

Telecoms InfoTechnology Forum

IP Networking: is the jury ready with its verdict?

Venue: Bloomberg Auditorium, 27/F Cheung Kong Centre
2 Queen's Road Central, Central
Time and Date: 2 – 5.30pm Tuesday 9 July 2002

2 – 3.30pm - Panel One:

- Frankie Sum, Managing Director, **Cisco Systems Hong Kong Ltd** – Next Generation Networks
- Ricky Wong, CEO, **Hong Kong Broadband** - IP for network operators
- Dr. Peter Lovelock, **MFC Insight** and Deputy Director, **TRP** – IP in China's telecoms

3:30 – 4:00 pm – Coffee Break

4 – 5.30pm - Panel Two:

- Dr John Ure, Director of the **TRP** – Broadband Internet = regulation for fixed-mobile convergence?

Expert Panel:

Julian Grudzien, Regional Head of Telecommunications, **HSBC**;
Bill Southwood, Director, **Arup Communications** (consultant to **Hong Kong Police Department** and **The Hospital Authority**);
Joseph Leung, Director of Information Technology Services Centre, **Hong Kong Baptist University**;
Jeremy Johnson, Director of Technology, Asia-Pacific, **Atrica Inc.**;
Franky Lai, President, Internet Service & Content Provider Group, **Internet & Telecom Association of Hong Kong.**



SPONSOR

QUARTERLY MEETING
JULY 9, 2002

List of Participants

| | |
|--|---------------------|
| Access Solutions International Limited | Donald Ko |
| Agilent Technologies | Henry Wong |
| Agilent Technologies | Ian Johnston |
| Agilent Technologies | Jingle Hon |
| Alcatel | Henry Woo |
| Alcatel | Iftikhar Jami |
| Alcatel | John Dindlebeck |
| Alcatel | John Lipp |
| Alcatel | Rockies Ma |
| Apple Daily Limited | Yau Sin Yue, Charis |
| Arup Communications | Bill Southwood |
| Arup Communications | Jonathan Lamm |
| Arup Communications | Patrick Leung |
| Asia Satellite Telecommunications Co Ltd | Michael Chu |
| ASTRI | Dennis Lee |
| ASTRI | Felix Lo |
| ASTRI | Patrick Lam |
| ASTRI | Sze Ho-Pong, Andrew |
| ASTRI | Tony Cheung |
| Atrica Inc | Jeremy Johnson |
| Baker & McKenzie | Michael Fagan |
| Bank of International Settlement | Tim Salter |
| BDA (China) Ltd | Rick Capstraw |
| bpConsultant | Dominic Tsang |
| CEFC | Eric Sautede |
| Cisco Systems (HK) Ltd | John Mak |
| Cisco Systems (HK) Ltd. | Frankie Sum |
| Cisco Systems (HK) Ltd. | Karen Chu |
| Cisco Systems (HK) Ltd. | Margaret Lee |
| Cisco Systems (HK) Ltd. | Zoe Lou |
| CLP Telecom | Andy Lake |
| CLP Telecom | Julian Kan |
| CLP Telecom | Peter Heavyside |
| CLP Telecom | Terry O'Neill |
| Computer Associates International | Rick Ng |
| Computer Today | Richard Chu |
| Consulate General of Canada | Brian Wong |

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| CyberCity Investment Limited | Philip Zhai |
| Ericsson Limited | Ivan Chan |
| Financial Services and the Treasury Bureau | K Y Tang |
| hk6.com Limited | Bryan Chong |
| HKCSL Limited | Kenny Leung |
| HKTUG | Simon Chan |
| Hong Kong Baptist University | Joseph Leung |
| Hong Kong Baptist University | Yan Mei Ning |
| Hong Kong Broadband Network Ltd | Jessie Cheng |
| Hong Kong Broadband Network Ltd | John Chong |
| Hong Kong Broadband Network Ltd | Ricky Wong |
| Hong Kong Broadband Network Ltd | Winnie Kam |
| Hong Kong Commercial Daily | Lee Hiu Wing |
| Hong Kong Council of Social Service | John Fung |
| Hong Kong Economic Journal | Eddie Lee |
| Hong Kong Information Technology Federation | Charles Mok |
| Hong Kong Information Technology Federation | Con Conway |
| Hong Kong University of Science and Technology | Xu Yan |
| HSBC | Julian Grudzien |
| HSBC Asset Management (Hong Kong) Limited | Paul Chow Man-yiu |
| I. Tel (Holdings) Limited | Mark Kearney |
| iBasis | Vito Chan |
| Imagi Production Limited | William Chen |
| Infocast | Chui Yee Kwok |
| Information Technology & Broadcasting Branch | Gracie Foo |
| Information Technology Services Department | Pang Hon Chi |
| Innovation and Technology Commission | Vincent Shen |
| Institute for International Research | Michael Cherrington |
| Intel Coporation | Jan Li |
| Intel Semiconductor Limited | Mark Parker |
| iPass Inc | Carmen Leung |
| iPass Inc | Derek Tam |
| ITAHK | Franky Lai |
| JAFCO Investment (HK) Ltd. | Michael Chow |
| Lovells | Adam Salter |
| Lycos Asia | Leong Kwong Yee |
| Ming Pao Newspapers Limited | Frederick Yeung |
| Ming Pao Newspapers Limited | Ken Lo Yiu Keung |
| New Tel Limited | Gary Koh |

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| New World Telephone Limited | Daniel Leung |
| Next Generation Ventures | Dr. Lo, Wai Shun |
| OFTA | Edward Whitehorn |
| OFTA | John Bradfield |
| OFTA | M H Au |
| Oriental Daily News | Jerry Lam |
| Oriental Daily News | Ka-chun Wong |
| Pacific Century Cyberworks | Fu Chi Hung |
| Pacific Century Cyberworks | Helen Li |
| Pacific Century Cyberworks | James Heung |
| Polycom Hong Kong Limited | Frank Hung |
| Prism Systems International Limited | Tony Yim |
| REACH | Vincent Kou |
| Siemens | Eric Fung |
| Siemens | Victor Suen |
| SIIC Asset Management Co., Ltd. | Angus Chu |
| Sing Tao Daily | Chan Kwok Kin |
| Smartone Mobile Communications Ltd | Johnny Yeung |
| South China Morning Post | Anh-Thu Phan |
| Sprint | Connie Tang |
| State Publications Limited | Edward Leung |
| Ta Kung Pao | Mandy Koo |
| Ta Kung Pao | Yung Chun Suen |
| Telecom Italia | Andrea Anselmo |
| The Standard | Paris Lord |
| The Sun | Alton Chi-yeung Yam |
| TRP | Peter Lovelock |
| Wharf New T&T Limited | May Chan |
| Wharf New T&T Limited | Rachel Chan |
| Yankee Group | Howard Hsu |
| Yankee Group | Mark Robertson |
| | Mariana Ng |

Executive Summary

1. One of the liveliest TIF's and yet almost complete consensus! Yes, the verdict is that recent developments have put the issue beyond doubt, IP networking is the way to go for carrier service providers and for corporate business users. Needless to say this was the view of **Frankie Sum, Managing Director, Cisco Systems Hong Kong Ltd** who were also our **sponsors** for this forum. Next generation networks are here today and proving themselves successful. Frankie Sum gives the example of Telstra in Australia where bandwidth on-demand is already a reality thanks to NGN, with customers being given access to the OSS. The Metro Ethernet network is fast becoming the state-of-the-art network around the world.
2. **Ricky Wong, CEO, Hong Kong Broadband** reinforces this view with a vivid account of one of the most successful examples of a new entrant fast establishing market share. His business started with broadband LMDS fixed wireless access that built upon the reputation of a low cost IDD business from City Telecom - which itself began as a callback business - and now is rapidly migrating to a Metro Ethernet network. The key point Ricky Wong raises is that broadband really does mean convergence of services now. To illustrate the point, he announced his intention to offer Near-VOD in the near future, pointing out that a Metro Ethernet network serves each subscriber to pay-TV through a dedicated port, so programme piracy, unauthorized viewing and non-payment become close to impossible.
3. **Dr. Peter Lovelock, MFC Insight and Deputy Director, TRP** recounts the tale of how IP telephony came to China, with the help of the Chen brothers who were jailed for their efforts before winning an historic court victory. Soon afterwards the Ministry licensed VoIP but restricted it to China Telecom and three other state-owned networks... until more joined the fray. The result, as elsewhere, has been by-pass and arbitrage of the tariffing system, stripping value from the industry at an astonishing rate. A mixed blessing of being granted competition when you wish for it.
4. Session Two passed the judgement to the corporate users and systems installers, but not before **Dr John Ure, Director of the Telecommunications Research Project**, had argued that, following Ricky Wong's point about convergence, the spread of IP and broadband raised serious issues for regulators and for the industry. For example, how to handle fixed-mobile convergence, how to redraw interconnection pricing principles when these two means of access were combined by customers as a joint product, and what are the implications for mergers and acquisitions in a world of convergence?
5. **Franky Lai, speaking on behalf of the Internet and Telecommunications Association of Hong Kong**, made a special intervention. He outlines a proposal from the ITAHK for the Hong Kong Government to support the setting up of a fourth Internet Exchange in Hong Kong to serve China traffic, following the IXs in Beijing, Shanghai and Guangzhou. As IP networking spreads across China (as Peter Lovelock relates) the demand will grow and the opportunities for Hong Kong to provide interconnection IP services, including for multi-media products, and to hub for the region of Greater China and South East Asia are all there. Otherwise most intra-Asian Internet traffic will continue to cross the Pacific on a round trip.
6. This point was very much echoed by **Julian Grudzien, Regional Head of Telecommunications, HSBC**. HSBC jumped on the IP bandwagon in the mid-1990s, later than some reflecting its caution with networking technologies. Julian Grudzien's testimony is summed up very simply: IP networking at today's standards is a major cost saver as well as meeting the flexible service requirements emphasized by Frankie Sum and Ricky Wong. A unified world network is the aim of the HSBC, with a single OSS to keep management simple

and low cost, leaving plenty of time and scope for new services, performance issues and security commitment. Being a world banking group there are plenty of legacy systems, but as HSBC on average makes ten acquisitions a year the bank finds that in most cases this becomes a question of integrating IP systems. And a great cost saving to the bank is that the access network is paid for by the customers who all have their own access to the Web. But! ... Franky Lai's point remains true, most IP traffic within Asia still has to hook through the USA, and for that reason *even HSBC is to move its e-commerce centre to North America.*

7. **Bill Southwood, Director, Arup Communications**, (consultant to Hong Kong Police Department and The Hospital Authority) looks at the issue from the viewpoint of a designer and installer of IP systems. In his view IP networking has made such huge progress in the past 18 months that the issue is now beyond any doubt, but by the same token planning future IP networks is best delayed until the last practical moment not to miss out on the latest developments and improvements. Bill Southwood stresses that the real problems lie less with the technology these days but with the human factor. He agrees with Julian that installing networks becomes an internal political issue as new ways of working, and issues such as centralization versus decentralization, challenge people's local interests. Where he and Julian seem to differ is that Julian is critical of the old style telco approach of building everything around and out from the core of the network (traditionally a voice network) rather than focus on a applications-driven approach. For Bill as an old telco-hand, nothing that smacks of a piecemeal approach really works very well.
8. Perhaps our last two speakers do most to highlight the problems, although both do so as IP converts. **Joseph Leung, Director of Information Technology Services Centre, Hong Kong Baptist University** provides a fascinating account of the costs and benefits of moving the university's entire internal network over to IP. The benefits include cost savings on not having to have two sets of cabling, and the potential range of services that can be developed over the network as equipment manufacturers like Cisco enhance their products. The costs he sees as transitional. For example, fax machines had to be individually reprogrammed, speaker phones required upgrades, communications between department heads and their secretaries had to be reconfigured as 'speed dialling' because the intercom was not supported by the IP network, etc. In addition, the IP network cannot yet replicate all the functions of the old feature-rich PABXs. Joseph was basically telling us that sure, there are some quality of service issues that have not been fully resolved, but these are temporary costs outweighed by the future scalability and applications of the network, for example, soft phone that transforms a PC into a telephone.
9. **Jeremy Johnson, Director of Technology, Asia-Pacific, Atrica Inc** added further insights into the evolution of IPO networking from its early days, and makes the important point that because these were proprietary networks using proprietary equipment the industry still suffers from inter-operability difficulties. Some equipment still won't talk to other equipment if the vendor is different. His hands-on experience working in the industry leaves him in no doubt that this remains an area where change is required, otherwise a trend that Julian notes, that the number of vendors is diminishing rapidly will continue. Bad for competition, but as Julian says, Cisco probably aren't too worried.
10. It is useful to pull together some of the issues raised that have implications for the regulator. Julian makes the point that IP has been around a long time, so it is a tried and tested protocol, but as Bill and Jeremy argue the vendors and network installers do not always ensure inter-operability, so Bill in particular sends a plea to OFTA to

add some pressure to ensure Hong Kong has as open standards as possible. Ricky makes the point that broadband interconnection remains an uncertain issue in Hong Kong that needs resolution. John Ure raised a number of regulatory issues that concerned him (see above) and Franky, in developing his arguments for a second Hong Kong IX to serve the China region, also makes the point that the adoption of IPV6 address space needs to be given more encouragement, adding that the university of MIT own more IPV4 address spaces than the whole of China. We are reminded also by Joseph that Internet 2 will be coming online very soon in Hong Kong, which will support IPV6. And to end on an upbeat note, Bill observes that Hong Kong is probably the leading city in the world for the deployment of Ethernet in buildings, the fruit of close collaboration between building management, designers and installers like Arup and Atrica, and, naturally, Cisco.

TELECOMS INFOTECHNOLOGY FORUM

BLOOMBERG AUDITORIUM

27/F CHEUNG KONG CENTRE

2 QUEEN'S ROAD CENTRAL, HONG KONG

9 JULY 2002

JOHN URE: Ladies and Gentlemen, welcome to the Telecoms Infotechnology Forum. For those of you who do not know me my name is John Ure. I am the Director of the Telecommunications Research Project based at the University of Hong Kong. And there is Peter, the Deputy Director of the TRP. Peter is usually based in Beijing.

Firstly let me thank our sponsor for today's forum, Cisco. We are very grateful for their sponsorship for this theme, and obviously Cisco is the leading equipment manufacturer in this area, so it is very appropriate to receive sponsorship from Cisco. And Frankie Sum will be speaking on behalf of Cisco. Frankie is managing director of Cisco in Hong Kong, and we thank Frankie very much because in fact he was due to go to Taiwan today so he has actually prioritized this. Thank you.

Our other speakers will be Ricky Wong, chairman of Hong Kong Broadband, and if there is any definition of an entrepreneur, it is Ricky, who I think has almost single-handedly helped to change the face of telecommunications in Hong Kong. Ricky has been developing wireless broadband using Cisco systems. Ricky can talk a little bit about the pros and cons, the difficulties and the successes involved.

And lastly Peter Lovelock will be talking about IP telephony in China. Peter has written a monograph on that subject for the ITU and so a very appropriate person to talk on that subject.

Before I introduce our chairman for the first session, who will be Simon Chan, the chairman, or chairperson to be politically correct, of the Hong Kong Telecom Users Group, let me just say to any members of the press, media in the room the house rule is please do not cite, quote directly nor attribute remarks without first asking the person concerned that they are prepared to be quoted. That is the only rule. So without further ado, Simon, let me hand over to you. Simon is, as I say, chairperson of Hong Kong Telecom Users' Group.

SIMON CHAN: Thank you John. Good afternoon, Ladies and Gentlemen. I will have a very easy job this afternoon because John has already introduced all the speakers, but this topic, IP networking is appropriate at this stage for us to discuss its future. Because right now IP network has been very popular in the Internet and even in the

corporate world. I used to manage an Asia Pacific IP network, having gone through the painful experience of moving from DEC-Net to IP because I used to work in Digital Equipment Corporation. So, without wasting your time I will have Frankie to talk about what is Cisco's perspective on the IP network. Frankie?

FRANKIE SUM: Thank you, Simon. I am going to spend the next ten minutes or so just to give you some perspective on Cisco's view on the Metro Ethernet solution, or rather the Metro landscape, and I will also touch on the importance for offering a diverse portfolio of products and services in such a dynamic and challenging market that we have today, as well as the importance of delivering a reliable, flexible and scaleable service architecture.

I think Metro Ethernet has been a term that has been widely used by a lot of people around the world, and we are going to take a look at some of the drivers and give you some perspective on exactly why people are talking about Metro Ethernet or why should we have Metro Ethernet service offerings.

