TELECOMS INFOTECHNOLOGY FORUM

BROADBAND IN HONG KONG

December 7, 1999

HK Convention and Exhibition Centre

SUMMARY PAPER

Executive Summary

1. The broadband theme of TIF in December 1999 was timely in light of OFTA's (the regulator: www.ofta.gov.hk) issuing of a consultation paper on broadband interconnection. TIF wishes to thank **Level 3** and **Newbridge Networks** for sponsoring this forum. TIF also wishes to thank the overall sponsor for 1999-2000, **Cable & Wireless HKT**.
2. Broadband is not just about increasing bandwidth or speed of switching and transmission, it is also about compression. The digital compression and multiplexing of traffic into bit-streams, and the compression of the original seven OSI layers (physical infrastructure to ….) into a new multi-tiered multi-media hierarchy. That is on the technological level. On the business level this translates into level 2 and level 3 convergence of …… which offers what **Stephen Shek, Director of Carrier Sector Marketing, Newbridge Networks**, calls 'new service providers' a single platform from which to offer customers, especially corporate business customers, multi-access to broadband services at ATM-levels of quality of service. Multi-access refers to being able to support the entire range of wireline and wireless modes of access, which provides service flexibility 'on demand' – including virtual private network management – and allows service providers to accommodate the various legacy problems corporate customers will inevitably encounter in a world of fast moving technological change. However, the bottom line as far as the business case is concerned is the ability to offer the services which create 'value-added' with service level agreements backing them up. Given these concerns and emphasis, this is clearly first and foremost the world of the business customer, and this is equally clearly the primary focus of most equipment vendors.
3. **Tom Burns, Director, Asia-Pacific Content Group, Intel Corporation**, stresses the five 'C's': *choice* of anytime, anywhere, the *convenience* of broadband and wireless 'always-on', the ability to *control* being online, the growing importance of *communities* of all kinds on the Internet, and simply the '*cool*' for youngsters to be online. Given these requirements, in addition to a suitable platform of content, firms' success in e-business will become increasingly dependent upon speed of transmissions, and equally broadband-to-the-desktop will rapidly become an essential requirement for everyone who regularly engages in e-commerce. Given speed, the next requirement will be the capability of the systems themselves. To take simple example, streaming audio and video is fast becoming a basic feature of most news and entertainment websites. The third ingredient Tom focuses upon is the need for security and encryption. Intel's research suggests that packet loss and packet delay is a highly important issue in the commercial use of the Internet today. The key message that arises from Tom's perspective is that needs and necessity will drive broadband rather than being an optional luxury, and those needs exist right now.
4. Todd Dutkin, Vice-President, Business Development, Level 3 who argues the case for 'silicon economics' take this theme further. Silicon economics is essentially the economies of network externalities (the more people on the network the more valuable the network becomes to those already on it and to those about to join it) plus the economic implications of Moore's Law which sees the cost of computational power halving roughly every 18 months. Silicon economics implies a virtuous circle of growth in user demand and the supply of applications, facilitated by bandwidth availability. Todd is in no doubt that policy and regulatory liberalization has promoted the latter, and as Level 3 is a strong contender for a licence to operate broadband delivery services from Hong Kong, Todd is concerned that remaining, albeit temporary, restrictions on external services from

Hong Kong will delay capacity growth. He points out that by the end of 2000 Hong Kong will still have less than 50 gigabits of international capacity. In support of this contention he argues that industry liberalization has encouraged disaggregation in the sector – Level 3 being a good example – which has spurred innovation and investment. It is much more difficult, for example, to upgrade a traditional circuit-switched network than to upgrade the transmissions layer or applications layer. Echoing Tom, Todd points out that a modern application, such as tele-presence, uncompressed requires up to 15 terabits a second of capacity. So, while Stephen focused on the need for business to equip itself with the capability, and Tom on the need for bandwidth to realize the potential of e-business, Todd focused on the need to open the carrier markets to drive investment in broadband.

5. Much of the discussion in the first part focused upon the gap between the USA and Asia, which was seen as an opportunity as much as a threat, but a note of caution was introduced. Silicon economics can also mean that margins fall, so volume becomes everything. For some that was a business leap of faith, but for others the evidence of market growth as soon as markets became liberalized was plain to be seen, for example, in Japan. One reason for this, it was pointed out, was that the Internet-based industries were very much in the investment stage, as stock valuations reflected, but sooner or later the price points would have to start rising to profitable levels. The disaggregation of the industry, for example, between wholesale and retail in the network side of the business, also poses interconnection issues for the newly emerging networked economy. A final note was struck in relation to Hong Kong and mainland China when the question was posed why invest in Hong Kong when the mainland was the really big prize? The answer seemed to be that while mainland China remains a largely prohibited market for foreign direct investment in telecoms, Hong Kong is the closest hub. The answer may be more reassuring to Hong Kong is its ongoing role as a hub is also linked to the potential for intra-Asian Internet traffic growth.

6. **John Ure, director of the Telecommunications Research Project, University of Hong Kong**, led the discussion for the second panel. John's stress was on the replacement of the 'narowband' model of telecommunications with the 'broadband' model. The former was rapidly running out of commercial juice, the latter not yet beyond first gear. The transition period was not just a question of time, but also of overturning most of the principles of the narrowband world. The key commercial issue was to see broadband as a mass commodity issue from day one, for may of the reasons pointed out by Stephen, Tom and Todd in panel one. That implied a major mindshift on the part of telcos. For example, it implies telco's treating the Internet Service Providers (ISPs) as their customers for broadband, not the end user. It implies equal access and treatment for all ISPs, commoditizing access wholesale prices and access retail prices to stimulate a rapid adoption rate and to reach the 'virtuous cycle' of silicon economics that Todd referred to. It implies regulation on interconnect which prioritizes vertical connectivity between end-users and Internet service, content and applications providers. And finally, John suggests ways of incentivising investment in broadband by making it easy for non-traditional entrants, such as property owners and estate managers to become players.

7. **Anthony Wong, the Telecommunications Authority and Director-General of the Office of Telecommunications Authority (OFTA)** balanced Todd's concerns with Hong Kong's degree of liberalization by pointing out that Hong Kong had comprehensively liberalized across the converging new media industries, multiple international gateway facilities licences would be announced in 2000, and the moratorium on domestic fixed wireline licences expires end-2002. He estimates this will result in Hong Kong's external capacity jumping from under 20 gigabits to over a

terabit with two to three years. Tony's primary focus was on OFTA's recent consultation paper on broadband interconnection, and he outlines the pros and cons, indicating OFTA's preliminary view that the TA should at least have the power to determine interconnect between networks even if purely market solutions were preferable. As in other jurisdictions, the most controversial aspects of the policy relate to the requirement for interconnection of access networks and the degree to which local loop unbundling, a requirement of narrowband policy, should be extended to broadband. The assumption is that a significant proportion of broadband traffic will end up local network-to-network rather than network-to-Internet. Although not stated, perhaps electronic commerce carries this implication.

8. **Frederick Tipson, Director of Regulatory Affairs, Cable & Wireless HKT,** congratulated OFTA on setting out the key issues very precisely in the consultation document. Fred stresses the point that a defining characteristic of investment decisions in a world increasingly dominated by the Internet is the uncertainty attached to any market view. From an operator's perspective, the challenges are not confined to markets, but cut across all aspects of running the business, and perhaps most of all challenge people's thinking about old and new ways of managing. This implies uncertainty as to how different players within the industry will position themselves and conduct their business. For this reason, in his own opinion, he is not convinced that regulation of interconnection will be unnecessary, but he hopes and thinks it will be.

9. **During the discussion** questions were raised about how companies might position themselves to cope with the uncertainties outlined above, and that led into a discussion about how far in the broadband Internet model should regulation attempt to prevent restrictive practices through vertical integration of content with service provision. In the media world exclusive content agreements were not only common, but were often seen as crucial to the business model, whereas in the telecoms world inter-operability, standards and interconnection were the rules of the game. The IT world stands halfway between. This debate is, in microcosm, the problem of convergence among industries with very different regulatory histories, industry attitudes and business models.

10. **Key issue?**: if there is a key issue coming out of the debate which follows it perhaps revolves around two opposite views of what drives investment. The one view would be that commitment to broadband requires the incentive of a return on investment, which implies light-handed regulation at most, allowing each operator to enter the market at their own level of resources, either employing wirelines or cable or terrestrial wireless or satellite. The alternative view would stress the role of competitive entry, promoted and facilitated through interconnection, and innovation at the service level. Returns on investment will be forthcoming only as and when the market for services, content and applications hit critical mass. This formulation tends to polarize positions, but it may have interesting implications not only for regulation but also for the types of business models that emerge. One of **Tony Wong's** points is that the Hong Kong government has traditionally viewed telecommunications as a social good in the sense that the entire economy and society benefits from its rapid development. This carries the implication that intervention could be justified where the social good was easy to see. In the broadband Internet world identification of the social good will remain relevant, but perhaps harder to achieve in simple terms, and the mechanisms for achieving it less straightforward.

2:00 – 3:30 Session One – Is there a business model for broadband?

***Chairperson*:** John Ure, Director of the Telecommunications Research Project, University of Hong Kong

***Speakers*:** Stephen Shek, Director of Carrier Sector Marketing, Newbridge Networks

Tom Burns, Director, Asia-Pacific Content Group, Intel

Todd Dutkin, Vice President, Business Development, Level 3

3:30 – 4:00 Coffee Break

4:00 – 5:30 Session Two – The Brave New World of Broadband: Where is Hong Kong on the map?

Chairperson: Simon Chan, Chair of the Hong Kong Telecommunications Users' Group

Speakers: John Ure, Director of the Telecommunications Research Project

Anthony Wong, Director General of OFTA

Frederick S. Tipson, Director of Regulatory Affairs, C&W HKT

SESSION ONE

STEPHEN SHEK
DIRECTOR OF CARRIER SECTOR MARKETING
NEWBRIDGE NETWORKS

Today's topic will include a discussion of what a broadband network should be able to deliver to the end user. What are corporate users looking for? Another look at where we are with broadband telecommunication today. How the evolution of this network will take place? How will the eventual network and the model that we're advocating look like?

As we all know this (slide 1) is a well-known curve showing that data and voice traffic is either at the intersecting point or the data traffic has already surpassed that of the voice traffic. However, as everybody is also well aware, the data revenue is significantly lower than voice revenue. What that means for all service providers in order to increase their revenue base they have to look at ways to add value to their current service, so that they can increase that revenue base. Moving forward, the enterprise user is going to look for new services. They are going to want that service anywhere, anytime, when they need it. They are going to look for guarantees. They want to have a pay-as-you-go and also a cap on this pay-as-you-go scenario. They want service when they need it, not to wait for a period of time before they get it. They want to pay based on value, so quality of service is going to be of significant importance. They want the network and the service that they buy to be cost-effective. Those businesses already running today have some form of data communication or voice communication. This legacy system may or may not be ready to move on to the next generation. So they need an accommodation of these legacy systems. Of course, everybody wants lower price. What does that mean? That means that the service providers has to have the following capabilities in order to meet service demand from the users:

- Rapid service deployment
- Extensive coverage
- Fast repair and return
- Consolidated billing
- Scalable and reliable service in order to meet the service level guarantees. Because this is bottom-line driven.
- Certainly quality of service
- Flexibility in order to support new service, new technology as well as accommodating legacy services.
- They need to be interoperable so that any existing system doesn't need to be torn down immediately.
- Of course, they also need to reduce costs. That's the only way they can offer competitive pricing.

This is another common diagram (slide 2) that people will see. The telecommunication world was built on disparate networks. It started with a voice network and private lines for most data communication and the newer capability of offering relay, ATM and Internet. As most of you are also aware that there is significant overlap between relay and ATM. There is frame ATM working. There is also significant overlap between ATM and internet as corporate users demand the quality of service that ATM provides. So what we're looking at today is some form of disparate networks and some trends in merging a lot of the data communications and technologies together. So, we're looking at level 2 and level 3 convergence, voice data convergence. As you know most of telecommunication was supported by switches and then came routers. Today most telecom vendors are looking at ways of merging the switch and the routers so that in your network core there is a single platform. What that means is that these high capacity, high function feature capable switch routers are going to be deployed in the core. The edge is the customer interface, which is where the switches and routers will be pushed out to to minimize customer impact. And these networks already support a variety of services namely, frame access, ATM access or some other forms of data communication access as well as on-net private line voice services. Now moving forward, corporate users will also want to have the ability to talk to the outside world. So you are looking at the devolvement of call servers that's going to provide the second link that is needed in order to connect this broadband network with the rest of the telecommunication network.

The next slide looks at the different platforms and networks that will merge into a very flexible high-bandwidth broadband network at the core with a variety of methods of access. We are going to be looking at a core platform that has both ATM and MPLS capability. Network-to-network interface will be mostly PNNI and the next generation network will be on a multi-service, multi-access basis.

The multi-protocol backbone that most vendors are promoting we also call virtual private networks. So in essence what you are looking at is various networks that co-exist in this one network. A single platform that has the capability of providing support on internet service, IPVPNs, frame relay, voice and whatever other type of requirements that are needed.

Another way of looking at the network where it would position itself with respect to the rest of the services is right in the centre of these three circles. The outer one is the typical voice service where we have the parts, the wires etc. On the other side you have the IP, the Internet – and of course, corporate data - and that runs the day-to-day activities. The new network has to be able to support all three and the overlapping services that each three of the technologies is the support.

Now, let's look at the access methods. The graph clearly shows you that the growth of business traffic is going to be the prime focus for most carriers as well as switch vendors. Fibre is where most businesses' requirements will be supported. Besides that you can see XDSL and broadband wireless climbing fairly high and quickly. So those two technologies will be another area that most vendors as well as broadband service providers will be looking at. They have to have that access method in order to bring broadband service to the customer. Right now that becomes a bottleneck if that access isn't there.

So, moving forward, you can have a network that is already connected up with the PSTN, the Internet, and the corporate private networks. The carrier needs to be able to provide either an XDSL or some form of copper-based broadband access. Today XDSL is a very strong technology to support it. Certainly there is also fibre and on-coming is broadband wireless: LMDS or MMDS. This will enable the service providers to extend their coverage regardless of what technology it is and regardless of where the customer is located. They will be able to provide the same kind of service. To elaborate a little more on wireless service, this is a very simple chart. You have a base station and, just like the cellphones, you have the antennae connected up to the customer site. Most customers, especially corporate customers, would have a customer base unit that would provide either a hub service or voice service etc. You can also see a combination of these technologies with wireless and ADSL or XDSL to increase the fan out, to increase the flexibility as well as capability.

Moving forward, in terms of the model for the new service provider, they would have a focus on the applications that the customer is looking for. They would have a core technology and core platform that is going to be multi-service, multi-protocol based. They would also have the flexibility of multi-access, in other words, based on various technologies. That would bring their service to the customer regardless of where they are. On top of all of these is network management. This is the critical piece where unless network management is strong and capable they're not going to be able to deliver the SLA, the quality of service that is needed. Certainly there is a need to have some form of service management. They have to have that capability in order to roll out new services, and in order to support the services they currently have.   So this is our view of the new model for broadband networks.

The way networks work

What does networking look like in a broadband world?

