

**COMMUNICATIONS
ALLIANCE LTD**



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INTRODUCTION

Communications Alliance welcomes the opportunity to provide this submission in response to the Regional Telecommunications Review 2021. Rural, regional and remote communities are vital to Australia's economy and future, and as the Committee is well aware, ensuring those communities are appropriately connected is important – but challenging – work.

Due to the nature of Australia's demographics and landmass, it has long been acknowledged that not all technology will be commercially viable in all areas of Australia, so Government programs to support this connection are necessary, as is helping people and businesses in the regions understand their connection options, with new and innovative technologies available every year.

We have answered those questions in the paper on which we are best positioned to provide input, noting that many are more appropriate for those in the regions to answer, drawing on their experiences.

Information is provided on a range of topics, but our specific recommendations are summarised below. On some topics, we have endorsed specific section of the submission from the Australian Mobile Telecommunications Industry (AMTA) – in particular on matters of mobile coverage and Powers and Immunities.

In addition, the final section of the paper on "Satellite Services" provides input from the members of Communications Alliance's Satellite Services Working Group (SSWG) on the many new satellite connectivity projects emerging globally and in the Asia-Pac region and how Government can best support the development and rollout of this technology to connect Australians. This section includes background on the services and timeframes for technological and service introduction from specific members. The different technologies offered by members of the SSWG and the broader Communications Alliance membership means that most of the comments in that section represent specifically the views of the SSWG.

Summary of recommendations

Service Reliability

We encourage the Committee to consider any recommendations on service reliability in light of the current consultations being undertaken by the ACMA, as any new or different regulations would risk being duplicative or conflicting.

On the matter of the current work on improvements to the sharing of data on infrastructure assets, **we recommend the establishment of a single, national integrated IT system (digital twin) which complies with Australian Government information security standards and covers all jurisdictions.**

Service Reliability During Natural Disasters

Our submission provides updates on the work telecommunications providers have done in coordination with Government and energy providers to improve resiliency during natural disasters. However, there is always more to be done.

We recommend that **Government should educate communities about how they can best prepare for these circumstances** and **we urgently suggest government engage with industry to develop a clear definition of essential services on a National level** (or at least to harmonise any such efforts across the States).

Emergency services

Industry has also been working on improving how telecommunications services can better support Australians during emergencies. In this section we provide information on Advanced

Mobile Location technology, and we also **recommend a Government commitment is made to fully fund the Emergency Cell Broadcast system once the design phase is complete.**

Regional Development

Government programs and the associated policy environments should seek to provide broad support where appropriate to help create a future that enables regional Australia to benefit from, and capitalise on, the digital changes to our society and economy, including through co-investment programs, and **network infrastructure providers — both established and emerging — should be a focus area for future co-ordination efforts.**

Emerging Technologies

We support the section of AMTA's submission on the rollout and capabilities of 5G, noting that not all Communications Alliance members support AMTA's recommendations on spectrum allocations. Additionally, while the section on Satellite Services provides information on that topic, the broader Communications Alliance membership proposes that **the ACMA develop an integrated satellite and regional services strategy.**

Maximising Outcomes

AMTA has provided information on how different levels of Government can streamline the process to roll out mobile towers, which we support. Additionally, we recommend that **telecommunications infrastructure is factored into, and planned for, as a part of all major infrastructure activity.**

Education

We note the important work done by the Australian Communications Consumer Action Network (ACCAN), including in coordination with other groups, in educating consumers on their options. In recent years, ACCAN's activities have spread beyond traditional 'telecommunications,' (voice and internet) services, with work being done on topics such as digital platforms, captioning on free-to-air television, and Australian content on broadcast services. As ACCAN's core funding is currently solely sourced from telecommunications carriers, **we suggest that consideration be given by all involved stakeholders to how fees can be gathered from all relevant sections of industry in the future.**

Other matters

We encourage the Committee and Government to consider whether some of the various activities on supporting and connecting regional Australia could be combined and/or include additional coordination to ensure efficient and effective use of resources.

Satellite

In addition to the recommendation on an integrated strategy, this section provides the following recommendations on behalf of the SSWG members:

- Government is encouraged to ensure that their policies and programs continue to allow C-band satellite services to economically operate in Australia to enable them to provide vital backhaul services for Australia's remote and regional areas.
- The ACMA should incorporate the 2 x 5 MHz into the general MSS band and assign 2 x 15 MHz (paired) to operators.
- Federal and State Governments should consider an Earth Station Protection Zone in regional South Australia covering satellite bands between 3,575 to 42,500 MHz but especially 3,400 to 4,200 MHz.
- Government should give serious thought to investing in satellite services (including C-band) through funding a relocation program for satellite service providers and operators into Earth Station Protection Zones.

- Government is encouraged to engage in ongoing review of the existing mechanisms for utilising USO funding, and greater support for advanced satellite-based connectivity solutions should be closely examined.
- Satellite should be a foundational part of national infrastructure.
- Utilising the ubiquitous coverage of geostationary satellites for backhaul, mobile network operators can connect multiple cell sites anywhere using a single pool of bandwidth dynamically allocated to each site based on peak usage per site, maximizing use of capacity.

About Communications Alliance

Communications Alliance is the primary telecommunications industry body in Australia. Its membership is drawn from a wide cross-section of the communications industry, including carriers, carriage and internet service providers, content providers, equipment vendors, IT companies, consultants and business groups.

Its vision is to provide a unified voice for the telecommunications industry and to lead it into the next generation of converging networks, technologies and services. The prime mission of Communications Alliance is to promote the growth of the Australian communications industry and the protection of consumer interests by fostering the highest standards of business ethics and behaviour through industry self-governance. For more details about Communications Alliance, see <http://www.commsalliance.com.au>.

ADEQUACY

Changing Demand

Mobile Services – the 3G Transition

We note the Committee's interest in the switch-over of the mobile network from 3G to 4G and 5G. Periods of transition such as network closures are a characteristic of the mobile telecommunications industry globally. This is due to the continually evolving nature of mobile telecommunications technologies, the scarcity of spectrum resources upon which mobile and wireless services are delivered and strong, ongoing growth in end user demands. New technologies offer end users better experiences and they can make better use of finite spectrum resources.

AMTA has provided further information on the closure of 3G networks in their submission, and Communications Alliance endorses what they have put forward.

Service Reliability

Current work on service reliability

We understand that service reliability is of interest to the Committee, as telecommunications services have become essential to a range of daily activities. While we do not have any particular views to put forward at this time, we would like to ensure the Committee is aware that the ACMA has been considering service standards for superfast broadband services and how to set those in coordination with the Statutory Infrastructure Provider regime.¹ We encourage the Committee to make any recommendations on this matter in light of those consultations and the existing regime, as any new or different regulations would risk being duplicative or conflicting.

Critical Infrastructure

The Committee has indicated interest in how the current work in the national security space on identifying critical infrastructure assets may or may not be relevant to the identification of critical assets for disaster management planning. Our view is that the existing framework under Sections 313-315 the *Telecommunications Act 1997*, (Telecommunications Sector Security Reforms (TSSR)) is sufficient.²

Our sector is subject to a number of security and resilience-related obligations under various pieces of legislation and (enforceable) co-regulatory instruments, many of which take an all-hazards approach. In addition to these obligations, Carriers have detailed disaster management plans in place. Thus, there are sufficient regulatory requirements in place regarding the identification and categorisation of critical infrastructure assets.

However, there could be improvements made to the sharing of data on infrastructure assets, which is currently state-based. A national solution would be preferable, with the caveat that high security standards are necessary and there needs to be extensive consultation on what level of detail is practical and/or appropriate.

