OPTUS

Submission in response to Department of Communications and the Arts review of

Viewer Access Satellite Television(VAST) service

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Section 1. EXECUTIVE SUMMARY

1.1 Optus welcomes the opportunity to provide this submission in response to the review of the Viewer Access Satellite Television (VAST) service.

1.2 Optus is proud to have been providing television and radio services to regional and remote Australians, no matter where they live, for over 30 years. Services are currently delivered via the VAST service and were previously delivered via the HACBSS and RABS remote area broadcast services.

1.3 The nature of content delivery is under constant and accelerating change. The advent of the NBN is only serving to hasten this change from the more traditional style of scheduled broadcasting.

1.4 Optus believes in a future with streaming content, as illustrated by our delivery of World Cup and English Premier League coverage to all Australians via the Optus Sport app. However, we recognise that there are challenges in delivering mass market content to remote Australia, therefore scheduled broadcasting remains a key mainstay in consumer habits.

1.5 The most efficient and cost-effective means of content delivery for those outside of terrestrial broadcasting and wireless technologies foot print is direct-to-home broadcasting via a single beam Ku-band satellite. This will ensure that those Australians living and working in regional and remote Australia will continue to enjoy television and radio in the same way as their city counterparts, no matter what the technological changes maybe.

VAST (via the Aurora Digital platform).

1.6 The VAST service has been an outstanding success in delivering reliable free-to-air television and radio services to viewers and listeners throughout Australia.

1.7 The VAST service has been broadcasting via the Optus Aurora Digital satellite platform since 2010. As the operator of the Aurora Digital satellite platform, Optus Satellite is a key stakeholder and strong supporter of this vitally important and highly valued community service.

1.8 The Optus VAST service operates on a platform called Aurora Digital on the Optus C1 and D3 satellites. It has 100% coverage throughout mainland Australia and Tasmania[1]. There are currently over 330,000 registered VAST STBs[2].

1.9 The VAST service operates in a controlled STB environment where STBs are certified by Optus as being standards compliant – protecting the VAST viewers and broadcasters. A controlled STB environment allows compliance with Australian local requirements, in particular parental control and closed captioning requirements.

1.10 Optus Satellite has proudly delivered VAST since its inception and stands ready and willing to continue supporting VAST beyond June 2020 should the stakeholders decide to continue the service.

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[1] Coverage depends on clear line-of-sight- to the Optus C1 and D3 satellites with no obstructions.
[2] The number of registered VAST STBs is based on data extracted from Optus' CA system.

Future VAST Technology

1.11 Optus always seeks to keep across the latest developments in telecommunications and broadcast/content delivery technologies.

1.12 There are new satellite transmission standards such as DVB-S2X and compression standards such as HEVC which both allow for the cost effective and efficient transmission of both HD and UHD (4K) content.

1.13 Optus has been developing new advanced STB features that have the potential of being deployed across the VAST environment. These features include:

(a) Advance PVR functionality (e.g. series record and remote access)

(b) Broadband connectivity and co-existing with wireless and satellite NBN technologies

(c) Support for on-demand services (such as ABC iView, SBS On Demand and FreeView)

(d) Support for more immersive interactive applications (HbbTV)

(e) Watch one program but record several more for catch up later

(f) Single STB multi-room technology

(g) Advance decoding

(h) Targeted content insertion such as local News and Weather together with emergency broadcasting messaging

Section 2. VAST SERVICE

2.1 Optus operates a satellite based Direct To Home (DTH) digital broadcast platform called "Aurora Digital". The Aurora Digital platform supports a number of services, including the service known as Viewer Access Satellite Television (VAST).

2.2 Optus' view is that direct-to-home broadcasting of content via a single beam Ku-band satellite is still the most cost-effective and practical means to deliver free-to-air television and radio services to regional, remote and blackspot locations throughout Australia where there is no terrestrial broadcasting service available.

2.3 Optus currently provides the VAST service under contract to, and on behalf of, the regional broadcasters' industry group – Regional Broadcasters Australia (RBA) – and the two national government broadcasters – ABC and SBS. The Optus VAST service includes approximately 80 television channels and 100 radio channels from the national broadcasters (ABC & SBS), commercial broadcasters and open narrowcasters.

2.4 Broadcasting on Optus C1 and Optus D3 satellites located at 156°E, the DTH services can be received by a small satellite dish and STB. The VAST service has been in operation since June 2010.

2.5 There are over 330,000 registered VAST smartcard/STBs identified in the Aurora Digital conditional access system and this is increasing consistently at a rate of 600-700 per week[3].

2.6 Although the broadcast services are free-to-air (in the sense that there is no subscription charge made for receiving them), the satellite signal covers many commercial licence areas and state boundaries and for commercial, copyright and legal reasons, individual viewer access is restricted to content services intended for that viewer's location.