We are all aware of the tough situation where we have the industry facing a lot of the capex spending issues around the world as well as the continued pressure on reducing our operating expenses. So it is most very important or mandatory to support the service providers' legacy infrastructure as well as offering new services on top of it by offering new revenue sources. And it is also important to create new OSS systems or management systems where the service provider can basically expedite and simplify the service offering or the service provisioning.

We also see the market is demanding a lot of richness in service offerings from the service providers, whether it is high bandwidth or differentiated services. Basically they would like to see how you can offer the different multiple services on one consolidated or cohesive network whereby you can offer different kinds of services such as data, voice and video, and how do you bundle all these services.

And also the flexibility on the network where you can have incremental bandwidth based on your requirement, based on the customer's requirement rather than at fixed input. And also the new OSS will allow service provider to provision their service offerings much easier to a point where the ideal situation would be for a customer to actually do their own provisioning.

And of course lastly the scalability of the network. The network needs to be reliable, dependable and also scaleable so that they can be upgraded as the situation arises.

Based on the IDC report recently they forecast that the number of Metro Ethernet subscribers across Asia Pacific is going to increase from 227,000 to about 9.2 million users, so that is a 40 times over, 40 times increase in the number of users across Asia Pacific, and just in Hong Kong alone last year there was recorded close to 100,000 Metro Ethernet subscribers, and IDC is predicting that number to increase to about 700,000 in 2006.

Now, Metro Ethernet from the end user perspective basically differs from the legacy infrastructure where the legacy infrastructure bandwidth is available at fixed prices, for example T1 or T3, whereby with Metro Ethernet customers can buy multiple of bandwidth, for example 5 megs or 4 megs at a time. So basically customers can buy or acquire additional incremental bandwidth based on their own requirements so they do not have to leap frog from T1 to T3 at one point in time. And so in addition to that the customer also does not have to change the CPU when they increase their bandwidth so that gives the end user a choice of bandwidth and also ease of using and cost savings.

Now, from the service providers' perspective by offering Metro Ethernet services they do not have to provide a truckload of engineers out to the customer premises to do the upgrade when the customer requires bandwidth upgrade. So in terms of capex they can reduce a lot of capex because they do not have to change the CPU when the customer wants to increase the bandwidth. And at the same time also save a lot of opex because they do not have to send a lot of engineers to the customer premises to change the CPU equipment when they require to upgrade their bandwidth. And on top of that, because they can do this upgrade bandwidth almost at the same time, it basically gives the service provider a zero down time, so to speak, when the customer does the bandwidth upgrade. So that the zero provisioning it basically allows them to have instant revenue realization. So that saves a lot of cost on the service providers' perspective as well.

This is basically a chart showing the different cost structure of some of the legacy network, the SONET/DH network that you have around the world, and also the cost for the Ethernet. So based on this analysis or this report basically you can see that the Ethernet cost is significantly lower than the legacy systems or infrastructure that we have currently available.

So the key to success for these service providers these days is basically to have a network that can rapidly adapt new services and at the same time they can also upgrade existing ones, but driving towards one common infrastructure to deliver all these new services. So it is critical to have one cohesive network for these multiple services, and with the Metro solution basically this can be accomplished by offering one cohesive network for multiple services.

The service providers around the world are all looking for higher revenue and higher margins, and by offering one infrastructure where they can accept new services and migrate the existing ones and also at the same time they do not have to change their whole infrastructure, so that saves a lot of cost to the service provider and allows them to be able to do. So Metro Ethernet solution, we believe, is one of the best approaches that the service providers can go with in offering one network with multiple services.

Now, with the affordable bandwidth, because the bandwidth can be incremented or acquired at incremental chunks, so the cost is low so with this affordable bandwidth and also the ease of bandwidth upgrade, it basically drives for a lot of new applications. It basically changes the attitude of the customer behaviour and so, with the lower cost

bandwidth and ease of growth, new applications such as video conferencing, IP VPN or voice over IP can be driven up. So we should see a lot more of these new applications coming up that can really generate a lot of additional revenues for the service providers.

And according to Yankee Group they expected in five years time, or rather in 2006, half of all the revenue generated from Metro Ethernet services will be based on value-added services. So basically all the service providers offering Metro Ethernet services will be shifting their revenue structure from a pure connectivity base to a more balanced portfolio where they will have both the value-added services revenue and also the connectivity revenue.

So I am going to talk just a little bit about one of the customer reference sites that we have outside of Hong Kong. I am sure Ricky will talk more about these services here in Hong Kong, but I will just touch a bit about the situation with Telstra who is the incumbent Telco in Australia. They have been deploying the Metro Ethernet solution since December 2000, so about a year and a half. And currently they are serving over a hundred customers in over 1,500 sites in Australia. And one of the beauties that they have is that any of their customers can actually get a bandwidth on demand. Basically they can ask for incremental bandwidth from 4 megs to 1 gig through the Internet and get a charge accordingly. So that helps them to increase their customer satisfaction level among all these hundred customers.

The solution is basically offering transparent LAN services for simple, low-cost campus to branch office connectivity. And their customers can basically self-provision the bandwidth according to their needs all through the Web using their on-line OSS system. And I am not going to go into detail on the architecture of Cisco. Basically they use POP Cisco products that are listed up here and they are also currently increasing or expanding the network across Australia into other cities as well.

So that is all I want to touch on, on Telstra, and that also ends my short presentation. And I will pass the podium back to Simon. Thank you.

SIMON CHAN: Thank you, Frankie. I am going to ask you to hold all your questions until the end. We want to have all the speakers to give their presentations first, and then we will have a panel here so that you can ask questions to any one of them, or you can ask them to answer each one in turn. So now I am going to introduce the second speaker who is Ricky Wong, CEO and Chairman of the Hong Kong Broadband. John just introduced him as one of the entrepreneurs in the Hong Kong telecoms market, but I think at most people remember the Superman during the IDD and the broadband competition award. They have this Superman advertising which is very interesting and creative. So please welcome Ricky.

RICKY WONG: Good afternoon, everybody. Just in case any of you do not know about my company, Hong Kong Broadband is a wholly-owned subsidiary of CTI Telecom and hopefully a lot of people know CTI. We have been doing the IT business for about ten years in Hong Kong. Hong Kong Broadband is a new company we set up about three years ago.

First let me tell you who we are. I assume not all of you have heard our name before, especially in the past fifteen months we only concentrated on marketing our product in the residential market. We are a fully licensed operator. What we mean is we have all the local and external fixed telecoms licence, including a wireless one and also wireline-based fixed telecommunications licence that allows us to build a Metro Ethernet network in Hong Kong.

Let me give you some brief information before I go into the details of how we do our Ethernet network in Hong Kong. We adopt the Metro Ethernet technology as Cisco have announced in the press announcement last week. We probably, in terms of the number of LANs, in terms of the total number of ports, in terms of the internal number of the buildings, we are probably now the third largest Ethernet, Metro Ethernet network in the world now. When I talk to the analysts or talk to the fund managers I always mention a few years ago when we attended these kind of seminars we always talked about the convergence of video and voice and data. Now we realize that the dream has come true in Hong Kong. We have been offering the Internet access service, the data service, and we have already introduced the voice over IP service for residential market. Hopefully later this year or early next year we will introduce a pay-TV service on our IP platform.

Our philosophy is we put all our resources, concentrate and build our own infrastructures. I always argue with OFTA whether we should use type 2 interconnections [local loop unbundling – ed.] or we should emphasize on building our own network. Our strategy is we try to minimize our reliance on the incumbent carriers. We try to reduce leasing the capacity from them.

The result after about two years, right now we have over 110,000 residential customers who are using our Internet access service. We provide a 10 meg upload and download Ethernet connection to every residential user. The beauty is they do not need any ADSL modem, they do not need any cable modem. They just need a \$100 LAN card and then they can connect directly to our LAN switches. Obviously this is the CISCO product.

Right now I think we are making good progress. Every day we have about 400 to 500 new customers joining our service. Hopefully not all of them from our competitors but most of them are from our competitors, but obviously because we provide the higher speed and lower tariff.

We have just launched, I mean fully launched our local phone service in early April. Now it is about three months time. We have more than 8,000, in fact it is over 9,000 because last night, I do not know why, they installed 500 customers just last night, so suddenly we have, every day now we have 300, 400, 500 so I think it is quite good. It keeps going on. So we have already launched two services. I think referring to Frankie's presentation, about the service richness, one of the drivers for the Ethernet, we can put a lot of services on the same network.

I received a phone call from two U.S. fund management companies and they say, Ricky, why is it that every six months you are announcing some new service?", and I am telling them that we do not need to invest too much because every day is IP. We just have a single IP network and then we have several different services.

We already achieved EBITDA positive, excluding, well, probably we make a reasonable profit in our IP business, but excluding that, excluding our reasonable good profit on IP business, just the IP service we already achieve EBITDA positive since March this year.

Our network right now is covering about more than 910,000 home passes. A lot of people ask what, Ricky, what do we mean on home pass? We mean home pass when our cable reaches just outside your main door. We have the cables on the corridor, not just on the road. We have a vertical, we have fibre vertical installer in the building. Horizontally we have Cat. 5E cables installed so the cable is right outside your door, and then we count one home pass. So right now, when a customer wants to enjoy our service, normally we can do that within a few hours. Now one can have so many customers signed every day because normally we do it as a team. One salesman and one technician. So the salesman will knock at your door. If you want to subscribe to our service normally within an hour the technician will have installed your service on the same night.

We focus not only on the residential market. We focus also on the commercial market. Right now we have about 400 commercial buildings already installed with our systems. Again when I talk about systems it is not only the fibre and cables but also the LAN switches, the router in the buildings. So right now we have about 3,000 buildings. My commitment to OFTA is 3,500 by end of next February. We probably can meet that deadline with no problems. Right now we have already 3,000 buildings in Hong Kong, every building with at least one router and several switches, I mean the LAN switches. Because I actually know that the distance, the name for the Ethernet in this point, the specification is only about 100 metres so the customer premises, the shared customer premises and the LAN switches are only about, it is 100 metres, so every building you have to put the LAN switches and the routers.

Our target, by the end of the year we will increase our 910,000 home passes to 1.2 odd millions residential home passes, and increase from 400 to 600 commercial buildings.

Again another driver for the Metro IP is the lower cost. We have been spending around one billion up in the last two years. We have got to spend another Hong Kong \$300-400 million in the next two years to complete our projects. Because, as you know, part of our network is not fibre-linked, part of the network is still routing on the RMTS, the microwave linkage. And we foresee that there will be a very big demand on the bandwidth so we are going to upgrade our wireless link to the fibre. Right now we have already installed around 1,000 km fibre in Hong Kong but we will probably invest more. That 1,000 km fibre is already in place but we are going to install more in the next two years.

In my second part of the presentation you will see that we are going to launch a third service. It is the pay-TV service so you can see the additional capex. It is relatively very minimal. For the voice our additional capex is only Hong Kong \$600, finally selling at \$68, our voice monthly subscription is only \$68 which is about 40 percent off the incumbent carriers. So in less than one year we can get pay-back for the capex.

For the pay-TV we upgraded some of the routers so we will probably spend \$50 million to upgrade all of the routers for the whole network, and we subscribe \$100,000 in the central box, so we see that the capex for the additional service is relatively much smaller.

Here I am just going to show off because a lot of people are questioning us, without a real estate developer's support we cannot access to a lot of big estates, but just to show you quite a lot of Cheung Kong, Sun Hung Kai and Henderson buildings we are already in. The largest one is South Horizons. South Horizons has about 12,000 home passes. And then Sceneway and Kingswood we are already there and providing different kinds of services.

OK, this shows you how, it is a simple architecture to show you how we connect our customers. Flat A, this user is a very typical customer right now using our service. His cable is probably using our first service, the Internet access service, so you see he has got a PC. The PC connected through a Cat. 5E cable. As I mentioned we already have Cat. 5E cables right outside the corridor. So this subscriber can apply our service. We just put another Cat. 5E cable into his apartment, and then some of the two-carrier cable we connect to the Internet, to the LAN card of the PC. And then when like a few months ago when we offer the phone service, this good customer used our service and then we just use one pair of these cables. These cables are already in this apartment, and they just use one pair of these cables to connect to his, just a normal phone. Now this is not the special phone. This is just a regular single-line handset analogue phone which you are using for right now. Nothing special. So all these cables will go down to the basement. In the basement of the buildings we will install the LAN switches and a voice over IP box. The PC will connect to the LAN switches, and the phone set will connect to this voice over IP box, and the voice over IP box will go back to the LAN switches. And all this garbage, all this IP packet will go through the big hole and go back to our data centre.

I mentioned the third service, the IP TV which we call the pay-TV service, we are going to launch hopefully before Christmas, if not then first thing next year. This is a set-up box. This is an IP TV server box. So again this box will connect to the messages and convert the IP packet back to the TV signal and then to the TV. We already have a demo site in some areas in Tai Po, and I think this is working quite well now.

So now we are going to move forward to become the pay-TV operator very soon. Again it is easy for the CISCO IP multicast technologies. We support 4 to 8 megabytes. Added to a video screen it is very close to the DVD quality. The customer can choose a simple way to watch our TV programmes. Obviously first is to set up the box plus a TV set. Another simple way is just using a PC and then plus video-client software, because again it is based on IP so the customer can just use a PC and then he can view the TV programmes. This is a test lab in our company right now. We are putting around 300 concurrent customers analyzing, simulating the environment like in a building, and the 300 users simultaneously connect to one router and several LAN Switches and they continue to switch between channel and channel or doing something else. I think the test results are very good and we probably will have about 120 or 180 channels available for all the pay-TV operators.

The main difference comparing this technology with the traditional cable TV technology is there is one problem they cannot solve, unauthorized viewing because in a coaxial cable system all the users are connected to the same head M. So no matter whether you are a user or whether you are not a user you will still receive the signals, and then obviously it is very easy, not now but some people go to Shenzhen and for \$100 you can buy a box and just plug in here and you can change the signal to an unscrambled signal. This is the problem I think the coaxial cable system is facing right now. But in our case every single customer is connected to a distinct port, so one user, one port. At any one time I know how many customers are paying to me. If I have got 10,000 customers paying me only 10,000 ports will be activated, not 10,001. So I know exactly how much customers are paying me and how many ports are activated. So if this is not a user, his port will turn red and there is nobody using the downlink. Even though from somebody else he gets another box, he will not receive the signal. That is how we solve the problems.

These are the last three slides we can show you, and I think it will be very useful for most of the corporate customers. In the traditional office premises right now you probably have PABX systems, right, connected to several handsets, and then you have your own in-house LAN connected to some PC, and obviously you pay either Hongkong Telecom or whoever, to get some local line, right, to connect to your PABX and then you probably use IMS or our company to get the Internet service. I think this the traditional way you handle your PC communications and voice communications.

One of the universities in Hong Kong has just changed. I am not sure whether I can tell but I think they are in today. I think they are one of the speakers here. As I understand it, correct me if I am wrong, they use a lot of IP phones, not traditional phones. They just

use IP phone and a lot of PCs connected I am not sure if it is the same but I think it is connected to the IP, to the Ethernet network. And then probably they are installing their own voice over IP gateway and then connect to the PSTN and still it is connected there. The benefit of that is I think first they can save a lot of internal cable instructions because they use the wiring. With the previous one they need two cabling, one for voice and one for data. For this one you only need one cabling system for both voice and data so you have already got a saving on the cable instructions. But still they need to maintain the voice over IP gateway, they need still the telephone line and they need the Internet access services.

What we are going to offer you is that you still you need an IP phone and you obviously you need a PC all connected to your in-house LAN network but now you only need single connections to us, and 10 megabyte or 100 megabyte connected to our network. Then all your voice packet will go to our carrier grade voice over IP gateway and connect to the PSTN. And all your PC data things will still go to our network, interconnect with Hong Kong IX or go to overseas. But the benefit obviously is you do not need to manage or maintain your own voice IP gateway. You even save, you do not have to pay any phone line charges any more. You save all the phone line charges. What you need is only one thing. You just need the line and Internet access connection. This handles all your voice and PC communications.

OK, I can answer some of your questions later, but this ends my presentation. Thank you.

Presentation by

Hong Kong Broadband Network Limited

9 July 2002

1

Who are we??

