Prepared on behalf of: Telstra Corporation Ltd

Australian Competition & Consumer Commission Domestic mobile roaming declaration inquiry 2016

Statement of Michael James Wright

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- [CIC begins] = information not to be released without a confidentiality undertaking

[CIC begins] = information not to be released even with a confidentiality undertaking

I, Michael James Wright, Group Managing Director Networks, at Telstra Corporation Limited (**Telstra**), of L14 275 George Street Brisbane, in the State of Queensland, say as follows:

- 1 I am the Group Managing Director Networks within the Operations business division at Telstra.
- I make this statement from my own knowledge as Group Managing Director Networks, from my experience accrued as an employee of Telstra across 35 years, and from having consulted and made enquiries of relevant staff and the records of Telstra.

1 BACKGROUND

- 3 I have been employed by Telstra since starting as a graduate Engineer on 6 January 1981.
- 4 In my current role as Group Managing Director Networks I am responsible for:
 - (a) the planning, design and construction of Telstra's networks and products across fixed, wireless and media;
 - (b) ensuring we continue to deliver new and innovative products to our customers in order to maintain our position as Australia's leading telecommunications provider; and
 - (c) working closely with product development and operational teams to design and integrate new products into our networks.
- 5 In my role as Group Managing Director Networks, I report to the Chief Operations Officer and work closely with the Board, including participating in decision making.
- 6 Prior to my role as Group Managing Director Networks (2013 present) I held the following positions at Telstra: Engineer Fixed & Mobile Systems (1981-1985); Senior Engineer Transmission & Mobile Systems (1985-1989); Manager Network Development Mobile Networks Queensland (1989-2001); National Manager Network Deployment OnAir Networks (2001-2002); National Manager Infrastructure Standards & Services Mobile Network Engineering (2002-2003); General Manager Product Infrastructure Mobile Voice (2003-2004); General Manager 3GSM Development (2004-2006); Executive Director Wireless Engineering & Operations (2006-2010) and Executive Director Networks (2010-2013).
- I hold a Bachelor of Engineering (Hons) from Queensland University of Technology awarded on
 19 March 1981. I am a Registered Professional Engineer Queensland.
- 8 My most recent curriculum vitae is attached as annexed and marked "MJW-1".

2 HISTORY OF TELSTRA'S MOBILE NETWORK

9 I have been personally involved in building each generation of Telstra's cellular mobile networks. I was also involved in building the public automatic mobile telephone system (**PAMTS**) mobile network, which predated the first cellular networks. Fundamentally, each generation of network is based on a different set of cellular communications standards.

- 10 The network architecture of each of the Next G and later networks I describe below has been built for one provider (Telstra) and, in relation to the Telstra Mobile Core & Radio Access Network, typically by a single vendor (Ericsson). This allows Telstra to make changes easily and efficiently to both elements of the network, enabling regular upgrades and early end to end integration testing of new devices for guaranteed handset capability.
- 11 In building each of these networks, the key focus for Telstra has been meeting the rapidly growing demands of customers for mobile services in Australia. Underpinning the adoption of each wave of new technology and investment has been a desire to provide wider and deeper coverage to Telstra customers across Australia.
- 12 When I refer to "wider coverage", I am referring to "coverage breadth". Coverage breadth is essentially the range of geographical land mass and relative population, over which the mobile network extends. This encompasses the highly populated metropolitan areas, to less densely populated regional areas, to even less densely populated rural areas and town centres, through to remote Australia which is very sparsely populated across a vast area of land. Coverage breadth essentially refers to the "footprint" of the network.
- 13 When I refer to "deeper coverage", I am referring to "coverage depth". Coverage depth refers to the quality or level of services that are provided within the coverage area. It refers to the quality of "in-building" coverage and data speeds, which improve internet and video downloading speeds.
- 14 Set out below is a brief history of each network build, my involvement and my understanding of the key technical motivations for each network.

2.1 Previous mobile networks

AMPS Network

- In the mid-1980s I assisted in developing and building 1G Advanced Mobile Phone Service (AMPS), Australia's first cellular network, which was launched in 1987 by Telstra (then trading as Telecom Australia). At the time, Telstra was operating the NEC supplied PAMTS from the early 1980s until 1993 which was fully automatic but not cellular. Ahead of the roll out of the AMPS network Telstra also built an Interim Manual Mobile Telephone Service (IMMTS) into some regional centres not covered by PAMTS. My role was to plan, design and build out the IMMTS, AMPS and Paging networks and related product platforms for Queensland.
- 16 The introduction of AMPS delivered the first cellular network with a range of phone types, including handheld, portable and in-car units. The AMPS network was based on the analogue

telecommunications standards operating on the 850 MHz cellular band offering voice calls and limited data connectivity. It operated on the same technology as a regular FM radio transmission via Frequency Division Multiple Access (**FDMA**) which used separate frequencies for each conversation.

- 17 I recall that this dedication of channel frequencies to individual conversations using FM radio and relying on physical separation of users to avoid interference between calls on the same channel meant that it was a relatively inefficient use of spectrum as it required increased use of bandwidth as users increased. Given this, the overall capacity of the network was limited and, once the physical and spectrum limits of a base station were reached, could only be improved by cell splitting through the construction of additional cell sites and the re-use of the same spectrum across those sites. As users of the network grew, congestion therefore became an issue if new sites could not be built in time.
- 18 Of further concern was that the FM signal transmitted could be easily intercepted such that eavesdropping was possible. The benefit of the low 850 MHz frequency however was that it had a longer range of signal propagation, which meant coverage for voice calls was relatively high. In addition, the Telstra Engineering teams worked to build higher powered sites in regional areas which, combined with the higher powered (3Watt) car and bag phones, gave rural users better coverage.

2G GSM Network

- 19 In 1991, AUSTEL, the then telecommunications industry regulator, introduced a proposed competition regime in respect of mobiles and mandated the use of a new 2G Global System for Mobile (GSM) communication standard being used throughout Europe. The competitive regime was created via a near equal 3-way split of 900 MHz spectrum held under license from the government in exchange for an annual fee.
- I remember when the government licensed both Singtel Optus Pty Ltd (**Optus**) and Vodafone Group Plc. (**Vodafone**) in around 1992 and 1993 respectively. I recall that both Optus and Vodafone were given the right to wholesale access to resell Telstra's AMPS network at regulated prices while they established their own infrastructure. Whilst Optus took up the access offer, Vodafone did not.
- 21 Under this regime, the three carriers were required to establish 2G GSM digital networks that were expected over time to attract customers from, and to replace, Telstra's existing AMPS network which was to be closed.
- I remember that at about this time Telstra introduced the first digital 2G GSM network. My role was to manage the network utilisation and test program for the technology introduction of this network using the newly appointed 2G network vendors. I recall that it was launched by Telstra

in April in 1993. I recall that Ericsson (for Victoria, Tasmania, South Australia and Western Australia) and Alcatel (for Queensland and New South Wales) were the initial network equipment and software suppliers for Telstra.

- The 2G GSM network operated on the 900 MHz cellular band licensed by the government. I recall that later in the decade Telstra, Optus, Hutchison and a new entrant called One.Tel Limited (**One.Tel**) all additionally purchased 2G GSM spectrum in the 1800 MHz band (also widely used in 2G GSM systems) in the first mobile spectrum auction held in April 1998. At the same time, I recall that Telstra, Hutchison and AAPT additionally purchased spectrum in the 850 MHz band that was being freed up by the closure of AMPS. The Hutchison and AAPT 850 MHz spectrum was ultimately rolled into Vodafone at a later date.
- 24 The 2G GSM network was based on Time Division Multiple Access (TDMA) technology which built on the FDMA technology of the AMPS network. TDMA meant that each frequency could now be split by time, with each timeslot (up to 8 per frequency) able to carry data for an individual voice call. This allowed more users per cell site and greatly increased the capacity of the network. In addition, TDMA technology gradually introduced many new features to customers including SMS text messaging, caller ID and circuit switched data.
- I recall however that despite the capacity improvements achieved under the 2G digital network the rapid take-up in 2G smart phones put pressure on the limited 900 MHz spectrum. Given the lower power of 2G GSM mobiles, inferior signal link budget to AMPS and the initially limited 35km range of the 2G GSM technology, significant coverage issues emerged in matching the broad coverage optimised AMPS network ahead of its scheduled closure.
- 26 Telstra undertook a range of activities to improve 2G GSM performance in regional areas however despite these efforts, the limited range of the 2G GSM network meant that it was simply not economic to extend it into more remote areas with broad coverage requirements and lower population densities.
- 27 The 2G GSM network was effectively a network covering metropolitan and more populated regional areas given these coverage issues. Telstra's 2G GSM network reached approximately 600,000 km² but it still fell short of AMPS. As such, despite Government expectations, the 2G GSM network had not supported coverage and competition into the rural and regional areas where the Telstra AMPS network was still being used.
- I recall that at about this time One.Tel purchased 1800 MHz spectrum and licenced Lucent Technologies to build out a metropolitan based 2G GSM network. The use of the higher 1800 MHz band and the poorer choice of sites left the One.Tel network with limited coverage. One.Tel's business subsequently collapsed.

CDMA Network

- I recall that as part of the Government's introduction of telecommunications competition, the AMPS network was mandated to be closed by 2000. However, I also recall that due to the slow take up of the 2G network and its limited coverage in regional Australia, it was recognised that the closure of the AMPS network would mean customers in rural and regional Australia may lose their mobile coverage.
- 30 I recall that as a result of this "coverage gap", Telstra (still partially government owned) was effectively required by the Government to design and build a new digital network capable of matching AMPS. In my view, this decision was politically driven because of the dissatisfaction of rural and regional communities with the coverage of the 2G GSM network. Telstra chose to develop the newly emerging Code-Division Multiple Access (CDMA) technology network to essentially replace the coverage of the AMPS network. CDMA was also referred to as a 2G network technology. I was the National Network deployment Manager for the CDMA network.
- 31 The CDMA network was launched in September 1999 and was designed and modified to match the coverage of the AMPS network by using the same 850 MHz spectrum being used by the AMPS network. Telstra had purchased the spectrum through spectrum auctions.
- 32 CDMA technology was not inherently optimised for rural coverage equivalent to AMPS and Telstra was required to undertake significant engineering design and optimisation changes in partnership with the vendor, Nortel. This included software changes to increase the inherent timing limits of the CDMA coverage range, development of high powered boomer cells and work on optimising the channel performance.
- 33 Despite this work, the availability of device types and handsets to match the higher powered AMPS devices and the complexity in enhancing the new CDMA technology made the closure of AMPS and matching of CDMA a complex and politically charged time for regional Australia. It took some time and a phased set of AMPS closures beyond 2000 until the CDMA coverage was optimised. CDMA technology did not use a SIM card so individual handsets had to be programmed for the user's number.
- 34
- 35 I recall that at about this time, each of the three carriers added to their 1800 MHz spectrum for 2G and secured 2100 MHz spectrum for the emerging 3G standard in auction purchases in 2000 and 2001. Whilst Vodafone and Optus focused their 1800 MHz spectrum purchases on the capital cities, Telstra purposefully bought additional spectrum to cover Cairns, regional

South Australia and other regional areas. Telstra purchased more than double the spectrum purchased by Vodafone. All three carriers bought 2100 MHz spectrum as did others such as Hutchison and Qualcomm.

36 With continuing rapid growth in customer numbers and call traffic with early data usage, Telstra knew additional spectrum would soon be required – and indeed the 2100 MHz band was later used for the 3G build in 2004.

3G Network

- 37 The 3G network standard evolved from the European GSM standards and was developed under a standards body known as 3GPP. The 3G network standards were developed in or about the year 2000 and networks and devices began to be built in the early 2000s. Like many new technologies, this standard took some time to mature and become stable. The 3G standard was designed to deliver both voice and data (initially up to 384 kbps). It was variously named 3G, UMTS or WCDMA.
- 38 The initial frequency standard assigned to 3G was the 2100 MHz band. This spectrum band had larger amounts of spectrum allocated per channel to support more users and higher speeds. However, as it was a higher spectrum band it was not optimised for coverage and, even in metropolitan areas, many more sites were needed to prevent users 'dropping back' to 2G on 900 MHz indoors.
- 39 The high cost of building out 3G at 2100 MHz and the emerging and uncertain nature of whether users would take up a network for data usage left many operators uncertain of the business case for developing the 3G network further. This resulted in sharing discussions between Telstra's Wholesale business unit and Hutchison who had built an early 3G network in major capital cities.
- In August 2004, Telstra (still partially Government owned) and Hutchison signed a Heads of Agreement to establish a 50:50 joint venture enterprise to own and operate Hutchison's existing 3G radio access network (known as "RAN") and jointly fund future network development. Hutchison's existing 3G network was launched in 2003 and operated on 2100 MHz spectrum licensed by Hutchison in the 2001 spectrum auction. Telstra also contributed its 2100 MHz spectrum to the joint venture. My role as the newly appointed General Manager 3GSM Development was to develop Telstra's 3G network. With the signing of the Heads of Agreement, I became the Lead Engineer on developing the detailed joint venture contracts associated with the planning, design, operation and development of the joint venture network.

41 This shared network was known as the 3GIS network and was launched in about September 2005. It connected the 3GIS Base Station Controllers (**BSC**) to Telstra's existing core network using a new standard known as Multi Operator Core Network (**MOCN**), which allowed both Telstra and Hutchison customers to use the 3G network layer. A "shared network" arrangement is quite different from a "roaming arrangement" given the deeper integration of the two networks. Further details on this shared network arrangement with Hutchison is set out below in paragraphs 159 to 162.



2.2 Next G Network

- I recall that in November 2005, following a strategic review under the leadership of Telstra's then CEO, Sol Trujillo, Telstra (to be fully privatised the following year) announced plans to build a new Next G 3G network. I was involved in the strategic review in conjunction with John Gonner (who had come to Australia from the United States to advise Telstra) and consultants Bain & Company. I led the planning for Next G, the technology specification and contract negotiations, the selection of the vendor, and the design and rollout program for the Next G network build whilst working through the plans to match the coverage and later closure of the CDMA network.
- 45 This network was intended to use the 850 MHz band to extend 3G coverage across the entire Telstra footprint. The 850 MHz spectrum had wider and deeper coverage than the existing 3G networks operating on the 2100 MHz band and expanded 3G coverage from around 10,000 km² to more than 1.6 million km². The use of the lower frequency bands was intended to make Next G particularly suitable to deployment in rural and regional areas. I recall at the time that Telstra had enough 850 MHz spectrum to turn on Next G and was subsequently able to re-farm the 850 MHz spectrum freed up by the closure of the CDMA network.

- In my view, the extent and scale of the Next G infrastructure, including new towers and broadband, that Telstra built in the course of the Next G rollout was significantly above and beyond any remaining infrastructure advantage Telstra may have held in inheriting the CDMA and 2G networks. This investment was made at a cost of \$1 billion (including the wireless rollout) under contract to Ericsson. I recall that under the roll out, Telstra had to effectively plan and build a new network from top to bottom with the help of Ericsson architecture. This resulted in Telstra installing Next G 3G on the 850 MHz band into 5112 towers (which was the sum of the existing GSM and CDMA sites) across 10 months as well as designing a range of new features such a high powered boomer cells to provide more coverage, together with introducing 3G coverage and new High Speed Packet Access (HSPA) speeds for the first time to vast areas of the country.
- 47 Telstra was able to re-use some existing sites from its previous 2G and CDMA networks but not without significant modification and upgrades of those sites. The installation of Telstra's Next G network required an entirely new set of radio equipment because of the change in technology and the standards that underpinned the network. This meant that any existing sites needed to be strengthened, upgraded or re-built to support this new technology, including turning repeaters into base stations, installing Ericsson 3G hardware inside equipment shelters, new low noise amplifiers at the rural tower tops, often new or changed antennas and feeders into each tower, and upgrading the power, air conditioning, rectifiers and batteries in each.
- 48 A major portion of Telstra's \$1 billion spend was in the rollout of the required backhaul for the Next G network. Telstra was unable to re-use much of the backhaul from its previous CDMA network because it could not support the bandwidths required for Next G services. This was an extremely extensive task given the reach of the network into remote areas. As a result of the backhaul rollout, Telstra's base station capabilities went from typically 2Mbps to at least upwards of 4Mbps in all regional sites, and in some cases 8Mbps. This involved investing in backhaul from the cities to each of the Next G sites, widening and thickening the routers and expanding the radio system or multiplex system to add more cells. Later, it also involved adding fibre optic Ethernet enabled backhaul to cover 93% of the population.
- 49 Telstra's 3G 850 boomer cell upgrades resulted in cell coverage in the 850 MHz band increasing from up to a 50km to up to a 200km radius depending on the site's location and terrain. The lower frequency along with a significant increase in towers equipped with 3G 850 MHz technology across all GSM and CDMA sites extended the geographic reach of Telstra's 3G services from around 10,000km² to more than 1.6 million km² in 10 months.

Telstra's role in influencing the Next G technology and standards

- 50 I was also engaged with the Global System for Mobile Communications Association (GSMA) which had supported Telstra's choice of building out the Next G network and closing CDMA (which was a controversial decision in Australia and abroad at the time). The GSMA is an industry body that represents the interests of mobile operators worldwide and has had a strong influence on the development of technology standards. I personally travelled to Barcelona in 2006 and subsequently to attend the GSMA's Mobile World Conference (MWC).
- 51 I recall that there were only three handsets at the time which had the required spectrum band and HSPA technology for use on Telstra's Next G Network. I worked with the GSMA to set up a user group of operators with similar spectrum holdings to influence device manufacturers to incorporate 850 MHz as an included additional band for 3G (WCDMA) handsets. This would ensure that the HSPA technology had critical scale and availability of compatible handsets to connect to the Next G network – without this scale manufacturers would not have developed enough handsets to supply the Australian market at a reasonable price. I continued to be involved with GSMA meetings and subsequently participated in technology meetings and specific technology programs, including the original embedded module and Machine to Machine (M2M) program.
- 52 Telstra pursued the development of Next G technology very aggressively internationally. This investment in promoting the global uptake of new technology was critical to Next G's subsequent success in Australia.
- 53 My experience throughout my time at Telstra is that it has always involved itself heavily in global industry participation to promote technology and standards in a way that benefits its customers and the Australian conditions.
- 54 In my view, if Telstra had not invested in the Next G network and promoted the technology globally, regional and rural Australia would not have access to the same technologies or handset types nor the same coverage, or quality of coverage and data performance, they have received to date. In fact it is unclear to me how rural Australia's CDMA network technology would have evolved in the absence of Telstra's Next G network strategy.

Closure of the CDMA and 3GIS networks

55 In order for Telstra to be allowed to close the CDMA network it was required to demonstrate to the government that the Next G network had coverage equivalence. The Government, through the Australian Communications and Media Authority (**ACMA**), engaged independent consultants to test this coverage equivalence.

- 56 To gain coverage equivalence to CDMA and to migrate these customers onto the Next G network Telstra had to develop extensive communications and customer solutions for users. In particular I was involved with the design of antenna attachments and a specific 'Country Phone' developed with ZTE. I also proposed the 'Blue Tick' standard and labelling system which to this day informs customers about phones with superior antenna and coverage performance.
- 57 Following confirmation of coverage equivalence, the CDMA network was closed on 28 April 2008.
- 58 In August 2010, following the successful launch of the Next G network, Telstra announced that the 3GIS network would be closed by 2012 and all 3G spectrum assets in the 850 MHz and 2100 MHz bands would be dedicated to the Next G network.

2.3 4G Network

- 59 The technology standard known as Long Term Evolution (LTE) is now referred to as 4G. LTE uses another form of radio signal modulation known as Orthogonal Frequency Division Multiplexing (OFDM) to deliver higher bandwidth and greater efficiency from the spectrum. There was early competition between vendors and industry bodies and a lack of clarity around the definition of 4G, with another standard known as WiMax also being seen as an early candidate. Once the industry settled on the LTE standards, the network equipment and chipset ecosystem rapidly evolved.
- I recall that the increasing pressure of data traffic on the Next G network (which had been doubling every year) motivated Telstra to introduce the 4G network four years earlier than expected. The original 4G network was a data network. Voice calls continued to be made via the existing Next G network under 3G technology until the recent launch of Voice over LTE (VoLTE) technology. Telstra launched 4G in September 2011 covering Australian capital cities, airports and 30 regional centres.
- 61 My role was at the time as Executive Director of Mobile Networks involved the planning, design, deployment and optimisation of all of Telstra's mobile networks and associated product platforms.

Telstra's role in influencing the 4G technology and standards

62 Telstra was also instrumental to the early development of the 4G Network technology adoption. The 1800 MHz spectrum provided a useful springboard for early 4G deployment focused on capacity and demand management in cities and urbanised areas. However, in order to efficiently bring 4G to more lightly populated regional, rural and remote areas, Telstra needed a viable low-band spectrum to be adopted.

- 63 The technology that underpins Telstra's 4G network is the LTE standard. The original spectrum band standardised for LTE and expected to be used in Australia was the 2600 MHz band. There were also longer term plans for the closure of Analogue TV to free up coverage friendly 700 MHz 'digital dividend' spectrum. These were expected in the 2014 2015 timeframe.
- 64 Through ongoing engagement in international forums, Telstra recognised the emerging potential to use the 2G 1800 MHz spectrum band to be re-farmed as an LTE band. Discussions with the vendor, chipset maker Qualcomm and handset manufacturers (in particular HTC) showed that an LTE network rollout in 1800 MHz would be viable. At the time, the 1800 MHz band was not recognised as a potential LTE band. I worked with the Global Suppliers Association (GSA) and lobbied internationally with a range of device vendors and at various industry events (such as the MWC) to have the band accepted and supported. From that beginning, 1800 MHz has become the most used band for LTE worldwide.
- During the development of the spectrum planning for the Analogue television spectrum digital dividend Telstra became extensively involved with the industry regulator, Telecom New Zealand and the International Telecoms Union (ITU) around the planning and design of the new 700 MHz spectrum band channel configuration. This included evaluating adjacent band sharing with television broadcasting, the performance of miniature ceramic handset filters, and the harmonic implications for GPS receivers in handsets, and formally presenting the results to a regional treaty forum of peers and the ITU. This band plan for 700 MHz became known at the Asia Pacific Telecommunity APT700 band. It is now being implemented in the majority of countries outside the United States and Canada (who have their own more complex arrangements).

Telstra's investment in the 4G network

- 66 In 2013 the Government auctioned the APT700 spectrum band and the 2600 MHz band. Telstra spent a total of \$1.3 billion at this auction, acquiring the largest 2x20 MHz block of the 700 MHz rural coverage friendly spectrum band. Telstra recognised the need to secure lowband spectrum suitable for LTE to address the needs of regional and rural Australia. It considered that acquiring this spectrum was necessary to continue to deliver the future capacity, best performance and broadest coverage 4G network. At the same auction, I noted that Optus acquired 2x10 MHz of this spectrum and Vodafone chose not to acquire any.
- 67 Telstra made the world's first data call on a commercial LTE network using the APT700 spectrum band. It is important to get scale in new spectrum bands such as the then new APT700 band so I once again worked with the GSA and GSMA as well as attended conferences in May to promote this new band. Most devices today now support the APT700 band, and it has been adopted by Latin America and partially adopted by Europe.

- It has been my experience that in order to provide more certainty in the longer term and to better manage increasing customer demand for data with greater capacity, Telstra has also ensured that it has invested heavily in its spectrum holdings across both the coverage friendly low bands (eg. 700 MHz and 850 MHz) and the capacity optimised high bands (1800 MHz, 2100 MHz and 2600 MHz). These investments have been made to ensure Telstra can continue to offer the best possible range of Next Generation mobile services. Telstra has also taken an aggressive technology roadmap approach with many early and world leading adoptions of Next Generation technologies across HSPA+, LTE-Advanced, MIMO and more to deliver more capacity and greater performance in the available spectrum.
- 69 In total, over the last six financial years, Telstra invested over \$8 billion in its mobile network on a fully allocated basis, including spectrum purchases and renewals.
- 70 In 2014, Telstra announced a new 4G service called 4GX, bringing higher speeds and extra 4G coverage to a range of communities across Australia in cities as well as rural and regional areas. The new 4GX service operated on new 700 MHz spectrum combined with the 1800 MHz band using an evolution of LTE known as LTE Advance Carrier Aggregation. 4GX services were initially switched on in all capital cities and surrounding suburbs and 50 regional locations. This has since rapidly grown to include coverage to regional towns across Australia.
- 71 Telstra has continued to evolve the speed and network efficiency of LTE through the world's first evolution of peak network speeds to 450Mbps and 600Mbps during 2015 and to 1Gbps during 2016.
- 72 In 2015, Telstra first introduced Australia's first 4G Calling, or Voice over LTE (VoLTE), allowing users to stay on the 4G network during voice calls (rather than switching back to 3G for the duration of the call). This rollout has allowed customers to progressively move to VoLTE as their handsets and settings have allowed throughout 2016.
- 73 In February 2016 Telstra invested a further \$190 million to acquire additional 1800 MHz spectrum for mobile use in 12 regional areas across the country, including major regional cities like Albury, Cairns, Grafton, Mackay and Darwin and their surrounding areas. This was to ensure Telstra could deliver a similar level of capacity and performance for regional Australia as we could for metropolitan areas.

3 TELSTRA'S FOCUS ON COVERAGE DIFFERENTIATION

3.1 The reasons behind the early network builds

74 While coverage has always been commercially important to Telstra, early network builds (particularly AMPS) into regional and rural areas were strongly influenced by government policy about addressing coverage concerns from people in rural areas. As Telstra was still Government owned (at least in part) across this period, it had to balance this stakeholder interest when making any decisions to build.

- 75 I recall that in the early 1990s, when the Government offered access to the existing AMPS Network following the part-privatisation of Telstra, there was an expectation that the 2G network coverage and quality would be so good that they could turn simply turn off the old analogue network. However, given the coverage issues with the 2G network, it did not deliver the nationwide competition envisaged by the Government despite its best intentions.
- 76 It was because of these coverage issues, and the Government's promise to switch off the AMPS network in 2000, that the Government of the day essentially required that Telstra build an alternative digital network which became the CDMA network. To build that network, Telstra had to invest in significant spectrum, as well as design an array of new features across its network to ensure the range would carry effectively into rural Australia. At this time, Telstra was building two networks, the 2G network and the CDMA network, under two different standards. This was an inefficient and costly exercise, and tended to cause confusion for end users. Furthermore, there were no handsets that could work simultaneously on both networks which led to some customers purchasing two handsets – one for use in regional areas on the CDMA network, and the other for use in GSM regional towns and metropolitan areas.
- 1 recall that at the time Telstra elected to proceed with the 3GIS partnership with Hutchison, there was not a strong business case for the 3G network given it was to be such a high frequency network without the coverage benefits of a lower frequency network. I remember that it was actually because of how poor that business case was that Telstra ultimately partnered with Hutchison, which made the roll out more economic. However, ultimately, given the high frequency of the 3GIS Network, it was only ever able to be a city or metropolitan based network.
- 78 As such, whilst 3G technology was able to deliver new features and speeds for customers, it was a city based service with regional and rural Australia limited to GSM or CDMA 2G technology.

3.2 The decision to build the Next G "city to country" Network

- 79 Telstra's decision to invest in Next G was a turning point in Australia's telecommunications history and, in my view, marked the beginning of a strong focus within Telstra on coverage as a means of competitive advantage across both metropolitan and rural customers. At this time, Telstra made a clear decision to differentiate itself based on coverage. Next G was the new "city to country" network, which from day one had wider and deeper coverage and greater speeds.
- 80 I recall that following the arrival of the new CEO Sol Trujillo and the full privatisation of Telstra in 2006, a strategic review was undertaken across all Telstra networks and IT. I recall that under

this review, management stood back and realised that Telstra had been building three separate mobile networks across GSM, CDMA and the 3GIS 3G network. It was considered to be very inefficient and confusing for customers. Following the review, the decision was made to invest in the Next G Network which would extend the new 3G technology across Telstra's entire network footprint. Telstra made the decision to make this investment on the basis that it could be used as a point of competitive differentiation between it and its competitors.

- At this time, the other carriers, Optus, Vodafone and Hutchison were building their 3G networks in pockets to cover the main metropolitan population centres. Telstra's business case for the Next G "city to country" Network was built on differentiating itself from its competitors by offering a better quality network with better coverage overall in terms of breadth and depth into buildings, and particularly for rural and regional Australia.
- 82 Given the relatively high cost of building a network across rural and remote sites, the business case for building the Next G network in those locations in isolation was considered poor. Put simply, the forecast direct revenues achievable in rural Australia would not provide an adequate return to cover the capital and operating costs of those network sites.
- 83 I recall that at the time people were questioning why Telstra would build a 3G network over its entire footprint, given other carriers were limiting themselves to just building islands of 3G in selected rural areas and how uneconomic it was. However, I understood that Telstra's thinking at the time was that it would put Telstra in a position to sell a "bigger footprint". Telstra's firm belief was that customers are prepared to pay for coverage and mobility in their services, not just in rural Australia, but across Telstra's entire customer base. It is my view that Hutchison had the resources to follow a similar strategy at the time yet did not pursue this.
- 84 Telstra understood fundamentally that customers value good and reliable coverage in mobile services, so with coverage in more places, fewer dead spots, fewer drop outs and faster data speeds they would be willing to pay for that quality of service.
- 85 Documents showing Telstra's business strategy with respect to the Next G network include:
 - Telstra's media release unveiling its city-to-country mobile 3G broadband vision, dated 15 November 2005. A copy of this release is annexed and marked "MJW-2";
 - (b) Telstra's Technology Strategy Briefing of 16 November 2005 (see pages 16-19 where I describe the upgrade to the mobile network for Next G). A copy of this document is annexed and marked "MJW-3"; and
 - (c) Telstra's public media release regarding the Next G network 'going live' dated 5 October 2006. A copy of this document is annexed and marked "MJW-4".

3.3 The "race for coverage"

- 86 With Next G marking a clear shift in strategy for Telstra towards a focus on coverage, speed and quality of customer experience as a competitive differentiator, it is my experience that Telstra very much views its infrastructure investment pathway in the 10 years since 2006 as demonstrating the ongoing "race for coverage" between the carriers.
- 87 Over time Optus and Vodafone have responded to the competitive coverage pressure placed on them by Telstra's Next G coverage advantage, by rolling out 3G in the 850 MHz band (held by Vodafone) and by re-farming parts of the 900 MHz 3G bands (held by each of them).
- 88 Telstra has since sought to build and maintain coverage, with the other carriers, most notably Optus, continuing to invest persistently in an attempt to erode this coverage advantage. It is my view that the "race for coverage" is still very much occurring in the Australian telecommunications industry.

4 TELSTRA'S CURRENT MOBILE NETWORK

4.1 Current network coverage

- 89 Telstra's 2G GSM Network is closing on 1 December 2016 (it announced the closure back in July 2014) due to the bulk of its customers having naturally moved to 3G and 4G enabled networks which offer faster speeds and better user experience.
- 90 Telstra's 3G and 4G are not marketed as separate networks, but are viewed as a single fully integrated mobile network enabled with 3G and 4G coverage comprising 'The Telstra Mobile Network'.
- 91 The Telstra Mobile Network is the largest mobile network in Australia covering more than 2.4 million km². Its 3G network coverage reaches 99.3% of the population and its 4G network coverage reaches 98% of population.
- 92 Telstra has invested in more than 8,500 coverage sites across city and country, providing the nation's lowest mobile call drop-out rates. More than 6,300 of these sites are 4G enabled sites, offering 4G speeds in all the capital cities, many suburban areas and regional towns across Australia.
- 93 Telstra currently plans to continue to extend its already expansive 4G coverage footprint in regional Australia from current 98% population coverage to reach 99% population coverage by the end of June 2017. This planned continued investment in 4G is based on the current

regulatory environment remaining unaltered. This increase amounts to an expansion in Telstra's total 4G coverage footprint of several hundred thousand square kilometres.

- 94 Telstra has also invested heavily in its fibre optic Ethernet enabled backhaul which connects sites covering more than 93% of the Australian population. This high-capacity backhaul ensures a faster and more reliable mobile experience.
- 95 Annexed and marked "**MJW-5**" is a coverage map which illustrates Telstra's current coverage of its 3G and 4G networks.

4.2 Current network capacity

- 96 The Telstra Mobile Network is currently enabled with the following network technologies and spectrum frequency bands, depending on location and the customer's handset capability:
 - (a) 4GX (LTE + LTE-A) is provided by the base 700 MHz frequency across Telstra's 4GX coverage footprint supplemented with LTE-A capability in aggregation with existing 4G on 1800 MHz and new 4G on 2600 MHz in selected areas. This process of 'gluing' two or more bands of spectrum together is referred to as carrier aggregation. Carrier aggregation creates a broader channel to allow more data, meaning customers have access to faster more reliable speeds.
 - (b) **4G (LTE)** is our original 4G service on the 1800 MHz frequency band. It is now largely provided in conjunction with, and exceeded in some areas by, our 4GX coverage.
 - (c) 3G (HSPA) is provided in the 850 MHz frequency band across Telstra's entire coverage footprint, supported by 3G in the 2100 MHz band to provide additional capacity in selected high traffic areas.
 - (d) 2G (GPRS/EDGE) is provided in the 900 MHz frequency band across Telstra's entire 2G coverage footprint (to be closed on 1 December 2016).