2.7 This requirement is met by means of grouping the VAST channels of each geographically restricted area to a specific bouquet, which restricts the Electronic Program Guide display to only the relevant VAST channels in that area. In addition to the bouquets, access to the VAST channels services is managed by the use of a Conditional Access system which mandates that a STB be equipped with a smart card in order to decode the channels to which a viewer is entitled. The Conditional Access system is jointly operated by Optus and the RBA.

2.8 VAST viewer entitlement to commercial services is solely controlled by the RBA. Entitlement to ABC and SBS services is jointly controlled by Optus (on behalf of the ABC and SBS) and the RBA.

2.9 VAST operates in an environment where there are multiple types of STB deployed across the consumer population. STBs are available from a variety of suppliers through their distribution channels. Thus, it is a so-called "horizontal market" and places demands on Optus, as the platform operator, to maintain integrity of the system by allowing only STBs which have been "VAST Certified" and which continue to satisfy ongoing certification requirements, to operate with VAST.

2.10 A key design criterion of VAST is that the feature set emulates the viewer experience of a terrestrial broadcast service in the Australian free-to-air television environment. All of

[3] These numbers are based on data extracted from Optus' CA system.

the technical specifications of VAST are set so as to be compliant with Australian requirements as specified by Standards Australia and Free TV Australia. Importantly, parental control and closed caption features comply with local Australian requirements.

The Aurora Digital Stack

2.11 The Aurora Digital Stack shows diagrammatically the various elements of the Aurora Digital eco-system. Optus views Aurora Digital as a technology platform consisting of various technical components supporting a number of different services - one of which is VAST.

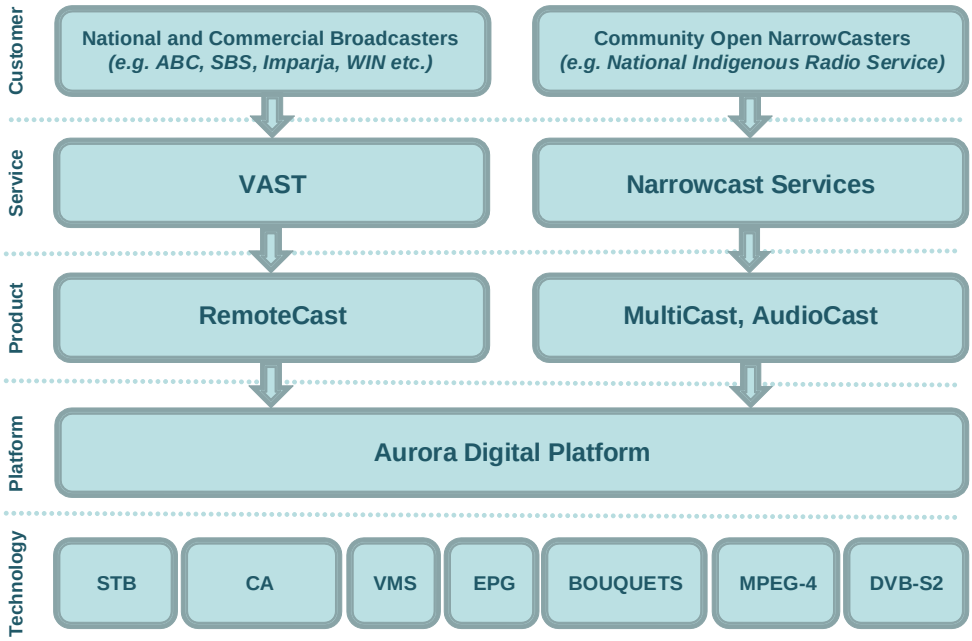
2.12 Since the platform hosts multiple services (including VAST) as well as other broadcast and narrowcast services, Optus has developed a separate suite of products to support the different categories.

2.13 For example, the National Indigenous Radio Service is classed as a community Open Narrowcast service and the customer would subscribe to a product known as “Optus AudioCast”.

2.14 The VAST service includes the two national broadcasters (ABC & SBS) and the commercial broadcasters (GWN, WIN, Imparja & SCA). This category subscribes to the “Optus RemoteCast” product.