- HKBN is a full license operator
- granted the licenses listed below by the Office of the Telecommunications Authority :
 - Wireless Fixed Telecommunications Network License
 - Wireline-based Fixed Telecommunications Network License
 - Cable-based External FTNS License
 - Satellite-based External FTNS License

2

Case Details

- our Network Development

- Adopts Metro Ethernet IP network in HK
 - the largest in the world
- Convergence of voice, data & video into single IP network
- Self-owned network, minimized reliance on leasing network capacity from other operators
- Stable monthly growth of broadband customers at around 12,000, possessing 110,000 residential customers
- Fixed line service : launched in HK in April 02 possessing over 8,000 customers

3

Case Details

- our Network Development

- Achieved turnaround position to EBITDA positive since March 02
- Possesses over 910,000 homepass and 400 commercial buildings network coverage in June 02
- Targets by the end of December 02:
 - Network coverage : 1.2 million residential homepass and 600 commercial buildings
 - 200,000 broadband customers
 - 100,000 fixed line customers

4

Major Capex

- IP technology allows HKBN to enjoy cost-effective project investments :
 - HK\$1-1.2B for a fibre optic IP network, coverage 1.2M households in HK
 - HK\$600 per voice subscriber including voice over IP box and switching gateway
 - HK\$50M for upgrading network of pay-TV services
 - HK\$1,000-1,200 per pay-TV subscriber

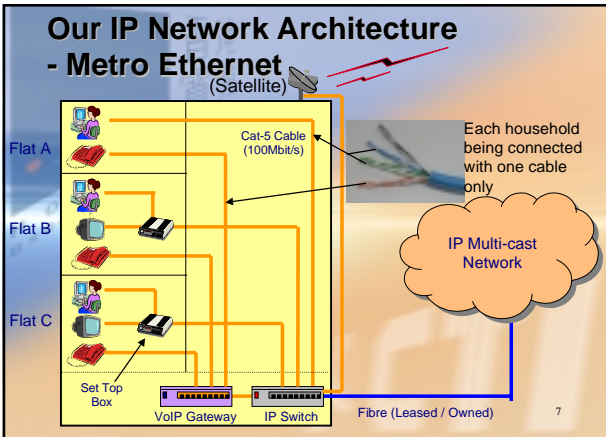
5

Network Coverage

- Major estates that are under our network coverage :

| Developer | Name of Estate | District |
|---|-------------------|---------------|
| Cheung Kong (Holdings) Ltd | South Horizons | Aberdeen |
| | Sceneway Garden | Lam Tin |
| | Kingswood Villas | Tin Shui Wai |
| | Eldo Court | Tuen Mun |
| Sun Hung Kai Properties Ltd. | East Asia Garden | Tsuen Wan |
| | Tsuen King Garden | Tsuen Wan |
| | Tai Po Centre | Tai Po |
| | Greenfield Garden | Tsing Yi |
| | Castello | Shatin |
| Henderson Land Development Co. Ltd. | Villa Athena | Ma On Shan |
| | Richland Garden | Kowloon Bay |
| | Metro City | Tseung Kwan O |
| | Sunshine City | Ma On Shan |
| | Shatin Plaza | Shatin |
| Sino Land Company Ltd. | Garden Riviera | Shatin |
| | The Trend Plaza | Tuen Mun |
| | Belvedere Garden | Tsuen Wan |
| | Miami Beach Tower | Tuen Mun |
| | Regentville | Fanling |
| New World Development Co. Ltd., Sun Hung Kai Properties Ltd. & HKR International Ltd. | Discovery Park | Tsuen Wan |

6



Moving Forward to become a Pay-TV Carrier

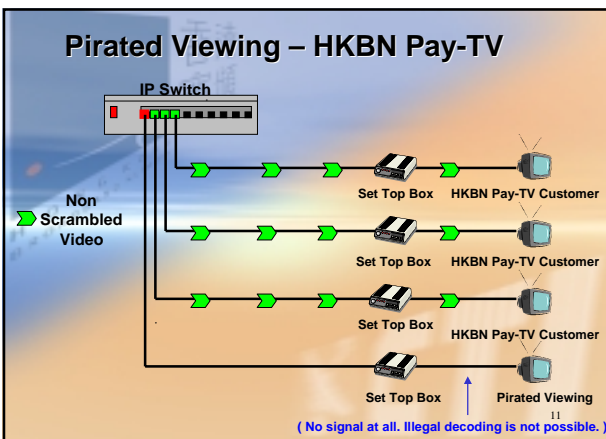
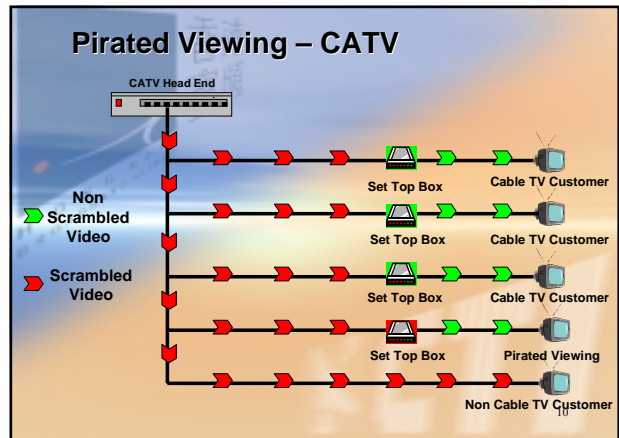
- TV/Video-ready multicast infrastructure
 - using existing IP network with minor upgrade (HK\$50M)
 - Cisco IP Multicast technology
 - supports 4-6 Mbps MPEG-2 video stream
- Two simple ways to enjoy our TV service :
 - Set Top Box + TV
 - PC + MPEG-2 video client software

8

Test Lab

- Able to emulate 300 concurrent users in an estate watching 120 – 180 channels at the same time
- And they switch channel randomly at the same time
- All cables and switches are fully loaded

9



Example : IP Phone Applications

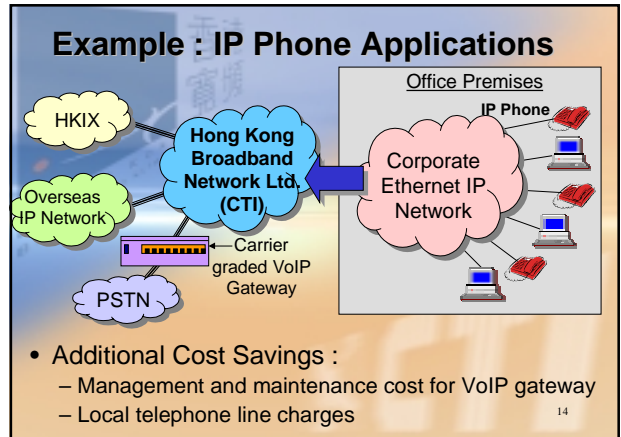
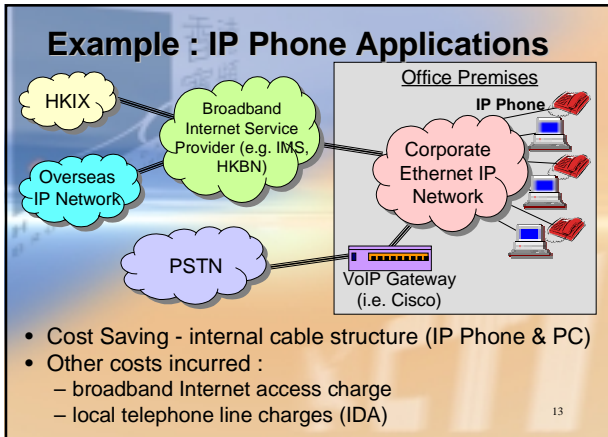
Traditional system : separate cabling for PC & telephone

HKIX
Broadband Internet Service Provider (e.g., IMS, HKBN)
Overseas IP Network
PSTN

Office Premises
Corporate Ethernet IP Network
PBX

- Cost spent on separate cabling system for PC and phone, broadband Internet access charge and local telephone line charges (IDA)

12



Thank You

15

SIMON CHAN: Thank you, Ricky. Interesting, exciting to learn another cable TV operator coming on line. Then we do not need to rely on one cable TV operator. OK, so talking about Ethernet and IP and all that, maybe it is a bit technical but I think some of the audience, most of the audience will probably understand. So I am going to introduce the third speaker who is Peter Lovelock. He, besides the role in the Telecommunications Research Project, also actually spends a lot of time in China and publishes a newsletter for China which has very interesting and amusing views on how the market is going. So, please welcome Peter.

PETER LOVELOCK: Good afternoon. That is me. John, in introducing me at the outset referred to the study that initially commissioned this, which was an ITU study on the impact of IP networking, in particular IP telephony, on the networks in developing countries as against developed countries. If you would like to see the reports I believe they are probably still on the ITU web site, www.itu.int/iptelephony/developingcasestudies. It is a short URL for the ITU. They usually go a lot further.

So I am always intimidated coming after someone like Ricky. Do you see all the photographers who come and take his photo?

IP telephony. Talking IP always makes me think of the line about how do you start a successful, small telecoms business in Australia? You give a couple of megs to a big one and see how they do. So it sort of makes me think about that particularly when we do China. IP has been an absolute revolution in China. What I will do is I will try to contrast what you have heard about the Hong Kong situation with what is happening in China because it has been a revolution rather than an evolution.

But I am not yet sure it is a positive revolution. Are we building value into these networks or taking them out? One issue, China is of course one of the beacons out there on an otherwise depressing telecommunications landscape. All this growth going on, all of this explosive build-out. There is nothing that is completely IP in China. Almost everything is going over IP at some point right now, but almost nothing is completely IP. There is no such thing almost as an IP network in China right now.

Let me take you back very briefly through the history of IP telephony in China. Do you all know, given you are part of China these days, do you all know the story of the Chen brothers? Da Chen, Xia Chen in Fujian Province? Yes? How, these guys opened up the networks? Anyone not know? You don't? I think we have got a provocateur at the back there. Let me do it very briefly.

There was going to be no IP in China. We had the call-back wars and the IDD wars which were referred to a little earlier in Hong Kong. China saw what this did to the value of the networks in China and a wise ministry, at the time the Ministry of Posts and Telecommunications, said no such thing happening here. We have telecommunications carriers who are doing a great job and we are going to keep the build-out happening and we are going to keep value in the network. No IP. But China made the same mistake

that everyone had made around the world. It tried to separate out web networking and what was telecommunications and what was all this new-fangled stuff called computers or information technology. And it usually started at the CPE, consumer premise equipment part, and if something was computers, it wasn't telecommunications. And a lot of smart young guys, and they were usually guys, worked out that if they hooked a computer up as the Internet commercialized in China, that they could access the Internet with software that was coming onto the market at the time, and they could allow you to make international phone calls at something akin to about twenty percent of what it cost you to make an international phone call at the time. And so these little computer guys sprung up all over the country and they started off giving everyone in their little neighbourhood the chance to make very cheap international phone calls.

This threatened the Minister of Posts and Telecommunications and the incumbent carrier, China Telecom, and they did what any law-abiding ministry does in a country like China, they sent the goon squad in and the goon squad would go in and they would rough people up and they would say this is illegal. And a couple of smart guys would say no, it is not, and so they get hauled off to prison and their computers are carted off and they see the error of their ways and they would go out of business. Until the Chen Brothers came along. The Chen Brothers said no, it is not illegal. They got thrown in jail, their computers got carted away and they banged on the prison walls for a while until someone said, hold on, we should give them the courtesy of a trial. So they got a trial, and they lost and they got thrown back in jail and they banged on the walls some more, and got a good lawyer and he hauled them out of jail. And he took them to the next highest level, the municipal procurator who happened to be a wong chop, a net worm. He used the Internet and he sat there and he read through the legislation as it existed in China and he said "this ain't telecommunications. They are allowed to do it."

Within 60 days of the Chen Brothers being told they could do IP telephony China Telecom got religion. They started offering IP telephony. But to do anything in telecommunications in China requires a licence so they had to get a licence. Well, the system looks a little bit rigged if you only give one person a licence, and it is not a rigged system in China. We play by the rules, so we thought we should give three licences. We would give one to China Telecom because they are already doing this now, and we would give one to the competitors, China Unicom, China Jitong. Fortunately enough at the time this was happening those two bodies had also become part of the overriding ministry, which was now the Ministry of Information and Industry, so the ministry was back in control. It had three IP licences, experimental licences, and then the bad boy on the block came to play. China Netcom, CNC, and they got given an experimental licence. So all this time we went from not doing IP, to four people being allowed to do it, these four guys, and they were supposed to do it experimentally while the ministry worked out if this was going to run out of control or not. We wanted to do orderly development, the crucial phase to do with anything in China.

Well, it was only until these other three guys got their licences, and what they would use IP telephony for was what they could not get access to, which was international traffic. By having an IP licence they could hook in around the international gateway. They could

start running international traffic and do exactly what the Chen Brothers had been doing. They would undercut China Telecom and start stealing the traffic, significantly higher than what they were charged for local access but not anywhere near as what China Telecom was offering. And within a period of three years we went from zero to one to four to, well, we call them eight, a multitude of licences. And that is what IP telephony has been used for and that is what IP has been used for in China.

Now when one of those competitors, one of the new competitors, got into the game as we began to liberalize out from four to eight licences, we got asked to come and do some work scoping out the size of the potential market. Where does a new entrant into a telecommunications market growing as fast as China aim? Well, they decided it was growing fast, you have got a lot of room for potential, right? And you keep looking back and you say hold on, where the competitors aim is in price arbitrage. Just the same as we have done in the IDD wars and the call-back wars in Hong Kong. We are taking on the incumbent who is having somewhat artificially held rates and we would attack and undercut. So when we got called in to work with this would-be wannabe competitor we said hold on, if you go down the IP path, isn't the same thing going to happen? But they did not want to hear that because their speculation, which proved fairly accurate, was that the size of this market in volume was going to grow and grow magnificently with a little bit of competition, and therefore they did what all good consultants do, straight line projections of the size of the market. So you have a very healthy looking telecommunications service market, and if you speculate up in a semi- straight line fashion you have a very attractive voice over IP component. We should be offering voice over IP, and we are going to do that the high-tech way. We have burnt all the bridges, elucidations, on building a state-of-the-art IP network and he lost you, right? There were the glazed eyes he was looking at. They were going to go the high-tech route. They started printing lots and lots of IP cards, because that is how you do it high-tech in China and you make them pretty because that is important. And this model worked. The competition came. Traffic grew and grew unbelievably. It was not supposed to look like this. This is IP menace. This is the bad guys. We were going to take the market away from them. They weren't supposed to know how to do this.

Self-explanatory information on where the traffic is coming from. Yes, and self-explanatory information on where you derive your revenue when you are projecting, or play minutes by the amount of cost, how much you retail for. Ah, this is not retail. Retail is officially prescribed prices and most of this is happening either through deals you strike with the carrier who works his backbone as a wholesaler and a retailer or through individuals buying their IP cards out in the market place. These rates are set by the Ministry and they are not overly attractive rates, but everyone has to play by those rules I was talking about that we all abide by in China so you print your cards. Therefore 100 coir, you buy them for 100 coir or 200 coir or 500 coir. Only to shoot them. You go out in the street and you ask for a 200 coir card. They are usually selling for about 63 coir at this point in time, because that is how you get market share, and that is what you have got to do to be successful in markets growing as fast as China. Remember that market share we showed?

So, we have the revolution take place. We have the successful use, introduction and use of a new technology which is used to leverage to open the market place. Wonderful. In the space of three years we go from what is still considered a monopolistic market to one of the more competitive markets in the region with price warfare so high that we have seen rates fall across network service offerings by in excess of 80 to 90 percent. Prices fall through the floor. This is all good. Traffic continues to go up. Unless of course you are a carrier. Now, remember those projections that we did for one of those that we were working with, people who were doing, for one of those competitive new network providers with a very healthy bottom line, if any, for starting in the voice over IP market.

Now at this point of time we are six months into the contract and the erosion has begun. So they come back and they revisit their assumptions and they come up with what you see on the file. Maybe this price erosion thing, maybe this is for real. Maybe price arbitrage is going to happen. Maybe that is part of what the voice over IP will do.

But take a look at one thing here. The numbers on the far right side column in both charts are the same except for that bottom line. Here is our key assumption being clever consultants. What we will do is we will say price erosion will impact voice over IP, so rather than seeing us taking about 20 percent cut of the overall revenue, we were a little aggressive here. We will scale that right down and grow it slower so we get a somewhat more realistic number. The problem with this assumption, of course, once you start price erosion, as we saw in Hong Kong, it does not just attack the voice over IP market, everything, everything erodes. These numbers do not sustain.

Traffic continues and therefore the need for equipment continues and the roll-out continues so there is a lot of committed investment. The young man who doesn't know the Chen Brothers' story at the back of the room of course benefits from all this equipment sale.

So if price arbitrage is what a lot of IP modelling is about, if we are going to see, oops, we are already seeing, a telecommunications market which is losing fundamental value from the service and carrier offerings, what does that mean? What does it mean in developed markets for incumbents who have to project full healthy revenues. Well, you saw the offerings you were going to get, the new applications, right, of course, video-conferencing, data transfers, file-to-file, new bandwidth applications. What does it mean for competitors in a developing market place? This is the share of the market projected for the IP hard component of voice, which is still seen to be the wealthy aspect of a developing market which is becoming the largest telecommunications market in the world, China, and that is where the competitors are focused. So what this tells you is that if you are coming in through IP it is still a fundamental telecommunications development game. You get your licence in China and you use the opportunity, but you had better be in these healthy drivers if you are going to sustainably develop the carrier offering, particularly once we get to the next stage of quality service offerings.

