Identification of Media Distribution Mechanisms and Models in Australia

Expert Opinion prepared for Allens Arthur Robinson

ACPG

The Australian Commercial Projects Group Pty Ltd
Incorporated NSW ABN 70 111 996 647
Brokers of Business Intelligence and Resources

Level 29 St. Martins Tower
31 Market Street
Sydney NSW 2000 Australia
V. +61 (0)2 9328 0206
F. +61 (0)2 9328 0208

4410 Massachusetts Ave NW
Suite 301, Kashogi Center
Washington DC 20016 USA
V/F. +1 (443) 254 5503

www.theacpgroup.com
info@theacpgroup.com

John R Paul

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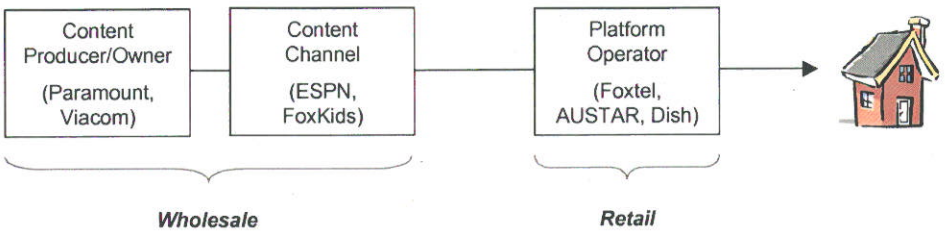
"I have read and understood the contents of the Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia supplied to me by Allens Arthur Robinson. I agree to be bound by the contents of those Guidelines."

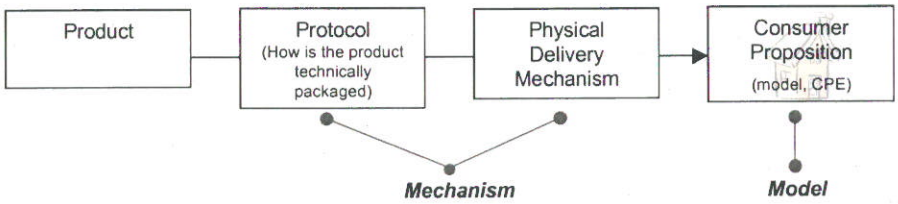
Source information for business metrics is derived from expert's direct experience and previous ACPG research. ACPG research draws on multiple sources.

1 Executive Summary

Audio/Visual [and primarily linear] media can be distributed using a number of methods and business models. Content distribution operates [like many products] in a wholesale and retail structure with some exceptional businesses operating both aspects.



This structure provides two types of opportunities for content distributors: a) sell individual programming or assembled channels to an existing service provider or b) construct a mechanism to specifically distribute the content to the end user.
This paper covers both types of opportunities. The latter can be further broken down into physical mechanisms and the business models that utilise these mechanisms.



The subsequent and effective choices for content distribution include:

1 Cable (Coax, HFC, FTTH)
2 Satellite DTH
3 Terrestrial Transmission (including MMDS)
4 IPTV on Cable or Phone Wire
5 Broadband Internet to the PC on Cable or Phone Wire or Terrestrial Transmission
6 Cellular Transmission
7 Courier Pigeon – physical home delivery

Bolded numbers indicate mechanisms that single, 3rd party content distributors could a) realistically purpose build or b) provision content access independent of the service provider. All options are available for negotiated access.

Future mechanisms that will provide additional distribution opportunities include IPTV (internet protocol television to a STB) and mobile media (robust linear media capabilities for cell phones and PDAs).

2 Introduction

This paper seeks to identify a) the range of mechanisms and models used to distribute audio/visual media and b) the conditional aspects of each. The methods are articulated first by physical mechanism (capability) and then by commercial model (practicability). This distinction is made because aspects of multiple mechanisms are often employed under a single business model.

Media businesses are inconsistently classified by either technology (CableTV, DTH, IPTV) or consumer proposition (PayTV, Free-to-Air) and these classifications are mapped back to the "capability – practicability" structure of the document. Similarly, new protocols such as IPTV are captured in their own capabilities sub-section – as they provide distinct and new methods for delivery using old or existing physical media.

Each distribution method is presented within the following format:

a) Description
b) Architecture
c) Deployment (including Consumer Premise Equipment)
d) Australian Market

Examples are provided globally but discussed in the context of the Australian market.

The mechanisms described herein are the specific [and in some cases currently deployed] ways in which a business can distribute and monetise audio/visual media in Australia.

3 Expert Witness: Background & Qualifications

John Paul has a unique and extensive background in both broadcast and PayTV operations and management. He started his career in broadcast operations for NBC affiliated stations in the US and has subsequently served in a number of executive and hands-on management roles in the Australasian media industry.

From 1992-1994 Paul assisted Steve Cosser and the Broadcom group to create and launch Australis Media, Australia's first PayTV operation. Paul had responsibility for subscriber management and reported to the CEO, Neil Gamble. Paul resurrected the consulting arm of his father's media publishing business in 1995. From 1996 to 2000 Paul served in a number of contract roles for AUSTAR Entertainment and Denver, CO based parent, United GlobalCom (UGC) including Satellite Operations Manager reporting to the COO (96), Vice President, Operations for Asia Pacific reporting to the President of UGC, Mike Fries (97-00) and General Manager, Interactive TV reporting to the CEO, John Porter (98-01). In these roles Paul assembled a number of business initiatives including AUSTAR's satellite operations, UGC's Asia Pacific development initiative, Joint PayTV Transmission Platform (for Optus, FOXTEL, AUSTAR) and AUSTAR's interactive TV business. Paul also served as UGC designated member of the Board for French holding company SFCC (owners of Tahitian PayTV operation).

In 2001 Paul joined US based WOW Digital TV as Senior Vice President of Business Development and Digital Television.. Following the launch of services in 2003 Paul returned to build his consulting business and has since undertaken a number of multi-resource projects for Broadcasters and content platform service providers – including Canadian Broadcasting Corporation (CBC), Australian Broadcasting Corporation (ABC), ShadowTV (NY) and Artifex Inc (IN). Paul's opinions regarding media dynamics have been solicited in a number of periodicals and public speaking engagements.

Qualifications: Bachelor of Science, Business Administration and Finance
Minor: Communications
The American University, Washington, DC 1990

4 Definitions and Scope

For the purposes of this paper, audio/visual media is defined as 1) linear audio and visual content that is assembled in substantial form to comprise a discrete subscription business or consumer end product and 2) any aspect of audio/visual content (linear or non-linear) that can be assembled into a discrete and sustainable consumer product – such as Games, Interactive Information Channel or other assembly of content It excludes [as a core product] still images, text, print media and end-user software – unless they are assembled into a channel or substantial end product.

4.1 Media Consumption Mechanics (linear and interactive)

The businesses and distribution mechanics referenced herein have been structured predominantly for linear media and linear (programmed) consumption. Linear media refers to sound and images that are assembled for an end-user to experience as an identifiable whole [and not the sounds and images themselves] and where the whole has an intrinsic value as 1) a purchased product 2) an advertising space or 3) an identifiable unit cost of production [in the case of public broadcasters]. Linear (programmed) consumption is the viewing of linear media set out in a channel or fixed daily schedule established by the source programmer – and usually based on time-of-day demographics.

In the last five to seven years (from 1998) technology and user dynamics have facilitated new services offered within media consumer packages (particularly PayTV) but containing either a) assemblies of non-linear products or b) linear products that can be consumed on-demand. These products, like a linear channel, would require conditional access. For example, a games channel with access to six or more games or linear news stories accessed on demand. Linear media and on-demand behavior are not mutually exclusive – one is a description of the content and the other is a description of the interaction.

The aspect of media products that this paper does not cover is non-linear media that is not assembled into a discrete product. E.g. ad hoc access to pieces or bytes of media images, sounds, incomplete stories, smaller elements of a linear program, sound bytes, outtakes, unassembled news feeds.

Examples of linear media:

- Part of a linear stream that is assembled by a channel

- A news program – 60 minutes
- A TV program – "Desperate Housewives"
- A movie or program selected from Pay Per View [on-demand]
- A movie rented from a video store
- A song on the subscription audio portion of PayTV
- A CD purchased in a music store
- A song downloaded on the internet
- An entire program downloaded and viewed on broadband internet
- Streaming radio or TV viewed on broadband internet

Example of linear media and linear (programmed) consumption: TV channels – Ch 7, CNN, Nickelodeon

Examples of linear media – on-demand consumption:

- Sky News Active
- Renting a DVD
- Selecting and attending a live performance
- Pay per View movies

Examples of non-linear media whose elements are assembled into a discrete consumer end product and commonly offered within PayTV services using conditional access:

- Games channel – Two-way TV, LudiTV
- Interactive weather service
- Interactive horoscopes

Examples of non-linear media include:

- news clip that does not comprise a complete report or story
- sound byte
- ring tone
- image
- video extract

4.2 Elements of media distribution.

Each media distribution method is discussed in the context of the following basic elements:

Content	the product being carried by the delivery medium and received by the consumer
Content Protocol & Control	The method by which content is altered or packaged for transmission over a delivery medium. There may be several protocol used to distribute content over a single delivery mechanism and conversely a single protocol can be distributed via multiple delivery media. Content may be controlled by encryption protocols or distributed without encryption – "in the clear"
Delivery Medium	The physical mechanism used to provision the content to the consumer directly or to make content available for the consumer to access such as terrestrial transmission, cable, satellite.
CPE (Consumer Premise Equipment)	The devices used to receive, decode, store and display content. This may be a single device [in the case of digital subscription radio via satellite] or three separate devices [in the case of satellite payTV – satellite dish, receiver box, television].
Consumer Management	The system and procedures for managing subscriber data, particularly with respect to content rights - who is authorised to receive what and when. Necessary in a subscription model only. More commonly referred to as subscriber management.
Business Model	The commercial relationship with the consumer; Subscription Package, Subscription on-demand, Pay on-demand, pay per use, Pay per volume (# of uses, bandwidth or file size), Free. The model often dictates aspects of the technical architecture.

PLATFORM

The third, fourth and fifth elements constitute a "platform" because they are frequently owned by a single entity and provide discrete functionality, from content creation to end-user consumption. Platforms, subsequently, have substantial commercial value in function and relationship with the household.

4.3 Analog and Digital

The analog v. digital (and HD v SD) discussion is almost entirely academic for the purposes of distribution analysis. They are different protocol for delivering content – and while their use has significant impact on capability, quality and cost [to an service provider], a service provider may apply either protocol to most delivery media. Digital broadens the product offering; any given service provider will use digital if the advantages can be monetised (legislative mandates aside). The single barrier to digital conversion is cost; analog signals will remain in countries where low disposable income precludes expensive consumer equipment. Digital is required, by

definition, for content delivery to a computer however conversion can take place in either direction via consumer units.

In the end, consumers do not care (and often do not know) about how the content gets into their home.

