



Telecoms Infotech Forum

Briefing paper

Broadband, broadcast and content: where does Hong Kong stand?

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Telecoms InfoTechnology Forum

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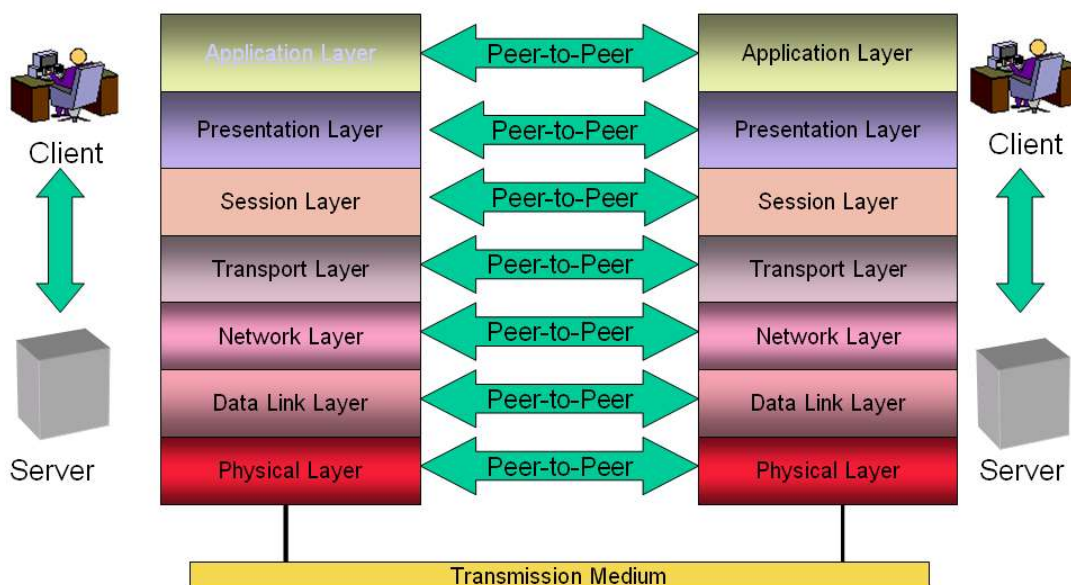
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Introduction

This briefing paper is looking ahead and speculating (no more than that) about convergence of fixed and mobile, of telecom, TV and the Internet. It argues that convergence may not be quite what it seems. As a reference point we start with the familiar ISO 7 layered stack that conceptualizes the layers of convergence from a technological perspective. (But equally at every layer there is a corresponding set of commercial relationships, vendors, services, etc.) Increasingly convergence on the telecom side is associated with the shift towards all-IP Next Generation Networks.

The 7 Layers 'Stack' Reference Model



NGNs typically converge layers 1-3 (physical, data link and network layers) into a network convergence layer and layers 5-7 (session, presentation and applications layers) into an applications convergence layer. Through convergence at the network layer, voice and data are no longer handled separately although operators can still treat them as specific traffic streams at the applications convergence layer. At layer 4 where everything is IP, service control (intelligent) functions (like QoS, authorization and security, etc.) are added to create a service control layer. This means that every application above layer 4 can be customized and personalized for particular end users. Part of this control may be remotely located on the edge of the network close to the customer increasing the level of flexibility the service provider has in varying and differentiating the levels of services to different users. IPTV would be an obvious application.

Convergence – The End of the Road?

If 'Being Digital' (the title of Nicolas Negroponte's 1995 best selling paperback) opened the way to convergence between telecom, TV broadcast and the Internet, broadband has given it technical credibility. But is it being driven by declining revenues due to saturated telecom markets for basic services and disruptive alternative technologies such as VoIP? If so, does this mean that convergence is more of a reaction to a threat than a grasping of an opportunity? Are we therefore seeing the convergence of weaknesses (two outmoded media) rather than strengths (technological synergy creating new opportunity) between telecom and broadcast? If so, does this imply that government aspirations and policies to promote jobs and businesses around these converging sectors are doomed to failure?

Imagine two roads stretching into the future, coming together at some point, and then leading to a cliff's edge. Is that the picture of convergence between telecom and TV broadcast? It could be if these sectors are seen as creeping closer to their exhaustion as communications media. On the face of it this seems counter-intuitive as the demand for telecommunications is ever-growing and the demand for entertainment seems pretty-much recession proof. But there are other ways of providing telecom and of providing entertainment and 'infotainment' and if in the words of Marshall McLuhan 'the medium is the message' then these other ways (for example, IM, IP telephony, blogs, P2P and mobile channels) will change more than just the format, they will change the way people experience content and what is being communicated.² The options may be threefold: (a) it's all hype and these alternative technologies are simply additional distribution channels for traditional telecom and broadcast services and an opportunity to develop new formats; (b) the changes are radical in the sense they will ultimately supercede traditional forms of telecom and broadcast services, but like previous displaced technologies, such as broadcast radio and newspapers (but unlike telegrams and telex and maybe fax), they won't die out and may return in new ways; (c) the changes are terminal in the sense that the business models that sustain them are non-sustainable.³

Perhaps the crucial issue is whether proprietary networks are sustainable. Currently, ownership of a network, including the customer access network and the core intelligent switching/routing network, is the key to market power, but for how much longer? In international markets, ownership of networks is no longer very important as the cost of international bandwidth falls, capacity rises, and major international carriers prefer leasing over building. In domestic markets Next Generation Networks are pushing network intelligence out to the edge, even into customer premises where it can be more easily replicated or even built into end-user devices. For mass consumer and SME markets access to the Internet and the Web may be all that is required. And in the local loop, broadband wireless access (BWA) technologies are offering effective ways and means to construct alternative customer access networks.

² McLuhan insisted that new media were successful when they extended existing capabilities of people to cater for their own needs and desires rather than trying to create new ones. There is something essentialist and universal in his view of human nature. The enormous success of P2P technologies that extend the capability of humans to communicate in ways of their own choosing supports this contention.