Can I finish there?

IP TELEPHONY IN CHINA: REVOLUTION OR EVOLUTION

(3 points of reflection; 2 points of development)

Peter Lovelock

Deputy Director, Telecom Research Project, Hong Kong U.
Thinker, MFC Insight

Email: lovelock@hkusua.hku.hk
peter@mfcinsight.com



1

Point of Inflection I: Virtual Licensing

Number of International IP Telephony Licenses

| Year | Number | Players |
|---------|--------|---|
| 1998 | 0 | 1 International Provider – China Telecom |
| 1999 | 4 | All "Experimental" Licenses: Telecom, Unicom, Jitong, Netcom |
| 2000 | 5 | Original 4 plus China Mobile |
| • -2002 | 8 | Telecom, Unicom, Jitong, Netcom, China Mobile, Railcom, China Motion (Virtual IP operator), Shanghai Cableplus Network (a.k.a. Shanghai Cable, the only cable operator who can operate trial convergent networks) |

Conclusion: *The international monopoly is dead;
the wall has been breached*



Point of Inflection II: Traffic and Revenue

Table 1: Minutes of IP Traffic ('000s of minutes)

| | Jan. 00 | Jun. 00 | Dec. 00 | Jan. 01 | Dec. 01 | May. 02 |
|---------|---------|---------|---------|-----------|-----------|-----------|
| Minutes | 28,072 | 545,261 | 707,260 | 1,858,695 | 2,378,720 | 4,614,389 |

Table 2: IP Telephony Revenue in China, 1999-2004 (millions USD)

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|----------------------------|--------|--------|--------|--------|--------|-----------|
| Local services | 7,464 | 9,331 | 11,198 | 12,877 | 14,809 | 17,030.40 |
| Toll services | 8,793 | 10,552 | 12,662 | 15,195 | 18,234 | 21,828.80 |
| International services | 4,148 | 5,393 | 6,741 | 8,426 | 10,364 | 12,436.80 |
| Total fixed line telephony | 22,247 | 27,394 | 33,050 | 39,497 | 47,006 | 57,347.30 |
| Total VoIP revenue | | 11.3 | 37.1 | 132.5 | 367.6 | 1,114.60 |
| | | | | | | 2,557.50 |



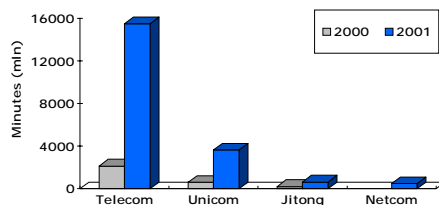
Carriers & Licensing in China

| | Fixed | VoIP | Mobile | Data | Paging | Others |
|----------|-------|------|--------|------|--------|--|
| Telecom | Y | Y | - | Y | - | • Owns PHS and CDMA licenses in some trial cities |
| Netcom | Y | Y | - | Y | - | • Owns PHS licenses in some trial cities |
| Mobile | - | Y | Y | Y | - | |
| Unicom | Y | Y | Y | Y | Y | • The only full licensed carrier in China: • China's largest paging network |
| Railcom | Y | Y | - | Y | Y | • China's largest fixed line network |
| ChinaSat | - | - | Y | Y | - | • China's largest satellite network |



Point of Inflection III: User Demand, from Supply-driven to Demand-driven

IP Traffic By Carrier



IP Market Comparisons

IP Traffic (1000's of Minutes) by Location

| | 2000 | 2001 | YE2002 |
|---------------|-----------|------------|------------|
| Local | 2,782,933 | 21,316,158 | 19,558,494 |
| HK, TW and MC | 137,296 | 457,074 | 289,414 |
| International | 55,695 | 489,992 | 191,147 |

Price Tariff for IP Services

| | Local | HK, TW & MC | International |
|----------------|-------|-------------|---------------|
| RMB per minute | 0.3 | 1.3 | 2.4 |



Question I: How do you sustain a model of price arbitrage?

Aggressive: IP Telephony Revenue in China, 1999-2004 (millions USD)

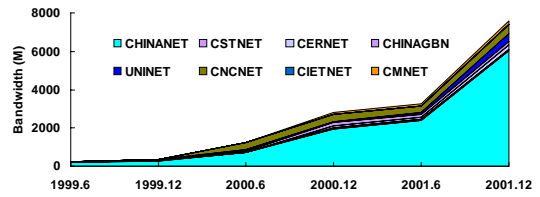
| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|----------------------------|--------|--------|--------|--------|----------|-----------|
| Local services | 7,464 | 9,331 | 11,198 | 12,877 | 14,809 | 17,030.40 |
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| Total fixed line telephony | 22,247 | 27,394 | 33,050 | 39,497 | 47,006 | 57,347.30 |
| Total VoIP revenue | 11.3 | 37.1 | 132.5 | 367.6 | 1,114.60 | 2,557.50 |

The Conservative Projection

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|----------------------------|--------|--------|--------|--------|--------|--------|-----------|
| Local services | 5,832 | 7,464 | 9,331 | 11,198 | 12,877 | 14,809 | 17,030.35 |
| Toll services | 7,416 | 8,793 | 10,552 | 12,662 | 15,195 | 18,234 | 21,828.80 |
| International services | 2,640 | 4,148 | 5,393 | 6,741 | 8,426 | 10,364 | 12,436.80 |
| Total fixed line telephony | 17,728 | 22,247 | 27,394 | 33,050 | 39,497 | 47,006 | 57,347.32 |
| Total VoIP revenue | 0 | 11.3 | 37.1 | 72.2 | 133.7 | 371.5 | 563.9 |

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International Bandwidth by Carriers

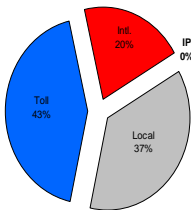


- In 2001, total international bandwidth capacity nearly tripled, increasing from 2799M to 7598M.
- CHINANET and UNINET's share of China's international bandwidth increased from 69.7% and 2% to 79.4% and 5.5% respectively
- CNCNET's share dropped from 13.5% to 6%, which implies increasing competition in China's data communication market.

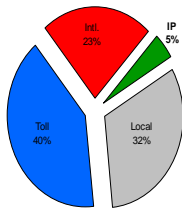
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Question II: How does a competitor build to such a model? (What is the role of IP telephony in an emerging telecom market?)

1999 IP Market Share



2004 IP Market Share



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SIMON CHAN: Would you like to take a seat here in front? I am going to invite the other two speakers, Frankie and Ricky, to take a seat as well. While we usually have high chairs so that everyone can see them, but now you are going to use some imagination, so we will try to sit over here. So this is your time. So we have seen Frankie talking about the technology, the Ethernet now is very doable in the Metro project area, so once you have got IP, the Ethernet, in place you could drive any traffic, and the IP scene is one of the dominant protocol, of course so now you could see that everything can run on top of IP. And then Ricky is going to implement the network which is going to provide you all types of services, the voice, the pay-TV and so on, and there is the experience in China which Peter had just talked about, the IP telephony, the growth of the VO IP in China, both for the domestic and international market. So that is a very good vehicle to break the monopoly.

So, question time. We have half an hour so plenty of time to ask different questions of our speakers. Anyone to ask the first question? Yes?

PARTICIPANT: My name is John Lin. I just want to know in the network that you are building here in Hong Kong, how many rallying points would a user have to go through from source to the source where the content .. (inaudible) .. voice cabling or ...

SIMON CHAN: OK, please use the mike and say again. If you just do the right thing. If you just start again with your question. OK.

PARTICIPANT: John Lin from .. (inaudible) .. I just was curious, just from a QS point of view, a question about the networks that are being built here in Hong Kong. How many, roughly how many routing points would be expected between the user and the content which would be, let us say, the video streaming or the potentially the gateway for the voice.

RICKY WONG: Sorry, I do not think I can give you a good answer on that because normally we have one, more than one router in one estate. You know in Hong Kong we have the big estates, they have ten buildings and then they have 5,000 home passes in one estate, and they will go from that estate to the major hubs in that region, and in that major hub region we will route on the backbone, so probably five to ten different routers.

PARTICIPANT: OK, and is it MPLS that you are using to provide the QOS for your real time services?

RICKY WONG: I do not think I am qualified to answer your question, but I would like to give you my card in any case, and if you are really interested you can send me an email and I can direct your question. I do not know if there is any friend from Cisco, because I saw some Cisco engineers, whether they can help you or not. I am sorry, I really cannot.

PARTICIPANT: Thank you.

SIMON CHAN: So this is a quality of service question, really, that this gentleman is talking about, so maybe Frankie could comment on the equipment side and how to provide a better quality of service? Yes, MPLS is just one of the protocol they use, right?

FRANKIE SUM: Yes, MPLS would be one of the many features that they can use and also within the router as well there is a lot of QS services as well.

PARTICIPANT: It is Ian Johnson from Magic Technologies. Ricky, I work in Discovery Bay so I do not get your wonderful service, I guess, but my question is I am interested in why you are getting into pay-TV because we get a lot of people calling and I guess if one more guy comes to my door at nine o'clock he goes off the balcony. And it is, the question is content and viewability rather than technology, and I would like to get your thoughts on why you guys are going to make a success of this. Are you getting some new content here or something?

RICKY WONG: No, I do not think we can any, cable TV right now is offering eight channels and is probably getting a good setup for fifteen by the end of this year or the middle of next year. I think you can ask the customer to switch to two things. DVD quality, because for those professional people who have been visiting our site I would say all the comment is excellent because it is DVD quality, they provide four or even six megabytes so the quality of the picture is very good.

The second thing is, say we can support like 150, 180 channels. Now those kinds of channels will vary, most of them will be on the niche market. It is one way to do it. You can imagine, some channels may even be like religious channels. Or the other way round is it may be, because of so many channels we can provide a service in, not VOD, but a near VOD arrangement. So every ten minutes or even every five minutes we can have a movie coming up, because when we have got 180 channels we can allocate 100 channels to be movie channels. Now Cable TV has only got what, three? A HBO, a Cee-fax, but if we have got 180 channels then obviously 100 channels, every five minutes we get a new movie coming up.

PARTICIPANT: Yes, just a final comment. That kind of situation has been revisited from the old Hong Kong iTV. Back in '95 they tried VOD. If it is near VOD that may work because then the customer can call up his own, as you say, his niche thing. So you are thinking of doing NVOD on this service, near video?

RICKY WONG: What I mean near VOD is getting, say Channel 1 to Channel 100 as movie channels, and every five minutes something comes up, so it may be one of the advantages over our competitors.

PARTICIPANT: OK, thanks.

PARTICIPANT: Connie Tang from Spread. I want to ask how the integrated services on IP are compared to the Hong Kong Broadband growth in terms of revenue and market share. And then the follow-up question is to Peter. Do you see the trend of

integrated services on the IP that is towards video, data, that will be taken up in China as well?

RICKY WONG: Well, obviously we would like for the 110,000, 120,000 subscribers that are using our VOD service I think we find it is very easy. I will ask them to trial, at least trial our phone service, unless those customers are not happy with our Internet service. If they are happy I think it is very easy to motivate them, give them some free trial incentive to ask those customers to try our phone services. No additional installation cost because the cable is already, the socket is already there in the apartment so it is very easy to ask the customer to change.

And I didn't mention in my slides but you will see our target is quite aggressive. Even though right now we have only 110,000 and 120,000 subscribers, but by the end of the year we expect 200,000 on the broadband. Even though today we have only 9,000 but I am targeting 100,000 voice subscribers by the end of the year. And bundling our IDD services, I think bundling is very useful, bundling, and also cost selling. I did not mention about IDD – this is in Hong Kong – but I assume most of you know we have 1.3 million registered subscribers in Hong Kong. We have over 60,000 companies in Hong Kong using our IDD service every day, so with all of this platform I think it is relatively easy.

PETER LOVELOCK: Yes, and then no. Yes, for exactly the reasons you have just heard, bundling and convergence are the way of the future, and the charts that you saw from the sophisticated presentations that came before mine are exactly the same presentations that the Chinese carriers are working to. It is the same carriers as everybody around the world uses. It is like a wizardry brotherhood. There is about six secretive consultants somewhere in the upper echelons who put these charts together and every telecoms carrier in the world is moving to them right now.

So yes, they are going to bundle everything they can, and some of the vendors are pushing this because it makes sense. Subscribers want to be able to get 180 movie channels. In China as well you get conferencing and VO IP and everything down one pipe. China is not as wealthy as Hong Kong by any stretch of the imagination, but you do wonderful market projections based on that sizeable market, and then people cannot afford to pay for all those services, so we will start to bundle and then they will work out that there are some people who want to pay for movies and video-conferencing, but it is not the mass market, so then we will start unbundling and we will start target niche-ing those people who want those things and we will split them up and some very clever small carriers will target that bit of the market that they know they can service to, and it will fall apart straight away.

RICKY WONG: I missed some point. It is because our service is .. (inaudible) .. based so this is basically a true two-way communication, so if anyone is interested they can come to our office and we can show you the demonstration. On the one hand it is pay-TV and you can watch a movie, and on the small corner you can read or write your email, or you can on the other hand watch the TV, it may be horse racing. The nice thing

of that it is not a one-way broadcasting thing. It is a true two-way and everything on IP, so you can, like on our signal box at the back we have already got a printer port, a keyboard connector and a mouse connector so it is set up to facilitate for two-way communications.

PETER LOVELOCK: Just one follow-up comment as well. John introduced, I think both John and Simon introduced Ricky as one of the most innovative and successful entrepreneurs in Hong Kong, which he is. Hong Kong is an extraordinarily sophisticated services market and moves very, very quickly to identify what people want and respond to it, which is I believe one of the successes that Ricky brings to the market. If it does not happen in Hong Kong it is probably not likely to happen anywhere that you can identify what the customer wants and respond to it very, very quickly, which is what this model is premised upon. That is not going to happen in markets like China. There is no concept of customer service, let alone the belief for a large telecoms carrier to be able to respond rapidly to what the market tells them they want.

Video-conferencing is a lovely example there. At one stage, and it is only eighteen months ago one of the multinationals in China looked at doing video-conferencing with its headquarters back in Europe. It was cheaper to fly the five executives out to China and put them up in one of the five-star hotels for three days rather than the three hour video conference link.

RICKY WONG: That is very true after the 9-11.

PARTICIPANT: I am Bill Southwood and I am a communications. I want to cite what Peter just said because I agree with you at the moment that China consultant may not be such a market, but Ricky has given us an example of actually working closely with property developers clearly to go and get your services into some of the biggest developments around the place. Clearly you have offered advantages to Henderson and Sun Hung Kai and people like that.

Now one of the other models that might work in China is to actually get some third parties and other carriers or the government to get in there and start providing service. One of the problems you quite rightly say in Hong Kong is that what customers generally want and what Hong Kong is, is about here, and what the industry provides is generally up here, or if it is not, it gets there pretty jolly quickly. China is the other way round, so there is an opportunity for third parties, I would have thought, to get in there and provide something that is not currently being provided by the traditional industry. I will be interested, Ricky, in your comment on how that works in Hong Kong and Peter, yours, on whether that might not be another route into China.

RICKY WONG: Well, I do not think I can give any comfort because we did not have any experience in China. The only thing I have in China is a call centre, and probably the government there was angry with me. No, to be frank we have no experience on how we do that. I do not know whether Peter has any comment?

PETER LOVELOCK: Yes, I have got a comment. I have two. Ian referred earlier to the glory days of VOD stuff in '95, and at that point John and I were working on case studies for the IMS service, and we looked at it as it came to fruition and they were projecting a VOD market and they were targeting it in pretty much exactly the way you are talking about. And then I skipped out of town for a while and went to Geneva and I came back about eighteen months later, and we called them up to do a follow-up pilot study, and went round there and they said, listen, come in, look at the traffic statistics. We have got a problem. The VOD stuff, it is not unsuccessful. It is nothing like we think except for one part, porn. But it is weird because where we are seeing the porn take off – it's Japanese, very cheap porn by the way, so it is good for our economics. We can buy it cheap and we can sell it at the same price we charge for Western movies which are far more expensive. We have a problem. The traffic is spiking at between three and six in the afternoon. It is the housewives! That is what we have worked out, and we do not know how to market to them because if we market to them and say we know you are watching, tune in for more, their husbands are going to turn to them and say "what are they advertising to you for?" So we cannot do that, so we are trying sort of Mills & Boons approach. We have promised more to come, thinking the housewives will pick up on this. It was not a successful play.

