines for enterprises, and as a result, that’s generally how incumbents have pitched their services. In Hong Kong, PCCW has a Layer 2 VPN service based on Ethernet that
matches what is offered by HGC and targeted at a similar corporate customer profile. Telstra’s wideband IP service and KT’s Entum VPN service are similarly responses to competitors such as Uecomm in Australia and DACOM in South Korea. Neither of these is exclusively Ethernet, however, and use Ethernet for access/aggregation and connecting with IP cores for long-distance transport. Many carriers find themselves in this position, with IP backbones already well-built for carrying Internet or corporate traffic. By using Ethernet at the edge, they are taking the opportunity to ride on established infrastructure and don’t have to waste resources building another Ethernet core MAN backbone.

KT is one of the few incumbents to be using Ethernet to service residential customers. Its Netopia service delivers 10-Mbps Internet access using Ethernet, largely to building complexes in South Korea. Again, Ethernet is used for access and aggregation and connects to KT’s IP Metro core.

**Greenfield Incumbents**

For greenfield incumbents — with little legacy equipment or customers — Ethernet offers the opportunity to dramatically reduce the cost of deploying a data service network infrastructure. Greenfield incumbents are largely in developing markets, and the use of Ethernet can support business and consumer traffic and become the main metro core. China is a good example in which basic Layer 2 Ethernet networks are being rolled out across dozens of cities.

**Ethernet Poised to Become Mainstream**

Ethernet is disruptive technology and, in Asia/Pacific, initially has been championed by alternative carriers. Incumbents cannot ignore the threat — and have reacted by building Ethernet networks primarily designed to meet the competition head-on. This dynamic is enough to see Ethernet increasingly being established as a mainstream enterprise data transport offering across many developed Asia/Pacific metropolitan markets during the next two years, led by South Korea and Hong Kong.

In some markets, early signs are that Ethernet will be used beyond transport to facilitate the delivery of a range of IP applications beyond basic data transport services to residential customers and small and midsize businesses (SMBs). Incumbents — focused on cost control and asset use — will not be the leaders in this.

The question for all carriers then is one of approach.

**Who Is the Customer: Large Enterprises, SMBs or Residential?**

Perhaps the most fundamental decision for a carrier is identifying their market and what they think will be the services and applications they can sell to it. The following major markets can be sold to:
Large enterprises — They use basic transport Layer 2 between smaller numbers of locations. Customers will continue to want guaranteed bandwidth and service quality to run their own applications over it.

SMBs — These have larger numbers of smaller business customers and need a package of voice and high-speed Internet, with applications such as VPN, storage, data replication, surveillance and application service provider services.

Residential — They use voice, high-speed Internet, video-on-demand, streaming broadcasting and games.

The clear difference between the large enterprise focus and SMB/residential is the sheer number of customers involved, and the improvement of the yield per customer in the latter will involve bundling a range of network-based services.

Initially incumbents and competitive carriers have been focused on rolling out broadband Internet services as the initial offering to SMB/residential. We see this as only high-volume but low-margin strategy as broadband Internet increasingly becomes a commodity. Already 12-Mbps broadband Internet access can be had in some markets in Asia/Pacific for US$30 per month or less.

Carriers focused on the SMB/residential market will have to deliver a range of applications beyond Internet access. The problem is that few models exist for this, and applications have unproven revenue/profit potential. In addition, feedback from Metro Ethernet providers such as Hansol iGlobe in South Korea suggest a move to applications is still perhaps too early, even in the most developed Ethernet markets. It has found that most business customers are still reluctant to buy anything other than basic Internet access. Larger enterprises want to stay with their leased lines for corporate data transfer, and SMBs are generally not sophisticated enough to see a rationale for additional applications. Hansol’s main value-added success has been with VPN-selling to SMBs that have chains of remote locations.

**Layer 2 vs. Layer 3**

One of the questions for any carrier looking to deploy Ethernet is: What sort of network should they build? On the face of this is a question about technology, but it is actually a decision that comes from the carrier’s business service and applications strategy — what are the carriers’ target customers?

Layer 2 switches — similar to those found in the LAN environment — provide connectivity between points without regard for the higher-layer applications. Layer 2 Ethernet deals with transport only and supports services such as Ethernet virtual leased circuits, transparent LAN services and Layer 2 VPNs. This is sufficient to replace conventional data services such as frame relay and leased-line, a big revenue-earner for incumbent carriers. The added value comes in the form of bandwidth-on-demand and the scalability and flexibility of the bandwidth offerings. Layer 2 Ethernet
VPN is analogous to frame relay in that corporate customers maintain their customer premises routers. The big advantage of Layer 2 is that it is relatively simple, the lowest-priced option for deployment and the most used today.

Adding Layer 3 to the network should allow a carrier to run a range of value-added IP applications over Ethernet, using the extra intelligence to make better routing decisions that support enhanced QOS needed for applications such as video or Voice over IP and the ability to build class of service.

Layer 3 doesn’t always mean different hardware but does involve a software upgrade to the network infrastructure. That in itself is generally not prohibitively more expensive, meaning from a capital expenditure point of view, a big difference is not necessarily seen. However, the additional complexity at the management and provisioning stage means added complexity in setting up the network, when compared with a Layer 2-only network. One challenge for carriers servicing corporate customers is the issue of resolving the customer’s IP address scheme and routing arrangements with that of the carriers.