³ Compare the IT world where, for example, Microsoft has openly declared that the emerging Web2 models led by companies like Google are advertising driven, not subscription driven, and P2P principles allow light weight software applications to be marketed quickly and improvements made on the fly as against the behemoth model of heavy-laden multi-layered proprietary 'bloatware'.

Wibro/WiMax and the Digital Divide: A Lesson for Hong Kong?

iProA is running a digital divide awareness campaign in Hong Kong next week. To many it might come as a surprise that a place like Hong Kong is suffering from a digital divide but cities like Philadelphia and Taipei have tackled the digital divide issue through city-wide WiFi deployments based on innovative public-private partnership models. Could Hong Kong do something similar and, for example, promote construction of WiFi hotspots in all public libraries?

In the M-Taipei project, the Taipei Municipal Government awarded Qware, a subsidiary of the Uni Group, a nine-year exclusive franchise in a build-and-operate (BO) tender to cover 90 per cent of Taipei's 2 million residents by the first half of 2006. The city is not putting up any of its own money and Qware has committed to invest up to USD100 million in the network. Access is now free but once 50 per cent coverage is achieved Qware will make a public announcement about what charges it intends to levy. The tariff will be regulated by an NGO-like body within the Taipei municipal government called the Taipei Wireless Management Community (Taipei Wuxian Guanli Weiyuanhui). It is made up of professors and members of the community and it will have responsibility for managing Qware's business. Taipei municipal government has been proactive in assisting Qware realize its goal by providing it with locations for free to set up APs (access points) and holding discussions with Taiwan Power to build out power lines to APs to maintain a continuous supply of power. M-Taipei is part of a broader eTaiwan and M-Taiwan programme, the latter is focused on turning the island into a WiMax testbed to aid local chipset designers and equipment manufacturers.

P2P – the Road Ahead⁴

Peer-to-peer communications at the applications level (see the horizontal relationships conceptually illustrated in the diagram above⁵) are in every sense 'extensions' of human activities by means of media technologies in the sense intended by Marshall McLuhan.⁶ No wonder that email, SMS, instant messaging and file-sharing of music and video files have all boomed while pre-ordained corporate inventions such as WAP and VOD and MMS have bombed. What the former have in common is that their success did not depend upon any commercial marketing. Email was not invented for mass consumption. SMS was not invented for public use at all, rather as an operator signaling band, and although people had to write programmes for IM and file-sharing they came from the Internet community, not from the corporate world. People simply invented their own use for these media.

IPRs and Copyright

⁴ With apologies to Bill Gates, who published a book with this title in 1995.

⁵ In the commercial world, the horizontal peer-to-peer relationship might be termed inherently 'democratic' or 'unordered' in that control is with end users who become the facilitators (e.g., P2P sharing software) and the producers (e.g., blogging) of content as well as its consumers. The vertical, the client-server relationship, is what we might term inherently 'hierarchical' or 'ordered' in so far as content is produced and supplied or delivered from a given commercial source, while end users order it, receive it and consume it. So IPTV, cable TV, free-to-air TV, VoD are essentially vertical/hierarchical.

⁶ For a useful summary, see Todd Kappelman at <http://www.leaderu.com/orgs/probe/docs/mcluhan.html>

The development of the Web 2,⁷ and the proliferation of P2P software programmes are highly disruptive of existing business models. While the cost of production of a movie, for example, is high, the cost of reproduction is minimal. While the cost of traditional physical distribution channels is moderately high, the cost of electronic distribution is zero. People who up-load P2P content or ‘seeders’ are not often commercially motivated, and down-loaders are ubiquitous.⁸ The use of criminal law to protect IPRs in these cases is therefore controversial, and there is considerable argument as to the wider economic impact of piracy. On the one hand there is no doubt that P2P file sharing or swapping is damaging to the revenues of the companies that produce the content being shared, and there are civil remedies as well as criminal ones. A practical argument against civil remedy is it may be ineffective, but it remains to be seen if criminal prosecution is any more effective.⁹ One argument against criminal prosecution is that tax-payers money is being used to protect the private commercial interests of large corporations, a situation that has arisen because of trade politics. On the other hand, it could be argued that piracy is the operation of a free market under a different name, rather like a black market. Drawing the legal line is a political issue, influenced as much by powerful lobby groups as disinterested economic analysis. The basic economic argument is that copyright and IPRs in general protect and therefore encourage investment, but the implicit assumption is that investment in existing business models is to be protected. The real challenge is to find new business models using P2P, and these may be far less profitable than existing ones. P2P may conceivably lead to the decline of some large corporations and the rise of small independents, until the small independents grow to become the large corporations of the future.¹⁰

Broadband Convergence

The Negroponte Switch-Back

In the early 1990s, Nicolas Negroponte of the MIT’s Media Labs presented the idea of everything wired and wireless trading places, a proposition that became known as the ‘Negroponte Switch’. He revised this idea in 1997 when he observed that ‘Bits will travel wirelessly in proportion to the degree to which they’re public.’¹¹ In other words, the end user will often prefer to receive and transmit wirelessly via a mobile phone or a WiFi connection or through an iPod, etc., but the backhaul and long distance transmission is likely to be wired. On the other hand, wireless broadcast satellite may be the most efficient means of *broadcast* to cable headends and servers around the globe, but the multicasting of TV reception signals to the end user is more efficiently achieved over wires, and it also frees up much wanted UHF and VHF spectrum for alternative and maybe more valuable uses. ‘The issue is not wired versus wireless but

⁷ ‘Web 2’ is seen as complementary to the ‘Semantic Web’ exploiting meta-tag technology to develop Web-based applications and possible new business models. See http://en.wikipedia.org/wiki/Web_2.0

⁸ This suggests a widespread and growing public acceptance of what media companies call ‘theft’. This is not a moral judgment, rather a suggestion that public behaviour may also indicate public opinion.

⁹ It would seem that the recent prosecution in Hong Kong of a Bit Torrent seeder made only a temporary blip in Internet traffic recorded by the Hong Kong Internet eXchange (HKIX).

¹⁰ In the field of entertainment this could work. In other areas, such as pharmaceuticals where wider public interests and possibly market failures are involved, policy intervention would be required.