In terms of the China operation, yes, of course, there is always opportunity for third parties to get in between the government-controlled set price structure and the nascent demand which we all see coming from the middle class, which is appearing. Where do I start with the problems that third party operators always have in China? Does that mean the opportunity is not there? Of course it is there. What you learn is you have to be able to move very fast. I am talking about a sophisticated service market that is Hong Kong, where the carriers have worked how to see the market, find an opportunity, respond to it and move. You have to move even faster in China and we do not see that many bodies that are that capable of doing it, not least of which because their access into the market is usually one of two ways, either government contacts, the ordinary *guanxi*, or enterprise contacts, the new-found *guanxi*, which means the first weapon of attack is price arbitrage every time.

PARTICIPANT: I am Alan Chau from OFTA. I have a question on the technology on the Ethernet, actually. Ricky, do you see that this Ethernet technology is a suitable technology when your network gets larger? And also I have a question for Frankie. Can you explain to us what are the trade-offs in selecting between the conventional STH SONET technology and the Ethernet? Because in one of your slides you showed that the Ethernet technology is so much cheaper than the STH and SONET technology, so if it is so good, so cheap then presumably everyone will migrate to Ethernet technology. But what is the reason why people are still hanging on to the SONET or STH technology, and what cannot be done by the Ethernet technology that can be done by the STH or SONET? Can you explain some of the trade-offs in the selection?

RICKY WONG: Maybe I answer the questions first. As I understand quite a lot of suppliers are now shipping some new switches or new routers that have the fibre optics interface, so basically we can just plug in the fibre directly into the router or the switches.

That can support from one gigabyte per second to ten gigabytes per second. The cost is extremely low compared to the traditional equipment. So back to your question which is why up to now we do not see any difficulty to support, we even expect that we can have growth from existing 120,000 to 300,000 or 400,000. We are still confident that the network can be handled. We do not, unless the demand for capacity is more than like ten or twenty gigabyte per second, but I think it still quite a long time to have such demand.

Even though we support the pay-TV because we are using the multicast technology, I am not sure if everybody knows the difference between VOD and multicast. Maybe in the VOD that you need certain megabyte, maybe four or six megabyte for each video you use, right, but with multicast you do not have to. Even though you have like 150 channels, like six megabyte per channel, like 900 meg, so no matter how many you use we still need 900 meg to deliver 150 channels easily, and that is why we showed the pictures that we think a .. (inaudible) .. is a very intensive loading test and also we put a line in some areas. I think pay-TV is OK but if it goes beyond twenty gigabytes then I do not know. Maybe that depends on how the manufacturer has any new recent developments.

FRANKIE SUM: I guess traditionally a lot of the companies spend a lot of money on the STH and SONET switches so we do not expect them to throw away their switches and then migrate to Ethernet all at one time, although it would be nice to do that, but we do not expect that to happen around the world. So we do not expect everybody will jump into, migrate into Ethernet. But we expect that more and more service providers will move in that direction because the Metro Ethernet basically offers a lot of flexibility to them as well as meeting a lot of the customer demands and also things like provisioning your services a lot faster and costs a lot less to the end user. So we do expect the trend to move in that direction, but we do not expect everybody to throw away their legacy systems, especially at a tough time like what we have today. Everybody is squeezed on reducing their opex, and their capex is also a big issue. So people have to basically maximize or optimize whatever network they have by adding new services to it if possible.

RICKY WONG: I think I can include one more comment on that because fortunately or unfortunately not all the fixed cable operators are laying their own cable in the buildings. I think you know that very well. Most of them are relying, leasing the Internet wiring from the incumbent carrier. But those cables, most of them are Cat. 0 or Cat. 3 cables. Only a new building the incumbent carrier places the Cat. 5 or Cat. 5E cables so if you are using Cat. 0 or Cat. 3, no. Cat. 3 can but definitely not for Cat. 0, it is not possible for the Internet. And we are doing a totally different approach with all those buildings, we have our own Cat. 5E cable and that is easily to support the Ethernet applications and I think this is one of the major reasons why the approach is quite different.

SIMON CHAN: So we may have to hope that all the eggs in one basket does not fall out. So I am sure that the .. (inaudible) .. is more reliable these days. OK, let me just count how many questions there are. Two, three, OK? That's all.

PARTICIPANT: Alex Tse from ITSC. Ricky, I want to ask you one question on a cross carrier. Now you have your IT network within your service, do you see any benefit or disadvantage of having IP used by different carriers straight through, that is an end-to-end IP transportation?

RICKY WONG: Well, I think this is an issue in OFTA. It is not how we can do it, like what we call broadband interconnections. Right up to now we still do not have a standard or regulation to govern the broadband interconnections. Everybody just puts in all our own connections to the Hong Kong IX. So whether we have benefits, for sure, because everything looks like easy, but how we can transform from today's technology to the next generation, everything is IP, you know, it is, I do not think I can see that for the rest of my life this will happen, because like video-conferencing, I am sorry, I have not got the .. (inaudible) .. with Peter, but .. (inaudible) .. because we have to, we have video-conferencing for a long time, right, over ten years, but unfortunately the video phone we do not have. I do not know IP phone you do not have, so how can you get that, IP straight from one point to another point, I think it will take another ten, twenty years. You know I put all my national and IP network but I am not so optimistic that within the next ten years we will bring it in. I do not believe.

PARTICIPANT: This is a question for Peter. You know there was a lot of activity in China for developing Metro Ethernet solutions, China Telecom was building up a Metro Ethernet solution, people delivering a bunch of services. Can you maybe talk about the progress of those networks and how that is going?

PETER LOVELOCK: China Telecom – I think there are two parts – China Telecom is rolling out, although it has slowed in the first six months of the year, as you know, it is rolling out a lot of broadband access than I think the world has seen. The amount of loops being rolled out for the broadband connections was going at a staggering pace through the start of this year, but it has slowed down a little bit.

Metro Ethernet, I do not have anything to add there. There has been a flurry of activity that appears to be following exactly the same path that China does when it starts pushing down a new technology and service offering path. They are totally against those and they attract a lot of attention, and the usual suspects all piled in. QS Enterprise offerings as well, getting itself listed, which is what I think you were talking about back there. And then they started making whisperings that they will shut the market down and appoint the couple of carriers per market that they want to see dominant, or develop a successful market having everyone involved and therefore brought the price down.

PARTICIPANT: Patrick Lam from SG. I have a question for Sum. You mentioned that there will be some sort of bandwidth on demand available. My question is would there be an upper band of the bandwidth that people can request, like can every user that requests ten megabytes per second or something, or if that is true then there will not be any QS problem in the future. Is that true?

FRANKIE SUM: Well, yes, it all depends on what kind of service offerings these Telco are offering. For example in the case of Telstra you can actually ask for just four meg or five meg or all the way up to one gig of bandwidth. So it all depends on what kind of offerings Telco is willing to offer to you and that would also be based on the kind of infrastructure that they have built up, whether they are ready for that kind of limit. So the upper limit is basically bound by the infrastructure that they build up.

PARTICIPANT: So after the user requests it, it would be bandwidth on the fly or the user still has to wait for some time before they reach the band?

FRANKIE SUM: The waiting time is very minimal, and that is why with this kind of Metro Ethernet service basically the Telco or the service provider can minimize the down time so they can have this instant revenue realisation without any down time at all.

PARTICIPANT: Thank you. Actually I have one more question for Ricky. Since the traditional telephony price in Hong Kong is very, very low and it seems like your POP net architecture, I mean for the IP telephony, do you still need some sort of traditional lines going out to PSTN, I believe. How can you compete with the IX, for example, PCCW, and still be profitable in that kind of really competitive market?

RICKY WONG: I think I already showed there are only two cost components, two additional cost components for us to introduce the local voice services. The first is the equipment, that is the main switches and the local voice over IP box which is installed in every building. The cost I already showed is Hong Kong \$600. The other cost is establishing those what we call the POI interface line connected to PCCW or other second network or the mobile. Those is a sharing cost. It is 50:50, like the line maybe, the .. (inaudible) .. P-500, and I can assure you that that kind of cost is relatively minimal to our operation. In our last week's presentation we showed the members that the cost profit margin right now for the voice service is about 85 percent. So that is why we say even though we charge \$68 per hour, the pay-back for that \$600, the capex, is pay-back period is less than a year or around a year, so I think it is, this kind of work is very good business.

SIMON CHAN: Thank you. OK, very interesting discussion. So we have seen the power of IP and IP telephony so in the second session you will see the other side. You will have more debate on whether IP is good for all the networks or whether IP is for the future. So, can we have one more round of applause for all our speakers.

JOHN URE: We will start again at about just after four o'clock. We have got Julian, Jeremy, Bill, Franky – is Franky Lai here yet? He is outside. Franky Lai is going to be talking a little about the ITA HK proposal for Internet exchange. So please come back for that. Thank you very much indeed.

JOHN URE: Terry O'Neill from China Light & Power is going to chair this session.

TERRY O'NEILL: Thank you, John, for that introduction. OK, we are going to move on very swiftly now. Dr Ure is going to start with his presentation, and he assured me it is no longer than five minutes, and then we will follow on with Franky, if that is OK, and we will move through three other short presentations and then we will take questions from the floor. So let me pass over to you.

JOHN URE: Thank you, Terry. I just want to interject into the debate some things which are preoccupying me regarding the more policy/regulatory side of the era of Internet broadband, mobile, Internet and so forth. And the point I would like to start with is a point Ricky made right at the beginning of his talk, and that is that we have talked about convergence for a long time. It is actually now happening. It seems to me that is absolutely right. That is what broadband does. It can actually allow it to happen. So in the case of mobile, for example mobile Internet, 3G+, by which I include all the technologies based upon IP networking in mobile, they offer some kind of concept of convergence.

As far as customers are concerned, clearly they will be interested to pick and choose, to mix and match. What I mean is that it seems to me that there is no reason why, if I have a 3G phone, I could not use my 3G phone to call up data, but I might not want it coming back down to my 3G phone. I might want it on my PC, and as a consumer I am not concerned too much about the technologies that are behind it or the operators. I want a service that will integrate those things for me. And there are plenty of substitutes for things like 3G coming onto the market. And again, as a consumer I probably would want unified billing.

Corporate customers, on the other hand, are very significant markets it seems to me. I just mention one here because it happens to be something I think as a result of China's membership of WTO, I have a sense that this is going to open up the area of warehousing, wholesaling, distribution and retail, that chain. And that chain is one of the chains that indeed may offer a lot of opportunity for the Internet-based network using mobile phones.

Network operators. This is I think really the key thing, that network operations I think are still living in a period of denial. Their business is disappearing at a rate of knots and they are still kind of hanging around, as it were, waiting for the 3G thing to happen. Now I believe that the way that Ricky has gone, and the way that for example BT in the UK is now going, that is commoditising access, is the only answer. But what that means in terms of convergence, it seems to me, is that there will be convergence of interests between fixed and mobile, fixed mobile, etc. Singapore Telecom recently announced this level of convergence in terms of customer service, unified billing. PCCW actually, sold CSL. I see that Cable & Wireless, sorry PCCW – that's going back a few years – PCCW were going to be offering their 802.11 and 3G. They were going to have their cake and eat it. They seem to have got out of the 3G market for the moment.

But what I see is the for the first time on the horizon a kind of a more rational basis for consolidation, for M & A or for joint ventures or for some form of unification across the different networks. I also think that the whole thinking about closed gardens really are, as

I have suggested there, there are no flowers in that garden. There are just weeds, and I do not think there is any future in that. Also this stuff about MMS. I call it Trivial Pursuits. I was chairing a meeting of 3G a couple of weeks ago and somebody was talking about *i-mode* in Japan. The only success story that anyone ever quoted to me in the industry, a success story in an industry but *i-mode* does not make a profit. This is the success. So he was waxing lyrical about how they make business from wallpaper and downloading music. Trivial Pursuits is no basis for the long-term development of this industry. Bruce Hicks in today's South China is quoted as talking about the inevitability of six operators coming down to four in Hong Kong. The problem is that no-one knows how it is going to happen. Is it serendipity? Is it who falls in love with whom, or who hates whom? Well, I think that the rational basis for a merger and consolidation is beginning to appear and it is round this sort of convergence, but if M & A or similar kind of convergence are the logical outcome, that requires and is going to require a lot more re-thinking about the way the industry is regulated.

And that is really the point that I just wanted to come to. I think regulation is going to have to become more flexible. OFTA already has issued an M & A statement so it is preparing its ground in that regard. The issue of licensing spectrum rather than licensing the services that you run across that spectrum, which is being experimented with in Australia and North America and possibly in Europe, that has to be considered here. Spectrum trading has to be considered. The 3G operators are already lobbying in Europe for spectrum trading, which I read between the lines is really just a strategy for exit for many of them. Spectrum trading has to be reconsidered, and also the methods of billing, which is why I have already raised on previous occasions the possibility of moving from, for example, mobile party pays to calling party pays. These are allowing that process to happen which will mean the end of the previous regime.

So I think there are a lot of regulatory policy challenges that the whole move toward an IP networking world is going to pose to the regulator, and that is probably something for later. Those are the points I want to make.

Mobile Broadband Internet

Telecom InfoTechnology Forum
Bloomberg Auditorium, Cheung Kong Center
9 July 2002
Presentation by John Ure
Associate Professor and Director of the
Telecommunications Research Project
University of Hong Kong

Convergence

- With 3G+ convergence will be the name of the game in reality for the first time!
- Consumers will only find value if they can “pick and choose” and “mix and match”
 - plenty of 3G substitutes coming along!
 - unified billing
- Corporate business customers will have highly segmented requirements - eg. warehousing, distribution, wholesale and retail in China?

Convergence

- Network operators = an access business *en masse*
 - → find access partners who offer fixed, fixed wireless, 802.11, cable, etc
 - → unified billing systems?
 - closed garden = no flowers, just weeds
 - MMS = trivial pursuits?

Convergence

- M&A = logical outcome?
- Regulation = need to become more flexible
 - licence spectrum, not services?
 - Spectrum trading?
 - MPP vs CPP? (vs PNETS?)

TERRY O'NEILL: OK, John, thank you very much. Franky, if you would like to take the platform. Frany is from the old school of Hongkong Telecom, and has moved on to further successes since.

FRANKY LAI: It is my honour to be here. I was with Hongkong Telecom for nearly thirteen years and in this industry for more than eighteen years, and I started my career in Hong Kong setting up a data computer service about eighteen years ago. And today on behalf of Internet and Telecom Association of Hong Kong I would like to deliver a position paper for your reference and information.

Recently Internet & Telecom Association of Hong Kong produced a position paper with recommendations and introduce it to Hong Kong Government in which we want the Hong Kong Government to really help Hong Kong, to position Hong Kong as the fourth clearing centre for the Mainland China. In Mainland China there is already three Internet clearing centres: one in Shanghai, one in Beijing and one in Guangdong. And Hong Kong should be the fourth one. And after that Hong Kong should position ourselves as the regional clearing centre for the Asia Pacific. And we make this paper to Hong Kong Government and hope we can escalate this information and talk to the Mainland China authorities and see whether we can have this chance to secure this position. And in the following few minutes I would like to talk about the whole paper, and the key points for your information.

Clearing, Internet clearing in fact is talking about two major ISP's connecting directly, a direct link to each other and agree to forward each others packet directly across this link instead of using the standard Internet backbone. Clearing agreements establish direct connections between ISP's and allow them to exchange traffic without going through the crowded public network at this point. These direct connections help improve the performance and offer high quality of service. In general this results in faster access because simply there are fewer connections in between.

However, most of the Asia Pacific countries have direct or indirect connections back in the United States today because the United States is the main Internet hub in the world. It means that a person within Asia faces an unnecessarily long routing distance and slow .. (inaudible) .. and this is also an inefficient use of bandwidth and other network resources. Ultimately all this has a cost implication. Further charging for each connection is quite complicated and gives rise to a number of disputes. I heard a number of ISP's suffer some financial or billing dispute .. (inaudible) .. and then after a long negotiation and they can issue back the service.

Now, the ITA Hong Kong has a proposal that for better efficiency in terms of cost and network resources and utilization is that instead of having just Asian countries connected back to the United States it is much better for Asian Pacific countries to exchange directly against and within the Asian countries. And this would keep inter-Asia traffic within the region. Asian countries, just a single port, Japan Korea have already shown their interest in setting up an Asian-based clearing hub in their respective countries.