Stephen Shek

Director, Carrier Marketing
Newbridge Networks Asia Pacific Region

December 7, 1999

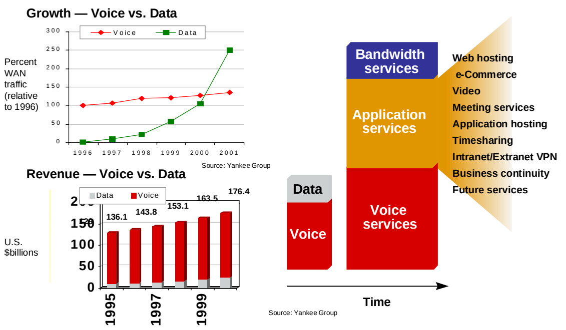
NEWBRIDGE

Agenda

Today's discussion

- What a Broadband Network should be able to do
- Broadband Telecommunication today
- Evolution of the network
- The model of the new network

The Opportunity Ahead

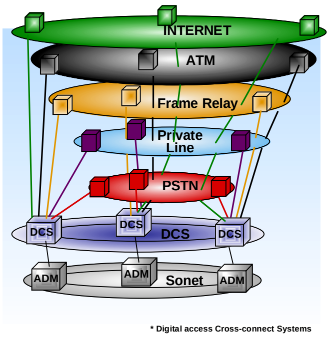


What a Broadband Network should deliver

The service that Enterprise or End Users want	What does that mean to Service Providers
New advanced business services	Rapid service deployment
Uniform services, anytime, anywhere	Expand service coverage
Performance guarantees (SLAs)	Rapid provisioning and repair
Pay as you go (predictable)	Consolidated billing
Services on demand	Scalability/reliability
Pay based on value	QoS/CoS
Customized, cost-effective services	Flexibility (IP and legacy)
Accommodation of legacy systems	Interoperability
Competitive pricing	Reduced costs

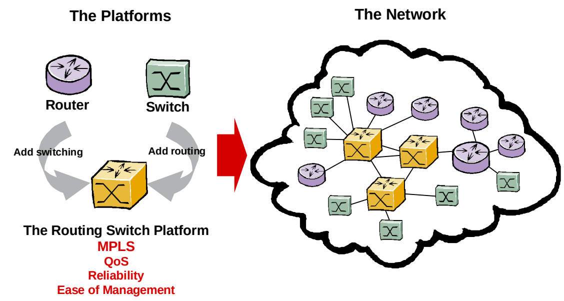
Today's Networking Challenge

- Number of voice & data services being offered continues to increase
  - Separate networks for Internet, voice and data services
  - Separate overlay networks for different data services
- Technology Convergence
  - Connectionless & Connection-Oriented
  - L3 & L2 (Routing/Switching, IP/ATM)
  - Transport integration
  - Require true agnostic, best possible technology for service offering

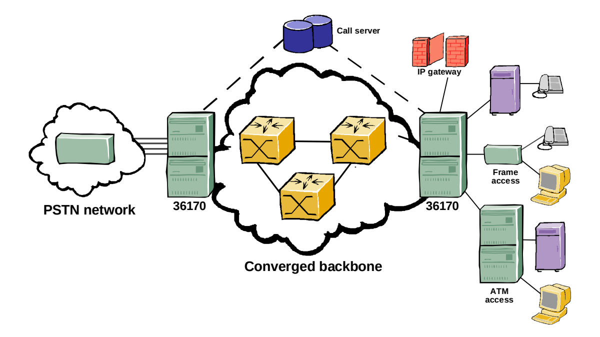


* Digital access Cross-connect Systems

Evolution of the Network Core

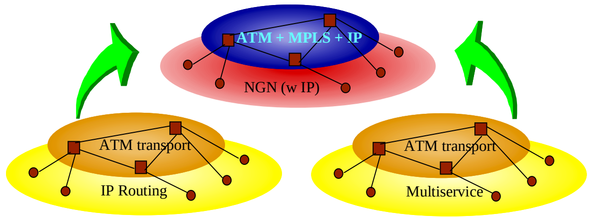


Voice and Data Convergence

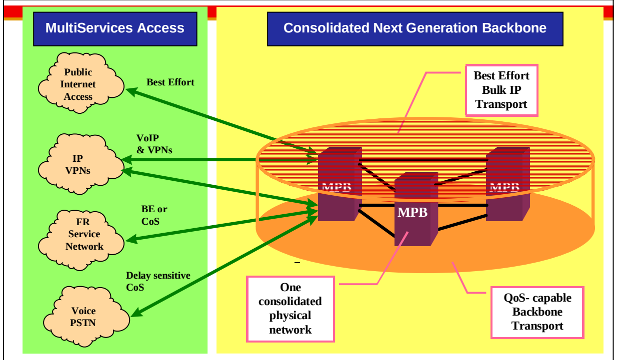


Multi-Protocol Backbone Networking

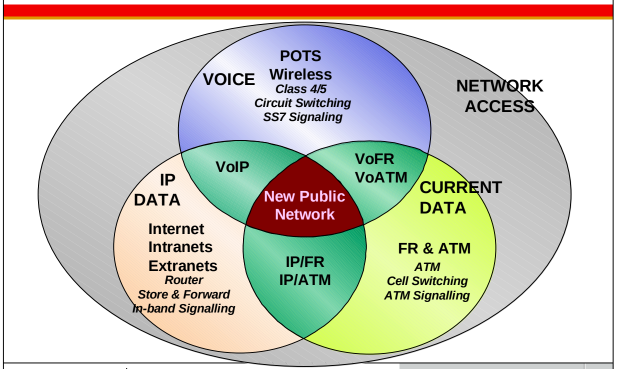
- Multi-Personality Switching Platform
- Simultaneously supports ATM and IP/MPLS control stacks
  - *PNNI routing/signalling and OSPF/(LDP,RSVP+)*
  - *True NGN (multiservice networking) capable*
  - *Ease migration of ATM-based network to MPLS-based network.*



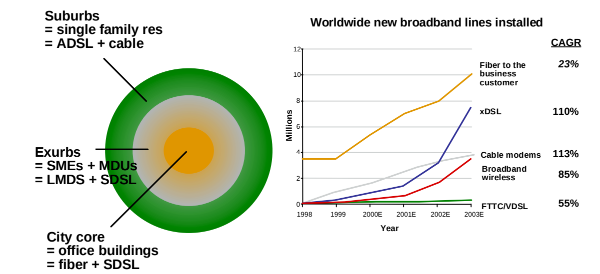
Consolidated Backbone Architecture



The New Public Network

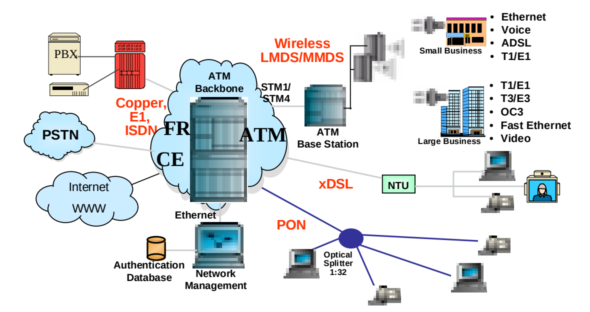


The Unquestioned Need for Broadband Access

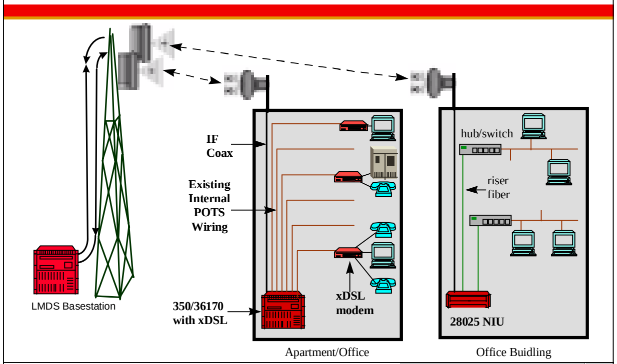


Source: Ovum, *The Future of the Local Loop, Markets and Strategies*, 1998, "Ovum Forecasts, Telecoms, the Internet and Digital TV," 1999; The Leadership Connection Interviews, Ernst & Young

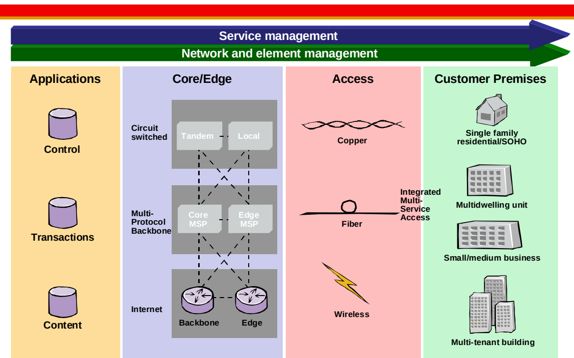
Flexible and Versatile Broadband Access



Distribution of services in a building



A Model for Service Provider Networks



NEWBRIDGE
The way networks work™

TOM BURNS
DIRECTOR, ASIA-PACIFIC CONTENT GROUP
INTEL

A lot of what I will talk about are global in concept but they apply to the Hong Kong situation. A lot of people hear that I work in the content group of management; that's a name that basically supports the software developers in the worldwide arena on Intel architecture platforms. So one of the things I wanted to start today with is a very simple equation that I'll try to build some ideas around. The feature sets that businesses bring to the marketplace, coupled with their e-business capabilities, multiplied times what we're talking about here today – broadband – the higher the performance of the network, is actually going to result in the ROI for e-business capabilities, going forward. I'll try to make some observations that we're beginning to see in the marketplace. What this equation means is that more speed definitely gives a better experience. It's up to the business people to take that speed component and those features and capabilities and put them together in a way that attracts the customers. But this is the opportunity that exists when you do have a broadband platform coupled with a high performance content and platforms.

I would like to quickly go through some environmentals. What we're looking at is roughly a billion connected devices within just a few years time. And they'll be transacting trillions of dollars of e-revenue. And this is going to be fuelled by the global e-business explosion. This is a large opportunity for Hong Kong. If you have the infrastructure in place you have a large reach worldwide and this is an opportunity to reach customers beyond the geographical boundary conditions of Hong Kong and also of Asia. Another thing, of course, we're seeing with the IPO valuations around the world in the different stock markets, is people taking the MIPs (*millions of instructions per minute – ed.*) computing coming out of the PC side of the industry, coupled with the broadband (bits per second) that the telecom industries are providing and coming up with new user models. A lot of traditional user models are being changed very, very quickly. The opportunity here, of course, is to take advantage of that. Industries doing that are music and pc distribution (Dell). The travel industry is going to have a large impact in Hong Kong with our tourist capabilities. People are going to want to see the hotel rooms and sites before they come. This is going to take broadband experience.

The other thing, unfortunately, we're also seeing is not everybody is embracing this. I guess the people in this room are here because they've already embraced this but there is an opportunity to fall behind. I think probably in Asia, and in Hong Kong, we have to be concerned with leading and moving forward as aggressively as we can. If you're not going to take advantage of this new platform with hundreds of millions of users with high speed and built-in computing devices whether those are PCs or cellular telephones, your competition could pass you by. And lastly we're seeing a brand new phenomenon. I'm sure all of you have high-speed access at your homes or your offices but I enjoy being served over the Internet at my convenience. We are training a new group of users; whether those are purchasing managers in businesses or consumers at home, to get the information or the service when they want it in the form they want it in and delivered to their desk-top or computing device.

Let me just quickly use a couple of Intel examples. One example is e-commerce, e-business capability where you can buy things over the web. Another one is more informational, more text based, but you do see some graphics and GIFs but not a lot of richness. However it downloads very quickly because most of us, unfortunately, whether in the business or home arena are not connected to high-speed networks. The last one is something we call Intel Web Outfitter Service which is what we would like the web to be going forward. High-speed networks with high-performance PC platforms. This is not meant to be a sales pitch but what I do want to get across here is that web sites like these we're finding more and more of. If you go back just two to three years web sites then looked very old and ugly. All you have is a bunch of text. Compared to this foreground web site here which is very rich in graphics, there's a lot of audio, video etc. This is what consumers are looking for. When I use the word consumers I also mean business people. This is a way to get your brand across, your product presentations, your catalogue etc to make business decisions and purchasing decisions on line. So we're going to see more richness with these features.

The second aspect of the equation is capabilities. I've only chosen one here to save some time. Clearly one of the capabilities here with a new business site would be cost-savings for internal purposes or to pass on to your consumers. These are just some examples from a source called Organization for Economic Cooperation, back in April this year. Significant cost savings are associated with taking advantage of a communications platform that a lot of customers are already connected to. You can't ignore this type of cost-saving if you're competition starts basing their business and pricing decisions and service models on these particular costs. So features plus capabilities, combined with speed is where we're heading. I don't go to very many web sites any more that are text-based. Some of the latest figures out from some of the research institutes shows that of news and entertainment sites around the world, over 50% have streaming audio, over a third have streaming video and a lot of that is due to the combination of better software programming, better infrastructure (like broadband) and better computing platforms – being able to process that rich data. People will not go backwards. Companies are now using this capability to present products in a richer environment to hopefully close more sales more quickly on their web sites. We are also going to see a new form of community. Chat rooms have become popular. We've moved from simple text-based chat rooms to somewhat avatar based (*using simple visual representations of characters – ed.)* to more 3D, moving aggressively to immersive 3D chat rooms. With a 1-megabit connection, coupled to a high performance PC next year you'll be able to do simultaneous voice animations with hundreds of on-line users. We've seen the first examples of that. A particular example I'm referring to is people skiing, with hundreds of other people, with very detailed graphics of the ski slopes, trees, the chair lift going up and you could switch back and forth between a 56K and a 1.5 meg and it's scaled. If you had a 56K connection you got basically one or two trees, at 1.5 meg you had a lot of people skiing with you with a lot of overlay of the ski slopes. That will be coming on line next year. It is critical that the broadband network's in place to do that.

The third thing that we're seeing is concerns about encryption and security. Broadband's going to help us here because the overhead on encryption and decryption is very high with regards to the end-user experience. If you time-out an end-user experience because they're trying to handle 128-bit encryption it doesn't bode well for sales at that particular website or for them coming back. So I want to quickly just talk about a couple of things that we're finding are impacting performance on the network. This is based on Intel's e-commerce work that we've been doing in the region and worldwide. What we're finding out is that the opportunity for our underlying foundation of the service provider for the broadband is very critical to our end-user experience. We want them coming back to purchase more of our products on the web site. What we're finding out is that there are a lot of things that go into a successful e-business site for the end-user experience if they're placing orders on line. At the bottom the CPU has some things to do with it as the CPU's used for computational purposes for the encryption. As we move up we've got the encryption. Packet delay turns out to be quite important. The highest level's the packet-loss, moving forward. So these are things where the opportunity for the broadband helps higher speed but also tuning that circuit for the end-users with packet-loss, computational capability and packet delay. So there is a new infrastructure for success. Ubiquitous computing is non-stop. It started with desktops, notebooks, mini notebooks. We're at webpads and PDAs now and cellular phones are already here doing transactions. This industry on the high-speed connectivity side just keeps ramping up. The previous speaker talked about some of these: ADSL, cable, third-generation wireless and, of course, satellite. What all these things are going to do for users is bring up what we're calling the 5Cs. They're going to want choice of anything and everything when they want it. They're going to want the convenience of the wireless network and broadband speeds to work at their leisure. We're finding that they definitely want to control what they see. There's trade off involved in talking about security and personalization, how much information we give away in regards to having somebody give us what we want when we want it. The community's going to get more important; either those are hobby-based or people with like-minded requirements or subject matters or purchasing communities. And lastly, there is a feeling in this new digital era of being cool or being perceived as leading edge. We have to translate that into dollars as business people but there is goodness in the word "cool" with regards to delivering services and solutions that capture the imagination of your targetted audience.

So the new rule's and new game's to take the entrepreneurial capabilities of what Andy Grove called free MIPs and free BOD (*broadband on demand – ed*.) and tie that to the traditional discipline of the companies for traditional IT to build out a new business solution. With these new capabilities we're looking at a lot of new players joining quickly and the established players can win but they have to move quickly.

So in summary I'd just like to come back to what we've got here which is an ability to build out a balanced communications platform with features and capabilities coupled with high-performance network which gives us an ROI for new business activities.

What are the issues that HK needs to address for a Broadband World

A Presentation to TIF

December 7, 1999

Hong Kong

by Tom Burns

Intel Asia Pacific

intel

Our Equation for the Day

(Features + Capabilities) x Speed

= ROI on e-Business

intel

The Broadband Platform

Where's It Going?

What's Visible Today: Environmentals

- E-business Global Explosion
- Broadband + Solutions unleashing new usage models
  - e.g. Music Industry Distribution
  - e.g. PC distribution
  - e.g. Travel industry
- Resistance to discard business models that previously served us well
- Customers enjoy being center of the Universe

A Billion Connected Computers and Trillions of $ of Online Transactions

intel

Features….

retail

home

IWOS

intel

Capabilities….