¹¹ According to Negroponte, George Gilder was one of the first to coin this term (see http://www.wired.com/wired/archive/5.08/negroponte_pr.html) Gilder also coined the term Metcalf’s Law (see <http://www.seas.upenn.edu/~gajl/metgg.html>) to describe Bob Metcalf’s observation of network economics in computer systems, although the concept had been known to telecom engineers for many decades. Metcalf was the inventor of Ethernet.

the strength of the signal.’ For ‘strength of the signal’ read bandwidth or the bits per second equivalent.

Fixed-Wireless Convergence

BT has become a pioneer of fixed-wireless ‘fusion’ in the UK with the Bluephone, a wireless handset that logs onto the fixed cordless terminal in the home or office, onto a WiFi in the local coffee shop or airport, and onto Vodafone’s 3G network out on the streets. The technical, commercial and regulatory issues FWC raises are many, but the key issue in the age of Web2 and P2P will become the ability to deliver (and sell) rich media services across several platforms from the same core network. From the consumer perspective this will be led by the evolving nature of handheld devices and devices networked by near field wireless communications such as Bluetooth, ZigBee, RFID as well as post-3G cellular networks and meshed WiFi and WiMax networks.

The big unknown in most markets will be what structures of ownership work the best. Will it be the incumbent model of a fixed-mobile-wireless broadband telephone company (part of the quadruple play) or a version of an MVNO model? The answer will probably vary across markets, just as it does now. In Hong Kong, the limited scale of the market probably means that large local property companies or large mainland Chinese companies with deep pockets and the ability to negotiate deals with rich media content providers will dominate. But if the local access market can remain open to smaller players such as ISPs and new entrants with access to the UHF and VHF radio spectrum vacated by ATV and TVB when they go one hundred per cent digital over the next 8-10 years (they start in 2007) the power of incumbents will then be highly dependent upon consumer preferences for fixed broadband connections and the delivery of more traditional IPTV products.

A Third Digital Paradigm Shift

Despite the first wave of digital technology coming in the late 1980s and 1990s it is only recently that the consumer end of the network has started to fully undergo the transformation. Slowly handheld devices have emerged that permit digital end-to-end communications and hold out the promise of providing fully-meshed (4G and beyond) P2P public wireless networks.¹²

The second digital wave has been the Internet. The telecom world is still in the process of migrating to an all-IP network and Next Generation Networks (NGNs) are very new, but they imply two new phenomena. First, more services are making use of the Internet to by-pass traditional network gateways and their tariffs. These are mostly P2P services, such as VoIP and VoBB using services such as Skype, Vonage, and the

¹² For example, Korea is energetically promoting Wibro as the technology to follow CDMA. Wibro works in the 2.3GHz frequency and is designed for metropolitan areas using cell coverage up to 1 km radius with peak connectivity rate of 50Mbps. It is planned to install an AP (access point) on Korea’s bullet train and another AP inside the train. Then the speed of passengers inside the train relative to the speed of the train is zero and they can easily access Wibro. While CDMA is a voice centric system, Wibro is a wireless data centric system and uses OFDM (Orthogonal Frequency Division Multiplexing) technology. OFDM is a spread spectrum technique that transmits multiple signals simultaneously over a large number of carriers that are spaced apart at precise frequencies. This spacing provides the ‘orthogonality’ which prevents the demodulators from seeing frequencies other than their own. This is useful in preventing signal interference because in a typical terrestrial broadcasting environment there are multi-path channels so the signals are received from various different paths.

various instant messaging, voice and video camera services offered by Yahoo, MSN, etc. Second, NGNs are making it easier to personalize services by locating network intelligence (for example, subscriber line cards, SLCs) along the edge of the network (along the outer fibre rings and inside customer premises) and therefore closer to the user. This means less signal attenuation and greater realized bandwidth can be delivered to subscribers.¹³

According to Bill Gates in *The Way Ahead* (1995) digital content was to be part of the second wave, and it *was* in terms of documents, but his predictions in terms of video are coming to be realized only slowly. Digital video content is really coming as part of the third wave alongside P2P technology discussed above. The Web provides one outlet for digital content and 2.5G and 3G mobile phone networks provide another, but the major content providers of today, the movie studios and TV video producers are still serving a predominantly analogue market. But for both cinema and TV the picture is about to change.

Digital Cinema

Most movie theatres are still using analogue equipment, using reels of celluloid film that have to be shipped in large numbers to cinemas around the world.¹⁴ The cost of installing digital cinema equipment (around USD 150,000) has been the stumbling block. But in November 2005 the French company Thompson, owner of Technicolor and with upwards of 45 per cent of the USD1.5 billion analogue market, reached agreement with several major Hollywood movie studios to equip their theatres in the USA and Canada. A ten year contract gives Thompson a 'virtual print fee' on every film exhibited. Thompson has plans to follow up in Europe and India.¹⁵ In Ireland, north and south, Avica Technology has a contract to equip 515 cinemas with digital equipment. Movies will be downloaded from satellite using encryption.¹⁶ In Singapore, digital cinema is part of the Government's 1999 Digital Media Exchange programme. In Asia's two largest digital societies, Japan and Korea, digital cinema is in its infancy. Less than one per cent of Japanese cinemas have digital screens and until Hollywood, which dominates Japan's market, accelerates digital releases Japan's cinemas will hold back. Korea got its first digital multiplex cinemas in 2005.

DVD Wars

¹³ The economics of telecom networks has changed as a result. In the analogue days core network costs were high and lumpy and transmission costs were traffic-sensitive. In the early days of digital, core network costs kept falling while transmission costs ceased to be traffic-sensitive to any appreciable extent. In the era of NGNs core network costs are related entirely to the quality and scope of services to be offered, transmission costs are minimal, and the major incremental costs at the edge of the network are customer-sensitive to deliver personalized services.

¹⁴ 'George Lucas kicked off the digital cinema charge in May of 2002 with "Star Wars: Episode II, the Attack of the Clones," the first big budget live action movie shot entirely on digital video. Most theaters played 35-mm film transfers of the movie, but some played it on digital movie projectors. Film never entered the picture.' <http://entertainment.howstuffworks.com/digital-cinema.htm/printable>. But the fact remains that many film directors prefer the granularity of analogue and are reluctant to give this up. On the other hand, cheap digital video equipment is opening the door to new independent film-makers.