2.15 All broadcast services in each category are supported by a common platform – Optus’ Aurora Digital platform.

Figure 1 Aurora Digital Platform



VAST High-Level Design

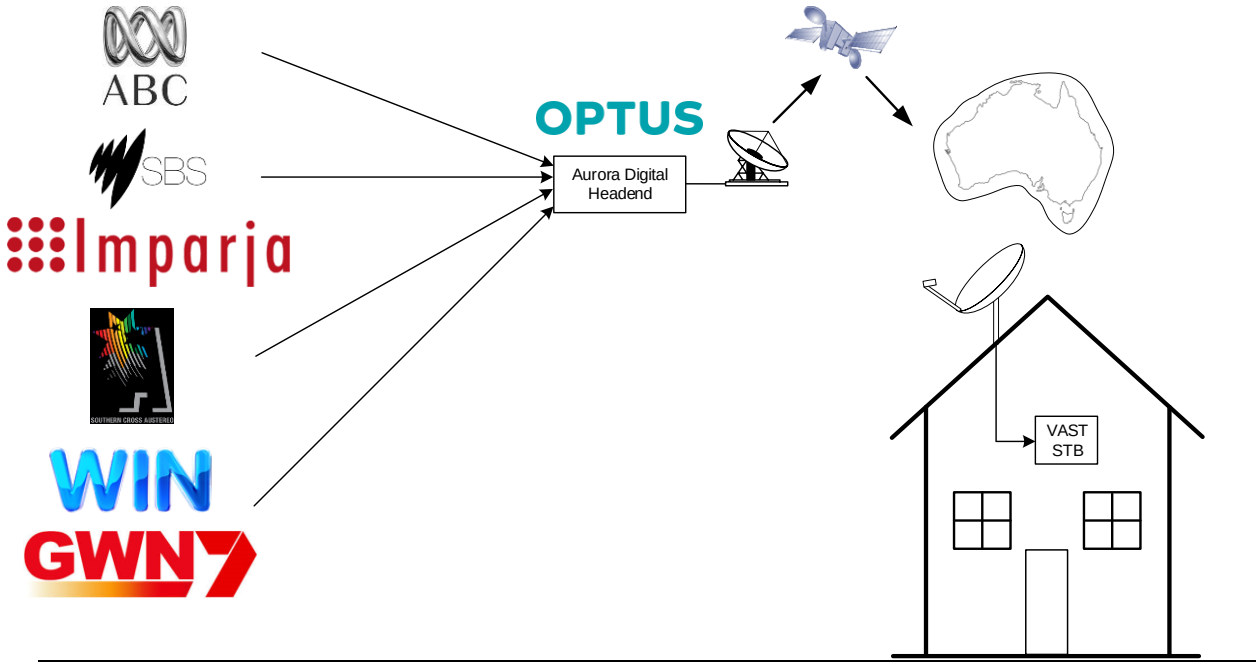
2.16 The following diagram shows the high-level design that supports the VAST service. VAST broadcasters perform content playout and compression at their premises and their content transport streams are transmitted to the Optus Belrose Satellite Facility by either fibre or microwave link.

2.17 The headend is located at Optus Belrose where the various customer transport streams are multiplexed together. Platform service information and conditional access is added prior to transmission to the satellite.

2.18 The VAST services are uplinked to 7 transponders across two satellites; Optus C1 and Optus D3. These two satellites have an Australia wide footprint and can be received direct-to-home from a 65cm mini dish in most population areas.

2.19 The satellite signal is connected to a VAST STB in the home that receives and descrambles the services and presents the video/audio content directly to the viewer's television via the HDMI port.

Figure 2 VAST Delivery



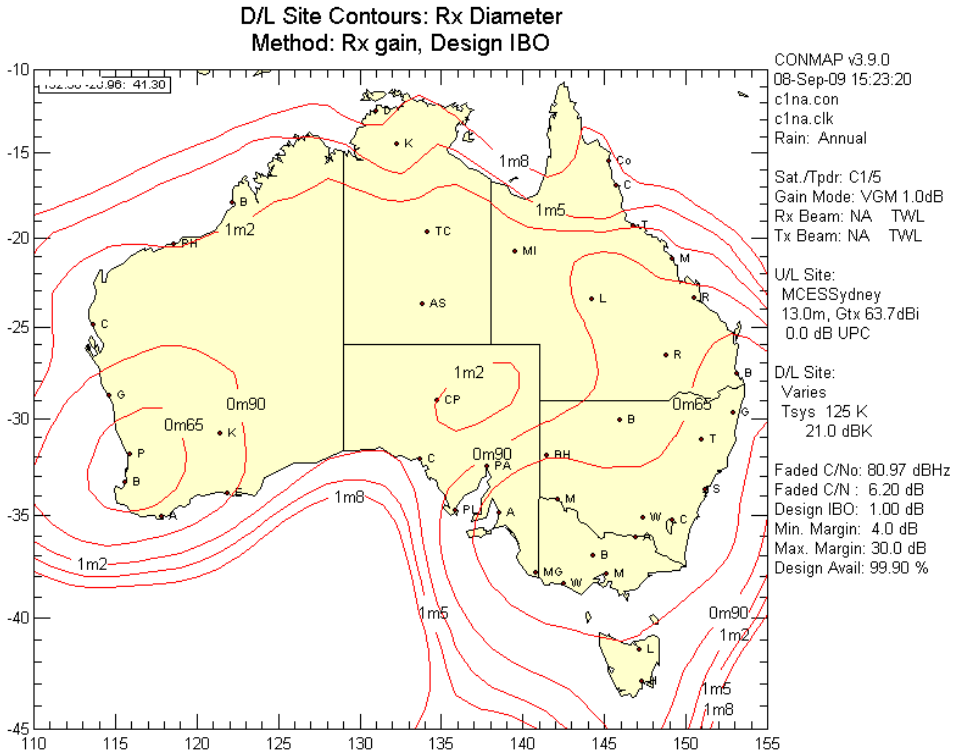
VAST Coverage

2.20 A natural phenomenon of satellite communications is that it is susceptible to rain-fade due to water droplets attenuating the radio transmission.