Transaction Savings by Category			
	Traditional System	Internet	Percent Savings
Airline Tickets	$8	$1	87%
Banking	$1.08	$.13	89%
Bill Payment	$2.22-$3.32	$.65 - $1.10	71% - 67%
Term Life-Insurance Policy	$400-$700	$200-$300	50%
Software	$15	$.20 - $.50	97% - 99%

SOURCE: Organization for Economic Cooperation and Development 4/99

intel

Speed….

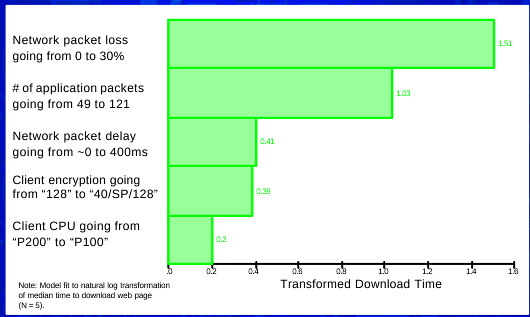
- Enhances end user experience
  - Richer graphics, Video/Audio, better display of products using new tools
- Allows for new forms of interaction
  - 3D Chatroom with voice, animation and hundreds of online users
- Requirement as Encryption/Security become standard
  - Overhead to end user experience

intel

Experimental Results - Main Factors Degrading HTTPS Performance

- These factors effect central tendency of download times:
  - #1 Packet loss
  - #2 Number of packets involved in the HTTPS transaction
  - #3 Packet delay and encryption method
- These factors effect variability of download times:
  - #1 Packet loss
  - #2 Number of packets

Pareto Graph for Main Factors on Median Time to Download an HTTPS Web Page



An Infrastructure for new Success...

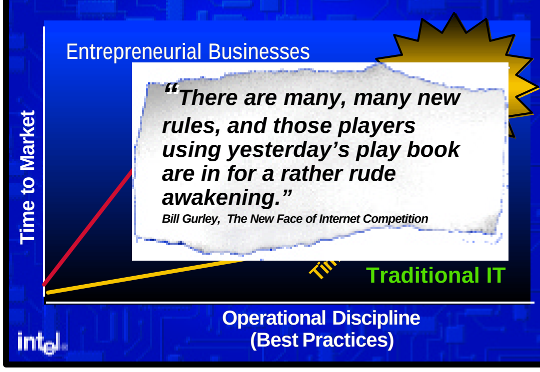
- Ubiquitous computing
  - DT’s, NB, miniNB’s, Webpads, PDA’s, Cellular Phones
- Anytime, high speed connectivity
  - 28.8k, 56k, ISDN, G.Lite, ADSL, Cable, 3G, Satellite
- New Services targeted for users…
  - 5C’s

What End Users Desires:

The 5 “C”s of End Users

- Choice: Anything and Everything in an instant…and it is paid-off increasingly with Broadband - 24 X 7, Always On
- Convenience: Virtual time and place utility, but with the realism that only Broadband can deliver
- Control: Ability to Navigate and Personalize, with Rich User Interface; allows the end user easy management of the choices offered
- Community: Add Contextual relevance; allow users to publish with richer media via broadband; realistic virtual worlds/communities
- Cool: Leading edge in services and appealing to the target audience; the “digital generation”

New Game, New Rules



Summary

-
- (Features + Capabilities) x Speed = ROI on e-Business

TODD DUTKIN
VICE PRESIDENT, BUSINESS DEVELOPMENT
LEVEL 3

I'd like to start with the fairly obvious. Currently there's a lack of global bandwidth and Asia's need is fairly critical. Secondly liberalized markets are conducive to price competition, better quality of services and it creates the chance for attracting top-notch resources and capital. In addition the current demand for telecoms services is unprecedented and the industry shows no sign of slowing down. These combined factors are creating a new paradigm that is a catalyst for changes in the telecommunications industry.

I'd like to start with a quote that will set the stage for today's discussions very nicely: The Internet is the greatest single revolution in communications since the invention of the printing press. This illustrates the impact of the Internet on the telecoms environment. I think this next slide is going to speak to that quite well.

In Asia the need for bandwidth is rapidly approaching a critical stage. In many cases Internet use in Asia is exceeding that of our European counterparts. And in Hong Kong and in the rest of Asia, we're now achieving the critical mass that was experienced in the US in 1994 and 1995. Today Hong Kong has a higher Internet penetration and growth rate than that of the UK, France and Germany. Step back for a second. That's impressive. This is a tremendous growth we're seeing in Asia. Australia, Taiwan, Hong Kong and Singapore have higher penetration rates than that of the UK. If we look at Hong Kong and Taiwan, the annual growth rate is tremendous. This is a huge phenomenon that's happening in Asia. Unfortunately this fast growth rate has not been matched by the introduction of new bandwidth.

Here we have a slide that illustrates very well that there is insufficient capacity to meet demand. Today Asia's cable capacity still lags far behind that of the US and Europe. There's approximately 2,000 gigabits of transatlantic capacity planned to go into operation by the end of next year. In Hong Kong there'll be less that 50 gigabits of capacity at the end of next year. For the Internet community to reach its full potential I think it's quite clear more capacity is needed and this will have to come at a lower cost. The current lack of bandwidth means that prices are still higher in Asia than elsewhere in the world. In general we see them about 8 to 10 times higher than in Europe and the US. The flow-on effect of this lack of capacity is great.

1. You can see the associated costs of this kind of difference in the paradigm have to be passed on to the internet-enabled businesses and in turn the customers.
2. You see from this paradigm that internet-enabled businesses cannot be as profitable or competitive in the Asia Pacific region as that in other regions.
3. You can see that this is constricting private investment that will limit opportunities in the Asia Pacific region and therefore growth of this new industry is stymied here.

You are probably asking where this leads us. This paradigm we see currently in Asia provides an excellent opportunity for silicon economics to emerge. As was witnessed in the US several years ago, market liberalization has brought about dramatic decreases in cost. This has lead to a boom and a boon for internet or web-centric customers, unlocking the potential for companies that require competitive pricing to flourish, including the ISPs, content providers, the system integrators, the VAPs (value-added providers), web hosters and e-commerce players in general. And as these companies grow the positive effects are passed on to the customers who then increase the use of their web-centric products. This sparks competition and greater demand which in turn heightens demand for more bandwidth. Hence, what we've deemed the virtual cycle.

In addition to this demand discussion a structural shift brought on by deregulation has enabled the growth of the telecoms industry both globally and in Asia. What is happening can be compared to the history of the computer industry. Twenty years ago the mainframe market was dominated by one provider - IBM. They developed the memory, the microprocessor, the hardware etc. To move away from the mainframe and towards the PC industry led to the disaggregation of this market and we saw competition at all layers from the hardware layer to the application layer. So what does this mean for the telecommunications industry? Well, pretty much the same thing. I think we're seeing here disaggregation is creating a tremendous opportunity in the telecoms industry. It's attracting large amounts of private-sector capital. The subsequent flow of that capital becomes the basis for greater growth that in turn creates pressure for better quality products and services. Our next generation telco, like the PC industry is reliant on this fragmented structure and the industry is seeing competition at all layers from transmission to switching to routing. We're also seeing new applications made possible by the availability of more bandwidth at lower costs. I think to talk about demand and industry structure would be only part of the story.

Technology is of course an important enabler. Technology works to create value and separates traditional telco from the new ones. Traditional telephone technology is centrally-planned and improves slowly. IP technology is market-based and improves rapidly.

This slide demonstrates the time needed to double performance from the transmission layer to the application layer. As you can see, upgrading a traditional circuit-switch network is much, much more difficult than upgrading the transmission or application layers in a disaggregated industry. I think that's a really interesting point because obviously speed to market is a very important factor in success.

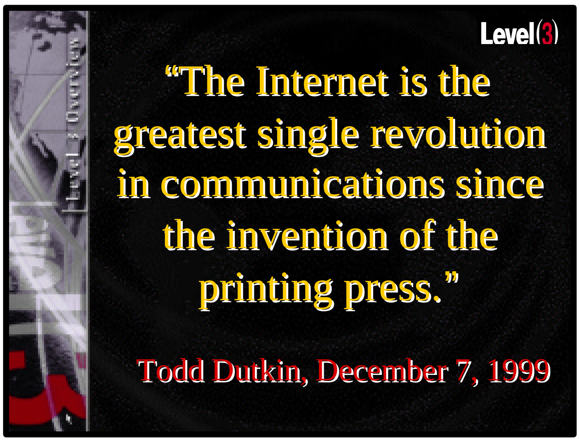
In addition IP technology is led by the market whereas telephone technology is planned as a function of the government or national carriers. In our current telecoms paradigm, responsiveness of the market is a great determiner of the winners and losers and most efficient technologies reap the greatest rewards.

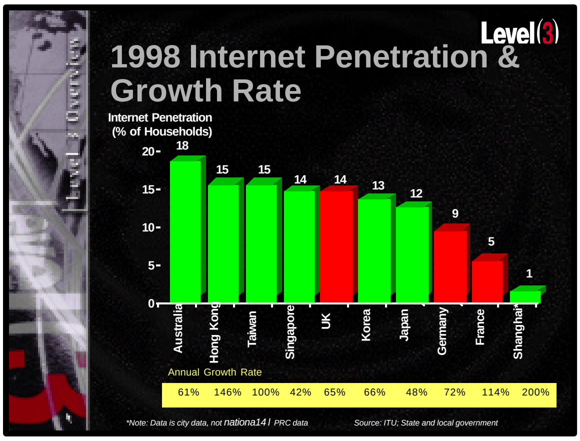
I think this slide is an excellent demonstration of the winners and losers. We can clearly see that those based on IP technologies are far cheaper than those based on traditional technologies.

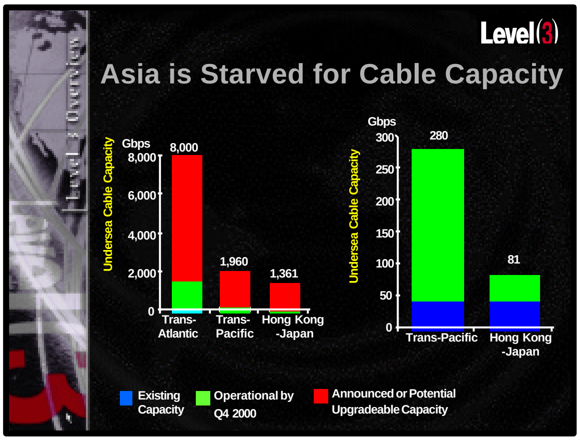
As the cost of bandwidth decreases new applications emerge. I think we went through these previously so I won't dwell on them. I'd like, however, to illustrate by example the last point. If we look at tele-presence as just one of the applications that will emerge in the future and we make some general assumptions about what's needed to really make tele-presence actual you can see it requires 15 terrabits a second of capacity, uncompressed, to actually realise this. That's tremendous. For those of us that lived in a 64K world this is phenomenal growth rate that's needed for the industry.

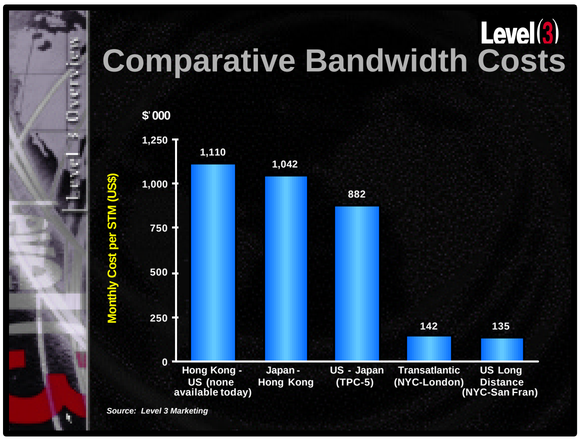
To conclude, the return on investment for fat pipe providers is based on silicon economics, gains in IP technology and, of course, volume, volume, volume.

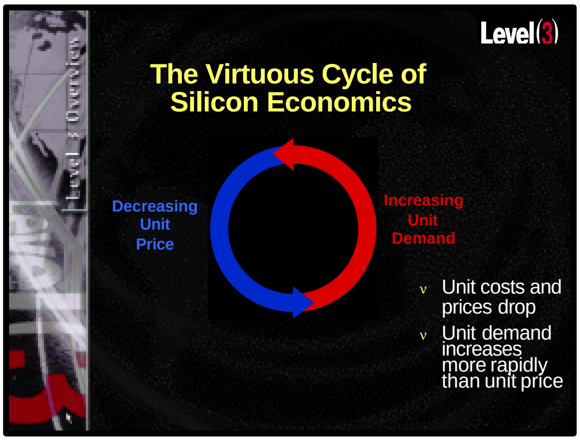

Level 3
The Changing Economics of Telecommunications
Todd Dutkin
Vice President, Business Development, Level 3 Asia

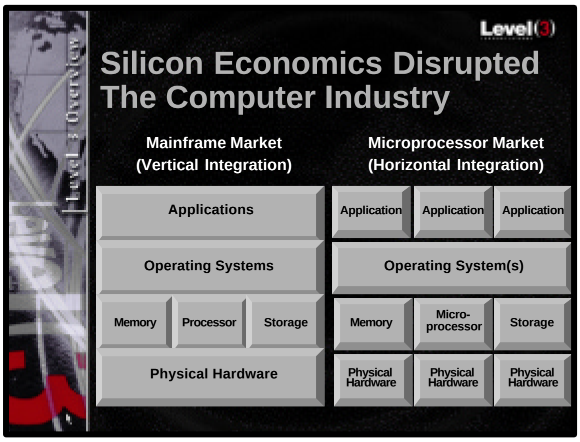

Level(3)
"The Internet is the greatest single revolution in communications since the invention of the printing press."
Todd Dutkin, December 7, 1999

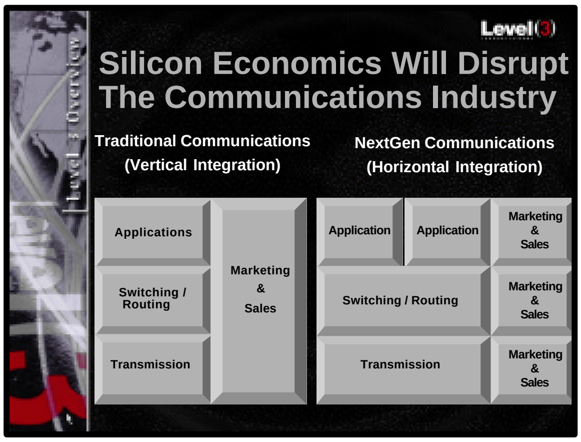

Level(3)
1998 Internet Penetration & Growth Rate
Internet Penetration (% of Households)
18
15
15
14
14
13
12
9
5
1
Australia
Hong Kong
Taiwan
Singapore
UK
Korea
Japan
Germany
France
Shanghai*
Annual Growth Rate
61% 146% 100% 42% 65% 66% 48% 72% 114% 200%
*Note: Data is city data, not nationa14 l PRC data
Source: ITU; State and local government

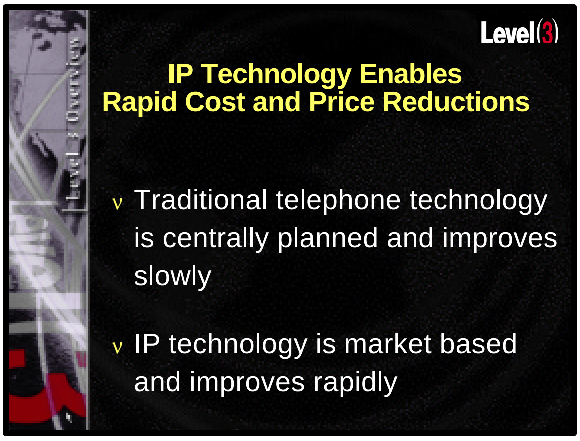

Level(3)
Asia is Starved for Cable Capacity
Undersea Cable Capacity
Gbps
8,000
1,960
1,361
Trans-Atlantic
Trans-Pacific
Hong Kong -Japan
Undersea Cable Capacity
Gbps
280
81
Trans-Pacific
Hong Kong -Japan
Existing Capacity
Operational by Q4 2000
Announced or Potential Upgradeable Capacity

