Response to

Media Development Authority

Policy and Regulatory Framework for Mobile Broadcasting Services in Singapore

By BROADCAST AUSTRALIA and PGK Media

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Broadcast Australia and PGK Media's Response to the Media Development Authority's Public Consultation Paper "Policy and Regulatory Framework for Mobile Broadcasting Services in Singapore"

1 Executive Summary

Broadcast Australia (BA) and PGK Media (PGK) appreciate the opportunity provided by the Media Development Authority (MDA) to give their views on the Policy and Regulatory Framework being developed for the introduction of Mobile Broadcasting Services in Singapore.

BA and PGK strongly support MDA's intention to introduce Mobile Broadcasting services to Singapore and believe that the proposed broad approach to the regulatory framework will, if implemented, provide a strong basis for future mobile TV services.

In preparation for the release of spectrum, BA and GPK have entered into a Joint Venture (BAGPK) for the purpose of participating in the delivery of digital mobile broadcasting services in Singapore. BA owns and operates broadcasting infrastructure in Australia providing transmission services to the national and commercial television and radio broadcasters. PGK Media specialises in research and development of innovative technologies for the broadcasting, advertising and media industries. BA has conducted a series of mobile TV trials in Australia and PGK is currently conducting a mobile TV trial in Singapore.

BAPGK has provided comments on the proposed mobile TV structure based on its experience in the Australian and UK markets, mobile TV trails, market research through its work with a number of industry suppliers over the last 4 years. BAGPK's comments reflect the principles on which its preferences are based.

BAPGK believes that the overall regulatory framework for the introduction of mobile TV in Singapore should:

- be light touch, providing the opportunity for market forces to operate wherever possible;
- incorporate the application of community standards particularly in relation to content;
- be technologically agnostic, allowing the licensee/s their choice of a technology that is appropriate to its/their business requirements;
- identify MDA core requirements "up front", avoiding downstream surprises, in order to create certainty for the successful licensee/s;
- provide for regulatory intervention in circumstances where specific market or competition issues need to be addressed.

Such a framework would provide the flexibility and certainty required to attract the significant investment needed for the rollout of mobile TV services.

Finally, BAPGK strongly encourages the MDA set a licensing timetable ASAP in order to ensure early momentum within the mobile TV arena is maintained and Singapore emerges as a regional leader in the provision of these services.

BAPGK would welcome the opportunity to discuss its response with the MDA at its convenience.

2 Background

2.1 Broadcast Australia and PGK Media

Broadcast Australia (BA) owns and operates the most extensive broadcast transmission infrastructure network in Australia with approximately 600 transmission sites across metropolitan, regional and rural areas reaching more than 99% of the population. BA's wholly owned subsidiary, The Bridge Networks, supplies communications equipment and installation services to the communications industry.

BA is owned by the Macquarie Communications and Infrastructure Group and is the sister company of Arqiva, a UK based company.

BA and its subsidiary companies currently employ over 350 staff situated in 14 locations around Australia as well as Auckland, New Zealand and in Hong Kong. As of March 10 2008, it is expected that staff numbers will increase by a further 74 staff operating out of an additional 2 offices (Adelaide and Sydney).

BA was created in 1999, following the privatisation of a government agency responsible for the broadcasting of analogue television and radio to the Australia population. Since then, it has expanded its business base significantly into a medium sized enterprise which is a world leader in the delivery of digital broadcast services. It now operates in the international arena (for example, Hong Kong, Singapore, Malaysia, China, etc…) and incorporates a number of subsidiary companies.

In 2007, BA acquired a majority shareholding in Radio Frequency Engineering Ltd, located in Hong Kong and the Repairs and Maintenance Division of Kordia Pty Limited. BA is currently in the process of acquiring Hostworks, a company located in Adelaide which provides infrastructure for website management.

PGK Media was founded in 2001, and specialises in research and development of innovative technologies for the broadcasting, advertising and media industries. A key PGK Media project Mr. Taxi Smart and PGK Digital Video Billboard was the first broadcasting solutions for public transportation and Out-Of-Home advertising in Singapore. In 2007 PGK Media launched TV2GO, the first Digital Mobile TV broadcasting trial in Singapore with nationwide transmission of multiple live channels on the latest commercial ready TV Phones, PDA, Laptop dongles and PC receivers. PGK is also developing cross platform addressable broadcasting solutions bringing live TV and dedicated channels in taxis, buses and video billboard.