2.21 Optus has designed the satellite transmission link specifically for VAST in order to minimise the effects of rain-fade to VAST viewers. The satellite link design availability target for the VAST service is 99.9% and is based on industry standard modelling. In Optus' opinion, this is intended to provide an excellent level of performance.

2.22 The following diagram is an antenna size contour map showing the receive antenna size required throughout Australia in order to achieve an availability of 99.9%. Note that the 65cm contour covers a large portion of south-east and south-west Australia where the majority of VAST viewers are located. In other areas, a slightly larger antenna size is recommended to achieve the availability target.

Figure 3 Receive antenna size requirements



The VAST Certified STB

2.23 Optus has developed a “VAST Certification Plan” to certify compliant set top box hardware for sale to consumers. This process allows for a controlled STB environment. Optus believes it is crucially important to have a controlled STB environment to ensure the inter-operability of various brands of STB hardware on the one platform. It provides viewers with a guarantee that their chosen STB will receive the VAST service correctly once installed and provides broadcasters with confidence their service is complying with Australian Standards.

2.24 The VAST STB certification process is open to any STB manufacturer willing to develop a STB for deployment in the VAST environment. The process has been very successful with 3 manufacturers (UEC, Humax and Phoenix) developing a total of 8 variants providing consumers with choice of brand and features as well as inter-operability confidence and standards conformance. Once Optus certifies a STB, a manufacturer has the right to use the VAST logo on the STB.

2.25 The benefits of a controlled STB environment:

(a) ensures compliance with Australian Standards and practices (e.g. parental control or closed captions)

(b) facilitates STB functionality and ongoing inter-operability

(c) allows for television or radio services to be easily started, moved or stopped

(d) enables emergency messaging capability

(e) provides the ability to manage patent and licensing requirements

(f) enhances platform security

(g) enables piracy management

(h) minimises operational issues inherent with an uncontrolled STB environment

2.26 Optus has had direct experience in the operation of an uncontrolled STB population via its previous platform “Aurora” which operated from 1998 until 2013 and hosted the RABS service. The deployment of essentially any STB into that platform severely hampered its operation.

2.27 An uncontrolled STB environment makes it very difficult to:

(a) assure compliance with Australian broadcast standards (e.g. parental control or closed captions)

(b) deploy firmware updates to correct STB issues and new features to the existing STB fleet

(c) make headend changes to services

(d) re-groom the platform for efficient operation or recover from a transponder failure

(e) deploy anti-piracy measures

2.28 Based on our experience with the difficulties of operating the previous Aurora platform in the past with an uncontrolled STB population, Optus designed the replacement Aurora Digital platform in 2010 to include a controlled STB environment. Optus has operated the Aurora Digital platform for the past eight years, achieving a significant improvement in platform security, conformance to standards and general ease of operation.

2.29 During this time, we have regularly deployed new firmware to the STB population to correct software bugs and to activate new features. We are able to make headend changes and regroom the services with confidence, to ensure efficient operation of the platform, as the behaviour of the STB population in the field is known. In addition, we have deployed anti-piracy measures to maintain the security of broadcasters’ content and services on the platform.

2.30 This also provides a direct benefit to the VAST viewers because they can be confident their purchased hardware can be maintained with up-to-date firmware, security and compliance settings as well as enabling the latest user features.

Section 3. POTENTIAL FUTURE TECHNOLOGY

3.1 Optus sees a bright future for VAST services. It is far from a static service, with several exciting future broadcasting technologies in the development pipeline, some of which are suitable to apply to the VAST service. Optus would need to work with relevant stakeholders to implement new technologies. These include:

(a) DVB-S2X modulation;

(b) HEVC (H.265) Video Compression; and

(c) New STB Technology.

DVB-S2X Modulation

3.2 When VAST was launched in 2010, the best available satellite transmission standard was DVB-S2. Subsequently, the DVB-S2X standard was published in 2015.

3.3 Generally, DVB-S2X provides sharper roll-off options, more choices of modcod (more granularity) and more modcods across the range (from BPSK for mobility up to 256APSK for HTS applications). This can potentially improve capacity and spectral efficiency, particularly at the higher order modcods, making it suitable for applications such as high data rate broadcast contribution links and general IP backhaul.