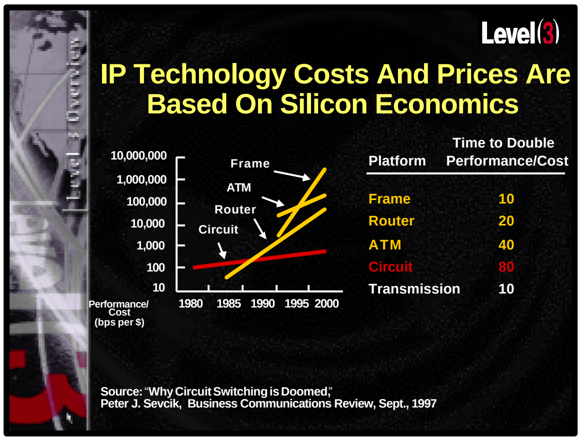

Level(3)
Comparative Bandwidth Costs
$'000
Monthly Cost per STM (US$)
1,110
1,042
882
142
135
Hong Kong - US (none available today)
Japan - Hong Kong
US - Japan (TPC-5)
Transatlantic (NYC-London)
US Long Distance (NYC-San Fran)
Source: Level 3 Marketing

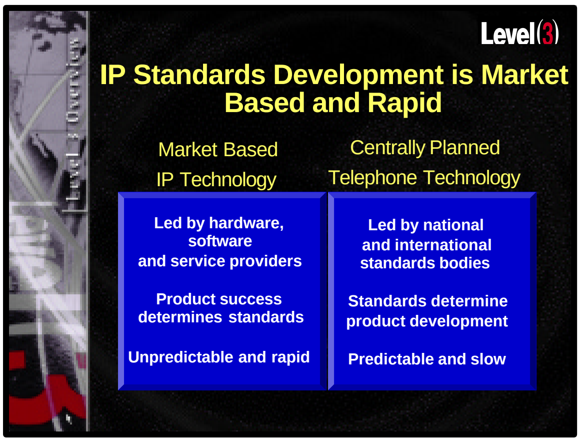

Level(3)
The Virtuous Cycle of Silicon Economics
Decreasing Unit Price
Increasing Unit Demand
Unit costs and prices drop
Unit demand increases more rapidly than unit price

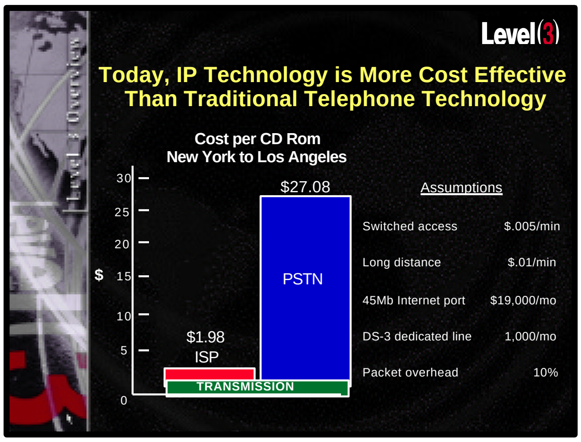

Level(3)
Silicon Economics Disrupted The Computer Industry
Mainframe Market
(Vertical Integration)
Microprocessor Market
(Horizontal Integration)
Applications
Operating Systems
Memory
Processor
Storage
Physical Hardware
Application
Application
Application
Operating System(s)
Memory
Micro-processor
Storage
Physical Hardware
Physical Hardware
Physical Hardware

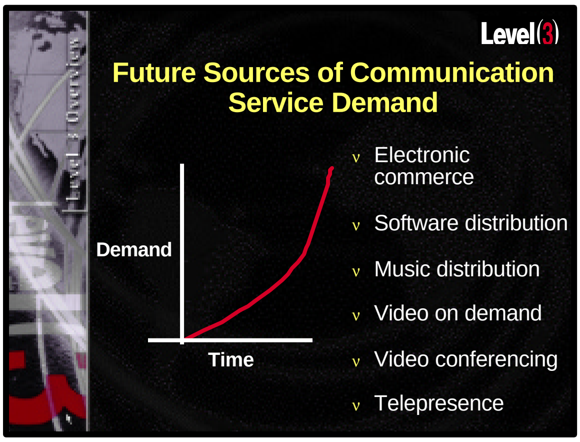

Level(3)
Silicon Economics Will Disrupt The Communications Industry
Traditional Communications
(Vertical Integration)
NextGen Communications
(Horizontal Integration)
Applications
Switching / Routing
Transmission
Marketing & Sales
Application
Application
Marketing & Sales
Switching / Routing
Marketing & Sales
Transmission
Marketing & Sales

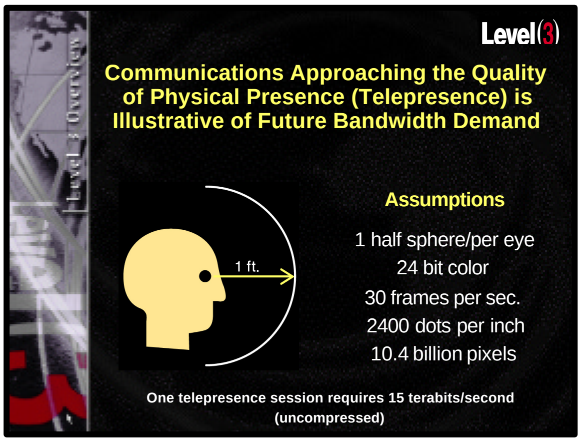

Level(3)
IP Technology Enables
Rapid Cost and Price Reductions
Traditional telephone technology is centrally planned and improves slowly
IP technology is market based and improves rapidly

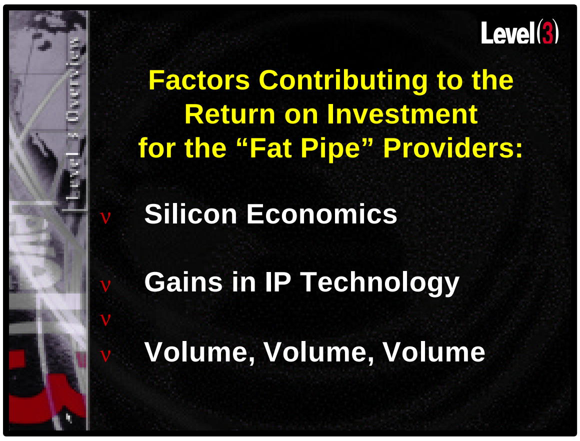

Level(3)
IP Technology Costs And Prices Are Based On Silicon Economics
10,000,000
1,000,000
100,000
10,000
1,000
100
10
Frame
ATM
Router
Circuit
1980
1985
1990
1995
2000
Performance/ Cost (bps per $)
Time to Double
Platform
Performance/Cost
Frame 10
Router 20
ATM 40
Circuit 80
Transmission 10
Source: "Why Circuit Switching is Doomed,"
Peter J. Sevcik, Business Communications Review, Sept., 1997


Level(3)
IP Standards Development is Market Based and Rapid
Market Based
IP Technology
Centrally Planned
Telephone Technology
Led by hardware, software and service providers
Product success determines standards
Unpredictable and rapid
Led by national and international standards bodies
Standards determine product development
Predictable and slow


Level(3)
Today, IP Technology is More Cost Effective Than Traditional Telephone Technology
Cost per CD Rom
New York to Los Angeles
30
25
20
$
15
10
5
0
$27.08
PSTN
$1.98
ISP
TRANSMISSION
Assumptions
Switched access $.005/min
Long distance $.01/min
45Mb Internet port $19,000/mo
DS-3 dedicated line 1,000/mo
Packet overhead 10%


Level(3)
Future Sources of Communication Service Demand
Demand
Time
Electronic commerce
Software distribution
Music distribution
Video on demand
Video conferencing
Telepresence


Level(3)
Communications Approaching the Quality of Physical Presence (Telepresence) is Illustrative of Future Bandwidth Demand
1 ft.
Assumptions
1 half sphere/per eye
24 bit color
30 frames per sec.
2400 dots per inch
10.4 billion pixels
One telepresence session requires 15 terabits/second (uncompressed)


Level(3)
Factors Contributing to the Return on Investment for the "Fat Pipe" Providers:
Silicon Economics
Gains in IP Technology
Volume, Volume, Volume


Level(3)
COMMUNICATIONS
www.level3.com

DISCUSSION

During the discussion period the following points were raised:

John Ure: I'd like to ask each of the three speakers in turn: what do you think is probably the most necessary requirement in Hong Kong in order to make bandwidth available or to develop an industry based upon the fact that bandwidth will become available? If you had to recommend to government one major strategy to increase bandwidth and its use, what would that be?

Tom Burns: there's an opportunity for Hong Kong. If you look at the network diagrams, all the pipelines go back to the US because of the nature of the Internet as it currently exists. But if you look at the Asian population and the uptake as Todd represented in his foils about the growth rates out here, it's huge. As the telecom industry puts out faster bandwidth and better networks, I guess it becomes less of an issue but what we've got to keep in mind is that content's going to continue to go up. The number of megabytes that people are going to consume. So the ability to have an Asian hub, which is talked about frequently with the possibility of Hong Kong leading that capability for the region, the network has to be grown intra-Asia between the different countries and capabilities. Today a good portion of the higher-speed network goes back to the US. That's an opportunity here because by reaching those local consumers intra-Asia could provide a business capability for businesses here.

Stephen Shek: actually I would look at the option for Hong Kong in three different ways. One certainly is locally within Hong Kong in terms of access to each of the buildings, homes and offices. Certainly wireless is now taking the world. LMDS and MMDS has two technologies. Every country is looking at it. So one thing that Hong Kong probably can do is quickly award some of these licences and get the ball rolling so that there will be competition on the local level. That will drive down the price. Another way is the connection to the rest of the world; international bandwidth. If Hong Kong is to become the Asian hub then definitely the bandwidth coming in and going out must be increased. That's the only way to get more traffic through Hong Kong and that is the only way to build Hong Kong up as the economic as well as the technology hub. Thirdly, the global presence and economic – e-business area – that Hong Kong can probably build up. As the capability and technology and the resources build up then Hong Kong would be in a position to take that.

Todd Dutkin: I think the key enabler of bandwidth creation for Hong Kong or intra-Asia would be liberalization of the market. That's going to be the key driver. Let me just point to the US or the EU paradigm. I think what we see happening in those markets that have liberalized substantially is many providers and multiple investors. In that kind of paradigm you are going to have not only competition, the virtuous cycle I talked about, but you have competition that will drive the markets. I think that for Asia to be successful it really has to adapt an open paradigm of competition. That will stimulate a lot of the private sector investment. In Asia the only environment that's actually doing that full scale right now is Japan. I think Japan has at least taken the first step in that process. I think if Hong Kong is to be successful it needs to move quickly towards that type of paradigm.

A participant asked what Japan is doing right now that Hong Kong could follow as an example.

Todd Dutkin: If you look at Japan as of February 1998 they signed the WTO agreement that fully liberalized the market. So from February last year you've had open competition, unlimited licences, anybody could invest in the Japan environment. There has been no numerical restrictions on the number of people that come into the market. In turn what that's done is stimulated a whole host of investment. Not only by the incumbent operators to invest in new and modern technology to remain competitive, but, because that's the second largest market in the world you also have a range of new carriers coming in there to try to get at the opportunities in the Japan market. So a lot of it was structured on the regulatory commitment by Japan to fully liberalize that market.

Tom Burns: there's a complimentary thing. I don't think it's first order but definitely second order. In the last few years the Internet's been the killer application from the PC industry point of view. People have slowed down their purchase rates of CDs and packaged software and they're going on the web in bigger numbers. It's quite interesting to look at Japan's PC consumption numbers tied to some of the lower priced ISPs and we see that PC sales have risen. I don't know what came first. Of course, there's been some economic issues in Japan and there's deregulation going forward. But the PC market was held back by higher ISP prices. When those prices started coming down and bandwidth became more available on the home side we saw PC consumption go up.

Stephen Shek: another point you can consider is the globalization of the world. With the opening up of the Japan business market, NTT's been split up and at the same time you're going to see Cable & Wireless, BT and all these other global carriers taking a foothold in Japan. With that you can see more cables going into Japan. DWDM technology is being deployed there. So with that I can foresee that Japan's price will come down and service will increase.

A participant noted that he understood the model of creating more bandwidth with fatter pipes but didn't understand the business model of who's going to pay for it. New telcos are not making money, e-businesses are not making money, subscribers are paying less and less for the services whether it's voice or Internet access. Can somebody explain the business model that will persuade people to build these fat pipes.

Todd Dutkin: It's a very good question. I equate what Level 3 is doing to building the roads and railways at the beginning of the 20^{th} century. We are providing the shovels and the pickaxes to the gold miners of 1849. We are the underlying infrastructure that supports the growth of the Internet. When you say that new telcos aren't making money, what we're seeing is actually a total paradigm shift from what's happened in a traditional telephone structure to a new structure. Traditionally we had a monopoly and rates were high and people within that structure paid very high end-user fees. You got monopoly returns on investments. What you're now seeing is carriers, and you cut across a lot of different lines whether it's the carriers, or the e-commerce providers, the ISPs, or the services that sell to them, each one of them makes a business decision going into the respective business. To unbundle your question is fairly complex because there's no single business model that I can point to. Intel will have a different business model. Newbridge will have a different one to mine. My business model's basically to sell the underlying infrastructure. That underlying infrastructure lowers the cost to everybody above the chain. Stephen presented that chain which is the lowest from the transmission to the service. And what's happening in this whole paradigm is actually you're seeing the cost reduced. People previously didn't make money because costs were so high. Now what we're seeing is the costs of the infrastructure and underlying support is dropping which is allowing the ISPs to make more money. It's allowing service providers above that layer to make more money. I know that's probably not a sufficient answer but it's a complex question.

Stephen Shek: If we're talking about money I think the stock market's aware that the Internet has created multi-billionaires throughout the world. In terms of where is the return on investment I think carriers and service providers will have to look at ways of adding value. So with competition the cost of transmission has dropped, the cost of equipment has dropped. As a result everybody has a thinner margin. The only way to maintain or expand that revenue base is to look for new ways. This competition is going to force the whole telecommunication industry to move up to the next level of competency.

Tom Burns: Our problem is that we have to build a fabrication plant that costs in excess of US$5 billion today for a microprocessor that's not yet designed or functioning for a market that we hope will be available in three years time. One way to answer your question is that you have to be a blooming optimist because what you're betting on is that you can find marketing and services to attract some form of consumers to pay for your service. It is critical when you're making those types of bets that you get the volume otherwise you cannot amortize your costs. It behooves you to find new ways to use your product. And that competition, that need to cover your costs and grow revenues and services is what really powers this thing forward. On the web just last night I found a site where I could make a phone call and they'll digitize my voice, put it on an e-mail and send it to a whole bunch of people on my e-mail list. These services are going to do what consumers – whether business or home users – are going to pay for. Probably the utilitarian factor of the bandwidth, as we've all noted, is going to get lower, because of the competition. It's going to be the services you put on top of it. I'm not a financier but, as Stephen mentioned, there's a lot of money looking for this next opportunity. I think optimism is the key requirement to survive and grow this business!

A participant noted: I just wanted to follow up on the question earlier about the Japan example. Since Japan signed the WTO agreement in February 1998, what kinds of enhanced services or broadband services are actually coming about there that we can look forward to if Hong Kong is to liberalize?

Todd Dutkin: Japan liberalized in February 1998. I don't think any carrier in that market that has not been existing has introduced new services. The reason for that is to build a broadband network takes time. This is not something that happens overnight. As such you'll see the situation where it'll be a couple of years before you're actually going to have the capacity on line and available for people to offer these new services. I think this is a retrenchment time for the industry. I think the first market that's been attacked, like in all markets, is the traditional voice market. You've seen a lot of changes in Japan. When I first started going to Japan it was with a different company. We received a Type 1 licence in Japan. When I first got there the price of a telephone call to the US was Y340 for 3 minutes and today the pricing structure is about Y30 a minute. So you can see that the first wave of competition has actually hit the stores in the easiest arena for it to hit, which is the voice market. I think what you'll see in the next couple of years is systems like Japan/US come on-line. You'll see broadband international capacity available in Japan and what you'll see is the connectivity between Japan and the rest of the world will increase dramatically. This will allow the ISP and web-centric businesses to grow. I would say that as in the year 2000 when that capacity becomes available the real dynamic changes will become apparent in the market.