Another issue that also needs to be addressed is the overall shortage of IPV-4 based addresses, and also we have the disproportionate allocation of these very limited resources for the use of Asian countries. Nowadays the ISP's in the region are relying on just a Band-aid, temporary solution, and we got the ISP addresses for this approach only. Unless this situation is being resolved it may be it becomes a foreseeable barrier for the deployment of peer-to-peer applications and the deployment of 2.5 G and 3G mobile applications.

In view of the above situation the Internet & Telecom Association of Hong Kong proposes the setting up of an Internet clearing hub for the Asia Pacific region which will be based in the Hong Kong SAR of China. The Association also proposed that the Government should play a key role in the setting up an Asia Pacific task force for establishing governance and standards pushing for the systemic implementation of IPV-6 in the region, and that would mirror the effort and the actions in this respect already being taken in the United States and in Europe.

ITA Hong Kong and its members strongly believe this arrangement can not only provide the region with benefits in terms of cost and resources deployed efficiently, but that it can also provide considerable economic benefits to both China and Hong Kong. The Asia Pacific clearing hub can also be positioned as the multimedia data and infotainment hub, having all the required IT infrastructure and support logistics that would be able to handle all regional multimedia data and infotainment content. China and Hong Kong are in a very strong competitive position in the region and are neatly placed in assuming a leadership position in this initiative. As such the Hong Kong SAR Government backed by our IT and telecoms industry should actively and persistently pursue this initiative.

In short, because Hong Kong had a very good system in international property right protection, and also in China we have a lot of Internet traffic because of the huge volume, with Hong Kong being positioned as the multimedia hub or Internet clearing hub it would create a lot of job opportunities, investment opportunities for Hong Kong. That is the reason and rationale behind why ITA Hong Kong promotes this IP hub clearing centre for Hong Kong in the region.

Thank you very much.

TERRY O'NEILL: Thank you, Franky. Thank you very much. So, four other speakers now, each of which may or may not have a short piece to deliver to the floor. Julian Grudzien, Head of Telecommunications, HSBC, would you care to come and say anything?

JULIAN GRUDZIEN: Thanks, Terry, I do not think I have a great deal of detail about HSBC and Internet protocol, which is probably a blessing because to be honest with you, if you are a user it is very tough to be interesting let alone visionary. We tend to be still implementing technologies five years after you guys have got fed up talking about them, and John in his earlier programme presented this issue of the advent of IP, and carriers versus the Internet community, and spiced it up as a court room drama.

Well, from HSBC's position at the user-end of the spectrum, the trial was over a long time ago. The verdict was delivered, IP won, the jury was sent home. The world moved on. My own personal take on what happened is that the Internet indeed won because they developed their network solution from the application parameters. Carriers on the other hand approached things from the middle outwards so they designed a network solution using techniques and terminology from the voice network world which they were rather comfortable with and then they looked around for systems to use. But in the meantime those systems in fact were an inbuilt way of talking to each other and they said thank you very much. And X25 has become about as useful as a dating agency in a brothel. The only system the carriers really ever had control of was the telephone, and even that is not there.

So what can I tell you about HSBC and IP? Well, like a lot of organizations of a certain size HSBC group has adopted an IT strategy. It says a lot of things but buried in there somewhere is a statement that our preferred stated Internet is IP, and I do not think there is any surprise about that. It also declares that we must migrate our traditional thick green screen applications towards the brown-faced model, and that is not because those applications are particularly network friendly. Far from it. They have an order of magnitude more fierce for bandwidth than their predecessors. But it is because when you have maybe 200,000 desktops on an internal network and perhaps 30 million customers potentially to reach, the browser is a great way of managing down the costs associated with the electronic delivery. So obviously the use of the browser reinforces the importance to us of IP.

The strategy also reaffirms our long-held principle that all members of the HSBC Group should use a single common global network. In other words we are not frightened to use the specific applications or the network. Had we succumbed to the numerous demands over the years for applications-specific networks, because every user believes that his application of course is the most important, HSBC would now be operating perhaps over 100 international networks and probably pay twenty times as much as it has done for staying true to this principle.

Yet, like a lot of financial organizations we have got a huge legacy of applications that are not yet able to exploit IP so our challenge in recent years has been to meet that

exploding demand for new IP-based applications whilst at the same time continuing to support those that rely on these now charmingly eccentric legacy protocols, X25, SPLC. I think we still have some Burroughs consoles passed down, and they take a while to go away.

So when we woke up to this challenge in the mid-1990's, we felt we had a couple of ways of dealing with it. The easy way was just to simply build a new IP-only network and set that alongside our existing legacy network which again was a company called Telnet, some of you folks might remember, around long before Cisco, but is sadly now defunct so I would not be very surprised if some of the suppliers ended up working for Frankie, but a good technology in its day.

The more difficult option was to stay true to our declared principle of a single, common network. And it was that that led us to, I think, probably 1996, invite I think it was about fifteen suppliers at the time to tender for the provision of network technology that would allow us to integrate legacy and get us through the transition plan to an IP-only network and when that joyous day arrives when the last legacy application is retired off the network at which time IP will probably be a legacy.

I do not think our network history is a great deal different from most financial organizations. Back in the seventies we used dotcom networks for the mainframe, for our banking systems. In the late seventies, early eighties .. (inaudible) .. came along. And in our case .. (inaudible) .. switching core and integrate the emerging SMX with five applications. The mid to late eighties digital transmission came along so we were building a general data max network. Voice to data. Mid 1990's the IP as we saw it. This was a change from our traditional banking side of the group, but from upstarts in our treasury and capital markets, which has since grown to be a phenomenal contributor to profits. The investment bank now contributes more than 30 percent, and these folks start introducing new technology, like IP and we realised that they were not going to go away so we found this challenge of combining the legacy with IP which I have described. The winner of that tender was a company called Hypercom of Phoenix, Arizona, better known for their point-of-sale technology but they have a fairly sophisticated customer networking division, and we have now rolled out their integrated enterprise network product to almost all of the 8,000 odd offices we have across the group.

And that has served us very well, that was five or six years ago. We now have had a lot of success with retiring those protocols, to take a look at the next generation of technology. We put a tender out a couple of months ago and we are hoping that maybe we can put all our applications on to IP-only environment, but the jury is still out on whether that is going to succeed.

A few words about what is driving our network growth. Three words: centralization, centralization, centralization. And maybe five years ago HSBC had over 100 data centres across the group, two or three in each country where it operated. We now have maybe less than 30, 35 and that is done on a regional basis. So most of Asia's operations come out of Hong Kong, Europe out of Sheffield and North and Central America is out of

Buffalo and upstate New York, and South America is out of Cochiba in Brazil. And we have been very successful with that. We are now going to take it a step further. We want to do that on a global scale and get those thirty odd data centres down to maybe a handful, perhaps even just one with a separate back-up in another country. And if we are going to achieve that it is going to have huge implications for storage networking, so we are talking to the storage vendors about that. We do not know yet quite what technology is going to solve that problem. We do not think that anybody is going to change speed of light any time soon. So there are physical limitations on the distance over which you can use a desktop-type technology for real time disk sharing so maybe data volting or something is going to be a solution there.

We are also a couple of years into a five year roll-out of migration of processes from domestic environments to a few centralized group service centres which we are only doing now with our customers in Hong Kong, moving the low-scale, menial tasks into product markets which are a bit more attractive. So we have half a dozen group service centres now in places like China and India, shortly in Malaysia. And that has allowed us to use Internet technology, and we want to move up the process food chain now. We have had success with those and want to start tackling the more sophisticated ones, those that face the customer, particularly in the contact centre environment, and move on to the network roll out, which is to deliver the customer contact in whatever form that might be, whether it is Internet or on-line or whatever.

Very quickly, what we see as advantages, universal dominant/open IP enables convergence. The point here is not that it is IP but that it is one protocol and therefore we do not have to duplicate our resources and our skills and our training and so on, trying to understand all the protocols. We have 30 million potential customers. The beauty of that one is that the customers are prepared to pay for that. They are prepared to buy their own PC, their own browser, subscribe to their own ISP. That is fantastic. In the early eighties when we saw the PC taking hold, we were encouraged to roll out a fixed-byte based electronic bank to our corporate customers, a company called Hexagon, which some of you may remember, and it is probably a bit dated now but functionally very, very rich, and in order to support that we had to roll out banks in cities all round the world. It was quite an investment and took a lot of effort, successful but it is not something we would want to repeat with 30 million retail customers. Difficult enough to save with just several thousand customers. So the Internet is obviously a godsend to an organisation like HSBC

I mentioned that we moved to a thin client so that reduces significantly the cost of managing the IP. The thick client just goes away. So if you want to make changes to the application you can do that centrally.

HSBC acquires maybe half a dozen reasonable-sized companies each year and they come with the network. Ten years ago it could have been any technology. Invariably today it is an IP network, most often Cisco, and that makes it easy to merge. There may be some differences in the IP numbering schemes they use. We can use the best translation, but basic communication is there and it is a relatively quick task to bring these folks up so

that we can start using the group systems in our data centres and inter-leverage those economies of scale that mergers are supposed to bring.

The downside, I do not think Cisco see the first one as a down side but we think that competition is healthy. The tender I mentioned, we have five. Years ago we had fifteen companies willing to sign it. The one we sent out two months ago we had less than five. I do not think that is necessarily good.

When you are open to security vulnerabilities, the huge IT security industry that has grown up around that and now we have, particularly because our data is financial data, we have to invest phenomenally in the equipment and resources and the administration associated with managing the vulnerabilities, and that is quite a feat.

The Internet is not the world's fastest network. There are companies trying to do something about that, Cable & Wireless and Digital Island, with mixed results. IP traditionally has been implementing the software so there are performance constraints there, particularly as often happens it is not implemented efficiently.


From HSBC's view, quality service not yet proven. I do not mean the technology. I am sure there are a good many examples where it is. The challenges for us are more to do with the administration of that across a huge network. The classification of applications, and what priority should they get, and that becomes almost political and you need arbitration and there is a lot of admin that goes with having that so we are struggling with that now.

You still need today an underlying transmission network. We are using TBN and relay stuff. And here probably one of the most irritating ones for me is the Internet is still very, very U.S. centric Internet, and it was great to hear Franky a moment ago saying they want to do something about that. Where were you two years ago when HSBC was rolling out its on-line HSBC products across Asia? And if you are a customer in Calcutta or Indonesia or somewhere, what we found was that the Internet simply did not exist between the main Asian countries and Hong Kong, which is a sad tragedy, and carriers have been very slow to do anything about that. We are going through difficult times, I know, but carriers are retreating across Asia and the surviving ones do not seem to be focused on doing much about intra-Asia Internet. And what that means for us is that are going to move our centre of e-commerce away from here, and we are going to move into the USA and have a dotcom portal there where on-line customers who can approach us electronically eventually will come, and it is kind of sad that it is coming to that, but when you look at the measurements that we see on the ground on the coal face for pay retrieval times across Asia, they are appalling.

As I said it is very tough to be a visionary, and as a user these are some of the things that are on our horizon, and were probably well established on your horizons some time ago. We have not yet got the comfort that we can mix voice and data yet and have a common network but this exercise we have right now for the next generation equipment is going to see whether that is possible. We want to look at IP technology, contact distribution


because we are beginning to see genuine business cases emerging at last for use of streaming-type technologies for email and so on. A lot of those applications when you are working closely with them are meretricious but we now see that they are actually looking as though they can generate a businesses case so we want to get ahead of the pack on that one. I feel pay-TV, again I do not think there is a huge demand for that in our group but there are some niche applications and we are expanding those technologies there.

So, very quickly, a nutshell version of HSBC and IP. Thank you very much.




HSBC and the Internet Protocol

Julian Grudzien
Regional Head of Telecommunications, HSBC
Telecoms Info Technology Forum - 9th July, 2002


HSBC 

HSBC Group IT Strategy


- IP is data communications protocol of choice
- Thin browser-based applications replacing thick green screens
- Common network for all HSBC Group members
- Actively retire legacy protocols

HSBC 

HSBC's Network Evolution




- Simple multidrop networks
- Packet switching - combining SNA & X.25
- The advent of digital transmission
- The IP frenzy - driven by aggressive capital markets business
- Combine legacy and IP
- Moving towards IP only ?

HSBC 


HSBC's Drivers For Network Growth

- Data centre centralisation on a global scale
- Storage networks
- Back/mid-office centralisation
- Contact centre centralisation - delivering the customer contact (voice, browser, PDA, fax, e-mail, SMS)

HSBC 


The Advantages of IP

- Universal/dominant/open - enables convergence
- Provides a ready path to our 30 million customers - the Internet
- Enables thin client - hugely reducing application software support costs
- Relatively easy to merge with acquired networks

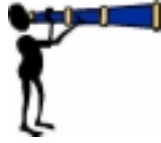
HSBC 

Challenges

- Limited competition in enterprise equipment sup
- Downside of open-ness is security vulnerability
- The Internet is not the world's fastest network
- IP is usually implemented in software - performance constraints, particularly if not deployed efficiently
- QoS not yet proven
- You still need a transmission network
- Internet is still US-centric - hinders Asia regionalisation

HSBC 

Looking Ahead



- Realisation of the “one-network” goal?
- IP Telephony
- IP acceleration - QoS/DiffServ/Content Distribution
- IPTV

HSBC 



HSBC and the Internet Protocol

HSBC 

TERRY O'NEILL: Thanks very much, Julian. OK, Bill Southwood, Director of Communications, with Hong Kong Police and Hospital Authority as clients.

BILL SOUTHWOOD: Thanks very much, Terry. Julian has just given us a very good example of a very well informed customer who has actually had a lot of time and a lot of effort to go and expend on rolling out an IP network. I think the conclusions you have come to are not a bit surprising. I think most financial clients would do that.

I am going to speak for a number of other clients who have found themselves consumed with fear, uncertainty and doubt over what on earth to do about this. It really is about this. They would like to know what they ought to do. I am going to illustrate this firstly very briefly with a little about Arup and Arup Communications and a bit about my credentials. My credentials for being here are that my client, Rafael Chiu from the Hong Kong Police Force Information Systems Wing, is busy at the moment assessing some tenders for using IP over Tetra. Now, that is a totally different subject which I would be delighted to speak to a future gathering on, but Raphael could not make it so he asked John if, or John asked him if somebody else could. We were consultants to the Hong Kong Police Force for their fixed, integrated fixed communications system, so you have got me. As a bonus I will talk about a couple of others as well.

Firstly, though, we are Arup Communications. I founded the group as part of the Arup group of Arup & Partners twenty years ago. I moved myself and the global leadership to Hong Kong because it is a far more interesting place than London about two years ago. It has been a couple of pretty exciting years, I must tell you. We are totally independent and, while we deal with every one of the suppliers in this room, we are not owned by any of them. What we try and do is to say that technology, of course, is important. Technology is what drives all of this stuff, but what people in Hong Kong want is business innovation. The first client I joined when I came here said profit equals revenue minus cost. How much money can I make? With technology I can ring up five suppliers and get five CD ROMs full of technology. So you have got to have the two of these things together and integrated, obviously. Arup, offices all over the world. 6,500 people. 1,100 people in Hong Kong in our Kowloon Tong offices, and what are we doing? Contributing to Hong Kong's skyline, the solidness of the floor here, and it is the responsibility of our structural engineers, the air-conditioning is our air-conditioning engineers. We do not do the sound systems in this room, I am pleased to say, but we would be delighted if Bloomberg would like us to go and get our audiovisual people in here, but you can see a number of things including Julian's bank and most of the railways and roads that you drive over. Even the water supply we have done. Enough of that.

What we are talking about here is some of the customers and what the customers are looking for out there. I am going to talk in some detail about the Hong Kong Police Force. I am going to illustrate it with a job we did twelve months previously for the Hospital Authority, but a few of the other customers that we have got here, Mass Transit Railway, the points that were being made about a developer getting involved in communication provision. The nexus between property and communications in Hong Kong has been more advanced than anywhere else in the world. It has gone a bit sour

with various rather stories over the last few years. Richard Lee had not quite as expensive Chinese New year party recently as he used to have, but nonetheless it is still a very powerful engine. Bank of China in Beijing a few years before, the Esplanade in Singapore.

I would like to give you two examples from two very different clients, both government or semi-government. Hong Kong Hospital Authority with 43 independent hospitals. The HA would say that sometimes it feels like barely controlled anarchy. They would also say, and they said to us, what is the difference between a surgeon and God? The answer is God does not think he can carry out operations, and a surgeon has no doubt about the god-like status that they have. But they had PABX's from dozens of different vendors and many different data systems.

The Police Force, more than 200 sites. The command structure, as you have heard from the Police Force, very tightly, centrally controlled, and also meridian gauge PABX going way back twelve years which connect via PSTN. Data, ATM core, four systems, but then the leased lines going out to the edge of things.