4.4 Open vs Closed systems

The open/closed system discussion is also (almost) academic for the purposes of distribution evaluation – because, contrary to vendors exhortations, no system [after implementation] is truly open except the common computer protocol – TCP/IP. The reason for this is that complex distribution systems require changes to support individual businesses, countries and applications; once these changes are made the system is no longer standard, open or inter-operable. For example:

1. OpenTV Middleware was heralded as open standard, however the implementations that took place in the UK and Australia were very different and applications could not be swapped.
2. MHP is also heralded as an open standard middleware to facilitate interactivity. This is true only in theory as MHP is a written standard from Europe. The implementation of MHP by Sun Microsystems, for example, is not compatible [directly] with other implementations.
3. Australian PayTV service providers use DVB MPEG2 standards developed in the mid-nineties – the FTA networks in Australia are using a more recent implementation of DVB-T. These two streams are not directly compatible.

The open system debate should have no bearing on infrastructure options.

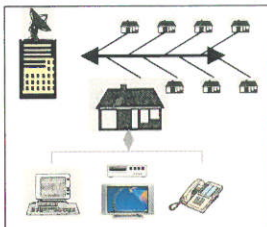
4.5 Consumer Architectures

Media products relate to consumers individually or in groups per the following:

Broadcast/multi-cast	one to many relationship where a single content package occupies a fixed amount of bandwidth and is visible to any powered, authorised device connected to the network.
Download/On-demand	one to one relationship where a consumer requests and receives a piece of content or service that occupies bandwidth for the duration of download and/or usage. Content in this case can be stored for use later and would occupy space on a storage device. Telephony is an example of an on-demand consumer service (although a monthly subscription fee also applies).
Hybrid (IPTV)	Usually a one to one relationship where downloaded, streaming content is unicast or multi-cast (in groups) over an IP network - disguised as broadcast content. Changing a channel is, in fact, [not switching broadcast streams but instead] ending one access and beginning another. This is used to simplify broadband computer interaction into a TV style interaction – see IPTV in the Protocols section.

5 Mechanisms – Delivery Media

5.1 Cable (excluding phone wire)

	Physical, two-way medium capable of carrying multiple, simultaneous products and protocols to the home in a one:many relationship. Average profitability threshold – 10 yrs.	Avg capacity Deployed Australia Protocols/ Products	10 – 100s mbps >250m homes >80 countries 2 major cable service providers w/ >800,000 subscribers Analog Digital DVB MPEG2 Digital IP (broadband) Digital IPTV Telephony

Cable is a physical medium linking service provider to home via a network of trunk and branch cable which can consist of:

- Coaxial cable — an electro-magnetic conductive core
- Fibre optic cable — strands of fibre using light as medium
- Hybrid fibre – coax (HFC) — a combination of both
- Fibre to the Home (FTTH) — fibre optic cable running all the way to the home

Content is distributed from a central location, via the cable to a consumer's receiver box.

Cable networks are capable of carrying a variety of simultaneous protocols due to their wide bandwidth and are used primarily in the paytv and telephony sectors due to the expense of construction. Cable is laid either underground or on utility poles and very rarely overlaps with another system's cable network. This is called 'overbuild' and has occurred (by exception) more recently in Europe, north Asia and Australia.

Cable has been the dominant distribution medium for subscription television and telephony, globally until satellite was introduced in the late 80's. Cable, like twisted pair telephony infrastructure, can deliver broadband internet, including IPTV. IPTV is problematic for coaxial cable networks but can be carried in FTTH. IPTV is discussed in the Protocols section 5.7.

ARCHITECTURE

Cable networks are designed for high density population areas and communicate with a consumer's receiver box – or directly to the TV in older systems – in a one-to-many relationship. There is a single signal that contains all of the services effectively broadcast on the cable and received by a consumer depending on that consumer's authorisation to receive (authorisation is also transmitted to the box). In older systems security (or consumer control) was managed by a physical device called a tap-lock which an installer would remove for actively subscribing customers. Currently, however, most content is encrypted at the cable headend and decrypted by the consumer receiver box – and displayed on an analog or digital television as required. In some cases the cable service provider [company that aggregates and sells content, deploys receiver boxes and manages subscriber relationship] will not own the delivery medium (cable network) but instead lease capacity from an infrastructure provider. In these cases the service provider will seek exclusive arrangements through equity

participation, capacity dominance or contracted terms. This practice is rare in North America and Europe but more common in north Asia and Australia.

Cable networks can carry the following protocols and products – simultaneously, if required. A Cable Service Provider may offer one or all of the products below:

1. Multiple channels of digital or analog streaming vision and audio (TV pictures, music, interactivity) using either analog or digital protocols like MPEG2 – delivered to a receiver box connected to a television. Commonly referred to as **Cable TV or PayTV**.
2. Broadband Internet connections from 128 mbps - delivered to a Personal Computer. Commonly referred to as **Broadband Cable**.
3. 2 Way voice telephony.
4. Dedicated data services (one-to-many) however most of these have been replaced by Broadband internet connections.
5. Multiple channels of digital vision and audio (TV pictures, music) using digital Internet Protocol (IP) delivered to a digital receiver box connected to a television. Commonly referred to as **IPTV** but very much a part of **PayTV** business models.

Items 1, 2 and 5 can be used to deliver linear media however #2 is more suited to capturing non-linear or bites of media due to its limited bandwidth, social dynamics of PC location in the home and complexities of PC operation.
Items 2 and 5 use identical IP protocol yet are packaged for different receive devices.
Items 2 and 5 are discussed in the protocols section 4.7.
Item 5 is discussed in more detail in the Phone Wire and Protocols sections.

Cable capacities have grown from 400 mhz (or roughly 50 channels) in the 1980s to 800 mhz systems (> 100 ch. Analog or >400 ch. Digital). New digital fibre networks can carry hundreds of megabytes of data per second- > 500 channels. Cable can also carry broadband internet connections, interactive applications, Pay per View content such as movies, NVOD, telephony, VoIP and IPTV – see Protocols section.

There are two exceptions to the one-to-many relationship of cable services. 1) Broadband connections provide a one-to-one data relationship yet are limited by allocated bandwidth and speed. 2) Cable Video on Demand systems can download a movie to an individual box yet more often use advanced techniques to either cache or carousel content to avoid single user delivery.

Consumer Premise Equipment

All modern cable systems require a receiver/decoder box ranging from US$35-$80 for analog boxes to US$150-$500 for digital boxes (with PVR). In most cases the cable service provider provides this box as part of a subscription service – e.g. the consumer has the right to use 'cable provider owned equipment' via contract, lease or rental. The box receives the signal over the cable, decodes the signal and presents the signal in a format understood by a standard analog TV or digital display device (depending on the box output and device input capability). The receiver box is necessary to provide all of the services identified above in items 1-5. Ancillary services such as broadband internet connectivity are accessed via a modem inside the box, attached to the box externally or in some cases entirely separate from the box. Although the latter case does not require the box – most cable systems [who directly provision both

products] require a PayTV subscription (and hence a receiver box) before they will supply a cable modem. That is, you cannot receive broadband internet without subscribing to PayTV. This situation does not exist in Australia where the providers of PayTV and Cable Broadband Services are different entities. In this case a consumer can get broadband without having to subscribe to PayTV. CPE can also include a telephone or IPTV receiver box if these services are offered.

DEPLOYMENT

Cable is very expensive to deploy – on average $US35k per mile and US$150 per customer drop (US$800 per drop for FTTH) – and most contemporary deployments use the wider band, more efficient fibre optic cable. However, cable always remains an option for a new service provider who wants to retain absolute security and offer a wide range of services. Cable can be very effective in small communities where the cost of running the cable is less expensive.

Alternatively, a content provider can strike a deal with an existing cable service provider to carry content. In this case the content provider would need only to assemble and deliver the channel in an appropriate format – see below.

Network deployment involves laying cable plant, purchasing content to on-sell, constructing a play-out and customer service headend and installing consumers homes with receive equipment. Additional equipment is required to provision telephony.

The following elements are required to deploy a cable system:

1. Permission and capital to lay substantial physical cable plant.
   Indicative Build Costs:
   - HFC US$25-30,000 per mile (including headend)
   - FTTH US$42,000 per mile (including headend)
2. Acquisition of content for consumer resell
3. Investment in and construction of distribution headend:
   a. Content reception, assembly and play out equipment
   b. Cable plant management
   c. Subscriber management and billing system
   d. Content encryption system
4. Customer Service facility – approx. 1 CSR (customer service representative) per 3000 subscribers.
5. Capital acquisition of receiver boxes to sustain projected installation rate. Box ownership can be retained by cable service provider to maintain rigourous network control or they can be sold retail. In either case the service provider must float a substantial inventory of boxes.
6. Capital to support content, maintenance and installation expenses for 3-5 years prior to profitability.
   Indicative cable plant maintenance costs:
   - HFC US$1,100 per mile per annum
   - FTTH US$1,200 per mile per annum
7. Any required licenses.

In the case of provisioning content over an existing cable network

1. An agreement with a cable service provider to distribute the channel or content

2. Content assembly and play-out facility ($100,000-$1m to build or $200,000 p.a. to lease/operate)
3. Presentation of content to the cable service provider in a suitable format – some hardware may be required to convert content ($50-$100k)
4. Possibly bandwidth costs.

The major impediments to deployment:

1. Incumbent service provider. Authorities are reluctant to authorise multiple cable builds due to environmental impact.
2. Cost of cable plant.
3. Cost of consumer receiver boxes (digital).
4. Available bandwidth

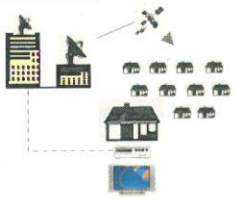
Advantages	Disadvantages
• Very secure • Capable of delivering multiple protocols and products • Capable of localization • Effective for densely populated areas • Large capacity • Capable of hosting new protocols like IPTV • CPE is broadly available from multiple vendors • Two-way capability	• Expensive and time consuming to roll out • Expensive to maintain • Susceptible to government mandated access regimes

AUSTRALIA

Cable is a viable and available technology for the delivery of all aspects of media content in Australia and all of the elements required for a business are readily available. There are no particular legislative barriers although a license is required and service providers must abide by ABA guidelines. There are also no standards issues for cable as it is an entirely 'closed' network however digital service providers have generally adopted MPEG2 compression. There are a handful of small cable service providers in Australia – outside of FOXTEL and Optus – Neighborhood Cable, Transact, AUSTAR in Darwin. FOXTEL uses Telstra infrastructure as part of an equity arrangement. The major hurdles for a metropolitan cable service provider would be a) permission to overbuild Telstra and Optus infrastructure and b) competition for homes in a small market dominated by large players. It is my opinion that this reason alone makes building additional metropolitan cable plant untenable from a commercial and approval standpoint. Regional cable builds, however, do not suffer from these challenges and remain viable options.

Alternatively, a content provider could avoid all operating headaches by establishing distribution with an existing cable service provider such as FOXTEL, Optus or AUSTAR. This is a simple and very common arrangement (see the business models section).

5.2 Satellite Transmission

	Space relayed, airborne, one-way medium capable of carrying multiple, simultaneous products and protocols to the home in a one:many relationship. Average profitability threshold – 8 yrs.	Avg capacity Deployed Australia Protocols	100-900 mb >60 m homes >60 countries 2 major DTH providers w/ >800k subs + handful of direct providers* Analog Digital DVB MPEG2 Digital IP

Satellite to the home or direct-to-home (DTH) is a widely deployed, space based transmission system that communicates directly with a receiver dish and box in the home.