Communications Alliance has developed Guideline G665:2021 *Telecommunications - Facilities Information Sharing* (discussed in the following section on the impact of energy on telecommunications networks), however, this is only a first step.³

¹ The ACMA began a [consultation process](#) on service standards for superfast fixed broadband services in late 2020. Comms Alliance provided [a submission](#), but the ACMA's process was placed on hold as the Department of Infrastructure, Transport, Regional Development and Communications began [a public consultation](#) on a similar topic.

² Communications Alliance's most recent submission on this topic, the Department of Home Affairs' consultation on the Draft Critical Infrastructure Asst Definition Rules, can be found here: [210514_CI-Asset-Definition-Rules_SUBMITTED.pdf \(commsalliance.com.au\)](#)

³ [G665:2021](#)

Security of data on infrastructure assets is a key matter to consider in any steps towards sharing of information, to avoid potential impacts to customer connectivity beyond the natural disaster impacts. In addition to cyber security considerations, Industry must be mindful of other concerns in relation to the protection of assets, such as targeted physical security threats or theft.

We recommend the establishment of a single, national integrated IT system which complies with Australian Government information security standards and covers all jurisdictions. This system, also known as a “Digital Twin”, would ensure that data was encrypted at all times, that access controls limit redistribution of aggregated data to only those who need it for the purpose of proactive planning and protection of facilities during emergency events, and that any data breaches could be quickly identified and effectively responded to. Industry would welcome an opportunity to work together with the Australian Government to reuse or enhance an existing government system or capability to meet these needs, or to develop one.

Service Reliability During Natural Disasters

Question 5: How might such impacts [outages in natural disasters] be addressed to ensure greater reliability? How can the network resilience be addressed in regional areas?

Telecommunications providers work tirelessly during natural disasters to protect Australia's connectivity, aid emergency services, and support communities. As soon as technicians and engineers are allowed access – and they often have to be escorted by emergency services – they work around the clock in difficult situations to get people reconnected as quickly as possible.

With that in mind, there were clear lessons from the 2019-20 disaster season of both floods and bushfires. There has been significant work done on improving reliability of services following this, and Industry is continuing to work with Government and other stakeholders on rolling this out and ensuring we are well prepared for any future events.

While Industry will continue this work, and welcomes Government initiatives such as the Strengthening Telecommunications Against Natural Disasters (STAND) program, it is also important to understand that telecommunications infrastructure – along with the mains power required for it – is vulnerable to natural disasters. Despite the many proactive measures being taken around preparation and responsiveness, disaster-related outages will sometimes occur. **Government should educate communities about how they can best prepare for these circumstances.**

Impact of energy on telecommunications networks

As noted in the consultation paper, telecommunications outages during natural disasters are often caused by loss of power. It is important to remember the role of batteries is to allow time for technicians to get to the site and fix an issue related to power supply – they are not a longer duration mains power replacement. Continuity of mains power supply is critical for telecommunications networks.

Communications Alliance and AMTA provided a joint submission to the Royal Commission into National Natural Disaster Arrangements in April 2020, that provides significant information and background on connectivity technologies and resilience.⁴

Communications Alliance and its members have continued to work towards improving coordination with emergency services and electricity networks following the 2020 bushfires, and in October 2020, Energy Networks Australia (ENA) and Communications Alliance signed a Memorandum of Understanding to help further improve collaboration and knowledge

⁴ [CA AMTA submission to Royal Commission](#)

sharing between the two sectors to better respond to emergency situations, in line with a draft recommendation of the Royal Commission for closer cooperation between the industries.⁵

The MOU sets out to achieve the following objectives:

- improve the safety of communities by mitigating the risks of being isolated due to telecommunications and/or power outages during emergencies;
- improve the sustainability of both telecommunications and power supply services to communities affected by emergencies to support their recovery; and
- targets effective collaboration between telecommunications and electricity networks and coordination of infrastructure in preparing for and responding to emergencies at a local, regional and state level.

The Communications Resilience Administration Industry Group within CA has also published *G663:2020 Telecommunications – Emergency Communications Protocol*⁶ and *G665:2021 Telecommunications – Facilities Information Sharing*⁷ Guidelines to assist relevant Australian Government agencies when events cause major disruptions to telecommunications services. These are to ensure that data is consistent between carriers, is fit for purpose, and that appropriate data security controls are identified and agreed.

We also note that the Digital Twin work – where it captures the electricity power supply sector – could be an effective way to share information on expected service restoration times in the future, per our recommendation in the previous section for a single, national integrated IT system for the sharing of data on infrastructure assets.

As the provision of telecommunications during times of emergency and/or natural disasters has a strong reliance on the electricity power supply sector, it is critical that these parties continue to be actively involved in working with end users on issues of information sharing and coordination. This includes access to real-time information from power supply companies on expected service restoration times, as this information can help guide the decision making of network operators when responding to outage events.

Essential Services Definition

There is not currently a clear definition of essential services on a National level. During a natural disaster or other event, the delineation of what services are 'essential' often determines access to infrastructure for repairs or supplies (such as fuel) for continued power.

As set out in our submission to the Royal Commission, **we urgently suggest government engage with industry to develop a clear definition of essential services on a National level** (or at least to harmonise any such efforts across the States) and to communicate this definition accordingly to ensure that the connection, operation and restoration of essential services can be maintained – across and within State borders – to the largest extent possible during a crisis.⁸

For example, ready access to liquid fuel for vehicles and for back-up generators is a key enabler for service providers endeavouring to protect, repair or provide back-up power supply to mobile and network assets in emergency situations. The telecommunications industry has sought – unsuccessfully to date – to have the members of the communications

⁵ [Memorandum of Understanding](#)

⁶ [G663:2020](#)

⁷ [G665:2021](#)

⁸ [CA AMTA submission to Royal Commission](#)

supply chain placed on the list of essential user activities under the Essential Users Determination under the *Liquid Fuel Emergency Act 1984*.

Strengthening Telecommunications Against Natural Disasters (STAND) program

The Federal Government's STAND Program, developed after the catastrophic 2019-20 bushfire season is a good example of Government funding targeted initiatives to meet specific community needs and supplement the resiliency efforts of Carriers in bushfire and disaster-prone areas.

Under the \$37.1 million program, the Government is providing funding to deploy NBN Co satellite services to emergency services and evacuation centres, strengthening regional and remote mobile phone base stations against outages, and boosting portable telecommunications equipment reserves to help restore services quickly.

Emergency services

Communications Alliance has been working with Government and others on two projects that will strengthen the information available to and access to emergency services across Australia, including in regional and remote areas.

Emergency Cell Broadcast

During 2020 Communications Alliance members pressed Government to consider creating an Emergency Cell Broadcast (ECB) system in Australia. An ECB system can be a lifesaver in natural disaster situations, because it means that mobile phone users can receive an emergency alert, even if they are in a location where they do not have mobile coverage via their own provider. The Government provided \$2.2m in the 2021 Federal Budget for work to design the ECB, but additional funding is required to build the system. **We recommend a Government commitment is made to fully fund the ECB system once the design phase is complete.**

Advanced Mobile Location

Government announced the availability of Advanced Mobile Location (AML) for Australians calling Triple Zero on mobile phones in December 2020,⁹ and the completion of the rollout in August 2021.¹⁰ AML gives emergency services more accurate and precise information on an emergency caller's location than previously available.

Government's announcement of the completed rollout included an example where "AML has already been used to save lives. In South Australia, the technology helped emergency services locate two kayakers caught in strong winds three kilometres offshore, which eliminated the need for an expensive air and sea search."