4.3 Current network speeds and latency

- 97 The following table provides a more detailed breakdown of the Telstra Mobile Network data speeds and latency (a measure of the time it takes a data packet to get from one point in the network to another), noting that:
 - (a) the network technology speeds quoted are those for which the technology is rated and actual customers speeds are always lower;
 - (b) typical user speeds are the range of speeds a customer might experience whilst using their connection in typical coverage locations based on extensive testing;

- (c) latency figures quoted relate to that component of user-experienced latency that relate to the Telstra network; and
- (d) % population coverage is the percentage of the population where customers are able to experience the quoted typical user speeds at their place of residence.

Network Technology	Typical Download Speeds	Typical Upload Speed	Latency	% Population
2GSM GPRS	30-40kbps	10kbps	~500ms	All coverage areas
2G EDGE	75-90kbps	30-40kbps	~500ms	All coverage areas
3G HSPA 14.4Mbps	550kbps – 3Mbps 550kbps – 6Mbps	300kbps-1Mbps 300kbps-3Mbps#	~100ms ~100ms	99.3%. (Entire coverage) 97%#
3G HSPA+ 21Mbps	550kbps – 8Mbps	300kbps-3Mbps#	~100ms	97%
3G HSPA+ [Dual Channel] 42Mbps	1.1Mbps – 20Mbps	300kbps-3Mbps#	~100ms	85%
4G LTE (1800 MHz)* 4G (LTE) rated devices *Will seamlessly switch over to our fastest available 3G speeds outside 4G coverage areas.	2Mbps – 50Mbps	1Mbps – 10Mbps		98% (combined 4G and
4GX (700 MHz)~ 4GX rated devices ~Devices will seamlessly switch over to our fastest available 4G or 3G speeds outside 4GX coverage areas.	Cat 4^: 2Mbps- 75Mbps Cat 6^: 2Mbps – 100Mbps Cat 9^: 5Mbps- 150Mbps Cat 11^: 5Mbps – 200Mbps	1Mbps-10Mbps	~30ms	4GX coverage)

Table 1: Network speeds and latency

300kbps-3Mbps upload speeds are available to 93% of the population

^ Depending on the Category (or 'Cat') of a device/handset, the speed a customer experiences on the 4G network will differ. The higher the category number, the faster the speeds. For example, Category 6 devices can achieve speeds up to 300Mbps, while Category 4 devices get 150Mbps.

4.4 Current network capabilities and services

Key capabilities

98 In my view, it is Telstra's focus on investment for the future and collaboration with worldwide strategic vendors to develop plans for future technology which has meant that its capabilities and services are truly world leading. Telstra's investment in rural Australia in circumstances which, viewed in isolation may not necessarily be economic, has led not only to coverage breakthroughs but also to the development of temporary coverage capabilities which are now deployed for commercial use.

- 99 Some of the key capabilities of the Telstra Mobile Network are set out below:
 - (a) simultaneous voice and data functionality;
 - (b) 3G and 4G network interaction: customers will seamlessly switch between the 3G network from the 4G network as they move in and out of coverage. Currently, Telstra's 4G network is not designed to exactly replicate 3G, and 3G is inevitably relied upon at the edges of coverage and importantly to manage load / traffic congestion where necessary. This is designed for load management reasons (ie. to manage traffic congestion). As referred to above Telstra's 3G and 4G are not marketed as separate networks, but are viewed as a single fully integrated mobile network enabled with 3G and 4G coverage comprising 'The Telstra Mobile Network'. Importantly, Telstra's coverage claims in respect of its network rely on both 3G and 4G coverage, with 3G providing the "fall-back" to Telstra's 4G coverage to improve reliability of service;
 - (c) wireless priority functionality for voice: the Telstra Mobile Network prioritises voice traffic over data such that in heavy demand times data capacity could be reduced to ensure voice calls can proceed. The priority system also allows Telstra to prioritise certain customers' voice calls, however only in situations where network demand is high and the capacity of the cell is at its limit;
 - (d) High Definition: Telstra introduced high definition (HD) voice technology in June 2011 across its entire network. HD voice technology delivers clearer voice quality as well as providing noise suppression. To enjoy the benefits of HD technology, both the caller and receiver need to be using a compatible handset on the Telstra Mobile Network;
 - (e) Voice over LTE: the introduction of VoLTE in September 2015 (an Australian first) expanded upon Telstra's HD voice technology using the Wideband Adaptive Multi-rate (WAMR) codec to increase the proportion of mobile calls that are HD quality and extend HD calling from mobile to Next G and compatible fixed phone services. Previously, when customers made a voice call on their 4G device, their device switched back to 3G for the duration of the call;
 - (f) Video over LTE (ViLTE): ViLTE video calling has been progressively released during 2016. ViLTE enables users to make high quality video calls to ViLTE compatible devices just like they make a regular voice call;

- (g) Voice over WiFi (VoWiFi): to help address the difficulty in getting strong coverage in every corner of the house, Telstra launched VoWiFi in 2016. VoWiFi uses a wireless broadband network standard for the purpose of voice conversation;
- (h) Out to Sea and In-flight coverage: the Telstra Mobile Network covers more than 1 million km² out to sea, which is not included in its coverage map. Projects are currently underway with the aim to provide in-flight WiFi service for aircraft passengers;
- network security: all entry points into the Telstra Mobile Network are firewalled and certified according to ISO27001:2005 standards. Surveillance audits are completed every 6 months; and
- (j) law enforcement requests: for example, device location.

Support for emergency services

- 100 Telstra's investment in emergency services capabilities is driven by its ability to differentiate itself from its competitors. In my experience, Telstra's ability to provide coverage in emergency situations, as well as being the only operator able to respond to these situations in the time frame, sets Telstra apart from others and contributes to its brand image.
- 101 Telstra deploys temporary mobile coverage and/or capacity to support emergency services and local communities during emergency situations (ie. fire, flood, accidents). The provision of these services is undertaken on a case by case basis in areas where there is existing coverage and backhaul available.
- 102 To support emergency services, Telstra has also invested in developing a LTE Advanced Network for Emergency / Enterprise Services (LANES) strategy. LANES is a concept developed by Telstra that will provide a dedicated service and preferential data treatment on the Telstra Mobile Network where LTE is enabled.
- 103 In December 2013, Telstra conducted the first live demo of LANES to a number of emergency services organisations and enterprise customers in the mining and resource industry. From December 2016, in a world first, Telstra's LANES emergency service will be available to Emergency Services Organisations (ESOs). This will provide ESOs with the opportunity to increase their network capability, coverage and reach, without having to build their own private network. Telstra's expansive core network and investment in spectrum, as well as its ability to provide the best coverage (or the only coverage) in rural and remote areas has enabled it to provide these services where others cannot.

Special event services

- 104 Telstra also seeks to differentiate itself from other carriers by making investments in special event coverage. It is my view that, by providing better coverage, fewer drop outs, network consistency, and reliability at times when capacity would otherwise be under tremendous stress, Telstra avoids negative publicity and word of mouth, contributing to its superior marketing message.
- 105 Where temporary coverage or capacity is sought for non-emergency conditions and the relevant resources are available, Telstra can deploy temporary mobile coverage and / or capacity for special events or even seasonal requirements at key holiday destinations. The requestor may be required to pay for part or all costs of the deployment, however costs vary on a case by case basis. This dedicated program deploys additional mobile resources at well over locations across Australia each year.
- 106 Telstra plans for this temporary coverage using information from the previous year, with a focus on ensuring its customers have access to a quality and reliable network in all situations. Special events are tracked and customers similarly provide feedback or place a request to Telstra on a needs basis.
- 107 An example of Telstra's capability in responding to temporary coverage requests for commercial opportunities is annexed and marked **"MJW-6**".

Other temporary coverage capabilities

- 108 In my view, what truly differentiates Telstra is its investment in rural and remote Australia as part of its drive to provide the best coverage in Australia. The product of this investment is Telstra's unique and considerable capabilities in providing temporary coverage in remote areas.
- 109 Telstra offers commercial temporary coverage capabilities to meet the needs of paying customers in a range of industries that operate in remote or other areas with no or limited access to mobile services. Typical scenarios include temporary coverage whilst a permanent solution is being constructed (ie. new mine sites), Defence exercises in remote areas, large remote infrastructure projects and remote workforce accommodation camps.
- 110 Among other solutions, Telstra has developed (in response to the Black Saturday bushfires in 2009) modular portable satellite backhauled cells (known as **Sat COWs**) that are light and compact enough to be "choppered" in, and new portable cell on wheels (**COWs**) for fast deployment by road. The Sat COW capability required a network modification with the Ericsson software and was developed for this purpose. The addition of generators and extendable masts to Telstra's portable COWs have also allowed deployment in locations where no power or tower infrastructure exists.

5 MOBILE TECHNOLOGY AND INNOVATION

- 111 It has been my experience that Telstra has invested, and continues to invest significantly in mobile technology and innovation in order to differentiate its services from those of its competitors. The investment in new mobile technology, particularly technology upgrades for rural and regional Australia, is not always economically rational or profit generating when viewed in isolation. The more remote and less populated the area, the more economically challenging it becomes.
- 112 Given the obvious economic challenges, it is important to understand that Telstra does not view its business as one of simply building static infrastructure in remote areas in an attempt to bridge the coverage gap. Telstra makes this investment in order to differentiate itself from its competitors by ensuring that it not only has a presence in rural and remote Australia, but that it delivers a quality service at the same time.
- 113 This means more than just building a tower this includes boosting capacity through the use of small cells or 'boomer' cells, working with vendors to ensure handsets are consistently compatible with advancements in technology and have sensitivity suitable for rural usage (ie. Blue Tick devices), and developing antennas for cars and homes to ensure the best possible tower signal can be accessed. More often than not, this also involves engaging with overseas industry participants and generating a conversation around worldwide industry innovation.
- 114 Set out above in paragraphs 50 to 58 and 62 to 65 are the details of Telstra's involvement in the development of 3G and 4G technology which demonstrate Telstra's track-record of innovation and being "first to market". I have further set out in the paragraphs below some of the additional technology developments in which Telstra has invested, followed by an explanation of the current and future technology that Telstra is currently trialling to ensure it continues to differentiate its network from its competitors.

5.1 Telstra's previous technology investments

- 115 It is my experience that Telstra has been a world leader in telecommunications innovation and, through close collaboration and co-operation with world leading technology companies such as Ericsson, Qualcomm and others, has brought to the industry a raft of 'world firsts' along the path to 5G and beyond.
- 116 In order to achieve these timelines and leadership positions, I have used my responsibility for network planning and investment and worked closely with executives from partner companies to develop longer term network forecasts to plan for future technologies well before they become available. This approach has allowed the network to be configured early and be compatible with the future technology (ie. early optical high speed Ethernet for both HSPA+ and early LTE).

These steps lowered the cost and time to introduce each of the technology evolutions. To name a few, Telstra:

- (a) launched the world's first 200km cell range with maximum network download speeds of 14.4Mbps (2007);
- (b) became the first operator in the world to activate HSPA+ technology on a live network (2008);
- (c) launched 21Mbps peak-rated mobile broadband modem making Next G the fastest mobile broadband network in the world, recognised by the Guinness World Records (2009);
- (d) together with Nokia Siemens, announced LTE world-first trial achieving 100Mbps at 75km using 2.6GHz (2010);
- together with Huawei Technologies, announced Australian first in successfully demonstrating LTE technology operating on 1800 MHz spectrum (2011);
- (f) performed the first live demonstrations of LANES (2013);
- (g) completed a live test of LTE Advanced (**LTE-A**) Carrier Aggregation, combining three data channels to achieve speeds of 450Mbps, a world first (2014); and
- (h) launched world first 600Mbps device (2015).
- 117 Telstra has also invested in creating or trialling products and services which enhance the customer experience and the capacity and coverage of its network, many of which are specifically driven towards providing better coverage across rural and regional Australia to ensure quality and reliability of service. For example:
 - (a) Satellite has now been proved a viable albeit expensive means for back-hauling Telstra Mobile Network Coverage such that coverage can now be deployed in remote areas with no or limited power and transmission. Our development of Sat COWs takes advantage of this and provide permanent remote coverage at iconic remote locations such as Birdsville.
 - (b) I proposed and promoted the testing and labelling of Telstra's 'Blue-Tick' Rated Device. These are devices that have been tested to provide customers with optimal device performance particularly in rural and remote coverage areas.
 - I pursued a then new mobile signal repeating device and arranged for it to support our 850 MHz band. Repeater technology is used to regenerate or replicate a signal. This

became the Telstra Mobile Smart Antenna which has been designed to extend indoor coverage over 3G and 4G for Telstra handsets or mobile broadband devices, provided there is at least partial coverage somewhere in the customer's office or home.

- (d) LTE-Broadcast (LTE-B) aims to introduce a multicast capability to the network in order to alleviate congestion. When Telstra's operational division and the network detects multiple users attempting to access the same content, it will shift to broadcasting within the local cell, rather than having every user continue to access the content directly from the network. This is particularly useful in managing capacity in areas of intense traffic such as sporting stadiums and other special events. There is also ongoing testing of opportunities for LTE-B in video broadcast, signage, mass M2M updates, software / OS updates, application updates and emergency alerts. Like many emerging technologies this needs the support and scale of many operators, and for this reason I worked with UK-based EE, Verizon and South Korea's KT to establish the LTE-B alliance this year.
- (e) in regional Australia, Telstra's Small Cell technology is being used as a cost effective means to deliver 4G coverage to areas where existing coverage is minimal or nonexistent. I asked my team to explore this option based on my experience with the use of early low cost repeater technology to improve in-building coverage in small towns.
- (f) Telstra recently supplied access to space on its radio spectrum and base stations to communicate with hydrogen balloons for Google's Project Loon – a plan to provide internet to remote regions via helium balloons that circle the globe.
- 118 Annexed and marked "**MJW-7**" is a series of media releases and articles from Telstra and various other partners in relation to the above achievements.

5.2 Telstra's future planned network innovations

- 119 I am aware that Telstra is currently actively engaged in network innovation through numerous trials and collaborations as part of its business plan and budgeting. Some of these include:
 - (a) On 13 September 2016, Telstra completed live network tests achieving speeds of 1 Gbps on the downlink (from the base station to the device) and 150Mbps on the uplink (from device to the base station) using a commercial grade chip set. A commercial product launch of a Netgear 1Gbps WiFi router is now imminent.
 - (b) On 20 September 2016, in collaboration with Ericsson, Telstra conducted the first live 5G trial in Australia for the public at the 5G Test Bed located at its Global Operations Centre. Telstra has also worked with Intel and Qualcomm on early prototype 5G enabled devices. Telstra is also actively involved with the 3GPP on 5G standards inputs and has already

gained support for feature proposals that will make 5G more suited to Australian conditions, in particular changes that will support longer cell ranges.

- (c) Telstra's involvement with The Boeing Company & Queensland Government's Advance Queensland Platform Technology Program is helping the development of new situational awareness drone technology to ultimately enable safer drone operation and enhanced data analytics. Telstra will be providing 3G / 4G dongles to Boeing to allow the use of its mobile network to provide data connections between sensors located on Telstra radio towers and a ground station located in the trial area.
- 120 Whilst the above developments are exciting, the true future of mobile services, and an innovation which I believe Telstra is in the process of bringing to the forefront in Australia, is the ability to service the wide area network M2M and Internet of Things (**IoT**) markets.
- 121 IoT development has been driven by an increased demand to connect all types of things to the internet in order to track, monitor and control our world – from water meters to environmental sensors. There are a range of "categories" designed to support different usage types.
- 122 IoT technology is inextricably linked to 4G technology. The various capabilities for IoT are formally included in the 3GPP standards that define LTE (4G) technology. The key capabilities for regional application of 4G IoT are that:
 - the technology can utilise the already extensive regional 4G coverage footprint for coverage; and
 - (b) specific capabilities of IoT allow low data rate IoT devices (such as sensors) to operate well beyond the edge of coverage of standard 4G devices. The fringe of coverage can therefore be extended by IoT technology as the resistance of the data transfer to packet loss is increased by repetition, made possible by the low IoT data rates. Hence, the extension of 4G out to 99% (assuming the current regulatory environment remains unaltered) will ensure that IoT is available across rural and regional Australia for application in the transport, agriculture and health industries.
- 123 I am aware that Telstra has been involved in shaping the industry standards to ensure IoT evolves in the same direction. It is continuing to work with the industry to drive the scale and standardisation of these solutions.
- 124 In February 2016, Telstra announced that it had enabled support for Category 1 (**CAT-1**) devices and is in the process of building a new foundation for IoT. CAT-1 represents the next

development in IoT LTE devices that are lower cost and offer longer battery life but are still required to carry reasonable data rates. CAT-1 will be closely followed by the introduction of both Category M (**CAT-M**) which will increase coverage and reduce device cost, and ultimately Narrow Band-IoT (**NB-IoT**).

- 125 My view is that NB-IoT will be the next big breakthrough in that it will provide deeper coverage into buildings and extend existing remote and rural penetration beyond our current geographical coverage. Telstra has partnered with Ericsson and its device partners to bring this technology to Australia for network trials and demonstrations to the industry.
- 126 In an Australian first, Telstra has also partnered with LTE for IoT chipmaker, Sequans Communications, to test their Calliope CAT-1 chipset on Telstra's production network.
- 127 With the IoT's ability to use a huge network at very low cost, I believe that this technology has the potential to drastically change the productivity of industries such as the agricultural sector. Yet this will require significant investment and development, and it still has a long way to go.

6 MANAGEMENT OF TELSTRA MOBILE NETWORK

6.1 Network Performance Targets

- 128 To ensure the network is performing to meet customer needs, Telstra has a set of internal Key Performance Indicators (**KPIs**) which it targets and which reflect what Telstra strives to achieve in terms of performance in the network. These KPIs are used internally to manage the capacity of the network and they are constantly evolving and improving as technology advances and as customer expectations and data usage increases.
- 129 These KPIs are intrinsically linked to customer demand and the value that customers place on coverage and innovation. It is my experience that having clear KPI targets is critical to ensuring superior and reliable network performance to support Telstra's desire to differentiate itself on a quality and coverage basis.
- 130 To ensure that Telstra had a leading ability to manage and monitor the complex traffic engineering, capacity headroom statistics and parameters associated with 3G and 4G, Telstra developed an innovative tool in conjunction with the University of South Australia originally known as 'Devil'. Telstra owns the intellectual property of this tool and licenced it to a company called Ascom for worldwide sale as a product known as TEMS Capacity Manager. In addition to a set of other KPI monitoring tools Telstra uses this tool extensively to manage the planning for cell capacity and performance across the network.

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- 132 In addition to the above core KPIs, Telstra uses a wide range of internal and external tools, metric and robots to understand and manage the customer experience delivered by the network.
- 133 Setting and meeting these KPIs is undertaken as part of the annual planning cycle. KPIs play an important role in determining where and when Telstra invests. Further details on Telstra's investment decisions are set out below in section 9.

6.2 Network Management

Congestion impacts on voice and data

- 134 It is our intention that Telstra's network is effectively designed and managed to prevent congestion including by appropriately forecasting traffic growth and ensuring the network is upgraded on an 'as needs' basis (see section 6.3 below which refers to the capacity management of Telstra's network).
- 135 Despite this, there are times when congestion may occur and planning in order to prevent congestion is not always possible. Congestion may occur where the number of users greatly exceeds the normal traffic use at a particular location (for example, during emergencies and special events, and even on highways when there has been an accident and there is a build-up of vehicle traffic). Some special events can generate mobile traffic equivalent to the traffic generated at a medium sized city that is usually serviced by multiple base stations. During periods of extreme customer demand, customers may experience difficulty in accessing the mobile network.

- 136 If congestion does occur the network will take the followings steps in line with a continual increase in congestion:
 - (a) data sessions will firstly be managed to even out data throughput to all users on the cell;
 - (b) the throughput will then be reduced to allow voice calls to be made; and
 - (c) lastly, all data throughput will be reduced to zero to allow voice calls to be made.

Network priority to services

137 Services are grouped into two categories which determine the priority of the service. The first category, known as 'Guaranteed', is that of voice. The second category, known as 'Non-guaranteed', includes High Speed Downlink Packet Access (HSDPA) connections. HSDPA is an enhanced 3G mobile communications protocol which allows networks based on Universal Mobile Telecommunications System (UMTS) to have higher data speeds and capacity. The LTE network standards allow for prioritisation of voice (ie. VoLTE) and data services using a set of Quality of Service (QoS) levels.

Network Redundancy and Availability

- 138 The Telstra Mobile Network is designed and maintained to specified network standards which are in line with world best practices and adhere to all Australian standards. Telstra's core mobile network systems for both voice and data are designed with redundant systems to mitigate the possibility of a single point of failure causing an outage.
- 139 The Telstra wireless core network (switches, routers and transmission) is designed for very high availability and robustness. Physical redundancy and, wherever feasible, geographical diversity are provided for each of the core network elements. In case of failure of one network element, automatic switchover to a working element takes place. With respect to the radio network best efforts are made to rectify faults in the shortest possible time.

6.3 Network Planning

- 140 Telstra regularly monitors and forecasts the growth of traffic on its network through use of the 'Devil' tool (described at 130 above) in order to manage the growing capacity usage of its network. With its existing customer base doubling its data usage each year, Telstra is constantly innovating to provide solutions for capacity stress. Some of these innovations to boost capacity have already been detailed in section 5 above.
- 141 When headroom KPI figures have been reached and congestion is forecast to become a chronic issue at a particular location, there are various solutions which Telstra can use to

expand network capacity to accommodate this growth. These options are tiered, and increase in both complexity and cost as you work through the options.

- 142 Where spectrum is available, the first step would be to add additional spectrum to the cell, to boost the power of the cell and improve its capacity.
- 143 Where no more spectrum can be enabled on the cell, the next step would be to assess whether any software optimisations may be an option, however these are usually only suitable for increasing coverage for a short period of time until a more permanent solution can be found.
- 144 Following the deployment of additional spectrum, or where additional spectrum may not be available, the next step would be to increase capacity by splitting the cell. Under cell splitting, a multi-directional cell will be 'split' into multiple cells (most commonly three) to improve coverage depth and to increase capacity. However, cell splitting is usually only effective where the cell is right on top of the traffic (ie. in the middle of a town), and so primarily only works best for more highly populated areas. It does not work as well for those cells that may be outside of a town, where the coverage required is only in one direction.
- 145 Beyond the above options, the next step would be to install new sites.

7 TELSTRA'S WHOLESALE ARRANGEMENTS

- 146 In my experience, the telecommunications industry has been characterised by various commercial arrangements and agreements that have effectively enabled enhanced coverage across the separate networks.
- 147 Telstra proactively sells wholesale access to parts of its network at negotiated prices via various arrangements. There are also separate co-build arrangements allowing competitors to build radio transmitters on Telstra's towers (known as 'co-location' or 'tower sharing'). Although I have not been intimately involved with the terms of these arrangements, I have spoken to those who are, and set out below is my understanding of various resale agreements or roaming "style" agreements that Telstra has previously participated in. I understand that co-location and co-building arrangements between the carriers is being described in the witness statement of Mr Robert Joice, and as such, I have not described these below.
- 148 In my view, the agreements described below demonstrate that commercial roaming agreements have historically operated effectively to provide the negotiated roaming services to other carriers, subject to the commercial limitations and technical restrictions of those agreements. Importantly, the terms of the roaming agreements meant that Telstra was able to limit the geographic coverage of the roaming services, and preserve its coverage advantage. The resulting limited coverage overlap also mitigated technical issues.

7.1 International roaming arrangements

- 149 Telstra offers international roaming to international visitors who roam domestically according to preferred roaming agreements Telstra holds with overseas carriers. Relative to domestic traffic levels, international roaming user numbers and related traffic levels are very low and do not materially add to or impact network load or performance.
- 150 In order to do so, Telstra sets up its network to recognise visitor mobiles. This will trigger two processes:
 - (i) interaction with the roamer's home network to register the visitor mobile onto Telstra's network; and
 - (ii) interaction with the back-end of Telstra's own network to allow that customer to make calls.
- 151 There will then be a set of billing processes agreed between the operators which involve the periodic settlement of costs relating to visiting customers who have roamed onto their respective networks.
- 152 International roaming is covered in a very robust way between all three Australian carriers due to the difference in coverage across networks. That is, if the Vodafone network is the preferred roaming network of a visitor, but that visitor travels to an area where there is no Vodafone coverage, the handset will automatically start searching for the next preferred operator, which may be Telstra or Optus.
- 153 Furthermore, handsets are programmed so that where there is no 3G coverage, the handset or device will connect to the 2G network (where available). Similarly, where there is no 4G coverage, the device can connect to 3G or 2G as applicable.
- 154 There are limitations to international roaming which detract from the user experience, such as no in call-handover, switching delays, and fewer features than what is available to Telstra customers. These are discussed in more detail in section 8 below.

7.2 Domestic arrangements

155 Telstra has previously entered into a number of commercial arrangements. In my view, these agreements demonstrate that, collectively, commercial agreements have historically effectively provided services to other carriers, subject to the technical limitations and restrictions of those agreements, as negotiated and discussed further below in section 8. Importantly though, at least over the last 10 years these agreements have been subject to geographic limitations which have sought to preserve Telstra's coverage advantage.



Arrangements across the 2G GSM and CDMA networks



162

7.3 MVNO arrangements

- 163 Telstra offers a wholesale product called "resale", where wholesale customers use a Telstraprovided SIM card to sell services under their own brand on the Telstra Mobile Network. Telstra began supplying wholesale 4G data mobile services for both pre-paid and post-paid mobile solutions to its mobile virtual network operator (**MVNO**) resale customers in April 2016, with speeds capped below those available to Telstra's retail customers.
- 164 This offering includes access to Telstra's 1800 MHz and 700 MHz coverage areas, with 2600 MHz spectrum coverage in selected areas, providing access to 4G coverage reaching 95% of the Australian population across 4800 base stations. Peak download speeds for 4G MVNO customers are capped at 100Mbps (an offering that Telstra views as competitive in the wholesale market place). VoLTE services are not currently part of the offering.
- 165 Outside of Telstra wholesale 4G coverage areas, wholesale customers can continue to access Telstra's 3G wholesale coverage reaching 98.8% of the Australian population across more than 1.59 million km² of land and 7,800 base stations.
- 166 The majority of the base stations built under the government's Mobile Black Spot Programme will automatically be added to the wholesale footprint, which is expected to change over the life of the 4 year program. Of the 58 base stations that have been built under the Mobile Black Spots Programme prior to 30 June 2016, 51 were automatically added to the Telstra wholesale footprint.
- 167 These wholesale MVNO arrangements are commercially very different to providing wholesale roaming to mobile carriers as MVNOs have not typically invested in building their own core or radio network.

8 TECHNICAL IMPLICATIONS OF OFFERING DOMESTIC ROAMING SERVICE

8.1 Potential approaches to domestic roaming services

- 168 In my view, any domestic roaming solution would necessarily pose technical challenges to Telstra's network, as Telstra's network was not designed to accommodate a large scale national roaming service. As set out above, Telstra currently offers international roaming, and has previously entered into limited domestic roaming arrangements. On that basis, some form of domestic roaming is technically possible.
- 169 Whilst possible, there are various technical complexities which are likely to be created or which become more pronounced as a result of any mandated domestic roaming arrangement. This is due to the fact that mandated roaming has not been done before in the Australian telecommunications ecosystem the scale of such an arrangement would be much larger than any previous arrangement entered into with Telstra (with several parties, significantly more end users and larger geographic scope). There is also the added complexity of how mandated roaming would impact on the evolution of new technology, and its impact on Telstra's investment incentives.
- 170 Under mandated roaming, I consider that the technical issues likely to arise would be most pronounced in areas where there is a substantial overlap in operator coverage, particularly where other carriers have "islands of coverage" over town centres but require roaming in the areas between these "islands" resulting in numerous, fragmented and moveable roaming boundary areas. In my view, the precise type and extent of these technical complications will also largely depend on the type of roaming service declared.
- 171 In this section of my statement, I have considered these issues by setting out three options for domestic roaming, and what I believe would be the technical implications that are likely to arise under these options.
- 172 I consider there to be three main technical solutions that could enable domestic roaming:
 - (a) A shared network approach using a MOCN (shared network). This model was used for the 3GIS joint venture with Hutchison where both parties shared the cost and responsibilities for managing and investing in the network. Whilst a shared network approach provides the outcome of roaming, it does so under a much more complex arrangement. It would involve a dedicated structure to manage the customer relationship and a deep integration of the access provider / seeker networks. By definition, it would be a national or network wide approach. This approach poses significant technical network integration issues and would be very costly. These technical challenges are discussed further below; or

- (b) An international roaming approach (standard roaming). Under this approach the host network would effectively provide continuous coverage to customers of the roaming carrier in all areas where their own networks did not have coverage. In effect, it would be a roaming arrangement technically similar to international roaming. It would therefore be a national and continuous approach to roaming. Whilst it would not require any significant network integration, it would be subject to many of the same constraints as the current international roaming arrangements and give rise to additional technical challenges which are discussed further below; or
- (c) A sub-national roaming approach (sub-national roaming). Under this approach the roaming would be limited to specific geographic areas, most likely those areas where there is only one carrier operating (predominantly in rural and remote Australia) and between the higher density regional areas where other carriers may only have "islands of coverage". Whilst it would not require significant network integration, similar to the standard roaming approach, it would face the same constraints as international roaming, with additional complications around how to define the geographic boundaries of the service.
- 173 In my view, each of the above approaches to domestic roaming involves a trade-off between what features can be supported, the complexity of the network, disruption risks, granularity of roaming areas and the time and cost of implementation.
- 174 These trade-offs can be broadly categorised as relating to:
 - (a) customer experience; and
 - (b) network management and operation.
- 175 My views on each of these categories is set out below. Whilst I have a good understanding of these issues, I have also sought the opinion of various technical experts within Telstra for the purposes of this statement.

8.2 Customer experience

176 The technical implications of standard and sub-national domestic roaming would impact the customer experience. In particular, whilst the customer would experience improved overall coverage, there is likely to be a degradation in quality in boundary areas (areas where the roaming and non-roaming coverage overlap) and reduced access to premium features in roaming areas. I describe these in more detail below.
In-call handover challenges

- 177 For both the standard and sub-national approaches to roaming, a customer roaming on to (or out of) Telstra's network will experience in-call dropouts. That is, there is no in-call handover between the networks which means that when a customer reaches the boundary of its network's coverage, the call will drop out, and the customer will be required to re-initiate the call once the handset has successfully switched to the new network. For the customer, this lack of in-call handover between the networks will mean their conversation is interrupted, or their data session terminates or becomes frozen, while their device searches for a new host network.
- 178 A seamless in-call handover solution does not currently exist for standard and sub-national roaming, and I do not consider it would be feasible to achieve this technically without engaging in an entire network re-configuration, involving a shared network solution. In particular, these issues would be more pronounced in areas where the access seeker has "islands of coverage" within the declared roaming footprint.

Switching delays

179 For both the standard and sub-national approaches to roaming, a customer roaming on to (or out of) Telstra's network will inevitably experience 'switching' delays caused by the customer's handset disconnecting and re-connecting to an alternate network. Depending on the particular device and signal strength of the alternate network, this process could take anywhere from between a few seconds and up to several minutes. For the customer, this would have various impacts, including a delay in being able to re-initiate the relevant call, or a delay in data downloads.

Handset management issues

- 180 For both the standard and sub-national approaches to roaming, given the above in-call handover challenges and switching delays, there is also the potential for this to result in handset management issues. For example, the handset may automatically "ping pong" between networks in low coverage areas in an attempt to repeatedly handover and reconnect between the two networks, which could lead to excessive volumes of charge records. Similarly, I understand that searching for a new network uses significant battery power of a handset. As such, reduced battery longevity may also degrade the customer user experience.
- 181 In the reverse scenario, even where the access seeker is able to easily switch to Telstra's network without experiencing "ping-ponging", there is a tendency for the call to remain on Telstra's network even when it is back in the coverage area of the access seeker. This not only raises customer service and billing issues, but would further add to congestion in overlapping areas which are not designated for the purposes of roaming.

Unavailability of network features

- 182 The telecommunications industry has evolved into an extremely technically sophisticated environment in that the features and functions on new generations of technology renders a customer's previous hardware incompatible. In comparison to previous and current roaming arrangements, this adds considerably more complexity to the implementation of domestic roaming and is likely to mean that, whilst roaming, customers will be unable to access innovative new products due to the sheer complexity and technological challenges of providing them.
- 183 In the case of international roaming, for example, Telstra currently does not provide products such as VoLTE, ViLTE and QoS to international roaming partners. This is due to the complexity of these Next Generation products – requiring an entirely new process to be set up with the overseas carrier, as well as customer handset compatibility and feature enablement on each device. For instance, VoLTE roaming is difficult because 4G is a data network and there is no ability to tag a voice call. These same issues would arise under a standard or sub-national approach to roaming.
- 184 Similarly, there are several 3G features which are currently not available to international roaming customers, despite the introduction of the Customized Applications for Mobile network Enhanced Logic (CAMEL) application.
- 185 Historically, a shared network approach has only ever been adopted for joint venture network arrangements (such as the 3GIS joint venture between Telstra and Hutchison) not simply for the provision of roaming to another carrier, and even then only supported basic features, not the complex suite of products and features that have arisen with 4G networks. Telstra would need to investigate precisely what level of network integration was necessary to enable all of the network features under a shared network approach to roaming. However, in my view, the integration cost of a shared network approach to try and resolve these issues makes it completely unfeasible and the cost implications would far outweigh any benefit to customers of the roaming arrangement.