Signals are assembled and transmitted from a service provider's headend to a geo-synchroneously (satellite remains in the same place) orbiting satellite that relays the signals back to earth over a wide area. The [frequency spectrum] bands currently in use by the satellites allow the consumer to use very small satellite dishes to receive the signals (45-120cm).

A Satellite behaves like a transmitter in the sky and is capable of carrying a wide range of services but is limited by the bandwidth of the components. These components are hardware which cannot be changed without prohibitively expensive space missions. The satellite configuration at launch is generally the configuration for the life of the satellite. The fixed nature of satellite bandwidth limits service providers to static media products – broadband internet is not an ideal product for satellite due its usage growth over time – e.g. growth in number of users and growth in amount of bandwidth used by each user. One way to overcome this limitation is to launch additional satellites and co-locate them with the existing satellite – where all of the consumer dishes are pointed. This is an effective yet very expensive way to expand the bandwidth available. New satellites cost between US$200m and $700m.

Satellite DTH is the second most prolific distribution mechanism for PayTV.

ARCHITECTURE

Satellite direct to the home (DTH) is designed to distribute a common content package over a wide geographical area to an unlimited number of receivers – similar to terrestrial transmission. The satellite is a transmitter whose antennas can be physically shaped to direct the transmission over a specific area – like a country or continent. Content is packaged and up-linked from a terrestrial headend – to the satellite – thence received by homes with a correctly pointed dish and authorised receiver box. Hardware specification and software-based, content encryption are the primary tools used to control the relationship and protect content. The consumer box decrypts the signal and displays it on an analog or digital TV as required (depending on receiver box outputs).

Content can be distributed in analog or digital and encrypted or unencrypted formats. Currently, however, most content is encrypted at the terrestrial head-end and

decrypted by the consumer receiver box – and displayed on an analog or digital television as required.

Almost all DTH systems worldwide are digital. In fact DTH subscription TV pioneered the application of digital to compress more content into existing bandwidth. Australia and South Africa were the first to launch digital video services in 1995.

Satellite networks can carry the following protocols and products – simultaneously, if required. A satellite service provider may offer one or all of the products below:

1. Multiple channels of digital or analog streaming vision and audio (TV pictures, music, interactivity) using either analog or digital protocols like MPEG2 – delivered to a receiver box connected to a television. Commonly referred to as **Satellite TV, DTH or PayTV.**

if a telephone return path is available (receiver box or computer is connected to a phone line for outbound internet traffic but receives inbound/download traffic from the satellite):

2. Broadband Internet connections from 56 kbps - delivered to a Personal Computer. This not a common product offering due to the dynamic bandwidth consumption of internet.

Satellites can carry enhanced TV, full interactive applications (if a telephone return path is available), Pay per View content such as movies, and other downloadable content.

The biggest limitation for satellite networks (unlike cable) is the lack of two-way communication [without the addition of a phone line]. The satellite receive equipment (box, dish, LNB) in the home is not powerful enough to send signals back up to the satellite so it is considered a downstream (one-way) technology only. Satellite capacities range from 200 mb to 900 mb or 40 to 500 digital channels – and this can be augmented by launching and co-locating additional satellites.

Most pay per view services on satellite are not video-on-demand (VOD). Due to fixed bandwidth limitations most pay per view offerings operate on a timed carousel where ordering an event authorises a consumer's box for a window of viewing. There are a handful of experimental systems that will download movies to a receiver box with a hard drive but the events would have to be ordered well in advance – but could be viewed at any time once they reside on the box's hard drive.

<u>Consumer Premise Equipment</u>

All satellite systems require a domestic receiver box (ranging in price from US$180-$500 – or as much as $500-$1000 with a hard drive) capable of:

a) translating the super high frequencies from the satellite to the lower frequencies of a TV set,
b) decoding the digital signal into an analog signal understandable by a normal TV set and
c) decrypting the encrypted signal according to the box's authorisation.

A receive antenna/dish is also required to capture the signal from the satellite.

DEPLOYMENT

Satellite PayTV deployment is similarly expensive to cable due to expensive lease arrangements for satellite capacity – yet is much simpler to establish when compared with laying miles of cable plant. It is unusual for a Satellite PayTV business to launch and operate its own space vehicles. Instead the service provider leases capacity from larger communications companies who are in the business of providing space-based bandwidth – and in this way satellite service providers do not own all aspects of their network. Managing space-based assets is highly technical; risk is usually spread across several components of a satellite if not several satellites (a constellation). Strict service agreements dictate the terms and structure of the relationship – as the satellite is the lifeblood of the service provider and the single link to potentially millions of homes.

Alternatively, a content provider can strike a deal with an existing satellite PayTV service provider or satellite operator to carry content. In this case the content provider would need only to assemble and deliver the channel to the terrestrial headend in an appropriate format – see below. Unlike cable, the content distribution deal in this case need not be with an existing PayTV business – but could, instead, be with the physical satellite operator. The ability to lease small amounts of spectrum on satellites with ubiquitous regional coverage allows a content provider to "get on air" and take direct responsibility for marketing and STB coordination. Many ethnic channels use this approach to 'go around' incumbent DTH service providers and establish a direct relationship with the home. Often, in these cases, the content provider will employ cheap, rudimentary conditional access or none at all. The consumer would be required to install a unique STB and possibly a separate antenna to receive the service.

A satellite resides in an assigned orbital slot and once the service provider begins installing dishes for customers it becomes effectively married to that orbital slot and and the company who owns it – unless the service provider undertakes a very costly re-pointing exercise to change satellites.

Deployment involves buying satellite space, buying content to on-sell, constructing a play-out and customer service head-end and installing consumer premises equipment.

The following elements are required to deploy a DTH system:

1. Satellite lease arrangement for sufficient bandwidth and regionally appropriate footprint (area covered by satellite) - US$25-75m per annum – based on 10-25 transponders carrying 10-15 channel each @ US$2-5m per transponder per annum.
2. Acquisition of content for consumer resell
3. Investment in and construction of distribution headend:
    a. Content reception, assembly and play out equipment
    b. Subscriber management and billing system
    c. Content encryption system
4. Customer Service facility – approx. 1 CSR per 2000 subscribers.
5. Capital acquisition of receiver boxes and dishes to sustain projected installation rate. Box ownership can be retained by service provider to maintain rigourous network and software control or they can be sold retail. In either case the service

provider must float a substantial inventory of boxes. [Receive devices for audio subscription services are much smaller and much cheaper.]
6. Capital to support content, maintenance and installation expenses for 5-10 years prior to profitability.
7. Any required licenses.

In the case of provisioning content over an existing satellite network

1. An agreement with a satellite service provider to distribute the channel or content
2. Content assembly and play-out facility ($100,000-$1m to build or $200,000 p.a. to lease/operate)
3. Presentation of content to the satellite service provider in a suitable format – some hardware may be required to convert content ($50-$100k)
4. Possibly bandwidth costs of approximately $500k per channel per annum.
5. Some type of encryption if dealing directly with the satellite operator (Optus).

The major impediments to deployment:

1. Cost of satellite bandwidth.
2. Availability of satellite bandwidth

For the service provider:

3. Cost of consumer receiver boxes (digital): US$180-500.
4. Licenses. In some countries the cost of licenses is prohibitive.

Incumbent service providers are not an infrastructure impediment to deployment (like cable) as overlapping satellite services/signal do not create environmental problems.

Advantages	Disadvantages
• Large coverage area – with single, space-based transmitter (access rural areas) • Overcomes most topography issues • Low maintenance • Readily available CPE • Unlimited receiver capability	• Cost of digital CPE • Fixed bandwidth limitations • Risks associated with satellites • No return path (one-way) • Not suitable for products with dynamic bandwidth requirements – like Broadband internet • No localization – one ubiquitous signal

AUSTRALIA

There are two Satellite PayTV service providers in Australia - FOXTEL and AUSTAR. They have independent businesses, areas of service, customer service and installation capabilities but share content, assembly, uplink, satellite and conditional access software.

There are no legislative or technical barriers for new content distributors to establish alternative DTH structures and/or to use different satellites to distribute content to the home. Additionally, the service provider would have to arrange its own encryption and CPE installation. There are a number of distributors who currently use this model...

1. in a business-to-business arrangement for specific content (SkyRacing, Pub Sports, TVN [see below]) or data (remote businesses, financial/business operating data, mining, etc.)

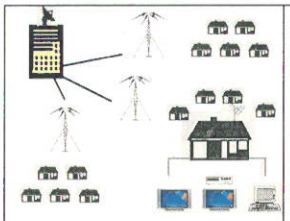
OR

2. in a DTH arrangement for the distribution of ethnic or narrowcast programming, which is often un-encrypted. TVN (ThoroughVision Pty Ltd – racing content) UBI (reincarnation of TARBS), BVN (Dutch), ERT (Greek), TVR (Romanian) and many other Asian services on PAS and regional satellites.

Australia has adopted DVB-MPEG2 standard for digital satellite and there are many vendors who offer compatible head-end and CPE equipment. A service provider may use analog transmission but this would not be the most efficient use of satellite bandwidth.

Similar to cable, a content provider could avoid all operating headaches by establishing distribution with an existing service provider such as FOXTEL or AUSTAR.

5.3 Terrestrial Broadcast Transmission (including Microwave – MMDS)

	Terrestrial, tower emitted, predominantly one-way medium capable of carrying multiple products and protocols to the home in a one:many relationship – usually employing multiple emission points (towers) Average profitability threshold – 8 yrs.	Avg capacity Deployed Australia Protocols/ Products	50 mb, 20 ch. >1 b homes >190 countries 3 commcl FTA's 2 public B'casters 1 wireless b'band service provider Analogue Digital DVB-T (COFDM) Digital IP

Terrestrial transmission is a widely deployed technology that uses parts of the radio frequency spectrum suitable for the stable transmission of images, data and sound over short distances - suited for densely populated areas. Signals are generally line of sight and emanate from a tower transmitter.

This mechanism is in use by Free to Air broadcasters, Wireless Broadband Internet ISPs, PayTV service providers [and formerly by narrowcasting, single channel ethnic services in the early nineties]. The latter two use much higher frequencies (microwaves) commonly referred to as MMDS (Microwave Multi-Point Distribution System). There are very few MMDS TV systems left in the world as most of them have migrated to satellite or cable for superior coverage and bandwidth.

Signals are assembled in a content head-end and distributed to a network of transmitters via satellite or trunk fibre provided by a telecommunications company.

Terrestrial Transmission is the predominant method of delivering FTA broadcast television and radio. It is also more recently been used to distribute internet data direct to users.

ARCHITECTURE

Terrestrial transmission is designed to deliver multiple channels of linear media or packet data to an unlimited number of receivers [within a transmitter's footprint] in a one : many relationship. However, internet data services use a one : one architecture and two-way communication. Signals are received by varying antennas (sold in a retail model) designed to operate in particular frequency bands. In some cases a television can receive signals through its internal antenna.

A common content package is assembled centrally and distributed to all of the transmitters simultaneously for immediate (pass through) transmission. The expense of this mechanism is the requirement for multiple transmitters and [usually leased] pipes to feed the transmitters. For example, the ABC uses a combination of Optus satellite and Telstra fibre to distribute signals to >300 transmitters around the country.

Terrestrial Transmission networks can carry the following protocols and products.