The planning and implementation of this technology was undertaken by industry through a Communications Alliance Working Group. Communications Alliance published its AML Guideline G557.6:2021 *Location Information for Emergency Calls, Part 6: Advanced Mobile Location* in December 2019, with an update in April 2021. The Guideline defines the arrangements for the transfer of AML information, associated with an emergency call, between a Mobile Carrier and the Emergency Call Person for 000 and 112.¹¹

Many people worked cooperatively behind the scenes to make all the pieces work seamlessly, such as by adding extra data links between mobile carriers, testing everything including different phone models, message delivery and various locations to the highest standard of reliability – as one would expect for emergency calls.

⁹ <https://minister.infrastructure.gov.au/fletcher/media-release/more-accurate-location-data-triple-zero>

¹⁰ <https://minister.infrastructure.gov.au/fletcher/media-release/location-technology-triple-zero-saving-lives-across-australia>

¹¹ [Commsalliance.com.au](https://commsalliance.com.au) - G557:2021 Location Information for Emergency Calls

OPPORTUNITY

Regional Development

Question 8: How can investment in telecommunications infrastructure work with other programs and policies to encourage economic development in regional Australia?

Question 9: What role could innovation, including new models, alternative investors or new ways of doing business, play to encourage investment in regional telecommunications infrastructure? What are the barriers?

The telecommunications industry has a strong history of working with Governments across Australia to deliver new and improved infrastructure for the delivery of telecommunication services, especially in areas where economic, social and/or other benefits are targeted. We welcome the way in which the guidelines for these programs typically undergo public consultation before being finalised and released, as this provides the opportunity for industry input around different aspects of program design.

New and innovative technologies, including 5G and satellite, have an important role in providing services to Regional Australians. In practice, no single solution or emerging technology will meet the needs of all end-users, so Government programs and the associated policy environments should seek to provide broad support where appropriate to help create a future that enables regional Australia to benefit from, and capitalise on, the digital changes to our society and economy.

In the past some new technologies have been funded as part of some co-investment programs, alongside funding provided to more established technologies, and this has been a sensible approach to balancing the testing of new models with the known capabilities of established technologies.

The key challenge for many of the areas or outcomes targeted by Government co-investment programs is the economic case, even with Government contributions factored in. Increasing co-investment would benefit many programs, and **network infrastructure providers — both established and emerging — should be a focus area for future co-ordination efforts**. Increased co-location could also be supported by greater financial support for co-locating parties and provision for some operational costs (which can be significant) to also be funded.

Emerging Technologies

Question 10: To what extent will new technologies enable significant change to the delivery of telecommunications services in regional Australia over the next 5-10 years? Are there any barriers to accessing these technologies?

Question 11: How can Government better support the rapid rollout of and investment in new telecommunications solutions in regional areas?

Mobile communications and 5G

5G networks will bring a range of new communications and connectivity capabilities to regional communities. The supply of higher bitrate and low-latency capabilities will enable the introduction of new and innovative services in the fields of health, agriculture, education, transport and smart communities. Technologies such as augmented reality (AR) and real-time remote control of machinery, both of which depend on low latency and high data rates to support image processing, will be enabled by 5G, bringing new services, enhanced community lifestyle and improved productivity to regional communities.

The higher data rates of 5G will also support the continued migration of people and families from capital cities to regional communities triggered by COVID-19 and enforced working from home policies for office-based workers. This migration brings income and opportunities that help to sustain and grow regional communities.

We note that AMTA's submission provides further information on the rollout and capabilities of 5G. We commend their proposals for supporting the rollout of 5G, however noting that not all Communications Alliance members support AMTA's recommendations on spectrum allocations.

Satellite

The section on "Satellite Services" at the end of this submission provides detailed input from the members of Communications Alliance's Satellite Services Working Group (SSWG).

While the different technologies offered by members of the SSWG and the broader Communications Alliance membership means that most of the comments in that section only represent the views of the SSWG, all Communications Alliance members are excited about the potential of satellite to help connect Australians to telecommunications services, and the potential of growth in the satellite and broader space sector.

The broader membership does endorse the SSWG's proposal that **the ACMA develop an integrated satellite and regional services strategy**, as appropriate coordination and planning is vital.

Maximising Outcomes

Question 12: How can different levels of Government, the telecommunications industry and regional communities better co-ordinate their efforts to improve telecommunications in regional Australia?

Powers and Immunities

Unfortunately, we often find that in communities who are raising concerns about connectivity, a Mobile Network Operator (MNO) is already in process of trying to build a mobile tower to improve connectivity, but is being held up by local government approval processes. This can delay connectivity improvements by years.

We endorse the relevant section of AMTA's submission on how different levels of Government can streamline the process to roll out mobile towers.

Infrastructure rollout

With the increasing importance of telecommunications services to the economic and social fabric of Australia **it is critical that telecommunications infrastructure is factored into, and planned for, as a part of all major infrastructure activity**. It is much less expensive, for example, to install fibre assets at the time a major corridor project such as a rail line or road is built compared to several years later.

AWARENESS

Education

Question 14: How can regional consumers be better supported to identify, choose and use the best connectivity options for their circumstances, as well as to understand and use their consumer rights?

Industry agrees that one of the challenges facing rural communities is to fully understand the options available to them, and how to access them. We believe this is an area where the Government should be providing leadership, and we are happy to look at supporting these efforts where we can.

The Australian Communications Consumer Action Network (ACCAN) plays an important role in educating consumers (noting that, as we understand it, they also work closely with Better Internet for Rural, Regional and Remote Australia and other groups who are active in this space). Currently, all of ACCAN's core funding comes from the telecommunications industry – specifically, telecommunications carriers – collected via the Australian Carrier Licence Charge (ACLIC).

In recent years, ACCAN's activities have spread beyond traditional 'telecommunications,' (voice and internet) services, with work being done on topics such as digital platforms, captioning on free-to-air television, and Australian content on broadcast services, as some examples. To be clear, we in no way object to ACCAN's involvement in these areas. However, as their activities such as educating the public on connectivity remain important, **we suggest that consideration be given by all involved stakeholders to how fees can be gathered from all relevant sections of industry in the future**, to ensure ACCAN is appropriately funded for activities such as educating regional consumers on their connectivity options.

On the separate matter of the Regional Tech Hub, we are not offering comment as we view the most useful feedback about that resource will come from regional communities themselves.

Public information

Question 15: To what extent is public information on connectivity options, including predictive coverage data and speeds, sufficient to help regional customers make informed decisions? What other information is needed?

Wireless technologies such as mobile are inherently variable and subject to environmental factors such as topologies, foliage and buildings among other things. The mobile coverage maps published by mobile network operators are the best indication of coverage that can be made, subject to the variability which mobile signals can be subject to, and we commend AMTA's response to this question to the Committee.

On the matter of non-mobile networks (such as local fibre and backhaul), information on telecommunications infrastructure is generally complex, and is likely to cause confusion, or worse, mislead end users. A simple analogy using major roads illustrates the point; is a two-lane divided road sufficient? In the case of the Monash freeway in Melbourne, clearly no given there are five lanes in each direction through Toorak and Burnley, whereas in remote locations it would be oversupply. While this comparison is straightforward and easily understood by consumers as it connects to road traffic, the delivery of telecommunications services is much more complex, with significant network management and provisioning activities that manage variations in time-of-day peak traffic. Consumers would also not be aware of the role of technology developments such as 5G edge-compute capabilities that can reduce demand for backhaul traffic.