Customer care

186 Ancillary to the issue of customer service is the management of network usage and self-care notifications. Telstra supplies billing information to its customers based on their customer profile and usage. However, customers roaming onto its network under standard or sub-national roaming would not have the benefit of this support or consumer profiling.

8.3 Network Management and Operation

Setting the geographic boundaries of roaming

- 187 For the reasons set out above, coverage overlaps and "islands of coverage" create significant issues as, in my view, one of the key technical implications of a sub-national approach to roaming is the complexity involved in attempting to set the geographic boundaries of that roaming in a way which avoids significant overlap. This is because, due to Telstra's signalling configuration (which is not unusual in a global context), it is not possible to simply "switch on" roaming at an individual cell level. For network management purposes, cell sites are necessarily 'grouped' together to form 3G Location Area Codes (LACs), which contain 100 cell sites, or 4G Tracking Area Codes (TACs), which contain 10 cells sites. I understand that for sub-national roaming to be "switched on", it would need to be done at the LAC / TAC level.
- 188 Under a sub-national roaming approach, there would be initial difficulty in defining exactly where one carrier's footprint starts and ends, especially in the "islands of coverage" roaming scenario. The complexity in doing so is demonstrated when you consider a regional highway or a remote town. These areas can often sit in between two carrier's base stations or are only partially covered by different carriers at any point in time. Given this, and Telstra management of its cell sites on a LAC/TAC basis, defining the areas to which sub-national roaming would apply would be particularly imprecise.
- 189 If the access seeker continues to build its network, it is even more difficult to manage overlap on a dynamic basis in an attempt to carve out "islands of coverage" where the access seeker builds a small number of base stations in areas where it has previously had no existing coverage, such as in a rural town.
- 190 My understanding is that it is also not easy to change the size, location and number of Telstra's LACs/TACs, and technical implications would flow from this.
- 191 In addition, Telstra uses the LAC/TAC boundaries for other purposes apart from roaming, such as paging and automated location based services such that the boundaries are relatively inflexible or, if forced to align with new roaming boundaries, would have a detrimental impact on network performance and customer experience around the boundaries. Where roaming is intended to fill the gaps between the different carriers' "islands of coverage" within the geographic boundaries of the area in which roaming is available, these issues become further exacerbated. This is particularly complicated in a shared network scenario.

Managing capacity and signalling constraints

- 192 In the context of either standard or sub-national roaming, where there is increased traffic around the boundaries of these LACs/TACs, it will be necessary to expand signalling and data links to ensure the additional signalling traffic does not cause congestion issues.
- 193 Signalling is where all of the transitions around an interaction with the network occur (ie. starting and finishing calls, and locating devices). There is only a limited amount of capacity in the network for signalling and the more time roaming customers spend around the boundary of a LAC/TAC, and the higher the number of customers in or crossing such boundary areas, the more pronounced congestion issues become. This is particularly an issue in a sub-national roaming scenario.
- 194 The use of non-Telstra devices roaming onto the Telstra network would result in increased signalling (to establish identity and network and feature compatibility). Such devices may also, depending on the headroom of the cell site, reduce the cell size and/or capacity by requiring more power than Telstra approved devices.
- 195 Significant numbers of users roaming from other networks could also trigger capacity expansions earlier than normally required that cannot be managed through additional 4G spectrum activation or cell splitting. That would potentially necessitate significant expenditure in infrastructure that was either not planned, or would be required to be brought forward. With the loss of Telstra's coverage advantage under mandated roaming, it is also the case that not all of these upgrades would continue to make economic sense.
- 196 The only way Telstra could manage these issues would be by trying to forecast likely increases in traffic and to expand the capacity in its network to accommodate these forecasts. To do this, it would require forecast data from other carriers of the likely traffic that would be using its network. In areas where the other carriers do not have a presence, such traffic forecasts will inevitably be unreliable. The actions of access seekers may also have an impact on forecast traffic. For example, if an access seeker increases its data cap or offers unlimited data usage to attract new customers, this will clearly increase usage.
- 197 Given the difficulties with forecasting, and the fact that Telstra would be relying on third party information that it has not yet tested, I do not consider that even a robust customer management platform or complex traffic forecasting analysis provided by all carriers would solve the potential for congestion and the creation of poor user experiences (for both Telstra customers and roaming customers). This is particularly the case for a standard approach to roaming, but would also be of concern for a sub-national approach to roaming.
- 198 I am not aware of any network operator that has been able to safeguard its customers by deprioritising roaming traffic in the event that actual traffic is in excess of forecasts. This is much

more complicated than simply disconnecting users from the network, particularly since the signalling traffic congestion still remains an issue whether traffic forecasts are exceeded or not. Further, even if possible, it would result in a degraded customer experience for customers of other networks, compared with the customers on the Telstra network.

Potential for network avalanching and overload

- 199 In addition to simply managing everyday signalling constraints, under a standard roaming approach, and to a lesser extent even a sub-national roaming approach where there was some duplicate coverage areas, the failure of the access seeker's network could be catastrophic. If a large failure of this nature occurred on the access seeker's network in areas of significant coverage overlap, all users on that network would simultaneously start signalling in an attempt to roam onto Telstra's network, which could cause major voice and data traffic congestion and even failures in Telstra's network leading to an outage for some or all customers.
- 200 This outcome is not desirable for those trying to roam onto the Telstra network, and would have a significant impact on Telstra customers who would be unable to access the network. Failures of this nature are not only very damaging for Telstra's customers, but would be very damaging for Telstra's commercial and operational reputation. Under configurations where the roaming overlap or magnitude of potential roaming customers is a lower percentage of the Telstra network traffic this risk would be lower. As the overlap areas and number of potential customers from other networks roaming increases, the level of risk would increase significantly.

Other operational impacts

- 201 The network operational impacts caused by the technical implications of roaming are varied and very hard to predict. This includes complications related to:
 - (a) <u>increased network support</u> under any roaming scenario, network support for the more complex customer usage scenarios and / or product features will require extensive IT and network development;
 - (b) <u>handset compatibility</u> a lack of ability to test and verify the different devices that are accessing the Telstra network will also make it almost impossible to tell whether a network issue is caused by the incompatibility of a device or some other fault in Telstra's core infrastructure. In these instances, if carriers are required to share information and make joint decisions in order to resolve an issue, this will lead to prolonged delays; and
 - (c) <u>network design and data integrity</u> additional roaming configurations over and above the current wholesale offering, whether they be national or sub-national, would also add significant overhead to network design and data integrity. On a sub-national approach to

roaming, where multiple roaming areas exist, there would also be additional overhead to ensure coverage mapping meets the roaming requirements.

- 202 Whilst a shared network approach might mean that some of the above additional complications eventually operate more smoothly, this would be at the cost of a very significant and large upfront investment in integrating the relevant networks. This would also raise significant information sharing arrangements and obligations, and a level of intimacy between competitors which would not be commercially acceptable.
- 203 I am not aware of a network sharing arrangement that has existed between more than two networks at any time.

8.4 Scope of costs involved to upgrade network and solve technical issues to facilitate roaming

- 204 Given the limitations of previous commercial roaming arrangements, Telstra has not had to implement a technical solution for the issues set out sections 8.2 and 8.3. To try and resolve these issues, whether it be for any future commercial roaming arrangement, or if required under mandated roaming, a technical solution and the cost of that would need to be investigated.
- 205 Depending on the type of roaming arrangement that is declared, the costs and processes involved in upgrading Telstra's network to facilitate roaming could be extremely expensive and time consuming. Trying to solve for the technical issues set out above would require complex testing, and attract a huge cost to implement the relevant upgrades, where it is even possible to do so.
- 206 The scale of analysis that would be required to look at these solutions, and cost them, would be an extremely significant and laborious task. Set out below are just some of the considerations that would need to be considered, and costed, even if the most simple roaming configuration was implemented:
 - (a) any necessary changes to the architecture of the network and interfacing with other networks;
 - (b) the development, building and testing product and service solutions associated with features that may be required but are not currently developed in standards or in vendor solutions;
 - (c) any necessary changes to vendor equipment;
 - (d) whether any capacity upgrades are required, for example, cost of installation of transceivers, software deployment; and
 - (e) any necessary changes to customer management systems and service 'ticketing'.

207 Given the type of roaming that might be declared is unclear, and given the above solutions have not yet been investigated, it is not possible to estimate how large these costs might be. The ability to recover and adequately compensate Telstra for those costs is also uncertain.

8.5 Future network developments and innovation

- 208 Telstra's innovation and differentiation is largely made possible because of a single vendor model. Everything is typically designed and tested by one vendor – Ericsson. This allows Telstra to make changes easily and efficiently to both sides of the network, enabling regular upgrades and guaranteed handset capability.
- 209 The shared network option raises particularly concerning issues for the roll out of future network developments and innovation. To enable the integrated network for these new features would require extensive interaction between vendors and networks leading to significant delays in software and feature rollout. This is entirely contrary to Telstra's strategy which is built on the rapid deployment of technology.
- 210 In effect, Telstra would lose control of its radio network and its ability to provide a quality and innovative service to its customers. In particular, Telstra would have an inability to control QoS on its radio network such that its LANES program would be negatively impacted.
- 211 Even with sub-national and standard approaches to roaming, whilst there would be fewer technical complications to Telstra making technological changes and updates to its network, there are likely to be constraints placed on Telstra under the contractual agreements with the access seekers. For example, if there was a contractual obligation that required Telstra to give notice to other operators of power outages or changes to the network, Telstra would be required to engage in additional management and rolling out changes could be delayed.
- 212 Additionally, in my view Telstra would have much less flexibility in dealing with small delays where notice obligations required a set period of notice. For example, if circumstances meant there was a delay to a power outage, rather than simply being able to push the work back a couple of days, Telstra may be required to serve out another notice period under its contractual obligations.

9 THE INCENTIVES THAT UNDERPIN TELSTRA'S MOBILE NETWORK INVESTMENT PROGRAMS

9.1 Telstra's investment programs

213 My team and I play an integral role in Telstra's annual investment planning programs. We receive various inputs from the business, usually from the product side, including the type and numbers of customers that Telstra intends to connect and what type of services those

customers are likely to consume. We then convert these inputs into an annual investment program.

- 214 Within the annual investment program, Telstra makes various types of investments.
- 215 There is a basic capacity "BAU" program, which this aims to ensure Telstra is continuing to meet its KPIs for existing and new users to support Telstra's superior network market position. It is the sum of investment required to carry Telstra's forecasted traffic and to maintain network quality, and will usually involve plans to increase capacity where required through upgrades to existing infrastructure or new tower builds as appropriate.
- 216 Telstra also makes strategic coverage investments. Given Telstra is, like most businesses, capital constrained, this program is targeted at making investments that best support Telstra's key coverage and quality claims in the market. As such, even if an investment is likely to yield a negative net present value, the fact that it will yield a positive coverage story or meet customer demand for more data / features etc, will attract its own value (or strategic market share) and be just as important as meeting Telstra's KPIs. As part of this, we look at Telstra's differentiation and competitive position and put forward an argument as to how and why the investment will ensure our network superiority is maintained and how this will either protect or enhance our mobile market share.
- 217 In addition, Telstra invests significantly in innovation and technology to maintain its hard won perception as being a "first to market" with new technology. This includes Telstra's investment in spectrum and the development of new features.
- 218 Fundamentally, Telstra's investment programs focus on what minimum spend is required to meet its existing customer needs and maintain its coverage and network superiority claims. However, Telstra's capital expenditure programs are also focussed on strategic coverage investments that can extend and deepen the capabilities of our mobile coverage.
- 219 Spending on strategic coverage investments usually takes place within the annual planning cycle, but there are occasions when I ask for additional funds, or a re-prioritisation of funds, which I think are particularly important to meet competitor activity or support new intergenerational features. When these arise, they are referred to the Telstra Board for information or approval, where appropriate and if required. Requests for additional funds outside of the annual planning cycle are not always approved. Set out below in paragraphs 229, 234, 235, 244 and 246 are some examples of business cases for additional capital expenditure, not all of which were approved, and some of which were only approved in part.

9.2 Key drivers of Telstra's investment programs

- 220 As set out above, Telstra's investments programs support Telstra's ability to differentiate itself from its competitors. In my experience, Telstra strives to differentiate itself on three key grounds, being:
 - (a) providing a premium customer experience;
 - (b) providing superior network coverage; and
 - (c) providing technology and innovation leadership.
- 221 Given the relatively similar nature of mobile services, differentiation as between your competitors is critical in competing for, and retaining, market share. I have described each of these grounds below.

Premium customer experience

- 222 Telstra seeks to concentrate on what matters most to customers by delivering a high quality customer experience based on key performance indicators which include speed, reliability, fewer drops-outs and customer service. A description of these KPIs is set out above at paragraphs 128 to 133.
- 223 Telstra uses these points of differentiation to market itself and build market share. Marketing claims that Telstra is able to make because of this include:
 - (a) <u>faster speeds and greater reliability:</u> "Australia's fastest mobile network" and "greater reliability and faster speeds in more places"; and
 - (b) <u>fewer drop-outs:</u> "the Telstra Mobile Network has fewer drop-outs and works better in more places – such as in buildings – than any other Australian mobile network."
- 224 To ensure this premium customer experience, Telstra makes investments under its basic capacity investment program which ensure, to the extent possible, there is enough capacity in the network for existing and forecasted new users to continue to experience reliable services and faster speeds. These investment decisions are made based on projected growth in network traffic as part of the annual planning cycle.
- 225 Ideally, these investments are made with enough lead time to ensure that Telstra can continue to deliver services to its customers in accordance with its KPIs. These investments are proactively made to occur on a "just in time" basis.

- As I have discussed above, Telstra focuses on providing superior network coverage nationwide as a key point of differentiation from its competitors.
- 227 Telstra actively markets its superior network coverage and most of its customers recognise that it is one of Telstra's key strengths. Marketing claims that Telstra is able to make because of this include:
 - (a) <u>largest coverage:</u> "Australia's largest mobile network covering more than 2.4 million square kilometres, so you can do more on the go"; and
 - (b) <u>fewer dead spots:</u> "With more than 8,500 mobile coverage sites nationwide, the Telstra Mobile Network has fewer dead spots than any other Australian mobile network".
- 228 To ensure it can continue to market these claims, and given Telstra is capital constrained, Telstra makes strategically focused investments aimed at supporting these points of differentiation. These investments effectively build out the network in terms of extending the existing footprint, improving the existing coverage, as well as rolling out new technology across the existing footprint. The ultimate aim of these investments is achieving differentiation in respect of both coverage breadth and depth against Telstra's competitors. Given they are coverage related, Telstra's investments tend to focus on infrastructure investment in rural and regional Australia.



- 230 I recall that this investment was made on the basis that it would ensure Telstra could continue to materially differentiate itself in the marketplace in breadth of coverage, stay ahead in depth of coverage, and position its network for video traffic by accelerating the network technology advancement.
- 231 Included in these strategic investments is Telstra's involvement in several government assisted coverage programs to increase regional and remote coverage, as well as quality of customer experience. In FY06-FY15, government funding accounted for less than 1% of Telstra's mobile

investment spend on a fully allocated basis excluding spectrum purchases and renewals. Examples of coverage programs include:

- (a) Telstra has committed \$165m to the Federal Government Mobile Black Spots Programme Round 1. Under this program, in December 2015, Telstra activated the first of the new mobile sites which will see Telstra build 429 new 3G/4G towers across regional and rural Australia as well as up to 250 small cells in small country towns. Although the nominated Black Spot sites under this program are generally not commercially viable, investment in these sites supports Telstra's strategic coverage strategy by providing Telstra with continued marketing opportunities to assert regional coverage superiority as well as demonstrating Telstra's commitment to the Australian community.
- (b) The Western Australian Government funded Regional Communications Project, which was a four year project across FY12-FY15 targeted to improve the mobile coverage at small communities and strategic sites in regional Western Australia, which again, although not generally commercially viable, supports Telstra's coverage advantage.

Technology and innovation leadership

- 232 My experience is that Telstra has consistently invested in being a technology and innovation leader in mobile services. This is because providing new and better technology earlier than the rest of the market operates hand in hand with the premium service, quality and coverage brand that Telstra has built. Marketing claims that Telstra is able to make because of this include:
 - (a) <u>continued investment:</u> "Telstra has a clear technology and capacity management roadmap that will ensure Telstra and its customers remain at the forefront of mobile connectivity".
 - (b) <u>Australia's fastest mobile network:</u> while this also rests heavily on Telstra's capacity and spectrum investment, it is Telstra's world leading innovation with LTE-A speed technology that helps Telstra to make best use of that capacity and keep Telstra faster than its competitors.
- 233 Telstra's investment in developing new features like LANES, LTE-B and Narrowband IoT is aimed at maintaining this point of differentiation in the market, and Telstra works hard to ensure it can translate these new technologies into usable services quicker than its competitors.

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236 Additional spectrum is clearly a key strategic asset for Telstra. Telstra is incentivised to continue to invest in spectrum because it enables Telstra to increase its existing bandwidth which translated to increased capacity and faster more reliable speeds for our customers. Newly acquired and future spectrum acquisitions will also prepare the way for growth in new products such as IoT, M2M, LTE-B and Enterprise LANES.

10 THE IMPORTANCE OF COVERAGE SUPERIORITY TO RURAL AND REGIONAL INVESTMENT DECISIONS

237 As set out above in section 2, the history of Telstra's network demonstrates that seeking to differentiate its services through coverage superiority is built into the DNA of the Telstra network. Telstra's decision to invest \$1 billion in 2006 to completely transform its network by building the Next G Network covering 98% and expanding to 99.3% of the Australian population, and its continued expansion of the 4G Network, have been fundamentally driven by its pursuit of coverage differentiation compared to its competitors. This pursuit of the coverage advantage has delivered significant benefits to rural and regional Australians.

10.1 The business case for infrastructure investment in rural and regional Australia

- 238 The business case for many infrastructure investments in the more highly populated metropolitan areas can be justified by examining the expected NPV of the individual sites based on expected direct revenue.
- 239 However, for many of Telstra's investments decisions in sites across rural and regional Australia, the expected NPV of the sites based on expected direct revenue makes the investment simply uneconomic. This is because the cost of building and maintaining individual sites in rural areas is much greater than in metropolitan areas, however these areas are much less densely populated resulting in far less direct revenue potential. The more rural and remote the network extends, the less populated and challenging the terrain becomes, and the less economic these investments become on a direct revenue basis.
- 240 Whilst investments in rural and regional Australia do not provide adequate returns in themselves, they are able to be justified by Telstra on the basis of the potential market share gain Telstra is able to secure by using coverage and quality claims to signal to the broader market, including in metropolitan areas, Telstra's network superiority.
- 241 In my view, there is a clear and established marketing benefit in having this coverage and quality superiority, and the competitive advantage it has generated for Telstra across the broader market place is what has incentivised Telstra to invest so significantly in rural and regional Australia.



10.2 The importance of coverage to Telstra's competitors

Optus also clearly recognises the coverage benefit. In recent years, Optus has strategically built in selected rural areas to obtain a localised coverage advantage in order to shift community perceptions about Telstra's coverage superiority. In a deliberate way, Optus has located base stations in outer metropolitan and regional areas where it can achieve this localised advantage in an attempt to cast doubt on Telstra's coverage superiority and reduce Telstra's market share. For example, in 2012, Optus installed a base station directly in the small South Australian town of Corny Point where, to date, Telstra has only supplied limited coverage in the area from a number of surrounding base stations.

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10.3 The focus on coverage does not result in inefficient investment

245 Whilst Telstra's strategies are influenced by competitor activity in rural markets, it does not seek to invest in any location in order to simply 'match' the infrastructure of a competitor. This approach is not only necessitated by capital constraints, but is also more consistent with Telstra's longer term strategic coverage investment program which is designed to provide more value to its brand and service than simply matching the infrastructure of a competitor. In this way, Telstra largely focuses on innovative solutions for rural Australia, rather than necessitating a capex spend that is always in line with, or in excess of, its competitors.



10.4 The benefits to rural and regional Australia

- 247 On average, approximately 15% of Telstra's mobile capital expenditure over the previous 12 years has been directed at the last 2% of the population in remote Australia. This includes investments in new sites as well as technology investments.
- 248 Many of the technology benefits that have accrued to rural and regional customers through Telstra's focus on coverage differentiation have been set out above in section 4.1.
- In addition to the technology investments mentioned in section 4.1, and as mentioned in section
 4.4, Telstra also heavily invests in special event and seasonal capacity requirements for rural
 Australia, servicing around 200 events / destinations per year and in some cases absorbing a

temporary capacity uplift of up to 300%. This capacity uplift is achieved through software licence upgrades, or building a temporary cell, or it may require re-building new hardware and upgrading backhaul. Examples of these special events include Splendour In the Grass in Byron Bay, Alice Springs Show Day, Birdsville Races, Tour Down Under in Willunga Hill, Rip Curl Pro at Bells Beach and the AgFest Field Days in Carrick (TAS).

250 A selection of media releases and articles relating to Telstra's particular focus on regional / rural Australia in recent years is set out at Annexure "MJW-12".

11 THE IMPACT OF ROAMING ON TELSTRA'S INCENTIVES TO INVEST

- 251 It is my view that if roaming is mandated it will essentially neutralise the strategic benefits of the current investment in 4G beyond the Optus 4G footprint, undermine the coverage differentiation Telstra has historically invested to obtain across both its 4G and 3G networks, and stifle investment in the development of new innovative technologies (such as the current 5G trials) and features.
- 252 This is because where roaming provides our competitors with the same coverage footprint as Telstra, Telstra will be unable to market itself on the superior coverage basis which has to date incentivised so much of its investment decision making.
- 253 Under roaming, Telstra will have no incentive to expand 4G beyond its competitors' footprints, and similarly, Optus and Vodafone, assuming they act in an economically rational way, would be unlikely to invest in building new sites where they can service their customers via roaming.
- 254 I firmly believe that the inability to differentiate itself on this basis would impact Telstra's ability commercially to justify a range of future planned and potential investments in regional and rural Australia, and would also provide disincentives to Optus and Vodafone to continue to invest substantially in infrastructure in these areas. In my view, it would effectively "freeze" any further investments in coverage.

11.1 There is still more infrastructure investment to come

255 Despite the significant amount of investment that has already been made in the Telstra network over the preceding 10 years, there is still significant investment to be made in order to unpack the full capacity and capabilities of the 4G network. This is the case even once the 4G network reaches 99% of the population which, based on current investment plans, will be by the end of June 2017.

Capital expenditure in regional and rural Australia

256 If roaming is mandated it has the potential to impact Telstra's ability to commercially justify a range of future planned and potential investments. Our current plans are to continue to invest

strongly in regional and rural Australia. Over the next five years we expect to spend a further \$350 million, which will include expanding coverage and capacity beyond our competitor's footprints, and improving in-building coverage and speed performance of our network.

Co-funded programs in regional and rural Australia

257 In addition to the above planned capital expenditure into regional and rural Australia, over the next 5 years Telstra also expects to invest in co-funded programs, including:



- 258 Telstra also expects to invest in programs which it has not yet made a financial commitment to, and which will be particularly susceptible to any decision as to mandated roaming. These include continued co-investment into coverage in remote towns, such as the recent fibre roll-out in Queensland to Birdsville and Bourketown.
- 259 Taking into account the expected external government funds on the above co-funded programs, amounting to approximately \$415 million, the total future planned capital investment program into regional and rural Australia equals over \$1 billion. This is significant additional investment that is being made into the future of telecommunications in Australia – any decision to mandate roaming I believe will inevitably impact this significant investment.
- 260 Whilst not quantified, any decision to declare roaming would also limit the future roll out of new technologies such as IoT, LTE-B and 5G.

11.2 3G-only roaming

- 261 Essentially, Telstra's network is made up of the combination and interaction of its 3G and 4G networks. It is my view that, if only 3G was to be regulated (ie. 3G-only roaming), this would create a disincentive to invest in upgrading to 4G technology and to continuously improve existing 3G services which usually occurs with 4G upgrade and will create network management issues between the two technologies where deployed by Telstra at the same cell site.
- 262 From a network management perspective, 3G acts as a 'fall-back' for the 4G network. Telstra currently uses 3G in sites where 4G is deployed to provide services where the 4G signal is not available, for example if 4G coverage in the basement of a building is limited or the 4G signal is limited at the edges of coverage in the cell. The technical compatibility of 3G and 4G means that both the network and the customer's handset can work to move the customer between 3G and 4G to maintain a high coverage quality without the customer needing to intervene or even necessarily knowing this is occurring. Customers therefore regularly move between the two networks as a means of capacity and coverage management. In these circumstances, it is difficult to envision a solution which would effectively enable 3G-only roaming without causing problems for the management of Telstra's network.
- 263 Telstra's contribution to the Mobile Black Spots Program and other co-investments require both 3G and 4G enablement. Telstra also continues to invest in ensuring its 3G software is kept up to date so that it remains compatible with 4G technology. When upgrading sites to 4G, Telstra also will undertake work in the course of upgrading a 3G cell site to 4G which has the effect of improving the quality of 3G coverage within the cell, such as speed and depth of coverage: for example, by upgrading the backhaul to bandwidth levels which support higher speeds on both 4G and 3G. This assists in ensuring that 3G and 4G can work in a complimentary way in a cell site to provide a consistent level of customer service.
- As 4G is the primary technology where 3G and 4G are deployed together and 3G is the 'fall back', 3G traffic is relatively flat or declining, whilst 4G traffic is currently growing. Telstra ultimately expects to close its 3G network as we continue to improve the quality and depth of 4G coverage so that it can provide consistently high levels of service without the need for a 3G fall back. I am aware that our current plans have 3G closure becoming increasingly likely from 2022, with a 50% chance of 3G still being available at 2025, and more than likely closed by 2028.
- 265 Although it does not currently have a solution for those 3G-only areas, Telstra is working towards improving those sites by upgrading them with 4G technology, even if customers are unable to obtain 4G speeds because of other site-specific constraints, such as limited backhaul capacity.

266 It is my view that mandated roaming on the 3G network will mean that there will be no incentive for greater investment in current 4G sites in regional and rural Australia, resulting in a lack of innovation and introduction of new features/functions. I also think it is very possible that as previously un-economic sites steadily depreciate and their operating costs outweigh any generated revenue, de-commissioning of towers may result in an actual reduction of the coverage footprint across Australia.

11.3 The implications of roaming on investment in rural and remote Australia

- 267 Generally, an investment is only made where it can be linked back to the recovery of its expenditure via direct or indirect revenue. As described above, there are many rural and regional sites that are not stand-alone economically viable due to low usage or low population density. Many of these sites were invested in either as strategic investments to provide competitive differentiation or as part of a partially Government funded program.
- 268 Without the competitive advantage obtained through Telstra's ability to make coverage claims from these investments, the business case for these investments simply falls away. Not only could this mean that the continued expansion of the 4G network to 99% may need to be reviewed, but it will also mean that entire rural communities will simply miss out on services or experience a degradation in coverage which is essential to the broader economic prosperity of those communities and regions.
- 269 It is my view that any decision to declare roaming would also limit the future rollout of new technologies such as IoT, LTE-B and 5G. Telstra currently has an incentive to, and does, invest in 5G trials with Ericsson, Intel and Qualcomm to prototype 5G enabled devices and test the technology. It is also actively involved with the 3GPP on 5G standards to gain support for features and longer cell ranges. A very different set of factors and economic analysis would be involved in decisions to invest in and optimise these technologies throughout rural Australia in the context of mandated roaming.
- 270 It is therefore my view that under roaming new features and new technology rollouts in rural Australia would inevitably be curtailed. Without a developed 4G foundation and continued investment, the introduction of any new 5G technology will not be economic.
- 271 Essentially underpinning all of this is my view that the introduction of declared roaming will result in a disincentive across all carriers for future infrastructure investment, particularly in rural Australia.
- 272 The current competitive and political state of telecommunications in Australia has resulted in its position as one of the top ranking telecommunications industries in the world, largely as a result of strong infrastructure competition. In my view, declared roaming will mean the end to the coverage race in Australia and ultimately a degradation of the industry and the valuable

services it provides to consumers and the broader Australian economy, with the greatest impact on rural and regional Australia.

Signature

Michael James Wright, Group Managing Director Networks, Telstra Corporation Ltd

Date: 1 December 2016

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-1" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-1

Curriculum Vitae MICHAEL (MIKE) WRIGHT

Business address:

Telstra Corporation Limited 14/275 George Street Brisbane, Qld 4000 Australia

Qualifications	Bachelor of Engineering – Electronics & Communications Second Class Honours – Division A Queensland Institute of Technology (1977 - 1980)
Professional Membershin &	Registered Professional Engineer of Queensland (RPEQ)
Other Participation	Member of Cisco Global Advisory Board Regular member of GSMA & GSA user groups and market initiatives

Personal Overview

- Member of Telstra's extended executive leadership team responsible for delivering Telstra's network differentiation strategy and world leading business & financial results.
- Current role includes responsibility for all fixed, wireless & media networks including planning, investment, design, technology strategy lifecycle and product development as well as network construction.
- Over 35 years of telecommunications experience with extensive breadth of technology and operational knowledge across wireless & fixed and media domains underpinned by a:
 - Highly innovative approach with clear strategic views both technically and commercially.
 - Well-developed Communication style that reaches stakeholders at all levels.
 - Extensive exposure to industry level and mass media including print, online, industry, commercial radio and TV.
 - Thought leader in technology innovation, global presence in wire-line and wireless technologies
 - Highly developed (and assessed) executive & leaderships skills.
 - Korn Ferry assessment
 - Rated at predominantly strong & development in Leadership Success Dashboard.
 - Cognitive Abilities (verbal and numerical) rated as Strength
 - Pivot Leadership professional evaluation 2014
 - Outstanding ratings in 5 of 10, Strong in 4 of 10 on competency overview

Career Summary

- 35 year history working for Australia's leading full service Telecommunications company.
- Extensive Engineering & leadership roles.
- Experienced with JV's, established offshore contracts and transformation of offshore networks (CSL Hong Kong).
- Recognised industry leader with key relationships into the executive levels of GSMA, GSA and vendors including Ericsson, Cisco, Qualcomm, ZTE, Juniper, ALU, HTC, Huawei, NSN and Samsung.
- Strategic thinker, delivery leader and change agent across many years of innovation:
 - 2005 strategy development & delivery of Telstra's Next G network in 10 months
 - 2011 strategy development & delivery of Telstra's LTE1800 network

- 2013/14 strategy development & delivery of Telstra's LTE network in APT700
- Spectrum strategies and creation of world user groups and support for core spectrum bands in 850, 1800 and APT700 MHz bands
- Developed LANES LTE for Emergency/Enterprise Services concept and strategy
- 2015 Established world Alliance for LTE-B promotion
- Leader in technology, commercial evolution and international influence with:
 - Extensive (~60) World & Australian First's in wireless, fixed and media technologies over the past 10 years
 - Over 50 speaking, panel and thought leadership roles/ engagements at international events

Key Roles & Achievements

Mar 2014	Group Managing Director Networks		
	• DR to COO & member of Telstra Extended Executive Leadership (eXCo) team		
	• ED responsibilities expanded with exCo responsibilities and Telstra external roles/		
	sponsorship representative		
Jun 2013	Executive Director Networks		
	• DR to COO		
	 Newly established Networks Division reporting to COO with ~3000 staff and 		
	expanded end to end responsibilities for:		
	- All Telstra network engineering in access, core, transport and media		
	networks		
	- Network maintenance technicians		
	 Telstra's internal Network Construction Workforce of ~2000 		
	• Capex budget ~2Bn, EBIT ~\$820M, 3000 FTE		
Jun 2010 – Jun 2013	 Executive Director Networks & Access technologies DR to COO 		
	• End to end responsibilities for all Telstra network engineering in access, core and transport networks, ~1600 staff		
	- Capex budget ~1.5-2Bn, Opex ~\$800M, 1500 FTE		
	Major contract market testing/renewal/trials (Ericsson/Samsung) with complex		
	commercials. Multi-year contract/board approvals >\$550M		
	• Developed world leading and first mover LTE 1800 strategy, business case board		
	approvals that underpinned future market leadership		
	 Innovations/ business cases & innovations: DOCSIS3.0, ADSL TopHat 		
	• Developed and aligned board to Telstra's Carbon reduction program		
	• Drove deeper strategic vendor partnership with:		
	- Cisco, Member of Global Advisory Board		
	- Juniper established for BNG to evolve ASP core		
	 Ericsson expended into transport partnering 		
	Complex management of major community protests, representation on TV, political		
	and community. Resolved with favourable view of Telstra		
Nov 2007 – Jun 2010	Executive Director Wireless Engineering & Operations		
	 Reporting to COO followed by GMD TN&S. 		
	- Capex budget \$350-450M p.a., Opex \$300-350M, 560 FTE.		
	- Network Capex flat, traffic doubling every 8 months.		
	Delivery of leading capabilities		
	- Blue Tick for handset grip certification		
	- Development of 'Country Phone' & Rugged phone with ZTE		
	- First ever SMS emergency alert during Victorian Bushfires		
	- World's longest LTE call to 75km with NSN June 2010		
	- Green Power : Fan cooling & Solar Power Supplements		
	- Saterine SG bases for emergency deployment		
	• Koles in GSIVIA panels/ initiatives for :		