1. Single or Multiple channels of streaming vision and audio (TV pictures, radio, music,) using either analog or digital protocols like DVB- COFDM – delivered directly to a home TV/antenna. Commonly referred to as **Broadcast Television/Radio or FTA or Digital Terrestrial Television (DTT).**
2. Multiple channels of streaming vision and audio (TV pictures, radio, music,) using either analog or digital protocols like MPEG2 – encrypted and delivered to an MMDS antenna and receiver box. Commonly referred to as **MMDS or PayTV.**
3. IP Broadband data delivered to a receive antenna and modem. Commonly known as **Wireless Broadband.**

Terrestrial transmission networks can, in fact, carry any type of media and protocol however they are particularly constrained by terrestrial bandwidth allocations. Terrestrial transmitters must use an allocated slice of bandwidth carved out of a spectrum that is shared with aviation, public safety, marine, public transport, amateur radio and anyone else with a radio transmitting device.

Consumer Premise Equipment

There are three types of CPE employed by three associated protocol:

Broadcast Television/Radio	TV/Radio antenna
MMDS PayTV	Microwave antenna and receiver box
Wireless Broadband	Two-way Microwave Antenna and modem

DEPLOYMENT

A single transmission facility is simple and cost-effective to build – somewhere between $30,000-$500,000 [depending on size]; however, linking or feeding a multiple transmitter network can become complex and expensive. Terrestrial transmission is, generally, much cheaper than running cable or satellite and provides a rapid solution to network construction. Terrestrial Transmission's primary use is to broadcast free services to unlimited receivers without the cost of, or operating responsibility for, physical distribution plant [such as cable] and without the need for unique CPE. The low cost of radio and analog TV receivers makes terrestrial broadcasting ideal for developing countries as well.

A transmitter network is planned around population densities and topography. It is suitable for cities and towns due to its limited range (>70k) and requirement for line-of-sight. It is, therefore, subject to transmission anomalies such as atmospheric interference, structural interference and RF interference (interference with other radio frequency services). In all cases a common signal is distributed from a central headend to the transmitter network via satellite, fibre or microwave link. Local facilities can be established to condition content or delay the signal if required.

The following elements are required to deploy a Terrestrial Broadcast system:

1. Acquisition of RF spectrum (space) via license and/or purchase
2. Construction or lease of transmit tower(s) and transmitter boxes
3. Establishment of distribution pipe to towers
4. Establishment of service play-out head-end
5. Acquisition of content

In the case of MMDS PayTV and Data :

6. Acquisition of content/internet access for consumer resell
7. Distribution headend:
    a. Content reception, assembly and play out equipment
    b. Subscriber management and billing system
    c. Content encryption system
8. Customer Service facility – approx. 1 CSR per 2000 subscribers.
9. Capital acquisition of receiver boxes/modems and antennas to sustain projected installation rate. Box ownership can be retained by service provider to maintain rigourous network and software control or they can be sold retail. In either case the service provider must float a substantial inventory of boxes.
10. Capital to support content, maintenance and installation expenses for 3-8 years prior to profitability.

In the case of provisioning content over an existing network:

1. An agreement with an MMDS service provider to distribute the channel or content
2. Content assembly and play-out facility ($100,000-$1m to build or $200,000 p.a. to lease/operate)
3. Presentation of content to the service provider in a suitable format – some hardware may be required to convert content ($50-$100k)
4. Possibly bandwidth costs
5. In the case of broadcast free-to-air the content provider would have to work within an exiting licensing regime which would translate to a content sales agreement with an incumbent broadcaster.

<u>The major impediments to deployment:</u>

1. Cost of spectrum licenses
2. Cost of distribution pipes
3. Topography – hilly and mountainous terrain blocks signals

Terrestrial transmission is considered to be the simplest and most cost-effective delivery medium but one with many limitations.

Advantages	Disadvantages
• Relatively inexpensive to deploy • Unlimited receiver capability (anyone who can see the transmitter) • Lower risk of failure due to singular location of equipment • Localisation capability	• Large networks of transmitters expensive to maintain • Quality effected by distance, atmospheric anomalies and topography • Transmitters can interfere with one another

AUSTRALIA

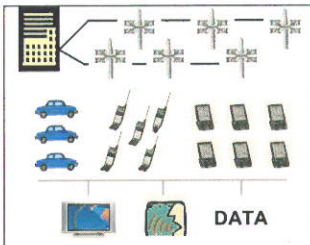
Terrestrial Transmission is in use widely throughout Australia for FTA television and radio - and for other commercial services using the 2.5ghz and 3.5ghz bands of the radio spectrum. In each case the spectrum and associated operating license must be obtained. Until recently PayTV service provider AUSTAR provided PayTV signals via 2.5Ghz MMDS network – until migrating all subscribers to satellite. Currently the 2.5ghz and 3.5 ghz spectrum is in use [or being contemplated for use] by two-way wireless broadband internet. The microwave spectrum is available for the delivery of linear services in analog or digital formats however arrangements would be required with the current license holders. Microwave was the first technology used to deliver

ethnic language, PayTV services in the late 80's/early 90's and remains a viable alternative for [niche] linear content providers today. A single content provider has two options for distributing products using terrestrial transmission in Australia:

1. Sell aspects of the content to an incumbent FTA broadcaster licensed under the Broadcast Act.
2. Lease 2.5 or 3.5 ghz MDS space and towers from current owners and organize CPE directly with the consumer. This was the model for ethnic broadcasters in the early nineties – Teleitalia, New World Chinese TV, ALB – Arabic and Lebanese Broadcasting. Analogue receiver boxes cost between $25 and $75.
3. If there were an incumbent MMDS PayTV service provider then negotiating carriage would also be an option.

Transmission standards have been adopted by the industry and compatible equipment is readily available. There are no specific standards issues that would preclude a service provider from utilizing terrestrial transmission.

5.4 Terrestrial Cellular Transmission (Mobile Media)



Terrestrial, overlapping, cellular, tower emitted, two-way medium capable of carrying multiple protocols to moving devices in a one:one and one:many relationship.
Average profitability threshold – 4 yrs. with existing cellular infrastructure

Avg capacity	Protocol dependent
Deployed	Limited users <15 countries
Australia	1 primary service provider in trial
Protocols	Analog GSM/GPRS DVB-H (tv) 3G proprietary

Terrestrial Cellular transmission is very similar to Terrestrial Broadcast Transmission, above, with one fundamental difference – it was not designed for linear media distribution. Therefore, the aspects and architecture discussed herein will be predominantly limited to the newly introduced linear media capabilities.

Generally, cellular networks are designed for moving reception devices (cell phones, PDAs, automobiles). The transmitters are smaller, more numerous, cover smaller areas (cells) and overlap to allow contiguous coverage. It is a widely deployed technology that uses parts of the radio frequency spectrum suitable for the stable transmission of voice, data and more recently images over very short distances for short periods of time - suited for densely populated areas. Signals are generally line of sight and emanate from a tower transmitter.

This mechanism is in use by mobile telephony/data operators and commercial telemetry operators (wireless meter reading, equipment monitoring)..

ARCHITECTURE

Each user is discretely identified by the network. Data (voice, images, text) is exchanged at the users request – with the exception of network communication (messages and network data) which is continuously delivered to interrogable devices. While cellular networks have been traditionally and exclusively used for voice and data, new generation phones and protocols allow the transmission of images and linear media – albeit in smaller pieces. In fact, the user dynamics of linear media on mobile devices are yet untested. A number of operators are offering live TV and video clips (mobisodes) but usage data is too small to form an opinion of consumer demand.

Additionally, there are a number of varying protocols used to distribute linear media to mobile devices – both in a one:one relationship and a one:many relationship. This dichotomy of methods provides a wide range of products and experiences – particularly in quality of image. Similarly, mobile linear architectures vary from method to method. For example, there are five primary protocols for delivering linear TV; the assembly and play-out functions of each may have different origins. More specifically, some phones are capable of receiving live broadcast television through a) an integral tuner, b) a DVB-H chip – a standard established for digital TV to mobile devices or c) an existing data standard, GPRS. Alternatively, a user can download a piece of content via GPRS or a proprietary 3G protocol like Verizon's (US) V-cast.

Currently, the technology is driving usage instead of the inevitable reverse. The business models range from free to subscription to subscription + download fee.

Mobile content is in its infancy and capabilities will be developed in conjunction with content providers.

The common denominator is a new and in some cases robust mechanism to deliver linear media to mobile devices. Successful content will most likely take two forms

- Existing strongly branded content repackaged for mobile device (ESPN, FoxSports, CNN, etc)
- New content created specifically for mobile phone/PDA viewers

The latter option may see some new and innovative content suppliers enter the market because the infrastructure providers (telcos) historically lack competence in content dynamics.

Terrestrial Cellular Transmission networks can carry the following protocols and products.

1. Analog voice (almost extinct)
2. Digital TDMA or CDMA voice/data
3. GSM voice/data + GPRS data
4. 3 G proprietary protocols – voice/data/ multi-media

for linear media:

5. Single or Multiple channels of streaming vision and audio (TV pictures, radio, music,) using an integral VHF/UHF tuner. One:Many broadcast.
6. Single or Multiple channels of streaming vision and audio (TV pictures, radio, music,) using an integral digital TV standard for mobile devices – DVB-H – Digital Video Broadcast - Handheld. DVB-H uses MPEG4 compression similar to many PayTV digital systems using MPEG2. One:many broadcast.
7. Single or Multiple channels of streaming vision and audio (TV pictures, radio, music,) using DMB standard – Digital MultiMedia Broadcast. One:many broadcast using terrestrial or satellite transmission.
8. Single channel/stream of linear vision and audio (TV pictures, radio, music,) OR downloaded clips using existing digital data standard- GPRS. – very slow, poor quality.
9. Downloaded clips of linear video/audio using a proprietary 3G standard such as (US) Verizon's V-cast.

Protocols 5 – 9 are referred to as **Mobile TV**.

Terrestrial cellular capacities [for linear media] range from 'painfully slow' to broadcast speed per the following:

- GPRS – 20-40 kbps (144kbps theoretical speed limited by handsets)
- Proprietary one:one (Verizon V-cast) – 400-700 kbps w/ 2mbps bursts
- DMB, DVB-H and integral tuner, one:many broadcast architecture – very fast – depends on broadcast bandwidth allocated to content.

Consumer Premise Equipment

CPE, or in this case, user equipment, is primarily mobile telephone and data devices – cell phones, PDAs, blackberry, etc, sold in a retail model. The mobile devices must be compatible with the network and protocol applied. This means that, in certain cases, new phones will be required with compatible firmware and chipsets.

DEPLOYMENT

The deployment of linear media onto mobile devices assumes an existing cell phone network which will not be discussed here. Cell phone networks are vast, expensive infrastructure including hundreds of repeaters and advanced network management software – and are not constructed for the sole purpose of distributing linear media (unlike satellite, cable and terrestrial broadcast). Therefore the only relevant deployment aspects relate to systems and software necessary to host linear media. Infrastructure providers own most aspects of a one:one network to insure proper communication – unless a broadcast model is used, which relies primarily on the phone or device.