¹⁵ The length of contract is crucial in attracting financial support for the digitalization of cinemas. See *Financial Times* 11 November 2005, p.19

¹⁶ 'The encryption technology was developed by Digital Cinema Initiatives, a joint venture of Walt Disney, Fox Entertainment Group, Metro-Goldwyn-Mayer, Paramount Pictures, Sony Pictures Entertainment, Universal Studios, and Warner Bros. Entertainment.' <http://www.pcworld.com/news/article/0,aid,120130,00.asp>

One of the factors holding back digital movies has been competing industry standards for DVDs. The Sony Corporation is promoting Blu-ray and Toshiba is promoting HD-DVD. Among those supporting Blu-ray are Sony-owned Columbia Tri-Star, Disney, MGM, 20th Century Fox, Philips, Dell, Samsung and Matsushita. HD-DVD is supported by Time Warner, Universal (Dreamworks), Paramount, NEC, Sanyo, Canon and others. Discussions between Sony and Toshiba seem to be getting nowhere as each competes to reach the market, but the issue is important for the film studios that make twice the revenues from DVD sales as they do from box office receipts.¹⁷

Digital TV -HDTV

HDTV (high definition TV) is not to be confused with Digital TV or DTV that simply multiplexes more analogue programmes into the transmission path using MPEG compression algorithms¹⁸ and delivers them to a set-top box for decoding into analogue TV viewing or to a digital TV receiver.¹⁹ In the USA and Europe satellite and cable TV have made the greatest use of DTV to date.

USA

According to the National Association of Broadcasters, in the USA digital terrestrial transmission (DTT) covers nearly 100 per cent of TV households, but some estimates suggest that 4 in 10 TV households still use old analogue sets incapable of decoding a digital signal. In November 2005, the US Senate voted 7th April 2009 as the 'hard' cut-off date for analogue broadcasting plus a budget of USD3 billion to help consumers with analogue sets install digital converters. The House Energy and Commerce Committee choose 21st December 2008, and USD 1 billion, and these dates and dollars have yet to be reconciled.²⁰ Separately the FCC has ruled that manufacturers of small TV sets up to 24" must install tuners to receive digital signals by 1st March 2007. Problems over standards for HDTV have been holding up the transition process.²¹

Europe

Europe has been particularly forward in adopting digital TV. In the UK around 60 per cent of homes have at least one digital TV receiving programmes either free-to-air DTT (Freeview) or satellite pay-TV (BSkyB) or through cable.²² Germany did the switch over in 2004. The last major European country to adopt digital TV has been France, but

¹⁷ Stores are already distributing DVDs online, but will VoD over IPTV eat into the DVD market?

¹⁸ The Motion Picture Experts Group (MPEG) worked out standards for audio and visual encoding. MPEG-1 is for the initial encoding of audio and visual content and is widely used in video CDs and MP3 players. MPEG-2 provides transport and audio and visual standards for broadcast-quality TV and is widely used for DTV today. MPEG-4 improves upon MPEG-1 to support 'objects' such as 3D images, and also DRM, and incorporates upgraded MPEG-2 standards.

¹⁹ DTV offers more cinema-like picture quality because it uses an aspect ratio (width of image on screen divided by its height) of 16:9 or around 1.78:1 which is closer to the aspect ratio of 2.39:1 used by cinematography than to the aspect ratio of 4:3 or 1.33:1 used by a traditional TV screen which is closer to the aspect ratio of a full 35 mm film frame known as the Academy standard of 1.37:1.

²⁰ Under the 1996 Telecommunications Act, the cut-off date for analogue broadcasts was set as 31 December 2006, as long as at least 85 per cent of TV households could receive digital signals, but there is no agreement on how to measure this figure.

²¹ There are 18 different Digital TV formats of which two are widely accepted as high definition. HDTV has more than twice the lines of resolution as analogue TV.

²² According to Ofcom by Q2 2005 there were over 10 million households subscribing to digital pay TV and nearly 6 million receiving free-to-air DTT. In total over 50% received digital TV by satellite, 33% by DTT, the rest by DSL/cable. http://www.ofcom.co.uk/research/tv/reports/dtv/dtu_2005_q2/q2_2005.pdf. The growing popularity of the free-to-air digital satellite BBC-backed Freeview service is particularly noteworthy as it follows the collapse in 2002 of an earlier subscriber model ITV Digital.

the take-up rate seems swift and likely to reach one million by end-2005.²³ France aims to have 85 per cent country coverage by 2007. Across Europe digital TV is catching on fast, but the spread of HDTV is another matter. Lack of suitable content is again the major factor which in turn limits the market economies of scale and keeps prices of HDTV sets higher than they could be. But over time this vicious circle will change into a virtuous circle and consumers will be faced with yet another format change.

Asia

In 2000 Japan's national broadcaster NHK launched a digital TV service by broadcast satellite but take-up was poor. Hi-Vision TV sets, Japan's version of HDTV, were just too expensive to attract a large number of buyers. DTT was launched in 2003 and 2011 has been set as the target for nationwide coverage at which point all analogue broadcasts are scheduled to cease. To meet this target it is reported that Japan's communication ministry is set to allow digital terrestrial programming to be carried by IPTV services.

In Korea the deadline for switching on digital TV broadcasting is the end of 2005. Korea has adopted the US ATSC standard. Korea Telecom (KT) and rival fixed line operator Hanaro Telecom were awarded 't-commerce' (TV commerce) licences by the broadcasting commission after a running battle between the communications ministry and the broadcasting commission reflecting concern from the cable operators. Both plan to trial IPTV, setting up TV portals. KT is also the largest shareholders in Skylife which since 2001 has been the country's only digital satellite broadcaster.

Australia

Digital TV started in 2001 and all five free-to-air TV stations are simulcasting (analogue and digital) in Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Canberra and Darwin. By 2008 the aim is to have the country covered and phase out analogue. To promote a shift towards HDTV the government has imposed a quota of high definition content of 1020 hours annually for each operator in Sydney, Melbourne, Adelaide and Perth. A digital pay-TV cable and satellite service, Foxtel Digital, also joined the market in 2004.