Further details of BA and PGK Media's operations can be found at Attachment 1.

2.2 Intended Relationship between Broadcast Australia and PGK Media

BA has executed a Heads of Agreement with PGK Media to form a Joint Venture (JV) company. Full documentation is now being finalised.

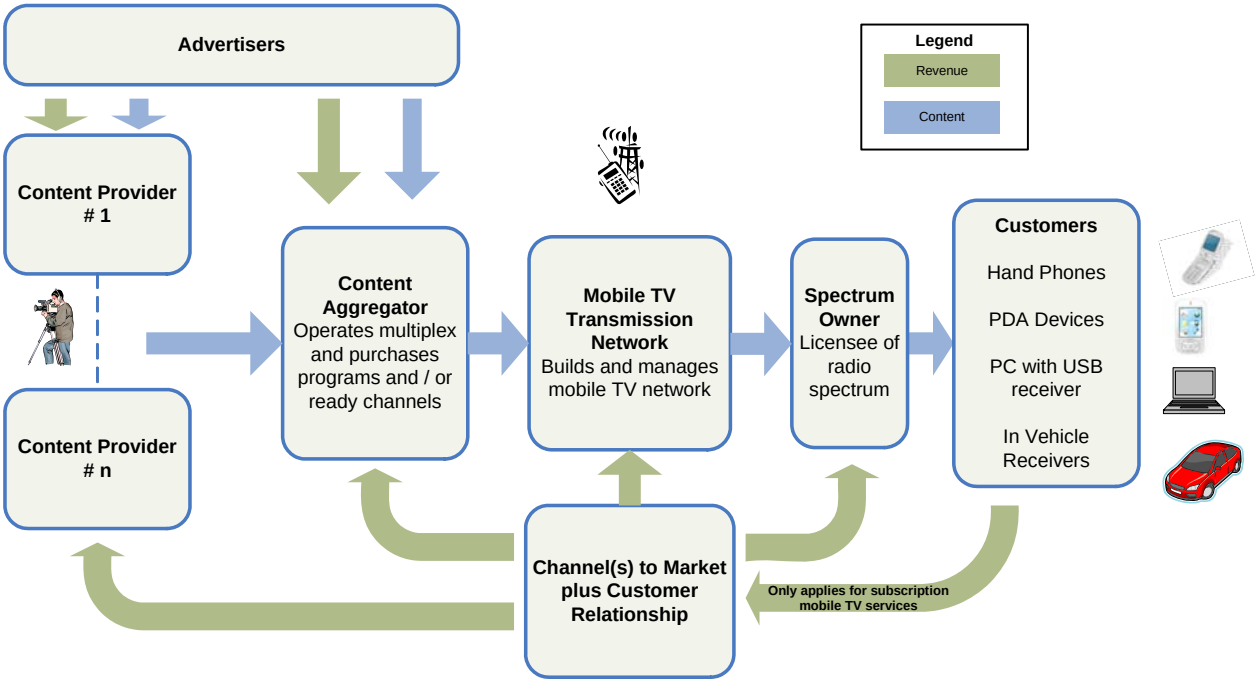
Under the JV, BA will hold a majority equity position and currently intends, through the JV, to participate in the spectrum allocation process proposed by MDA for mobile TV deployment.

2.3 Value Chain for a MTVS

Diagram 1 below sets out what we believe to be the key functional elements of the value chain structure for a future MTVS. These functions while being necessary to deliver a MTVS would not necessarily be carried out by the MTVS licensee but could be subcontracted to

third parties. On this basis BAPGK believes that any licensing structure for a MTVS needs to be sufficiently flexible to allow for differing business models.

Diagram 1 Value Chain for MTVA



2.3.1 Content Provider

It would be expected that MTVS licensee would source multiple content providers from a range of sources including production companies; content aggregators or independent suppliers. Content would then multiplexed into a single transport stream ready for transmission.

