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Productivity Commission 2017 Inquiry on the Telecommunications Universal Service Obligation

Mr. Robert Smallwood

Mid West Development Commission

Perth, WA 14 Feb 2017

DISCLAIMER:

- Western Australia's Regional Development Commissions are currently operating under 2017 Caretaker Conventions[1].
- Accordingly, the position(s) espoused in this presentation are based exclusively upon technical and operational criteria and are not intended to be necessarily critical of, or supportive of, any political party or of the policies, platforms or positions held by any political party.

[1] https://www.premier.wa.gov.au/Pages/Caretaker-Period.aspx

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Robert Smallwood

Mid West Digital Economy Strategy Manger

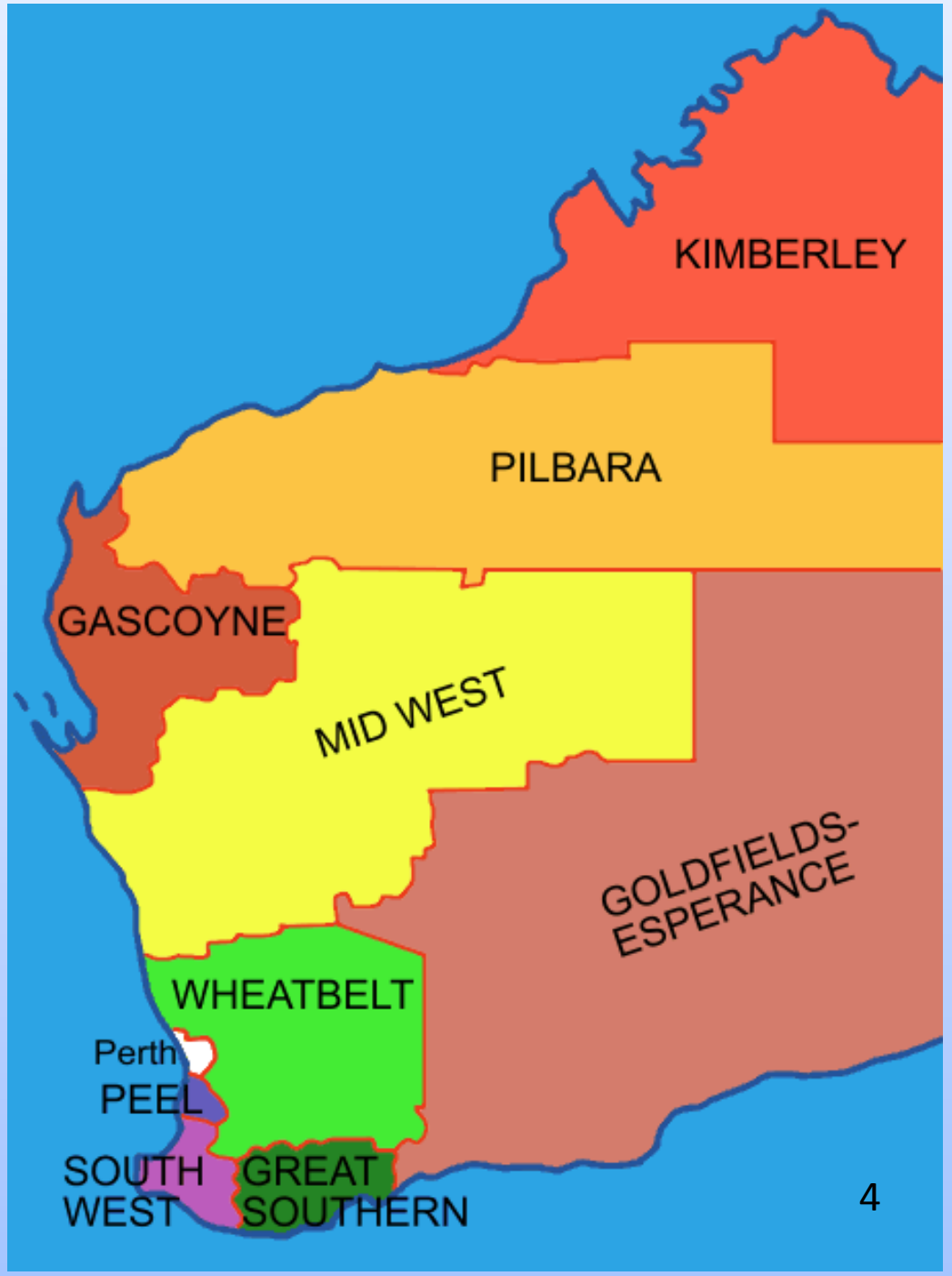
25+ yrs. in telecoms, IT & electronic media