China

Figures recently released by CASBAA suggest there are over 600,000 pay-TV subscribers to digital cable TV services from over 100 million cable homes. An estimate from BDA suggests as many as 2 million cable DTVs at the end of 2004 and a SARFT target of 10 million by end 2005.²⁴ In total there are an estimated 380 million TV homes in China. Since 2002, SARFT has been driving the switch-over by paying for local media content in digital format,²⁵ but the rivalry between SARFT and the MII, together with national and regional reorganization of both the telecom and the broadcast and cable TV sectors, has been holding back convergence. Politically as well as commercially the matter has to be resolved well before the 2008 Beijing Olympics,

²³ In good French tradition it is not called DTV or DTT but TNT which stands for TV Numerique Terrestre but also for TV Numerique pour Tous or digital 'TV for all'. TNT is a joint venture between the public broadcaster and a consortium of cable and satellite operators.

²⁴ Fang Meiqin 'Triple-Play: Waiting for IPTV' China Communications, 10.2005, pp.73-75.

²⁵ SARFT has a four stage plan. Cable systems in all major Eastern cities and provincial capitals in the central and western China will become digital by end 2005. Stage two, which lasts until 2008, will include all cities in Eastern China and some in the west. Stage three will include all towns above county level by 2010, and stage four will cover the whole country by 2015.

and typically Shanghai was chosen as a pioneer to launch IPTV services in 2005. In fact Shanghai has two IP-based systems, a ‘premium service’ 3TNet high-speed IPv6 enabled system and a plain IPTV system.²⁶ China Telecom and China Netcom (CNC) have plans to roll out trial IPTV networks in the country’s major cities.²⁷ For example CNC has attracted 50,000 subscribers to a pilot IPTV service in Harbin. Both companies have teamed up with the only company yet to hold an IPTV licence, the Shanghai Media Group.²⁸

HDTV is due to come to China in January 2006 when it is reported that China Central Television (CCTV) will launch the country's first digital high-definition TV channel. CCTV has been testing the new digital high-definition channel since September in Hangzhou, the capital of eastern Zhejiang province. But the greatest unknown is China’s DTT standard. China has plans to launch by 2008, but whether China will persist with its own standard remains unclear. The decision is important to Hong Kong where the Government has told ATV and TVB to adopt the DVB-T European standard if the mainland fails to announce a standard by the end of 2006.²⁹

Mobile TV as *the* IPTV?

As was the case with voice and early narrow-band data, one of the key drivers for next-generation entertainment services is going to be the choice that convergence offers the end-user. *Not* the choice of receiving existing content onto their handset – although, that obviously will be there, and there are many press releases already out for the possibility of watching ‘mobisodes’ or sports highlights on the way home from work. Rather it will be the choice of determining how best to use their time. And, as has been the case with mobile voice, with SMS, and with email, the emergence of this control over time will be the factor which leads to a host of new service offerings... or ‘killer apps’.

As intelligence in (or control over) the network is moved out to the edge of the network in an all IP world, one of the significant fears of the entertainment industry has been what it will mean for existing revenue models. IPTV networks change the broadcast model to one of either unicast (full IPTV, see for example, HKBN) or, at best, interaction with the end-user (partial IPTV, see for example, PCCW). In either case,

²⁶ Shanghai’s 3TNet system (3 trillion bps DWDM transmission network) currently connects to Hangzhou, is IPv4/IPv6 enabled and will serve the Yangtze delta region. It is a Chinese Internet TV system developed under the “863” National High Technology Research Programme.

²⁷ Although China has as many broadband subscribers as Japan, speeds are typically no more than 512Kbps, unsuitable for IPTV, which is why some vendors of streamed video tools predict karaoke services and music videos rather than full screen video will be the prime driver of IPTV. In his speech in Davos in February 2005, Bill Gates argued that nothing short of 40 Mbps would be sufficient for home broadband interactive and rich media services to take off.

²⁸ China has also imposed stringent restrictions on licensed foreign satellite broadcasters. China is in a transition period to digital TV and facing several dilemmas, including whether to push ahead with its own national IPTV and DTT standards and reconciling the competing interests of telecom and broadcast operators. With the Beijing Games looming up these are sensitive times and foreign competition and widespread access to foreign media is not welcome.

²⁹ The current DTT standards are: in Europe - Digital Video Broadcasting – Terrestrial (DVB-T); in the USA – Advanced Television Systems Committee (ATSC); in Japan – Integrated Services Digital Broadcasting (ISDB). China has narrowed six alternatives down to Digital Multimedia Broadcasting Terrestrial (DMB-T) a multicarrier system designed by Tsinghua University in Beijing and Advanced Digital Broadcasting Terrestrial (ADB-T) a single carrier system designed by Jiao Tong University in Shanghai. Search http://en.wikipedia.org/wiki/Main_Page for details.

the end-user is effectively able to *time-shift* broadcast programming. And, as the entertainment industry knows, that means that they can no longer count on a captive audience for advertising – which provides the vast bulk of the entertainment industry's revenues.

It is not that end-users don't want advertising. Indeed, it is well recognized that for consumers, advertising is extremely useful – it is often the information with which they make their choices. But given the choice, in the comfort of their lounge room, television viewers will often time-shift past the ads, if they can. So, when do they want to receive advertising? Often when they need it (such as when they are shopping, or when they need to search for a price or a good), or when they have the time (such as wanting to know the program schedule on the way home from work, see the latest movie promotions, or, yes, perhaps the sports highlights).

No one is seriously expecting too many consumers to watch 2-hour movies on their handsets; indeed, very few people are seriously expecting to generate audiences for half-hour television programmes (despite the hype around mobisodes), but audiences are already looking for programme information when they are mobile, and can be expected to watch the latest promos. Similarly, while mobile users use their handset to play games to kill time when waiting for the train or the bus, no one expects there to be a great deal of real-time multi-user game playing over a mobile connection (at least not in the near future), but there is already a lot of information swapping going on, by SMS or by chat, while players are away from a fixed broadband terminal. Integrating this connection will mean that players have far greater choice as to when they leave their virtual world and return to the real one.