Noting MDA's concerns to ensure the content delivered by a MTVS is suitable, BAPGK believes (refer 1.6 above) that responsibility for meeting regulatory standards should fall on the content provider via a content licence (and not the MTVS licensee). This would ensure that the MTVS licensee only sourced content which had been licensed and guarantee that transmitted content was pre-qualified for inclusion on an MTVS. This approach has been used in Australian for Datacasting content and could be applied by MDA to MTVS licensing.

2.3.2 Content Aggregation

The content aggregating function may or may not be undertaken by the MTVS licensee but contracted to a third party/s. This will depend on the core competencies and approach of the licensee.

The content aggregator function will be to source and package content into programmes that will appeal to the consumer (eg a combination of sports, news, movies, and other genres) within and between channels.

In this role, the content aggregator becomes the gateway to accessing channel capacity. Whether this represents a blockage will depend on the identity of the content aggregator and how it deals with any up-stream access issues.

Should the content aggregator be also wholesaling content packages to MNO's and/or other channels to market, this may result in down stream issues. Whether, this constitutes a blockage will depend on:

- the detail of arrangements between the content supplier and content aggregator e.g. exclusive agreements with a content supplier may limit access to a channel to market; and
- the availability of alternative sources of MTVS to the market.

Please see further discussion of this point in section 4.4.

2.3.3 Mobile TV Transmission Network Operator

The MTVS transmission provider may be the MTVS licensee or a third party contracted to provide this service. The transmission provider would be expected to provide the infrastructure (i.e. supply and operate the transmission and multiplexing equipment) for broadcasting the MTVS content to its customers.

The allocation of a MTVS licence and hence the transmission of a MTVS service would allow MDA concerns (such as interference issues) to be made a condition of the MTVS licence and hence the responsibility of the licensee.

2.3.4 Channel to market and Customer Relationship

This function is most likely to be performed by one or more MNOs but will depend on the activities of the MTVS licence holder i.e. a licence holder may already have established customer relationships.

These activities include:

- Establishing a sales channel for the MTVS;
- Making handsets available;
- Determining the product packaging and retail pricing;
- Acquiring customers;
- Maintaining a relationship with those customers e.g. billing.

2.4 Expected BA/PGK Model

The JV interest in delivering mobile TV in Singapore is structured on a number of principles which form the basis of the following response to the MDA consultation paper:

- The JV would act as MTVS licensee and install, operate and maintain the transmission network for the delivery of mobile TV;
- The JV would not seek to become a Mobile Network Operator (MNO) but would work to partner with existing MNO/s who have an existing customer base and would offer Mobile TV as an additional service to their current offering. The JV would seek to maximise the potential customer base for this service by seeking to ensure mobile TV services were available to all MNO subscribers;
- The JV may act as a content aggregator or use an external content aggregator or use a hybrid model.

This means that BAPGK would be seeking a regulatory framework which:

- Licensed the spectrum for the delivery of MTVS;
- Made Content providers, not the MTVS licensee responsible for the content put to air and for meeting any content related legislative requirements.
- Licensed content providers conditional on them conforming to relevant legislative requirements similar to the Datacasting Licensing regime operating in Australia

(removing the requirement for the licence holder to act as a content policeman refer section 3.1 below);

- BAPGK's view is that an access regime will ONLY be required where potential competitive bottlenecks exist either upstream or downstream (see further comments in section 4.4). The regulatory framework should account for this eventuality.

In summary BAPGK believes that regulatory responsibility should attached to the entity in the value chain that is in control of that activity.

3 Technical Issues

3.1 The standards available

BAPGK supports MDA's intention not to consider the use of satellite technology to deliver MTVS in Singapore and agrees the technical constraints and economic impediments make it inappropriate for the Singapore market.

3.2 Standards and frequencies suitable for Singapore

In the current environment, BAPGK **supports** the use of UHF spectrum and believes that the UHF band is the **most** suitable for multi-channel high quality MTVS services in Singapore. BAPGK also believes that Media FLO and DVB-H are both suitable technologies to deploy in this band.

BAPGK sees the VHF spectrum identified, as less attractive as:

- a more limited channel capacity may impact on the viability of the MTVS and could result in a sub-optimal consumer and investment proposition;
- it could result in different technology to deliver the services perhaps causing consumer confusion.