- Sr. telecommunications management roles in Australia and USA (Honeywell, Telstra, AVST et al.)
- Sr. roles major Internet data centres construction and operations and other IT
- Local and State government roles, regional digital communications
- Technical responsibilities in radio/TV broadcasting, professional audio

Regions of Western Australia

- 598,000 residents outside of Perth (23% of the state)[1]
- 32% of economic output of A$193 billion (14.6% of Australia's GDP)[1]
- Western Australia as a separate country would be among the Top 50 economies in the world by GDP.[1]

Global-competitiveness is key to regional success



1. "Regional Development in Western Australia". CEDA, "State of the Regions" report. June 2016

INTRO + Key Points

- Disclaimer – we are under Caretaker Conventions - handout copy
- 598,000 people live in regional WA outside the Perth metro area.
- Reliable telecommunications is critically important to global competitiveness of the region, and becoming more so by the day.
- There a number of aspects to the revised USO being considered -- including broadband -- others will be addressing those areas today.
- My focus today is exclusively on **VOICE** services.
- **There is consideration of the existing USO Voice services being delivered over copper or radio networks being replaced by SkyMuster or mobile networks.**

In essence, we have three major CONCERNS with this:

1. **That this would significantly degrade the customer experience for voice services.**
2. **That troubleshooting and maintenance of satellite services without access to a land line or mobile service would become extremely problematic.**
3. **That the evidence to date suggests that SkyMuster's availability is insufficient to ensure a high probability of availability during an emergency.**

Key Points (2)

With respect to 1: (Customer Experience)

- According to ITU user research, a SkyMuster to SkyMuster phone call would result in "Nearly 100% users dissatisfied". [1]
- It is not acceptable that an existing high-quality voice service be replaced with a lower-quality service. A degraded quality of voice calls and consistently poor customer experience is likely to negatively impact regional competitiveness.

With respect to 2: (Troubleshooting)

- Troubleshooting a failed SkyMuster service without access to a landline or mobile phone is not a reasonable expectation of non-IT specialists.

With respect to 3: (Emergency services access)

- Reliability targets (99.7%) and service restoration targets (10-90 days) for SkyMuster are insufficient to meet public safety requirements[2]. Further, from the information that is available, SkyMuster does not appear to be meeting its reliability targets to date.[3]

1. International Telecommunications Union Standardization Sector--Transmission Systems and Media, Digital Systems and Networks. Recommendations G.107, G.109, G.114 http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=6254
2. *"During October 2016 the average time for Sky Muster complaints to be resolved was 21.4 days." Senate Estimates, 2016*
3. *"Nbn Chief Customer Officer John Simons said so far SkyMuster had not met anyone's expectations".* Port Lincoln Times 12 February 2017.

Key Points and Recommendation

I would like to highlight two specific very recent examples:

- **Horrocks**
- **Bucketty**

- **<u>RECOMMENDATION</u>**:
  It is our view that until it can be clearly demonstrated that SkyMuster voice services or the mobile networks can deliver at least an equivalent customer experience (along with equivalent reliability) to the existing USO voice services, then the latter should remain in place.

SUMMARY POSITION

MWDC would support changes to the USO only if conclusively demonstrated to improve the customer experience for regional, rural and remote Australians.