- Horizon Series World Phone panel

- HSPA enabled Embedded notebook panel
- Embedded M2M modules (awarded Hong Kong Nov09)
- Promotion of iMB mobile TV standard
- Extensive communication and promotion of WBB & Next G
 - GSMA MWC 2008/2009/2010, Nov 2008 Macau.
 - IEEE WBB Forum Brussels 2008, 2009
 - Industry Analyst briefs with CEO Australia, London
 - 4G World Chicago 2009, 2010
 - Movil 2010 Latin America June 2010
- Recognition and Awards for NextG network:
 - Guinness Records 2008 (14.4 Mbps)/ 2009 (21 Mbps)
 - Best Asian & Best Mobile Carrier '08 Telecom Asia Award
 - Supporting partner for 2007 3G A-List 'Education' Award
 - 'Next Gen Network Service Provider: Frost & Sullivan APAC ICT
 - 'Best Mobile Ent'& 'Best of Show' Mobile Media Awards
 - 'Best Telco Transformation' 2007 Telecom Asia Award
 - Global Telecoms Business Magazine's 2007 Innovation
 - GSMA Innovation Award Mobile Codes
 - Acomms Awards 2007, 2008
 - Engineers Australia Awards, Vic & NSW 2008
- CSL Hong Kong transformation strategy
 - Advisor on network strategy, arch & spectrum auctions
 - Lead team to evaluate ZTE and recommended contract.
 - Lead role to negotiate contract with ZTE. Recommended ZTE contract to COO/CEO. Support for Hong Kong CSL build and launch
- International Telstra opportunities
 - Analysis & review of business opportunities in China & Asia.
 - International strategy discussions with key suppliers & CEOs
- Feb 2006 Nov 2007 <u>Executive Director Wireless Engineering & Operations</u>
 - Lead Wireless Engineering & Operations Team during \$2Bn transformation, 590 Staff, 2 years of 1\$Bn Capex spend, \$300-500M Opex p.a. Delivered on budget, ahead of time. Worked closely with CEO, COO and GMD levels cross company on wireless strategies & issues.
 - Develop/ deploy/ drive World Leading Next G network
 - Established world user group for 850 MHz ecosystem with GSMA, GSA, Ericsson and operation forums
 - CommsDay awards July 2007 & Keynotes on WBB at GSMA MWC
 - Delivered new/ enhanced Mobile TV, Ring Tone, AGPS, PTT products
 - Drive device & network equivalence to CDMA, mitigating public, media and government backlash. Achieved Government approval of CDMA network equivalence
 - Lead rollout of NextG network in 10 months to over 5000 sites
 - Hands on with all aspects of delivery core, build, radio and product. Establish Wireless Engineering & operations team under one group
 - Established detailed network capacity forecasting & planning models to derive network unit costs for voice & data for cross company pricing

Jun 2004 – Feb 2006

General Manager 3GSM Development

- Lead in transformation strategy for 3G850 & closure of CDMA.
 - Lead tender and contract for Next G network supply & build
 - Contract terms, technology & performance lock-in:
 - Network cost savings & core modernisation to MSC-S
 - 2G radio & core upgrade including EDGE
 - Major win coverage equivalence for CDMA closure
 - Power/capacity and 200km extended range
- Representation of Company & Strategy to Market and analysts with CEO in Australia, UK as well as Politicians, media & radio interviews
- Technical Lead Telstra/Hutchison 3GIS Technical Due Diligence & Contract negotiations & strategic contract establishment
- Lead 3G2100 Market RFT new benchmark in 3G pricing, 45% reductions, \$300m saving over 5 years

	Chair JV 3GIS Technical Committee		
	• Delivery of 3G2100 Hutchison/ 3GIS JV billing, 3G-2G HO, products		
Jun 2003 – Jun 2004	<u>General Manager Product Infrastructure – Mobile Voice</u>		
	• Rating in top 3% of executive talent by Highlands		
	First full view of mobile product cost allocations with Capex investment		
	New Products: Welcome SMS, HR GSM, CLI, CDMA Communic8		
Aug 2002 – Jun 2003	National Manager Infrastructure Standards & Services – Mobile Network Engineering		
	• Cost reductions: Battery 60%/\$20m, Build cost 10-20%, Antenna 20%		
	Standardised buildings, power/earthing, voltages, structures		
Jun 2001 – Aug 2002	<u>National Manager Network Deployment – OnAir Networks</u>		
	Industry consultation strategy ACIF code with all Australian carriers		
	• Significant tenders/cost savings for network build		
	Development of National deployment standards/ lower costs		
	• Expert witness for criminal case involving mobile tracking		
1989 – June 2001	Manager Network Development – Mobile Networks Queensland		
	• Start-up wireless engineering team in emerging Wireless Business.		
	• Switching, RF planning, sites for Paging, AMPS, GSM, M'bank, CDMA		
	• Technology briefings for Execs & Sen. Hon Richard Alston.		
	• Legal/ planning appeal Expert witness first Aust EME test case.		
	CDMA Rollout National Site Development Manager		
	- world leading 1:3 & 1:1 SFH, Low cost GSM repeaters		
	Qld University of Technology Faculty Advisory committee		
	• Expert adviser GSM vendor selection India for Modi-Telstra JV		
	National integration & test lead for GSM into Telstra network		
1985 – 1989	Senior Engineer – Transmission & Mobile Systems		
	Analogue and digital transmission design.		
	• First Optical transmission shelters & tail systems		
	Wireless Design, Interim Manual Mobile Telephone System		

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-2" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-2



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15 November 2005

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Telstra unveils 3G city-to-country delivering mobile 3G broadband

Telstra today unveiled its mobile broadband vision for Australia announcing a three-year plan for a single, super-fast national 3G mobile service. Telstra Chief Executive Officer, Mr Sol Trujillo said Telstra's 3G city-to-country plan would deliver faster speeds, wider coverage, and better mobile services for both city and country customers. "Telstra will be the first Australian telco to deliver high-speed 3G services across the country creating the best and largest network with wider and better coverage than exists today. "The national 3G service will provide Telstra's customers with existing and enhanced services including voice and video calling, mobile internet services and wireless broadband," Mr Trujillo said. Telstra also announced that it had chosen Ericcson Australia Pty Ltd as the vendor to upgrade its 3G capability (3GSM) nationally. Telstra and Ericsson have entered in to a Memorandum of Understanding in relation to this project and will finalise their commercial arrangements as soon as possible. Ericcson was chosen because they provided the best technical solution at a competitive cost and they also met Telstra's timeframes to provide the 3G city-to-country service. Mr Trujillo said the new network would use the same (850 MHz) frequency and booster technology approach used by Telstra's existing CDMA network, thereby providing the same broad coverage in rural areas, without the need for extra base stations, "Technology improvements mean the national 3G service will match the existing CDMA coverage and continue to reach 98 per cent of people. "This effectively removes any divide between city and country mobile customers in accessing the same range of leading-edge mobile services," he said. Both city and country customers, using the next generation of mobile phones on the 3G service, will benefit in the following ways:

- country customers will experience the latest 3G services including video calling and fast mobile internet services;
- when city-based customers travel in regional areas, they will get significantly improved mobile phone coverage compared to their GSM service today;
- · all customers will benefit from improvements to in-building and highway coverage; and
- all customers, when travelling overseas, will get access to hundreds of global destinations on GSM's extensive global roaming service.

Mr Trujillo said the existing CDMA network and the Telstra and Big Pond Wireless Broadband services will remain in place until the national 3G service has the same or better coverage and services. "Wireless broadband coverage on the CDMAbased EV-DO network will continue to be expanded as part of our commitment to accelerate the growth of our leading wireless broadband service until such time as the national 3G service is available. "At this time, Telstra and Big Pond Wireless Broadband customers will receive free upgrades and replacement data cards and modems. "Customers will be given plenty of notice to upgrade their handsets in the same way they do today but with the added benefit of attractive handset deals to ensure they can make full use of the new services." Mr Trujillo said Telstra's *3G city-to-country* plan played a key role in the Company's overall vision to provide Australians with 21st century telecommunications services. "This investment into the Australian community is pro-growth, pro-shareholders and pro-country. "The *3G city-to-country* vision means future investments in a single efficient 3G network will benefit our mobile customers by providing better services,





ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-3" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-3



17 November 2005

The Manager

Company Announcements Office Australian Stock Exchange 4th Floor, 20 Bridge Street SYDNEY NSW 2000 Office of the Company Secretary

Level 41 242 Exhibition Street MELBOURNE VIC 3000 AUSTRALIA

Telephone 03 9634 6400 Facsimile 03 9632 3215

ELECTRONIC LODGEMENT

Dear Sir or Madam

Transcript from Telstra Technology Briefing

In accordance with the listing rules, I attach a copy of the transcript from yesterday's Telstra Technology Briefing for release to the market.

Yours sincerely

Ponto bration.

Douglas Gration Company Secretary

Telstra Corporation Limited ACN 051 775 556 ABN 33 051 775 556

TELSTRA

TECHNOLOGY BRIEFING

16 NOVEMBER 2005

GREG WINN: I think we going to go ahead and get started absent the packs. They are out in the lobby. So they are going to bring them in and start distributing them? Okay. So we will get started here. And first off, thank you for coming after enduring yesterday. If it was hard on you, it was hard on us because we have heard it a lot and we have been living and breathing it.

I'd like to just make a comment that the people you are going to hear from today are primarily our engineering talent and the people that are going to make all of this happen as well as we were very fortunate to have two of our key strategic partners represented today and I'll speak more about that in a moment. But when we get to questions and the media, I would just like to be clear with everybody that you are talking to the technical team and the engineering team and they all talk technology all day long until they are blue in the face and hopefully answer your questions and satisfy those. But they are not about the politics which are interesting and they are not about the regulatory climate which is even more interesting, but they are about building this new next generation network, both in the mobile space and the fixed space for all of Australia. So I just caution you along those lines.

Secondly, we are in it for the long haul and it's a long/long haul but it's a print and what I mean by that is that we are going to do this faster than anybody else has done it in the past or even attempted to do it. We have a very detailed game plan laid out and we are about execution. So we are not going to react as a senior team to the share price, to the commentary. We are about building this network, getting it done and getting on with it and creating values. So this is a story of transforming Telstra as an incumbent telco into a world class, world leading communications enterprise that helps Australia and its citizens do anything they want to anywhere in the globe.

So, with that, I want to tell you a little bit about who is here today and I'm going to take a few minutes to do that and then the people will - I can't see because of the bright lights other than the first couple of rows. But I am assuming that as I introduce people they will stand up and you'll get an idea of who they are so as we conclude the presentations and we do the initial Q and A, you can tag on to some people for any of the specifics that you're interested in again from an engineering standpoint.

So again, we are going to spend about 60 minutes roughly going through a

thumbnail sketch of the technology. It's a little bit deeper than yesterday, but you will be hearing from the people that actually are designing and working with our strategic vendors on this.

We have with us today Dan Burns. Dan, would you please stand. He has been called various things in the newspaper but he runs our engineering and operations on the technology side. And Dan is a very experienced seasoned telecom exec. He also spent some time with Accenture and has a lot of experience with Sol and I, and he leads the overall engineering technology side of our business.

We have Mick Rocca. Mick is part of the senior leadership team at Telstra, general managing director, and Mick's team builds, maintains and installs our networks. They do the hard work. Sol called me a plumber yesterday, well, Mick is a plumber too and you know, we have the fun job. We actually get to do the work.

With us as well is Hugh Bradlow. Hugh is the chief technology officer of Telstra. One of his responsibilities is Telstra's research labs, and Hugh will be working with all the various strategic vendors over the next few years as we help mould and shape what we are going to be doing here in the future.

Along with that, Ken Benson. Ken runs engineering for Telstra and Ken is a seasoned veteran of both the BT and Telecom New Zealand and Telstra and has been in the industry a long time as well.

We have Lawrence Paratz who runs our new fundamental planning organisation. Lawrence is responsible for the architecture of Telstra's networks and all of the infrastructure associated with it. So where do we have duct work in the streets, interduct where we are laying fibre, power, space planning etc.

We have Andrew Johnson. Andrew is going to be leading - he is to lead our data operations side of the business. Andrew is leading several of the strategic initiatives that we are going to be talking about in terms of the tactical portion of it as well as working with our BigPond organisation on how we are repositioning some of the networking capabilities over at BigPond.

Then just in going down through the organisation, people that you will be hearing from day, Jamie Chard. Jamie, why don't you come on up and take one of the seats. Jamie is going to be talking about the softswitch. He also is a veteran of Telstra labs and Telstra and is the brains behind our softswitch strategy. Bill Felix and Kerby Lyons will be talking to you about the IP core, the multi-service edge that we are putting in and the ethernet, also veterans in the industry. Now, these two gentlemen when you read their bios happen to have a background at both AT&T and then Qwest. I just want a clarifying point. They

- 2-

were at what we call Classic Qwest. I never had the pleasure of meeting either one of them prior to the merger with US West and I had left at the merger so the first time I encountered either one of these individuals was when I was meeting employees here at Telstra.

Jim More. Jim, come on up. Jim is going to talk to you about the access strategy which is a big chunk of what we are doing so he is going to be able to answer questions about fibre, fibre to the node, fibre to the premise, etc.

Mike Wright, he is our lead engineer in the wireless space and he will be talking to you a little bit about what we are doing with the 3G platform. John McInerney I cannot see. John is a veteran as well and is leading part of our IT transformation. Some of you may ask where our CIO is, and if you understood what we were telling you yesterday, our CIO, Vish, is busy just trying to keep the spaghetti bowl connected together and couldn't take the time to be here.

Stuart Lee, and Stuart would you stand up. Stuart runs the program office. He is a gentlemen you may want to talk to a little bit. He is responsible to me and to the board to make sure that all of the programs that we have going are tracked, on track, delivering the business outcomes and the financial outcomes that we have indicated.

Peta Jurd, Peta is responsible for strategic alliances and works with our various strategic partners and is working with some that we have not yet announced and she manages those relationships for us and works closely with our CTO, Hugh Bradlow.

Ian Wheatley, another one that you may want to corner if you're successful. Ian runs procurement or sourcing as they refer to it here and Ian is responsible for all of the procurement across the big Telstra. That includes our subsidiaries and he is the one that is going to be rationalising the supplier base outside of technology as well inside of technology.

Catherine Payne. I think Catherine may be in the back of the room. Catherine is in our PR organisation and comps person that is responsible for communicating and dealing with the press but also with our employees and how we communicate what we are doing and we are going to be doing a lot of that.

Tarnya Dunning as well is part of Catherine's organisation. She is here and you may want to get a chance to speak with her.

Then we have Damien Coleman, and, Damien, I want to make sure they see you. Damien is my lead attorney and, you know, we have got to have an attorney. They are good to have and particularly in this environment. John Goner. John, would you stand, wherever you are at. John is a consultant. He has worked with Sol and I in the past. John has built networks in Europe, the US and we are trying to get John to sign up for a short stint here as we deploy 3G, but he is very well known in the wireless world and has built both CDMA and GSM networks. And I believe that's it on that side.

Then our investor relations people, David Anderson and Greg Slade and Anthony O'Brien are here. I believe they are in the back of the room. If you have more financial type questions, I will refer you to IR.

And then we have Andrew Maiden, and I don't know if Michael Grealy made it or Rod Bruem but more of our PR people. From Bain, if you choose to try to track the Bain people down, we have Chris Harrop and Mark Kovac. I'm not sure whether Andrew Klein was able to make it this morning or not and they are here as well. So, I think that's it on the Telstra side of the house and then I'm very pleased that we will have available and they have agreed to make themselves available to the press after - or to the analysts, after we conclude the formal meeting, and Hilary Mine who is the CEO of Alcatel Australia and Hilary joined here in Australia in October and she is responsible for the businesses across Australia and New Zealand and New Guinea. Prior to that, she was the senior vice-president of Alcatel North America and she has got an extensive background in technology, is an outstanding partner and Hilary and I work closely together and she is going to be available for you as well.

Along with Hilary is Phil Tully. Phil is the senior vice-president of operations for Acatel Asia Pacific and Phil is here today and he also will be responsible for managing this huge Alcatel project. So he will be running all of the Alcatel resources and helping with the project planning all the time and making sure that we stay on schedule, on time under cost, so that we deliver fully functional. So Hilary and Phil are here from Alcatel and they will help you on the Alcatel side of it.

From the Ericsson partners we have Barry Borzillo. Barry is the managing director for Ericsson Australia and Barry and parts of his team will be here as well, and then we are very fortunate that we have Hakan Eriksson. Hakan, would you please stand. He is the worldwide CTO for Ericsson. And I really encourage you to talk to Hakan because he will answer any of your questions regarding the debates about CDMA, GSM but more importantly what a road map is and how there is a very clear plot I believe would be the term you'd use, to move us from 3G to Super 3, to 4G riding on an IP network software defined switching, and it's going to be very very good for all of Australia and how it positions us globally, and he will probably share with you some of the other players in the market that are doing the same thing. So it's not Telstra by itself, we are not out there alone, and I think Hakan will be able to help you with that.

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And in addition to that, and I seem to have lost - Alex Sinclair is here. He is the chief technology officer of the GSMA Association. He has years and years of experience with all the mobile operators all around the globe and he also will be available for answering questions.

So, that's the team of people that we have assembled for you today and we will make them available. I will try to stay for a few minutes at the conclusion but I have to get to another commitment and I will be on my way. So to kind of lay out the day or the morning here, and the good news is this doesn't last as long as yesterday did, we are going to start and we are going to work our way from the customer into the core. That's how we are going to talk to you about what we are doing.

So I'm going to start with access and Jim More is going to speak to you about the access part of the network. Then we will get to the backbone and how we carry and aggregate everything in to the softswitch which will be Jamie, and then we will talk about wireless and then we will talk about IT and then we will open it up for a 20 to 30 minute general Q and A and then the people will be available post the formal part of the program. So that with that, I'd like to introduce Jim Moore and, Jim, why don't you take them through the access please.

JIM MORE: Okay, thanks Greg. To kick off the technology discussion, as Greg said I'm talking about access. Let's just first define what I mean by access. It really is the connection between the customer and the core network for which my other colleagues will be talking about after myself.

Access is also one of the biggest pieces of infrastructure that Telstra has in the end-to-end picture of our network. It has got a long history, access. It has been a backbone of Telstra since it formed. It's essentially based on a copper network and also has over time developed a number of other technologies which have enabled us to expand it, enhance it and provide services other than telephony which is really what it was originally designed for. So it's a huge asset we have, and just to give you a sense of its size, at this stage in the copper network alone, we have 21 million pairs, capable pairs available for connection to customers across Australia. So it's a large asset and a key part of what this overall transformation is about.

Before I talk about the technology as such, it's important to really understand what we are trying to deliver over this technology. In a sense, access is enabling a number of different types of future products to be provided. The sort of things that will be available are things like high speed internet, voice over IP which Jamie will talk more about later, the possibility of TV delivery over IP, telecommuting, video conferencing and video delivery of services in general.

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So the importance of what the access network can deliver is in twofold. There's two really key dimensions to access. What we will be aiming to do is deliver a capability which is fast so; speed is important. So if we are delivering video content, a high speed content to a customer, getting it quickly is important and getting a lot of information is important. So speed is a critical criteria for access.

The second part of access is really about capacity. As more and more customers use more and more of these sorts of products, they start to demand more and more of the infrastructure and the dimension of their actual core network and the access network. So it's very important for us in access to build enough capacity to deliver what will be a very demanding requirement to satisfy these services. So where are we today? Access, as I said before has got a history. There's a lot of copper network out there. We very much intend to exploit that copper network and leverage it to the best possible use. But as we have developed the access network over the years, it has really been an evolution of technology. We have grown from access from a copper network to a fibre network. We have delivered fibre for a number of reasons. One of those reasons is to enable us to expand our access business. As the communities grow, new estates are built and the redevelopments occur. What we have done is build technology in our access business connected to the exchange by an optic fibre, but we actually put electronics in the field in cabinets that sit on the street side. What they do is enable us to connect to more customers through multi-plex equipment.

As a consequence of doing that over the years, what we call pair gain technology has been a huge benefit for us in expanding the reach of access but it has one drawback in the sense that it was built at a time when telephony reigned supreme and of course it's no longer possible to pass Broadband through some of these technology. So unfortunately, they become a broadband blocker, and a very visible one. Examples of this would be and it has got lots of profile in recent times is our rim technology, remote integrated multi-plexes. They are the ones that are large cabinets that sit in the street. Enabling those for Broadband has been a priority for us. In addition to that we also have very small pair gain systems that simply split one pair into two or four services, a digital multiplexes as well but they are sprinkled through our distribution network.

So just to put a size around what we have today particularly in the five major cities that were spoken off yesterday. There's 5.4 million PSTN or ISDN services; there's 1.1 million in that footprint alone which is now served by Broadband. What we have been doing as you well know, we have been rolling out Broadband technology now for some time and the technology we have been using is essentially ADSL first generation. And that 1.1 million services there is using that technology in the main.

Data speeds are 1.5 megabits per `second out to as far as we can go. One thing about ADSL, it's dependent on the distance as to how far you can reach. At lastly, at this stage, we have a 97 per cent Broadband coverage in the five major cities. The remaining 3 per cent are right down to those Broadband blockers that I mentioned before.

So, what are we transforming access to? Well first of all, we are transforming it to a high speed Broadband capability. As I said before, speed is important and speed is certainly an aspect that we are focussing very heavily on. But I mentioned both dimensions of speed and capacity. To achieve the sort of speeds that we need to achieve using the DSL technology, we really have to get closer and closer to our customers. The defining characteristic of ADSL is it really is dependent on how far you are away from the DSLAM, the technology that serves it.

So our intent is to capture customers within one and a half kilometres of those DSLAMs which means one and a half kilometres around the exchange and any of those customers outside that one and a half kilometre distance will be satisfied with a technology that's deployed in cabinets, in the street and they will be located also within one and a half kilometres.

The benefit we get from that is those customers are all then served with the technology that's capable of delivering 12 megabits per second or higher. The 12 megabits per second I will explain in our next slide what our limitations are around that. The other aspect of this technology is that as we deploy more and more out into the network in cabinets and serving those customers, we will fully populate those cabinets. So our intent is to fully provision. The advantage of that is much faster connection times and much better customer experience. Lastly, the welcome part of all of this evolution to the new Broadband world is we will actually remove the Broadband blockers, those pair gain technologies I mentioned before out of the network.

A little bit of defining what 12 megabits and ADSL means. This is a very telling graph. ADSL is essentially a very high speed multi-plex technology. It's delivered over a copper pair. It's not the world's best transmission medium so it's in a sense as you go further away from the DSLAM, the signal attenuates so it is the speed you get as a customer gets less the further out you are. To ensure we get a uniform and high speed experience for the customers, we have designed the 1.5 kilometre point as being the point at which you can achieve the full maximum 12 megabits per second or higher.

12 megabits per second is effectively the ACIF which is the Australian Communications Industry Forum. The benchmark they set as being the minimum depends on where you are and the circumstances and the degree of
interference that's in the cable at the time. You may get higher than 12 megabits, it may range up to 20. The other aspect of putting technology into cabinets and what we call the fibre to the node technology, is it means that as you will see in those five major cities, two-thirds of those customers will be served by cabinets, one third will be served from the equipment in the exchange. The important criteria around all of this, that 100 per cent of those customers in those footprints will get those speeds as there will be no Broadband blockers in the way and all those customers will be within one and a half kilometres.

Another important technology which we have installed in trial situations in Queensland is fibre to the premises. This was mentioned yesterday by Greg. Fibre to the premise takes the fibre technology all the way beyond the node points to the actual household. It is the most effective way of delivering the highest speed service in a long term. Economically it is the best candidate for deploying in new estates, in greenfield areas where there's no existing infrastructure.

So it is the deployment of fibre to the premise will be in those new estates. It will provide a voice and very high speed services. It has the additional capability of providing video in two different forms. In our current technology we use which is called BPond, Broadpond Passive Optical Network, we either deliver it over an RF equivalent RF network or we can deliver it over IP. The options we have at our disposal. The other important aspect of the technology for fibre to the premise, is that it's free. It's soon migrating or evolving to the GPond technology which is gigabit passive optical network which enables us to get much higher speeds again to customers.

As I mentioned before, pre-positioning is a fundamental part of us getting our best customer experience. The reason it's such a great initiative to do that is because essentially what we have been working with in terms of Broadband up until now, if Broadband services are required, we roll a truck to connect that technology to that customer's line and therefore the connection times take days. With the technology such as what we are talking about and the fact that we are fully populating it into those locations, means that we can reduce that multiple days of connection time down to hours. So it's a much greater experience for the customer and it's certainly better for us.

Another aspect I would also like to mention is that as we transform our network to this fibre base and to this high speed DSL technology base, what also comes with this is a much more effective maintenance regime. It's less costly to maintain. It's less impact on customers. It's a much cleaner environment for Broadband and a much better experience overall.

So what does all this mean in terms of what we are going to do over the next

three years? In that time, we are going to upgrade 450 exchanges within this five city footprint. They will all be upgraded with these IP DSLAMs. We will be installing 20,000 fibre to the node deployments. These are located at the cross-connect point or the pillar point as we call it within the access network. In preparation for delivery of this service, we will be what we call conditioning the network. This is the access network. In doing that, we are removing the Broadband blockers, and the best example of that, we have 7,500 pair gain systems we are taking out.

We will replace those where we need to with clean copper and also we are replacing other blockers that we have in our network which are things like loading coils, bridge tap, those sorts of things that actually interfere with the signal coming from the DSLAM. This is happening over a three year period. What we will end up with is a fully provisioned high speed Broadband to 4 million service addresses. All these PSTN services that currently earn that footprint will be served by the voice on IP technology that Jamie will talk more about and they will be satisfied through what we call a multi-service access network technology.

thank you very much.

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GREG WINN: So much for technology. Turn up the mic on the podium please. Anyway, thanks Jim. I can't emphasise enough what this is going to do to our cost structure and what we call bad volumes. Things like truck rolls, fault management, repeat reports, impacting our customer experience and all the associated costs, let alone the enablement of all the new technology and the services that go with it. So next up, now that we have talked about the access, we are going to talk about our backbone. Out at the ethernet aggregation, the service edge and the IP core and Bill Felix and Kerby are going to team on that. We are a little bit behind schedule, guys, so we will need to kind of pick it up. Thanks.

BILL FELIX: Okay, with that prompting, I will be brief. I'll give a very brief overview of the overall transformation program that we are focussing on in the core area and ask Kerby to come up and talk about a few specifics in that area.

Involved in core transformation is a journey to a unified common packet core. There are typically three elements involved there. There is a core itself, service edge and how you distribute packets. The keys to success in this area are going to include meeting rapid growth through scalability options that lower our unit cost, about dramatically increasing our reliability through in part better design, in part new infrastructure, and in part retiring some of our older infrastructure.

Lastly, it's about enabling new services and new service combinations. You may be a little surprised to see the same view graph from Jim as from me. You will see this view graph later because we want to emphasise the point that what this is about is our customers. From a core standpoint, I'm here to help the gentleman you saw come before and the gentleman you will see come behind effectively do their jobs and deliver our services to our customer. My viewpoint is a little different in that I'm an enabler. So in that enablement set, this is not just about bandwidth. This is about being able to provide on an application basis the quality of service that each customer in their application might need first on a static and then later on a dynamic basis.

Lastly, it's about being able to mix those seamlessly. Where we are today, well, within the core and the distribution area, we have a large number of networks and distribution footprints. There's a variety of reasons why we are there but here is where we are. What I would say about this is one of the fundamental things about the telco business is that it's a scale game and we are at a significant disadvantage at this moment in time. Worse is John will get into later, each one of these platforms also has its own support system infrastructure further exacerbating our scale disadvantage. Equally important to underline here with this kind of architecture, it's very very difficult or impossible to enable the products and the product combinations we would like to do going forward.

So with that, a little bit about what the new world might look like, its three major elements. First is about what we call ethernet distribution. I would underline for all three of these elements, we are also always working on providing additional scale options at a lower unit cost, but there are some key other things for each one of these. For ethernet distribution, it's about integrating voice, video data and mobiles distribution plots into a single plot which we do separately today. It's also equally important about providing for lack of a better term the hooks that will later on allow us to be able to provide that quality of service item that I mentioned earlier.

In the multi-service edge area, this is in part about providing IP base support for our current customer set, things like ATM and Frame which does a number of things. In addition to unit cost advantages it's also been enabling our customers to make decisions about their equipment on their own timeframe independent of what we are doing and allow us continue to migrate away from mature infrastructures at our choosing. Equally important, it's about pushing our core out further into the network which will enable some key reliability activities that I'll talk about in about one second.

In the MPS core, probably three key things right there, medium terms, we have some important site constraint issues which we intend to address, but equally important this initiative is about dramatically increasing our reliability through use of completely modular hardware and software designs as well as redundancy, as well as designed in day one, the ability to seamlessly combine and add new services. So with that, I'm going to pause and then ask Kerby to come up and talk a little about the key programs.

KIRBY LYONS: Thanks, Bill. So essentially what I hope you got out of that so far is that there's a lot of operational complexity that's in the network. A lot of it was because the technology limitations at the time when we started rolling these product sets out, so what I'm going to walk you through is taking a look at the ethernet aggravation, the multi-service edge and IP core and how our plan is to quickly - four years is quick from a technology perspective - simplify the network, provide a better service to our customer and encourage all the new applications that Jim spoke about. Now, a lot of that you will see is as we reduce the number of platforms, hopefully it becomes obvious that operational complexity continues to decrease.

Ethernet aggregation. What you see is we essentially have nine different types of distribution networks that we use today. As you can imagine, the complexity of trying to manage that and continually offer a reliable service to the customers gets very hard. The whole plan is to, as the technology, use the new technology and our strategic partnerships with Alcatel to be able to reduce that complexity by introducing new technologies and collapsing a lot of these architectures together. And again going back to enable better service to our customers, right.

If you will notice, a lot of the platforms you will see there, that it's really an increase in capacity from the current technology from 40 gigs to 160 gigs, given, you know, a four times increase as far as the capacity of the network which we want to acquire for the access application that's coming on board.

Multi-service edge, same thing. A lot of technology was installed into the network to support different product sets because the technology has continued to collapse and evolve overtime. Now was the appropriate time to go out and start replacing that technology, use the new technology, collapse our product sets, simplify operations, but maintain the scalability that's required to continue to go forward. Our network today is running around on 60 gig platforms. What we are looking to do is increase that up to 400 gig platforms through different strategic partnerships again.

IP/MPLS core again two different networks driven by two different product requirements limited by the technology that we had available. New technology, Cisco CRS 1 allows us to collapse those two different networks into one network but still increasing the overall capacity by 77 times the capability set we have today. It's a huge increase. That increase allows us to meet the access requirements, the Broadband initiatives that we have coming and to continue to grow the network for the next five to ten years.

Now, all that's real good. It's all a lot of puffy charts so when can we get it

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done? Bam, Cisco CSR1, March, right; we are going to start putting traffic on that platform in March. We are going to continue to evolve the rest of the network over the next four years, we are going to exit some of the legacy platforms if you will to simplify the network. They have to both be done almost in parallel. We will be a little bit ahead with the new technology. We will migrate and rationalise the network as we continue to put the new stuff in, but this is a very realistic timeframe and it's something that we are going to get done.

GREG WINN: Thanks, Bill and Kerby. I think just so we are clear and I am obviously dual-tasking. As you think of it again from the customer, from the access to the nodes and why do the speeds build and the capacity builds, it's because we are funnelling things into a core so the core has got to have a lot of horsepower to be able to run these next generation networks and all these applications that we are talking about. Again, for the analysts in the room, you know, the reductions of these ethernet platforms, the edge platforms, the amount of router boxes we are going to have, it significantly changes our CAPEX and our OPEX structure, not just immediately as we deploy and decommission, but on a going forward basis because the ability to add capacity, it doesn't take as much effort and it's not as costly in the future. So that's why you see our CAPEX curves change as we get further out in time. So next up, moving into the softswitch now, Jamie Chard.

JAMIE CHARD: In 1999 Telstra launched its first voice and IP product. Since then we have delivered a number of products to market that actually use an IP core to deliver voice capability and carry voice traffic. It's been an exciting ride because the products, the technology and importantly the architectures are maturing. They have reached a point of maturity now where we are taking it to the next stage and going to progressively roll out a softswitching infrastructure to relate large components of our traditional core what we have refer to as the PSTN, the switched voice network. Today I'm going to take you through some of that transition and I'm also going to take you through what we mean when we talk around a digital home and around the delivery of home gateways and those new services that we spoke about earlier into the home.

Jim picked up on these services here. In a voice context, we will continue to deliver the plain old telephony service, what people refer to as the PSTN. The plain old telephony service will be delivered differently with different infrastructure, but that's not as far as it goes. We are looking to deliver enhanced voice services and capabilities. So not only is there voice on IP, there is video on IP. There is also the transition of the plain old telephony service into a more enhanced voice service so not just VOIP but something more - greater than what you would actually expect off a plain old telephony service.

Let us look at our current network. Telstra has a fairly traditional network for

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delivery of voice. It's a three layered network based around what is referred to as class 4 and class 5 switching. At the moment we have about 250 odd nodes in our network switches, that is core switches, that actually deliver that capability to our customers. This network is a single application network in the sense that it is primarily there to deliver voice. Yes, we have a lot of voice products that are wrapped around that but that network is optimised for voice. It is not optimised for the sort of multi-services that we have been talking about here today.

Within those the five city areas that we are looking at for the transformation, we have around 5.4 million services in operation. So as Jim picked up earlier, those services for the plain old telephony service will be transitioned over to the new softswitch infrastructure. That will take out 116 of those 250 odd class 5 and class 4 nodes that I spoke of earlier.