3.3 Should a standard be mandated?

BAPGK supports MDA's decision not to mandate a single standard for MTVS in Singapore; based on the principles of:

- regulating on a technology neutral and platform neutral basis; and
- use of open global standards, given the small size of the Singapore market.

BAPGK also notes the MDA's intention to consider the potential for market failure when evaluating the bids for multiplex licences.

It is BAPGK's strong view that it will be important for MDA to ensure that the policy and regulatory environment will deliver the following pre-requisites to ensure a viable MTVS:

- The capacity to cover the proposed market areas;
- Is cost effective in the context of establishment and operational costs versus the price acceptable to customers;
- Can deliver the required content and interactive services to ensure a compelling market proposition;
- Is supported by a range of handsets and other devices at competitive prices likely to lead to mass market adoption.

3.4 Should the MDA impose quality of service requirements?

BAPGK supports MDA's decisions:

- Not to mandate objective inputs to picture quality e.g. frames per second, picture resolution;
- Not to mandate performance indicators for customer service;
- To impose minimum network coverage requirements on nation wide multiplex licences; and
- Specification of a 95% (outdoor coverage) level for multiplex licences.

It is noted that MDA reserves the right to set Quality of Service requirements on picture quality and indoor in-building coverage **if** necessary. MDA also proposes to require applicants to specify the indoor coverage and the minimum signal strength that they propose to offer (backed up with calculations) as part of the tender process. BAPGK notes the intention that higher points will be scored for better indoor coverage in the tender evaluation process, however, makes the observation that beyond agreed de minimus limits, it should be a business decision for the MTVS licence holder to establish greater network density, dependent on take-up.

It is BAPGK's view that it is important that MDA states its service requirements "up front" i.e. at the time of tendering rather than as proposed to "regulate outdoor coverage in the short to medium term". Any deferral of decisions in relation to coverage, either in-door or outdoor will create uncertainty for the licence holder. Any intention to reward "better indoor coverage" in the tender process must also be identified and quantified.

BAPGK agrees with the principle of an availability target, however, believes that it is best left to the commercial "carriage" contracts to determine the availability definition and requirements.

4 Licensing Framework

4.1 The types of licence required

BAPGK believes that the current regulatory structure could be used for future MTVS licencing through two licences: content licence/s for content providers and a MTVS broadcasting /multiplexing/infrastructure licence. This approach would allow a MTVS to undertake all functions itself (refer section 1.6 value chain diagram above) or contract out some or all of those functions to third parties. It would also ensure a separation of responsibility in relation to the provision of content.

As per the principles set out in Section 1.6 above, BAPGK supports the MDA proposal that content carried on both an MTVS and cellular mobile TV networks e.g. 3G, conforms to the same content conditions as do broadcasters and class licence holders. However it is BAPGK's view that content carried on a MTVS must be "pre-licensed" i.e. that content providers must apply for an MTVS Content Licence which requires licensees to conform to the relevant content regulations. This then removes any obligation on the MTVS licensee to "police" content, particularly if the MTVS licensee obtains content from a third party aggregator and is not responsible for service programming.

BAPGK recognises the potential for a two tier licensing framework – niche and nationwide licences but believes that only the conditions associated with a nationwide framework are relevant to a MTVS as set out in Figure 3.1 "Proposed two-tier framework for MTVS and cellular mobile TV service" for a Nationwide Subscription TV licence. BAPGK does not believe a service offered under the niche framework would be viable.

4.2 Licence award mechanisms

Should MDA choose to allocate a licence/s via competitive process BAPGK supports the use of a comparative tender rather than auction process. BAPGK's support of this approach assumes that the process would:

- Identify clearly any requirements e.g. coverage requirements, licence duration (including renewal), number of licences to be issued, constraints on number of licences held etc;
- Be service based and exclude any form of competitive bidding as implied in the evaluation criteria addressed in S3.2 of the Consultation document

BAPGK would like to have more clarification should MDA seek to incorporate a price based component in the comparative tender process. It is our view that the process should be clear i.e. either it is price based or service based and that it is not possible to combine these approaches. Should MDA seek to incorporate a price based component in the comparative tender process, then BAPGK's preference would be that a price-based approach be adopted i.e. an auction.