OTHER TOPICS

Question 16: What other matters should the Committee consider in its review and why are they important?

Policy and regulatory coordination

We support work on improving connectivity and access to services in regional, rural and remote communities – however, we question whether the current number of parallel activities is the most efficient use of resources.

We would encourage the Committee and Government to consider if some of these activities could be combined and/or include additional coordination.

Examples include:

- The recent consultation on the Regional Data Hub queried the types of data available and useful to the regions. While this is an important matter, one of the specific topics called out was telecommunications. It may have been more effective to include questions and reflections on the telecommunications issues for the Regional Data Hub in RTIRC's work.¹²
- The Australian Broadband Advisory Council (ABAC) has just released a report into agri-tech, which we would hope to see relevant Government Departments or other such bodies use, instead of duplicating.¹³
- There may be benefit in greater connections between the Regional Tech Hub, the Regional Data Hub and the information provided in ABAC's report.

¹² [Regional Data Hub Consultation | Department of Infrastructure, Transport, Regional Development and Communications, Australian Government](#) and [Communications-Alliance-response-to-Regional-Data-Hub-Consultation.pdf \(commsalliance.com.au\)](#)

¹³ [ABAC Report into Agri-tech](#)

SATELLITE SERVICES

This section of the submission provides information and positions from the satellite service providers represented on the Satellite Services Working Group (SSWG). All comments in this section represent the views of that group, and not of the wider Communications Alliance membership.

We have also provided a list of specific acronyms and technical terminology used in this section.

Terminology:

APAC	Asia-Pacific
CGC	Complimentary Ground Component
ESIM	Earth stations in motion
ESPZ	Earth station protection zones
FS	Fixed service
FSS	Fixed satellite service
GSO	Geostationary orbit
IoT	Internet-of-Things
ITU	International Telecommunication Union
LEO	Low Earth Orbit
M2M	Machine-to-Machine
MEO	Medium Earth orbit
MS	Mobile service
MSS	Mobile Satellite System
NGSO	Non-geostationary orbit
VHT	Very High Throughput
VSAT	Very small aperture terminal

Positions

Government policy and maximising outcomes

This section provides views on answers to the below two questions, on what policies, strategies or programs Government and regulators should consider to support the continued connection of Australians to satellite services.

Question 3: How have the Government's policies and programs affected telecommunications service outcomes in regional, rural and remote Australia? How can these be improved?

Question 13: What changes to Government investment programs are required to ensure they continue to be effective in delivering improved telecommunications?

Integrated satellite and regional services strategy

The ACMA has made significant efforts in support of the full range of connectivity solutions that can be made available to all Australians, including those beyond metropolitan areas, in a cost-effective way. The SSWG commends the ACMA on its ongoing efforts to achieve, as much as possible, the right mix of connectivity solutions to provide cost-effective broadband to *all* Australians. Spectrum resources are the life-blood for enabling cost-effective wireless broadband ubiquitously, therefore the limited spectrum allocated to satellite services must

be prioritised in the same way as for terrestrial services. Failure to balance the prioritisation of spectrum for satellite services will significantly impact the cost-effectiveness of satellite broadband connectivity and, in so doing, potentially increase the digital divide between cities and regional Australia – impacting on untapped benefits from regional economies.

The SSWG recommends that as part of the ACMA's overall strategy on national broadband, the ACMA needs to ensure that satellite services are a significant part of that strategy in order to meet the growing regional requirements and the economic potential of regional Australia.

Satellite broadband networks can only cost-effectively offer connectivity services to the regions if they have access to the spectrum needed and the market in a non-discriminatory fashion. This can be done by a) maximising the economic viability of satellite services with the necessary resources, like spectrum, b) encouraging innovative satellite technologies, such as small mobile antennas to benefit all users with ubiquitous satellite technologies (i.e. maritime pier-to-pier and aviation gate-to-gate connectivity) and, c) avoiding sub-optimal spectrum utilisation due to exclusion zones/coverage black spots arising from incompatible services operating in co-channel and/or adjacent channel without adequate protection from out-of-band emissions into the satellite frequency bands.

The ACMA is encouraged to develop an integrated satellite and regional services strategy as a matter of urgency based on existing mechanisms available to the ACMA for incorporating industry and user input.

C-band satellite spectrum access concerns

The unique propagation characteristics of C-band satellite systems (due mainly to their lower operating frequency range compared to Ku and Ka band systems) enables reliable backhaul telecommunications services in high rainfall and oceanic areas of Australia and its territories.

C-band satellite services can also be quickly deployed to provide telecommunication services as a response to natural disasters, particularly in high rainfall and oceanic areas, due to their minimal reliance on terrestrial infrastructure.

Satellite C-band systems often provide the backhaul for the main telecommunications services - mobile voice and data, broadband internet and fixed voice services, where the communities are remote due to distance or separated by sea (islands or maritime/offshore). Terrestrial backhaul from remote customers to the core network is still cost prohibitive compared to using satellite services. Industries that use satellite C-band systems in regional and remote Australia include mining, oil and gas, news and entertainment, aviation, government (weather, research, defence, scientific monitoring), together with satellite operators needing to monitor and control satellites (both C-band and others) providing coverage in Australia and the region.

What is of concern to the SSWG is that the ACMA is presently proposing changes to the licensing framework of C-band earth stations, which if implemented, will significantly impact the economic viability of operating these C-band satellite services in Australia. These changes are being discussed in ACMA's Technical Liaison Group (3700 MHz TLG).

The ACMA is proposing to apply similar licensing rules used in mobile services (e.g., mobile phone base stations) to satellite C-band earth station receivers. While that sounds an equitable arrangement, terrestrial and satellite services performance characteristics are completely different. Major differences include the need to have highly sensitive satellite receivers to receive faint signals from satellites 36,000 kms away, which can easily be interfered with by mobile phone base stations. Also, current satellites operate on frequencies that cannot be reprogrammed, unlike mobile phone base stations.

The ACMA is proposing that Area Wide Licence (AWL) arrangements be applied to satellite C-band earth station receivers in a similar way to how mobile phone base stations are licensed through spectrum licences. The cost of AWLs are determined by the following tax formula:

$$\text{AWL tax} = \$/\text{MHz/pop price} \times \text{bandwidth (MHz)} \times \text{population of geographic area}$$

The ACMA is proposing that satellite C-band earth station receivers must be licensed with sufficient geographic area and frequency bandwidth so as to be protected from potential interference from neighbouring mobile service base stations. For mobile services, this licensed geographic area is populated with a high number of mobile phone users (i.e. the percentage of end users in the 'population of geographic area' is high), while for satellite services the end users are remote or a very small percentage of the 'population of geographic area'. This means that the AWL cost/unit bandwidth/user burden is disproportionately higher on the satellite licence holder. In addition, as mentioned previously, satellite C-band earth station receivers need significantly larger geographic area to be protected from interference compared to mobile phone base stations increasing the license costs to a point where it is likely to be uneconomical to operate these satellite services.

The knock-on effect to regional and remote Australian communities and industries if satellite C-band operators and service providers are unable to economically provide backhaul services for the main telecommunications services is a reduction of telecommunication services to these users.

The Government is encouraged to ensure that their policies and programs continue to allow C-band satellite services to economically operate in Australia to enable them to provide vital backhaul services for Australia's remote and regional areas.

Use of 2 GHz band for MSS/CGC services

The Government of Australia has been proactive in encouraging satellite usage for regional and remote areas of Australia. It is important for the Government to continue working closely with the ACMA to ensure Television Outside Broadcasting service providers have been transitioned out of the 2 GHz frequency band so that the band can be licenced for MSS / CGC services by Q1 2023 and utilised in regional and rural areas for a variety of critical enterprise and consumer services.