3.4 Another benefit of DVB-S2X is Channel Bonding. This provides the ability to combine transponders into one signal. This is primarily designed for the delivery of Ultra High Definition TV by enabling stat-mux efficiency gains with high bit-rate signals. Channel Bonding could also be used to lower the SI and encryption overheads on DTH platforms similar to Aurora Digital.

3.5 Optus has assessed DVB-S2X for use in the Aurora Digital platform and the VAST services and does not believe it is suitable for several reasons:

(a) At the modcod level Optus is operating for VAST (i.e. 8PSK), there is not a significant difference in spectral efficiency between DVB-S2 and DVB-S2X.

(b) The selected operating modcod for VAST was optimised for the required receive antenna size (65cm) and the adjacent DVB-S2X options provide only a minor benefit to the platform throughput.

(c) The major consideration with introducing DVB-S2X would be backwards compatibility. There are over 330,000 registered VAST STBs on the Aurora Digital platform and none of these could receive and demodulate a DVB-S2X carrier.

HEVC (H.265) Video Compression

3.6 The current VAST Certified STBs support MPEG2 and MPEG4 video compression standards and most VAST services are broadcast in MPEG4.

3.7 In 2013, HEVC was ratified as a standard, promising up to 40%-50% improvement in bandwidth efficiency over MPEG4.

3.8 Optus has considered whether its Aurora Digital platform could support migrating VAST services to HEVC. In theory, broadcasters could encode in HEVC format and the existing Aurora Digital headend would pass the content through to transmission without issue. Optus has tested this capability and can demonstrate it to the stakeholders.

3.9 Again, the major consideration is backwards compatibility with the existing deployed VAST STB fleet as none can decode HEVC content.

3.10 However, if the stakeholders desired, new HEVC services could potentially be introduced that would only be available on new STB models capable of supporting HEVC. Whilst the legacy VAST STBs could not access the new service, viewers may be enticed to take-up new hardware so that it could be accessed.

3.11 Optus notes that the new Gen 2 STB (see following) that has been developed for other Aurora Digital services does in fact support the HEVC compression standard.

New STB Technology

3.12 STB suppliers are continuously developing new features and capabilities for their next generation STBs. Optus is in constant communication with the STB vendors to stay across these technology developments and assess their suitability for commercial deployment on Aurora Digital.

3.13 An example of new STB technologies that are currently being developed for use with VAST include: Integrated STB/TV, smartcard-less CA technology, wireless in-home connectivity, HEVC decoding, HbbTV support (for broadband delivered content), Ethernet broadband port access and PVR support.

3.14 The new Gen 2 STB (UEC DHR4901) is an example of new STB Technology. It has been developed for use on Aurora Digital and supports these new features including:

(a) 2 TB HDD

(b) 10 channel PVR

(c) Hybrid broadband/broadcast capability (HbbTV)

(d) Ethernet broadband port

(e) 16 DVB-S2/S2Xsatellite tuners

(f) 4 x DVB-T/T2 terrestrial tuners

(g) SD, HD, UHD

(h) MPEG2, MPEG4 and HEVC decoding

(i) HDMI 2.0

Figure 4 New STB Technology (UEC DHR4901)

Advanced Features of Gen 2 STB

3.15 The Gen 2 STB includes the following features that could provide significant benefits to a future VAST environment. Optus has completed proof-of-concept testing of these features.

Hybrid Broadband/Broadcast Capability

3.16 Optus can demonstrate an application on the Gen 2 STB that could support on-demand services such as ABC iView or SBS On Demand allowing the viewer to switch between broadcast and broadband delivered content.

3.17 Optus could develop the on-demand TV application such that it could work whether the viewer elects to have a broadband service or not.

3.18 If a broadband service is available, then the STB operates using normal HbbTV functions to support, for example, the ABC iView application.

3.19 If the viewer elects not to have a broadband service, then the following process could be used to provide a limited on-demand service to the viewer.

(a) A private partition on the 2TB hard drive of the STB can be used to store content that is curated by the broadcaster and presented to the viewer on-demand.

(b) The storage of the content onto the HDD can be done in two ways:

(i) As a linear recording in real time controlled via the Aurora Digital headend over the satellite

(ii) As a data file in non-real time in the background via the Aurora Digital headend over the satellite

(c) When the viewer selects content to play, the STB searches the stored content on the local HDD and it is replayed directly. If this content is not present, the request is re-directed to the content provider via the connected broadband network (if available) and the content is then streamed to the viewer.

3.20 By way of example, the ABC iView service could operate without broadband by downloading (or force recording), say the top 25% most popular videos to the STB and caching the content on the HDD. The viewer simply interacts with the content via the locally stored ABC iView application and the video is played on-demand.

Ad Insertion

3.21 Optus has completed a proof-of-concept test that allows an advertisement being played out in the linear stream to be replaced by an alternate advertisement stored on the STB local HDD private partition.