In relation to the Evaluation Criteria, BAPGK believes it important that significant weight be applied to:

- Financial capability of the bidder;
- Operational capability of the bidder;
- Content relationships;
- Proposed coverage and quality of service;
- Business model.

BAPGK believes that key MDA requirements such as consumer protection can be addressed through licensing e.g. of content providers or the imposition of licence conditions and need

not be addressed as part of the evaluation criteria. This also applies to competitive issues which can also be dealt with via access provisions and again do not need to be part of the selection criteria. This will leave the selection criteria clear to meet clearly defined objectives of the MDA.

4.3 Licence Duration

BAPGK supports the MDA position of allocating licence/s for an initial minimum period of 10 years (15 years would be preferable) with an option to renew for a further 5 years. It is our view that renewal should be automatic and only be rescinded in the event that the licensee is in breach of its licence conditions. It also our view that the licence extension should be at no additional cost to the licensee apart from the normal licence fee charges as set out in section 3.4 of the Consultation Paper. This approach will give the licensee certainty and address and assist the business case for the investment in long term network assets.

4.4 Other Licence Conditions

BAPGK supports the requirements proposed by the MDA that licensees:

- Provide television type services of at least 65% of the multiplex capacity used with non programme associated data limited to 35% of the multiplex capacity;
- Pay a licence fee will be consistent with other broadcast licences i.e. 2.5% of total income subject to a minimum of $50,000 p.a. for nationwide licences;
- Will be exempt from licence fees for the first five years to facilitate growth of the service;
- Conform to the class licence framework for content that will be used for the mobile TV platform.

5 Market Structure Issues

5.1 Demand for MTVA in other countries

Noted.

5.2 Demand for MTVS in Singapore

Market research in Australia found that consumers used their MTV handset as a second or third TV with viewing in the home the higher compared to all other viewing locations. This may impact on Singapore habits as well. Experience from trials in Australia and UK, is that once the consumer sees and experiences the quality of MTVS (in this case provided using DVB-H technology), interest in MTVS increases.

5.3 The number of MTVS multiplex licences to issue

As already stated, it is BAPGK's view that the small Singapore market will not support multiple MTVS and consequently does not believe that the issue of four multiplex licences to different independent parties would be viable (based on consumer research undertaken in Australia and supported by MDA research). Significant investment will be made and risk taken to by the initial licensee and it is essential that it is given sufficient opportunity to establish a mobile TV market before further competition is contemplated.

It is also recommended that MDA maintain their decision to allow applicants to bid for one or more UHF licences to provide the opportunity for the licensee to obtain economies of scale and provide a more attractive service to the limited Singapore market.

5.4 Access to multiplex capacity

It is BAPGK's view that the need for an "access regime" will vary depending on the makeup of the industry following licence allocation and there is no "one size fits all" solution. It therefore remains to be seen the extent to which potential access discrimination arises as a practical matter in the context of the introduction of MTVS in Singapore.

BAPGK notes that the MDA is mindful of the commercial realities of launching a nascent MTVS. In particular:

- The upfront risk and capital that will be involved in establishing even a limited Mobile TV network and service is significant;
- There are currently existing service offerings in the market – specifically those offered as part of 3G services. While technologically different, they provide similar services and benefits to the end user;
- Existing broadcasters may be able to adapt and redeploy existing spectrum holdings to offer mobile TV services
- That not all potential MTVS licence holders or business plans give rise to competition concerns in upstream (content provision) or downstream (service distribution) markets and in such circumstances market forces should prevail.

The extent to which access provisions may be necessary will depend on a number of factors including:

- The number of licences allocated. BAPGK believes that an environment where there is already established multiple independent MTVS providers, is likely to provide free and fair access to all through simple competitive pressures. BAPGK believes an access regime in this situation would very likely be inappropriate;

- The type and quantum of spectrum allocated to the licensee/s and the amount of excess capacity this generates. Where licensees only have access to one spectrum block, BAPGK believes an onerous access regime could have significant detrimental impact on the commercial viability for the licensee,
- The level of independence of the licensee from existing broadcasters, content providers and mobile network operators. BAPGK strongly believes an access regime in clearly independent operator situations would be unnecessary as it would be in the licensees interests to work with all parties seeking upstream or downstream access, and
- The level of market interest in access to excess capacity.