The transformed network is moving towards, as we have said, a common core. We just had Bill and Kerby take us through that. Key to that is the centralisation to a smaller number of softswitches so we will be looking at five mated pairs of softswitches. To give you an indication currently we have on most of our class 5 switches we would normally dimension to about 120,000 odd services in operation. These softswitches will take us up to a dimensions of about 2 million services in operation off each softswitch. Those softswitches because of the size of the customer base and because of the centralisation clearly need to be redundant and resilient so we are looking to have five mated pairs of those softswitches within each of the zones that we have designated, and I'll speak to that shortly. The core of the delivery of the voice itself will be switched effectively through the IP core network, so based on the MPLS and IP core.

We will continue to deliver the plain old telephony service so the features and the capabilities people see today will be there. They won't need to change their handset as such. It will still be delivered down the same copper line, the same base-band transmission that you do see today. But should the customers choose to, we will also take them up a level in terms of the voice capability to an enhanced voice services which actually deliver the voice all the way to the customer over the Broadband part of the line. So we deliver over that ADSL connection and we will be delivered as voice on IP and we will touch on that shortly in terms of the digital home.

The transition as you will see here, we have depicted what it means for a customer that is on a traditional plain old telephony service. In effect the copper wire is being taken away from being into a class 5 switch as you see down the bottom with those pictures down the bottom and follow the arrows. They are transitioned up into the multi-service access nodes. These multi-service access nodes are effectively a DSLAMs enabled with voice cards and

voice capability. So at the termination point of the copper, the voice is changed from a base band voice signal into an IP signal and is carried as voice on IP across the core.

Central control is from the softswitches, the five mated pairs of softswitches in the core of the network. The actual transition of those packets and the quality and the delivery of those packets goes across that quality enabled IP core that we spoke of earlier. It comes back again into the core of the net, back into the DSLAMs and delivered back out to the other customer at the second end of the call. We will also be introducing further capabilities as I said around the voice on IP, so as we've depicted there also, certain transmission of voice and the enhanced services will be going IP all the way out to the customer over their Broadband connection.

The softswitches here we have depicted where those softswitches were. We have looked to have those centrally located and fully redundant, full capability to switch over between those nodes. We will also look at geographic diversity on those softswitches as well so should we happen to lose node or we need to lay balance across the various areas, we will do so. In these type of networks it is very important that we maintain that control point because the capabilities are inside that core softswitching unit and that driving the whole of the voice network. So as we are saying, approximately half of Telstra's services will be moved over to this new softswitching core. So the remainder of the network will be continued to be delivered off the class 5 and the class 4 exactly the same as they have now.

I spoke a little bit earlier and mentioned the words "digital home". About 12 months ago Telstra initiated a project around the delivery of these capabilities into the home. It's okay to have those services there but it's not okay if the customer can't use them or doesn't have the capabilities, the technical knowhow, can't make them work. At the end of the day, the customer is looking around service and that service to be delivered to them. They don't really care about how the technology is to get to them.

Recently there was a study in the United States looking at people setting up their home networks and the technology involved with that. Currently, over 55 per cent of people actually get somebody else to set up their core network, and bear in mind these are the technology leaders. So the complexity involved in setting up your home network is just way too difficult for most people.

You like to know that of the 55 per cent that they referred to, a large component of that was the spouse, the others are friends and other people around them. But they are definitely looking for somebody to help them set up their home networks and it only gets more complex. The aim of the digital home and the capabilities that come about through the use of home gateways and things is to allow us to be able to service directly into the home and make it easy for the customers to effectively connect to these devices and should they have any problems, we will be able to be there to assist them through that whole process. That means that we will be able to look into the home gateways and see exactly how they have got their capabilities. Of course, we have to be very mindful of things like privacy etc., but if the customer is seeking assistance, then we will be there to make sure that their home network and their services are delivered in the way that they expect those services to be delivered. In other words, they work, they get what they pay for.

How do we do that? We noted that we have softswitches and a range of application servers which are depicted on the far side of this slide. But the actual capability to deliver into the home is around two key elements, the first of which is the home gateway. That is the central hub which brings the service into the home, delineates between the various service, sets up the configurations, allows the customer's services to be managed in such a way that the actual service is effective and efficient. Back inside of the core of the network we deploy what is referred to as remote management systems. Those allow us to do auto configurations of the devices as required. They also allow us to troubleshoot and to see what is actually happening in a core network.

As I noted earlier, there are key requirements there that of course we are not really looking into customers' networks without their permission. But basically, when there is an issue in place, we will have the capability to assist the customer so that they have that service and that service is delivered. There are a range of other components that are actually wrapped around that, some of which you see, there are authentication service and other things that allow this service to effectively be plug and play. You bring home a unit, you bring home a set-top box or something, you plug it in and off it goes and the network will fully configure it and manage it for you.

The delivery of the softswitching program and the digital home program. The self-switching program is going to take two years for us to deploy the actual softswitches in those five designated areas. Once the softswitching deployment is complete, we will then start to transition over those customers in those footprint areas to the MSANDS. Those MSAND boxes as they get rolled out as Jim noted across the core. At the same time, we will start to as we move over exchanges, we will of course start to take out some of those 116 odd class 5 switches. The ongoing program for that we expect may take up to the end of the year 5, it may be it's done sooner, we will see as the transition goes through, but the core capabilities will be in the network in the end of the two year program. Thank you.

GREG WINN: Thanks, Jamie. I think a couple of key points here is we are

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going to move with absolute speed so we intend to try to beat these timelines because time is money. Secondly, in the analysts' community, by the way I was asked to remind everybody either remind you or remind me, I'm not sure what the note was for, but we will have the analysts ask questions first and then the media after. But when you think of these 116 switches, classified switches were taken out, with that in our cost structure comes power and we spend a tremendous amount of money on power every year in terms of upgrading power capability into these locations.

We are not going to have to do the power builds, the UPS back ups, the generators, the fuel storage, all of this stuff that goes with growing these old networks gets collapsed to these new softswitch locations which by the way consume less power, require less cooling. Do the machines run hotter in today's world? For the most part, yes, but they are not as big, they are not multi-floors of equipment. We are going to recover a lot of space from a real estate standpoint, so our total cost of ownership going forward has dramatically changed. Everything from how many locations we have to have people in to surveillance and to work on it, to the utilisation of for the most part space that we own where we have our switches which we can convert to any kind of space we choose to do so. So it's going to again fundamentally change the cost structure. Now we move quickly to the wireless side. Mike Wright will talk about our 3G initiatives.

MIKE WRIGHT: What you will see in this slide is a common theme that has come through all today today and that is we are building a new capability on a common underlying IP/MPLS core, and it is no different to the mobile space where we are going to add 3G functionality and softswitching to that same underlying core to build the next generation network.

What we are planning on doing is delivering a multi-service capability over a single national mobile platform and that platform is going to enable voice calling, video calling, enhanced content and wireless Broadband to our entire national footprint. If you look very, very carefully at the top left of the slide you will see the attractive gentleman we use for the voice calling photograph in our demonstration. He is in the front row.

A quick summary of where we are today. We actually have three mobile networks, particularly since the recent launch of our 3GSM network. We have over 8.3 million mobile customers. They are serviced by over 4,900 GSM towers and that covers around 600,000 square kilometres of the Australian footprint. We have over 2,100, 3GSM towers at the 2.1 gigahertz frequency. They are in the major capitals and they cover around 7,300 square kilometres of coverage and we have 3,480 or more CDMA towers that service 1.6 million square kilometres of footprint. Much of this is overlaid on the top of each other. If you look to the right-hand side of the slide there, you see that what we get out of having these three networks is a lot of network duplication and a lot of duplication of investment.

Much of the GSM network lays on top of the CDMA so what this does to us, it dilutes our capital, it causes us to roll out replicated network coverage. In addition, we have three core switching networks. If you look at the drawing at the top, you will find all mobile networks look basically the same, all that changes is usually the name of the boxes and sometimes the vendors. But in essence they are basically the same elements. So what we have is a CDMA network with a radio access network and a core MTX switch and some packet elements. We have a replication of that with our GSM network and we are just divulging with our 3G network with R&Cs for the radio access and softswitch core elements for our core switching element.

So we do have a fair amount of network duplication. If we look at this nice simple slide of technology evolution, you also see a bit of the story. The top two rows really show what I call the GSM infrastructure environment. This is a GSM technology standard that has evolved out of the GSM standards group, and the (inaudible) shows the CDMA environment. Now, we have both of these environments. We have a GSM technology environment and a CDMA environment. For perfectly good reasons, when the analogue network closure occurred, the most suitable technology solution to replicate the analogue coverage was CDMA and that got us a start in this position where we had a replication of networks.

What has occurred with that though is each of those technologies evolve and generate new features and functions and it has caused us to replicate our investment as we upgraded them from basic 2G networks to packet capable 2.5G networks to 3G capable, wide band CDMA in the case of 3GSM, and EBDO where it's just starting to deploy in our CDMA network. So this again dilutes our capital and causes us to replicate investment. So our plan is to collapse these into a single GSM technology. So what going with one technology evolution path does for us, is it allows us to follow that evolution strategy. So we have the beginnings of our 3G network in our capital cities now.

We are going to move in next year to build a national 3GSM capability, over 1.6 million square kilometres, so that's increasing our 3G capability with voice, video and high speed data capability from 7,300 square kilometres of coverage to 1.6 million square kilometres of coverage and 98 per cent of the population. On that road map brings us - at the time we are launching this functionality next year, we will also be implementing the second generation of high speed downlink packet access because we like long acronyms which is a Broadband capability on this technology with a peak data throughput of 14.4 megabits per second.

I want to emphasise and you would have seen on the earlier slide that we also like to quote the average user capability and the average user capability over our HSDPA network is in the vicinity of 550 kilobits to around the 1.1 megabits. The 14.4 is our peak throughput capability of the technology and probably belongs mainly on the marketing brochures. But this same technology evolution is already planning a number of extra steps. We have already seen the 3GPP group commence studies on what is called long-term evolution or more particularly known as Super 3G. Super 3G has had three standardisation meetings already. We are yet to see the fine detail which is due to be finished off in 2006. But already we know that it's aiming for peak throughput speeds in the hundred megabits per second range and lower latencies and even the ITU are looking into 4G and there's much debate about the definition of 4G but we are seeing standards being set and discussions around an aimed target speed in the one gigabit per second range.

I re-emphasise these are the peak ranges. The average user speeds and the total throughput capability of this technology is not to be as significant as a fixed network but it certainly is a significant throughput capability. So part of our evolution strategy is to build on this road map so even the infrastructure we are installing now in 2006 will have blade plugging capability in the racks of equipment to take us to the Super 3G capability when that technology is standardised and the equipment is available, built on a common platform, a common transport platform.

So it's an important element of what we are trying to build. So what we will be doing is installing 3GSM equipment into over 5000 base station sites in Australia which is the sum of our existing GSM sites and our CDMA sites including the overlay minus a few minor microcell sites that don't provide any coverage at all. We will be upgrading and migrating to a single softswitch based core system serving our entire GSM ecosystem, which is our 3G and our current 2G network which we will continue to operate. We'll upgrade all of our legacy equipment in our 2G network which at the same time will enable edge capability which is enhanced data for GSM evolution which is a higher data throughput capability for GSM frequency devices. So this will totally deliver us 1.6 million square kilometres of CDMA capability, of 3G capability equal to our current CDMA footprint, and they will deliver collectively voice, video and high speed data.

A significant element of all this is the customer. We have a great amount of experience with where our customers want to use the service and a significant part of this strategy is to ensure that we take nothing away and, if possible, we actually give something more. So, if you look at our technology that we are rolling out into the particularly the rural areas, we have some extended coverage that many customers enjoy services in remote areas. And in fact, what we are looking to replicate is the current coverage of our CDMA network. If we go back and look at when we launched our CDMA network, that technology itself inherently in the software specification and as with 3GSM has a limit around the 50 to 60 kilometre range of timing written into the software and into the standards. What we did when we launched CDMA to match analogue is have that software changed to remove those limits to give us coverages up to the vicinity of 200 kilometres in timing. So that's one aspect of the coverage range part of the story. For 3GSM, we have also worked with our vendor and arranged to have that same technology timing limit adjusted so we have the equivalence of timing signalling in this new technology.

So having removed the timing difference, what is left then is the fundamental sensitivity of the radio technology itself. As it turns out, 3GSM is based on wideband CDMA technology. It is also a CDMA technology and it can achieve the same radio sensitivities as our CDMA network. So a very important element of what we are doing here is to think about the customer and ensure that we deliver the same or better service and the same configurations for them. So we have put a lot of effort into that and worked with our men to ensure that we do deliver that.

So what we are doing is, summarising, we are upgrading over 5,000 sites to 3GSM at 850 megahertz and it's the move to this 850 megahertz frequency spectrum which gives us the additional coverage range. We are transforming to a single softswitch core architecture, and in addition to that, we are going to make some additional improvements to our network. We will be improving the network by adding additional sites in areas where we currently have had feedback that customers would like better service. We have set aside some additional sites to improve some highway coverage and by the very nature of the 850 megahertz spectrum we will be improving in building coverage.

This is a two year program. By the end of 2006 we will have commenced service capability, and by the end of 2007, the software upgrades that will deliver us the full extended range will be complete and we will have our full 3GSM 850 coverage over the 1.6 million square kilometres. An exciting time, a very tight timeframe but something we are very confident we can deliver. Thanks.

GREG WINN: I know many of you probably have questions around the technology, and again Hakan and Alex will make themselves available to answer questions post this conference. I would like to also remind you, we had a choice. I could have put the guys in the front row up here that lead these, the general managers, general managing directors etc. that run the business. These are the guys that actually run the teams doing the design and the engineering working with our strategic partners. I thought it best for both analysts and the press to see the people that really do the work, don't just administer it. So, Mike, thank you, and last but not least, and one of my hot spots is the whole IT situation because I've lived with it for 35 years in the

industry. It was bad 35 years ago and it hasn't gotten better. And we are going to do something about that, so John McInerney, please.

JOHN McINERNEY: Thank you, Greg. As Greg said, last but certainly not least, I'm going to take you for ten minutes and have a brief overview in terms of what we are going to do in terms of IT transformation. As a starting point, it's important to understand the scope of our work. Our work covers business support systems including areas such as CRM, sales and marketing and billing, also covers areas such as operational support systems, assurance for fulfilment, network inventory, network management, etc, so it's a very large scope of the work that we are trying to cover.

Before I kick off today, I wanted to I guess reinforce some of the items that Greg discussed yesterday. That is that we are going to deliver this capability cost effectively and we are going to deliver considerable and significant simplification of our systems environment at Telstra. These are two underlying drives that we have taken through our review over of the last couple of months to really ensure that we deliver great outcomes. The other item that was discussed yesterday was around scenarios and there were two scenarios presented by Greg yesterday, one around sales order and fulfilment and the other around assurance.

I'm going to be touching on those. I haven't got time to go through them in detail today, but I'm going to reinforce where we are delivering capability to really create a much better scenario going forward for both those areas and for other domains within Telstra as well. It's where I would like to try and kick off the presentation today, really targeting what we have in terms of current capability and where we expect to be in three to five years in terms of the future capability.

It is important to understand that we are not waiting for three years. There's going to be multiple drops along the way starting from early in the new year. The three I've highlighted today, the first one covers a single view of our customer. And there would not be a T1 telco in the world at the moment who isn't targeting a single view of customer. There are really strong drivers as to why this is important.

The first one I'll touch on is from a marketing and sales perspective. Bill Stewart touched on this yesterday in terms of customer behaviour, purchasing patterns, segmentation. There is key data caught up in our systems. It's spread all over a multiple number of systems within the organisation. We need to consolidate from a logical perspective that data so it can be utilised. The other area to look at, a single view customer is a favourite probably of Greg's as well, from a CSR or a customer service rep perspective. We have customers service reps out there working on things such as the account management, fulfilment,

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assurance, many areas that are touching the customer.

The scenario as put forward yesterday demonstrated just how difficult, especially from an assurance perspective, it is to satisfy a customer's demands when you've got multiple systems covering multiple products and therefore creating multiple interactions back into our customer base. The second point there is around customer self-service. Customer self-service takes many forms, web based and IVRs, voice recognition, even down to email. You know, what we are looking to do is to make that customer experience a lot more effective, a lot quicker and a lot more efficient from a Telstra perspective as well.

When I think about customer self-service, I think less about a portal on the web and I think more about the back office in automating in the back office. If you consider one of the scenarios put forward yesterday in terms of fulfilment, the shear number of interactions that a customer has to have with Telstra in terms of product bundling, the shear number of screens and systems that our CSRs have to work with to take an order, you can understand the frustration and the problems that we face both internally and with our customer base.

What we are looking to do is to significantly automate that process. This very much lines up with the moving into an IP world where the interaction of our customer base is going to increase dramatically over the next three to five years. We are going to be bringing new services to market very quickly and we need the capability to do that effectively. So, you will see that there's a big focus on making sure that we drive out that type of capability and underpinning that is a very strong network inventory plot. A very large backbone of the work we are doing especially down to that OSS level is about defining a much more concise, accurate view of our network imagery to allow that flow through to occur.

The final point down there is in relation to network fault management, yet again covering another one of the scenarios that Greg covered yesterday. Our network fault management really from my perspective covers three areas of capability, the first one being the pure physics of our network, how we are managing the physical network. We have an existing capability out there. It's a very difficult thing for our CSR sales to work with. When we have an issue, we tend to have multiple groups using multiple screens, using multiple systems to resolve an issue and sometimes they can be quite simple issues as well. It comes down to around alarm correlation, route calls analysis, we have a basic capability, we are going to increase that capability significantly.

The second one is around assuring services. In the IP world, we are going to be rolling out a lot of services using the same network and the same bit of cable. So the driver for us to actually understand how those services are performing on our network is a significant driver going forward. First and foremost is the customer experience. That is, the physics of the network may be fine, but what is the experience of our customer in utilising these services? And therefore we have to understand the performance of applications at the back end of the network on the throughput. They become key drivers for us to actually work with our customers and understand the experience they are having at their end.

How do we get here? The two diagrams you see represented that obviously aren't readable but they tie back into I guess the top one in terms of mapping what is our current systems back to our current network products and our current products, and is able for us to actually look at the history of how these systems are rolled out and they are rolled out very much in alignment with the roll out of products. This means that we have got multiple systems across multiple products, and hence the issues we have in relation to the single view of customer and other items that I've covered.

The other item there is a large portfolio with high complexity, and the little spaghetti diagram you see in front of you is meant to represent complexity and that is complexity in terms of integration. When I talk IT, I talk heavily around integration. When you've got over 1,000 systems, integrating those systems is an extremely difficult task. Integrating those then back into the network, into our parked areas, into customer and sales areas becomes even more difficult.

Extensive custom coding and vendors. I guess the one point that is important to understand is that we are going to be going for commercial off the shelf products. We are going to be increasingly simplifying that environment for us going forward. We are going to stop customising code and we are going to improve the life cycle of our assets as they currently stand.

The final point there is the approach we have taken is very much a hole of customer view approach. It has not been a product or a network view of our technology, it has been very heavily driven by how we need to service our customer.

What are our key drivers? Velocity of change is a term that is used quite a bit in IT, but after you have heard the presentations before me, you will understand the level of change that we are currently going through and we are going to be going through over the next five years. The IT systems need to support that level of change. A great example of velocity of change is probably in terms of service delivery platforms. We have a large focus and a significant focus on how we are going to roll out service delivery platforms to enable quick and effective interactions with Telstra without getting into the detail of our network configuration.

A point raised and two points raised yesterday by Greg, we are going to reduce our 1200 odd BSS, OSS systems significantly over the next three to five years. This is not a wish list. This is something we are going to drive extremely hard.

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It underpins the simplicity that we are going to bring into the environment and the capability we are going to drop as well. It's a significant driver going forward. The co-cost of ownership will be driven by that as well. We are going to be dropping the capability, we are going to be also removing cost. The architectural model that we are looking at is one around building a really strong fixed capability upfront, allowing the changes in the future to be more of a variable based change model allowing us to get to market and cost effectively as well.

Aligning with the presentations today is also a migration to the new IP, the new network generation that we are going to be closely working with over the next three to five years. In some sense we have to be leading that process. We need to make sure that as we roll out networks, we can assure them, we can activate them, we can build them. So we are going to be very much at the forefront of that roll out as well.

Finally, it wouldn't be an IT presentation without a transformation blueprint. This takes many shapes and forms and this is meant to be a representative of I guess the scope of the work we are looking at in terms of what we are trying to cover. The other focus of the picture is to really say that this is not being driven around products. This is not being driven around networks, that the focus of this is very much on terms of customer experience. We are covering all aspects of IT. We are covering the integration back into the network and we see it as being all encompassing. The major take away I would like to see is that the simplification is key for IT and the decommissioning path that we have got and we are focussing on is probably the number one key item for us. Thank you.

GREG WINN: Thanks, John. You know, I cannot emphasise enough that this whole IT situation, if it wasn't not being politically correct, I would say it is the root of all evil in the telco industry. But we are going to be absolutely ruthless in our pursuit of decommissioning systems, and the first software developer code writer that even attempts to modify a piece of software will be doing something else for a living, hopefully working for one of our competitors and screwing up their IT platforms.

You know, these things have a life of their own. I have watched it happen for many years and they are hard to take out. The good news and what John didn't go through in detail is we know every single one of those systems. We know how much is working on it, how many lines of code we have. We have a clear path as to how we are going to take them out and I am going to measure people on how we decommission. How are you going to measure us on this? We will read out regularly; we are going to be transparent. There's commercial agreements we are not going to divulge. We are not going to give you all the details of the plans, but we will read out frequently and regularly as to our progress on this transformation. We have nothing to hide. This is exciting. I've got to tell you, if you are an engineer or an employee of Telstra, it's a very exciting time.

Job cuts are difficult, but I can tell you that most of the employees that I've talked to, they understand. When you work in a large cumbersome business and you see what is happening, intelligent people know what needs to be done and our employees know what needs to be done. I would tell you they are extremely excited. The men and women of Telstra are the finest and match up with anybody anywhere on the globe in this industry. They have not had the tools and they have not had the support to do what is necessary to do. Now, they have it.

Our board has approved it, we announced it, we are taking a beating over what we are doing. This will be a much stronger company going forward and we are going to be one heck of a competitor, and these people get the chance to do something that most people don't get to do in their lifetime, that is truly fundamentally change a business and have the impact on their country the way they will as they transform Telstra.

So, with that said, we are going to open it up for questions from our analysts and we will just direct them wherever. So just line up if you tell us who you are and what you are doing, I'll either answer questions or direct them out.

MIKE McDONALD: My question is about the - - -

GREG WINN: The mic isn't picking up his comments please.

MIKE McDONALD: (BBY). My question is about the transformation process as it affects customers. Yesterday, you talked about the migration for the closure of CDMA. It's not entirely clear to me to what extent a lot of the data products and the fixed network are also implicitly involving a migration or a close down, services like ISDN, Frame Relay, X25, the DDN family. As we heard, a lot of the products that are sold to customers today are sold on the - they are branded by the technology. So my question is, notwithstanding an IP core which largely exists today, to what extent are these edge technologies that are marketed specifically around legacy systems, to what extent are they going to disappear and what are the downstream implications for migration plans, customer disruption, the customer equipment that is located and purchased by the customer as well as the impacts on your own billing and IT systems?

GREG WINN: I'll take that one on. I can't answer all of your marketing questions but having been a former chief marketing officer I fully appreciate what you're implying. Number 1 is the edge devices that we are putting in and the company which - or the companies that we are dealing with that we have

not announced yet. In that space we will have the ability to continue to maintain our X.25, Frame Relay, ATM Technologies and migrated on to the IP core without impacting the customer in their environments. So that's part of the answer. So there will be time to migrate. 2 is that are marketing teams, and Dave Thodey spoke yesterday, they will be contacting all of our customers as we turn up these networks and giving them plenty of advance notice and hopefully this will be a great marketing opportunity - not hopefully, it will be - for Telstra to work with the customers and move them to next generation technology on a timeline and a migration path that works for them. It does not impact what we are doing to the network from our access all the way in.

We actually have looked at the technology to ensure that we can have an easy transition for our customers. That said, if you remember in yesterday's presentation and you looked at amount of growth in the IP platform and what is happening, particularly in the enterprise market space down through our medium sized businesses, the growth is exponential and our customers are planning and wanting to move to VIOP, wanting to move to higher speed data. We think it's going to be a relatively easy transition over the next several years as we build this out. Plenty of advance notice, account teams will be working with the customers and we will migrate them seamlessly. Next. Question.

RICHARD LONG: (Deutsche Bank) A question on the fibre to the node firstly. In relation to the fibre to the node network, you are looking to have ADSL2+ in the network going to two-thirds of homes in the relevant exchange areas. How long is it going to be before the decision is made or what sort of timeline can we expect before it's a decision to oh well, actually we should have put ADSL or VDSL rather in the network and go to 100 per cent of homes in the exchange areas. Is this network going to be depreciated over ten years or less, because what we have seen thus far is that the life cycle of these types of assets is exceedingly short; and the second question on the 3G network. In the regional areas, what were the economic issues that play that made you decide to go through 3G in the bush rather than put the existing CDMA network on the planned IP (indistinct) score?

GREG WINN: Okay. Let's see, first you're asking about - I don't have the answer off the top of my head on what the depreciation cycle is, but the infrastructure that we are putting in place with the fibre to the node architecture is we can upgrade the cards in those cabinets. In fact, in 1998 we were deploying VDSL and we were the first in the world to do that. I personally had it in my home and we were driving 22 meg over that. Last - we called it the last mile or last one and a half kilometres here, delivering 160 digital video channels so it's more of a software and a card plug upgrade. It's not anything to do with our fibre or our infrastructure. So the network that we are putting in place is upgradable. If those speeds become desirable or necessary and if there's a commercial reason to do so, we will be able to do so and it's an easy

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forklift if you will and it's also very containable in terms of how you roll it out based on the market demand and what you want to do in that space.

So it's a clear strategy. It also goes beyond the fibre to the node. It gets to your backbone and how you are carrying all of this on the core and the speeds. We are putting in the infrastructure to carry the higher speeds as we go. I'm sorry, on the 3G piece of it - - -

RICHARD LONG: The economics of just migrating the existing CDMA network. It's got EVDO, it's pretty fast on to the IPM core rather than going and doing the forklift upgrade to - - -

GREG WINN: Actually, I think technically 3G is W - wideband CDMA underlying architecture but I showed some economics yesterday and those were actual numbers. The CAPEX costs per subscriber in CDMA is a little over four times the costs of the CAPEX, cost per subscriber in the GSM world and then on the minutes of use, so how much additional capital we are having to spend to maintain this network is three times what we spend on GSM. So the economics are very, very compelling, number 1. Number 2 when you look at it over the five year timeframe, the actual - without getting into specific costs, but the incremental costs we are basically redirecting our CAPEX spend and taking our OPEX cost down dramatically in terms of how we operate the networks.

The economics work very, very well. The HSDPA has when we turned this network up, we have more speed than EVDO has today. We have very carefully thought out this whole issue about the data migration when you get into the issues and our Ericsson, Hakan will probably speak to you afterwards, answer some questions about the spectral efficiency of what we are doing and what the long-term costs of ownership are. So I think you will get some good answers there. Thank you.

SACHIN GUPTA: (Morgan Stanley) Just a general question. How realistic are these timelines given your plans? They sound more extensive and aggressive to what BT and KPN has announced. I mean, what gives you the confidence that you will achieve this transformation in the next three to five years? And a question for Jim, just with the fibre to the node, you said it's two third fibre one third DSLAM. What is the rationale for that and what sort of speeds would you be looking to offer on copper over the next two to three years?

GREG WINN: I can answer parts of your question. Let's start with the transformation piece versus BT. What why do we have the confidence we can do it? Number 1, we have the commitment of our strategic partners. When we went through the evaluation of the people that we were looking at doing this with, one of the key items for me just wasn't the price if you will. It was the speed, it was who were they going to put on the team. We wanted what we call

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the A team. We wanted world class people that had experience doing these kinds of roll outs and we wanted to make sure that the companies in this case, your question is around Alcatel, they have committed global resources all the way through their chairman. Serge has basically said to Sol and myself and Hilary and Mike Quigley have confirmed it, any resource we need anywhere on the planet, Telstra will have to get this done.

They have a lot of employees in the region and they are going to help us build this so we are very confident. In fact, I would say as strange as it may seem, they are aggressive timelines. They are very, very doable and there's incentives for our strategic partners and for the people leading internally to get it done even faster. I personally believe we are capable of getting it done faster. So that's the transformation piece.

Also, in comparison I would tell you with BT, they have a whole lot of other issues to do in how they are going to roll out their - I'm sure you've been to London and all that. It's a lot different environment than you have here so some of the cost structures are going to be different and the stuff they have to do to get it done. Now, the other part of your question was the distance issue, one third, two-thirds. Well, the one third is that given the density in these five cities, the one third is within the 1.5 kilometres already, so we don't have to put the node out. The DSLAM can reside in the exchange building if you will.

It reaches all of those customers that are within 1.5 already. The 20,000 nodes that we are going to deploy are for those customers that are beyond the 1.5 footprint where we have to push the fibre out, drop the DSLAM and then do the same kind of ranging. And what was your last part I'm sorry?

SACHIN GUPTA: What sort of speeds would you be looking at on offer on copper? Any changes to that?

GREG WINN: It is copper from the DSLAM to the home unless we do a fibre to the premise build and we are offering a minimum of 12 megabits. The structure is capable of delivering much higher speeds than that. But that's what we are going out with.

JUSTIN CAMERON: (Credit Suisse First Boston) I don't know if this is actually a question for Mike but I'm just trying to get an understanding of how the 3G network will work obviously in regional areas particularly surrounding handset issues. I suppose what I'm trying to understand at the moment is you are talking about running on an 850 megahertz spectrum and obviously you've got the agreement with Hutch which is running over I think 2.1 at the moment. Is there a dual mode handset out there at the moment that will provide that service or what is the dynamics behind that to play? GREG WINN: I think Mike, he directed the question to you. Go ahead.

MIKE WRIGHT: Initially we will do an overlay of 850 and the 2.1 will continue to operate and multi-mode handsets and multi-frequency devices are coming next year. We don't actually need in the metropolitan areas at day one the 2.1, but it will actually form a complimentary network where the handsets will hand between the two frequency layers and we will use the 2.1 for capacity relief as well as our current ongoing 3G network sale.

JUSTIN CAMERON: Just in relation to the handsets, is there anywhere else in the world that's using the 850 spectrum for 3G and I suppose the reason why I highlight that is if Telstra is the only company globally rolling out on 850, then there's going to be scale issues in relation to pricing handsets and all that. What's the feedback on that I suppose?

MIKE WRIGHT: There's a substantial commitment by Singular in the US who are very substantial operator with over 50 million customers to roll out 850, and there's an excess of ten other operators in the world on the verge of looking at 850 3GSM as well, so there's quite a substantial number of operators looking to roll into that frequency van and as a consequence we will see the availability of handsets. Indeed, the underlying chips today are being built with all the frequency bands in them.

GREG WINN: I want to emphasise, Singular is the largest carrier in the US and one of the world's largest and they are already committed. It's not they're going to commit. They have committed and the manufacturers are already talking to us about handset capability. By the time we get this up, that will be a nonissue.

PATRICK RUSSEL: (Merrill Lynch) First of all, thank you very much for today, very insightful and also thank you for yesterday. Just a couple of things. One in terms of removing the pair gains, just trying to get a view as to how that's going to impact competing providers that take up unconditional local loops, whether it will have an impact on their business plan; and secondly, in relation to the new GSM network on the 850, I just want to be clear, is that different to the 900 spectrum you are currently using in the capital cities? You know, the 900, 1800, 2.1, and also just trying to get some confidence about the ability to fill all the gaps. I mean, there is a very large acreage which is covered by CDMA. You are looking to extend that by GGSM. I'm just wondering how you are going to manage the rest in terms of extending GSM into that footprint. How many more base stations will you need to build to populate that area and what kind of assurances can you get from your equipment supplier about offering an equivalent service because I certainly feel that Barnaby Joyce won't be too happy if people in the rural area are losing their CDMA coverage and they are not obviously being compensated with an equivalent service. I know it's

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paramount for you guys but I know from a political point of view it could be a bit of a problem.

GREG WINN: I'll start with your first question on the impact on competitors taking out the pair gain. As network operators, these people up here are agnostic to the retail wholesale issue. The network has - a pair of wires doesn't know whether it's a retail customer or a wholesale customer and it's first come first serve, equal terms and equal conditions. We are adamant about that. Actually the competitors benefit from this because pair gain is a blocker for us. Therefore it is a blocker for them. And as we take the pair gain systems out, that enables broader coverage, more homes that are available to serve and whoever from a marketing standpoint I guess gets to those customers first and wins the hearts and minds of those customers will be the carrier running over that loop.

So it is a good deal for the competitors that we are doing this. They get the advantage once again to ride on our coat tails because I would also like to reemphasis they can build any infrastructure want to any time they choose to do so and if you - I think you are from Merrill, Patrick, you can look at the financials of Singtel and they have the resources to build where they choose to, when they choose to do so.

Okay on the wireless side, on the coverage, I'm going to leave the spectrum issue to Mike. But we were very clear yesterday and our partners with Ericsson, we have the same or better coverage as CDMA. Our CDMA customers are going to have a better product. They are going to have better roaming capability internationally. They are going to have a clear migration path to the future in terms of Super 3 and 4 and they are going to be move all over Australia and have a seamless service experience and we have equal or better coverage. It's not an issue. It's a non-issue. Ericsson is as committed as we are on that and when we need to build additional towers, we will do so but that is more around existing gaps that we have today in either the GSM or the CDMA coverage that's provided today and we would have had them in our plans eventually anyway. Now, on the spectrum issues, Mike, will you take that.