On existing evidence, replacing existing USO voice services with SkyMuster satellites (even using managed VOiP together with nbn TC-1 traffic priority Bitstream services[1]) or mobile phone networks would:

1. Result in a significantly degraded customer experience;
2. Create significant hardships for regional Australians;
3. Increase the 'Digital Divide' between city and country;
4. Compromise the global competitiveness of Regional Australia.

The burden of proof for demonstrating improved customer experience for any changes to the USO should fall squarely on the Productivity Commission.

1. Traffic class 1: *"Our highest priority traffic class. It is delivered as a committed information rate (CIR) with defined latency, jitter and loss characteristics. It is suitable for applications that require highly deterministic traffic parameters such as voice."* nbn™ Ethernet Bitstream Service. http://www.nbnco.com.au/sell-nbn-services/products-services-pricing/nbn-co-ethernet-bitstream-service.html

Response to Productivity Commission Draft T-USO

- Productivity Commission's Draft Review of the T-USO proposes that nbn SkyMuster satellite or mobile networks (could) be employed to deliver USO voice telephone calls.
- Even under ideal conditions, voice services delivered over SkyMuster satellite could not comply with ITU-T Latency Recommendations, resulting in *"Nearly 100% users dissatisfied"*, according to ITU user research[1]. (On a two-hop call)
- The customer experience on a two-hop SkyMuster managed VOIP call is significantly worse than a call on a land line or a call on a satellite phone.
- SkyMuster was not designed to support real-time voice capability and therefore cannot be (fully) optimized for voice call traffic.
- Changes made to the USO to incorporate broadband as an essential service should not result in the customer experience of voice services being degraded and regional people subsequently being worse-off. (*"No Disadvantage"* criteria)
- **CONCLUSION: On the current evidence, SkyMuster satellite or mobile networks used to deliver USO voice services would significantly degrade the overall customer experience and compromise safety; therefore, neither is a suitable platform for delivering USO voice services.**

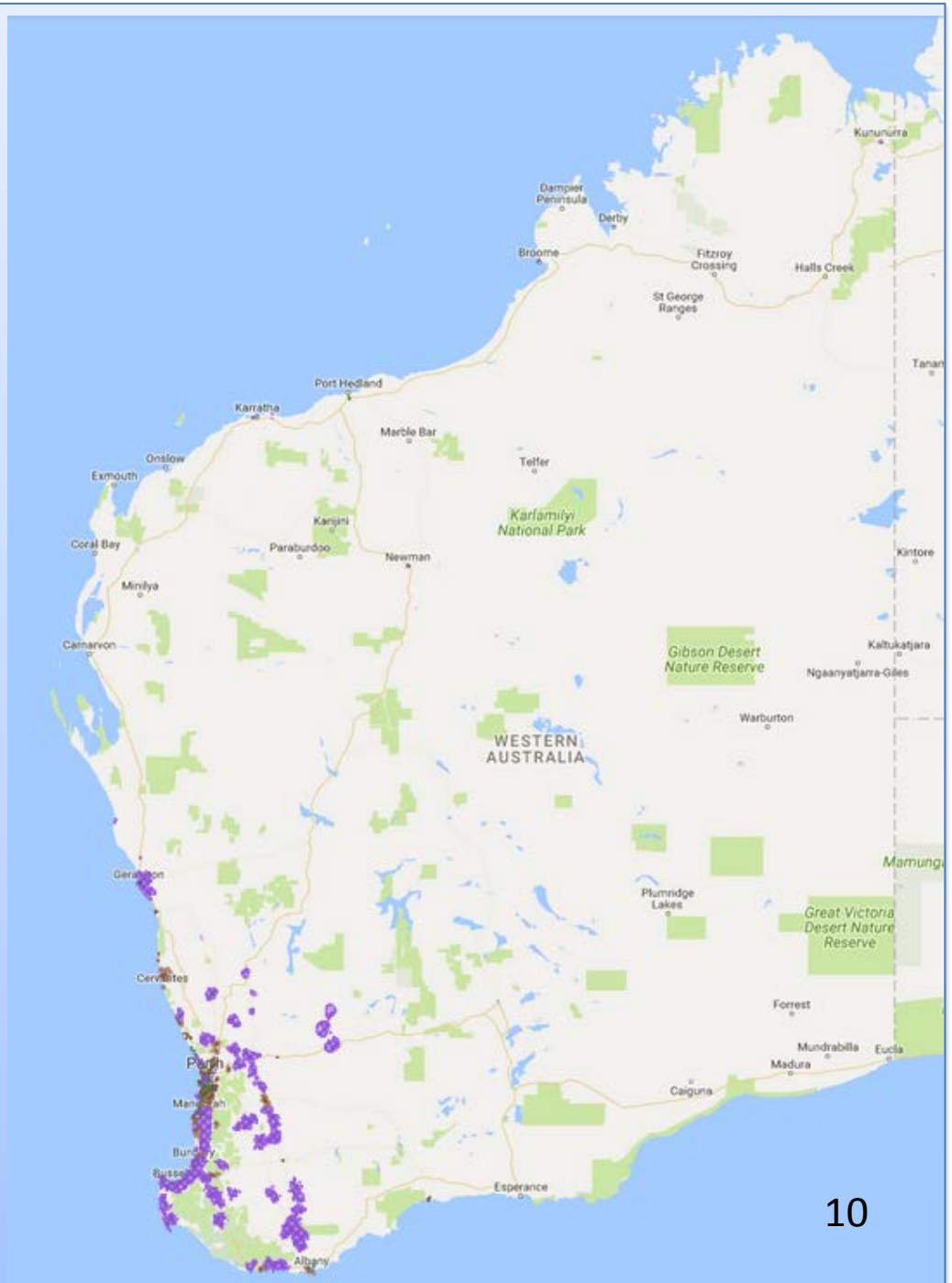
1. International Telecommunications Union Standardization Sector--Transmission Systems and Media, Digital Systems and Networks Recommendations G.107, G.109, G.114 http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=6254