Additionally, BA believes it is essential that all MTVS licensees control sufficient of their capacity to ensure a balanced market-driven proposition is created and taken to market. As such any access regime should be restricted to a small proportion of total available capacity. This should certainly not be more than 25%.

BAPGK does not support a regime which requires a licensee to build additional capacity (i.e. over and above its own requirements) without the certainty that there is a viable access seeker, just to satisfy the notion that multiplex capacity is a scarce resource.

BAPGK would support an approach which:

- Requires that access seekers must pay for the delivery of additional capacity and hence share in the burden of providing capacity additional to that required by the licensee (including a reasonable return for the access provider in their investment);
- Only applies to licence holders with more than one national channels;
- Requires the access seeker to have:
    - Sufficient financial standing to meet the obligations arising from access. This will be particularly material where capital expenditure must be committed to in the granting of access;
    - Is technically competent to meet the requirements of integrating their service into the system;
    - No history of contractual or regulatory breach that would make them an inappropriate or unacceptable contracting party; and

It is important to ensure that the granting of access to the access seeker would not have anti-competitive effects in upstream or downstream markets. For example a requirement to grant access to an access seeker who already provides a mobile television service via other channels may give an unfair advantage to the access seeker who would have two paths to market while the licensee has only a single path, in circumstances where access rights are not reciprocal.

Finally BAPGK, supports an access regime which, rather than being prescribed in detail, sets out the principles and circumstances for access and provides an avenue of appeal should an access regime become necessary. An example of this approach is stated in section 44H of the Trade Practices Act in Australia.

It is our view that this approach avoids unnecessary impediments to service establishment and provides a vehicle through which access seekers, should they emerge, have an avenue through which to obtain access. This approach will also allow bidders for MTVS licenses to address in their licence applications the method by which they intend to allow access to third parties wishing to gain access to multiplex capacity and for such submissions to be taken into account in application assessments.

5.5 Advertising revenue cap

BAPGK supports MDA's proposal that a cap on the share of revenues earned from advertising by mobile TV subscription service providers should **not** be applied. The imposition of a cap has the potential to severely limit the capacity of the service to earn revenue and hence be viable.

6 Regulation of Content

6.1 Regulation of MTVS content in other countries

BAPGK recognises and strongly supports the need to protect the content available to children.

6.2 The framework for MTVS content regulation in Singapore

As stated in Section 3 above, BAPGK supports the MDA proposal to ensure consistency across platforms in the provision of content and proposes the creation of an MTVS Content licence as the vehicle for implementing this requirement as per the Datacasting Licencing in Australia.

This will then ensure that content is pre-licensed and conforms to MDA content requirements and removes the need for the MDA to seek approval for significant changes to content which would be unnecessarily restrictive and mitigate against the delivery of a dynamic and innovative service.

6.3 Public service broadcasting (PSB) obligations

6.3.1 Obligations for specific programme content

BAPGK supports MDA's proposal **not** to impose PSB obligations on MTVS and cellular mobile TV service providers given the potential negative impact on viability.

6.3.2 Must-carry obligations

BAPGK supports the MDA proposal **not** to impose a must-carry obligation on commercial MTVS and cellular mobile TV operators given the potential impact on viability.

BAPGK does not oppose an MDA obligation for MTVS licensees not to interfere with reception of the local FTA TV broadcasting services provided these are broadcast on compatible mobile TV technology with that chosen and implemented by the MTVS provider. Should the technology not be compatible, then there should not be any obligation on the MTVS provider.

6.4 Advertising and sponsorship regulation

BAPGK supports the application of the current framework for advertising regulation to MTVS and cellular mobile TV services. This would fall within the responsibility of the content licensees.

Appendix 1 Background to Broadcast Australia and PGK Media

Background to Broadcast Australia

BA owns and operates an extensive broadcast transmission infrastructure network in Australia providing more than 2,000 managed transmission services from approximately 600 transmission sites across metropolitan, regional and rural areas and reaches more than 99% of the population. Figure 1.1 below indicates the location and distribution of sites.

BA is owned by the Macquarie Communications and Infrastructure Group and is the sister company of Arqiva, a UK based company.