In addition, while the allocation to MSS is welcomed as the right decision for Australia, the SSWG feels 2 x 5 MHz of spectrum may be wasted. This smaller band was allocated to 'narrowband MSS' to support IoT.

If the ITU identified spectrum for MSS IoT applications then the band chosen by the ACMA may go to waste. **The SSWG suggests the ACMA incorporate the 2 x 5 MHz into the general MSS band and assign 2 x 15 MHz (paired) to operators.** This would be the best outcome for regional Australia especially given traditional MSS can support IoT as efficiently as a bespoke system.

Additional satellite Earth station protection zone (ESPZ)

The ACMA's answer to the concerns raised by Australia's satellite service providers and operators is to relocate satellite Earth stations into remote or regional areas where spectrum costs are lower. While this might satisfy the satellite spectrum cost equation, it does not resolve the capital and operational costs, together with the logistics of human resources to manage and maintain remote satellite earth station sites. The capital costs would include land acquisition, setup of the satellite Earth stations, backhaul and power services. Increased operating costs and resourcing issues to provide engineering maintenance of these sites would be a high risk to the operations.

Currently the ACMA manages three GSO Earth Stations Protection Zones (Quirindi, NSW, Moree, NSW and Roma, QLD) covering satellite bands between 3575 to 42500 MHz and two NGSO Earth Stations Protection Zones covering satellite bands between 3400 to 4200 MHz at Mingenew, WA and 3600 to 4200 MHz at Uralla, NSW. The SSWG has in past submissions to ACMA made proposals to consider an Earth Station Protection Zone in Northern Australia.

The SSWG proposes that the Federal and State Government consider an Earth Station Protection Zone in regional South Australia covering satellite bands between 3,400 to 42,500 MHz but especially 3,400 to 4,200 MHz. Such a site needs economic and engineering consideration including the requirement to be near diverse trunk fibre infrastructure to minimise the backhaul costs and network interactions necessary. There are a number of benefits to having an ESPZ in South Australia including:

- low rainfall and stable weather, assists in reliable satellite communications,
- fills in the ESPZ coverage gap between western and eastern Australia for telemetry, tracking and command (TT&C) of satellites and broadens customer communications options, and
- supports SA's growing space industry.

Compensation for re-location

As a result of proposed changes by the ACMA to license arrangements for C-band satellite services as detailed in the response to Q.3, satellite service providers and operators are needing to seriously consider relocation into regional or remote areas as an option to continue to operate services.

The SSWG notes that a strong precedent has been set for compensation for spectrum clearance whereby the national and commercial Free To Air (FTA) broadcasters were allocated in the 2012 - 2013 federal budget; \$143.2 M over five years 'to support the process of restacking of television broadcasting services to new channels to release a digital dividend of 700 MHz spectrum' and \$53.5 M over four years 'to assist with the purchase and deployment of electronic news gathering equipment to assist them to operate in alternative spectrum bands to clear for release the 2.5 GHz spectrum band'. Not only were these budget allocations made to compensate for the equipment required for the digital dividend band clearance but also a broadcast licence fee rebate was made to further compensate the broadcasters.

As indicated in the Regional Telecommunications Review 2021 Issues Paper, state and territory governments have funded telecommunications infrastructure through the Mobile Black Spots Program funding new mobile base stations across Australia. In line with this, the SSWG **recommends that the Government give serious thought to investing in satellite services (including C-band) through funding a relocation program for satellite service providers and operators into ESPZs**, similar to CEPT (European Conference of Telecommunications Administrations) and North America. This would be a way to invest in regional and remote Australia that would provide benefits to both their telecommunications needs and related service providers. Government could use some of the proceeds from spectrum auction sales to fund the relocation costs of the incumbent satellite services and operators.

Universal Service Obligation funding

Government is encouraged to engage in ongoing review of the existing mechanisms for utilising USO funding, so as to support and enable communities in developing regional solutions for local telecommunications services such as those mentioned above. **Greater support for advanced satellite-based connectivity solutions should be closely examined.**

Service Reliability

Question 4: How do service reliability issues impact on regional communities and businesses? How do outages, including in natural disasters, impact on communities and businesses?

When an outage occurs, it's a reality check and people suddenly realise how dependent they've become on the internet.

Examples of terrestrial disruption that can impact communities include:

- Back on 14 February 2018, Optus issued notification regarding North Tropical Coast and Tablelands District of Queensland being impacted by severe weather on 4 February 2018 through to Monday 5 February 2018. Due to the extent of damage the expected recovery was set to 8 April 2018.
- On 17 June 2021, millions of Australians were unable to access internet banking services after a major outage hit multiple banks like Commonwealth Bank, Westpac and ANZ and services were all disrupted for more than an hour on Thursday afternoon.
- On 2019, Tonga experienced a near total blackout of mobile and internet services after the country's only undersea cable was damaged and it created a national crisis.

Service reliability issues and outages can cripple businesses, hamper communications and cut off access to e-government applications.

The COVID-19 pandemic has made the criticality of uninterrupted services even clearer. The satellite sector has remained critical to keep many nations and economies going in facilitating work-from-home and home-based learning arrangements, providing business-critical connectivity and resiliency, as well as keeping individuals and societies connected, informed, and entertained with access to e-platforms (i.e. e-commerce, e-finance, e-medicine, video conferencing, video streaming, online gaming, etc).

Question 5: How might such impacts [outages in natural disasters] be addressed to ensure greater reliability? How can the network resilience be addressed in regional areas?

New business and application needs in the market have resulted in increased bandwidth requirements with a heavy reliance on network availability and quality.

Satellites are instant infrastructure, providing ubiquitous and always-on connectivity. It is ideal for diversity and restoration.

Satellites are independent of terrestrial infrastructure, highly survivable and robust; satellites are able to provide the load sharing and surge capacity solution for large sites; and satellites are best for redundancy, adding a layer of path diversity and link availability, especially for single path fibre systems.

Satellite solutions also provide consistent latency irrespective of geographic distance within the coverage area. They are also suited to offer high peak to average ratio noted in traffic patterns. Satellite communication networks also offer flexibility in dynamic allocation of capacity as well as fast upgrade to cater for growing demand.

Satellite should be a foundational part of national infrastructure. With satellite backup options, proper preparation can do much to mitigate financial and service impacts due to planned or unplanned, natural or man-made disruptions. This will ensure service providers

can maintain services, companies to have business continuity and society to have access to critical communication services.

Industry Coordination

Question 10: How can different levels of Government, the telecommunications industry and regional communities better co-ordinate their efforts to improve telecommunications in regional Australia?

The Covid-19 pandemic has massively driven people, organisations, businesses and governments to digitalisation and digital platforms. But according to the Telstra and Roy Morgan's Australian Digital Inclusion Index 2020, in the midst of accelerated digital growth, 2.5 million Australians remain offline.

In parts of regional Australia, the costs of improving mobile coverage are high due to these communities being remote from existing infrastructure and small in population. This means mobile network operators have a limited number of target subscribers. That is why governments, MNOs, non-governmental organizations, and even multinational corporations must partner together in many cases to solve the problem.

The Australian Government has also provided significant investment in the cost of building new infrastructure through grants programs like the Mobile Black Spot Program (MBSP) and the Regional Connectivity Program (RCP), along with programs run by other tiers of government and industry.