3.22 This feature allows a broadcaster to segment their advertising to many more markets without the need to transmit multiple linear broadcasts. The advertisement is transferred to the target STB via a data file transfer over the satellite.

3.23 This feature would not only save transmission capacity costs for the broadcaster, but it would make the service more relevant to the viewer as the advertising content would be more applicable to their local region. Further development could provide targeted advertising to each specific STB based on a recommendation engine and STB analytics.

App Support

3.24 The advanced STB features that Optus is developing include support for Apps (applications). These can include popular streaming apps commonly used in smart TVs, such as ABC iView, SBS On Demand, Netflix, Stan etc.

Section 4. HISTORY OF OPTUS AND REMOTE AREA BROADCASTING

4.1 Optus Satellite's history dates back to the 1980's when the Australian Government created AUSSAT in 1981 as the national satellite carrier. AUSSAT hosted the first remote area broadcast service "HACBSS" from 1985, supporting National and Commercial broadcast services.

4.2 Optus entered the telecommunications market in the early 1990's and provided Australians with a choice of carrier for the first time. Satellite is where Optus started with the purchase of AUSSAT in 1991 as part of the telecommunications licence deal.

4.3 Since 1985, Optus has proudly and continuously hosted the remote area broadcast services throughout the 3 eras of HACBSS, RABS and VAST. We have an unmatched track record in delivering the highest quality satellite television and radio broadcast services to communities in rural and remote Australia.

4.4 Optus Satellite now has five operational satellites in orbit with the ability to deliver services throughout Australia and New Zealand.[4]

Figure 5 Remote Area Broadcasting Historic Timeline

HACBSS
Homestead and Community Broadcast Satellite Service (1985-1998)
Platform: B-MAC
Satellites: Aussat (Optus) A1 and Aussat (Optus) A2

RABS
Remote Area Broadcast Service (1998-2013)
Platform: Aurora
Satellites: Optus B3 and Optus C1

VAST
Viewer Access Satellite Television (2010-present)
Platform: Aurora Digital
Satellites: Optus C1 and Optus D3

[4] See www.optus.com.au/satellite.

Section 5. ACRONYMS/DEFINITIONS

Parameter	Definition
App *or* Application	An independent software program designed to perform a specific function for a user on their compatible device (eg., smartphone, tablet, smartTV, laptop, STB). Apps are typically downloaded by the user directly onto their compatible device.
B-MAC	A form of analogue video encoding; MAC being Multiplexed Analogue Components and B-MAC being the proprietary version used by Scientific-Atlanta
Bouquet	A collection of services marketed as a single entity.
Conditional Access *or* CA	A system to control viewer access to services
DTH	Direct To Home
DVB	Digital Video Broadcasting
Electronic Program Guide	A means of presenting available content to the consumer and allowing selection of the desired content. Broadcasters transmit schedules in their streams and the STB uses this information to produce the Electronic Program Guide.
FTA	Free to air
Free TV	Free TV Australia
HACBSS	Homestead and Community Broadcast Satellite Service
HD	High Definition
HDD	Hard Disk Drive
HbbTV	Hybrid Broadcast Broadband Television
HEVC	High Efficiency Video Coding (H.265)
HTS	High Throughput Satellite
Modcod	Modulation and Coding. The combination of modulation and Forward Error Correction (coding) used to transmit the Satellite Signal.
MPEG	Moving Picture Experts Group
MPEG-2	See ISO/IEC 13818 1,2,3

MPEG-4	Advance Video Coding (H.264)
Multiplex	A group of services mixed together (multiplexed) for broadcast over a digital transmission medium for later separation (de-multiplexing) by a receiver
Piracy	Reception and display of a broadcast service at a location where such reception is not authorised by the broadcaster concerned
PVR	Personal Video Recorder
RABS	Remote Area Broadcast Service
RBA	Regional Broadcasters Australia - represents the interests of Australia's regional and remote commercial broadcast licence holders
SD	Standard Definition
SI	Service Information - data carried in a transport stream that enables the headend to control the STB in order to display the channels received from multiple transponders.
Stat-Mux	Statistical Multiplexing, allowing content to operate at varying bit-rates depending on quality demands
STB	Set Top Box
Transponder	A wireless communications device that receives and transmits a communication signal at a prescribed frequency range. The communications payload on a satellite has a number of transponders.
Transport Stream	A data structure defined in ISO/IEC 13818-1
VMS	Viewer Management System - a system to manage viewer content entitlements
VAST	Viewer Access Satellite Television - a service funded by the Australian government that provides satellite delivery of free-to-air television to users in Australia unable to receive reliable local terrestrial transmissions