Physical deployment costs depend on selected protocol. GPRS, for example, requires no incremental investment aside from media servers (@$50k each). DVB-H, however, requires DVB-H chips in the handsets and DVB-H multiplexing and head-end equipment. Assuming that the mobile telephony operator establishes the network equipment then the remaining costs relate to bespoke production and packaging of mobile oriented content. For example, Fox Networks is producing "mobisodes" of the Paris Hilton's "Interns" program specifically for mobile devices. Other content producers are re-distributing primary broadcast content, unchanged.

The following elements are required to deploy a mobile TV cellular transmission system – however not all elements are required for every protocol:

1. establishment of headend media players for selected protocol
2. establishment of multiplexing and network management systems (hardware and software) for selected protocol – cost not known
3. acquisition or production of short, packaged content

In the case of provisioning content over an existing network:

1. An agreement with a mobile telephony operator to distribute the channel or content
2. Content assembly and play-out facility ($100,000-$1m to build or $200,000 p.a. to lease/operate)
3. Presentation of content to the operator in a suitable format – some hardware may be required to convert content ($50-$100k)

The major impediments to deployment:

1. Availability of protocols on existing mobile telephony networks
2. Cost of re-producing content specifically for mobile phone environment
3. Lack of operators undertaking mobile TV initiatives (temporarily)

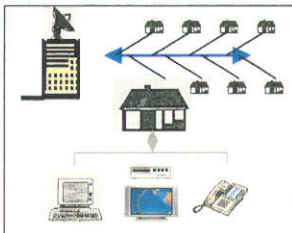
Advantages	Disadvantages
• Access to large user base • New consumption dynamic – mobile – opportunity to create new, dynamic-specific content • Low cost, new pipe for content providers • Opportunities for interactive media (SMS)	• Lack of deployed, compatible, consumer devices • Small screen with lower quality media • Kills device battery life • Potentially expensive head-end equipment for DVB-H standard

AUSTRALIA

Cellular transmission for mobile TV is a viable yet under-developed alternative to deliver shorter duration content – or content that is packaged for mobile users. Mobile telephony infrastructure was not originally constructed with linear media in mind and it is unlikely that a content provider would construct a cellular network for single product access. However, the networks that exist in Australia today are currently offering basic linear media access using GPRS and will be launching more robust protocols within 12-18 months. Optus and Telstra are the prime movers while smaller operators and reseller such as Orange, Voda Phone and Cellular One will be forced to adopt dominant methods. Telstra has launched a trial of the DVB-H standard with FTA and PAYTV content participants. It is most likely that cellular platform operators will behave like PayTV service providers and buy content to onsell to subscribers. Although the detailed commercial dynamics are unclear, it is apparent that mobile consumption of linear media is creating a new alternative for content distributors.

The jury is out however, on consumer behaviour and consumption habits with regard to live broadcast TV vs. purpose built content – like mobisodes.

5.5 Phone Wire/Twisted Pair (Broadband/IPTV)

	Physical, two-way medium capable of carrying multiple, simultaneous products and protocols to the home in a one:one relationship. Average profitability threshold – 6 years for IPTV/Broadband on an existing telephony infrastructre.	Avg capacity Deployed Australia	*Refer to protocols section* *IPTV/Broadband*
		Protocols/Products	Analog Digital voice Digital IP (ADSL broadband) Digital IPTV

Phone wire, or 'twisted pair', or POTS has been delivering voice communications for over 70 years – and is very similar to cable architecture. It is only very recently that a) digital data has been transmitted on an analog carrier (over the same wire) and b) a protocol has been developed to allow additional data to be carried on higher frequencies on the same line. This protocol is called ADSL (or Asymmetric Digital Subscriber Line) and effectively splits an existing line into two sections – one for voice and one for data. The ADSL protocol affords substantially more capacity for broadband internet and the newest application – IPTV – streaming multi-channel television using IP (internet protocol) over ADSL configured phone lines. This means that telcos can provide telephony, broadband internet and PayTV over the existing, single-line telecommunications infrastructure.

The relevance of Phone Wire delivery to the distribution of linear media is directly related [and limited] to the ADSL and IPTV protocols. Prior to the introduction of these protocols, telephony infrastructure was not an option for distribution of linear media.

IPTV is discussed in more detail in the Protocols section.

ARCHITECTURE

Phone wire is a physical medium linking the telco operator to the home via a network of trunk and branch cable, exchanges (or nodes) and twisted pair. The primary difference between (PayTV) coaxial cable and telephone twisted pair is the need for multiple exchanges to bridge and push signals into specific geographic areas due to the limited distances a signal can travel on the very small wires. The signal attenuates over long distances. There are, however, very few systems left that are exclusively comprised of phone wire; telephone exchanges can now be fed by any of the following methods:

- Coaxial cable — an electro-magnetic conductive core
- Fibre optic cable — strands of fibre using light as medium
- Hybrid fibre – coax (HFC) — a combination of both
- Satellite

The ADSL protocol affords the delivery of linear media via conventional two way broadband or streaming, multi-channel IPTV. And there will most likely be a hybrid product that presents a lean-forward, interactive ,internet experience and a lean-back

TV experience – at the user's discretion. An IPTV network that sits on telephony infrastructure is a virtual PayTV system that can be structured freely. IPTV can accommodate multiple PayTV vendors that are separated virtually (and subscribed separately) – as long as bandwidth constraints are minded. A multiple vendor structure on an IPTV/ADSL platform is, however, unlikely due to the infrastructure owner's desire to gate-keep the consumer relationship and associated revenues.

Telephony infrastructure [irrespective of product - telephony, broadband or IPTV] discretely identifies each user and provisions service based on a combination of subscription and usage. Infrastructure has been widely deployed over almost a century and is ubiquitous in 1st world countries. The ADSL protocol however (due to the higher frequencies used) cannot reach all homes attached to an exchange. ADSL attenuates much quicker and is therefore suited to densely populated areas.

Phone Wire networks can carry the following protocols and products – simultaneously, if required. A telephony operator may offer one or all of the products below:

1. POTS, 2-way voice, fax and data (dial up internet) using a domestic telephone, facsimile or dial up modem. Commonly referred to as **Telephony**. Specific voice protocols not listed.
2. ADSL Broadband internet connectivity. Commonly referred to as **ADSL Broadband.**
3. ADSL delivered IPTV using an integrated computer/receiver/decoder box attached to a TV and structured for one-way, one:one streaming but capable of two-way. **IPTV.**

Typical telephony infrastructure capacities:

POTS voice/data	56 kbps
ADSL upload	100-200 kbps - approximately
ADSL download	up to 20mbps

Consumer Premise Equipment

CPE depends on the product being received and ranges in cost from $20 for a basic telephone (for voice services) to $500 for advanced PVR enabled IPTV receiver/decoder box (for PayTV services). More specifically

Voice	domestic telephone
Data	facsimile machine, dial-up modem - $50-$200
Broadband ADSL	DSL modem - $80-$150
IPTV	integrated computer/receiver/decoder box $200-$1000

In almost all cases the CPE is consumer purchased and owned, however this model may shift with IPTV. IPTV can be offered using a PayTV subscription model which may include a leased receiver box.

DEPLOYMENT

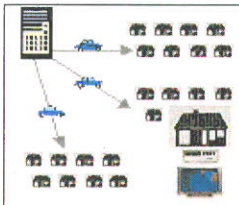
The deployment of linear media onto phone wire assumes an existing telephony network which will not be discussed here. Telephony networks are vast, expensive infrastructure including thousands of kilometres of wire and advanced network management software – and are not constructed for the sole purpose of distributing linear media (unlike satellite, cable and terrestrial broadcast). Therefore the relevant deployment aspects relate to systems and software necessary to host linear media – which is discussed in the protocols section for IPTV and Broadband ADSL.

AUSTRALIA

Given that content distributors will likely use an established telecommunications operator it will a) be up to one or more Australian telecoms operators to implement ADSL/IPTV and b) be up to content providers to negotiate carriage – unless the operator 'opens' IPTV. Currently IPTV is not substantially deployed in Australia and only Telstra is making noises about its launch. TransACT cable in ACT have conducted a limited deployment.

Please refer to the Protocols section below for more information on IPTV and Broadband – as these options span several delivery media.

5.6 Courier Pigeon

	Manual, courier based, one-way delivery of DVD content directly to the home. Average profitability threshold – unknown	Avg capacity >100 terabytes Deployed ≈15 countries Australia 1 large business several smaller Protocols/Products DVD home delivery

Courier Pigeon is any manual method of delivering content directly to the home ON a physical medium – such as DVD. A person physically arrives at the consumer's home with a selection of content previously chosen by the consumer. The fastest systems can deliver content overnight – which may be a bit slow for some consumers but there is no faster or broader broadband service that can deliver the volume of content (usually movies) into the home. Only future deployments of IPTV will approach the volume of physical delivery. The only limit to this type of content is the physical amount of time a consumer has in a day to consume the content.

ARCHITECTURE

Home delivery services usually allow the subscriber to choose a maximum number of movies per day/week/month based on a subscription fee or a subscription fee + smaller usage fees. The 'subscription only' model is predominant. Consumers can often choose the frequency of delivery and are obligated to mail back the DVDs within a reasonable amount of time. Delivery services also boast no or low late fees to attract subscription.

DVDs can be delivered via courier or government post depending reliability.

Delivery service providers either directly own or lease large libraries of movies which are physically stored in central locations for rapid dispatch.

Consumer Premise Equipment

The only CPE required is a DVD player.

DEPLOYMENT

Deployment for an service provider requires the following:

1. Access to a large physical DVD library at a substantial cost – similar to the investment required of a large DVD rental store multiplied by >ten.
2. Reliable, rapid distribution
3. Subscriber and inventory management systems
8. Customer Service facility – approx. 1 CSR per 3000 subscribers + web interface

In the case of a single content provider – this is not a viable platform to distribute content unless the content can be sold into a DVD title library. However, it is a very viable alternative for movie rights holders and library owners.

The major impediments to deployment:

1. Consumer awareness - marketing

Advantages	Disadvantages
• Very secure • Huge capacity • Effective for densely and sparsely populated areas alike	• Expensive DVD library arrangements • Limited to predominant medium – and associated CPE • May lose out to future deployments of IPTV

AUSTRALIA

Telstra's BigPond Movies is the dominant player with a handful of other businesses not far behind – such as Hoyt's Homescreen Entertainment and V2.

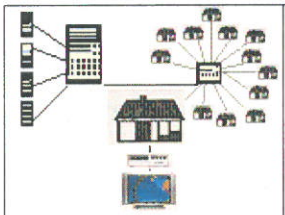
A content provider would have to establish its movie titles as part of a label or specific library to become part of deliverable DVDs. These mechanics are particular to film industry and are not discussed herein.

5.7 Internet Protocol (IP) – Reshaping into Delivery Mechanisms

The two protocols discussed in this section can be carried by several of the physical media identified in Section 4 yet form their own unique methods of delivery due to specific capabilities and architectures. Subsequently [and more in the case of IPTV] these protocols are the new delivery mechanisms supporting 1) conventional business models such as PayTV and 2) evolving on-demand business models.

In summary, the loose set of rules that guides the communication of the internet is being traded (and upgraded) for hardware that affords the operators more control over how content gets into and out of a user. This increased control removes inconsistencies in communication thus allowing better quality delivery of high bandwidth media.