BA's core business is providing fully managed TV and radio transmission services for the government-owned broadcasters the ABC and SBS under long-term contracts, as well as providing transmission services to commercial broadcasters, particularly in regional areas. In addition to supplying fully managed broadcast transmission services, BA owns and operates satellite downlink facilities and provides site-leasing services to broadcasters, telecommunications providers and other radio communication network operators such as public safety operators.

BA's core competencies include the design, operation and maintenance of a wide range of digital broadcast distribution and transmission services (i.e. microwave links, satellite receive earth stations, interface equipment, headend multiplex, systems integration, transmission `plant and associated peripheral equipment).

BA is continually expanding its core competencies across a broad range of digital and wireless technologies to ensure that it has the technical expertise required to meet its customers' needs. It has developed extensive experience in the emerging technologies of digital radio, mobile television and infocasting services through the conduct of trials over the last 4 years.

These trials were brought to 'on-air' operation in an environment which demanded high levels of service stability and availability. BA's success in bringing these platforms to air, often in short timeframes, coupled with the complex system integration and inter-operation of multi-vendor equipment and interfacing with a broad range of program/signal interconnection technologies, demonstrates BA's experience and competency in this field.

This strong technical knowledge base and proven track record has established BA as a leader in digital broadcasting technologies – e.g. Digital Radio (Eureka 147, DAB+ and Digital Radio Mondiale - DRM); DTTB (DVB-T); Mobile TV (DVB-H and MediaFLO); wireless broadband over broadcast spectrum (DVB-T with IP encapsulation); DVB-MHP based interactive television; satellite bandwidth-on-demand solutions; systems integration of complex broadcast systems; coverage planning using state-of-the-art planning software with terrain database; and operation of multi-coupled high power broadcast systems – analogue and digital TV, high power FM, high power AM.

These trials have provided us with an in-depth knowledge and understanding of these technology applications and their implementation particularly with regards to systems integration, statistical multiplexing, multiplex management and configuration and the distribution of digital content services across a variety of technology platforms.

BA is also expanding its core expertise through strategic acquisition. In October, 2007: BA acquired a majority share in Hong Kong 'confined coverage' engineering group Radio Frequency Engineering Limited (RFE) which specialises in indoor and confined space coverage, with the view to delivering indoor mobile TV solutions in buildings and tunnels - these skills have particular application to mobile TV services. As a regional leader in the design and integration of confined coverage systems, RFE has the necessary skill-set to complement BA's core expertise in terrestrial broadcast networks.

On 7 December, 2007: Broadcast Australia entered into an agreement to acquire all of the shares in Hostworks Group Limited ("Hostworks") Hostworks is recognised as Australia's leading provider of managed services for on-line media and entertainment companies as well as for management and hosting of a broad range of critical applications. Its customers include ABC, SBS, News, Nine MSN, Wotif and Ticketek. More than 15% of all internet pages viewed and traded-through by 10 million Australians each month, are hosted by Hostworks. This acquisition expands BA's core competencies and is complementary to its core expertise.

Mobile TV Trials

BA has conducted a number of mobile TV trials since 2005 with the objectives of providing BA and its technical and content partners the opportunity to understand the technical platform. BA and its partners also conducted market research to gauge consumer reaction to the service.

BA commenced its mobile TV trial utilising its Gore Hill facility in Sydney, and H.263 DVB-H technology. BA partnered with Telstra, RFS and Nokia: Telstra providing the telecommunications component of the DVB-H product; Nokia the headend and handsets and RFS the RF systems. BA provided the systems integration and transmission system. The trial was launched in July 2005 transmitting 16 television services. In September 2006 the Sydney trial was upgraded to utilise H.264 encoding.

Market Research was commissioned to provide an insight into the consumer reaction to what was then a very new concept with 370 handsets "in field".

In March 2006 and in conjunction with Telstra, BA launched a DVB-H showcase in Melbourne for the period of the Commonwealth Games providing seven channels of Games-related content. The Melbourne showcase utilised the next generation coding technology - Windows Media 9 encoding, a Cardinal headend and E-TEN handsets.