Tom Burns: There's another aspect with Japanese behaviour. They very much enjoy the latest fashionable gadgets and the market has been very aggressive in the purchase of these. Right now there's a tremendous number of phone transactions going on in Japan. DoCoMo recently announced that new capability there. NTT DoCoMo is fairly aggressive with 3G-wireless. There's an infrastructure and mentality and a market setting, I think, already in place in Japan where those wireless broadband services get built out (and I think NTT DoCoMo are starting some pilots next year) you're going to find a very quick uptake on those services. You'll be walking down the street and be able to do your Nikkei stock transactions and get your news from Asahi publications. I think the Japanese community seems to appreciate that capability.

Stephen Shek: in terms of the quick impact, certainly long distance as well as wireless gadgets, are things that you can see quickly. Another aspect that we should look at is Japan has the biggest telecom monopoly, NTT. It has 300,000 employees. For a big ship to turn it's going to take a fairly large radius of turn. That's exactly what's happening. NTT's broken up and they are changing. They're changing their infrastructure, mode of business and their marketing machine. We all can see for a large organization to change it's going to take a couple of years. Smaller telecom services like IDC, KDD are ready to introduce some new services. In some cases they already have pilots. You can see those services coming out into the mass market fairly soon. But these pilots are happening.

A participant commented on how the infrastructure is being financed with all the prices going up etc. I think Todd and Tom gave good analogies if you take the PC market where performance is going up all the time and they have to make forward looking investment in order to remain competitive. In telecommunications I can make an analogy with something that's very Canadian, the railway. The Canadian government hasn't invested in railways as much as it should have to be able to maintain the volume that would have warranted this mode of transport to keep going. Now, if you take telecoms I think service providers of today if they don't invest in their infrastructure won't be able to get the customer base due to increased competition etc. Now, there are other ways. Today we have service providers, equipment manufacturers and computing devices. There are ways, by thinking of multiple services that customers want and bundling them together, of generating more revenue. If you take, for example, advertising. Advertising is a whole new business now that used to be in magazines, newspapers and on TV for you to be able to see public broadcast. Now advertising has found its way onto the Internet and has helped some of the people that provide you with information for free to pay for those services. With the advent of broadband access, for example, advertisers and content providers will look into ways to leverage that.

A participant noted: I'm probably just drawing together a number of strands that have been mentioned. We've heard that Intel has to take an optimistic view of the future. It's high risk and that's being used as the analogy for investment in fat pipes and going out into broadband investment etc. We've looked at the fact that there has to be an appropriate return on investment for people going into fat pipes. We've just spoken about forward-looking investments at the moment. It goes back a little bit to the question of who pays for it. I'd be interested in the panel's views about, not so much the question of who pays for it, but who's allowed to use it once somebody's paid for it. If an incumbent invests in a broadband network, what would your views be on the regulation of that broadband network?

Todd Dutkin: if I can capture the essence of that question, once somebody pays for it who's allowed to use it. Is that right?

A participant: and how far does regulation intervene to set that price

Todd Dutkin: I think you're probably facing these issues more acutely in Hong Kong because you're dealing with an environment that's not fully liberalized yet. So what happens in a Hong Kong environment is certain anomalies crop up. So we have, for example, a PNETS (*in the absence of local call charges, ISPs and cellphone operators are required to hold of Public Non-Exclusive Telecommunications Services licences and pay CWHKT a per minute usage charge – ed.*) charge in Hong Kong. We have interconnection arrangements which are being mandated in Hong Kong; Type 1 and Type 2, or unbundled loop levels. I think that because of the regulatory environment we haven't moved to a fully competitive environment. I think Hong Kong has a lot of very difficult issues to sort through. You're going to rely on a lot of regulatory solutions not market solutions. I think that as an environment fully liberalizes relationships between carriers, between ISPs, between content providers, between end-users, naturally rationalize. So that the value chain from the underlying infrastructure to the end user is going to rationalize along competitive lines instead of regulated lines. It's hard to answer your question in Hong Kong because you're somewhere between a fully competitive environment and a regulated environment. So new entrants will want to use the network at what an existing incumbent will say is cream-skimming or taking advantage of its position. And from the incumbent's position, they don't want to give up the investment. So you have the new entrants vying for access to the network and incumbents looking to maintain their competitive position and it usually brings the regulator into the middle of that. In competitive markets you have a more rational structure.

Stephen Shek: Certainly I second Todd's position that Hong Kong is a complex environment moving from a regulated economy into a deregulated one in telecoms. So what we're going to be looking at is probably equivalent to what the US faced about 15 years ago. Eventually I would have to coin the Chinese phrase: Wool comes from sheep. Somebody, whoever uses that network, will have to pay eventually. The question is in a capitalistic environment what will be the price point, what is the level of service that you will provide. Today the Internet is still in the investment phase so you see a lot of money pouring into it even though nobody's making money. That's an anomaly for a short period of time. As this business consolidates, you're probably going to see price rises to a point where it becomes viable. So, the bottom line is eventually the service, with the value-added service will have to set a price point that is profitable for the business, the service providers and something that consumers and businesses can afford.

Tom Burns: I don't have any good answer. A few analogies come to mind. One is optimism has to be played back to an ROI. You're not going to attract the investment community or private capital if you can't get the ROI. The optimism is based on somebody believing and seeing a new way of doing business that maybe the previous business owners don't see. The optimism has to be tied back to something they think they can get value for. The second aspect of that is, as far as usage, there doesn't therefore have to be an ROI. Then we're back in the problem of volume. I think each country or city or wherever those regulatory issues take place are going to have decide that trade-off. Because clearly if you don't make both masters happier -- you need the investment community pumping the money in and getting the ROI and you also want to build demand because the price point are correct. The third point is if we look at a number of industries they've all gone through the same state. There used to be hundreds of electric utilities companies in the US market, compared with Hong Kong and the rest of the world. And there have been fall-outs. So you place your bets and hope that you've picked the winner. If you do then you'll become Bill Gates. I think the money's flowing in because people are placing their bets, hoping to hit it big.

John Ure commented that the debate that is beginning in Hong Kong about broadband interconnection is something that is going on now in many parts of the world. Two interesting areas that will have some influence in Hong Kong. One is on the question of opening up the broadband local loop. In the US, Germany and the UK they seem to be going down the road of local-loop unbundling. But in America, on the other hand, the FCC has stayed its hand on the question of whether not to open up the cable network. Whereas in Hong Kong no decision has yet been taken on the issue of broadband interconnection for the telephone network. That's part of the debate. But the regulator has, of course, decided to open up the cable television network. So that's a contrast with the US. I'll just flag my argument to come in the next session that I think from everything we've been hearing, that the driver of the new broadband age will potentially be at the Internet end; at the applications/content end of the business. And when we talk about interconnection we're really, in my view, talking about how can customers access Internet service providers and how can ISPs access customers in a competitive and open environment. It seems to me that really is the central question that has to be addressed.

Just coming back to the question of where the money comes from, as Todd says, it's a very wide subject this. Different business models apply and are being used and adopted by different companies and companies who occupy different positions in the value chain. Whether they're incumbents or whether they're new entrants also makes a big difference. But it seems to me that as far as the new entrants are concerned the internet model seems to rely at the moment – because as Steven said it's very much in the investment phase – on things like the capital gain that can be got through IPOs and positioning companies for strategic takeover. This in itself is a way that a lot of the money is actually being made. So many of the companies that exist today don't even have maybe long-term plans to exist in five or ten years' time. So strategies that are very much focussed on losing money by gaining subscribers makes sense in the short-term phase, although they don't seem to make sense for a long-term play. If any of you have been following debates about stock markets recently there's a very strong argument being put across that companies that pay dividends should lose their value because they're not ploughing them back into the business. And the new Internet model is you don't pay dividends. People make their money from capital gains. This is very much changing the investor model. From the Internet end that seems to be part of the ways of making money. Now, that would not apply necessarily to incumbents. But the other thought that struck me, when Todd was talking about the vertical disintegration and the horizontal competition that's taking place in the industry, that more and more in the US classically, intermediaries in terms of wholesalers, resellers, are playing a major role in driving the restructuring of the industry. In fact I'd be interested to hear from the speakers whether they see that kind of industrial restructuring happening in Asia and how important they see it as a way of promoting growth in the industry.

Todd Dutkin: I think that a critical element of the success in the US environment is that the market is so liberalized and the opportunities are so great as disaggregation occurs. You've seen a lot of opportunities for middlemen and opportunities created for different kinds of service providers. I think that in Asia we've seen it in the voice market. The voice market is a really good example of competition in Hong Kong. It's an extreme example of competition. I pick up the phone in Hong Kong and don't even think about making a long-distance phone call anymore. It's incredible what's happened in this market with the liberalization. So we've seen elements of it, like within the voice market in Hong Kong and in Japan we're going to see elements of it emerge at the infrastructure level as the new bandwidth becomes available next year. I think it's only until you have all market segments liberalized and you've really created that open investment structure so that private capital has a mechanism to flow into the industry and then create opportunities, that everyone around this room is an entrepreneur can participate in. The whole IPO phenomenon is that people with a good idea can go to venture capital and make it happen. Until we have the underlying structure set across all the segments of the industry, I don't think you'll see that emerge as it has in the US and very dramatically is emerging right now in Europe.

Stephen Shek: certainly the restructuring is happening worldwide and Hong Kong is no exception. As I mentioned earlier in my presentation, we're looking at the world consolidating all the voice and data traffic. We're looking at consolidation of the network structures. The flattening out of the hierarchical networks into a single multi-protocol backbone flat architecture. So this is where the service providers will drive down the costs, maintain the level of service and the quality of service and that is already happening. That's not saying that we're going to tear down all the telecommunications structure tomorrow. The shareholders of those already providing service are not going to let that happen until the depreciation is all done. So we're seeing this multi-protocol backbone flat structure growing to replace and in time, by attrition, what was old and eventually provide an umbrella network and service management to provide a new paradigm and support.

A participant asked the speakers to take him back to their advice to the government: I don't understand the concept of providing a hub in a broadband world. You all seem to agree that if you were to provide advice to the Hong Kong government right now, one of the opportunities would be for provision of backbone growth. But there's a disjuncture there. I don't claim to understand the model of broadband either at the moment but I think your answers to that are probably correct. We are going through a paradigm shift with the movement from a narrow band to a broadband world. The services that will drive this world we have yet to see. And the answer there is probably about volume. If I'm the Hong Kong government sitting here at the moment looking at why I would get involved in trying to influence the market I'd realize I was sitting on top of one of the smallest markets in Asia. I would have thought that the market, if it's going to be driven by Asia, you're looking at China, Japan, India, South Korea. Why would the Hong Kong government be getting involved to drive backbone broadband growth? And, if so, how would they do it?

Stephen Shek: In looking at a deregulated process then it could make sense for the Hong Kong government not to get involved and just let the market decide where it should fall. Usually, like the US and Europe, that will decide where the market will be. The supply and demand will naturally sort this out. In the case of Hong Kong, the government does have the responsibility of maintaining a level of stability. So the level of liberalization is probably what the Hong Kong government should look at. Certainly they want to promote competition, as I mentioned earlier. Right now the bottleneck is on the access side. So if they would look at some ways and forms of liberalizing that area, for instance, issuing some wireless licences, that would promote that competition. We have already seen a lot of companies in the long-distance market and hopefully that will drive the need for more bandwidth internationally and increase the bandwidth on the international cables. So this is one area that I can see the Hong Kong government can provide some value-add to the whole process.

A participant noted: if I understand the argument correctly so far, you guys believe that broadband is off in the future. The content isn't yet there and what's key to this whole argument is volume. If I'm looking at Asia, my big market, the attractiveness to me is China. Very quickly I start to build big, fat pipes into China and don't go to Hong Kong. There seems to be an opportunity there for Hong Kong to try to recreate its intermediary position.

Stephen Shek: I couldn't agree with you more. If Hong Kong wants to be a telecom hub then definitely there is a need for Hong Kong to upgrade not only the bandwidth access capability but also the level of service.

A participant noted: therefore the last thing they want to do at the moment is promote competition. They want to build big backbone provision before the content comes on line.

Stephen Shek: competition is where it would naturally drive you to provide a higher level of service. Competition is where it would drive you to lower the price. So in essence competition is going to maintain that momentum of driving forward the value. And if the China market is to open up, certainly there is not enough bandwidth going into China today. Everybody knows that. Where would it logically make sense? Hong Kong is the closest hub. This is where the majority of the bandwidth is going to be coming from and to.

Tom Burns: I would throw out that China is actually not important in that equation today because you can't do anything there. It's a closed market. There's no regulatory or legal underpinning that allows you to do things in China so building the types of broadband networks in China is simply not a reality today. So focussing back on Hong Kong, I would say the advice for the Hong Kong government is to start from your policy objectives. Where does Hong Kong want to be? Where is its competitiveness in the market? And what is best for the citizens and community of Hong Kong? I think that's where it starts. I think if Hong Kong's going to take a look at this paradigm and they say what is best for Hong Kong and what is best for the community, clearly Hong Kong has devolved from a manufacturing base to a services. If you view the Internet as being revolutionary and not evolutionary then the need for change is exponentially increased. And then the policy decisions have to be driven from that aspect. Hong Kong has to step up to the plate or it stands being left behind. It has a tremendous opportunity right now because other markets in Asia are seen as being behind Hong Kong. So the government sits at a crucible right now and they hold the fate of Hong Kong in their hands. And they have a large part to play in the decision to move Hong Kong forward.

SESSION TWO

JOHN URE
DIRECTOR
TELECOMMUNICATIONS RESEARCH PROJECT

The argument that I want to present goes along the following lines: competition and technology are driving down the traditional revenue sources of narrowband, IDD and cellular in particular, that this trend is irreversible and global, the economics of the broadband world will be entirely different from those of the narrowband, and the most difficult problem of all is that this will require a shift in the mindset both of telcos, regulators, and everyone else in the industry.

The end of the narrowband business model: primary sources of revenue have been IDD and cellular. These traditionally have provided, for example, the revenues for cross-subsidization of local loop. Tariff rebalancing in Hong Kong has addressed that problem recently.

Competition: meaning liberalization and deregulation are driving down prices to costs and technology is driving down costs. We had a lot of examples of that in the first session. Moore's Law that roughly every 18 months the processing capacity of computer chips tends to double, or the price of processing tends to halve, is clearly one of the observations at work here. But operating in the opposite direction is the implication of accelerated depreciation of existing networks and equipment and new investment in the products and services that are becoming available. For example, third generation mobile and the investment that is implied by that is quite considerable. The result of that is that profit margins shrink and the mass of profits shrink in those traditional areas. And price ceases to be an effective weapon in that arena. Price may decide market share but it doesn't necessarily grow the market. What grows the market is product and service differentiation. And differentiation implies innovation and that is costly. R&D costs, costs of producing the service, enhancing the technology that exists already, enhancing the network, marketing costs for the new services, etc.

Taking the two sectors firstly cellular then IDD: the recession has probably driven down the average revenues across Asia of cellular by about 30%. In addition the increase in competition in recent years has led to falling prices of handsets, monthly subscription rates and call charges. And lastly, longer term rather than a cyclical impact of recession as market penetration increases then lower value customers come on to the network. In other words falling average revenues per subscriber unit.

The next slide is taken from a Yankee Group presentation that shows about 30% falls in tariffs for monthly minutes of usage across Asia in the last three years. There we see for 60 minutes of usage, price declines of about 33.5%; 500 minutes of usage a slightly lower price reduction but all over 30%.

Another slide shows the average annual earnings before interest, taxation, depreciation and amortization per subscriber. These figures are from a mature market, North America. There is roughly a 40% decline between 1995 and 1998 in average earnings before interest, taxation, depreciation and amortization.