MIKE WRIGHT: On the spectrum issue, we use 900 and 1800 megahertz for our GSM technology and we also have access to the 850 band where we run CDMA. 3G 850 will plug into that same spectrum band into spare spectrum in that area.

PATRICK RUSSEL: It is a different band to the 900?

MIKE WRIGHT: Yes, it is.

PATRICK RUSSEL: All right, thank you.

TIM SMEARLY: (CitiGroup) Good morning. I just wonder if you could explain to us, there's obviously some regulatory hurdles in relation to the fibre to the node roll out. Could you explain what the potential CAPEX savings are if you don't or aren't successful in terms of your regulatory requirements or concessions, and so that the CAPEX savings and what plan B is, is I guess my first question. The second question in terms of the new Telstra approach of keeping it simple, can you just explain to us in terms of the 3G network sharing in metro areas, obviously running on 2.1 with a network sharing partner, if the further roll out is going to be out on 850, does that mean in terms of network sharing with Hutch has effectively come to an end so they are stuck with the network that you have currently spent or built on 2.1?

GREG WINN: Let's see here. I'll start on the regulatory issue in that there is going to - I think you were informed - I think Stanhope made a comment yesterday that there will be a regulatory session. I believe it's going to be some time early next week, so we will hold that in abeyance and you will have the opportunity to ask all the regulatory questions you choose to do so at that regulatory breakout session. That will attended by all our regulatory people including Kate McKenzie. As I said at the start, I do have something to do in that space. This is a technical conference on the engineering side and engineers, they are great people. They are fun, they don't have to live with regulators and they don't have to live with the politicians. They just go out and do their job every day and serve customers, so that's the fun part of their business.

Plan B, I think plan B was pretty clear. If the regulator chooses to try to reallocate our investors' capital, then we won't do it, plain and simple. It's no go on that piece of the network. I don't know how to be any more clear than that. What was the last part of your question? I think it was on wireless piece?

TIM SMEALLIE: Hutch, just in terms of Hutch, but just going back to that first issue, doesn't that mean that sort of 50 per cent of what we have talked about today, if it doesn't happen, there is effectively no plan B and you stick with the network as it is and all these new IT agreements and network supply agreements become irrelevant?

GREG WINN: No, I would say there is a plan B. I say it very clearly. The plan B is we don't deploy this technology and there's 4 million households that are not going to have access to it, because you've already heard the competitors' plan. They are selectively choosing where they want to go. They are not saying they are going to ubiquitously deploy across these five cities so plan B is no, we won't. The other part of plan B is that, you know, we will be even more aggressive in the wireless space because that's not regulated to the extent, and as you've seen we are going to push our partners at Ericsson if we get into that

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space to have wireless solutions faster and pull up those time lines for Super 3 and 4 so that we get a return on invested capital.

The other part on the Hutch agreement, that's a commercial agreement. We are in good standing with Hutch on that partnership. That partnership remains in place. We have had discussions with Hutch which are commercial in nature. So I won't divulge them and we are doing just fine on the Hutch relationship. No impact.

TIM SMEALLIE: In terms of the build though, if their network is reliant on using 2.1 gig and all your future build is going to be based on 850, does that mean they are now, in terms of the network sharing agreement they decide to go down the 850 path, they're effectively stuck with the same network footprint as they have today and that will be the extent of the network sharing agreement?

GREG WINN: I can't tell you what Hutch's plans will be, that's up to Hutch what they decide to do with their footprint, what they do with spectrum and how they approach the marketplace. The agreement that Telstra has with Hutch is alive and well, will be honoured and is a commercial agreement. I can't be any more succinct or plain than that. There's no impact on it.

TIM SMEALLIE: Thanks.

TIM SMART: (Macquarie) I just wanted to follow up I guess without wanting to bog down too much in regulatory stuff, but in terms of the comment that if there is access required or you have to give up access to that fibre to the node network, then you wouldn't - you probably wouldn't build it. My questions is if you are going to roll out 20,000 nodes, is it even feasible, notwithstanding the regulator's decision on access to that network, is it feasible that competitors would actually be able to co-locate in those cabinets or nodes in any event? I mean is it feasible that some of these competitors, say Singtel can roll out DSLAMs for 20,000 nodes?

GREG WINN: Is it feasible? They have already announced that they are rolling out fibre and nodes I think in their announcement or equipping X amount of exchanges. They have the same capability that we do. They can buy the equipment on the market from the suppliers, hopefully not the same way that we can, you know, but they do have scale in other parts of the world and they have the opportunity to do that. There is nothing that prevents them from deploying a DSLAM. They have already publicly announced and are deploying DSLAMs in the exchanges. To the earlier question, one third of our customer base will be served by exchange based DSLAMs. It's just up to them as to whether they want to go to the next layer, nothing stops the.

TIM SMART: That's my question. Two-thirds of what you put up there was to

say that two-thirds of the customers will be served by these remote nodes and street cabinets. I guess my question is, do you anticipate that if they wanted to and that's - they are only committed to go to a couple of hundred exchanges which have a lot of room in them, as far as I understand, these street cabinets where nodes are going to be sitting are going to be fairly small. My question is, is there sufficient space likely to be in those cabinets for them to co-locate?

GREG WINN: We are not building the network for Optus, Singtel or any other competitor. We are building the network for Telstra's use with Telstra's customers. Like I said again, maybe one of these things we need to do, if you haven't seen one of the cabinets one of our engineering people will arrange or maybe Alcatel can arrange and they are seated right in front of you there, for you to see what they look like. You know, you can generally put one of them on the back end of what we call a pick-up truck, I'm not sure what they are called here, and you can drop it on a sidewalk or a small patch of ground and hook it up and have added from a marketing standpoint. It's not a difficult task. What makes this difficult is the scale of it, how much we are going to do and how fast we are going to do it. But anybody is capable of deploying DSLAMs. There's nothing that prevents them. Next question.

RICHARD EARY: (ABN) Just a couple of questions, just to follow on from Tim is that you've talked a lot about sort of collapsing networks. Can you give us a feel for as a result of going through the process in terms of physical asset sales that may come up, would the regulatory environment preclude you from actually closing down local exchanges as a result of things like legacy issues or operator of last resort, and just if you can just talk about that to see whether we can get a feel whether there is an impact there from ash itself is the term, is it material, is it immaterial, and how quickly that may arise.

The second question was that you talked a lot today in terms of obviously service capabilities from the new networks. I think there was a point made that 55 per cent from the home network is outsourced in terms of obviously getting everything together from a home networking point of view. I mean, if that's the case, how much additional costs to serve need to be employed by Telstra to make sure that they actually capture those revenue opportunities, and is that something that you can give us a tangible number on because I notice that from offshore a lot of the carriers will say that actually a lot of the costs savings they are extracting from the network will be actually put back in to driving revenue opportunities from things like securing home networking agreements by outsourcing. I'm just trying to get a feel for in terms of what costs may come back in to obviously drive those revenues.

GREG WINN: Okay. On the first part regarding decommissioning of the parts of the PSTN, whether it's a next class 5 exchange switch etc. We are going to have like-for-like services and I think Jamie was pretty clear on that that we are just going to run it over a lower cost infrastructure so there shouldn't be any regulatory issue whatsoever because we are providing like services to what we provide today as far as from an end user viewpoint. If they choose to maintain the same types of services they have with Telstra, or if it's resold through one of the wholesale agreements, it will be the same type of service, we are just going to run it on a lower cost infrastructure. So, there shouldn't be any regulatory issues in that space.

Regarding the home networking devices, that is still work that's underway. We are building all of the core network infrastructure that will enable what you saw. The development of individual applications and services, it's my expectation that you will see that development come from partners, vendors, suppliers and entrepreneurs who, at the edge on these feature servers in a next generation network will be highly incented to develop new products and services because they will have an opportunity to participate either through royalty fees or some sort of revenue sharing agreement in the success of their products and services. So the innovation will come faster to the market.

If you are referring to the gateway device, that is not in the economics that we presented to you because we really view that the cost of the gateways will come down on like Moore's law. They are coming down pretty fast. If you just watch what has happened over the last few years, when you bought your first routers or your first modems and what they cost to what they are today, the home gateway devices will do the same because all the margins and the profit is going to be in the capabilities of the services themselves that we have out there. We look at it in terms of the actual devices themselves. We are not going to equip every home, there will be a take-up rates. It will probably follow somewhat the mobile model that you buy a handset and choose a carrier, that kind of situation even though we are in trial and working with two or three different partners on diversions of the home gateway. I'll leave it at that.

RICHARD EARY: Just to follow up on that is that you talked about partnerships in terms of home gateway. Does that preclude you from actually maybe doing small bolt-on acquisitions to try and obviously try and cement yourself within that space to obviously capture the margin rather than to outsource as you have done with the likes within the sort of like enterprise markets?

GREG WINN: Well, we will always look at any opportunity that comes along if it makes sense for our share owners, but in general I'm not particularly interested in doing that because at the end of the day, this is going to be a game about scale globally. And it's going to be about the application, services, the integration that we provide our customers, that will create this stickiness. The devices themselves will change and there's going to be different people that are capable of doing that. I try to avoid and I would probably be one of the voices that would say no at the senior table to any kind of an acquisition that got into any kind of manufacturing space. You know, we are a service provider, an applications provider, and we are going to drive - and there's world class people out there that are capable. I mean, look at Cisco, Alcatel and the others. When they want to make an acquisition they have the pockets to do so and Telstra doesn't need to get out there and start banging heads with them trying to do that.

I think that's it from a question standpoint for the analysts and, Andrew, do you want to (inaudible).

DAN WARNE: (APC Magazine) You've mad it very clear that the network has been built for Telstra's customers, for Telstra's use, and that your investment is for that purpose but the copper network was built before all this new investment. If a competitor like Optus does choose to put nodes out and locates them near your cabinets, what will be the situation be with access to copper lines into customers' homes?

GREG WINN: If Optus chooses to put their cabinets out there, they will have access to that copper loop. That's pretty clear from a regulatory standpoint, we understand that. They will always have access to the last 1.54 copper kilometres or last mile in the US. That's clear, that's the regulatory bottleneck. They have access to it and it's no big deal for them to cross connect from the node into that local distribution copper network. So we are not - I'm going to be real clear, we are not doing anything that will deny any competitor access to that last portion of the copper.

JENNIFER HEWITT: (Financial Review) Given the many benefits you have talked about of upgrading the whole network, the threat to not do some of that and the fibre to the node investment, if the regulatory framework isn't right, isn't it a case of cutting off your nose to spite your face and that will actually have a big impact on Telstra's future going forward?

GREG WINN: Well, that's an interesting viewpoint. But the fact of the matter is if it was your capital, so, Jennifer, if we were to open your purse and say, "You are going to make the investment", you would expect to get a return on your investment given the alternatives that you have. We are not going to put something out there that the regulator is going to force us to sell at less than cost and in fact our shareholders. We have a fiduciary responsibility to our shareholders, to all of them to do what is in the best interests of this business and throwing money away is not in the best interests of any share owner, to do that. So it's not cutting off our nose as you put it, it's making prudent financial decisions in the best interests of Telstra's share owners.

I also said earlier to one of the analysts' questions was that, you know, we do

have other plans. If it becomes necessary, we would push on our wireless partners to move faster towards Super 3 and 4 to have wireless alternatives where our invested capital, shareholders' capital gets a reasonable return in the marketplace. But, no, we are not going to be forced, nor will we willingly spend shareowner money where we shouldn't. Next question.

MIKE JONES: (The Financial Review). Two years ago Telstra's then says CIO at the time detailed a transformation project that would talk about reducing the number of vendors and suppliers internal, in Telstra's internal IT systems. It seems that, you know, now we are hearing the same sort of bold new transformation project, and isn't this simply a case of the same initiative but being two years later than expected?

GREG WINN: I can't speak to what happened two years ago, I hope you can appreciate that, I wasn't here. I really wasn't interested in it. But I can tell you what is different is that we have taken our board every step of the way since we arrived here in July and I actually started in this job I think it was 11 August, on a very detailed journey as to what needs to be done. Yes, there had been work done in the past that had looked at doing things like this. The difference is in my estimation, so I can't put it in a historical context for you, is that our board clearly understands what these initiatives are about. There has been full transparency. There has been full-buy in. They have had the opportunity to question multiple times particularly over the last week or so as we started to narrow in on are we going to do this or not and what the cost of it would be and what the financial implications would be, and the board has fully funded and fully authorised the spend to do this. So we have launched. We signed the MOUs which will lead to the ultimate contracts. Yesterday morning I want to say in the 7 to 7.30 timeframe we had a board call yesterday morning. The board voted on the resolutions including this transformation and IT space.

So it's fully vetted; it's fully funded. We have selected who we are going to do it with. In this case the piece you are talking about that has been awarded and there's other pieces yet to be awarded, I want to be clear on that, is the Sebel/Keenan/Accenture team and they are already underway. Throughout the night last night, we worked on making sure they had access to the information and we pulled the trigger yesterday as soon as things were official and the work is underway and they have been working all afternoon through the night and today as well and we are launched. It's happening.

MIKE JONES: Two more questions, one, will Telstra be outsourcing any more of its key internal IT systems, and then secondly, on the 3G system, 3G is limited by its ability to send data upstream as well as downstream in a synchronous mode which is important for many future applications that are coming out. How will you address that going forward, and secondly what will you do to address the fact that Telstra doesn't have access to the spectrum for Wi-Max

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which is considered to be a successor to 3G?

GREG WINN: Okay. I was listening carefully to your 3G, what was your first question? Then I'll let the - - -

MIKE JONES: Does Telstra plan to outsource any more of its key internal systems?

GREG WINN: You know, we will make the appropriate decisions as we come to that, but in general, we are not - when you say outsource, we have a substantial portion of IT that has been outsourced over the years. I happen to think that there will be portions that remain outsourced but we will have more of an inclination where we need to have intellectual property that's key to running the business, to have it closer to the business or inside the business versus outside. So you will see that kind of movement. All the issues about up-speed, uplink, downlink and all that, I think what we will do on that one, rather than answer it right now is Hakan is sitting in the front row right here and he's the world's expert and we'll let him answer it even though our guys could, so we'll try to get to some other questions, so just grab him and he will be happy to answer your question. Next question.

HOWARD DART: (Computer World) Just two questions to you, John, this is about the systems. Does open source software have a major play in this new architecture of yours? For example, a pros gross database, why and why not? And secondly, what makes off the shelf applications so good? Just yesterday I was hearing some IT director's horror story about a Sebel CRM implementation. So can you just elaborate on why that's going to make it a lot better for you.

JOHN McINERNEY: Open source. I mean if you go into the architectural design of what we are looking at from an IT perspective, opus or architecture, object orientated, service oriented, Parle, J2EE, there's lots of different aspects of the architecture that we are currently looking at. We look at even our involvement currently with TMF, our next trend in OSS strategies that we are working on as well. There's lots of various components of our architecture that will be continuously revisited and revised as this program rolls out, and there's no simple answer ever to an IT perspective in terms of the overall architecture plot from the standards perspective.

However, you will notice, and as an example, a head of architecture was presenting to team this week in terms of our plot from that perspective. So I believe we have got a very strong approach to how we are going to handle it and we are making that approach fairly public as we go forward as well. Second question, you will just have to remind me.

HOWARD DART: You were praising the virtues of off the shelf systems but not

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all of them are great and ...

JOHN McINERNEY: The approach we are taking around commercial off the shelf products is one primarily around simplification. That is in the past, we have customised a lot of these products as they have come in the door. We have also built a lot from legacy up. Our view in terms of the commercial off the shelf products, especially those that are best in league around the world is that when we talk about CRM, we talk about billing - these are tried and tested systems. We are not going in there for the first time. We intend to adapt our process to meet those systems rather than the other way around. The recent roll outs of those commercial off the shelf products within Telstra have been very successful.

GREG WINN: I would add to that that when you look at the history of this industry and you are in a unique position to do that research, where you get in trouble on systems is when you modify them. Because you are always moving to the next software release, the next upgrade and when you've customised the software, you have just added tonnes of cost in and Telstra has done that to themselves in spades across the entire infrastructure. That's why we have got the problem we do from a cost standpoint. We can't upgrade. That's why you have the problems, and as far as the Sebel implementation or somebody may have been lamenting one of them, we have done many Sebel implementations in the past as well as Amdox and others, and any implementation can have its problems; it's what the outcome is when you get there and we are going to deal with best in breed world class suppliers and we are going to stick to our knitting and let them stick to theirs.

MICHAEL SAINSBURY: (The Australian). I may have missed something yesterday but the 11 billion or so you are going to spend on this, can you give us a rough breakdown? I think Alcatel said they are a 3.5 of it, you talked about a billion or so on IT, what bits of - how big are the other contracts you have given out, particularly the mobile and the core and how much is left to give out? And the other question is just outside those 4 million homes that you are putting fibre to the node and sort of super DSLAMs to, what happens to the rest - what happens to the rest of Australia and why have you left them out?

GREG WINN: Okay, you want to know. Michael should I pound my fist first?

MICHAEL SAINSBURY: I don't know; it depends if you like the question or not.

GREG WINN: So, first question on the breakout, we are not going to give you the exact numbers but I will give you kind of a hierarchical break out and these numbers can move a couple of hundred million dollars either way, but in general, the Alcatel contract is in excess of \$3.5 billion, I think that's fair to say. The Ericsson contract is well north of \$1 billion plus. The Cisco contract is well

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north of \$1 billion, the Accenture/Sebel/Keenan one is much less than that but it's one third of the overall structure. We are going to spend in excess of \$1.5 billion on the IT transformation, and then I'm not going to reveal the other parts of the network because we are in commercial negotiation and I don't want to lose any leverage, and obviously we have a lot of suppliers that are fighting for the right to be one of Telstra's preferred suppliers. So I think that's the best I can do on the first part of your question.

The second part about outside of the five metropolitan areas that we have targeted, I think your question was what happens to the rest of Australia. We will continue to serve them to the best of our ability and our commercial outcomes would dictate that we do further deployment. We will consider that at the time, but for the time being, it is what we announced yesterday. Last question.

STUART KENNEDY: (The Australian), Just one quick question Greg. You indicated this morning that you actually moved faster on this transformation process than has been said before. I was wondering if you could really put the pedal to the metal, how quickly could you get the IT transformation done and how quickly could you get the 3G wireless done?

GREG WINN: Well, you know, it's a series of trade-offs. It's actually a great question. It's one that I have struggled with is how hard should we push this. I would say internally there has been a lot of debate. There are people even sitting up on the stage that feel that we are pressing them pretty hard. I think there is room as you called it, put the pedal to the metal to do it even faster. Our suppliers, strategic partners are pretty well stretched on it. They have committed to what we have shared with you. We will deliver on what we shared but I'm also incenting everybody to build it faster.

The trade off is with speed, and when you think of the spaghetti bowl as it has been referred to, and you saw the complexity of this network and the complexity of the IT, is that when you start to unwind it or untie the gaudion knot or however you want to refer to it, there are going to be things that go don't go well. I'm become perfectly blunt. It's going to be about how fast can we recover, how can we minimise impact to customers and that's where why I keep talking about speed. I want to get to the other side of this mess as fast as possible. But there is reasonable and prudent speed and I would tell you we are in a relatively comfortable zone on being reasonable and prudent. On the 3G, how fast can we do it? We can do it faster than what we are talking about. It's not an issue about how fast do we get it built.

It's an issue of from my perspective how are we going the migration of our CDMA customers? You know, and do it in such a fashion that they always have better capability than they have today and we move them at a reasonable pace

and then decommission the network. So the speed aspect on the wireless side is more of a function of transitioning customers and giving plenty of adequate notice, working obviously with the government on what the licence conditions and the various issues that we have there that we will work through with them, but we are comfortable that they will be very comfortable with where we are headed because the customers, our customers, the rural citizens will have better services than they have today and a clear road map of the future - to the future so that they are not left behind as in other types of deployments.

So that's basically where we are at. One other aspect of the wireless is we are putting it on IP core. You know, so the back haul of all the wireless will take a while to get built, more so than the wireless infrastructure itself.

STUART KENNEDY: Just the case with the IT transformation, what is the earliest you could get that done?

GREG WINN: The IT transformation?

STUART KENNEDY: Yes?

GREG WINN: We have got it on a three to five year timeline. I guess best case, best effort, no headaches, and we will have headaches, you could probably do it at the closer end of that range.

STUART KENNEDY: Three years?

GREG WINN: Yes, that would be absolute best. I think we will probably be in the four year range, particularly three years I think you saw yesterday we have decommissioned a substantial portion of our systems, so I look at the transformation two ways. What is the junk we are getting out or the clutter we are getting out and that we are going to move very fast on because that will take our existing unit costs down rapidly, and the second part of it is the enablement of the next generation services and architectures.

That concludes the questions. Our guests and our strategic partners are available from both Alcatel and Ericsson. The guys will hang out for a little bit but not long, so you better grab them. I've got a plane to catch so I'm going to leave. Thank you for yesterday and thank you for today and thank you for your questions.

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ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-4" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-4

Telstra launches NEXT G mobile network

October 6, 2006 - 9:04AM

Telstra has launched a \$1 billion NEXT G mobile broadband network,

offering high-speed wireless mobile and internet access to 98 per cent of Australians.

NEXT G, which boasts 12 channels of Foxtel television, sport and movie downloads, is more than 100 times bigger

geographically and up to five times faster than any other 3GSM network in Australia.

Telstra says the launch will help it claim leadership in the third generation, or 3G market, by May next year.

"From today, almost every Australian is going to have access to nationwide, very high speed mobiles and internet," Telstra group managing director consumer and small business David Moffatt said.

Telstra says it expects that 25 per cent of its total subscribers will be on its third generation (3G) network by June 2008.

Telstra chief executive Sol Trujillo said the world's geographically largest national 3GSM network delivers unequalled customer reach and speed across the country and is globally acknowledged as a superior spectrum for breadth and depth of coverage. "This is an exciting day for all Australians, no matter where they live and work," Mr Trujillo said.

"No one else, here or abroad, has built and launched such a far-reaching, high speed, wireless broadband network in less than a year," he said.

"It is a versatile, high capacity network with head room for higher speeds in the months and years ahead."

Turbo-charged with high speed downlink packet access (HSDPA), NEXT G is up to 50 times faster than dial-up and up to five times faster than other 3GSM networks, Telstra said.

Telstra customers will experience network download speeds averaging 550 kilobytes per second to 1.5 megabytes per second (Mbps), and peak network speeds of up to 3.6Mbps, increasing up to 14.4Mbps early next year.

Mr Trujillo said NEXT G was an integral part of Telstra's plan to transform the telco into a media communications powerhouse. "Customers can access Foxtel, Sensis search, BigPond content, music, email, photos, downloads, maps and My Account information," he said.

Telstra will now move to migrate its 1.7 million CDMA mobile customers to the NEXT G network by January 2008.

NEXT G will, however, require customers to purchase a new handset.

"For Telstra, 3G is the most significant target in the highest growth sector of the industry, so from our point of view, we aim for market leadership in that area by May of next year," Mr Moffatt said.

Rival Hutchison currently boasts around one million 3G customers.

Telstra said it had less than half that with 420,000 3G customers as at August this year.

"We've seen a dramatic growth in 3G customers," Mr Moffatt said.

Telstra says the new service will increase mobile revenue, but would not specify to what extent.

Other rival Optus has repeatedly declined to disclose the number of 3G mobile subscribers it has on its books.

And Vodafone, which boasts more than 200,000 3G customers, has said it will switch on its HSDPA 3G mobile service in Sydney and Melbourne metropolitan areas from October 20.

Telstra said at its annual results presentation in August that mobile revenue was \$4.972 billion in 2005/06, up \$284 million or 6.1 per cent on the previous year.

Third generation subscribers had grown nearly six fold in the second half of the financial year, Telstra said at the time.

Revenue from the company's retail broadband arm grew 58 per cent to \$730 million in 2005/06.

NEXT G customers will also be able to install a NEXT G turbo card into their computer, providing high-speed access to the Internet for business, entertainment, or personal applications, such as browsing the web or email.

On Monday, the government will launch the T3 prospectus, the document for the sale of the government's \$8 billion stake, but Mr Trujillo denies the sale has been timed to coincide with the NEXT G launch.

"We designed this date (for the strategy briefing) over a year ago," Mr Trujillo said, after suggestions it was squeezed ahead of Monday's prospectus launch.

"It has nothing to do with T3, it has everything to do with serving our customers and being better than those that we compete with," he said.

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This is the annexure marked "MJW-5" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-5

Telstra Mobile Network Coverage




Public Version - Redacted For Confidentiality - Whole Document

ANNEXURE CERTIFICATE

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Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-6" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-6

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-7" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

Annexure MJW-7

SOLUTIONS	> TECHN	IOLOGY	➢ ERICSSON	ERICSSON GLOBAL
	»	PRESS	SRELEASE	
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↓ Press releases		ERICSS NATIO	SON AND TELSTRA ACHIEVE WORLD FIRST 200 KM CELL RANGE IN NWIDE NETWORK WITH UP TO 14.4 MBPS	
		February	/ 12, 2007, 17:25 (CET)	
∻ 2007 ··› February		Ericsson signific cell ran downlin and CE These services	n (NASDAQ:ERIC) and Australian operator Telstra will achieve two cant milestones when later this week they launch the world's first 200km inge in a commercial mobile broadband network and maximum network ink speeds of 14.4Mbps. This was announced today by Ericsson President CO Carl-Henric Svanberg and Telstra Chief Executive Officer, Sol Trujillo. initiatives will further boost network capacity and ensure consistent s as Telstra's customer numbers grow.	
		Just four Range supporti	r months after the launch of Telstra's Next G (TM) network, Ericsson's Extended software has been installed in selected mountaintop sites across Australia, ing all 3G services over extensive geographical areas.	
		Sol Trujil Next G (llo said Telstra had displayed global leadership when it built the "turbocharged" (TM) network in just 10 months.	
		"We are services	e already seeing our customers use these world leading mobile broadband s in ways they have never done before," Trujillo said.	
		"Since la traffic c some c benefits	aunching Next G (TM) with HSDPA, Telstra has doubled the volume of total data carried on all of its wireless networks. With the new distance upgrades, even of the most remote customers in outback Australia will be able to see the"	
		The Eric from the who wa off-shore	e sson solution enables coverage up to 200km from a base station, a major leap e 50km range typically supported today. This is particularly important for users and to take advantage of the high-speed network from remote locations on and e (including ships and oil-rigs).	
		"Extende capabili services	ed Range gives Telstra a unique opportunity to offer ever-improving service ities to customers via their mobile devices, data cards, or home-networking s," added Svanberg.	
		The soft tripled. T to achie downlin during t (TM) cu	ware upgrade means the Next G (TM) network data capacity has now been The advanced software employs High-Speed Packet Access (HSPA) technology eve peak network speeds of up to 1.9Mbps in the uplink and 14.4Mbps in the k. Downlink speeds of 2.3Mbps at a 200km range have also been achieved testing. This also provides an increase in overall capacity for existing Next G stomers, even in the network's busiest periods.	
		"These a said.	are both world-first achievements on any nationwide wireless network," Trujillo	
		Telstra's percent	Next G (TM) network coverage provides mobile broadband access to 98.8 of Australians, covering 1.9 million square kilometres.	

Ericsson and Telstra achieve world first 200 km cell range in nationwide network with up to 14.4 Mbps - Press Release

Carl-Henric Svanberg said he was pleased to be a founding partner of Telstra's Next G (TM) test bed.

"Ericsson is fully committed to the continued evolution of mobile networks and looks forward to stretching the boundaries of technology," he said.

Already, the Next G (TM) test bed is testing 7.2Mbps data cards for launch in mid-2007 on Telstra's 14.4Mbps capable Next G (TM) network.

"The benefits of 3GSM technology and HSPA could not have been economically taken so extensively to regional and remote Australia without the use of 850 MHz spectrum and the Ericsson software enhancements to extend the range and capacity of the network," Trujillo concluded.

Notes to editors:

Latest press releases on Ericsson and Telstra www.ericsson.com/ericsson/press/releases/20061006-1079707.shtml www.ericsson.com/ericsson/press/releases/20061019-1082062.shtml

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Telstra to boost Next G speeds to 21Mbps this year - Telco/ISP - iTnews



Telstra to boost Next G speeds to 21Mbps this year



NBN Co to start fibreto-the-basement field trials

Telstra CISO Mike Burgess quits Telstra CEO, Sol Trujillo, has announced that the telco's Next G network speeds will be super-charged to 21 Mbps in 2008, with further plans to double the figure to



Telstra execs lose bonuses over network outages

Aussie telcos stop replacing Galaxy Note 7 over fire risk

42Mpbs sometime in 2009.

Speaking at the GSMA Mobile World Congress in Barcelona, Trujillo highlighted Next G's growth over the past year before spilling the beans on plans to increase the network's speed. Currently, next G customers are able to achieve speeds of up to 14.4 Mbps.

"We have an evolution roadmap with Ericsson which will deliver customers speeds of 21 Mbps in 2008 across our national Next G network - a world first - and 42 Mbps in 2009 using HSPA+ technology. Our partnership with Ericsson continues to break the speed barrier," Trujillo said.

Trujillo also took the opportunity to announce growth figures for Telstra's Next G network. He said the percentage of Telstra's mobile subscribers on 3G was 38 percent at the end of January 2008, marking a growth of 11 percent in the past four months. Telstra expects it to hit between 60 and 70 percent by 2010.

He also announced that during the December 2007 quarter, Telstra's 3G revenues exceeded 2G revenues for the first time.

"In making our Next G bet, we had to differentiate Telstra in a market that was competing on price with little innovation," Trujillo said. "Our strategy was to provide customers with high speed wireless broadband backed by 1-click, 1-touch, 1-command simplicity, on any screen, in real time. It was to integrate content seamlessly across different devices, for voice, data and video."

Next G is being positioned as the successor to Telstra's CDMA network which services rural customers. The CDMA network is due to be shut down in April this year.



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Funnily enough, eHSPA, HSPA+ and HSPA Evolution are all names for the same thing – the newest, fastest standard of "high speed packet access" technology.

The download speed is "up to" 21Mbps and the upload speeds will be "up to" 5.8Mbps, although

iTWire - World's first 21Mbps eHSPA/HSPA+ data 'ccall' made in Australia

these are "peak speeds" and as always, real world speeds will be slower, although presumably a lot faster than current 7.2Mbps download and 1.9Mbps upload "up to", "peak" speeds.

This announcement follows demonstrations of the 21Mbps HSPA Evoltion at Ericsson HQ and a demonstration at a Telstra investor day last month, at which Micosoft's CEO Steve Ballmer was a guest.

However today's announcement from Australia's dominant telco, Telstra, and global telecommunications behemoth Ericsson, marks an "industry first", which both companies say is "the successful activation of HSPA Evolution functionality capable of peak network speeds up to 21 Mbps into the Telstra Next G commercial network and the world's first data call on the newly-enabled network."

In addition, the announcement says that: "For the first time, a commercial network makes use of the enhanced, standardized improvements called HSPA Evolution."

Telstra promotes the otherwise obvious nature of a network speed and capacity increase, saying that: "this enhancement adds a new dimension to broadband experience with the capability for significantly faster internet browsing and file download, even faster than many fixed broadband connections. With HSPA Evolution, operators will increase the capacity in the networks and reduce the costs to deliver Mobile Broadband services."

Telstra and Ericsson speak on page 2, while LTE is also due - please read on!

Michael Rocca, the Group Managing Director of Telstra Networks & Services said, "HSPA Evolution is live and working for the first time anywhere in the world in a commercial network on the Telstra Next G network in Australia," Michael says. "Ericsson and Telstra are seeing great results ahead of upcoming trials and device deployment."

Mike Wright, the Executive Director of Telstra Wireless made the first data call on the Next G network in Brisbane, Queensland (Australia) at 16:00 AEST on 5 December 2008. Trials of the 21Mbps mobile broadband service on the Next G network will begin this month with a full commercial launch to follow early next year.

Ulf Ewaldsson, the Vice President and Head of Product Area Radio at Ericsson said: "Ericsson continues to bring the best possible Mobile Broadband experience to consumers all over the world.

"Ericsson has an impressive list of HSPA world-first records, including the first commercial HSPA network, first live with HSPA on the Uplink and also first with 5.8Mbps on the Uplink. With our achievement of 21Mbps in Telstra's network we continue Ericsson's technology leadership in the Mobile Broadband area. We thank Telstra for the close co-operation to reach this milestone."

The move to 21Mbps has arrived, as promised by Telstra, at the end of 2008, with 2009 clearly the year for Telstra to milk its competitive advantage for all it can against competitors Optus, Vodafone and Three Mobile who still live in a 7.2Mbps (or slower) world.

iTWire - World's first 21Mbps eHSPA/HSPA+ data 'œcall' made in Australia

The end of 2009 and into 2010 promises an upgrade to 42Mbps, followed by the advance to LTE (long term evolution) wireless broadband presumably in 2011, which promises to lower wireless latency to wired-equivalent speeds, and deliver the same kind of speeds at the edge of the network that you'll get at its centre.

Or at least, that's what the LTE camp is promising, which the carriers have demanded of the technology - we'll just have to wait and see if it happens. Until then, however, HSPA+ is the new standard, with Australia leading the world, and other countries sure to follow as the demand for wireless grows and grows.