And it is for this reason, that *this* time the telecoms companies are moving confidently into the content delivery space, because unlike the VOD experiments of the mid-90s, this time the convergence of mobile and fixed delivery means that telecom companies are not simply fighting for a share of the time that a user was likely to be in the lounge room; this time, the business models encompass a broadening of the time that the company engages the end-user. Charging for access, delivery and connection time makes a lot more sense to telecom companies, than content licensing models. For this reason – the business model (revenue) drivers – mobile entertainment is *the* crucial element of the emerging IPTV offerings, even where the operator may not (yet) have bundled in a mobile aspect.

IPTV as Triple or Quadruple Play – Back to the Future?

Two remarkably ill-advised waves of investment overwhelmed the telecom sector in the late 1990s. The first was a premature rush into 3G licences at over-bid prices. The second was telecom companies forgetting their core competencies and getting swept along on the dot.com bubble. By reverting back to basics many telecom companies have been able to build on their broadband competences laying the foundations for the triple play. But is IPTV just the reinvention of an old model?

Attempts in the late 1990s to commercialize the Internet and the Web often tried to leverage the possibilities of vertical selling through the use of 'click-through' either on the Web itself or through TV networks to Internet sales points. Let's call this TV-IP. Few of these attempts succeeded, although Web commerce did as illustrated by

Amazon.com and eBay. The first decade of the twenty-first century has seen an entirely different model develop based upon P2P. But does IPTV embrace P2P or is it the antithesis? Whereas telecommunications usage is mostly peer-to-peer real-time communications, TV broadcast is one-to-many and essentially server-to-client or hierarchical delayed-time communications. Convergence in terms of content being transmitted down the same big pipe is not the same as synergy in terms of business models.³⁰ As we note below PCCW has been sensible enough to keep telecom and IPTV separate. So at this stage triple play does not in reality take convergence very far.

Hong Kong Pay-TV Market

Competing in the pay TV market against Hong Kong Cable TV are three IPTV service providers. PCCW's *NowBroadband* TV is available over PCCW's ADSL network, Hong Kong Broadband offers service from a Web-server that is accessible from any broadband network, and TVB-backed SUPERSUN available by satellite and over HGC's VDSL broadband network. Although each service transmits using IP, the architectures and business models of these three IPTV services is very different.

Hong Kong Broadband Network's model is the most straightforward. It is pure Internet. Anyone can pay a subscription to HKBN, install HKBN's set top box (STB) and using any broadband network including HKBN's own Metro Ethernet network, can access HKBN's Web-server. For this reason, OFTA has declared HKBN's IPTV an Internet service not requiring a licence rather than a TV service that does. HKBN's competitors complain that this frees HKBN from any content controls imposed by the Broadcasting Authority. HKBN complains this prevents the company from requesting interconnection with the telecom and cable networks that could be used to access HK Broadband programmes. The architecture of HKBN's network, like the other IPTV networks run over a telecom network, would require additional servers at the edge of the network close to customers take the next step of providing video-on-demand which is hugely consuming of bandwidth.³¹

SUPERSUN uses the technology developed by Galaxy. While Intelsat was a partner in the Galaxy with TVB the network architecture was entirely satellite-based. Satellite technology works fine, but the cost of gaining access to buildings³² and of installing DVBs (digital video broadcast servers that tune and demodulate incoming satellite signals on building tops and then modulate them for delivery through the inbuilding

³⁰ The Korean Ministry of Information and Communications (MIC) seem to agree, treating 'TPS' (Triple Play Services) as nothing particularly innovative. Instead, the MIC is promoting the BcN (Broadband Convergence Network) that emphasizes the enhancement of the transport network (QoS, security, IPv6 and open APIs), the 'broadbandization' (or broadening bandwidth) of wired, wireless, and broadcasting subscriber networks to speeds of 50-100 Mbps, enhanced private networking and the spread of digital home networking, ubiquitous sensor network (RFID), R&D network, development of BcN related technologies (like 2.3GHz Wibro), and preparing an environment for building the BcN through encouraging its spread, reinforcing industry competencies, improving laws and systems, etc. IT839 refers to the "eight services" (Wibro, digital media broadcasting, home network services, in vehicle multimedia telematics services, RFID, 3G WCDMA, terrestrial digital TV broadcasting, and VOIP), the "three infrastructures" (broadband convergence network (BcN), RFID/ubiquitous sensor network, and IPV6), and nine future engines of growth (including next generation mobile communications and computers, embedded software, intelligent robots).

³¹With VoD (unicast) any number of subscribers can be requesting streamed video at any point in time, absorbing network resources.

³² In Hong Kong building owners usually charge per tenant.

vertical block wiring system) proved costly.³³ Programmes still reach SUPERSUN by satellite before being encoded and the signals scrambled prior to transmission over HGC's 10Mbps network, arriving at buildings from the ground up rather than the rooftop down. Like other IPTV broadcasters, SUPERSUN does not cache programmes prior to transmission, but the Broadcasting Authority does require the storage of programmes *as transmitted* for up to 60 days for review purposes. The programmes are transmitted to the STB only after an entitlement code message (ECM) has been sent to the STB and the user authenticated. All programmes are then transmitted in IP format to the STB, and user channel selection is merely an instruction to the STB from a remote control.

The cost of the STB is a key business component of any pay-TV or encrypted TV. The issue is scalability. The STB is as often as not heavily subsidized to win customers, just as cellphone operators subsidize handsets.³⁴ The cheapest STBs are mass produced commercially available products, and they are required not because encoded signals need to be modulated and demodulated, because this can be built into TVs and PCs. STBs are required to build in security, and they are not very good at it. For example, Hong Kong Cable TV as it switched over to a digital network acquired the ability to remotely change the STB encryption key, yet it is a continuing race against time as pirate decoders can readily catch up with the new encryptions.