Nbn's 3-year plan for WA

nbn™ Fixed Wireless and Fixed Line services

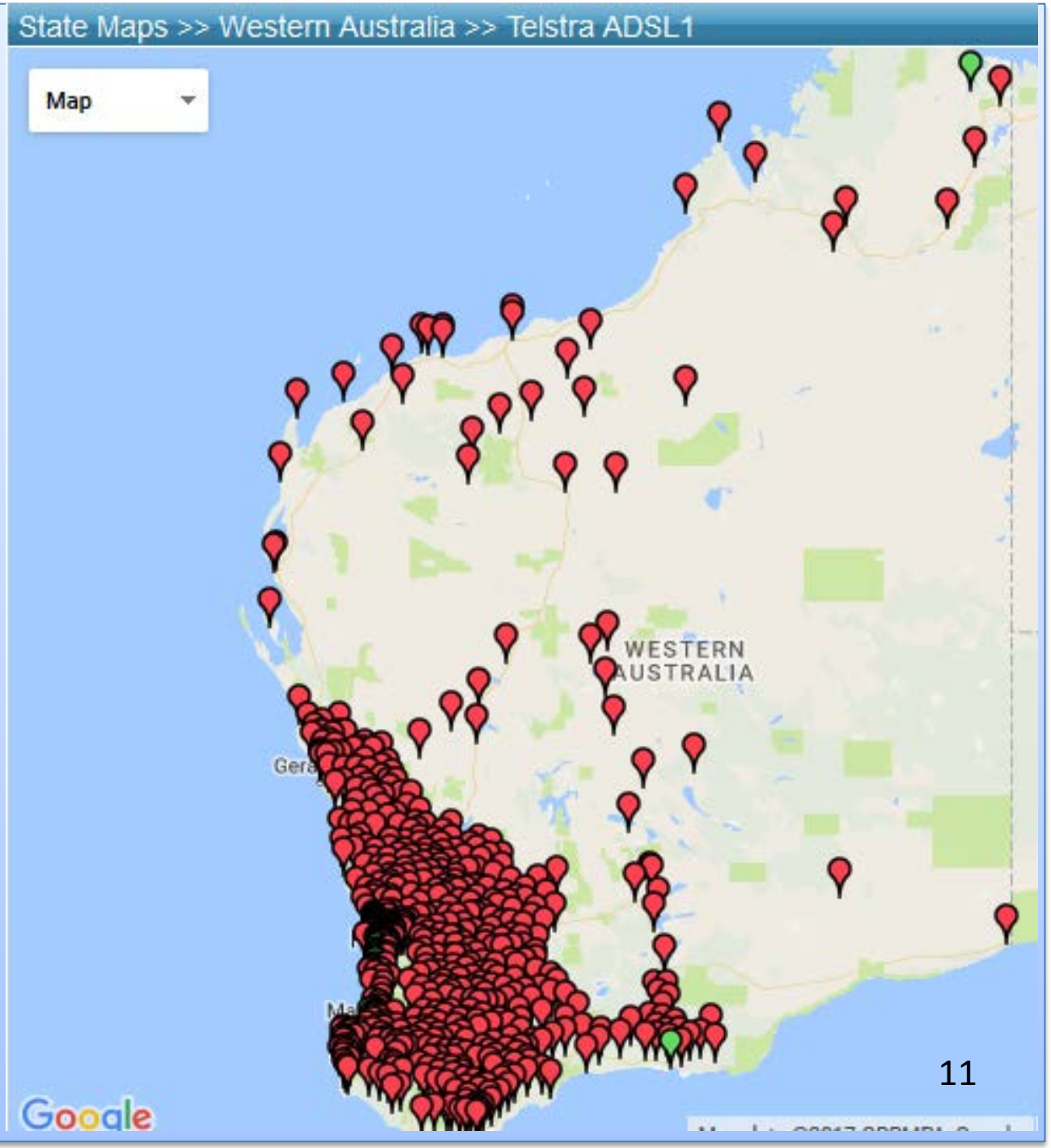
PURPLE

If you're not in a purple zone, you're on SkyMuster



ADSL Exchanges in WA 2017

(Telstra copper network)



List of WA ADSL Exchanges proposed to be replaced by NBN Satellite

- CARNAMAH
- COOROW
- CUE
- KULIN
- LAKE GRACE
- MULLEWA
- THREE SPRINGS
- BRUCE ROCK
- CORRIGIN
- DALWALLINU
- DUMBLEYUNG
- HYDEN
- KONDININ
- LAVERTON
- LEINSTER
- LEONORA
- MEEKATHARRA
- MORAWA
- MOUNT BEAUMONT
- MOUNT MAGNET
- MUKINBUDIN
- MULLEWA
- NAREMBEEN
- NULLAGINE
- PANNAWONICA
- PERENJORI
- QUAIRADING
- WILUNA
- WYNDHAM
- YALGOO

Source:
Great Northern Telecommunications

DELETED

Why are fixed-line services important in regional areas?