On the international side we have a number of factors coming into play. Accounting rates have been under increasing pressure, especially from the US, arguing for reform and threatening to unilaterally reduce accounting rates for different countries according to levels of income. Callback has been a major factor in bypassing the public service tariff and thereby undermining the position of established carriers and their tariffs. Voice over IP in this context has been one of the technologies available to cellular operators. And I just add in parentheses as far as my understanding of voice over IP is concerned, it has no interest in business applications whatsoever apart from the fact that it adds one more technology to people like callback operators. Refile is another factor that has been at work undermining the traditional accounting rate system. Both those were actively encouraged in Hong Kong by the regulator. In other economies the regulator has tried to hold back the tide. But all the evidence is that where it's illegal it grows nevertheless. International simple voice resale basically makes callback redundant, makes voice over IP redundant, makes refile redundant. International simple resale kicked in in Hong Kong last year and instead of accounting rates we have interconnection fees and delivery fees.

Finally, in Hong Kong as from next month we will have gateway facility competition, albeit not completely liberalized but a major step towards the total liberalization of the Hong Kong telecommunications market. That means lots of bandwidth coming in and to reiterate points that were made in the first session, basically prices go down, marginal costs of transmission basically are zero.

Telecom revenues from carriage, in an era of international simple resale and of growing bandwidth, will basically spiral downwards to effectively marginal costs of zero. The following is just a quote from a presentation that I gave earlier in the year. My calculations were that in 1995 if international simple resale had been introduced then the weighted average IDD tariff from Hong Kong would have fallen from HK$6.70/minute to HK$1.40/minute and Hongkong Telecom's IDD revenues in 1995 would have fallen by 80%. Now of course not all routes are open to ISR and of course none were in 1995. So that's a hypothetical case. But anybody who's been reading the reports of IDD revenues in recent months, knows that this is happening very, very rapidly and probably more rapidly than I had anticipated when I did that work.

Profits from narrowband carriage will basically disappear. The telcos will therefore have to reinvent themselves. The future is broadband. And the question of where will the revenues come from? As I see it basically the three areas are:

- Customer premises equipment or access devices (as the shorthand today is) – the pcs, mobile phones, television set-top boxes etc.
- Access networks: the traditional role of telcos
- Internet services, applications and content

Basically I will argue that the middle one, access networks, the demand for those will be derived demand. In principle there will not be a demand for access networks directly. Now I'll qualify that by saying that there may be intelligent functions in those access networks that will command a market in their own right, but that aside, the demand for access will be derived from the demand for internet services, applications and content. And that's therefore where the focus needs to be. This model will destroy the narrowband telecoms model. It will also, in my view, tend to destroy the traditional media narrow- broadcast model as well.

What this will imply for the industry is a mind-shift. The revenues and profits of narrowband will and indeed are rapidly disappearing. The revenues and profits from broadband will take time to appear. And the question of course is how to manage the transition. Because the investment that is required for broadband has to take place today even if the revenues and profits will appear only tomorrow or the day after. The answer, in my opinion, is from day 1 to treat the broadband market as a mass market. This means a rapid rollout of broadband access networks, ADSL, cable television, fixed wireless, satellite, whatever. Secondly, to price broadband as a commodity as soon as possible. The traditional narrowband model would be: think of a new service, introduce it as a premium service, go for corporate customers, premium residential customers possibly and then slowly reduce prices as competition begins to build up. That, I believe, is not the way to go with broadband. From day 1 it should be priced as a mass commodity; no premiums.

Finally, equal access for Internet service providers to access networks and access customers. ISPs here is a shorthand for all the web-based and internet-based business applications that are likely to be forthcoming.

I'm going to wind up with two diagrams and make the following points about them. This is a diagram of the traditional PSTN market, narrowband. A 56K modem provides the customer the opportunity to use the telephone line to dial up through a subscriber line unit into the PSTN and then through a 56K modem bank, which might be located in the PSTN or alternatively it may be located in the ISP's premises. Into ISP1 or ISP2 which represents commercial, public ISP networks and then on into the Internet. ISP3 at the bottom represents a private Internet – or Intranet, a corporate network – which could link through an extranet and firewall into the Internet. So that's the current layout. Notice the customer relationship is between the customer at one end of the diagram and the ISP at the other. When you ask to go online you contact your ISP, you do not contact your local telephone company. You get your software and password from the ISP, you use the telephone company's access network to dial up the ISP. In principle the telephone company is not involved at all.

Add on to that a broadband network. At the customer end you have again a PC. This time with an ADSL modem which at the moment has to be purchased either from Shamshuipo, the telephone company or a local ISP provider. In two to three years' time that will become standard equipment with every PC you buy. Then from there you go across an ordinary telephone line again into this time a digital subscriber local access multiplexer, or DSLAM. At which point the traffic is split. The PSTN traffic from your telephone is then diverted back through your subscriber line unit into the PSTN and just as it was before. But the PC data line is now transported over optical fibre into the ATM network and from that into ISP1, ISP2 or ISP3 and then on into the Internet or intranet. ATM1 and PSTN could and would be in principle part and parcel of the same network.

Now we have a competitor, ATM2. A number of possibilities arise. ATM2 can locate it's DSLAM where I've put it here on the diagram. I'll come back to that point in just one second. The ATM2 network can either buy and operate its own DSLAM, in other words, a separate and competing broadband network. In which case the telephone line could still go back to the original telecom operator and only the data line goes into ATM2. Alternatively ATM2 could interconnect with ATM1 at the DSLAM. Now whether it interconnects at the local loop which would be between the customer and the DSLAM (local loop unbundling) or whether it interconnects at the back of the DSLAM which would be essentially collocation, is an issue which will be discussed later. But the point here is that there are three possibilities: local loop unbundling; collocation where ATM2 has a physical presence in the exchange of ATM1; and, virtual collocation where ATM1 owns the DSLAM but sells some of the modules to ATM2 but retains ownership and operational control over the DSLAM. That issue is called the interconnection issue. I would say that there is a far more important interconnection issue here. This model runs on the basis that customers at that end of the chart want to access ISPs at this end of the chart. That's the broadband application business: content, everything goes through the web. Internet is the basis of interconnection in most of those services. In order for telecom companies to reinvent themselves they have got to stop looking at the customer on the left-hand side of the chart and start looking at the ISPs as their actual customers. Because what will drive the business demand for access will be how many customers on the left-hand side of the chart are logging on and buying the services of the ISPs on the right-hand side of the chart. The ISPs of course, could be owned by the telco but also could be completely independent.

It's in the self-interest of telcos, I believe, to accelerate the growth of the business by ensuring that the ISPs have the right to interconnect to the access networks if they request it. That, to my mind, is the necessary regulatory step in order to provide the customers with the right to access the ISP of their choice, and the ISP to access their customer. And telcos, rather than looking at their own ISP as their customer, should be looking at all ISPs as their customers and treating them on equal non-discriminatory terms.

Finally, the position of the DSLAM in the ATM2 network in this chart is deliberately located within the customer's building. The implication being that in this model it's not the second network that buys and installs the DSLAM at all. In this particular instance it will be the property developer or owner who will buy, install and operate on a closed-user network for their office or residential tenants, a local wide-area network. Not a local area network. A local wide-area network. The regulatory question would then arise about how many of the public access networks should be allowed to interconnect with that private DSLAM. I think there are arguments both ways. My primary point here is that this is opening opportunities for property developers and property owners to enter the telecommunications market and to accelerate the spread and take-up of broadband to the desk-top, front room or wherever. It could be offered as free, in the sense that you move into the building and the management of the building will cover the cost, which is not very great when spread across the building, in management fees, rentals etc. The key point is that in this model it is important to accelerate the take-up of broadband on the left-side of the chart in various ways and to give the ISPs an opportunity to access their customers to be able to meet the demand and thereby accelerate the investment in the ISPs for the applications and content. And that could be broadcast content as well as ordinary software applications.

Broadening Horizons, Not Just Bandwidth

John Ure
Director of the Telecommunications Research Project
Centre of Asian Studies
University of Hong Kong

Telecoms InfoTechnology Forum
www.trp.hku.hk/tif
7th December 1999

The Argument

1. Competition and technology are driving down the traditional revenue sources of the narrowband world , IDD and cellular
2. This trend is irreversible and global
3. The economics of the broadband world will be entirely different from the narrowband world.
4. This will require a shift in mindset

End of the Narrowband Business Model?

THE CAUSES

- Primary sources of revenues = IDD + cellular mobile ==> local loop cross-subsidies
- Competition (liberalization + deregulation): driving *prices down to costs*
- Technology: *driving down costs* (Moore's Law!) - BUT! accelerated depreciation + new investment!! (e.g. 3rd Generation mobile???)

Narrowband - Competition

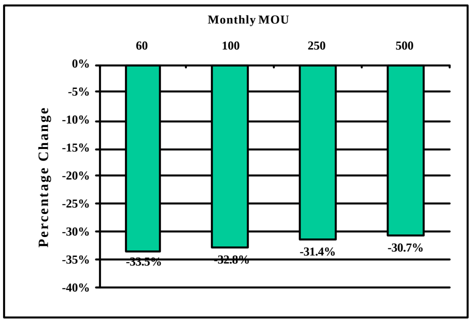
THE RESULT!

- profit ***margins*** shrinking + ***mass*** of profits shrinking
- price ceases to be effective weapon ==> product and service differentiation become more important
- Differentiation = innovation = costly! (R&D, costs of producing the service, enhancing the technology and the network, marketing costs, etc)

Narrowband - Cellular

- Recession (30% average decline in revenues across Asia?) + competition = falling prices of (a) handsets + (b) monthly subscription rates + (c) call charges + (d) market penetration of lower-value customers = *falling average revenues per subscriber or unit (APRU)*
- Price reductions across Asia-Pacific are dramatic - next slide (Yankee Group) shows 30% falls in tariffs for monthly minutes of usage '96-99.

Regional Decline in Wireless Prices, 1Q99 vs 4Q96



Narrowband - Cellular EBITDA

USA 1995-1998

Average Annual Earnings Before Interest, Taxation, Depreciation and Amortization (EBITDA) per subscriber

1995: US$235

1996: US$204

1997: US$137

1998: US$133

Source: Strategic Group; Herschel Shostick Associates; CTIA; Mckinsey analysis

Narrowband - International

- Accounting rates: USA pressure for reform
- Callback (including Vo/IP) and refile: by-passing PSTN IDD tariffs
- International Simple Voice Resale: interconnection and delivery fees replace accounting rates
- Gateway facilities competition: lots bandwidth => zero marginal tariffs!
-

Narrowband - ISR = End of an Era

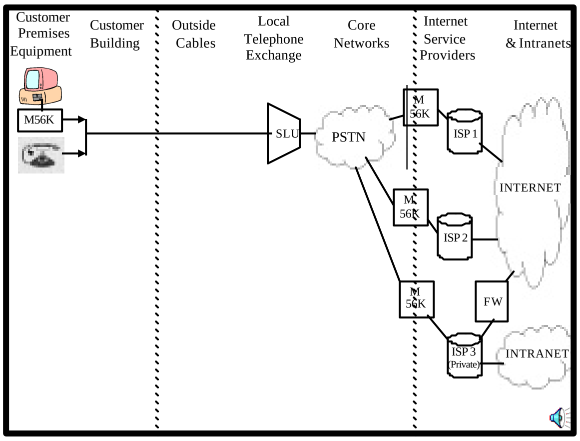
- Telecom revenues from carriage will spiral downwards:
  - e.g. *if* ISR had replaced accounting rates on all Hong Kong routes in 1995 the weighted average IDD tariffs *would have* fallen from HK$6.70/min. to HK$1.40/min and IDD revenues fallen 80%!
- Profits from narrowband carriage will disappear
- Telecos will have to reinvent themselves!

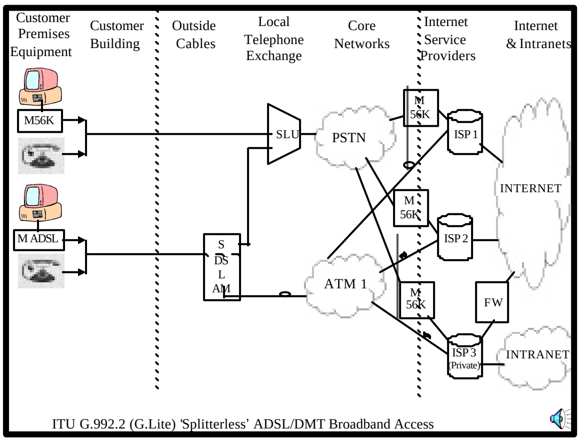
The Future is Broadband

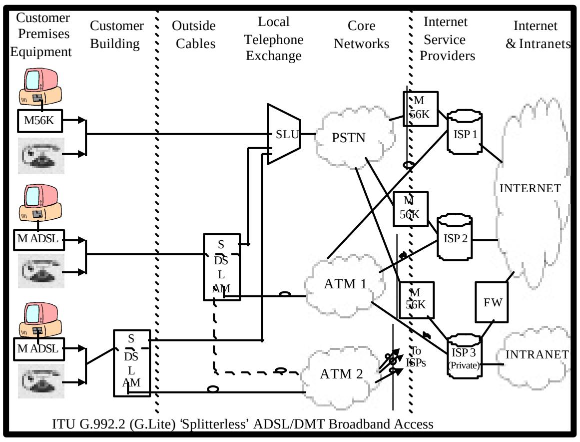
- Future telecom revenues will come from three principal sources:
- *CPE: access devices*
- *Access networks*
- *Internet services, applications and contents*
- This will destroy the narrowband telecoms model
- This will also destroy the traditional media ‘narrow-broadcast’ model ???

The Broadband Mindshift

- The dilemma: narrowband revenues and profits will disappear - broadband revenues and profits will take time to appear
- Answer: drive the broadband market as a mass market from DAY ONE!
  - = roll-out broadband access networks - ADSL (DMT; cable TV; fixed wireless; satellite DTH, etc)
  - = price to commoditize as soon as possible; no premiums!
  - = equal access for ISPs to access networks and customers







See TIF
Background Briefing Paper

Broadband:
Broadening Horizons, Not Just Bandwidth

www.trp.hku.hk/tif

ANTHONY WONG
DIRECTOR GENERAL
OFTA

First of all I totally agree with John that broadband is extremely important in the development of telecommunications in Hong Kong and everywhere. It is the most important issue in the future of telecommunications. I think that in the very near future broadband Internet access will be the key platform for all types of communications services. Indeed I can envisage people who only ask for customers to subscribe to the broadband Internet access service and then they will give you telephone free of charge. In Hong Kong I think we have been preparing for broadband for quite a long time. I can proudly say that Hong Kong has been well prepared compared with other places in the world. On the local side we have the most extensive VOD service introduced a couple of years ago by Hongkong Telecom VOD. The service is now offering a broadband interconnection to quite a number of hubs. I think most people here can connect to that service. It offers a fairly efficient T1 connection downstream and sufficient bandwidth upstream for most Internet browsing and services. We do have a second network; the Hong Kong Cable Television Network. At the moment it is only delivering cable television programme services. But it is applying for a licence to be able to use its network for other broadband telecommunications services including broadband cable modem services on which you can provide all other types of services. We are now processing that particular application with a view to granting a licence to HKCTV as soon as possible.

We have also invited applications for wireless fixed broadband telecommunication services using microwaves or satellites. We have received 14 applications. My staff is busy processing these applications. Again we intend to finish our processing work by the end of this year and possibly an announcement could be made early next year. At the same time we are also processing applications for pay tv services and we have received 10 applications for such services. All kinds of technologies, including satellite. Again, such applications are being processed as soon as possible and we believe that a result would be announced early next year.

Then we also have another form of broadband access being considered. That is the 3-G mobile. We intend to have such a service in Hong Kong by about the middle of 2001. That's the timeframe when the equipment would be widely commercially available. A consultation paper is being prepared. We hope to be able to release that maybe at the end of this year or early next year.

On the international side, as John rightly pointed out, January 1st next year is also the date when Hong Kong fully liberalizes the international market. We have also received quite a number of applications for licences; a total of 34 applicants. We are, at the same time, processing all of these applications with a view to issuing as many of those licences as soon as possible.