PCCW's *NowBroadband* TV has adopted a different approach, at least for the time being, in two ways. First, by sourcing the STB from a low cost manufacturer of DVD recorders in China, and removing the recording component. Second, by placing conditional access in the network itself as a Customer Access Unit (CAU) processing card in the DSLAM (digital subscriber line access module) *NowBroadband* TV is able to control from the network and to adapt to future changes in STB technologies. This also enables *NowBroadband* TV to track with absolute precision the patterns of individual usage, a potentially big selling point to programmers and advertisers. This together with an architecture that offers greater security against piracy meant that *NowBroadband* TV was able to negotiate broadcasting rights with major content providers, often on a revenue-sharing basis which is a major breakthrough in terms of business models in what is traditionally a rather conservative industry.

Is IPTV just TV on steroids or something more?

Perhaps the smartest thing PCCW did was then to run *NowBroadband* TV not as a value-added service over broadband, but as a standalone business.³⁵ The early failure of the Hong Kong Cable Consortium in the early 1990s, when the Hong Kong Government tried to kill two birds with one stone by directly linking a new cable TV network with a second telecom network, proved a simple point. Everything about these two sectors is different, from their investment profiles to their management styles to the

³³ The condition of inbuilding wiring systems is variable. HK Cable TV (previously Wharf Cable) has often installed its own vertical wiring, but there can be interference problems where there are duplicate systems. This has been the subject of OFTA consultation papers and directives.

³⁴ 'When a network serves more than 50,000 homes, the set top box should become the most critical component which can be easily managed through multisourcing... Of network operators who have cancelled their trials for reasons of economic viability, almost all forgot to model the costs of full deployment before they made their selection of technology for the trial.' Stephen Reeder, 'The China IPTV Opportunity', *China Communications* 10.2005

³⁵ But the demand for IPTV also generates a demand for Netvigator's broadband service, so IPTV is a complementary good.

nature of the service they are trying to sell. Just because everything can go down the same pipe (convergence) does not mean that they are closely related businesses (synergy).³⁶

But how far is an IPTV business more than just another means of delivering TV and getting people to pay for it? In many cases it may not be, but the future seems to lie in integrating the delivery system with the growth of home entertainment networks and the developments in consumer electronics, such as PVRs (personal video recorders ushering in ‘time-shifting’³⁷), Apple iPods and vPods, P2P media file sharing across the Internet, online Sony PlayStations and Microsoft Xboxes, Web2 services and applications being pioneered by Google, Yahoo, AOL, etc. In the case of *NowBroadband TV* the system architecture is designed for migration in this direction with SLCs located at the edge of, but still within, the network. On the other hand, Web2 content and Internet distribution are driven more by advertising models and less by subscription models that may by-pass the IPTV networks altogether. In this case on the telecom side the triple and quadruple play (voice, broadband, IPTV and mobile) may end up more as a ‘fingers in every pie’ hedging of bets. On the broadcasting side does the proliferation of pay-TV services ultimately end in a zero-sum game, or is there unsaturated demand remaining?

For the Hong Kong consumer the answers to these questions are not too important because the outcomes will depend upon consumer choice. For the regulator the answers may pose awkward questions about market structure, and for the policy makers there remains the issue of whether there are benefits to the economy in terms of local content development and employment. Despite previous debate, it still seems that Hong Kong lacks critical mass to stimulate major advances in local creative content production. And if P2P dominates the next wave of media growth then traditional thinking about the traditional media will cease to have much relevance.

The Regulation of Convergence

Regulation is taking two directions. First, OFTA is proposing through a series of consultation papers, new unified licences and thinking through the implications for numerous technical issues, such as interconnection and PNETs charges, numbering, USO contributions and the local access charge, the implications for spectrum allocations and assignments, spectrum trading issues, and so forth. Second, the CITB is proposing a unified regulatory body, bringing telecom and broadcasting under the same roof. While this may seem a logical development, the analysis above suggests that convergence does not go much beyond the technical issues of multiplexing at this stage and that business synergies between these two sectors is rudimentary, such as the demand for IPTV being complementary to the demand for broadband. It therefore remains unclear where the substantial advantages of a unified regulatory body lie. Hong Kong often takes its lead from the UK, the USA and Australia. However, in the latter two cases a unified body only implies sharing the same building or organization while

³⁶ Telecoms investment is lumpy and mostly infrastructure, broadcast investment is mostly in programming; telecoms is a technology-dominated industry, TV is content-dominated; telecom services are constantly reusable, the shelf-life of TV services is one showing; etc. This point is strongly made in J.Ure ed.(1995) *Telecommunications in Asia: Policy, Planning and Development*, HKU Press, chapter 6.

³⁷ Recent software advances also allow recorded programmes to be forwarded over broadband networks to PCs anywhere in the world, what may be called ‘space-shift’.

the functions seem to remain separated. In the UK case joint panels have been created, and no doubt intellectually interesting discussions take place, but it is still not clear what substantial advantages are forthcoming and whether they would apply to a small jurisdiction like Hong Kong.

If the unified regulatory body is set up in a collegiate form another issue arises because this would be the first of its kind in Hong Kong, something the civil service is not used to, although OFTA itself was first established with a Director-General who came on contract appointment. It would be an interesting innovation, and the principle that Government should draw more widely upon expertise from academia, industry and community organizations is to be welcomed.

Aide Memoire

The following are Executive Digests of two previous TIF conferences. They raise some interesting checklist items. For example, has proximity to the Mainland really helped content developers in Hong Kong? What has the HKWDC achieved to support local developers? Has Government followed through on its support for wireless applications development in the enterprise sector? Have operators adopted more simplified business models for developers and pricing models for consumers? Are consumers better educated about the services and applications available to them? And how far is convergence really being achieved in Hong Kong? Where does HK stand today?