Now, the first thing we have got to find out in both of these cases was what the users wanted. A user survey was called for so we went and talked, in the case of the Police Force, to 332 coppers right from the ranks, the people on the motorbikes, on the beat, right up to the Commissioner. Surveyed some of the sites, looked at the space that was there. Looked at options, systems design, cost modelling, cost benefit analysis, detailed specs, an implementation plan and a look at organization strategy. Now, a lot of these are very soft. They are not just straight technology, but again I would suggest to all of the technologists around here that these are just as important, and in many cases more important, than the hard things that we do.

In the case of the Police Force, what were the engines? The first engine is very clear. It was the fact that Jardine's one solution is not going to offer maintenance on their PABXs after 2006. The Police Force did not think that you, as their customers, would be happy thinking they could not make telephone calls in four years time so they needed a solution. Should they replace it with conventional PABX or do something different?

What are the new business requirements? We were required to look fifteen years into the future to policing Hong Kong in 2017. Economics, demographics, politics, absolutely everything. I wish I could do that in my own finances. We were looking for something that would open standards, telephony was open, if you were a telephone but every single digital phone was different. IP offered some standards. Productivity, projected investment and reduced operating costs.

So when we talked to the users, what did they want? What did they need? We interviewed them and we sent out with fairly unstructured interviews. We had a questionnaire but we talked to people from top to bottom in both organizations. In the case of the Police Force we sent out about 1,100 questionnaires, mostly electronically over the point to the Police Internet, and most of them came back on the intranet, on the

Internet as well. Increasingly people are just assuming that this is going to be the business tool that you use.

There were consistent but sometimes quite surprising results. In the case of the HA there was no correlation whatever between the age of the systems and the user satisfaction. It was far more dependent on how well they were looked after and how friendly the operator was and how friendly the system was manageable to the telephone manager. A huge story. There were some old fifteen-year old switches that they loved to death, and some new ones that they hated like hell. Strong correlation in the case of the Force between fulcrum and age. Again nothing surprising there but we got hard figures there.

Your telephone users, and we have not heard much about them today but I promise you they are still there and they are very important, they are now expecting from their telephone the kind of thing that they can get from their hand held and their mobiles. They are not going to put up with some messy old phone you just pick up and it might have a recall key. They want a calling line ident, they want a redial, they want all of the normal voice mail services. Now this is fairly good news for the IP telephony people because it means that you are no longer competing with a cheap \$80 or \$90 phone from Mong Kok or something like that. You are competing with serious proprietary digital telephones that would have to be bought from the PABX manufacturer. 3M's messaging mobility, multimedia. Much gain in productivity.

We then went out to test this in the market place, and I must say we had superb support from again from Cisco who are providing, showing the fully IP telephony through to all the hybrid manufacturers, the people, the Avayas and the Nortels and people like that. We also did a bit of market testing. We went to the Hong Kong Baptist University. You will be hearing from Joseph Leung in a minute. Because seeing a live IP telephony system really, really was very convincing. We made a prototype and we came up with two routes. The top route was an evolutionary route, and that was to go and say well, you have got ordinary old PABXs. Why not move through from a bit of evolution to a hybrid PABX and that gets you where you want to go, and that may not happen because it is all about timing.

The other one, which we said was progressive but when I tried to use the word revolutionary to the Police they said, "no, we do not use that word around here. We get very sensitive about the language." They also hate the word risk even if you put "managed" in front of it. So the progressive, the progressive route was to go directly, take a deep breath and go and bite the bullet, and Joseph will tell you what it was like to do that.

Linking premises, again you have heard this before, so I am not going to go into it. A total IP broadband network and evolution towards that without any question combining them together, sharing that was obviously a very good idea.

OK, what about the costs? Ladies and gentlemen, the bad news is it is going to cost you more in capital cost. There are a lot of reasons for that. The higher spectator network.

You are going to have jazz up your phone network. Higher cost of hand sets. There will be long-term recurrent savings, and we can demonstrate those, and there are some amazing advantages in terms of functionality, operation efficiency, investment protection, adaptability and that sort of thing. They are very difficult to quantify to your bottom line, but again one can make a try.

You are not meant to read the implementation plan. That is secret, but the two points were that I am an old Telecom engineer from way back and I believe that a network must grow from the centre. You cannot have pockets of integration you cannot have a piecemeal approach. You cannot say let us do a bit over in Kowloon North or Island South, or something like that. You have got to take the big bang approach. You have got to keep the network running while you do that. And you have got to have a migration strategy to depend on the technology. Quite tricky.

I am not going to read this huge lot of design considerations because basically you can read them yourselves but it comes down to four things that people needed, and we produce specifications, which the coppers are going to go out to tender on for police headquarters in a couple of months time, and for the rest of the network sometime next year. And those are to be technically sound, to meet the user needs, to be manageable and represent value for money. Mom and Apple Pie stuff, but to go and do that in a converging changing network was very important.

Many studies from organizations including government show that the most common failing of any integrated network is not the technology. Technology is pretty good. It is failing to get the people bit right. If you try and bring together the two very different cultures of an IT group which comes from a cold room with IBM stamped all over it, and the telephony people who had the soldering irons and main distribution frames and all that kind of thing. Bring them together and it is really quite challenging. But the way the Police, we looked at this, we interviewed lots of people, had a voice team which was over doing mobile and fixed communications. The mobile continue unchanged. The IT branch functions would continue but take fixed communication system as advice and integration team, second people from both groups to initially a virtual team to bring the integration about, which would eventually migrate across to IT, so voice becomes just another application running over the IT network.

Now astonishingly we actually managed to get this past the Police Force without anybody arresting us because we were proposing combining some jobs and actually in the long term saving some staff. It is not an easy call but you can do it if you do the homework.

The results. We produced a strategy for migration to IP-based services, replacing all the current PABXs by 2006, warming up to the smaller Centrex-based sites. A single network throughout the force. Better functionality and improved integration.

Now how have things changed in twelve months? We did a similar job for the Hospital Authority twelve months before. At that stage we could not say that true IP was a

solution. It is in the last twelve months it has come a very long way. Cisco seem to have disappeared but I am sure there are some of you left here, but it has changed. There are now third party phones coming out and the price is coming down below \$3,000 but it will get a lot lower and it is going to make a big difference. The new wireless LAN standard 802.11a will make a difference. The Hospital Authority will not use wireless LAN because of security. They are afraid somebody goes and hacks into somebody else's records, medical records. Not cool.

The message is with respect to standards are not good enough. OFTA, lean on people please and go round and get people truly open. Another subject, but in our studies the benefit of outsourcing were just not proven. Applicability depends on users' business. You have got to examine the existing processes, skill sets. Plan from the centre as an integrated solution. Do not try and do it piecemeal. And the timing is critical. You do not force yourselves to make a decision before you have to, but if you can wait a couple of months it will be a better decision. Things are changing so rapidly. But if there is an imperative, make the best informed decision you can and choose what we call the last responsible moment to make the decision. That is not, ladies and gentlemen, the last possible moment, but you have got to give yourselves a little bit of leeway in this, but work out what you need to do, when you need to do it and get the best advice you can and make the decision at the right time.

And the conclusion we come to is that integration will happen and the question is not whether, but when. That is the conclusions from two studies, many more, and we would be delighted to share any more of the insights with you, and certainly if anybody would like some IP advice we would be delighted to work for them too. Thank you very much.

PAUL O'NEILL: Thank you very much. Joseph? Bill unfortunately has put you on the spot by referring to you on behalf of the Baptist University. Whether you choose to respond, of course, is up to you.

JOSEPH LEUNG: Good afternoon. Hong Kong Baptist University is one of the biggest users of using IP telephony I think in Hong Kong. Actually the Baptist University got three old traditional PABX systems and last month, in the middle of June we powered down all the PABX systems and totally replaced by IP phones. Up to now we installed about 2,000 IP phones across three different campuses and they are looking fine. But of course if I tell you I do not encounter any problems I am lying. So I do not propose to do this, but I have some problems we encounter in the implementation stage, particularly it is on supporting the legacy analogue devices such as the fax machines. We encounter a lot of problems in supporting the fax machines. The problem is not on the system itself but rather on the fax machines themselves. We need to go to each individual user to configure the fax machines in order to work with the IP system infrastructure. So that is our problem. Initially we are not aware of this. We always enquire our problems on the IP system but we later find out that the problem is in the individual fax machines, so now we settle this problem.

Another problem is the voice mail because in the telephone system usually we have three components: the voice itself, voice mail and IVRS, integrated voice response system. We have both but we have all these three features. We also encounter problems in voice mail. The problem is we need a licence for every user. Initially we are not too aware of this. Whenever you want to add voice mail account for a user we need a separate licence so at the initial stage we did not have enough licences, so when users wanted voice mail we cannot add the features for them and then you know what the user will come and tell us what we are going to do.

Another thing is the Baptist University was using very good legacy PABX systems. They are the old systems. The features are very rich, the voice quality are very good so users are used to using very good quality phone services, and then when we install the IP phones naturally they will compare the new service or features with their old system, and frankly speaking the new features on IP phone cannot match as good as the old system because the old PABX system is purely telephone system so they have got a full set of features. But IP phones they have to devote on the network part as well as the voice features. I can tell you although there are many, many features in voice but you are only using one tenth of the features most of the time.

The one particular feature I want to voice out is, because if you use in future you would take care of this, is the intercom facility. Still now the Cisco IP telephone system cannot support intercom facilities between the boss and secretary, so what can we do? We can circumvent this. We can programme it by a speed dialing key, press it and then it will follow the call between the secretary and the boss, so we can circumvent this, but the feature is not a native feature what I want. So this is one of the problems.

So as a whole we are very satisfied with the migration. It takes us about two and half years from thinking up to powering down the PABX, about two and a half years. We start with a pilot system, testing in my compressor, about 70 phones, and then early this year we started to implement all the existing users, and last month we implement all of them to IP phone and then we power down the PABX. So we are very satisfied and that is out of our expectation. The voice part is extremely smooth other than the problems I just mentioned about the fax machine, voice mail and one minor thing is I just mentioned the IVRS, integrated voice response system for audio test system.

There is one feature still missing. Maybe it is a very common feature in fact. It is the fax on demand, when outsiders dial a number and they want to download a form through the fax. This feature is still lacking and we are presently working hard with Cisco and PCCW as well.

So, apart from these “minor” problems we are in fact quite satisfied with the whole migration process from traditional phones to the IP phones, so I am happy to answer more questions in the panel discussion. Thank you.

TERRY O’NEILL: Thank you very much. Final speaker, Jeremy Johnson. Jeremy, Director of Technology, Asia Pacific, for Atrica, and then following that we will have a panel discussion with questions from the floor. Thank you.

JEREMY JOHNSON: Thank you. What I thought I would do was just, we are talking today about the case for IP networking and whether we are ready or not, and I was going to quickly run through a couple of my personal experiences with IP network in a carrier environment working for vendors of IP networking and carriers trying to employ IP networking, and I am sure many of you will see similar experiences that you have been through.

I am from the technology side so most of my issues have been on the technology of this, and I think what we will see at the end of this, and the way I feel now, is that the technology is no longer the limiting factor for using IP networking and it is really the realm of other issues which we have heard about today in terms of business economics of the Internet, and users, are they comfortable with adopting IP services.

So initially as an example, in 1997 I was trying to deploy networked-based IP VPNs within some of the PTAs in China Telecom, and back in those days the technology to do some kind of network-based IP VPN were all very proprietary and very experimental in fact. And what was interesting is, when you take operations staff who have been using FR and ATM technologies, as an example, and tell them to try and use IP VPN’s and be able to support the services, in those days the control for those services was very in-your-face and the operators had to be able to do that and understand all the control planes protocols that are required for IP services. From that point I can clearly tell that at that stage until they became more transparent for operators and the vision teams that you could not maintain, provision or scale any type of IP network in a carrier market.

After that I had the fortune of working for places such as World Com in their hey day as opposed to how they are now. But one thing that was interesting during that time was I was involved in basically designing and rolling out one of the first global IP network-based IP VPN solutions, and AT&T was one of the other leaders at that time, and at World Com we did that on a combination using MPLS protocols with existing ATM switches. And at that stage the way that I saw it was that the technology was there. However, it was still quite proprietary, and because this was quite new you quickly ran into scaling limitations, the number of customers that you could support on a phase. You actually had to provision each device to provision services. So from network engineering operations people the service was available but they could still not actually play it on any type of scale. They still felt that there was a bit of a kluge in the system was not quite there. However at this stage World Com and AT&T and other customers like that had been successful in deploying global IP VPN services, which are network-based.

Following that I jumped into real high level IP type of services that were network-based. The examples of this are carriers being able to provide IP services to their enterprise customers, initially such things as IP VPNs, but also being able to handle traditional enterprise functions such as fire walling, intrusion detection systems, anti-viruses and so on. What I found in this type of experience was that the technology was really quite advanced and no longer was the technology the overriding issue of whether IP networks were ready to go. What I found to be most challenging at this stage was can carriers, do they have the sales team and marketing team to be able to educate and convince enterprise customers to outsource their services to a carrier and so, for instance, an example in China, it is very difficult for an enterprise IT manager to have confidence that they could outsource the security service to a carrier. Why should I trust a carrier to adhere to the privacy I require? How can I be sure he is not snooping on my services and so on? I want to keep those services within my enterprise and within my control. So overall in that scenario technology developed to that level that was still above the user systems to be able to accept those services.

Finally my current role at Atrica which is an optical Ethernet vendor who provides complete solutions similar to what we saw with Ricky earlier and the Cisco example, and again we are at a stage now where the technology really no longer is the issue. IP is supporting all the control plane functions, and some examples here are things such as OSPF-TE, LDP, RSVP-TE, all the control type functions for, say IP services or for, say a metro optical Ethernet service, and you now have all the economics that Franky was talking about earlier in terms of the business case for the Ethernet makes sense. The IP-based Ethernet and prices are falling to such a substantial level that your business model makes sense. The technology is there, and because these systems are more advanced and actually enterprises can now understand the services better because they basically see them as an extension of their LAN, as an example, and they can connect to their ports and they get video on demand, they can get services very easily. So I think we have actually come a long way from the earlier days when things were very experimental and there was a lot of user resistance and the technology was still unproven.

So it is slightly that I feel that technology is there, that you can make the case for IP to be a feasible solution. I think one thing that we are still lagging on is a lot of insolubility between vendors. In reality almost all of these networks that vendors talk about today really are single **bin** networks. There are very few which actually have the capability to run their control and protocols between each other, and if so it is on very limited fashion and not on a really dynamic set up of new services to customers. So besides that I think we are there. So for the actual adoption of these IP services the business economics needs to be compelling, which I think in the example of the Ethernet they are, as a replacement for legacy SONET type access. You need the technology. We are at the stage where engineering operations teams appear to be making a profit by the SLAs and provide things like 15 .. (inaudible) .. I have a list here but obviously we need a sales and marketing team that the carrier, that can really educate and convince enterprises and residential customers that they can benefit from their existing **three wire** or DS-3 type technologies, to these new IP-based services.

So as a summary, technology is here and we are starting to see examples of this, Hong Kong Broadband's, for example, success. Thank you.

TERRY O'NEILL: Jeremy, thank you. Gentlemen, Julian, Joseph, Jeremy, Bill, Franky, of course, if you would care to come and take the hot seats. As Simon said earlier, you have not got the awkward stools which we have seen in previous expositions. Just a recap, very much a review of the perspective which was very interesting. Julian giving us his feedback on IP and the organization issues that has created. Bill in similar fashion with two of the larger organizations in Hong Kong. Joseph actually giving us a snapshot of a hands-on introduction in Hong Kong at Baptist University for IP phone system and the challenges therewith. Jeremy, I think principally what is IP and what does it mean and at what stage in the process does it actually matter to the user and the customer, and Franky, last but not least, probably the point of view of the users, how little there is of Asia centricity in the Internet as of today. I hope I have captured those gems. And if I may start with the first question.

Will IP networking make a difference and how? If each of you had to describe in two sentences why IP networking is interesting as of today as opposed to alternative technologies, what would those words of wisdom be? Take it in any order you like, gentlemen.

JEREMY JOHNSON: So my feeling is that with IP, as we get more and more standardization and experience with that, it will allow a very quick turn up of services and it will allow carrier-to-carrier services to be provisioned very, very quickly, and we will see that mean time installation services will grow rapidly. The fact that customers can quickly and easily change their service to an on-demand type of service, that is very difficult with legacy STM Sonet-type services which face Asia today.

BILL SOUTHWOOD: From the user point of view I would say two things. One is it eliminates waste by bringing together a whole range of things that are currently duplicated. Secondly it allows increasing innovation, because you have got a platform that is absolutely standard, reliable, trustworthy, made for people that are developing applications, business applications. So it meets the business, it can do that without worrying will there be the infrastructure there.