Section 6. RESPONSES TO QUESTIONS

	Questions	Optus Responses
Feedback on VAST		
1.	In what ways is the VAST service appropriate for delivery of television in areas without reliable terrestrial coverage?	The VAST service is broadcast via the Optus Aurora Digital platform on both the Optus C1 and Optus D3 satellite. These two satellites have been specifically designed (in terms of orbital location, transponder configuration and beam shapes) for the Australian land mass. The link design has been tailored to optimise performance into a 65cm receive dish in the south-east and south-west of Australia (see contour map in section 2). The service provides 100% coverage throughout mainland Australia and Tasmania[5]. One of the great successes of the VAST service is that it provides equivalent television for viewers in remote areas in comparison to terrestrial free-to-air television viewers in metropolitan areas. VAST has bridged the digital divide such that there is equivalence of content and video/audio quality regardless of where a viewer lives. Viewers in regional and remote areas can receive the same free-to-air television content with equivalent quality-of-service as anywhere else in Australia. Therefore, the VAST service via Aurora Digital is appropriate for regional, remote and blackspot areas. In Optus' opinion, there is no other commercially viable technology providing the reach and coverage of single beam direct-to-home Ku-band satellite transmission as used to support the VAST service. It is still the most practical means to deliver FTA TV to these areas.

[5] Coverage depends on clear line-of-sight to the Optus C1 and D3 satellites with no obstructions.

2.	Are the current range of TV and radio services offered appropriate?	Optus believes the range of VAST TV and Radio services is appropriate because it is equivalent to terrestrial broadcasts. Optus continues to monitor the broadcast industry generally and notes the rise of on-demand services such as ABC's "iView" and SBS' "SBS-on-Demand". If required, Optus could support these services over VAST even when the viewer elects not to have a broadband service. This can be achieved with some further enhancements of the next generation of VAST STBs such as the UEC DHR4901. This device has a 2TB hard-drive that can load on-demand content over-the-air in the background and playout on request by the user. Optus would welcome further discussions with the stakeholders to develop this capability should there be a requirement. (see section 3).
3.	To what extent are VAST set-top boxes meeting the needs of viewers?	Optus believes the VAST STB is meeting the broadcasting needs of viewers but we are committed to continuous improvement and would consider modifications to allow access to on-demand services, as described in our answers to questions 2 and 5. With 3 manufacturers producing a total of 8 variants, consumers are offered a good range of brands and features creating healthy competition in the market place. Existing STBs range from basic VAST functionality to high-end PVR models and integrated STB/TV models. Although not currently activated, most devices are equipped with Ethernet ports that could be configured to receive streaming content if the stakeholders desired. Whilst reasonably priced, VAST STBs are slightly more expensive than the equivalent terrestrial STB. This is typically due to the additional compliance processes of operating in a controlled STB environment with a strictly controlled conditional access system. This leads to addition ongoing management, licensing and royalty costs. Terrestrial STBs are not as strictly controlled as VAST STBs. (see section 2 - The VAST Certified STB).
4.	To what extent do the regional commercial news arrangements on VAST meet the needs of viewers?	Optus does not have an opinion of the content on the VAST service. Regarding the delivery of news services, if the stakeholders desired, Optus could facilitate on-demand news services delivered via a hybrid model as described in section 3.
5.	Specifically, how could the current VAST service be improved?	There are opportunities to further enhance STB capabilities to support newer services such as on-demand services and HbbTV. Optus has worked with STB manufacturers to develop advanced features which have been used for other services not associated with VAST.

		If desired by the stakeholders, Optus would welcome discussing the opportunity to include these advanced features in the VAST environment. See “Section 3 - Advanced Features of Gen 2 STB” for further details.
Changes in the media landscape—2010 to now		
6.	How has the increasing availability of online TV content changed the way viewers access and consume content in areas unable to receive terrestrial FTA TV transmission?	Television viewing in Australia has changed significantly since 2010. The rise of streaming services and OTT has provided the viewer more choices of content on their living room screen. Optus notes the popularity of on-demand services such as ABC iView, SBS On Demand, Netflix Australia etc. that have been launched during the time since VAST commenced. These services have largely been enabled by the significant improvement in the availability and speed of broadband services in Australia since 2010. Growth in online delivery of television content is expected to continue. Whilst online content has become popular, particularly with younger generations, a significant proportion of Australians in regional, rural and remote regions, continue to watch linear broadcast television. Optus believes that direct-to-home broadcasting via a single beam Ku-band satellite is still the most cost-effective and practical means to deliver free-to-air television and radio services to regional, remote and blackspot areas of Australia.
7.	To what extent should future delivery models allow flexibility to utilise new technology to provide access to terrestrial television services?	As television viewing habits shift towards on-demand services over the medium to long-term future, there is a growing requirement for platforms that support both on-demand and broadcast content to evolve and improve. Optus is addressing this requirement through the development of hybrid on-demand/broadcast content delivery capabilities. Optus has developed new STB technology to support these future delivery models such as on-demand services and HbbTV. (see section 3 Advance Features of Gen 2 STB). These developments could allow VAST viewers to gain access to both broadcast and on-demand