This digital gap problem cannot be solved without including satellite backhaul as a priority, for only satellite backhaul, when compared to terrestrial backhaul, makes sense from both a cost and practicality standpoint for quickly expanding high quality mobile broadband coverage to the people living in uncovered remote areas.

With today's advancements in satellite technology, including high-throughput-satellites and dynamic bandwidth allocation capabilities, along with the ubiquitous coverage provided by geostationary satellite networks, mobile network operators can quickly and cost-effectively backhaul hundreds even thousands of rural and remote cell sites, bringing access to life-changing mobile broadband coverage to communities.

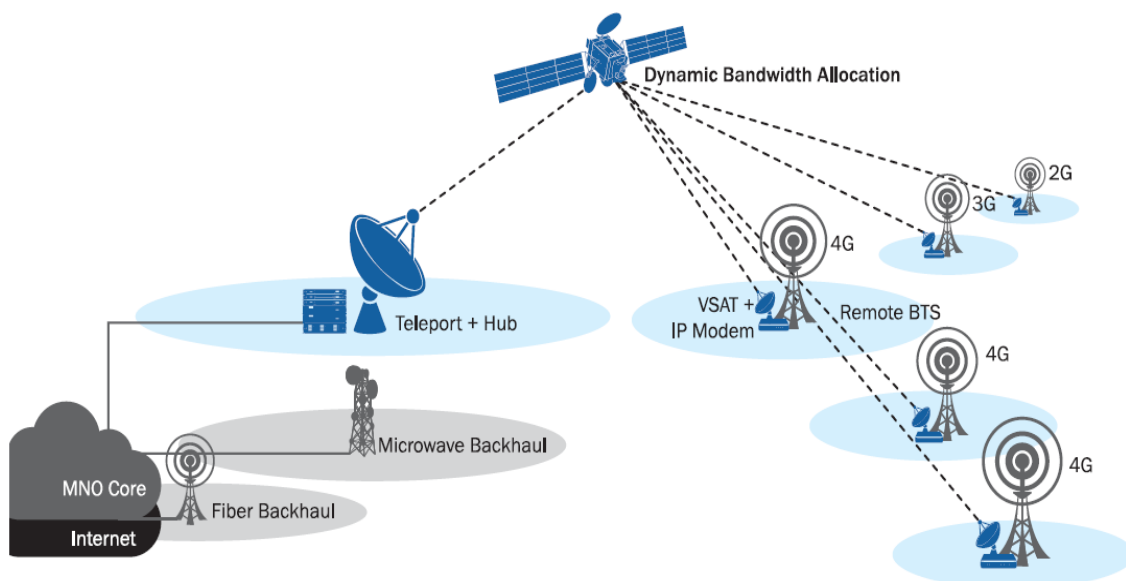


Figure 1. A Case for Satellite-Enabled Backhaul Managed Solutions ([Intelsat White Paper](#))

Utilising the ubiquitous coverage of geostationary satellites for backhaul, mobile network operators can connect multiple cell sites anywhere using a single pool of bandwidth dynamically allocated to each site based on peak usage per site, maximizing use of capacity. As a result, the cost of capacity is also dynamically distributed based on demand, making it an equally (or more) economical backhaul solution when compared to fibre or microwave in the same scenarios. And, using satellite backhaul, cell sites can be connected to a mobile network operator's core network in days or weeks, instead of months or years, as is the case with terrestrial backhaul. Finally, advancements in satellite technologies, such as signal acceleration and optimization, also ensure fibre-like backhaul connectivity to cell sites, providing end users with an optimal voice and data experience.

The various parties can come together to close the digital gap.

Satellite provider solutions, services and timeframes

The following solutions by individual satellite service providers detail the types of satellite constellations, together with details on specific elements including frequency bands, orbits, ground-segment requirements etc. The services being offered include where appropriate the applicability to regional and remote residential and business user needs. Satellite service providers have also provided expected Ready For Service (RFS) dates and timeframes.

This information comes from the below specific satellite service providers and is presented in alphabetical order:

1. Echostar Global - Operator of the Australian MSS Filing 'Sirion'
2. Inmarsat Leasing - the Australian entity for Inmarsat Global, headquartered in London, United Kingdom
3. Intelsat Asia Pty Ltd - the Australian entity for Intelsat US LLC
4. Omnispace Australia Pty Ltd - the Australian operating entity for Omnispace LLC, 'Omnispace,' headquartered in the United States
5. OneWeb
6. Viasat Australia Pty



EchoStar Mobile is planning the deployment of a Low earth Orbit *Mobile Satellite System (MSS)* and has a small number of satellites deployed currently used for testing. EchoStar Global uses up to 30 MHz of 'S Band' spectrum at 1980 to 2010 MHz and 2170 to 2200 MHz EchoStar Global is capable of supporting *Complimentary Ground Component (CGC)* which is a terrestrial cellular system which operates in harmony with the satellite communications system enabling users to seamlessly switch to the terrestrial system when in range.

For a country as vast as Australia with so much of its territory having inadequate terrestrial mobile coverage, connectivity using MSS is of critical importance. EchoStar Global is an Australian network that is capable of providing mobile services and 'Internet of Things' (IoT) connectivity over the entire continent and in fact globally.

EchoStar Global uses radio-frequency spectrum in the 2 GHz band (1980 to 2010 MHz and 2170 to 2200 MHz) and can support a CGC enabling full cellular grades of service to users when within range.

The 2 GHz band is unique because the band has been globally allocated on a primary basis to MSS, mobile service (MS) and fixed service (FS), which provides an opportunity for a combined MSS/CGC to offer instant and reliable global communications anywhere on the planet delivering social, economic, public safety and humanitarian benefits to government, enterprises and consumers regardless of where they live or operate.

Satellite services

2 GHz MSS/CGC will provide mobile communications everywhere, unconstrained by population density or terrain. This means farmers, miners, tourists and emergency services workers, such as we have seen with the recent bush fires, need never be without reliable communications. The addition of the 2 GHz bands to MSS in Australia will provide competition and additional choice in the market driving user affordability.

The availability of interoperable devices, alongside the expanding suite of cloud-based applications (as well as voice and data) create increased demand for MSS. MSS networks are increasingly employed as the connectivity solution for Internet-of-Things (IoT) and Machine-to-Machine (M2M) communications. Being able to have the MSS operator also utilize the same 2 GHz band spectrum for CGC in areas where it makes sense, will further increase the value of these services to users across Australia. Accordingly, EchoStar Global

supports ACMA establishing a national MSS/CGC regulatory framework to meet the needs of users for 5G and beyond.

Recently, based on a thorough consultation, the ACMA concluded that arrangements in the band should be changed to better maximise the overall public benefits derived from its use and that in order to facilitate this the 2 GHz band should advance to the implementation stage of the band planning process to enable MSS uses (including complementary ground component).



Inmarsat is the owner and operator of a global geostationary orbit (GSO) satellite constellations operating in the L-band (1518 to 1525 MHz (space-to-Earth) / 1668 to 1675 MHz (Earth-to-space) and 1525 to 1559 MHz (space-to-Earth) / 1626.5 to 1660.5 MHz (Earth-to-space)) and Ka-band (17.7 to 20.2 (space-to-Earth) / 29.5 to 30.0 GHz (Earth-to-space)), in accordance with relevant ITU regulations and satellite network filings.

Inmarsat's 4th generation satellites (Inmarsat-4) provide Mobile Satellite Service (MSS) and Inmarsat's 5th generation satellites (Global Express) provide Fixed Satellite Service (FSS) globally, including Australia. Inmarsat operates in the C-band (3550 to 3700 MHz) for feeder downlink for MSS satellites and C-band (3700 to 4200 MHz) for telemetry, tracking and control (TT&C) links to support the satellite services.