This is the existing scenario. At the moment something like 80% of buildings in Hong Kong are already covered by broadband capacity. We believe that this percentage could increase significantly when all the licences I just mentioned have been granted. Internationally, all the 34 applications we have received, we believe that if a significant number of licences are granted then we can significantly increase the broadband capacity between Hong Kong and other parts of the world. At the moment we only have about 20 gigabits of capacity linking Hong Kong to the rest of the world. This if far from enough for broadband Internet purposes. Mind you, it's more than enough for IDD traffic but that's not what we want. But after issuing these licences for international services I think the capacity in Hong

Kong will suddenly jump from the 20 gigabits to something over a terabit in the next year or two. So that puts us on the map as a major broadband hub centre in this region.

How do we make sure that all this capacity will be built? Not just by inviting licences. We must create a suitable regulatory framework, a suitably conducive market environment, before people are willing to put their money into the ground in Hong Kong. That is one of the major reasons why we have to quickly consult the industry and then decide on a suitable regulatory framework for people to invest and to rollout their businesses. On November 3rd 1999, about a month ago, OFTA issued a consultation paper on this very critical issue of broadband development and interconnection of broadband networks. How do we look at that? First of all the paper addressed the major critical issue of whether it is necessary for the government to regulate broadband services at all. Here in the paper we put up a few arguments for and against such a regulation. First of all the arguments for regulation:

As I said earlier we now have a couple of broadband network, wire-based: Cable & Wireless HKT's optical fibre based ATM network connecting to homes using the VOD as the platform. And the Hong Kong Cable Television's hybrid optical fibre coaxial cable system which also covers most of the homes in Hong Kong. These two networks have similar origins; they were developed from a network which initially was operated under a monopoly or franchise. In the short term it can be argued that these two networks are the sole two networks which have extensive coverage to customers. They also occupy lots of ducts in public streets and lots of space in building cabling facilities. So there is an argument for a requirement from other operators to interconnect into these two networks to be able to deliver a broadband service to the end customer. As John pointed out that is narrowband to narrow using the PSTN and we would like to broaden it to include Cable TV's coaxial cable system as the means of access to end-customers.

Another argument for regulation is that certain types of in-building wiring systems including; the communal antenna distribution system in every building in Hong Kong; and the satellite master antenna system (SMATV); and possibly some broadband systems being built by some developers in their future development projects (intelligent buildings) -- could be considered as bottleneck facilities in those buildings. If you are not careful and no government intervention is imposed, these kinds of cabling facility bottlenecks could turn into mini monopoly systems. They become the gatekeepers. Whatever services you provide you can only access the customers in that building through this bottleneck capacity. That is another argument that there must be some type of government intervention, to make sure that some kind of interconnection takes place and that it is offered to all parties at a fair price.

We must mention quite a number of new broadband access networks coming in. Definitely there will also be quite a number of new broadband services coming in during the next few years. If customers are connected to one network, they definitely want to communicate on broadband to customers connected on another networks. So the broadband networks must interconnect with each other. By relying on total commercial forces I don't think this can be 100% achieved. Some networks may, for their own reasons, not want to interconnect with some other networks. Or may impose some conditions that the other network may not accept. So there is the third argument for government to come in as a last resort.

On the other hand there are a number of arguments against regulatory intervention. One argument has been considered by the FCC earlier. The development of broadband systems is still in its infancy. We still do not have a grasp on exactly how the networks operator. We should let the commercial forces decide in the first instance to see whether they can commercially reach interconnection agreements themselves. So the government should withhold for the time being. And there are lots of alternative forms of access. I just mentioned quite a few categories. Maybe we let the market run to see if there is any need for government to intervene or not.

Another argument against government intervention is that if we impose unnecessary intervention in the market it might remove, or at least dilute the commercial incentive in the investment of the broadband infrastructure. People complain that they invested billions of dollars in building the network and here you require me to give it out nearly free of charge to somebody else. Why should I invest? If it's not handled properly that could be a problem of government intervention.

These are the pros and cons of whether the government should involve itself in broadband development and interconnection. We are seeking views from the industry and your views are particularly welcome on this point. However, in the consultation paper I did say that the preliminary view of the TA is that interconnect issues cannot be left entirely to commercial negotiations and market forces. We believe if there are a set of ground rules laid down in a regulatory framework then the commercial negotiations may take place accordingly and it would not take an unduly long period of time or delaying the availability of benefits to consumers. So at this point in time we are more inclined to have some kind of regulation as a fall-back position, in case commercial negotiation cannot decide the outcome then we might be able to intervene in the public interest to make sure interconnection is done efficiently and effectively.

One view that I particularly subscribe to is that I believe the access networks in particular are only platforms for consumers to access all kinds of services. And the network operators should not be in a position that they can restrict the customers' access to different kinds of information. That is a very important principle that we have to look at. [*TAPE STOPS HERE… TAPE STARTS MID SIDE B HERE]* …. I think the consultation paper discusses some of the more mundane issues. If we impose some kind of regulation on broadband interconnection, where should we go? What are the options? First of all we have to define what broadband is, where the line is drawn between broadband and narrowband, why should narrowband be treated in a different manner from broadband or vice versa? These are discussed in the paper. Again, your views are most welcome. Then we go on to discuss the different scenarios on broadband interconnection. First of all there is Type 1 interconnection that is between networks, two different platforms of broadband interconnection. For example, between Hongkong CTV's network and C&W HKT's network. How should they interconnect? What are the principles involved? These are the Type 1 network to network interconnections.

Then we will have to look at the Type 2 interconnection. Type 2 interconnection is the network to service provider type of interconnection. Making use of an access network to provide broadband service from another network. For example, the unbundling of the local loop for DSL use. I looked at the FCC which has just made an order last month to require the local loop to be unbundled for DSL use. In the US this is a great step forward. OFTEL has made a similar decision, requiring BT to unbundle its local loop by the middle of 2001. It's given them a timetable as well. We should also look at this particular issue in Hong Kong. On HKCTV, we are also at the moment considering how the network should be opened up for interconnection by other operators such as the 125 ISPs in Hong Kong. How could they, if they wanted to, interconnect with Wharf Cable's cable modem service. Could that be done? If so, how?

The problems that we are facing now in broadband interconnection are basically twofold. First is we do not have a lot of experience overseas to look at and learn from. Most people are just starting to tackle this problem at this stage. Unfortunately we are in a position that we have to face this problem, maybe earlier than other people in other parts of the world because we have liberalized the market significantly at this point in time. All of these networks will be rolling out very fast next year. If we do not have a suitably regulated framework for interconnection then these new networks will not have the full confidence in the investment of their infrastructure and rollout of services. And there is also the problem of consumers being confused on how they can get services.

The second problem is that the technology is changing all the time. Some of the technologies that are being envisaged for interconnection are not yet available. For example, for interconnection into the cable modem services, quite a lot of experimental systems are being tested right now. There have been some tests in Canada proving that it is possible for multi ISPs to be interconnected into one cable tv system. Equipment is not yet commercially available on that kind of interconnection platform. So we continuously have to look at what technology is possible and how it should be done at this point in time. Then we also have to look at the principles of charging. Whether the existing principles that we have adopted for narrowband interconnect should apply to broadband interconnection. Bearing in mind that the narrowband interconnection charging principles were derived on the primary basis that Hong Kong Telephone's network was fully developed before we liberalized the market and it's got a monopoly to develop its network in the first place. So there was an existing network with new people coming in. But for broadband a lot of the networks will have to be built from scratch and the technology is changing all the time so that investment risks are fairly high on the broadband networks compared with PSTN in the old days when the telco had a guaranteed return. So these are the principles that we have to consider and they are laid out very clearly in the consultation paper.

FREDERICK S. TIPSON
DIRECTOR OF REGULATORY AFFAIRS
CABLE &WIRELESS HKT

I thought I'd start with a cliché because despite the fact that we all want to address these issues with some sophistication, I think the reality is that at the moment the most we can say about the broadband world that we're entering is that it changes everything we're used to in the past. Again, coming from the traditional narrowband, voice-driven model what's crystal clear the more we dive into the issues that Tony Wong and John reviewed, is that the old models don't work and the old formulae become worthless. We're all basically fumbling in the same darkness at this point. I don't intend to try to shed too great a light on the problems. I'm going to really just reinforce the dilemmas that were just reviewed for the most part.

Again, let's just look at the simple facts of the matter. The technologies are evolving so quickly. In fact are obsolescing so quickly. It's very difficult to say what will be the basis for the broadband services that will be delivered in the next decade. Every time a company thinks it's got the magic formula to combine technology with service provision it's quickly outmoded. Not only is the technology different in terms of the basics, but there is still a great deal of evolution of the individual components of the technology. Such that it's difficult to cost appropriately the forecast development cycles and to relate those to the kinds of services which we all believe to be coming to us in the future.

So not only are the technologies changing rapidly, but the services themselves still remain to be understood. We're not sure what the demand will be for various services. We talk about convergence but it's still basically a buzzword. We're not sure what services fit into the bundle, how much they're going to be demanded by consumers, and what we can appropriately charge for them. There is not really a killer application, despite various forecasts that there will be one or another that will drive the dynamics of this industry development. We think it's some combination of the services listed here but just how they will be driven is certainly not clear. And in the market the size of Hong Kong which, after all, is only 6 million, as compared with the size of some of the markets in which the content is being focussed and developed, the leverage in fact in this business may ultimately not the network providers or the ISP side of the business but with those who create the content. That seems to drive customers' interest. It's also not clear just how much the internet will actually absorb in terms of how much directly will be available from the internet in terms of the massive download potential, both in entertainment and interactive services.

The networks themselves are certainly multiple and complex. We're lucky in Hong Kong that we face a relatively new future introduction of broadband capability over a wide range of possible delivery vehicles. We've talked about the CTV network and our own ATM/ADSL network at HKT but there are number of other providers that are quite clear about their intentions to introduce these services in the very near future. And given the progress in 3-G mobile licensing that's expected in the next year or so you may see quite a large number of operators in the market all offering services which can be defined as broadband. And most of these networks effectively provide local loops. What's not clear, of course, is who will survive in the process. But certainly there are a number of contenders.

And finally, how to make money in this environment is not clear to anybody. Believe me, I've sat through consultant presentation after consultant presentation about where the money comes from and

I'm still mystified as to how we're all going to make returns in the future environment. Not whether they will be made but where they will be made. So there are big bets being placed on the basis of relatively little knowledge. That's the way the business works these days. But what that does mean is there is tremendous uncertainty and risk on any bet that's placed. The lifetime of the assets is drastically shortened from what we're used to in the network planning environment just a short time ago. Because the equipment is not standardized in most cases it's expensive and constantly subject to substantial R&D costs. The advantage of being the first mover is not necessarily an advantage in the sense that there are tremendous up-front costs that go into experiments in this area; experiments that are largely translatable by other people. So the advantage of getting into this work first is not necessarily the greatest. It certainly can't be equated with terms like monopoly.

So what does it mean for regulation? I think Tony Wong's put his finger right on the important part of the consultation paper. That's in part 1, question 5, whether regulation is necessary for broadband interconnection. This answer is my answer, not the one that our group working on the issue would have liked me to have stated. I am not convinced that it's appropriate at this point to say that interconnection should not be a regulated aspect in Hong Kong. I think we all hope it's not necessary. We hope that the competition will develop in a way that will not require the regulator to intervene to establish the terms and conditions of interconnection. And at least it would seem that given the advent of networks in the coming 12 – 18 months, it's appropriate to see at least initially how this begins to take hold: how competition develops, what the economics of these various networks prove to be, what the interest level is in investing in the different parts of the network. And indeed watching other environments to see what kinds of services and service packages seem to be developing as the economic drivers of the business. But certainly thinking about interconnection can't be done on the basis of the old models. The kind of stability, the kind of reliable service stability that the voice environment provided is just not the world we live in. It's impossible almost from month to month to put your prediction on what sorts of services will dominate over others. So needless to say that drives me to the suggestion that restraint is called for. I think the posture of the current consultation paper is about right. It's raising all the right questions. It's leaving open the possibility that timing is key and that decisions don't have to be made immediately, although I acknowledge Tony's point, that they have to consider whether early intervention would facilitate that kind of competition. But it seems to me that that's probably unlikely.

Let me just make a couple of comments on the basis of the couple of presentations that were just made because I too think we ought to treat this as a forum and not as a series of set presentations. I think there's a bit of tension between John's point about the economics of the old network being driven basically to cost and the need for the traditional telco to reinvent itself. There's a bit of a time lag there as all the profitability falls out of the old business and there's a need to invest in the new business. And somehow we have to manage our way through that transition. Not only is it costly from the point of view of losing the old profit streams that the old company was reliably built on, but the personnel base, the human resource challenge of transitioning people used to the old models into the new environment is a tremendous challenge. It's one that takes a great deal of care and sensitivity and involves a lot of expensive retraining at a time when the money is being pulled in the direction of investing in the new networks, as it's being driven out of the old network. So there's no question that we'll have to reinvent ourselves. In fact as soon as we're finished here I have to go back and work on reinvention because that's truly what the company is spending a great deal of its time, energy and resources on. But it's easier said than done in this environment. And since we are the company that thus far has provided the kinds of network capabilities for the most part that Hong Kong is now famous for, we want to be able to be there at the end of the game. We want to be able to be part of the transition to this new environment, but we can't dispense with effective competition in the old environment. And that's a huge both management and financial challenge.

CABLE & WIRELESS
HKT
香港電訊

From Narrowband to Broadband: "It Changes Everything!"

Frederick S. Tipson
Director of Regulatory Affairs
Cable & Wireless HKT

Technologies

- Narrowband is circuit switched; broadband is packet.
- IP is now the universal communication protocol.
- But no single networking technology has emerged as the default broadband technology. (ATM is not it.)
- Broadband technologies and standards are immature. It is not unusual for equipment to become obsolete in 1~2 years.
- Set-top boxes, modems, XDSL, etc., all evolving.

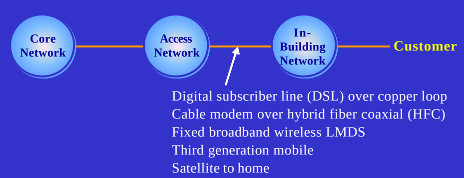
Services

- Demand for broadband services is uncertain.
- "Convergence" remains a buzzword.
- Still no clear "killer application".
- But future seems to suggest some combination of: broadcast entertainment, interactive TV and fast Internet access.
- "Leverage" (in Hong Kong) may be with content providers.
- How much content and features will Internet "absorb"?

Networks

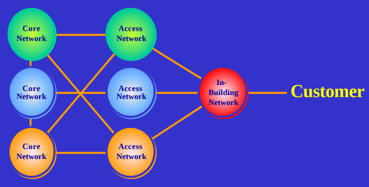
- Hong Kong *will* have multiple networks next year.
  - Wharf: HK CATV HFC
  - CWHKT: ATM/ADSL
  - Hutchison/Pacific Century: Satellite
  - Multiple Operators: Fixed Wireless
  - 3-4 Operators: Third Generation Mobile
- Each of these networks will include local loops, except for in-building wiring ("blockwiring").
- But which will survive in the long run?

Multiple Access Networks Will be Available in 2000



- HKCTV's network reaches over 1.67 million homes. Half of these homes are served by hybrid fibre coaxial network.
- One potential fixed broadband wireless operator pledges to roll out 70% territory coverage in 2 years.

In-Building Wiring Is The Critical Bottleneck



Situation is similar to mobile cell sites in tunnels and in-door areas.

Economics

- The business models are not yet understood by anyone and *keep changing*.
- Economic life-time of narrowband assets, usually 10+ years, are shortened due to technical obsolesce.
- Broadband equipment is costly because of limited suppliers, high R&D cost and insufficient production volume.
- First movers invest substantially in public domain for the whole industry, including market education and human resource development.

Competition & Regulation

- Key question in OFTA Consultation Paper is #I.5: “Whether Regulation is Necessary for Broadband Interconnection”
- Answer: “Hopefully Not, but Wait and See”
- Narrowband regulatory regime developed around a stable voice-oriented technology and service.
- First mover is not the same as monopoly; uncertainties around technologies, services, networks and economics suggest *regulatory restraint*.
- Broadband moratorium lasts until 1Q 2001.
-

Type I & II Interconnection

- Broadband regulatory regime should be technology neutral.
- Competition should decide the winning technologies.
- No consensus that broadband Type I Interconnection implies ATM interconnection. (ATM interconnection has been in effect through HKIX for sometime.)
- Standard for effectively managing interference in copper loop does not exist.