JULIAN GRUDZIEN: Yes, the word that comes to my mind is ubiquity. It is IP, it is the fact that it is one battle to initiate the data communications programme, and that is expanding just beyond pure data as well. So if you are managing a large multi-national global network that is a huge asset.

JOSEPH LEUNG: In that case our major point of concern is cost saving, and also the support, because my centre is already supporting the network at home. Right now it is just adding on top of that network voice improvement, so the same team of people can support both data and voice from the same cable infrastructure, so these are areas of concern. And also using IP phone we can save space because the computer room is always going bigger and bigger and more congested, so we can save more space and then offer more services.

FRANKY LAI: And also for the IP network there is much more a simpler network for network management. You are not required to manage a lot of devices in between the main line house to the branch line devices and I think that is of benefit to the users.

TERRY O'NEILL: Thank you very much. I will throw the questions to the floor. The gentleman at the back?

PARTICIPANT: Peter Lam from SG. I have a question for Joseph. I understand that before the deployment of your IP system I believe you just said that the major incentive was the cost, but after the deployment is there anything that impresses you the most? I mean like what is the most impressive thing after the deployment?

JOSEPH LEUNG: Yes, thank you very much. In fact before the deployment we already calculate the annual maintenance. Our existing PABX system, because they are very old, getting parts is in doubt and therefore the maintenance cost is very high. And then when we compared it with the IP phone maintenance cost we found it almost save us one-third of the maintenance cost, so that is one of the main drives behind us to consider the IP phone.

PARTICIPANT: After the IP phone what is the most impressive feature that impresses you? I mean that impresses you after the deployment?

JOSEPH LEUNG: The ease of use, because our support people are already supporting telephone and network for the past twelve, thirteen years, so our support staff are very easy to handle problems from users. And then using the same infrastructure, because we have been supporting Cisco products on narrow backbone, so it is very easy for us to support the IP phone. And then whenever users' questions come to us we know what the problems really are so we can handle the problems quickly. So as I just mentioned before on the voice part we are very satisfied with the migration other than the voice mail and IVRS.

PARTICIPANT: Yes, thank you. I also have another question for Julian. Julian, a corporation like Hongkong Bank size you mentioned that the, you are kind of wondering whether you would deploy the full IP service at this point. Say, for example, if you have a new office opening up say next month, would you still deploy a 100 percent IP infrastructure or would you still deploy the legacy infrastructure just for the sake of quality?

JULIAN GRUDZIEN: It is not quality that obliges us to still limp on with legacy in place. It is just that it does take a tremendous amount of time to retire legacy. So if we get a green field we take every opportunity we can to not run legacy applications whether it is networking or any type of IT discipline in there, and a lot of effort goes into that before we plan what we are going to do. So for example, service centres, also our new headquarters building in Canary Wharf in London which has been in the planning for two or three years, and obviously that is going to be a flag ship building for us and a lot of

thought has gone into making that a very modern environment from the IT and of course it has got IP in there.

Whether IP is going to be the only technology around on our network, whether we are going to truly achieve that one network goal, if you like, we are not there yet. We would like to be. We do not care whether it is IP or something else, the fact that it is one type of technology that we can have one box in each of the 8,000 offices, one line, or back-up line, and not have to do over the years what we have had to do, put multiple lines in, in certain cases. That goal, whether we can carry the voice and data and whatever else comes along, we are a little bit, I think, because of our size, behind the curve on that, but we now have a project under way and we are investigating those possibilities.

TERRY O'NEILL: Thank you very much. The gentleman on the far side? Just while the microphone is on the way perhaps I could just elaborate that question a little bit, and address the question to the panel, and probably as a telecoms company I stand accused as many other people would in this room. First there was ATM, no, hang on, main frame, then broadband, and you as users, I am sure, would be forgiven for being literally punch drunk with the speed at which some of these systems and network solutions have been introduced. Does that give you confidence or faith in the future for IP?

BILL SOUTHWOOD: I will try that one. I have got a couple of my colleagues here who are a lot closer to the technology. I think our view is that we see IP evolving but not in quite the same way and with the same throwing out of its predecessors as happened before. I have FDDI as a blessed memory as well, so there have been quite a lot of things that have been around and we have always seen them.

I think, and I have been around a long time, that we are in for a more stable evolution with IP than we have been with some of the others, and I do not think it is going to involve trashing quite as much of the network. The investment is so vast and it is also so much more relatively open and able to adapt, I think. I think it is something which is going to be more robust, and that certainly is our view, and that gave us confidence to recommend to many of our clients to go for it. I would be interested in the comments of the people that are actually spending their own money rather their clients.

JULIAN GRUDZIEN: Just very briefly, I think that is a great question that shows a lot of empathy with the user end of the business because it is very frustrating to be always faced with this avalanche of technology. The thing I would say about IP is that it is not an upstart. It is a technology that has been around for nearly thirty years. It has got longevity behind it and it has proved itself over those years and it has come through. And yes, I hope it will bring more stability than any other competing technology we have seen in the last twenty years or so.

JEREMY JOHNSON: I agree with all those points as well. IP is intrinsically supporting so many of the protocols on the LAN that we rely on for all of the services that we use today, and I think we will see some collapsing of the protocol stack and we will see things like IP optic fibre and so on, and I think most people agree that we may

miss out a couple of the more above layer one, layer two type of technology moving away, but IP will be the one that then goes over the fibre DWL as an example.

PARTICIPANT: My name is J Li from Intel. My question is regarding the IPV-6. We have been talking about this technology for a long period of time, but I am not quite sure in the climate there may not be that many yet. So my question is to ask the people on the panel, do they see the demand for IPV-6 in Hong Kong or why is the demand there? And second is there any technical barrier or what is the barrier to prevent this IPV-6 from happening, and my last question is what is the forecast you can see the development of IPV-6 in this region. Thank you.

FRANKY LAI: Talking about IPV-6 there is a demand actually especially for the Asian region because at the moment the IPV-4 allocation of addresses is under mainly the United States, and so far as I know the university of MIT, they own the IP addresses already more than the whole of Mainland China, and that is the existing situation. With the new definition of IPV-6 there is a huge amount of IP addresses that can be created and then it can benefit for individual communications. If any device we have to have their own IP address like for the mobile phone and then we can have the Internet security rather than based on the network provider security in between.

Now that is a driving force why we believe IPV-6 had not a demand and somewhere looking for that technology in development but also who will lead this technology in the region, and sometimes we need some government participation to drive the standard and the governancy of IPV-6. The countries like Korea and Singapore have already been talking about they fully support the IPV-6 and some devices are being manufactured in Korea already taking this protocol as their device technology platform. And because of that demand for IP address, security, true mobility and end-to-end security protection I believe there is a potential for the growth of IPV-6.

JOSEPH LEUNG: Maybe I would like to supplement a little bit on the IPV-6. In Hong Kong the academic sector, that means the different tertiary institutions, are joining in venture in trying to launch the Internet tool among Hong Kong, and then if we are going to use the Internet tool then we will support the IPV-6. The Internet tool will be used for research projects, because right now the standard Internet is already very congested. We cannot use it for high bandwidth applications so we are going to develop Internet 2, and we would expect the technology about one or two times higher among the eight universities, but then we will expect the government and also other related organizations.

TERRY O'NEILL: Any further questions? Dr Ure, in the front row?

DR JOHN URE: Just one question on the security thing. Julian, you mentioned the fact that our Internet is a blessing because the subscribers pay for their own network. I was reading an article the other day about how in Singapore there have been quite a few break-ins, as it were, to personal computers where their bank account numbers held on

the customer's computer have been stolen and then those accounts being used to shift money from Account A to Account B.

How much of a serious problem is that, because the end-to-end security which all of you are talking about are on the networks that you manage, but the weak link in the chain is the bit that you do not manage. How serious a problem and what solutions are there now?

JULIAN GRUDZIEN: Well, a bank executive is never allowed to admit that any fraud ever exists whether it is self-inflicted or from outside, but of course it does happen from time to time, and we have departments that are set up to investigate and deal with that, but they are usually recruited from retired policeman and people like that rather than technical people. I do know that from talking to our particular Plod, he tells us that we still have far more fraud incidents which are not a consequence of technology, just ordinary old-fashioned scams or the errant branch manager, but I believe it does happen from time to time. And I am aware of a few cases that my own team will categorise under modern technology and personal intrusion detection and there are special processes that come out of that and we have a flash report system at any time an incident beyond a certain sort of scale occurs. I will get an email in my box or something and I get to see one a week of some nature.

But whether that results, it does not often result in a customer of ours being defrauded so the cases you do hear about, one in Singapore and there is a similar one in Hong Kong, where it is usually the loss of passwords. I am always intrigued that for twenty years nobody has ever remarked about the use of TTMF for PINs when you dial an IBR to do your banking transfers. Probably more than most – I probably should not be saying this – but valuable pieces of data that you could expose to exchange of eyes, and what is to stop a technician tapping in on that and then reading out what your PIN is and then working out what are your associated banking numbers. But we have had very, I do not think we have had a single time when that has occurred and the technologies that are now emerging to protect certain kinds of information on the Internet are of an order of magnitude more secure. So I am fairly sanguine about it. No doubt tomorrow someone will crack our system and prove me wrong.

BILL SOUTHWOOD: Could I just add, from the point of view of two of our clients who you can imagine are both mission critical, the Hospital Authority, they are very concerned about records. I think one message is that the industry has a mission to explain if there are parts of our network that are insecure, we must tell the customer how insecure it is and demonstrate it but also tell the customers when it is going to be secure and what they need to do. They do not want Tung going to hospital and somebody sitting outside with a sniffer downloading his medical records. And these are done in other countries.

The other point is I think we need to explain that no electronic system is going to get past plain stupidity. If somebody gets his laptop stolen and all his passwords are unencrypted and unprotected on there, it is as bad as you writing your PIN number on the back of your

bank cash card and wondering, when the thing gets nicked, why people are taking money out of your account. So an electronic system is not going to make it easier to stop people being really stupid. What we have got to do though is, as people get more and more dependent on it, to make it very, very clear to them what they must do and make it very clear to them when the technology is deficient.

TERRY O'NEILL: Further questions? Perhaps I would like to follow that up with a specific question to Joseph, actually, in relation to the IP phone system. Certainly the cost of IDD calls in Hong Kong has come down dramatically but, given the installation of IP phones system, do you still need some form of password protection to prevent unauthorized use of IDD or how does that work?

JOSEPH LEUNG: In fact the system is very good in protection. Every individual extension can have a single password control. So as far as billing is concerned it is very convenient, in fact. So according to the extension, by looking at the bill, I know who has dialed IDD calls and I will charge that to the individual department so it is very convenient.

TERRY O'NEILL: Well, that is me warned. OK, sorry, any further questions? Time is slipping away, I am afraid.

PARTICIPANT: My name is C Kau from Intel. Two questions. One question is to Julian. I understand the security aspect for the banking and financial industry is very important. You realize that as one of the challenges, and I just want to know if at any stage that your company will consider outsourcing that service to a third party, to service providers?

JULIAN GRUDZIEN: That is so against the grain for HSBC that I cannot say never but you know, we are an outsourcers' nightmare. We are so arrogant about controlling our own destiny. It has been a long held policy and it still is today. It is supported at the very, very top of the bank, and on the occasions that we have attempted that – I think three or four years ago we tried to outsource our credit card processing – it was rather a disaster.

You have got to ask yourselves how much that is the outsourcers' fault and how much it is entrenched views within banks and IT, but my personal view is that if you are above a certain size of organization, that there are economies of scale that cut in doing it yourself. And so outsourcing is probably a more fertile market in smaller organizations.

PARTICIPANT: My second question is really perhaps for Joseph. I think someone asked the question but it is more regarding on voice running on top of IP. Voice running on top of IP promises more than cost savings, It actually promises a lot of features, new features added, perhaps like a personalized phone that the feature is portable. When you go home you plug in and you have all the same features as you enjoy on the phone at the office.

I guess the question is other than you lost the features of intercom, do you get any new features that you think is good when you move on to IP? I am asking this question in the context of trying to understand what are the services that service providers would be interested to provide and subscribers like yourself or corporations, businesses, would be interested to ask for.

JOSEPH LEUNG: Well, to respond, in fact there are a couple of advantages. I do not have time to voice out one by one. In a campus environment IP phone is particularly useful. The user can unplug the phone and then plug into any outlet. When he moves to another outlet, just plug in and then the number will remain the same, so that saves a lot of hassle for the repeating user along the campus.

Secondly, IP features can support soft phone. In some areas installing hardware phones may not be possible for some of these areas. I can just set up a PC and then the PC can emulate an IP phone, but conventional PABX definitely cannot.

Other features you can plug in the directory. You can look at the phone, display the directory and then you can just dial by directory. Also when you hear the phone you can know who is dialing to you. Before when you pick up the phone you have a little bit of moment to think about how I am going to reply to the caller, so there is a little bit advantage we never had before.

So there are various advantages but maybe I cannot list them out all one by one.

TERRY O'NEILL: OK, thank you very much. Time for one last question?

PARTICIPANT: I am Henry from Argent Technologies. You mentioned the voice quality of your network actually is not near the PSTN network. Could you highlight that, and if so is there an echo or what problem are you getting? Have you actually considered the third party test measurement devices to test your network? And the question is partly have you any thoughts of maybe measurement equipment during installation and maintenance of your newly installed network?

DR JOSEPH LEUNG: Well, in fact what I have mentioned the voice quality during the installation phase. In the initial phase we found that particularly using a hands-free dialing, speaker-phone dialing, you have to move your mouth very near to the mic otherwise the other party will think you are very far distance talking to him. And then we have this problem, change from what they call to order management operating system. They had to change the feature in order to solve this problem.

In fact we face a lot of problems and then we report the problems to Cisco and then they get to the problems then they help us and so that is our experience. So now the quality in fact is even better.

And then another problem is hearing the signal from outside, dialing from outside, and then internal is alright but whenever someone needs to make a call from outside the

signal is very small and it is difficult to hear, and then we bring this problem to Cisco and they upgrade the operating system and then the problem has gone. So right now as far as I mentioned for voice quality, it is very good now. Thank you.

BILL SOUTHWOOD: Just adding to what Joseph said. I said that when the Police had four prototypes from Cisco, Alcatel and Nortel and Lucent and it was not done with testers but was done with a more stringent test which is actually the calibrated ear hole with people talking over these things. I must say that things have improved remarkably in the last twelve months in terms of the testing, and I think that the subjective quality that people are hearing now is as good as the TDM system or very, very close to it. Now clearly you can have a test to prove that there are exceptions, but it has come a long, but long way away in twelve months.

JULIAN GRUDZIEN: Yes, we are finding that all the good things that we have been talking about with IP convergence and so on, one of the biggest challenges, however, is performance but you know, particularly on the Internet which for a network manager it is the most anarchic network in the world and you have no control over it so performance is a big issue and we are finding we are having to invest more in benchmarking measurement tools and stuff like this because we are being forced to by business and customers and we are more conscious of network performance issues.

BILL SOUTHWOOD: But this is not like it used to be, like talking to the dark side of the moon.

TERRY O'NEILL: Final question, one sentence. Anybody in the house from World Com? And your question is, and of course thanks to you Jeremy, Joseph, Franky, Bill, Julian and John, World Com will they be filing for Chapter 11 and is that a good or bad thing for IP? One sentence in your own time.

BILL SOUTHWOOD: If I knew the answer to questions like that I would not be sitting here.

JULIAN GRUDZIEN: We actually like it a little bit, and we do not like kicking people when they are down, I suppose, but because of the trouble that carriers are in right now we have been able to negotiate some wonderful deals. But the cable systems never go away. The faces might.

FRANKY LAI: Chapter 11, that is like Chapter 7.

JEREMY JOHNSON: Since World Com is one of the firms I worked for, I would rather not comment. Some of my friends are still working there.

JOHN URE: Since World Com is a member of the forum I guess I sympathise. Again thanks to all our panelists, Jeremy, Joseph, Franky, Bill and Julian, and thanks to Terry for stepping in and being such an excellent chair, and you can do that again, Terry. You have a job now.

All that remains for me to do is again thank our sponsor, Cisco, also to thank very much Bloomberg for the use of this splendid auditorium. Bill has offered to give them some advice. You can see them outside. And I think this has really been one of the liveliest forums we have had for a long time, and the fact that we are still going and we are over time now already, so that really says something about the presentations and the dialogue. So thank you very much.

Norman, our web master, did ask me to remind everybody that we have now got a free find web search engine which will search Acrobat files on our web site, so if any of you have tried searching and could not search the Acrobat files, we now have a search engine to do that. So do visit the web site, and thank you all again for attending. Thanks.