Whichever way you look at it, wireless broadband is constant improving, and while it seems obvious that wired networks will always remain faster and offer greater capacity, wireless technologies are powering ahead in leaps and bounds, making it easy for anyone, today more than ever, to go completely wireless.

All we need now is true wireless power to charge our devices anywhere, and while the MIT has made moves to bring wireless power to life, it's still a some years away.

Wireless broadband, on the other hand, is so rapidly being taken for granted that mobile/wireless data is, essentially, finally as ubiquitous as mobile/wireless voice.

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One of Australia's best-known technology journalists and consumer tech experts, Alex has appeared in his capacity as technology expert on all of Australia's free-toair and pay TV networks on all the major news and current affairs programs, on

commercial and public radio, and technology, lifestyle and reality TV shows. Visit Alex at Twitter here.





Satellite Cell on Wheels or as we like to call it our 'SatCOW'



Expanding on our existing Next G[™] network technology Telstra has now developed a new prototype Next G[™] mobile base station that is highly portable and offers almost immediate mobile coverage in areas without any infrastructure.

A fitting complement to other innovative technology you may have already heard of such as the Mobile Exchange on Wheels (MEOW), which is a portable ADSL 2+ enabled exchange that can provide temporary landline and broadband services in areas impacted by a natural disaster, and the traditional CoW (Cell on Wheels) which provides mobile phone coverage.

Well, now we have developed the Satellite Cell on Wheels (SatCOW) which uses satellite transmission to connect to Telstra's terrestrial network and provide Next G[™] network coverage to the surrounding area for even quicker deployment in even the most remote areas.

The 'SatCOW' is our latest prototype and has been turning heads around the country for the past couple of months. Its role in facilitating the rapid provision or recovery of mobile network service has attracted the interest of government and emergency services organisations during exclusive demonstrations of the equipment.

The transportation of the SatCOW is a compact affair as can be seen in the accompanying slideshow designed for purpose, it is packed in cases and can be transported using a standard vehicle such as a four wheel drive. It is also suitable to send to a site via freight or light aircraft.

It takes under two hours for two field technicians on site to assemble and commission. This means rapid network recovery to ensure that we can meet the needs of our customers.

Satellite Cell on Wheels or as we like to call it our 'SatCOW' - Exchanges, MEOW, SatCOW

Like the MEOW, the SatCOW will be well suited to use in situations where natural disasters have occurred, or where existing towers have been damaged or even for permanent installation in remote areas especially where terrestrial based backhaul is not available.

The Author



Mike Wright Group Managing Director, Networks

Mike Wright is Group Managing Director of Networks in Telstra Operations. Mike currently leads the engineering and internal construction capabilities for all of Telstra's fixed, wireless and media networks. He has over 30 years experience in telecommunications commencing his career designing and building telecommunications networks including early work on digital switching, paging, optical fibre and transmission networks. Since then he has made significant contributions to the establishment and evolution of Telstra's mobile networks through Analogue, GSM, CDMA, WCDMA to the completion of Telstra's world class, nationwide LTE/HSPA enabled mobile network. Mike has been highly engaged in the wireless technology evolution including a series of world leading developments such as 200Km cell range, HSPA evolution, the world's largest HD Voice footprint and Australia's first Cat 4 and LTE-A capabilities. He has extensive international experience in developing wireless ecosystems including the establishment and promotion of user/focus groups to grow the 850 MHz HSPA and 1800 MHz LTE ecosystems. Mike's network team is also driving the evolution and development of wireline network capabilities including low cost ADSL expansion techniques, DOCSIS 3 upgrades, 1 Tbps Optical transport trials, world first Application Aware Networking capabilities and evolution to new ASP network architectures. Mike is regular presenter and influencer at international forums and has regularly presented and/or judged at Mobile World Congress, Broadband World Forum, 4G World, GSM Latin America and LTE Asia.

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Telstra and Nokia Siemens Networks LTE world-first trial achieves 100Mbps at 75km using 2.6GHz

18 June, 2010 Sydney, Australia – June 18, 2010

Telstra and Nokia Siemens Networks LTE world-first trial achieves 100Mbps at 75km using 2.6GHz

Telstra and Nokia Siemens Networks have conducted groundbreaking trials of next generation mobile technology in Australia, successfully achieving peak speeds of 100Mbps download and 31Mbps upload over a record-breaking distance of 75 kilometres in regional Victoria.

"The two companies are testing the application of LTE technology in regional areas through a combination of laboratory and long range field testing to determine the limitations that physical distance imposes on the LTE customer experience."

Michael Rocca, chief operations officer, said the range testing is of critical importance for the future of this technology in regional Australia and Telstra's learnings will be of great interest internationally.

"Australia has the sixth largest landmass with the ninth lowest population density in the world so any technology we introduce has to travel long distances, cover large areas and still perform to the levels Telstra customers have come to enjoy."

"Telstra's Next G[™] network does this extremely well today and we want to ensure that when we bring LTE technology to Australian consumers, our customer experience remains one of the best in the world," Mr Rocca said.

Nokia sites use cookies to improve and personalize your experience and to display advertisements. The sites may also include cookies from third parties. By using this site, you consent to the use of cookies. Learn more. Kalevi Kostiainen, head of Nokia Siemens Networks, Australia and New Zealand said, "The outstanding results of this trial were made possible through close collaboration between Telstra and Nokia Siemens Networks. The benefits of LTE in urban environments are currently being deployed globally, having already been extensively tested and the business benefits well understood. Through this unique joint trial we can now see how LTE can be extended to provide cost effective solutions for rural and remote environments."

"Nokia Siemens Networks is a leader in the development and deployment of LTE/SAE technology and this demonstration of capacity and capability with Telstra further reinforces our leadership position," Mr Kostiainen added.

About Nokia Siemens Networks

Nokia Siemens Networks is a leading global enabler of telecommunications services. With its focus on innovation and sustainability, the company provides a complete portfolio of mobile, fixed and converged network technology, as well as professional services including consultancy and systems integration, deployment, maintenance and managed services. It is one of the largest telecommunications hardware, software and professional services companies in the world. Operating in 150 countries, its headquarters are in Espoo, Finland. www.nokiasiemensnetworks.com

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Notes to Editors

Technical detail on regional Victoria trial Frequency band: 2.6GHz Cell Range: 75.4km Bandwidth: 20MHz Antenna: 2x2 Multiple Input Multiple Output (MIMO) Telstra and Nokia Siemens Networks LTE world-first trial achieves 100Mbps at 75km using 2.6GHz | Nokia

Modem: Class 3 Ue connected to 25dB high gain external antenna (capable of 100Mbps downlink and 50Mbps uplink throughput) Peak downlink throughput: 100Mbps (average 88.07Mbps) Peak uplink throughput: 30.99Mbps (average 29.6Mbps)

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Telstra and Huawei announce first Australian LTE trial in 1800MHz

Telstra and Huawei carry out Australia's first LTE demo at 1800MHzMelbourne, Australia, 2 July 2010: In an Australian first, Telstra and Huawei Technologies successfully demonstrated Long Term Evolution (LTE) technology operating on 1800MHz spectrum.

Globally, 1800MHz spectrum is used for 2G GSM services and is an integral part of the world standards for LTE technology. As operators move to deploy LTE networks, it is expected that this spectrum will complement 2600MHz spectrum and the 700MHz band anticipated to be made available through the digital dividend.

Michael Rocca, Telstra chief operations officer said that exploring LTE's performance across a variety of frequency bands is critical to creating deployment options that will bring the best outcomes for operators and customers. "Our trials with Huawei are giving us valuable insights into the potential of LTE technology at 1800MHz and helping Telstra understand how we can make best use of both existing and potential future spectrum assets to continue to deliver a world class mobile broadband service," Mr. Rocca said.

Peter Rossi, CTO of Huawei Technologies Australia said: "Working with Telstra is a great opportunity for Huawei to show the flexibility of its advanced technology solutions and industry-leading LTE feature set. We look forward to ongoing co-operation with Telstra in the years ahead."

Telstra and Huawei are trialling LTE technology in Victoria to understand the technology's characteristics and application in the evolution of the Next G[™] network. The 1800MHz evaluation will include tests of throughput using MIMO antenna configurations as well as several industry-leading advanced features including Inter Cell Interference Coordination to reduce radio network interference and improve throughput, and Self Organising Networks where LTE network technology automatically optimises its performance, reducing operating costs while improving customer service.

About TelstraTelstra is a leading telecommunications and information services company, with one of thebest known brands in Australia. Telstra offers a full range of services and compete in alltelecommunications markets throughout Australia, providing more than 9.0 million Australianfixed line and 10.2 million mobile services, including 6.3 million 3G services. About HuaweiHuawei is a global leader in providing next generation telecommunications networks, andnow serves 45 of the world's top 50 operators, along with over one billion users worldwide.The company is committed to providing innovative and customised products, services andsolutions. Visit www.huawei.com.au for more information.

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Inside Telstra's handset testing facility - Telco/ISP - iTnews



Inside Telstra's handset testing

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By Chris Jager Nov 30 2012 12:49PM

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Telco opens doors to its Mobile Innovation Lab.

Telstra this year tested 14 new handsets and 29 software upgrades in its Mobile Innovation Lab in Western Sydney.

The facility is the proving ground for vendors who want to earn the Telstra 'Blue Tick'; a Heart





Linked gallery: Photos: Telstra's handset testing facility



network staff to put their hand up for redundancy

Telstra still struggling with fourth big outage this year Foundation-style recommendation that is only awarded to devices suitable for rural coverage areas.

New smartphones are put through a rigorous testing process which includes an anechoic chamber that simulates network conditions in remote areas at the very edge of coverage. Transform legacy data into breakthrough apps faster than ever with CA API Management.



Telstra's Mobile

Innovation Lab is used to test everything from tablets and smartphones to the small modules found in vending machines and motor vehicles.

Beginning life 30 years ago, the facility – which resembles a Cold War bomb shelter in places – quickly evolved from a niche operation into a major component of the business.

"When this facility kicked off, it wasn't considered mainstream; mobile devices were a niche product" Telstra's director of network and commercial planning, Anthony Googan said.

"To give you a feel of how far we've come, we now have a device penetration of around 110 percent; that's one for every man, woman and child."



Telstra sends comms-on-wheels to Tas bushfires

By Joshua Gliddon Jan 8 2013 9:29AM

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Telstra CEO says telco still supports marriage equality A truck intended to demonstrate the capabilities of the National Broadband Network has been repurposed as a communications hub in bushfire-affected Tasmania.

According to Telstra representatives, around 500 landlines are still down, along with a similar number of internet services. Mobile phone coverage has also been affected, but not to the same degree, the carrier said.

Telstra's NBN demonstration trailer has been deployed at the Sorrell Evacuation Centre,

providing a place for affected residents to access phone, internet and portable-device recharging points.

The carrier noted that due to congestion in Sorrell, it has prioritised voice over mobile data services.



A mobile exchange on wheels.



Telstra has also shipped a mobile exchange on wheels to the island state on an overnight ferry service. The EoW is intended to provide supplementary communications services in the event of exchange damage. The mobile exchange is a trailer-sized unit connected to ADSL2+ and capable of providing 450 landline and 330 ADSL 2+ services to affected residents.

Representatives also said the company has a mobile Satellite Cell on Wheels (SatCOW) on standby to provide mobile phone services in bushfire-affected areas.

Services in Dunalley, Nubeena and Koonya have been reinstated using high capacity generators at exchanges impacted by the fires, the telco said.

The focus for the next few days is to deploy further generators to remote sites and repair fire-damaged cabling.



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Media Release

31 January 2014

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Telstra to conduct world's first stadium trial of LTE Broadcast technology

Telstra will conduct the world's first stadium trial of Long Term Evolution Broadcast (LTE-B) technology during tonight's T20 International cricket match at the Melbourne Cricket Ground.

LTE-B technology allows content to be broadcast to an unlimited number of users through a single stream of data, freeing up network capacity for general use when launched commercially.

Possible future uses of the broadcast technology, some of which will be tested tonight, include people listening to live commentary, getting real time match statistics and being able to watch replays and game highlights on their smartphone or tablet.

Telstra Executive Director Networks, Mike Wright said the trial follows successful lab demonstrations and would be one of the first live event LTE-B trials in the world, marking a significant step in developing the technology for commercial use.

"When a large number of people gather in one place we often see a huge spike in the demand for data, which can stretch the capabilities of our network and affect our customers' experience. This is particularly evident during sporting events with a lot of our customers looking to enhance the live event by accessing commentary or stats online," said Mr Wright.

"LTE-B offers us the ability to deliver content more effectively and provide all users the same high quality service using one single stream of data. This streamlined process frees up the rest of the network to carry other data, voice and text messages.

"We have successfully tested the technology in the lab, and tonight's trial will give us valuable insights into how it performs in the real world – from both a user and technical perspective.

"We will use the results from trials such as this to refine the network and work with manufacturers and content owners to develop devices and applications in preparation for a commercial launch," said Mr Wright.

The trial will be conducted with Telstra's network partner Ericsson, with content provided by Channel Nine with the approval of Cricket Australia and the Melbourne Cricket Club.

The trial will stream three channels of dedicated content to selected participants using specialised LTE-B enabled smartphones with specialised device firmware been provided by Samsung.

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Ericsson and Telstra achieve world's first 450Mbps in commercial LTE-A network demonstration

2014-05-15 Categories: Portfolio

- Telstra (Australia) and Ericsson achieved the world's first 450Mbps speed with LTE-Advanced (LTE-A) Carrier Aggregation in Telstra's mobile network
- 450Mbps downlink speed achieved by combining three 20MHz LTE carriers with the next evolution of LTE-enabled devices
- Ericsson's LTE-A Carrier Aggregation delivers better app coverage, browsing and media performance across the entire network

Today, for the first time, data has been transferred in a live production network at speeds of 450Mbps. Ericsson (NASDAQ: ERIC) and Telstra completed this demonstration to show the speeds that can be delivered using multiple LTE carriers with Ericsson's LTE-Advanced Carrier Aggregation software in an advanced mobile network.

The downlink speed was achieved by utilizing 60MHz of spectrum, with a 20MHz LTE carrier in the 1800MHz band plus 2 x 20MHz LTE carriers in the 2600MHz band. The next evolution of LTE devices, known as Category 9 (supplied by Aeroflex) was used, reflecting Ericsson's support for the advanced device ecosystem.

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Mike Wright, Telstra Group Managing Director, Networks, says: "Technology demonstrations such as this are an important step on the path to network readiness. Together with Ericsson, Telstra continues its commitment to advancing mobile networks to manage the future wireless data needs of our customers.

"We demonstrated 300Mbps with Ericsson in December 2013 and only five months later we are now demonstrating 450Mbps. Take up of LTE-A enabled devices is growing and advanced technology tests like this are essential to our network development strategy to ensure we are ready and able to deliver the most reliable network speeds and experience to customers."

As LTE traffic grows, operators are looking for technologies to make the most efficient use of available spectrum – and carrier aggregation is a key technology to deploy. Additionally, the deployment of advanced networks will support business innovation and development of our networked society. Today we can see that mobile users depend more and more upon mobile broadband in everyday life. More advanced networks will support more innovation.

Thomas Norén, Head of Product Area Radio at Ericsson, says: "With the successful demonstration of LTE-A three component carrier aggregation capability in the network and continued development of devices, it is important for leading operators to ensure the network keeps pace with LTE-A developments. Ericsson's strong technology partnership with Telstra has resulted in yet another world's first technology achievement."

By combining three 20MHz LTE carriers, operators can provide subscribers with peak throughput speeds of up to 450Mbps, in ideal conditions.

"To ensure the best user experience, Ericsson has continually tested the interoperability of devices and applications with global chipset and device manufacturers and will continue to do so as the Carrier Aggregation ecosystem evolves," Norén says.

Ericsson is the market leader in LTE. Today, 50 percent of the world's LTE smartphone traffic is served by Ericsson networks, which is more than double the traffic of our closest competitor. Ericsson also powers the world's first two commercially launched LTE Advanced Carrier Aggregation networks in South Korea. Ericsson has signed more than 190 commercial contracts for LTE and Evolved Packet Core in more than 70 countries on six continents, of which more than 140 networks have already gone live commercially. Ericsson is present today in all high-traffic LTE markets including the US, Japan, South Korea, Australia and Canada, and has been selected by the top 10 LTE operators as ranked by LTE subscriptions worldwide. We expect to hold 25 percent of all essential patents in LTE, both for TDD and FDD mode, and we support common hardware and software for FDD and TDD systems, giving operators maximum flexibility in their FDD and TDD deployment.

Notes to editors

Download high-resolution photos and broadcast-quality video at www.ericsson.com/press.

Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, businesses and societies to fulfil their potential and create a more sustainable future.

Our services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

With more than 110,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.

Founded in 1876, Ericsson has its headquarters in Stockholm, Sweden. Net sales in 2013 were SEK 227.4 billion (USD 34.9 billion). Ericsson is listed on NASDAQ OMX stock exchange in Stockholm and the NASDAQ in New York.

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Google to bring 'Project Loon' internet balloons to Australia



Google to bring 'Project Loon' internet balloons to Australia

5 comments



Google is bringing its audacious internet-transmitting balloons — which may eventually bring connectivity to the last unconnected places on Earth — to Australia.

The company will test-fly 20 balloons in western Queensland in December in partnership with Telstra.





A Project Loon balloon floats above a remote area of New Zealand during last year's test.

It's the latest step in Project Loon, Google's plan to beam internet to remote regions via helium balloons that circle the globe on stratospheric winds.



The balloons carry antennas that can beam 4G-like signals to homes and phones 20km below.

For the trial, Telstra will supply base stations to communicate with the balloons and access to space on the radio spectrum.

It follows initial trials above Christchurch in New Zealand in June last year. Google said at the time it was drawn to the area's favourable stratospheric conditions.



The project made headlines earlier this year when a New Zealand man spotted a downed balloon in the ocean and mistook it for evidence of a plane crash.

Google's ultimate goal is to have a ring of balloons circling the Earth, bringing internet to the estimated two-thirds of people who are presently unwired.

It's also hoped the balloons could one day provide coverage to areas struck by natural disasters.

Project Loon has been in development since mid-2011 by scientists at Google X, the secretive lab also working on Google Glass and driverless cars.

The technology is especially attractive for developing countries because it might let them avoid having to lay costly underground fibre cabling.

The trial in Australia comes as some local councils consider becoming NBN providers in order to deliver internet to remote regions of the country.

HOW PROJECT LOON WORKS

1. Web-connected base stations bounce signals up to the balloons, which float at about twice the altitude of passenger jets.

2. The signals hop forward from one balloon to the next.

3. Each balloon transmits internet signals down to an area more than twice the size of Canberra.

4. Card table-sized solar panel powers on-board gadgetry. Balloons can stay airborne for about 100 days.

Telstra launches world's first 600Mbps-capable Category 11 device - Telstra Exchange





Telstra, in collaboration with NETGEAR[®] Inc, Ericsson and Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, today announced that it is bringing the world's first 4G LTE Advanced Category 11 (Cat 11) 600Mbps* capable device to its customers in Australia on the Telstra Mobile Network.

This announcement comes only one month after the launch of the first Cat 9 (450Mbps*) devices on the Telstra Mobile Network.

The Telstra WiFi 4GX Advanced III Mobile Broadband Hotspot is the latest ultra-fast mobile broadband device to join Telstra's product range and uses 3 band Carrier Aggregation technology.

This technology means customers will have access to significantly faster peak download speeds and added capacity in the network.

Customers can enjoy faster downloads, streaming with less buffering, swift application response times and a better overall experience. But above all, the evolution in Telstra's network that supports Cat 11 devices is really designed to boost network capacity.

John Chambers, Executive Director, Mobile, at Telstra, said he is excited to offer more cutting-edge solutions to customers thanks to strong relationships with the partners involved.

"This is the world's first commercially available Cat 11 experience and is a breakthrough addition to our mobile device range thanks to our ongoing partnerships with these leaders in innovation,' said Chambers.

"When you combine the power of Qualcomm Technologies' Qualcomm® Snapdragon[™] X12 LTE modem with Qualcomm® VIVE[™] 11ac, Ericsson's LTE-Advanced Carrier Aggregation technology on Telstra's network, and the NETGEAR AirCard® 810S, it really is an unbeatable technology that we are pleased to offer our customers before anyone else in the world."

The new Telstra Wi-Fi 4GX Advanced III mobile hotspot supports up to 15 WiFi-enabled devices simultaneously. Customers in a 4GX enabled area can securely share blazing-fast WiFi with friends, family and co-workers while on the go. The hotspot automatically switches between 4GX, 4G and 3G coverage in areas where 4GX is not yet available. With its powerful battery, customers can connect for up to 11 hours of continuous use or 260 hours on standby.

Telstra's World First Cat11 600MBPS

TELSTRA'S WORLD FIRST CAT 11 600MBPS DEVICE IN ACTION

Outdoor Speed Test 4GX location - Harris Park The early Cat 11 enabled footprint is concentrated on the CBD's of Eastern Seaboard capital cities; initially Sydney, Melbourne, Brisbane and Canberra, and in selected popular holiday locations. The network reach supporting these Cat 11 speeds will also continue to expand in line with growing mobile data demand.

* typical user speeds will be lower and depend on factors such as location and network conditions, and, when customers use a WiFi device, the total number of users connected to the device.

The Author



Rick Molinsky (Editor) Telstra Exchange, Editor

Award winning writer/producer with over 20 years experience in Australia, London, Los Angeles and New York across multiple platforms, including digital, television and print. Roles have included being a producer, director and journalist for BBC in London, E! Entertainment, Channel Seven, Network Ten, Foxtel and Fairfax Media.

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Small cells deliver Telstra's fast mobile network to even more regional Australians

Telstra customers in more than 130 rural and regional communities will benefit from fast 4G mobile coverage on Australia's largest mobile network as part of Telstra's \$165 million commitment to regional Australia and the Federal Government's Mobile Black Spot Programme.

The Federal Government today announced 135 4G small cell base stations will be rolled out to communities across the nation, providing the latest in fast mobile data capabilities to even more rural and regional areas.

Telstra Group Managing Director, Networks, Mike Wright said rolling out the small cell technology was part of Telstra's commitment to expand its 4G coverage to 99% of the Australian population by June 2017.

"As the carrier with the nation's largest mobile footprint and the first to bring 4G mobile services to regional Australia, we know how important high-speed mobile can be to supporting local communities and businesses and we are excited to add another first to the list by delivering this innovative small cell technology to our nation's regions," Mr Wright said.

"The growing use of mobile devices such as smart phones and tablets is changing the way we live. The introduction of fast 4G data services via a small cell in these locations will mean residents will be able to access social media and video on the go for the first time as well as increased opportunities for local businesses.

"It also opens a digital door to emerging technologies such as Voice over LTE (VoLTE), which will, in due course, allow customers to make voice calls using 4G.

Mr Wright said the 135 small cells sites, which are funded solely by Telstra, were in addition to 429 communities who will benefit from expanded Telstra 3G and 4G coverage under Round One of the Federal Government's Mobile Black Spot Programme.

"When we made our bid under Round One, our core objective was to maximise new coverage to regional communities, which is why we made this additional pledge to further expand mobile data services at our own expense," he said.

"We worked closely with the Federal Government to identify the communities who were eligible for this small cell technology and we are proud to be part of this important initiative which will connect so many more regional communities. We will also continue to work with the Government to identify further opportunities to deploy this innovative technology to more rural areas. "Of the 429 3G/4G mobile base stations, we have already delivered new and improved mobile coverage to a number of communities across the nation in only a few months under Round One of the Programme and we look forward to rolling out coverage to even more Australians in the near future."

About small cells

A small cell is a miniature version of a standard base station that is traditionally used to boost coverage and capacity in densely populated urban areas. Telstra has reworked the technology and will use small cells to deliver 4G data services to a selected area in small towns and communities.

At this stage, the small cell technology can provide data services only; however, we are working on implementing Voice over LTE technology which will in due course allow customers to make voice calls using 4G.

Location to receive a small cell	State
Ballimore	NSW
Bellbrook	NSW
Bexhill	NSW
Bookham	NSW
Booral	NSW
Bostobrick	NSW
Brungle	NSW
Bukkulla	NSW
Bulga	NSW
Bunnan	NSW
Bunyah	NSW
Burrinjuck	NSW
Bylong	NSW
Chillingham	NSW
Deepwater	NSW
Euabalong	NSW
Euchareena	NSW
Gunderman	NSW
Gwabegar	NSW
Humula	NSW
Jiggi	NSW
Karuah	NSW
Kulnura	NSW
Liston	NSW
Lower Portland	NSW

Main Arm	NSW
Modanville	NSW
Mogriguy	NSW
Mt Taylor	NSW
Old Grevillia	NSW
Rappville	NSW
Rugby	NSW
Rye Park	NSW
Tabulam	NSW
Tallimba	NSW
Tyringham	NSW
Wantabadge	NSW
Watsons Creek	NSW
Wollar	NSW
Wollomombi	NSW
Wyndham	NSW
Aileron Station	NT
Aurora Kakadu Hotel/Roadhouse	NT
Hay Creek Road-Stuart Highway	NT
Jilkminggan Community-Roper Highway	NT
Lake Bennett	NT
Mcarthur-Carpenteria Highway	NT
Renner Springs-Stuart Highway	NT
Tipperary Station Road	NT
Alva Beach	QLD
Avondale	QLD
Binna Burra Resort	QLD
Boreen Point	QLD
Bramston Beach	QLD
Cawarral	QLD
Cherbourg	QLD
Dingo SCAX	QLD
Hampton	QLD
Hillview	QLD
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Mintaro	Mintaro	SA
Monash SA	Monash	SA

Myponga	SA
Norton Summit	SA
Pinery	SA
Port MacDonnell	SA
Port Neill	SA
Sevenhill	SA
Spalding	SA
Stockport	SA
Terowie	SA
Truro	SA
Wirrulla	SA
Yeelanna	SA
Yundi	SA
Adventure Bay	TAS
Avoca Exchange	TAS
Beechford	TAS
Colebrook	TAS
Lilydale	TAS
Nile Exchange	TAS
Sprent	TAS
Swanwick	TAS
Weymouth	TAS
Yolla	TAS
Borung	VIC
Cavendish	VIC
Cheshunt	VIC
Dargo	VIC
Darraweit Guim	VIC
Dartmouth Dam	VIC
Gellibrand	VIC
Hill End	VIC
Maroona	VIC
Navarre	VIC
Smeaton	VIC

Small cells deliver Telstra's fast mobile network to even more regional Australians

Tarrawingee	VIC
Tooborac	VIC
Traralgon South	VIC
Calingiri	WA
Coolup	WA
Gingin West	WA
Kirup	WA
Tammin	WA

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Telstra Mobile Smart Antenna

The Telstra Mobile Smart Antenna has been designed to extend indoor coverage for Telstra mobile handsets and mobile broadband devices operating on Telstra's 850MHz Next G network. All you need is at least one spot within your office or home where you can make calls. You can then use the Telstra Mobile Smart Antenna to extend that coverage to other areas of the building (e.g. where there is no signal or the existing signal strength is low).

Increased coverage can help you:

- make voice calls and access mobile broadband in more areas of your home or office
- enjoy more reliable voice calling in more parts of your home or office
- experience more consistent mobile broadband data speeds in more parts of your home or office.
- Support multiple number of devices. The number of devices the Smart Antenna can support can vary depending on user location, the type of use and signal strength. The Smart Antenna is expected to support the needs of a small office/family residence.

Telstra Mobile Smart Antenna benefits include:

- easy installation as there are no network cables or complex settings just plug into a standard 240V power supply
- seamless coverage as you move between the extended coverage provided by the Telstra Mobile Smart Antenna and immediately adjoining 850MHz Next G network coverage areas
- unlike other coverage solutions, the Telstra Mobile Smart Antenna doesn't need a fixed broadband connection
- extended handset battery life the Telstra Mobile Smart Antenna can help improve your handset's battery life by reducing the amount of battery it needs to connect to the 850MHz Next G network.

The Telstra Mobile Smart Antenna is suitable for indoor use, for a family residence or small office. Unlike other mobile repeaters - which may interfere with mobile networks and are illegal to operate - the Telstra Mobile Smart Antenna is designed, tested and authorised for use on Telstra's 850MHz Next G network. To use the Telstra Mobile Smart Antenna, you need to:

Troubleshooting Tool

Diagnose and fix common broadband connection, Wi-Fi, e-mail and home phone problems.





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 Residential customers call 13 2200 (say 'coverage') 					
 Business customers call 13 2000 (say 'coverage') or contact your account executive. 					
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Yes it was, thank you No, I still need help					
Still need to get in touch?					
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ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-8" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-9" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-10" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

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Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-11" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.

ANNEXURE CERTIFICATE

Prepared on behalf of: Telstra Corporation Ltd

Australian Competition and Consumer Commission

Domestic mobile roaming declaration inquiry 2016

This is the annexure marked "MJW-12" to the statement of MICHAEL JAMES WRIGHT dated 1 December 2016.





Telstra will build 429 new mobile towers in regional Australia



https://exchange.telstra.com.au/2015/06/25/telstra-will-build-429-new-mobile-towers-in-regional-australia/[14/11/2016 10:13:24 AM]

We are very pleased to announce that Telstra will participate in one of the largest ever expansions of mobile coverage in regional and remote Australia, through the Federal Government's Mobile Black Spot Programme.



We will be building 429 new 3G/4G towers over the next three years, plus a further 250 4G data only small cells, representing a combined investment of more than \$340 million in regional and remote Australia by Telstra, the Federal Government and several State and Local Governments as well.

Mobile connectivity has grown in importance as the combination of smart phones and tablets with increased mobile broadband speeds and capacity are changing the way we live and the availability of these services is often taken for granted in metropolitan locations.

Telstra has a heritage of nearly 35 years in providing mobile telephony to Australians, having brought every generation from 1G (that's right there was one before Cellular started in 1987) through to the 4G networks of today. Along that journey we have been intimately involved with extending coverage through the rollout of new towers as well as creating new and innovative ways

to stretch and improve mobile coverage into the far corners of the nation.

With this heritage we are acutely aware of the challenges facing communities living with limited access to a mobile network and that is why Telstra is excited to play an important role in delivering mobile coverage for the first time to a large number of regional communities as part of the Federal Government's Mobile Black Spot Programme.

Over the next three years we will build 429 new 3G/4G towers to deliver mobile service to over 400 communities who currently have no coverage in or around their towns. This means places like Leeuwin in Western Australia, Cape Otway in Victoria, Coffee Camp in New South Wales, Widgee in Queensland, Lulworth in Tasmania, Imanpa in Northern Territory and Fregon in South Australia will be receiving coverage from a new Telstra tower, as well as hundreds more. This has been made possible by the support of not just the Federal Government, but very significant contributions by State and Local Governments as well.

In addition to the new mobile towers, we will be installing 250 Small Cells to deliver high speed 4G data services in some small country towns where suitable Telstra infrastructure is available. There will be 200 nationally and another 50 specifically for Queensland as part of our arrangements with the Queensland Government and we are now working with Government on how to allocate these small cells. At this stage, the Small Cell technology can only provide data services, however, we are working on implementing Voice over LTE technology which will allow customers to make voice calls using 4G.

Telstra has been investing in the expansion and upgrade of our wireless networks for the long term and in the past five years alone we have invested around \$5 billion in our mobile network. Since we launched our Next G® network almost a decade ago, more than 99% of our network has been funded by investing our own capital.

With this Government partnership we are committing \$165 million of our own funds in return for the \$94.8 million allocated to Telstra by the Federal Government and we have worked with Victorian, NSW, Queensland, Tasmanian and Western Australian State Governments as well as multiple Local Governments to attract tens of millions of dollars in targeted additional funding. This means Telstra is able to deliver an investment of over \$340 million in regional telecommunications. Coupled with our unparalleled experience in building networks, this investment will bring new and improved coverage to hundreds of communities across the country.

The Telstra mobile network currently reaches over 99.3% of the population and is by far the largest network in the country, covering 2.4 million square kilometres of the Australian land mass, thanks to our long term commitment to network investment.

As the first carrier to bring 4G mobile services to regional Australia, we know how important highspeed mobile can be to supporting local businesses, tourism and education, so we are also continuing the expansion of our 4G and 4GX services.

We will be offering other carriers the opportunity to use space on our towers to install their own equipment and offer services to their customers from these towers, in accordance with existing industry practices. Our competitors are well-resourced and free to invest in extending their networks into previously unserved regional areas. So this is not just good news for Telstra customers but an opportunity for all carriers to invest in expanding their coverage in regional Australia.

We are proud to have put forward a strong bid for regional Australia as part of a competitive tender process, and we look forward to rolling out the new towers and expanding coverage for hundreds of communities over the next three years.