5.7.1 Digital Broadband IP to the PC



Protocol for delivering user-accessed, open standards data to a PC in a one:one relationship with speeds >128 kbps
Average profitability threshold for ISP – 4 yrs; for content – varies by model

Avg capacity	128 kbps – 2mbps FTTH 1-10 mbps some countries greater
Deployed	>100m lines >50 countries
Australia	Numerous service providers Telstra and Optus largest
Protocols/ Products	Digital IP

Broadband Internet can be carried by almost any of the mechanisms identified above and provides speeds in excess of >128 kbps. The growth of broadband networks and consumer adoption has afforded a more robust, albeit inconsistent, forum for media distribution. Broadband is, itself, a service using internet protocol. The use of Broadband Internet to describe a business usually refers to the access service and not the content – because it operates on a one to one basis – like telephony. A user can access any individual content by specifically requesting and communicating with an address. A consumer can obtain content via download or access to broadcast/multi-cast (or streaming) media – both are considered on-demand behaviors.

This provides an 'open' and unlimited content access environment – unlimited in the sense of choice not bandwidth Greater download speeds have facilitated a broader use of on-demand linear and non-linear media – particularly video. A content provider does need to negotiate carriage but can, instead, set up its own media server for users to access. If a content provider wants to be a part of an existing, branded destination that has already built a strong user base then it would negotiate carriage with this destination. In some cases popular destinations purchase content to attract traffic (like many of the portals) – and in other cases content providers put their content up for free to attract traffic and hence advertising dollars.

ARCHITECTURE AND DEPLOYMENT of broadband networks is not specifically covered by this document but instead discussed in the context of the physical mechanisms carrying broadband – above.

The content architecture, however, demonstrates the flexibility of distribution. Content is digitized and stored on a media server – which can be located anywhere and accessed by anyone in the world with a broadband connection. Multiple users can access content on a media server at the same time but too much traffic could overload a server. Content aggregators have media server farms with large capacities. The size and amount of content is dependent on the size of the server, average connection speeds [along the entire network] and PC capabilities to display and store the content. Because these aspects vary greatly, Broadband internet is suited for short, smaller (or lower quality) bites of content. Longer, linear content can be downloaded and stored for viewing later but download times can be quite long. There is also a substantial amount of pirated content available – content that has been illegally transcoded into digital and made available for download. Protecting content in an open standards environment is very difficult.

More recently (last two years), advances in network hardware and architectures have vastly improved data speeds over ADSL networks to an extent which may allow high quality viewing of linear media on the PC. Some of the specific technologies and vendors are discussed in the following IPTV section.

Some specific mechanisms used to distribute content via Broadband IP to a PC:

1. Download – making a piece of content (file) available on a server for users to download and keep on their own PCs. In some cases the download file may be time-limited where it becomes unusable after X number of days – using DRM (digital rights management) software.
2. Streaming – a file is played over and over or transcoded live for a user to experience rather than store. It is possible, with advanced software, to capture and record the stream but most users would have this capability
3. Podcasting – a recent application of scheduled downloading where a user's podcsting software is configured to search for specified content on a regular basis and capture the most recent version. Podcasting was originally conceptualized for subscription to music products but rights issues have delayed this application. Instead Radio is making the most use of it by advertising Podcasts of recent radio programs. A user can subscribe, automatically download and listen (post-broadcast) to favourite programs. This has allowed radio broadcasters to extend their reach and value of the content by extending its life.

Consumer Premise Equipment – CPE is a personal computer and a broadband modem.

Deployment for a content provider requires the following:

1. Content assembly facility ($100,000-$1m to build or $200,000 p.a. to lease/operate) – less if used exclusively for broadband.
2. Establishment of media servers and digitisation of content – onto media servers ($15-50k per server)
3. If content is sold or metred per use – then server software to manage user access and billing is required

To place content on an existing destination or media server group:

4. An agreement with a broadband content aggregator to distribute content

5. Presentation of content to the service provider in a suitable format – some hardware may be required to convert content ($50-$100k)

Deployment of an entire broadband network to distribute content is beyond the scope of this document however some aspects of upgrading existing networks for faster speeds is discussed in the following section, IPTV.

The major impediments to deployment : - There are very few impediments to deploying content on broadband because content can be deployed in many forms and levels of quality. The major problem with broadband is the disparity in network quality – providing a different experience for different users.

Advantages / Disadvantages [limitations]

Advantages	Disadvantages
• Massive user base • Very flexible • Cheap and simple to setup and distribute content. • Viral in nature – if content is good and placed well within search engines it will be found and communicated rapidly • Opens the door for specific applications such as VoIP and IPTV.	• Disparate quality • Breadth of offering on broadband internet requires aggressive branding, marketing and high quality product. • Difficult to protect revenue generating content from illegal access and distribution. • The computer is generally located in a non-living area of the house like an office where certain content genres are more likely to be used – news, factual, short entertainment. Watching movies or feature length program episodes is more likely to take place in a living or family room. • The computer is a VERY user unfriendly device for navigating and watching linear content. The potential for interruption is large.

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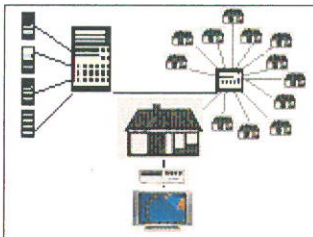
There are numerous Broadband Access providers (Telstra and Optus dominate the market) and even more content aggregators. There are endless places on the web to proffer content however capability limitations restrict most linear media to short or low quality content – when compared with digital PayTV or IPTV. Additionally, the location of the PC in the home [and the dynamic of the device] is not conducive to feature length content consumption. Therefore, the plethora of opportunities available on broadband must either be exploited with purpose built (edited) content or directed into more effective mechanisms such as IPTV. The former is happening very effectively with on-demand and advertising revenue models. Some examples of linear content offerings on broadband include:

- RealNetworks – Streaming/downloadable live news, sports, short films, entertainment
- CinemaNow - rent or buy downloaded movies. Rental costs US$2-4.00 for 24-48 hours.
- ClickStar – not yet launched – JV between Intel and Morgan Freeman's 'Revelations Entertainment' for the provision of downloadable movies

- Thousands of download sites where the user takes copyright responsibility – TV Central – for TV show, sitcoms and movies.
- Internode (Aus) has announced a VOD service for 2006 using its ADSL2 network and effective IPTV.

5.7.2 *Digital IP for TV (IPTV)*

	Broadband IP based method of delivering streaming, linear media using one:one relationship disguised as one:many via cable or phone wire. Average profitability threshold – unknown	Avg capacity Deployed Australia Protocols/ Products	2-6 mbps home penetration unknown 9 countries not yet deployed Analog Digital IP - TV

IPTV is the application of new hardware and specific network architecture over existing Broadband IP networks – using ADSL and FTTH – to deliver multi-channel, linear media to the TV (not the PC). The loose set of rules that guides the communication of the internet is being traded (and upgraded) for hardware that affords the operators more control over how content gets into and out of a user. This increased control removes inconsistencies in communication thus allowing better quality delivery of high bandwidth media. Additionally, the relative improvement in media quality can be scalable – e.g.,there are solutions, short of wholesale network upgrade, that afford enough of an improvement to allow consistent linear media delivery. In some cases, a single piece of hardware at a network point can enable control and quality improvement. However, most implementations to date relating to multi-channel PayTV are much more substantial.

IPTV is a very new technology and has the capability to combine aspects of traditional television with on-demand, interactive aspects of broadband internet where appropriate. It does not change the dynamics of content supply in a particular market but can provide a more flexible means of delivery for operators seeking the triple play – telephony, data and television. While cable operators have been pursuing the triple play for over seven years – and have networks capable of passing all types of high bandwidth data, the telecommunication operators have been struggling to make their data-centric architectures accommodate entertainment media – until now.

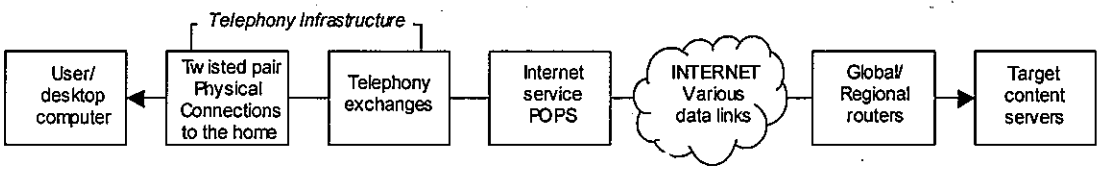
ARCHITECTURE

The distribution architecture of an IPTV system is largely dependent on the architecture of the delivery mechanism, when physical characteristics and attenuation are considered; yet IPTV maintains a more conventional architecture with respect to content and customer management. Characteristics of the delivery mechanisms – such as the rapid attenuation of higher frequency ADSL signals over distances – are discussed in the individual mechanism section. Secondly, IPTV architectures are too complex and immature to discuss in detail for the purposes of identifying content distribution mechanisms. Therefore, only the fundamentals are discussed below.

The primary problem with normal broadband is lack of control and ownership of the various links in the network chain – thereby delivering varying levels of quality. IPTV requires a much more closely managed structure to insure that video arrives in TV form: uninterrupted and good quality. The idea behind IPTV is to use IP methods and structures to deliver content but with new more tightly controlled architectures

and hardware. Each box in the diagram below is theoretically operated by a different entity. While broadband networks have theoretical capabilities they are, in fact, limited by individual components that may not operate to theoretical standards. Additionally, simulating rapid channel changing would be impossible in the following structure.

Simplified Internet Chain

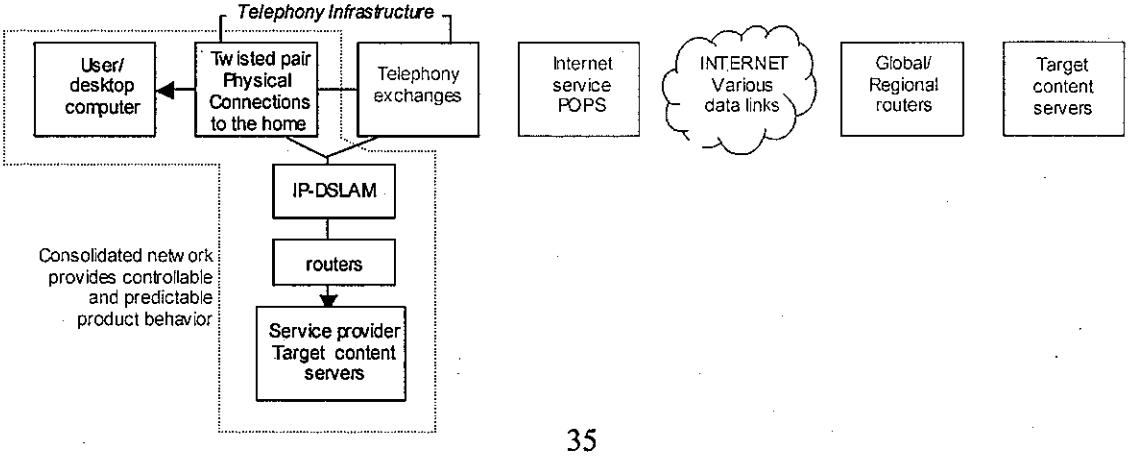


An IPTV service provider achieves a more tightly controlled architectureby applying any or all of the following methods::

1. Owning the telephony and ADSL infratructure so that it is free to impose new architectures or…
2. Installing specific hardware (IP-DSLAM- see below) that bypasses existing telephony infrastructure and affords direct connectivity to a broadband network.
3. Implementing security that either protects the connection itself between media servers and the user or employs a conditional access system that encrypts and decrypts content. Current systems that rely on the former will most likely be integrated with the latter [at the request of content providers].
4. Installing smart network technology that a) knows where to make multi-cast, channel groups available to preserve bandwidth (IGMP) and b) uses advanced path routing to make delays in stream access unnoticeable.
5. Deploying a smart receiver box that presents the media server content in a channelised TV form and reduces exposure to network issues.
6. Any combination of 1-5 above.