Inmarsat has over 40 years' experience in providing secured, reliable and robust solutions across several market sectors including maritime, government, aviation and enterprise.

Inmarsat Enterprise Solutions

- Inmarsat Enterprise solutions are used across many industries and markets, such as transportation, energy and utilities, mining and construction, maritime, environmental management and agriculture
- IsatData Pro (IDP) is a satellite messaging service which allows transmission of small amounts of data very economically. This makes it ideal for IoT applications where sensors or other assets are deployed in remote locations. The service can be used as a backup or primary connectivity service and the IDP device will work anywhere in the world within Inmarsat's L-band network
- Isat Data Pro devices are small and have a compact form factor with very low power requirements and are easy to deploy to allow delivery of business-critical event driven data in remote areas
- Broadband Global Area Network (BGAN) is a global, portable voice and broadband connectivity service. BGAN services provide connectivity for both static and mobile applications and a range of rugged, low power terminals are available to suit different applications
- BGAN M2M is best suited for organisations that manage remote assets and need real-time critical data for IoT and remote control applications
- Land Express is a broadband solution for higher data requirements where portability is crucial. Land Express services are used by media organisations to transmit video from remote locations as well as AID/NGO organisations where they may be operating in areas with poor infrastructure

Satellite services

Inmarsat is currently offering MSS and FSS capacity in various industries through the existing operational I-4 and GX satellite constellation.

a) Enterprise:

- communications/connectivity for transport, mining, oil and gas, renewable energy, agriculture, media and utilities sectors
 - internet of Things (IoT)
- b) Government:
- eHealth
 - emergencies and public safety
 - remote weather stations
 - state fisheries management
- c) Aviation:
- Aviation safety and control
 - In-flight connectivity

Timeframe

Inmarsat holds the class and apparatus licences in Australia to operate and provide commercial services in Australia.



IntelSat operates the world's first Globalised Network, delivering high-quality, cost effective video and broadband services anywhere in the world. IntelSat's Globalised Network combines the world's largest satellite backbone with terrestrial infrastructure, managed services and an open, interoperable architecture to enable customers to drive revenue and reach through a new generation of network services. Thousands of organisations serving billions of people worldwide rely on IntelSat to provide ubiquitous broadband connectivity, multi-format video broadcasting, secure satellite communications and seamless mobility services. The end result is an entirely new world, one that allows us to envision the impossible, connect without boundaries and transform the ways in which we live.

Satellite services

IntelSat is supporting the following industries:

- Commercial Aviation - We work with 20 Commercial Airline Partners and over 3,000 aircraft
- Land Mobility - Users in mining, rail, oil and gas, first responders, border security, and disaster response are discovering innovative ways to optimise their operations in hard-to-reach locations or where other networks simply don't exist. Whether there is a need for mobility or for portable connectivity, IntelSat's land mobile services meet the demands of teams in motion
- Maritime – We are the largest provider of connectivity for the offshore oil and gas market
- Telecommunication Networks - seven out of ten Mobile Network Operators work with us
- Cellular backhaul over satellite enables mobile network operators (MNOs) more ways to provide uninterrupted voice and data services to customers. It expands their coverage into more geographic areas where previously considered economically and feasibly beyond their reach

- With our cellular backhaul managed service, MNOs can back up and build out 2G, 3G, 4G, 5G, and IoT coverage anywhere, in less time and more cost-efficiently than when relying on terrestrial backhaul alone
- Media - We reach over two billion people via television and radio
- Government - Secure Communications for Mission Success - Intelsat partners with government ministries around the world to help their civil defence agencies connect to programs, resources, and to each other. They rely on our secure, cost-efficient, high-performance satellite networks to power mobility applications in the air and on the ground that range from border security and remote military operations to disaster preparedness and recovery.

Timeframe

Intelsat holds licences in Australia to operate and provide commercial services in Australia.



Omnispace is the owner and operator of a global non-geostationary orbit (NGSO) satellite system in the 2 GHz S-band (1980 to 2025 MHz earth-to-space / 2170 to 2200 MHz space-to-earth) that has been brought into use in accordance with applicable International Telecommunication Union (ITU)

regulations. Omnispace is leveraging over AUD\$1 billion of assets the company has acquired to deploy a global constellation in non-geostationary orbit (NGSO) to provide mobile-satellite service (MSS) and hybrid connectivity.

Further Details:

- Omnispace has two MEO filings, each with 2 planes, 5 satellites/plane, 45 degrees inclination, 10,360 km circular orbit
- Omnispace's Medium Earth orbit (MEO) filing for 1980 to 2025 MHz / 2170 to 2200 MHz was brought into use (BIU) with the F2 satellite through Papua New Guinea (PNG) administration's NICTA and has been notified to the ITU
- Omnispace's MEO filing for 6925 to 7075 MHz / 5100 to 5250 MHz has been brought into use, notified, and fully coordinated through the UK administration's Ofcom
- Omnispace Australia has a scientific licence for a viticulture IoT pilot in Victoria
- Omnispace Australia also holds licences for its C/X-band gateway and has an operational satellite Earth station in Ningi, Queensland

Satellite services

Omnispace Australia has participated in discussions with the ACMA concerning the use of the 2 GHz S-band (1980 to 2010 MHz and 2170 to 2200 MHz) for mobile-satellite services (MSS) with a complementary ground component (CGC), particularly for providing 5G NTN (non-terrestrial network) and Internet of Things (IoT) services to rural and remote Australia.

Omnispace is now investing in new technology and infrastructure as part of its next generation global constellation to provide hybrid 5G connectivity. The Omnispace network will power critical global communications, including 5G and Internet of Things (IoT) connectivity, directly from its satellites in space to mobile devices around the world. Omnispace is building upon the investments it has already made to validate 3GPP standards-based 5G NTN products and technologies and to demonstrate 5G connectivity from space.

Omnispace is currently offering MSS capacity in various markets through its existing operational on-orbit F2 satellite network. The F2 satellite network is the first element of the NGSO constellation that will be capable of providing 24 x 7 coverage around the globe

('Omnispace System'). Omnispace plans to launch additional satellites into space in 2022, leading to the expansion of the Omnispace System.

Omnispace's integrated MSS/Complementary Ground Component (CGC) system can provide a broad range of services, including a wide array of possible commercial and government communications services:

- Industries: Commercial services to enterprises in oil, gas, mining, fishing, agriculture, etc.
- Connectivity: Internet connectivity in maritime and rural and remote areas
- Emergencies/Public Safety: Communications during natural and man-made emergencies, as well as disaster warnings to the public and government agencies
- Internet of Things (IoT): Connected car applications, smart city (urban and rural), transportation and logistics (on-shore and off-shore)
- Unmanned Aerial Vehicles: Situational awareness for disasters such as fires, damage caused by weather events, delivery, insurance inspections, etc.
- Hybrid: In areas that are lacking in coverage or capacity due to blockage or density
- Aviation Networks: hybrid networks that utilise both satellite and terrestrial networks to provide Internet access to aviation interests

Timeframe

For Omnispace to provide commercial service in Australia using its 2 GHz S-band spectrum, the company will need to be granted authorisation to operate in the band. In January 2021, the ACMA issued its timeframe for licencing the 2 GHz S-band in its Outcomes paper, 'Replanning the 2 GHz band (1980–2010 and 2170–2200 MHz),' which will enable MSS use including complementary ground component in the band. According to the ACMA timeline, the development of the framework for the allocation of licences will occur in Q3 of 2022.