Telecoms InfoTechnology Forum – 25th March 2004 Hong Kong as Asia Wireless Development Centre Mandarin Oriental Hotel

Executive Digest	
Hong Kong's advantages include:	Cultural as well as commercial closeness to Mainland China and being part of the Pearl River Delta with over 40 million cellphone users, more than Beijing and Shanghai combined; Hong Kong developers often find it easier to start operations in the PRD, before moving further inland.
Driving mobile "data"	Demand for access may level off, but demand for usage is the driver and requires (a) low prices (b) simplified pricing schemes, and (c) many useful and easy-to-use applications
Demand for applications	Two types: (a) peer-to-peer, and (b) value-added, such as remote monitoring services.
BREW and JAVA	Both have their place. Java creates common platforms across diverse networks and applications that are not too secure; BREW offers a common platform on secure networks, encouraging security to shift from the handsets and third-parties to the operators' networks.
Hype	People choose what they want to use, not operators; handsets and networks rarely deliver all that they promise, but is it sufficient for the applications to work well?
Standardization	Interoperability is the key functionality, for example at the applications service layer of the stack, which is really harmonization of standards; at the consumer end standardization of functionality is a market opener, but not at the expense of choice.

Standards in Hong Kong	Should Hong Kong adopt Mainland China's standards as they develop to gain access to the mass market?
Standardization and the role of HKWDC	Promote harmonization of standards or standardization as appropriate; (b) collaborate with overseas Centres to achieve this at the regional and global levels
Marketing role of HKWDC	(a) Promote a "Seal of Approval" that can be widely recognized; (b) publicize success stories; (c) run annual competitions for developers;
HKWDC focus	3 enterprise sectors – logistics, tourism and financial and insurance markets) and one consumer market, mobile entertainment.
Business models	Hong Kong operators need to seriously reconsider the business models they offer developers, simplifying them (maybe <i>the key issue</i>) and offering more stimulation to the market; but simple models also need to be known about, so <i>transparency</i> is also important; the role of aggregators needs to develop in Hong Kong – a role for the HKWDC?
3G	On the network side it offers considerable economies in the use of spectrum and for that reason alone it will eventually replace 2G; as it becomes truly broadband it offers considerable scope for convergence between access devices feeding traffic into networks; on the demand side, see Mobile "data" above. On the issue of yet more 3G licences, it could be noted that (a) sooner or later all the 2G networks will migrate to 3G, and (b) OFTA's position has always been consistent – let the market decide, and 'protect competition, not the competitors.'
Developers in Hong Kong	Need the mass market of China, but Hong Kong is an excellent test-bed; need standardized business models to cut down on endless repetitions of business applications and revisions in application specifications.
Cultural issues	It seems that Hong Kong people like to talk and listen, and are less inclined to text messages; they are more responsive to 'pushed' content than to 'pulled' content
Challenges, such as Chinese character sets, security, DRM and IPRs	These represent challenges, but by definition challenges represent commercial opportunities for those who can offer solutions; this is where Hong Kong should put its focus?
Way forward for Hong Kong developers	Reduce complexity of applications, drive down prices and pave the way for Hong Kong brands to emerge.
Research & Development	Needs Mainland China market to justify the cost. The HKWDC can play an important facilitating and partnering role here?
Role of HK Government	As a promoter and facilitator, wireless, especially for enterprise solutions, is already a high priority; as a user Government can promote the use of wireless for staff working outdoors and for public access to online information.
HKWDC	Already a really practical achievement; for sustainability HKWDC may need to examine its role as a potential aggregator, as a provider of some services to specific clients, as a partner in development, and as a test and authentication centre.

Telecoms InfoTechnology Forum
Next Generation Wireless Services in Hong Kong
20th November 2002
The Sheraton Hotel, TST, Hong Kong

Executive Digest

Issues	Technical	Financial	Development	Market
SME developers	<ol style="list-style-type: none"> 1. Handset & api standards 2. Development tools updates 3. Information “bank”? 	<ol style="list-style-type: none"> 1. Development funds 2. Marketing money 3. Financial advice 4. Financier understands the industry 	<ol style="list-style-type: none"> 1. Testing & simulation 2. Skill sets 3. Premises 4. Working with operators 	<ol style="list-style-type: none"> 1. Regional or global reach 2. Compelling quality content 3. Tailored applications – subcontracted? 4. 2-3 year windows of opportunity?
Network operators	<ol style="list-style-type: none"> 1. Vendors’ deliverables and backwards compatibility 2. Interoperability 3. Roaming 	<ol style="list-style-type: none"> 1. Profitability 2. Marketing budget 	<ol style="list-style-type: none"> 1. Business -people process 2. Test facilities 	<ol style="list-style-type: none"> 1. HK small market 2. Acceptable billing system 3. Open access to developers
Vendors of handsets and equipment	<ol style="list-style-type: none"> 1. Standardization and open systems 2. Interoperability 3. Roaming 	<ol style="list-style-type: none"> 1. R&D and Marketing 2. Support to SMEs in-kind 	<ol style="list-style-type: none"> 1. Technical support 2. Development platforms 	<ol style="list-style-type: none"> 1. Need for a revenue model 2. Global interoperability
Consumers	<ol style="list-style-type: none"> 1. Mostly low tech 2. Mostly uninformed 	<ol style="list-style-type: none"> 1. Low handset purchase cost 2. Low churn cost 	<ol style="list-style-type: none"> 1. Irregular users 2. Can anything be compelling? 	<ol style="list-style-type: none"> 1. Complements lifestyle 2. Good value 3. Passing time
Enterprise users	<ol style="list-style-type: none"> 1. Stability, reliability, scalability 2. Backwards compatibility 3. Security issues 	<ol style="list-style-type: none"> 1. Total cost of ownership 2. Risk versus cost of adoption 	<ol style="list-style-type: none"> 1. Role of market marker 2. Restructuring of industry 	<ol style="list-style-type: none"> 1. Ready-made content to go mobile 2. Niche, large project or mass market?
Government	<ol style="list-style-type: none"> 1. Interoperability 2. Open systems 3. Technology neutral 	<ol style="list-style-type: none"> 1. Facilities sharing and deferred 3G fee payments 2. Support for test facilities and info banks? 3. SME development loans? 4. Tax breaks for early adopters? 	<ol style="list-style-type: none"> 1. Support for industry forums and shows 2. Back industry initiatives for joint 3G test sites/ info banks for SMEs 3. M&A policy 4. Review of PNETS? 5. Licensing 	<ol style="list-style-type: none"> 1. Consumer and data protection 2. Encourage rational pricing and billing systems 3. M-commerce certification and security 4. Government adoption of mobile services