		TV content even when there is no broadband network available. If desired by the stakeholders, Optus would welcome discussing the opportunity to include these advanced features in the VAST environment. New technology will always continue to provide ever increasing gains in efficiency and new features. However, we note the necessity of remaining backwards compatible with legacy viewer receiver equipment in a broadcast environment. For this reason, introduction of new technology needs to be carefully managed with regard to the existing viewer base. Overall, the broadcasting of content via a single beam Ku-band satellite remains the most cost-effective and practical means to provide Australia wide access to free-to-air television and radio services. This broadcasting technology can be complemented by the emerging hybrid platforms being developed by Optus that support on-demand services as described in section 3.
Conditional Access		
8.	How could the process for viewers to apply for and access VAST be improved? Does the process remain appropriate?	VAST activations are fully automated via Optus' Viewer Management System (VMS). We receive 600-700 activation requests per week from the RBA after they qualify the viewer's location with respect to the broadcast license areas. Activations via the VMS typically take a few seconds, do not require human interaction and can be done online. In some circumstances, where commercial services are not requested, an activation for ABC and SBS services only can be done through a web-based activation portal operated by Optus on behalf of the public broadcasters (www.myVAST.com.au). This portal is fully automatic and activations are achieved within a few seconds of the submission. Optus believes the existing technical processes and systems are appropriate but is committed to continuous improvement.

		Optus is aware that some viewers experience difficulty when their STB has been switched off for several weeks and requires a re-activation of services. Both the RBA and Optus provide a web-based service that will re-activate an STB within a few seconds. However, more could be done to improve awareness of this capability. Whilst Optus publishes this information on the VAST web-site, and in the on-air help channel, a public awareness and education campaign covering this and other VAST related issues would be a benefit to the wider VAST viewers. Another enhancement that Optus could develop is user self-activation via the STB. This could be facilitated via the STB broadband port and would require a back-channel connection via the internet.
9.	What are the key reasons for maintaining the conditional access arrangements beyond 2020?	There are four main functions of the conditional access system on VAST: 1. The conditional access system is used to enforce the commercial broadcast license area boundaries as defined by ACMA. Once the viewer's address is established, the RBA determines what services the specific STB is eligible to receive and then commands the Optus VMS system to activate the relevant commercial channels. 2. The conditional access system provides the capability to perform a regional blackout for a certain state service from ABC or SBS. For example, in the case of a court ordered media blackout in relation to a specific issue in a particular state, the conditional access system enables broadcasters to provide state-specific news services in order to comply with the court order. 3. Conditional access is required for the enforcement of the controlled STB policy. The controlled STB is achieved through the VAST STB Certification process. This allows conformance with mandated STB specifications as required by the various VAST stakeholders including the government, Standards Australia, Free TV and the broadcasters. In particular, compliance with Australian local requirements for parental control and closed

		captions. The controlled STB policy arrangements provide a guarantee to the consumer that their purchased STB hardware will operate correctly on the VAST service. 4. Conditional access allows broadcasters to honour their content rights agreements and avoid breaching international broadcasting legislation. It also inhibits content piracy and ensures that Australia complies with United Nations Direct Broadcast principles. Whilst the Optus Satellite coverage area footprint naturally extends beyond the coastline of Australia, our conditional access system prevents unauthorised reception in non-Australian locations (such as Papua New Guinea). Conditional access provides the ability to deny access to services in locations where the broadcaster does not have content or broadcast rights and prevents unauthorised access to content both within and outside of Australia.
Funding		
10.	What are the main factors that would most influence industry investment in the delivery of FTA TV services in areas unable to receive a reliable terrestrial transmission? Why?	Optus Satellite's core business is selling satellite transponder capacity. We invest in platforms such as Aurora Digital in order to facilitate the use of satellite capacity for services such as VAST. These investments include fibre backhaul connectivity systems, broadcast headend transmission systems, conditional access systems, satellite uplink systems and STB development. Optus has invested significant resources into providing a viable and successful VAST service. Optus will continue to invest in such systems provided it makes business sense to do so. We assess the future satellite capacity requirements for the Australian market when it comes time to replace in-orbit assets. Since satellite procurement and launch is high risk requiring a very high upfront capital expenditure with a finite life expectancy of typically 15 years, the business cases must be carefully assessed within this context. Long-term commitments from customers for satellite capacity is essential in order to justify a satellite replacement program. In addition, there is a long lead-time for the procurement of a satellite which is typically 3-4 years from order to being in-orbit.

		Regarding STB development, in Optus' experience, STB vendors usually require additional payment for special or unique feature development as well as minimum volume commitments. Stakeholders should consider how these funding requirements would be met should any special features as described in this document be required.