Depending on the timing and granting of the licences, commercial services could be offered as early as 2023.



OneWeb is building a global communications network powered from space to deliver low latency, high-speed broadband Fixed Satellite Service (FSS) through a non-geostationary orbit (NGSO) satellite network. The initial phase the constellation will include 650 LEO satellites in circular polar orbits at 1200 km. OneWeb produces one

to two satellites per day at its factory and is currently launching at cadence of 36 satellites per month. As of September 2021, OneWeb has successfully launched 322 satellites in orbit.

OneWeb is well advanced in implementing its plans to provide satellite broadband access to Australian customers and it is about to finish the construction of three Ka-band gateway earth stations in Australia.

Satellite Services

OneWeb forthcoming satellite-based network will provide fibre-like connectivity and help to transform the lives of citizens, particularly those in currently unconnected areas, through high-speed, broadband connections for such critical services as e-Health, e-Learning and e-government, as well as information and social applications on the internet.

OneWeb will provide Cellular Backhaul to Mobile Network Operators and internet service providers so they can extend their coverage in areas where network infrastructure investment is challenging or not commercially feasible currently. OneWeb will be able to deliver advances in 4G and 5G back-haul roll-out and reduction of costs to users. The extended

OneWeb broadband coverage can play a key role in overcoming the digital divide, bringing-together the most remote of the country's communities.

By extension, OneWeb will also be able to provide key connectivity for Civil Government, Defence and Disaster Relief needs, offering secure communications in Air, Land, Sea, and Space communications, offering rapid deployment capabilities, military-grade network security; flexibility, and the ability to scale.

OneWeb will also be offering solutions that have also been specifically tailored to the unique needs of the maritime and aviation services. Whether it is improving access to real time performance data, or enhancing customer experiences for plane and cruise passengers, our capabilities enable user access to fast, flexible, secure connectivity as a standardised service.

Timeframe

OneWeb's commercial services will start in November 2021 in areas above 50 degrees North, and full global coverage will be by end of 2022. OneWeb will be offering maritime and aviation services by 2023.



The ViaSat 3 network is a constellation of three Very High Throughput (VHT) satellites, one of which will serve Australia and the APAC (Asia-Pacific) region from an orbital location of 160 degrees East in the Ka bands (17.7 to 21.2 GHz and 27.5 to 31 GHz).

Viasat will provide high speed broadband to users throughout Australia including to fixed premises (VSAT) and those on ships, aircraft, and ground transportation by way of Earth stations in motion (ESIM) fitted to these platforms.

Viasat can also provide community broadband by providing high-speed connectivity to community-offered Wi-Fi service (and the newly released Wi-Fi bands in some countries); as well as providing satellite-powered connectivity to mobile base stations.

This allows fast broadband connectivity for education, healthcare, commerce, agriculture and personal communications to be provided cost-effectively across urban, sub-urban, and underserved and unserved regions.

Viasat will also offer fast broadband services direct to individual users, businesses, healthcare facilities, government, agribusiness and mine-sites anywhere in Australia.

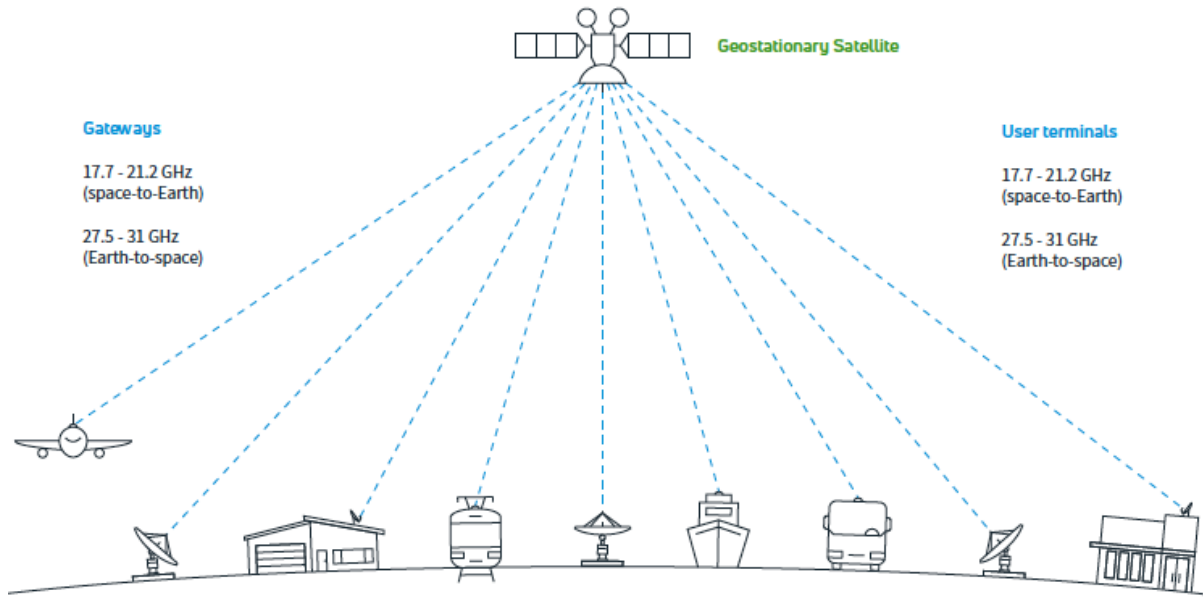


Figure 2. ViaSat-3 forms of service delivery

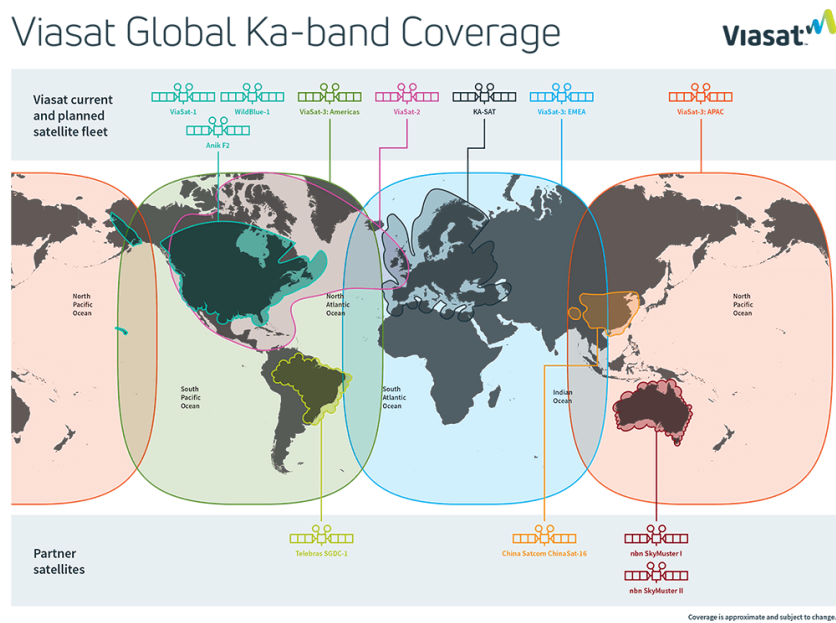


Figure 3. Global and APAC (including Australia) footprint of existing and planned services

Satellite services

Viasat offers high speed broadband to all Australians regardless of where they live work or travel. Viasat solutions support individuals, communities, farms, and mine-sites, and enable businesses to vastly improve efficiency through access to broadband anywhere on the enterprise.

Timeframe

Mid 2023



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