Increasing coverage across Australia

In addition to extending mobile coverage through the rollout of new towers, we have worked on new and innovate ways to stretch and improve mobile coverage in remote areas. Some of the ways we have done this include:

- High powered Boomer Cells with extended range features that provide more coverage from towers located on high ground
- Low cost signal repeaters such as our Telstra Mobile Smart Antenna which boost signal into homes and buildings
- New 4G Small Cells that provide localised 4G coverage in selected small townships
- "Blue tick" phones designed for improved reception in rural areas
- Next generation solar power mobile sites that allow installations where power is not available
- Our Satellite backhauled micro-cell that can be broken down into a few carry-bags for helicopter transport to the most remote of locations during emergencies

Additional information on how to maximise your coverage is available here:

https://www.telstra.com.au/coverage-networks/our-coverage#maximisecoverage

WA VIC		NSW and NT		QLD, SA and TAS			
Ajana	WA	Ancona	VIC	Abercrombie Road, Paling Yards	NSW	Eulo	QLD
Armstrong Road, Boscabel	WA	Apollo Bay	VIC	Anglers Reach	NSW	Flying Fish Point	QLD
Badgebup	WA	Arawata	VIC	Araluen	NSW	Forsayth	QLD
Baudin	WA	Archerton	VIC	Avonside	NSW	Gargett	QLD
Beacon	WA	Austins Hill	VIC	Babyl Creek	NSW	Glastonbury	QLD
Beaumont	aumont WA Barongarook VIC Balala NSW Goldsborou Valley		Goldsborough Valley	QLD			
Beedelup East	WA	Barwon Downs	VIC	Barry	NSW	Greenvale	QLD
Bindoon West	WA	Benambra	VIC	Bedgerebong	NSW	Gregory	QLD
Boolathana	WA	Bethanga	VIC	Bentley	NSW	Gulf Developmental Road, between Georgetown and Croydon	QLD
Borden	WA	Blackwood	VIC	Binalong	NSW	Haden- Maclagan Road	QLD
Broomehill Village	WA	Bonang	VIC	Blue Mountains National Park South	NSW	Jackson	QLD
Bullara	WA	Boolite	VIC	Bodalla	NSW	Julatten	QLD
Bunjil	WA	Broadford	VIC	Bogee	NSW	Kin Kin	QLD
Burracoppin Road, Cramphorne	WA	Buchan South	VIC	Bonalbo A	NSW	Landsborough Highway, between Blackall and Tambo	QLD
Cape Cuvier	WA	Buffalo River	VIC	Bonalbo B	NSW	Landsborough Highway, between Winton and Cloncurry	QLD
Cape Range	WA	Bullarto	VIC	Bonshaw	NSW	Long Pocket	QLD
						Maleny- Kenilworth	

Cardabia	WA	Butchers Ridge	VIC	Brooms Head	NSW	Road, between	QLD
						Conondale and	
						Kenilworth	
Carnamah East	WA	Cape Bridgewater	VIC	Bunnaloo	NSW	Marlborough	QLD
Cave Spring	WA	Cape Otway	VIC	Burringbar	NSW	Maryborough Biggenden Road, between Brooweena and Maryborough	QLD
Chester Pass Road, Toolbrunup	WA	Carlisle River	VIC	Burrumbuttock	NSW	McKinlay	QLD
Chittering	WA	Carrajung Lower	VIC	Buxton	NSW	Moonie	QLD
Coomberdale	WA	Chetwynd A	VIC	Camboon	NSW	Moore	QLD
Cuballing	WA	Chetwynd B	VIC	Capertee	NSW	Mount Chalmers Road, intersection of Sleipner Road and Mount Chalmers Road	QLD
Cundinup	WA	Chinkapook	VIC	Central Tilba	NSW	Mount Mee	QLD
Dalyup	WA	Connewirricoo	VIC	Clarence	NSW	Mount Sylvia	QLD
Dalyup North	WA	Cudgewa	VIC	Clunes	NSW	Mulgildie	QLD
Darradup	WA	Culla	VIC	Coalcliff	NSW	Quilpie, Diamantina Developmental Road	QLD
Dinninup	WA	Dartmouth	VIC	Coffee Camp	NSW	Rannes	QLD
Doyles Road, Kulin West	WA	Denver	VIC	Colo Heights	NSW	Somerset Dam	QLD
Dwellingup South	WA	Dereel	VIC	Comboyne A	NSW	Speewah	QLD
East Barrabup	WA	Devils River	VIC	Comboyne B	NSW	Toobeah	QLD
East Yuna	WA	Digby	VIC	Copmanhurst	NSW	Torrens Creek	QLD
Eastbourne Road, Diamond Tree	WA	Dixons Creek	VIC	Dalgety	NSW	Ubobo	QLD

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Eganu	WA	Dumbalk	VIC	Dalton	NSW	Urandangi	QLD
Elabbin	WA	Dumbbalk North	VIC	Darbys Falls	NSW	Watsonville	QLD
Elleker	WA	East Warburton	VIC	Deniliquin	NSW	Wattle Camp	QLD
Ferguson Valley	WA	Edi Upper	VIC	Dooralong	NSW	Widgee	QLD
Fisheries Road between Condingup and Neridup	WA	Eganstown	VIC	Drake	NSW	Woolooga	QLD
Gidgegannup	WA	Eldorado	VIC	Dungowan	NSW	Yaraka	QLD
Gilgering	WA	Enochs Point	VIC	Elands	NSW	Amata	SA
Goldfields Highway, Kookynie	WA	Gellibrand	VIC	Ettrick	NSW	Curramulka	SA
Goongarrie	WA	Glenlyon	VIC	Farrants Hill	NSW	Fregon	SA
Grass Patch East	WA	Gormandale	VIC	Golspie	NSW	Indulkana	SA
Grass Valley	WA	Goughs Bay	VIC	Goolma	NSW	Meribah	SA
Great Eastern Highway, between Carrabin and Bodallin	WA	Granya	VIC	Grattai	NSW	Mimili	SA
Grey	WA	Guildford	VIC	Hernani	NSW	Montacute	SA
Hamelin Bay	WA	Harrow	VIC	Hickeys Creek	NSW	Ngarutjara Homeland	SA
Horrocks	WA	Havilah	VIC	Hillgrove	NSW	Paruna	SA
Inggarda	WA	Hazeldene	VIC	Jerrys Plains	NSW	Pipalyatjara	SA
Jacup	WA	Highlands	VIC	Kings Plains	NSW	Port Moorowie	SA
Jalbarragup	WA	Howqua Inlet	VIC	Kioloa	NSW	Cramps Bay	TAS
Julimar	WA	Kadnook	VIC	Koonorigan	NSW	Eggs And Bacon Bay	TAS
Kalbarri Loop	WA	Kalkee	VIC	Kunghur	NSW	Elliott	TAS
Kalgan	WA	Kanumbra	VIC	Kurrajong	NSW	Gawler	TAS
Koolanooka	WA	Kawarren	VIC	Ladysmith	NSW	Loyetea	TAS
Kununoppin	WA	Kewell	VIC	Laguna	NSW	Lulworth	TAS
Lake Argyle	WA	Killingworth	VIC	Lemon Tree	NSW	Melrose	TAS

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Learmonth WA Kongwak VIC Lue NSW Nunamara Leeuwin WA Korong Vale VIC Mannus NSW Rossarden Lowden WA Lalbert VIC Mayfield NSW Sisters Beacl Lumeah WA Landsborough VIC Merriwagga NSW South Riana Maya North WA Leonards Hill VIC Minnie Water NSW Targa Maya North WA Leonards Hill VIC Mount Hunter NSW Whitefoord Meanarra Hill WA Lyonville VIC Mount Tomah NSW Merkanooka WA Marnoo B VIC Murningo NSW Mimegarra WA Mirboo VIC Nettai NSW Mogumber WA Molyullah VIC Nethercote NSW Mount Pingerup WA Moonambel VIC Nethercote NSW Mut Burdett WA Moyhu	Latham	WA	Kinglake West	VIC	Lower Peacock	NSW	Mole Creek	TAS
LeeuwinWAKorong ValeVICMannusNSWRossardenLowdenWALalbertVICMayfieldNSWSisters BeaclLumeahWALandsboroughVICMerriwaggaNSWSouth RianaManypeaksWALandsboroughVICMinnie WaterNSWTargaMaya NorthWALeonards HillVICMount HunterNSWWhitefoordMeanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurningoNSWMimegarraWAMinryipVICNattaiNSWMogumberWAMirranatwaVICNerrigaNSWMount PingerupWAMoonambelVICNewileNSWMt BurdettWAMoyhuVICNewileNSWMt BardettWAMoyhuVICNewileNSWMt BardettWAMoyhuVICPatersonNSWMt MaddenWAMyrrheeVICPatersonNSWMumberkineWANareenVICPossum CreekNSWNanup EastWAOuttrimVICRockleyNSWNareirWAPigeon PondsVICStanhopeNSWNareirigWAPigeon PondsVICStanhopeNSWNareirigWASaint AndrewsVICTarloNSW <t< td=""><td>Learmonth</td><td>WA</td><td>Kongwak</td><td>VIC</td><td>Lue</td><td>NSW</td><td>Nunamara</td><td>TAS</td></t<>	Learmonth	WA	Kongwak	VIC	Lue	NSW	Nunamara	TAS
LowdenWALalbertVICMayfieldNSWSisters BeachLumeahWALandsboroughVICMerriwaggaNSWSouth RianaManypeaksWALandsborough WestVICMinnie WaterNSWTargaMaya NorthWALeonards HillVICMount HunterNSWWhitefoordMeanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMurningoNSWMerkanookaWAMarnoo BVICMurningoNSWMinegarraWAMarnoo BVICNattaiNSWMogumberWAMirranatwaVICNethercoteNSWMogumberWAMirranatwaVICNethercoteNSWMount PingerupWAMoonambelVICNevilleNSWMt BurdettWAMoyhuVICPatersonNSWMt BardettWAMoyhuVICPatersonNSWMt BardettWAMunthamVICPorters RetreatNSWMt MaddenWAMurtherVICRockleyNSWManup EastWAOuttrimVICRockleyNSWNapierWAPatchewollockVICRockleyNSWNarialingWAPortland WestVICTarloNSWNoohkanbahWASaint AndrewsVICTarloNSWNoonkanbahWASaint LeonardsVICTarloNSW	Leeuwin	WA	Korong Vale	VIC	Mannus	NSW	Rossarden	TAS
LumeahWALandsborough WestVICMerriwaggaNSWSouth RianaManypeaksWALandsborough WestVICMinnie WaterNSWTargaMaya NorthWALeonards HillVICMount HunterNSWWhitefoordMeanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurringoNSWMimegarraWAMirroboVICNattaiNSWMogumberWAMirroboVICNethercoteNSWMorangupWAMolyullahVICNethercoteNSWMothBurdettWAMoonambelVICNewMt BurnsideWAMount EcclesVICNumerallaNSWMt BurnsideWAMunthamVICPatersonNSWMt MaddenWAMurtheeVICPatersonNSWMumberkineWANareenVICPorters RetreatNSWNabawaWANetherbyVICRockleyNSWNapierWAPatchewollockVICSackville NorthNSWNarrikupWASaint AndrewsVICTarloNSWNoonkanbahWASaint AndrewsVICTarloNSWNoonkanbahWASaint LeonardsVICTarloNSWNornalupWASaint AndrewsVICTarloNSW <td>Lowden</td> <td>WA</td> <td>Lalbert</td> <td>VIC</td> <td>Mayfield</td> <td>NSW</td> <td>Sisters Beach</td> <td>TAS</td>	Lowden	WA	Lalbert	VIC	Mayfield	NSW	Sisters Beach	TAS
ManypeaksWALandsborough WestVICMinnie WaterNSWTargaMaya NorthWALeonards HillVICMount HunterNSWWhitefoordMeanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurringoNSWMimegarraWAMirrono BVICNattaiNSWMinilyaWAMirbooVICNethercoteNSWMogumberWAMolyullahVICNethercoteNSWMorangupWAMoonambelVICNethercoteNSWMothet WAMount EcclesVICNumerallaNSWMt BurdettWAMount EcclesVICNumerallaNSWMt Frankland WestWAMunthamVICPatersonNSWMumberkineWANareenVICPotters RetreatNSWNabawaWANetherbyVICRockleyNSWNapierWAPottand WestVICSackville NorthNSWNarrikupWASaint AndrewsVICTarloNSWNoonkanbahWASaandy PointVICTarloNSWNoonkanbahWASaamt LeonardsVICTarloNSWNornalupWASaandy PointVICTomambaNSWNornalupWASaamt LeonardsVICTarloNSWNornalup <td>Lumeah</td> <td>WA</td> <td>Landsborough</td> <td>VIC</td> <td>Merriwagga</td> <td>NSW</td> <td>South Riana</td> <td>TAS</td>	Lumeah	WA	Landsborough	VIC	Merriwagga	NSW	South Riana	TAS
Maya NorthWALeonards HillVICMount HunterNSWWhitefoordMeanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurringoNSWMiregarraWAMinyipVICNattaiNSWMinilyaWAMirbooVICNetligenNSWMogumberWAMirranatwaVICNetrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNetwertalNSWMt BurdettWAMoonambelVICNumerallaNSWMt BurdettWAMoyhuVICNumerallaNSWMt BurdettWAMoyhuVICNswMt MaddenWAMurthamVICPatersonNSWMumberkineWANareenVICPossum CreekNSWNabawaWAOuttrimVICRockleyNSWNapierWAPatchewollockVICRockleyNSWNarikupWAPipers CreekVICStanhopeNSWNoohkanbahWASaint AndrewsVICTaylors ArmNSWNoonkanbahWASaint LeonardsVICTomboyeNSWNomalupWASaint LeonardsVICTowambaNSWNomalupWASaint LeonardsVICTowamba <td>Manypeaks</td> <td>WA</td> <td>Landsborough West</td> <td>VIC</td> <td>Minnie Water</td> <td>NSW</td> <td>Targa</td> <td>TAS</td>	Manypeaks	WA	Landsborough West	VIC	Minnie Water	NSW	Targa	TAS
Meanarra HillWALyonvilleVICMount TomahNSWMerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurringoNSWMimegarraWAMinyipVICNattaiNSWMinilyaWAMirbooVICNelligenNSWMogumberWAMirranatwaVICNerrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNevilleNSWMt BurdettWAMoonambelVICNumerallaNSWMt BurnsideWAMount EcclesVICNumerallaNSWMt Frankland WestWAMunthamVICPatersonNSWMumberkineWAMurtheeVICPosture NSWNabawaWANateenVICPosture NSWNannup EastWAOuttrimVICRockleyNSWNaringWAPigeon PondsVICSherwoodNSWNaringWAPortland WestVICSherwoodNSWNoobijupWASaint AndrewsVICTarloNSWNoonkanbahWASaarsfieldVICTowambaNSWNornalupWASasmill SettlementVICTowambaNSWNungarinWASaemill SettlementVICTowambaNSWNeridupWASaemill 	Maya North	WA	Leonards Hill	VIC	Mount Hunter	NSW	Whitefoord	TAS
MerivaleWAMarnoo AVICMumbilNSWMerkanookaWAMarnoo BVICMurringoNSWMimegarraWAMinyipVICNattaiNSWMinilyaWAMirbooVICNelligenNSWMogumberWAMirranatwaVICNerrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNethercoteNSWMt BurdettWAMoont EcclesVICNumerallaNSWMt BurnsideWAMoyhuVICNymboidaNSWMt Frankland WestWAMunthamVICPatersonNSWMumberkineWANareenVICPosters RetreatNSWNabawaWANetherbyVICPossum CreekNSWNannup EastWAOuttrimVICRockleyNSWNareilingWAPigeon PondsVICStanhopeNSWNarrikupWASaint AndrewsVICTarloNSWNoobijupWASaint LeonardsVICTaylors ArmNSWNornalupWASasrfieldVICTowambaNSWNungarinWASaemill SettlementVICTowambaNSWNendupWASaemill SettlementVICTowambaNSWNoeahWASaemill SettlementVICTowambaNSW	Meanarra Hill	WA	Lyonville	VIC	Mount Tomah	NSW		
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MimegarraWAMinyipVICNattaiNSWMinilyaWAMirbooVICNelligenNSWMogumberWAMirranatwaVICNerrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNethercoteNSWMt BurdettWAMoonambelVICNewilleNSWMt BurdettWAMoont EcclesVICNumerallaNSWMt BurnsideWAMoyhuVICPatersonNSWMt Frankland WestWAMunthamVICPatersonNSWMt MaddenWAMyrrheeVICPorters RetreatNSWMumberkineWANareenVICPossum CreekNSWNabawaWANetherbyVICRockleyNSWNapierWAPatchewollockVICRockleyNSWNarilingWAPipers CreekVICSherwoodNSWNornalupWASaint AndrewsVICTarloNSWNoonkanbahWASaandy PointVICTarloNSWNornalupWASaarsfieldVICTowambaNSWNungarinWASawmill SattlementVICTowambaNSWPerillupWASheep HillsVICTrunkey CreekNSW	Merkanooka	WA	Marnoo B	VIC	Murringo	NSW		
MinilyaWAMirbooVICNelligenNSWMogumberWAMirranatwaVICNerrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNevilleNSWMt BurdettWAMount EcclesVICNumerallaNSWMt BurnsideWAMoyhuVICNymboidaNSWMt Frankland WestWAMunthamVICPatersonNSWMt MaddenWAMyrrheeVICPorters RetreatNSWMumberkineWANareenVICPorsum CreekNSWNabawaWANetherbyVICPossum CreekNSWNapierWAOuttrimVICRockleyNSWNarilingWAPigeon PondsVICSackville NorthNSWNeridupWAPortland WestVICStanhopeNSWNoonkanbahWASaint AndrewsVICTarloNSWNoonkanbahWASaady PointVICTomboyeNSWNungarinWASaarsfieldVICTowambaNSWOcean BeachWASheep HillsVICTrunkey CreekNSW	Mimegarra	WA	Minyip	VIC	Nattai	NSW		
MogumberWAMirranatwaVICNerrigaNSWMorangupWAMolyullahVICNethercoteNSWMount PingerupWAMoonambelVICNevilleNSWMt BurdettWAMount EcclesVICNumerallaNSWMt BurnsideWAMoyhuVICNymboidaNSWMt BurnsideWAMoyhuVICPatersonNSWMt Frankland WestWAMunthamVICPatersonNSWMt MaddenWAMyrrheeVICPorters RetreatNSWMumberkineWANareenVICPorters RetreatNSWNabawaWAOuttrimVICPossum CreekNSWNannup EastWAOuttrimVICRockleyNSWNapierWAPatchewollockVICRockleyNSWNarrikupWAPortland WestVICSherwoodNSWNoohanbahWASaint LeonardsVICTarloNSWNoonkanbahWASaarsfieldVICTomboyeNSWNungarinWASassfieldVICTowambaNSWOcean BeachWASheep HillsVICTrunkey CreekNSW	Minilya	WA	Mirboo	VIC	Nelligen	NSW		
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Mt MaddenWAMyrrheeVICPilligaNSWMumberkineWANareenVICPorters RetreatNSWNabawaWANetherbyVICPossum CreekNSWNannup EastWAOuttrimVICRockleyNSWNapierWAPatchewollockVICRocky CreekNSWNaralingWAPigeon PondsVICSackville NorthNSWNarrikupWAPigeon PondsVICSherwoodNSWNeridupWAPortland WestVICStanhopeNSWNoobijupWASaint AndrewsVICTarloNSWNoonkanbahWASaint LeonardsVICTaylors ArmNSWNungarinWASarsfieldVICTomboyeNSWOcean BeachWASheep HillsVICTrunkey CreekNSW	Mt Frankland West	WA	Muntham	VIC	Paterson	NSW		
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Ocean Beach WA Sawmill Settlement VIC Towamba NSW Perillup WA Sheep Hills VIC Trunkey Creek NSW	Nungarin	WA	Sarsfield	VIC	Tomboye	NSW		
Perillup WA Sheep Hills VIC Trunkey Creek NSW	Ocean Beach	WA	Sawmill Settlement	VIC	Towamba	NSW		
	Perillup	WA	Sheep Hills	VIC	Trunkey Creek	NSW		

Pingaring Pederah Road, between Pingaring and Pederah	WA	Steiglitz	VIC	Urbenville	NSW
Pithara	WA	Strzelecki	VIC	Walcha Road	NSW
Point Quobba	WA	Tangambalanga	VIC	Wanganella	NSW
Popanyinning	WA	Tatong	VIC	Warroo	NSW
Porongurup	WA	Taylor Bay	VIC	Webbs Creek	NSW
Ravensthorpe West	WA	Tolmie	VIC	Wentworth	NSW
Red Bluff	WA	Tongio	VIC	Wherrol Flat	NSW
Rosa Brook	WA	Trida	VIC	Windellama	NSW
Rosa Glen	WA	Upper Ryans Creek	VIC	Windeyer	NSW
Ryansbrook	WA	Victoria Valley	VIC	Woolomin	NSW
Salmon Holes	WA	Wallaloo East	VIC	Wyong Creek	NSW
Scadden West	WA	Wallup	VIC	Yarramalong	NSW
Seabird	WA	Waratah Bay	VIC	Finke	NT
South Coast Highway, Peaceful Bay	WA	Werrimull	VIC	Imanpa	NT
South Western Highway, between Broke and Walpole	WA	Wombelano	VIC	Minjilang	NT
South Yuna	WA	Woods Point	VIC	Mt Liebig	NT
Sturry Road, Cranbrook	WA	Yea	VIC	Wallace Rockhole	NT
Tarin Rock	WA	Yeodene	VIC		
Tenterden	WA	York Plains	VIC		
Tindale Road, Bow Bridge	WA	Youngvale	VIC		
Tindale Road, Plantagenet	WA				
Ucarty	WA				

Telstra will build 429 new mobile towers in regional Australia | Telstra Exchange

Upper Chittering	WA
Varley	WA
Vasse Hwy, Collins	WA
Wannamal South East	WA
Warralakin	WA
Warroora	WA
Wellington Mill	WA
West River	WA
Windy Harbour	WA
Womarden	WA
Wongamine	WA
Woogenellup	WA
Yallabatharra	WA
Yallingup East	WA
Yandanooka	WA
Yandeyarra	WA
Yealering	WA

The Author



Mike Wright Group Managing Director, Networks

Mike Wright is Group Managing Director of Networks in Telstra Operations. Mike currently leads the engineering and internal construction capabilities for all of Telstra's fixed, wireless and media networks. He has over 30 years experience in telecommunications commencing his career designing and building telecommunications networks including early work on digital switching, paging, optical fibre and transmission networks. Since then he has made significant contributions to the establishment and evolution of Telstra's mobile networks through Analogue, GSM, CDMA, WCDMA to the completion of Telstra's world class, nationwide LTE/HSPA enabled mobile network. Mike has been highly engaged in the wireless technology evolution including a series of world leading developments such as 200Km cell range, HSPA evolution, the world's largest HD Voice footprint and Australia's first Cat 4 and LTE-A capabilities. He has extensive international experience in developing wireless ecosystems including the establishment and promotion of user/focus groups to grow the 850 MHz HSPA and 1800 MHz LTE ecosystems. Mike's network team is also driving the evolution and development of wireline network capabilities including low cost ADSL expansion techniques, DOCSIS 3 upgrades, 1 Tbps Optical transport trials, world first Application Aware Networking capabilities and evolution to new ASP network architectures. Mike is regular presenter and influencer at international forums and has regularly presented and/or judged at Mobile World Congress, Broadband World Forum, 4G World, GSM Latin America and LTE Asia.

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Media Release

17 June 2016

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Gormandale community celebrates new and improved mobile coverage

Gormandale residents are today celebrating new and improved mobile coverage courtesy of a recently installed Telstra mobile base station.

The Gormandale mobile base station is the third in Gippsland to be switched on under the Mobile Black Spot Programme and was jointly funded by Telstra and the Federal and Victorian Governments.

The new base station now covers Gormandale and surrounds with mobile coverage including the latest 4GX technology, and addresses a known black spot the community wanted fixed.

Telstra Area General Manager Loretta Willaton said testing of the site was now complete and feedback from local residents and businesses to the area had been universally positive since the mobile base station had been switched on.

"Prior to the Mobile Black Spot Programme, Gormandale had no mobile coverage. The feedback I have personally received is that the ability to seamlessly use a mobile in and around town has made a great difference to residents and businesses," he said.

"Whether it's to call family and friends, surf the internet and social media or for businesses on-the-go, it's great so many have embraced the new coverage this base station has brought.

"Australia is a big country and we are proud to be part of this important initiative which is connecting so many more regional and rural communities."

As part of the Mobile Black Spot Programme, Telstra will be building 429 new 3G/4G mobile base stations in black spots across regional Australia. Construction will take place across the next three years with Austins Hill already live and planning and construction commencing at Mirboo, Carrajung Lower, Dumbalk and Sandy Point.

The Mobile Black Spot Programme involves an investment of more than \$340 million in regional and rural Australia, with \$165 million from Telstra, \$94.8 million from the Federal Government and tens of millions in targeted additional funding from State and Local Governments.

Telstra recently launched a user friendly tool for communities to follow the rollout of the Round One mobile base stations.



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Media Release

20 June 2016

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Small cells deliver Telstra's fast mobile network to even more regional Australians

Telstra customers in more than 130 rural and regional communities will benefit from fast 4G mobile coverage on Australia's largest mobile network as part of Telstra's \$165 million commitment to regional Australia and the Federal Government's Mobile Black Spot Programme.

The Federal Government today announced 135 4G small cell base stations will be rolled out to communities across the nation, providing the latest in fast mobile data capabilities to even more rural and regional areas.

Telstra Group Managing Director, Networks, Mike Wright said rolling out the small cell technology was part of Telstra's commitment to expand its 4G coverage to 99% of the Australian population by June 2017.

"As the carrier with the nation's largest mobile footprint and the first to bring 4G mobile services to regional Australia, we know how important high-speed mobile can be to supporting local communities and businesses and we are excited to add another first to the list by delivering this innovative small cell technology to our nation's regions," Mr Wright said.

"The growing use of mobile devices such as smart phones and tablets is changing the way we live. The introduction of fast 4G data services via a small cell in these locations will mean residents will be able to access social media and video on the go for the first time as well as increased opportunities for local businesses.

"It also opens a digital door to emerging technologies such as Voice over LTE (VoLTE), which will, in due course, allow customers to make voice calls using 4G.

Mr Wright said the 135 small cells sites, which are funded solely by Telstra, were in addition to 429 communities who will benefit from expanded Telstra 3G and 4G coverage under Round One of the Federal Government's Mobile Black Spot Programme.

"When we made our bid under Round One, our core objective was to maximise new coverage to regional communities, which is why we made this additional pledge to further expand mobile data services at our own expense," he said.

"We worked closely with the Federal Government to identify the communities who were eligible for this small cell technology and we are proud to be part of this important initiative which will connect so many more regional communities. We will also continue to work with the Government to identify further opportunities to deploy this innovative technology to more rural areas.

"Of the 429 3G/4G mobile base stations, we have already delivered new and improved mobile coverage to a number of communities across the nation in only a few months under Round One of the Programme and we look forward to rolling out coverage to even more Australians in the near future."

About small cells

A small cell is a miniature version of a standard base station that is traditionally used to boost coverage and capacity in densely populated urban areas. Telstra has reworked the technology and will use small cells to deliver 4G data services to a selected area in small towns and communities.

At this stage, the small cell technology can provide data services only; however, we are working on implementing Voice over LTE technology which will in due course allow customers to make voice calls using 4G.

Location to receive a small cell	State
Ballimore	NSW
Bellbrook	NSW
Bexhill	NSW
Bookham	NSW
Booral	NSW
Bostobrick	NSW
Brungle	NSW
Bukkulla	NSW
Bulga	NSW
Bunnan	NSW
Bunyah	NSW
Burrinjuck	NSW
Bylong	NSW
Chillingham	NSW
Deepwater	NSW
Euabalong	NSW
Euchareena	NSW
Gunderman	NSW
Gwabegar	NSW
Humula	NSW
Jiggi	NSW
Karuah	NSW
Kulnura	NSW
Liston	NSW
Lower Portland	NSW

Main Arm	NSW
Modanville	NSW
Mogriguy	NSW
Mt Taylor	NSW
Old Grevillia	NSW
Rappville	NSW
Rugby	NSW
Rye Park	NSW
Tabulam	NSW
Tallimba	NSW
Tyringham	NSW
Wantabadge	NSW
Watsons Creek	NSW
Wollar	NSW
Wollomombi	NSW
Wyndham	NSW
Aileron Station	NT
Aurora Kakadu Hotel/Roadhouse	NT
Hay Creek Road-Stuart Highway	NT
Jilkminggan Community-Roper Highway	NT
Lake Bennett	NT
Mcarthur-Carpenteria Highway	NT
Renner Springs-Stuart Highway	NT
Tipperary Station Road	NT
Alva Beach	QLD
Avondale	QLD
Binna Burra Resort	QLD
Boreen Point	QLD
Bramston Beach	QLD
Cawarral	QLD
Cherbourg	QLD
Dingo SCAX	QLD
Hampton	QLD
Hillview	QLD

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Injinoo	QLD
Injune	QLD
Innot Hot Springs	QLD
Lake Tinaroo	QLD
Mena Creek	QLD
Moranbah Airport	QLD
Morven	QLD
Mourilyan Harbour	QLD
Mungallala	QLD
Murray Upper	QLD
Palmer River Roadhouse	QLD
Peranga	QLD
Reesville	QLD
River Ranch	QLD
Seisia	QLD
Severnlea	QLD
Tarzali	QLD
Tingoora	QLD
Umagico	QLD
Woorabinda	QLD
Wowan	QLD
Balgowan	SA
Bute	SA
Caltowie	SA
Cape Jaffa Anchorage	SA
Coobowie	SA
Farrell Flat	SA
Geranium	SA
Gumeracha	SA
Kalangadoo	SA
Kangarilla	SA
Lipson	SA
Mintaro	SA
Monash	SA

Myponga	SA
Norton Summit	SA
Pinery	SA
Port MacDonnell	SA
Port Neill	SA
Sevenhill	SA
Spalding	SA
Stockport	SA
Terowie	SA
Truro	SA
Wirrulla	SA
Yeelanna	SA
Yundi	SA
Adventure Bay	TAS
Avoca Exchange	TAS
Beechford	TAS
Colebrook	TAS
Lilydale	TAS
Nile Exchange	TAS
Sprent	TAS
Swanwick	TAS
Weymouth	TAS
Yolla	TAS
Borung	VIC
Cavendish	VIC
Cheshunt	VIC
Dargo	VIC
Darraweit Guim	VIC
Dartmouth Dam	VIC
Gellibrand	VIC
Hill End	VIC
Maroona	VIC
Navarre	VIC
Smeaton	VIC

Small cells deliver Telstra's fast mobile network to even more regional Australians

Tarrawingee	VIC
Tooborac	VIC
Traralgon South	VIC
Calingiri	WA
Coolup	WA
Gingin West	WA
Kirup	WA
Tammin	WA

Reference Number: 075/2016

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Media Release

23 June 2016

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Telstra invests in Mining Technology Solutions & Services

Telstra today announced the formation of Telstra Mining Services, a strategic investment in the mining industry, following the appointment of two global mining experts and the acquisition of mining communications technology services business from CBO Telecommunications. The move cements Telstra's commitment to providing deeper capabilities for customers in the mining, oil and gas industry.

Subject to completion on June 30, Telstra will acquire the network design and consulting services business of CBO Telecommunications, whose capabilities include deep expertise across Wi-Fi and Mesh technologies and the design, build and maintenance of enterprise grade networks used in mine sites.

Alongside CBO's longstanding relationships with key mining customers and solid industry reputation, it also has significant complementary capabilities to support the future growth of Telstra's mining focused private LTE and public LTE (LANES) businesses.

Martijn Blanken, Group Managing Director, Telstra Global Enterprise and Services, said that Telstra Mining Services was a key pillar of Telstra Global Enterprise and Services' strategy to build new growth businesses.

"These investments are part of our strategy to create a significant global mining technology product and services business," he said.

"Telstra is committed to becoming a new driving force for mining in Australia by helping the industry transition to a digital future."

David Keenan, Head of Telstra Global Industries, said: "The decline in global commodity prices is largely driving a downturn in the resources sector and, as a consequence, sharpening the industry's focus on reducing costs and maximising production.

"This downturn has created a once in a lifetime shift, where miners are looking to technology innovation to help them future proof their operations.

"Telstra Mining Services will be focused on helping our mining customers drive better business outcomes by significantly improving in-shift staff and asset productivity.

"Telstra Mining Services will deliver the technology solutions that makes this possible, such as high bandwidth networks, mobility solutions and software capabilities, through our own developments, strategic partnerships and in bespoke collaboration with customers." To continue to build specialist mining capabilities, Telstra has also appointed Jeannette McGill and Eric Nettleton. Starting on July 1, Ms McGill, the recent Head of Technology and Innovation at AngloAmerican Platinum, will be the Head of Telstra Mining Services. From Johannesburg, McGill is well respected for translating technology insights and trends in global markets to strengthen mining business' value chain and has a wealth of technical and operational mining experience. Mr Nettleton has joined Telstra's Global Products and Solutions team to work on the next generation of mining technology products. He also has extensive mining industry technical experience after leading both the Automation Technology R&D team at Rio Tinto Innovation and the Rio Tinto Centre for Mine Automation at the University of Sydney, developing new technologies for Rio Tinto's Mine of the FutureTM program. The acquisition of capabilities and expertise is in addition to organically growing Telstra's mining industry capabilities, including introducing bespoke products such as the Telstra Resources Network Management solution, which provides remote management of on-site ruggedised industrial data networks. "Building on our strong organic foundation, the acquisition of CBO's network consulting, engineering and services business was the next step to expand our communications business beyond the mine gate," Mr Keenan said. "This investment means we can confidently meet the industry's communication needs at Australian mine sites. With the addition of Jeannette McGill, Eric Nettleton and the CBO team to the existing Telstra Mining Industry team, we have significantly strengthened our mining specific domain expertise. "This is only the beginning as we will continue to deepen our capabilities to deliver tailored technology innovation to our mining customers, both in Australia and internationally." Reference Number: 083 / 2016 Share this announcement Subscribe to the Announcements Feed < Back to results

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