Conclusions

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- Listen to all views, but wait to let the market develop.
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- Focus on block-wiring as the potential bottleneck.
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DISCUSSION

The following points were raised during the discussion period:

A participant noted: I don't quite understand what the broadband moratorium until first quarter 2001 is about. Can you please explain that.

Fred Tipson: Actually I'd be interested to hear Tony's summary of what the government interprets that phrase to mean. When our licence was granted for the VOD business there was a government policy statement issued at the time. Essentially along the lines that the government, in recognition of the fact that broadband investment was risky and required a certain amount of courage in investing in an undeveloped business, the government provided a period of time for the network to be created. It indicated a willingness to restrain itself from mandating the unbundling of that network. That was to be a policy limited in time in order to flag the fact that at some point that issue would be revisited by the regulator in deciding whether it was still appropriate to maintain that approach. Frankly I think it was a productive step.

Tony Wong: I think it's spelt out quite clearly in paragraph 3.5 of the consultation paper that we have issued. So if you want the details, please refer to OFTA's consultation paper issued on November 3rd, 1999. Very briefly that is what Fred just said. When we licensed the VOD service in Hong Kong we realized that it was an extremely high risk investment in terms of the uncertainty in the technology and OFTA has agreed not to determine any type II interconnection for the new facilities installed for the first three years of the operation to ensure the technology is more stable in this R&D stage. Other operators could not piggyback on the service without bearing the full risk of that particular investment. That was the principle of this particular statement that was issued by the TA. That expires in early 2001 and that statement does not apply to type I interconnection, for example network to network interconnection, and it does not apply to the facilities that were in the old PSTN network and not the new investment in the new VOD services.

Simon Chan: throughout the afternoon discussion it seems like the Internet is the key when talking about access and broadband access. I think we are all scratching our heads about how to make money out of this ballgame. Does anybody have any good ideas?

A participant congratulated Fred on his presentation. I think one of the things you touched on is the fact that on top of building the broadband infrastructure, service providers have to look at building the content that's going to appeal to the customer base. Now you've touched not only on broadband Internet that everybody's talking about, but also on broadcasting, content and you can probably touch on advertising. Assuming these are the views of Hongkong Telecom, how do you see that moving forward? Either through regulation or through industry consultation, you Hongkong Telecom can be more effective in order to provide content to your customers. As you mentioned also one of the challenges you have is you have 6 million users which, when you compare to the US of 270 million users, it might be a bit more difficult to get the type of content you require. How do you see a country like Hong Kong achieving that?

Fred Tipson: I think it's obviously a combination of attempts. Clearly many telcos around the world are trying to change themselves in terms of their operating culture into companies that more resemble Silicon Valley start-ups. There's been a mixed record of success with sorts like me becoming the sorts of people that invent interesting new services. But nevertheless that's got to be part of the process because the old models don't work any more and companies will either make that transition or they won't survive in one sense. But obviously it also involves finding the right partners to work with because these are capabilities that can't all be homegrown. In our case among the things we're hoping to put together is the joint venture that will provide access to content to supplement what's already available in Hong Kong and provide something interesting to our customers that will bring them to the network. The one we've announced, of course, most recently, is with Star TV. But all of them involve challenges of putting together the package that will actually appeal to customers. One of our experiences with iTV service, as gallant an effort as it's been, is that getting the kind of content that will appeal sufficiently to people to pay the price points which are necessary to cover the cost of doing it is very difficult. Again, with the size of the customer base we have. There's really no magic to it. Those are the things that have to be done. It's finding the right partners and being able to make those human resource transitions that are essential.

A participant asked Fred Tipson what business he thought he was in.

Fred Tipson: that's a good question. It has a lot to do with business models and people's willingness to tolerate risk and people's experience with what customers will pay for etc. What we want to be in is to be an integrated service provider across the range of services. Ultimately we think that's what customers would like from a service provider. We think there would be competition among multiple providers of those combined services. So it'll be a matter of whether we do it better than somebody else. But voice is becoming almost incidental, not only in the economics but also from the customer's perspective as to what's important. So we certainly can no longer be a telco in the voice sense of the business. We have to be providing these services that only broadband capabilities ultimately can deliver.

The participant replied that if he drew the analogy of Fred in a boxing ring taking on about 18 different players – content provider, access provider, backbone provider etc – and you say you want to be an integrated company, would I be unfair.

Fred Tipson: I think you've probably hit the nail on the head. Hopefully we'd take them on sequentially rather than all at the same time.

John Ure: I think one of the potential problems that might arise, especially from a regulatory point of view is that if companies like Cable & Wireless HKT and any others become integrated service providers at the content end of that integration arises some quite difficult problems about exclusivity of content and access. I previously indicated that as far as access was concerned to ISPs I think that the regulations have to be very , very clear that access is not in any sense exclusive and that ISPs are in a very competitive market. However, at the content end of that integrated service, if one looks at the broadcasting model that exists today, lot of the content is exclusive and that's the way that industry has developed. So, if we're talking about integration or, convergence, I can see major regulatory problems arising as these two ends of the spectrum come into some integrated service provision. I think this isn't just going to be a Hong Kong problem, it's going to be a problem worldwide. Going back to the issue of content, I would maybe divide a line between global and local content. Global content is stuff from the web: broadcast, streaming video etc. And I do think that the demand for fast Internet is actually going to be the closest thing we'll come to a killer application. It's going to be the mass market, the fast Internet. When a corporation wants broadband it may want it for videoconferencing or large file transfer but it also wants it for broadband fast Internet from the desk. Every member of that company having that capability and access. That's a mass market. It's also a mass market potentially for small and medium-sized enterprises and residents, so it cuts across the normal segmentations. But in the local content, going back to my point about the role of property developers and owners, there's a lot of opportunity to provide the local communities (whether it's closed user groups or wider communities than that) content that is very specific to those communities. Local information etc. And if one defines local in terms of language then one's talking about local language websites etc. I think that will be a growth area. The interesting thing about that is that local companies and local content providers will be at the heart of that development.

Tony Wong: the point of possible bundling of access and content is a crucial one for broadband development and that is one of the key issues we are seeking industry consultation on. Whether we should allow a certain content to be bundled with access to a particular network is a key issue. That forces customers to subscribe to a particular network to issue certain content. Is that reasonable for the consumers or is that something that we should not regulate?

Fred Tipson: I agree that's very important but it's important not to be too dogmatic on the question of exclusivity of content. Take, for example, the exclusive Wharf agreement to televise the World Cup in 2002. They paid a lot of money for that right and they'll be the only company on their network that offers that service. Now we could legitimately argue that that's not fair, that it's not sufficient competition, but in fact most of those large events are packaged that way: boxing, sports, Hollywood content etc. And I'm not suggesting that anything goes. I'm just pointing out that it's a very complicated industry in which most of the leverage lies outside of Hong Kong. The way that those sports are marketed those companies will choose one and only one provider. There are other kinds of content where I think it would be completely inappropriate to have that kind of restriction, but that's part of the debate we're in. Certainly I would distinguish that from access by ISPs to the customer. Those are very different issues. I certainly agree that we need to be sure in Hong Kong that there are multiple providers of access to content.

Simon Chan: let me just share my experience. I recently have seen a webcast at about 700kbps. You can actually have live tv, already. That implies that you can actually unbundle the content versus the transmission. If you want content that is exclusive to a particular provider you could then subscribe, but if you have internet access with one provider but the content is relying on another provider then at the vertical model you are deprived of access to that content. That's what I think we have to look at: whether with the technology today you can actually say that you subscribe through the Internet to this content and charge you a certain amount of money. But the access can be unbundled. I think with broadband today we could actually achieve that type of scenario.

A Participant: It occurs to me that far from the question of discussing whether to regulate or not, nobody's suggested whether in fact the government should subsidize (horror of all horrors, of course). But the point is the very first speaker said that this revolution of the broadband networks is equivalent to the railways in the last century, with very large spin-offs on the economy of the country. And *a* *previous speaker* earlier said that we should be looking to the region and not just Hong Kong. Really the problem related to the distribution network in Hong Kong is very small compared with the opportunities for regional participation in content. So one wonders whether the government should support. Rather like water pipes: just put them in and let the real competition begin. I am reminded that there have been two recent spectacular examples of diversion from the free-market principles. One of them is related to IT. The Chief Executive said that IT is very important for future economic growth and to manifest that the government has invested enormous amounts of money in an infrastructure to enable something called cyberport to be built. I don't know what the cost is to the government. I've heard a figure of HK$1 billion as the cash for the infrastructure. But the lost opportunity costs of the land and a lot of other figures must put the figure up to many, many more billions than that. So it occurs to me: if we follow this policy of spending public money because it's good for the future of Hong Kong and IT, how much would a broadband network cost to every home and every office in Hong Kong? And how would that compare in cost to the amount of money we're putting into cyberport.

Tony Wong: (*Third Tape change – the speaker compared Hong Kong's infrastructure approach to that of Singapore One)* But we in Hong Kong have not chosen to adopt that form of government subsidizing the development of physical infrastructure. We can do it more efficiently in another way, by just opening up the market and creating a conducive environment for the private sector. Look at the number of applications I have by using our policy, not even using any taxpayers' money, but we have lots of interest. People fighting for a licence to put money down into Hong Kong instead of using taxpayers' money. The government has spent a lot of money in creating the environment though. We have paid Hongkong Telecom HK$6.7 billion to get the right for us to invite these applications. So that is the investment that the government has made. Instead of spending it on some kind of technology which government usually makes a mistake investing in. Civil servants sitting at desks are not the best people to decide on what technology to buy. The private sector should make the decision. If they make a mistake that's their commercial decision. I think this is much more efficient than the Singapore style. The government has also subsidized the industry through other indirect means eg, the cyberport. That is a kind of subsidy on the introduction of content on the future Internet platform, particularly on Chinese language-based systems. They will have some kind of advantage there. And the government has also been investing significantly in other supporting facilities. For example in creating certification authorities, in having electronic transactions in the government to take a lead, to stimulate demand in the industry, to invest significantly in IT education as well. So these are the ways the Hong Kong government has been achieving its objectives, not by directly investing in pieces of cable.

John Ure added: my understanding is that the actual costs of upgrading copper wire, twisted pair network that exists in Hong Kong with what's called G-light, the 1.5 meg upgrade, is actually not that much. In the overall accounting of things it's a fairly effective and efficient method of providing broadband at not too much of a horrendous cost. In the US cable networks are much more ubiquitous than they are here and cable, obviously, is going to be an important facility that exists on the ground now. So my understanding is that the actual value out of a broadband network in one sense has up to now been a question of where is the demand coming from, we can roll it out but is the demand there. I think we're now in the situation where, because of competition, I think Cable & Wireless HKT has taken the initiative – and competition I think has driven that – to roll out the broadband network. It's obviously to their advantage to have a ubiquitous broadband network. And the very rolling out of that network will help create the demand. I think that fast Internet is going to be a killer application in that area. But there is one other aspect of that which is I think the development of a wholesale market that encourages the mass commoditization of broadband is also going to be important. I think one of the ways we're going to distinguish between one economy and another is the attitude of the incumbent to wholesaling. My bet is that if, for example, Cable & Wireless HKT adopted a very, very competitive wholesaling policy then the issuing of fixed wireless licences might be totally irrelevant at the end of the day.

Fred Tipson: Just to make the obvious point that Tony made, if customers want it they'll pay for it. And even people without much money seem to be willing to pay a lot for services that they consider to be important to them. To John's point, when our broadband network was planned (before I was here) I'm assuming that it was not based on fast Internet as being the reason to build the network. There was an assumption that money could be made from interactive tv, video on demand etc. In fact everything on demand: racing, banking, shopping. Unfortunately nobody's demanding it. It hasn't been a very successful service. It had great forecasts and I'm sure that there were consultants paid gazillions of dollars to tell us that everybody would love it. That just illustrates the fact that it's not always clear what the network will ultimately used to make money from. I don't even think that it's yet clear that broadband Internet access as such will prove to be in and of itself a justification for the levels of investment that people are making. But that's why people like me are paid, to think about these things. And half the time, at least, we're wrong. So if the government were having to make those decisions you can bet they'd also be wrong half the time and the public would be furious. I wonder in Singapore, if the government hadn't spent so much money on their network, whether they'd have ended up with more network alternatives and more efficient set of networks and a more interesting set of services than they currently have. My understanding is there's a lot of capacity but not much interest in what goes over the network. That's a classic example of the dilemma that any government faces in trying to decide where to put its money.

A participant noted: I'd like to backtrack a little bit to two words that *a previous speaker* used: "every home" Tony, is there going to be any provision for the equivalent for universal services in the new licences. We've seen now after three years with three new telephone companies, only one company has access to alternative to HKT. Most people like myself – small businesses, domestic premises which aren't in the central business areas – have no opportunity to jump ship from Hongkong Telecom. What provision is there going to be to make sure that wherever you live in Hong Kong you can get access to broadband. That it's not restricted to those areas which the companies see as immediately profitable.

Tony Wong: the quick answer to that is we have not considered that there is a need right now at this point in time to impose a requirement that every home in Hong Kong should have access to broadband in the immediate future. We believe that with the degree of competition that we will be seeing in the next 12 – 18 months, there will be sufficient commercial incentive to rollout the networks to most homes, if not 100%. Because we are looking at all kinds of new technologies coming in. Broadband could be provided not only on wired basis but also on satellite and microwave basis. That would automatically provide some kind of broadband access and services to people who want it wherever they are in Hong Kong. At this point in time we don't see the need to have a regulatory requirement for somebody to provide universal services. We will keep a watchful eye on it of course.

A participant noted: the Financial Secretary yesterday was ruminating requirements for new taxation in Hong Kong. There's currently a HK$36 billion budget deficit this year. And traditional sources of property income are falling. I notice that the spectrum which was recently auctioned for the wireless broadband licences will not require a tender offer. Given the changing basis of taxation is there not a fiscal requirement that the future auctions of spectrum are actually going to have to be offered by tender. One, is that a more rational way of allocating this out and two, is this simply a fiscal requirement and the government is going to put pressure on OFTA to change the way that it's allocated in future.

Tony Wong: we have not used the auctioning system so far for spectrum allocation for mobile, PCS and even the current exercise for wireless fixed services. The successful applicants would not be submitted through a tendering process for spectrum pricing. They will get the spectrum on an allocated basis. If your question is whether we will do it for 3-G, that is something that we have yet to consider in the next round of consultation. Let me put it this way, so far we have adopted the policy that the telecommunications sector is not a sector on its own. We believe the advantages in developing this telecommunications sector covers many, many other sectors in Hong Kong because low-cost, efficient telecommunications services will directly benefit other services sectors such as finance, banking etc. That has always been the Hong Kong government policy. And I will say that going to auctioning of spectrum for 3-G would be a change of policy that we will have to consider very, very carefully. Actually when we select licences for these kinds of services eg, PCS, we in fact adopted what I described as a negative auctioning exercise. That is people have to bid. But they don't bid for a lump sum to be put into the Treasury for something else. They bid for the lowest price to the consumer for the best quality of service. And in this way we believe the benefits will flow directly back to the telecom users, not to the Treasury for something else. That has been the policy that we have been using all the time. If you're looking at the government purse, OFTA last year made 75% profit on our average net fixed assets. We have accumulated something like HK$500 million in our banks. The Financial Secretary has not asked for the transfer of this fund back to the Treasury, which it can do.

Simon Chan: actually this policy of not auctioning is good news for users in Hong Kong because we hear a lot of other stories about auctioning the wireless network and the cost eventually goes to the consumer.

A participant noted that the cost to the consumer is a great advantage to the community as a whole. So I'll come back to my other argument about why not make it zero. Along the lines that we're paying for the cyberport.

Tony Wong noted that the cyberport is not zero.

The participant countered that the government subsidy to Disneyland and the cyberport for business, it seems to me there would be great advantage to give free wideband network to everybody. Whether it's provided by private enterprise or not, at least it could be subsidized, because the precedent's set.

Tony Wong restated that there has been lots of subsidy – HK$6.7 billion!