From May to August 2007 BA provided hosting, transmission and systems integration services to the Irdeto mobile TV trial from its Sydney facility utilising H.264 coding, a Thomson Grass Valley headend and Samsung handsets. BA worked with Irdeto in trialling its conditional access systems, and evaluating statistical multiplexing and statistical encoding in a DVB-H environment. Fourteen television services were transmitted including ABC1, SBS and Channel 7. BA has also developed and operated electronic programme guides for each trial.

BA has taken the lead role in designing and implementing the complex system integration of emerging products and sub-systems for DVB-H platforms. This incorporates encoding, content aggregation and distribution over IP, automated data content aggregation and publishing, e-commerce integration, complex multiplex management, terminal functionality for specific applications such as service guide, user logs, aggregation of user data etc.

This learning developed in Sydney has also been utilised in overseas DVB-H and MediaFLO mobile TV trials, specifically in Malaysia.

Background to PGK Media

Founded in 2001, PGK Media is a firm that specializes in research and development of innovative technologies for the broadcasting, advertising and media industries. To highlight some of PGK Media projects we can mention Mr. Taxi Smart and PGK Digital Video Billboard as the first broadcasting solutions for public transportation and Out-Of-Home advertising. In 2007 PGK Media launched TV2GO, the first Digital Mobile TV broadcasting trial in Singapore with nationwide transmission of multiple live channels on the latest commercial ready TV Phones, PDA, Laptop dongles and PC receivers. PGK is also developing cross platform addressable broadcasting solutions bringing live TV and dedicated channels in taxis, buses and video billboard.

Achievements:

- Execution in 2003 of the largest media trial in Singapore involving 500 interactive taxi systems with Comfort Transportation.
- Appointed in 2004 by Reliance Infocomm India and Sharp Electronics to study, design and manufacture an IPTV system for its new cable network.
- Awarded in 2004 and 2005 by Media Development Authority of Singapore with two DAB projects. Both projects were successfully presented at BroadcastAsia.

- Secure in 2006 the DVB-H spectrum and licences for nationwide Digital Mobile TV Broadcasting Trial in Singapore.
- Awarded in 2007 with a nationwide public infotainment pilot project under the Interactive and Digital Media R&D Project Office in Singapore

TV2GO Mobile TV Trial – Singapore

TV2GO is the first full nationwide Mobile TV trial in Singapore adopting the latest DVB-H Digital Video Broadcast Handheld standard. TV2GO live channels range from News to Sport to Entertainment and are transmitted over the air similar to the way that televisions at home do. Mobile TV is a digital broadcasting technology that allows the viewer to receive and watch their preferred programmes wherever they are on-the-go, at home, in the park, on the bus or at the cafe using commercially available mobile TV phones, enabled media players and newly developed receivers for Laptops and PCs. Mobile TV is not a streaming video like the one using 3G or GPRS where you have to download the programmes before watching, but a real time live broadcast service always-on and instantly available supporting an exciting range of new engaging real-time interactive TV services such as voting, polling, content purchase and access to dedicated micro-sites. For more information visit www.tv2go.sg.

Appendix 2 Glossary of Terms

ABC	Australian Broadcasting Corporation
AM	Amplitude Modulation
BA	Broadcast Australia Pty Ltd
BAPGK	Broadcast Australia and PGK Media
DRM	Digital Radio Mondiale
DTTB	Digital Terrestrial Television Broadcasting
DVB-H	Digital Video Broadcasting - Handheld
DVB-T	Digital Video Broadcasting - Terrestrial
FM	Frequency Modulation
FTA	Free to Air
GPRS	General Packet Radio Service
H.264	MPEG-4 Part 10, or MPEG-4 Advanced Video Coding
IP	Internet Protocols
IPTV	Internet Protocol Television
JV	Joint Venture
MPEG	Moving Picture Experts Group
MHP	Multimedia Home Platform
MNO	Mobile Network Operator
MTVS	Mobile Television Service
PC	Personal Computers
PGK	PGK Media PTE LTD
PSB	Public Service Broadcasting
R & D	Research and Development
RF	Radio Frequency
RFS	Radio Frequency Systems

SBS	Special Broadcasting Service
TV	Television
TV2GO	Brand used by the existing PGK Media Mobile TV Trial in Singapore