One of the reasons given by vendors for the need of Layer 3 intelligence is the need to give better QOS, an important consideration when the carrier starts to go beyond transport in application-specific services that need a defined and guaranteed level of QOS. Interestingly, carriers running Ethernet over their own fiber say this isn’t an issue as they have so much capacity to spare. Overprovisioning in the interim can solve performance issues until a clear need is seen to invest in more intelligence.

The difficulties in Layer 2 appear to come when networks are scaled up to thousands or tens of thousands of endpoints on a shared Ethernet backbone. Think of a residential environment in which a single customer might use 64 Kbps for a voice call, 512 Kbps for Internet surfing and 3 Mbps for on-demand or multicast TV or video on demand, potentially at the same time. For those wanting to target SMBs with a range of services, the issues are the same as delivering a range of services to large numbers of customers. Importantly, service differentiation allows pricing differentiation so the carrier is not reduced to a dumb pipe.

Carriers approaching Ethernet with the more defined view of the applications end game in sight — and few have so far — seem to believe that the answer to achieving the aim of keeping operating expenditure down is MPLS, that is, using it as a services/application creation tool, rather than a QOS mechanism.

**Cannibalization**

One of the biggest issues for incumbents is whether Ethernet will add to revenue or cannibalize those of profitable local leased-line and frame relay services. Cannibalization over time is inevitable. In the short term, it can be mitigated by pitching Ethernet speeds and prices well above where the bulk of local leased-line customers buy. But carriers in competitive
marketplaces don't have that luxury. Carriers are treading a fine path — offering Ethernet VPNs to customers that they think are in danger of defecting, while keeping the service under a low profile to the rest of their enterprise user base. KT has users of its Entum services paying about 30 percent less than they would for a leased-line network.

Gartner Dataquest Perspective

Competitive Carriers
For competitive carriers rich in fiber, Ethernet is a prime choice, given its lower capital and operating expenditure requirements. It can give them an early chance to differentiate themselves from an incumbent’s offering, using the lower cost base to offer less expensive prices with added bandwidth flexibility. But we urge caution. Carriers that go this path too aggressively can kill their own markets and speed the commoditization of their main source of revenue — transport. Carriers should be very careful not to underprice their products. Competitive carriers have found their Ethernet services to be grossly undercutting the price of their competitors — understanding street pricing is critical to avoid commoditization and a costly price war.

Even competitive carriers will have to get into the business of providing applications. The question is timing. Large corporations, by and large, still only want Layer 2 transport or are happy to stay with their reliable leased lines. The market for SMBs or consumer-related applications delivered by Ethernet is only at its early stages — and for most countries is limited to only Internet access. For many alternative carriers, Layer 2 for the moment is enough — QOS can be assured by overprovisioning, and with Internet access as the only real application, they don't need Layer 3 yet. The timing question has no firm answer and depends on local conditions and how the take up applications move elsewhere. Layer 3 VPNs with a class of services attached should perhaps look for one of the more promising first steps toward an applications-driven approach.

No carrier in Asia/Pacific has directly offered a full range of services in the way that Italy's FastWeb, a metro-focused carrier owned by e.biscom, has attempted. It sells a bundle of voice, streaming TV and high-speed Internet access for about US$70 per month to consumers using Ethernet. In the SMB market, it sells products such as premise surveillance services.

In Asia/Pacific, Ethernet access remains focused on Internet access. But without the economy of scale of a large user base, Internet access for most carriers will not be good enough to sustain the investment returns needed. Prices of broadband in many markets continue to fall. In Hong Kong, for example carriers have now bid the market down for 12-Mbps Ethernet access to an unbelievably low US$4 per month. Meanwhile Hong Kong Broadband, a small competitive carrier, looks as if it will become the first carrier in the region to move to a video, voice and high-speed Internet bundle package when it launches pay TV next year.
**Incumbent Carriers**

The use of Ethernet in an incumbent carrier's network is less clear-cut. Many carriers in Asia have developed IP over SONET/SDH infrastructure in their metro networks, supporting their established broadband networks. In this case, Ethernet's most obvious benefit is inexpensive access and aggregation networks, directly over fiber, that connect to the IP metro core. In time, it seems likely that as fiber goes closer to the edge of networks that smaller Ethernet metropolitan rings will be used as the prime aggregation technology. Ethernet in this scenario becomes an increasingly important part of the carrier's last-mile portfolio as end-user bandwidth demands grow, but the main metropolitan transport remains IP over SONET/SDH. Initially, these edge Ethernet networks will be Layer 2 but may have to be upgraded to MPLS as necessary as the user base and application use grows and the need for QOS/cost of service increases. For incumbent carriers focused on cost control, this will be an attractive approach as it lowers cost in the short term but increases costs 15 percent to 20 percent in the long term.

In the meantime, incumbents must react to the threat from competitive carriers. Several carriers have quickly built end-to-end Ethernet networks that overlay their SONET/SDH and ATM networks in an effort to match those Ethernet services offered by competitive carriers. Carriers must do this to keep their high-end enterprise customers that request this service happy. The trick, for incumbents, is offering this service to those that want it without raising general awareness of the pricing advantage of the service to the bulk of business users, which they want to keep on legacy infrastructure and pricing.

**Key Issue**

What are the optimum business models for incumbent operators, alternative operators, ISPs and other carriers?

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