While there are a variety of possible architectures it is apparent that there are two emerging operating dynamics: 1) the telecom infrastructure operator who is free to implement new architectures and 2) Broadband ISPs and IPTV operators who [currently rely on aspects of telecom infrastructure but] want to bypass teleco operators and their, sometimes, cumbersome networks. In both cases the chain of components is consolidated and localized. Aspects of the two dynamics are contained in 'DEPLOYMENT' below.

Simplified Internet Chain - IPTV



From a content standpoint, IPTV uses a combination of unicast (one to one) and multi-cast (one to more) modes to allow consumers – via an HTML set top box – to access media streams efficiently. In the case of VOD the relationship is one to one however multiple channels must be grouped into multi-cast streams (or groups of channels) that can be accessed by the user but are only provisioned to an area, host, or router when requested [or "sniffed out" by a user request]. Without this grouping the multi-channel content delivered to individual users would overwhelm the capacity of an ADSL network. This complex functionality is neatly packaged into a set top box that appears as if it is changing channels.

Download capacities of typical ADSL networks are between 512 kbps to 6 mbps and HFC/FTTH 10 mbps to hundreds of mbps. Newer ADSL2 and ADSL2+ networks can reach speeds in excess of 20 mbps. This equates to systems that can handle between 25 and 100 channels. More channels would be possible on cable networks if the IP traffic were the only traffic carried. Content is assembled (and converted/transcoded if necessary) and placed on media streamers.

Consumer Premise Equipment

IPTV STBs are effectively computers packaged into a 'living room' compatible device – similar to current PayTV boxes. STB capabilities and standards vary widely among vendors because 1) in many cases the specifications are theoretical and 2) IPTV is a very new application of broadband.

The job of an IPTV STB is to simulate the conventional user dynamic of changing channels while the box and network navigate a complex hierarchy of streamed, grouped and downloaded content.

DEPLOYMENT

It is very difficult to discuss actual deployment characteristics due to the complexities of architecture and lack of commercially disclosed information. However, fundamental deployment requirements are setout below.

Full deployment involves contracting advanced network systems/software with an integrated STB solution and layering the necessary architecture over an existing ADSL or FTTH network. Most of the system is software and smart firmware in components like routers, hosts, etc.

A less than full deployment could entail the installation of specific hardware to improve how multiple media streams are handled for a specific group of users. One of these 'smart' devices is an IP- DSLAM (Digital Subscriber Line Access Multiplexer). The IP-DSLAM is not a magical piece of hardware that any content provider can set up and have any number of users access, like a server. It is a specific stream-handling box that can be implemented by an ISP/IPTVP in adequate numbers across a broadband network. It allows the user to bypass the telecom ADSL structure and access controlled content directly from the IP-DSLAM network operator – who is normally an ISP committed to some manner of linear media delivery or higher speed

broadband content. The dynamic is similar to the user relationship with multiple dial-up ISPs via the existing twisted pair. There are many complexities with IPTV architectures and conflicts between the telecom and ISP could arise. Currently, in the US there are raging debates over multiple providers accessing singular teleco-owned broadband networks. Advanced IP-DSLAM and other similar technologies may make these debates academic.

While the IP-DSLAM approach is attractive to non-teleco operators it does not achieve the same control and improvement that wider network upgrades or new systems offer. Faster speeds over ADSL broadband do no equate to IPTV on its own – it must be packaged with a TV compatible STB and multi-channel offerings. It does, however, mean that the teleco provider is not going to be the default or exclusive IPTV service provider in a market – and IPTV service could pre-exist a full telecom network roll-out..

The service provider's challenges notwithstanding, a content distributor could approach distribution in exactly the same way as it would any other PayTV operation. The major difference is the opportunity to access superior VOD capabilities of IPTV.

The major impediments to deployment :

1. Cost and complexity of IPTV headend software – currently only offered by a handful of vendors
2. Quality of ADSL network and existing twisted pair.
3. Successful productisation of the STB front end for ease of use.
4. Existing investments in PayTV businesses may make new infrastructure unappealing without a specific new revenue stream.
5. There are no specific impediments to content distribution deals on IPTV

IPTV delivered via telephony infrastructure is considered to be the most flexible and effective protocol for linear media and other combined multi-media content – to one device. It is also, however, a relatively new medium that must still prove itself commercially.

Advantages / Disadvantages [limitations]

Advantages	Disadvantages
• Very flexible product structure – combines aspects of broadband with TV • Utilises existing physical infrastructure • Provides new competitive service providers (usually telcos) to sell content to • Non-infrastructure owners can also build capability with direct DSLAM architectures • Vastly improved VOD offerings	• Requires substantial investment in new headend software and network architecture • May not introduce new revenue stream for markets where telcos are already operating PayTV systems

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There are currently no full IPTV deployments in Australia however there are a handful of broadband ISPs who are building overlay networks to provision IPTV content speeds. These ISPs are, in some cases, substantial telco operators and will

most likely be the first proponents of IPTV 'style' functionality using direct DSLAM hardware. Telstra have been planning a potential IPTV launch but have not made any substantial operational commitments. It is very conceivable that IPTV initiatives could be launched specifically for delivery of VOD. . Generally, telecommunications and internet operators are highly incentivised to introduce IPTV due to bundling opportunities.
Some of the ISPs/telco operators who have taken 'first steps' to accommodate IPTV speeds on their networks – independent of major carrier's networks:

1. "In an Australian first, **Adam Internet** will use a utility company's fibre optic cables to offer ADSL broadband with larger download limits and at higher speeds. It will use energy utility ETSA Telecom's fibre-optic cable to avoid Telstra's expensive backhaul to exchanges, where it is installing DSLAMs capable of providing 24Mbit/s ADSL2+ speeds. The new ADSL2+ services will be available in early 2005 with the rollout complete by August. People living within a kilometre or so of an Adam-enabled exchange should be able to get speeds up to 24Mbit/s. Most other people will get speeds around 12Mbit/s - still faster than the best residential broadband available today. In an agreement with ETSA Telecom, Adam Internet will have fibre links to most exchanges in the Adelaide area by May 2005. It will cost $9.6million to install DSLAMs into the 24 exchanges, with the fibre links ensuring it will almost completely avoid the Telstra network."[1] Current deployment information not available.

2. **IINet** has recently announced that IPTV will be part of its 2006 strategy. iiNet is now the third-largest ISP in Australia, with c170,000 DSL subscribers, c40,000 voice customers, and c280,000 narrowband subscribers, and in New Zealand, with c13,000 DSL and c100,000 narrowband subscribers. iiNet has announced the next phase of its DSL deployment that will enable a total of 211 exchanges by the end of CY 05, and a total of 400 exchanges by the end of CY 06. iiNet estimates that post December 2006 it will be able to service c65% of its customer base using its own DSLAM infrastructure.

3. **iPrimus**, while not publicly announcing IPTV plans, is building additional infrastructure capable of delivering rich media products. In December 2004, iPrimus committed to spending $60m on a nationwide broadband network. The proposed rollout is to take two years, with $30m spent on installing 150 exchanges with DSLAMs by June 2005, and a similar programme to be undertaken the following year. Primus currently has 208 Points of Presence across the nation, optical fibre in the CBDs of Melbourne and Sydney, and 40 DSL exchanges in various CBD inner suburbs, designed to offer net access speeds of around 2 to 8 megabits per second. Primus Telecom is Australia's fourth-largest fixed-line telecommunications carrier, with approximately 280,000 narrowband, 95,000 DSL and c300,000 full service voice customers.

4. **Internode** (Aus) has announced a VOD service for 2006 using its ADSL2 network and effective IPTV. In addition to exchanges across South Australia, the ISP hopes to roll out equipment to enable ADSL2 across another 35 to 40 exchanges in metropolitan Melbourne, Sydney, Brisbane and Adelaide by September 05. "Echoing comments by iiNet chief Michael Malone last week, Mr

[1] Adam website

Hackett said Internode hoped to establish content deals with movie providers so it could deliver video-on-demand services. "The only way that we can compete in DVoD is to build it ourselves, and that's a lot of what this is about," Mr Hackett said. The ADSL2 service would be sufficient to enable Internode to compete with the likes of Foxtel Digital, he said. "Speeds of 12Mbps don't have so much to do with downloading that Linux file faster. It's much more to do with television."[2]

IPTV will likely follow European initiatives and be introduced to Australia within three to five years - but may serve a complimentary role [to PayTV] in the form of VOD.

Some of the European installations that foreshadow Australia's adoption:

- France – France has undertaken the most substantial deployment of IPTV with France Telecom and TPS - 80 channels and a potential reach of 4m homes. Subscriber numbers are not available. Operators neuf Telecom and Free have also launched substantial IPTV offerings with the latter offering 40 channels.
- Italy – Fastweb started in 1999 and launched IPTV in 2001 (according to its own press). As of 03/05 it had 542,00 subscribers to basic services (approximately 12 channels) with 40% penetration of a higher tier with more channels.
- UK - Homechoice
- Spain - Telefonica
- Canada - Bell Canada
- Scandinavia - Telenor
- Iceland – Telecom Iceland

IPTV could conceivably be the single largest competitive threat to existing media delivery models, like satellite PayTV, because it leverages an existing protocol and infrastructure. The extent to which additional infrastructure is needed becomes the operator's primary challenge. At a minimum, IPTV could be a substantial and viable alternative to current distribution mechanics – particularly for VOD and niche programming.

[2] Australian IT- Aug 31, 2005

6 Models / Products

The following sub-sections outline the business models employed to distribute linear content over the physical mechanisms described above. These models are the commercial execution aspects of the mechanisms and provide the outlets [in real terms] for content. In other words, the technology is academic without sustainable commercial activity.

The pursuit of various business models has developed an evolved content supply market including:

high demand – broad appeal (movies, sports, kids)
high demand – narrow appeal (arts, ethnic)
high demand – long viewership (movies)
high demand – short viewership (news, music)
mid-low demand for broad audience etc.

Every content distributor wants money for their content (either directly or through ad revenue) but due to oversupply the consumer value may have to be developed over time. This means paying someone to distribute the content 'for exposure' with the hope that it will become a high demand product. This type of content is often referred to as 3rd party access because neither the platform service provider nor the channel knows where the content will go. The channel, by definition, has more confidence in its product and is willing to fund distribution.

The reverse of this situation is established, high-demand content that is sought by platforms to draw consumers. In this case the content supplier is frequently courted to supply its content to new platforms – such as mobile TV and IPTV.

6.1 Subscription (Pay) TV/Radio Service [to the end-user]

PayTV service providers have successfully aggregated high demand content and built infrastructure to deliver this content into the home. PayTV includes IPTV, Satellite DTH, Cable and MMDS. The PayTV business model is particularly relevant to linear content distribution because it is the most prolific and commercially successful model to date – outside of store bought content. PayTV service providers purchase content in channel form on a 'per subscriber - per month' basis and package this content into monthly subscription products.

The value proposition for the consumer:

1. Variety of linear content/channels
2. Appealing packages of content that cater to specific genres and demographics.
3. Clear reception – in some cases DVD quality digital reception
4. Uninterrupted movies and feature presentations
5. Additional services such as on-demand, interactivity, internet connectivity

A PayTV service provider will assemble a content offering with three strategies:

1. core genres and channels – news, sports, movies, kids – 'what will make consumers subscribe ?' This includes premium movie and sports content.
2. other channels to round out offering – general entertainment, documentaries, special interest - 'what will make consumers stay with the service ?'
3. 3rd party content that is offered based on bandwidth availability – that may not be considered part of core content/value strategy. The content provider normally covers the service provider's costs (at a minimum) in this scenario.

These three approaches to content aggregation and the subsequent commercial success of the primary service provider are what provide opportunities for content distributors.

6.2 Broadcast TV (free-to-air)

Broadcast Television is linear media presented for linear consumption at no charge to the consumer – funded by advertising.

The broadcaster purchases content based purely on demand and fiercely battles for consumer viewership to make the broadcaster's ad proposition more valuable.

Broadcast TV and Radio is a good opportunity for program content distributors but not whole channel distributors – due to the single channel nature of broadcast TV.

6.3 Broadband Internet Service to the PC - Broadband TV to the PC

Broadband Internet is an access service. This means that a consumer pays a service provider for BB internet access and then [potentially and] separately 3rd party content providers for proprietary content. In certain circumstances, the access provider also provides a portal or gateway to aggregated content.

The relevance of Broadband Internet is not the access provision model [which works like PayTV with a monthly subscription fee] but the content destinations a user can access via the internet. These destinations are virtually unlimited and offer content in anything from free to subscription models. Globally, broadband internet access has grown exponentially over the last five years providing a massive audience for content distributors.

6.4 Mobile Data and Communications (Mobile TV)

The business models for Mobile TV are similarly varied because the medium is so new. High-demand content is being sought by service providers and lower demand content is seeking service providers for carriage.

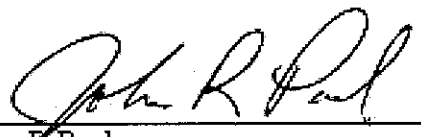
Content is being acquired [by platform service providers] and similarly redistributed to consumers a) for free, b) for subscription and or usage fees and c) for bandwidth/download fees – globally.

In this case, content dynamics will begin to reflect the more evolved PayTV industry. Service providers will have to pay for premium content or retransmit broadcast content that seeks additional outlets and relies on ad revenue. Additionally, purpose

built content (called mobisodes) will likely be funded by distributors who see value in the mobile platform. This is already happening in US and European markets.

Identification of Media Distribution Mechanisms and Models in Australia

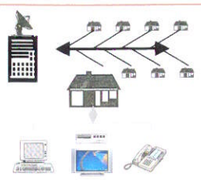
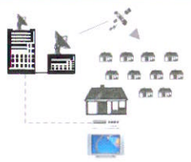
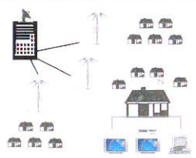
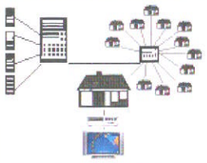
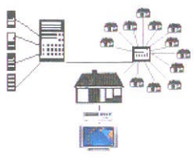
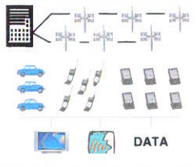
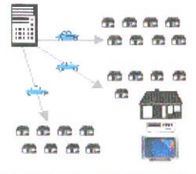
Expert Opinion prepared for Allens Arthur Robinson
By John Paul – ACPG Pty Ltd



27 September, 2005

John R Paul
Senior Partner, Media - ACPG Pty Ltd

Delivery Mechanism Summary

Primary Delivery Mechanism	Diagram	Description	Predominant Model	Deployment Cost	Advantages	Disadvantages	Global Deployments	Australian Market	Available Protocols
Cable		Physical, two-way medium capable of carrying multiple, simultaneous products and protocols to the home in a one:many relationship. Average profitability threshold – 10 yrs.	PayTV	Very expensive to deploy and maintain HFC - US$25-35,000 per mile, US$150 per customer drop. US$1,100 per mile p.a. to maintain. FTTH – US$42,000 per mile, US$800 per drop CPE box – US$35-$500 per unit	• Very secure • Capable of delivering multiple protocols and products • Capable of localization • Effective for densely populated areas • Large capacity • Capable of hosting new protocols like IPTV	• Expensive and time consuming to roll out • Expensive to maintain • Susceptible to government mandated access regimes	Widely deployed – predominant mechanism for PaytV >250m homes > 80 countries	2 major cable service providers w/ > 800,000 subscribers. FOXTEL, AUSTAR, Optus	Analogue Digital MPEG-2, MPEG-4 DVB Digital IP (incl VoIP) Digital IPTV Telephony
Satellite		Space relayed, airborne, one-way medium capable of carrying multiple, simultaneous products and protocols to the home in a one:many relationship. Average profitability threshold – 8 yrs.	PayTV	Very expensive to deploy or lease. New satellite – US$200-700m Leasing satellite capacity - US$25-75m per annum – based on 10-25 transponders carrying 10-15 channel each @ US$2-5m per transponder per annum. CPE US$180-$500 + paytv operating expenses	• Large coverage area – with single, space- based transmitter (access rural areas) • Overcomes most topography issues • Low maintenance • Readily available CPE • Unlimited receiver capability	• Cost of digital CPE • Fixed bandwidth limitations • Risks associated with satellites • No return path (one-way) • Not suitable for products with dynamic bandwidth requirements – like Broadband internet	Widely deployed – 2nd largest mechanism for PaytV >60m homes >60 countries	2 major DTH service providers w/ >800,000 subscribers Other smaller direct satellite content providers: UBI (ex-TARBS), ERT, BVN, TVR, CCTV	Analogue Digital DVB MPEG-2 Digital IP
Terrestrial Transmission		Terrestrial, tower emitted, predominantly one-way medium capable of carrying multiple products and protocols to the home in a one:many relationship – usually employing multiple emission points (towers) Average profitability threshold – 8 yrs.	Free to Air	Moderately expensive to deploy – depending on # of transmitters Transmitters - $30,000 - $500,000 per transmitter to build Distribution network to transmitters $1m-$10m p.a. depending on # of channels	• Relatively inexpensive to deploy • Unlimited receiver capability (anyone who can see the transmitter) • Lower risk of failure due to singular location of equipment • Localisation capability	• Large networks of transmitters expensive to maintain • Quality effected by distance, atmospheric anomalies and topography • Transmitters can interfere with one another	Most widely deployed distribution technology >1 b homes >190 countries MMDS – only a handful of systems left in the world	3 Comercial FTA broadcasters – 7,9,10 and 2 public broadcasters – SBS, ABC. MMDS not currently used for video services but previously used by ethnic narrowcasting channels	Analogue Digital DVB-T COFDM or ATSC Digital IP
IPTV on Cable or Phone Wire		Broadband IP based method of delivering streaming, linear media using one:one relationship disguised as one:many via cable or phone wire. Average profitability threshold – unknown	PayTV	N/a - built on top of existing networks Network software costs unknown – millions CPE – box $300-$800	• Very flexible product structure – combines aspects of broadband with TV • Utilises existing physical infrastructure • Provides new competitive service providers (usually telcos) to sell content to • Vastly improved VOD	• Requires substantial investment in new headend software and network architecture systems • May not introduce new revenue stream for markets where telcos are already operating PayTV systems	Moderately deployed <15 countries France largest deployment – France Telecom + TPS, 4m home reach; Home penetration unknown Other countries – Spain, UK, Iceland, Italy, Canada, Norway	Not yet deployed Telstra exploring deployment Australian ISPs/Telcos installing their own IPTV capable networks: iiNet iPrimus Adam	Digital IPTV
Broadband Internet to the PC on Cable or Phone Wire or Terrestrial Transmission		Protocol for delivering user-accessed, open standards data to a PC in a one:one relationship with speeds >128 kbps Average profitability threshold for ISP – 4 yrs; for content – varies by model	Service – Subscription/Usage Content – Free w/ some on-demand subscription however ad model dominates	N/A – built in top of existing networks – cable, phone, wireless Media servers to make content available to broadband users - $15-50k per server. One server can handle one channel or multiple clips of video.	• Massive user base • Very flexible • Cheap and simple to setup and distribute content. • Viral in nature – if content is good and placed well within search engines it will be found and communicated rapidly • Opens the door for	• Disparate quality • Breadth of offering on broadband internet requires aggressive branding, marketing and high quality product. • Difficult to protect revenue generating content from illegal access and distribution.	Widely deployed >100m lines >50 countries	Widely deployed >1.5m users Numerous service providers. Telstra and Optus largest service providers providing broadband over cable, phone wire	Digital IP Voice over IP
Cellular Transmission		Terrestrial, overlapping, cellular, tower emitted, two-way medium capable of carrying multiple protocols to moving devices in a one:one and one:many relationship. Average profitability threshold – 4 yrs. with existing cellular infrastructure	Subscription/Usage Content may be free with advertising	N/A – media distribution built on top of existing networks Media servers to make content available to users - $15-50k per server. One server can handle one channel or multiple clips of video.	• Access to large user base • New consumption dynamic – mobile – opportunity to create new, dynamic-specific content • Low cost, new pipe for content providers • Opportunities for interactive media (SMS)	• Lack of deployed, compatible, consumer devices • Small screen with lower quality media • Kills device battery life • Potentially expensive head-end equipment for DVB-H standard	Mobile Media: Moderately deployed – growing rapidly Limited users <15 countries More robust services in more countries anticipated within 12-18 mo.	Mobile media: Moderately deployed Slow GPRS services Limited users Tesltra in DVB-H trial More robust services anticipated within 12-18 mo.	GSM/GPRS CDMA/TDAM Analogue DVB-H 3G proprietary
Courier Pidgeon		Manual, courier based, one-way delivery of DVD content directly to the home. Average profitability threshold – unknown	Subscription	Access to large physical DVD libraries – substantial licensing fees. Courier and customer service costs – specific metrics unknown	• Very secure • Huge capacity • Effective for densely and sparsely populated areas alike	• Expensive DVD library arrangements • Limited to predominant medium – and associated CPE • May lose out to future deployments of IPTV	Widely deployed in developed countries > 15 Users unknown	Handful of service providers dominated by Telstra and Hoyts	N/A

In every case, a content distributor's costs would include 1) Content assembly and play-out facility ($100,000-$1m to build or $200,000 p.a. to lease/operate) and 2) presentation of content to the service provider in a suitable format – some hardware may be required to convert content ($50-$100k). These costs would particularly apply to negotiated access deals and may also include bandwidth costs [which, in the case of satellite, would be approximately $500,000 per channel p.a.].

On-demand linear content or intermittent access to non-linear content (VOD and web consumption)
Broadcast TV/Radio
PayTV
Internet Services