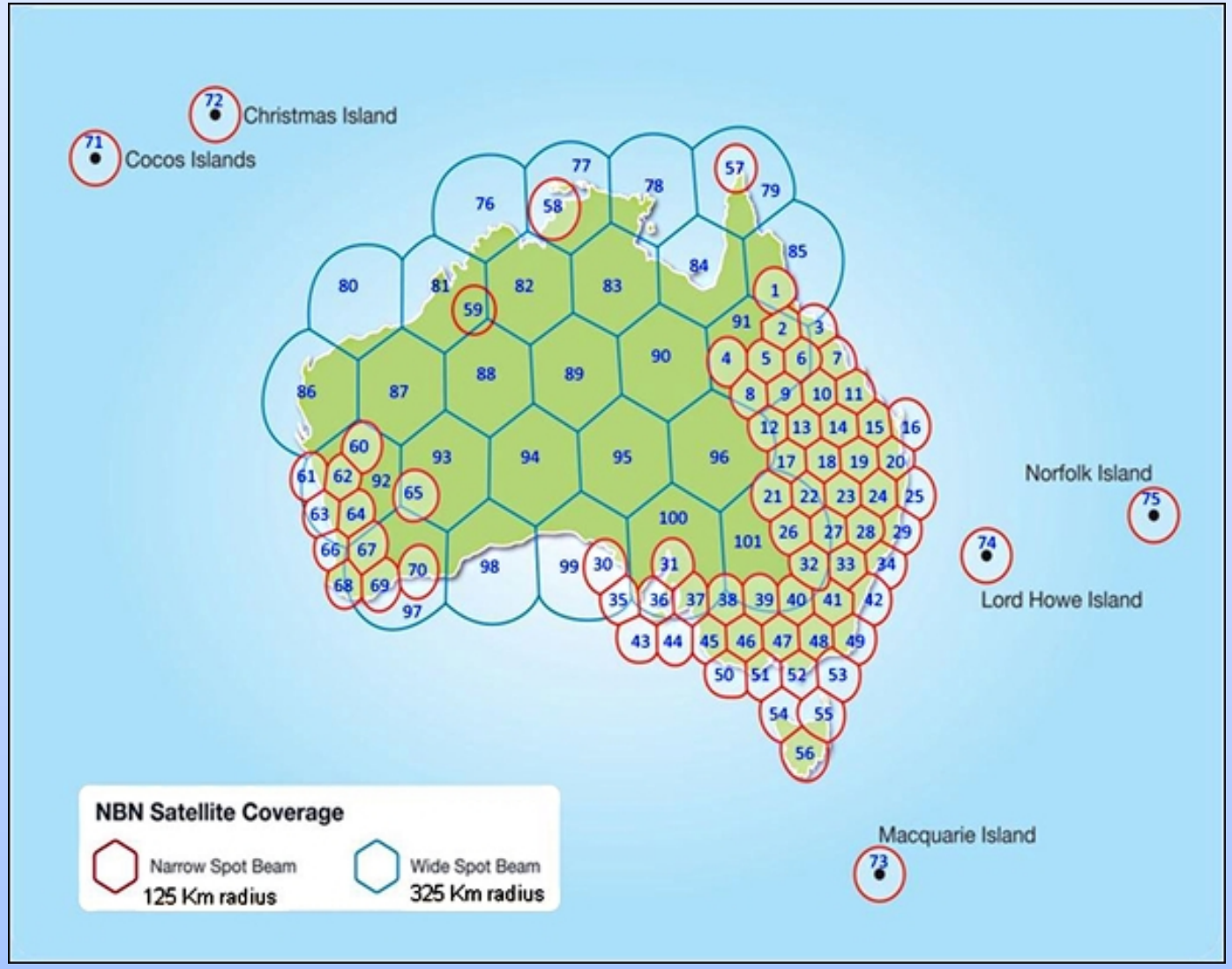
- SkyMuster's history of reliability issues, its inherent complexity, and the inability of customers to troubleshoot or report faults over satellite when the service is down, argue strongly against removing existing fixed line USO voice services.
- USO fixed-line voice services currently provide a redundant communication path and a link to troubleshooting assistance when SkyMuster services fail.

February 7th, 2017, by Paul Budde, Managing Director, BuddeComm

"…we now have two broadband access services in Bucketty, when the Telstra ADSL service in our area is being used heavily (late afternoon, early evening) the ADSL service slows down; so I then change over to the ***satellite*** *service.* ***That service typically cuts out every 10-20 minutes or so****, and then reconnects automatically, mostly within a minute. When I eventually tire of these drop-outs I switch back to the ADSL service in the hope that the service performance there has improved, and remarkably this seems to work most of the time.*

Is this satisfactory? Of course not. Needing to have two services in order to get some sort of accessible online connection is appalling. But I don't have much choice as there is no light at the end of the tunnel for those who have to rely on the NBN."

SkyMuster Spot Beams



nbn earth station to spot beams

Bourke NSW	Broken Hill NSW	Carnarvon WA	Ceduna SA	Geeveston TAS
Beam 3	Beam 4	Beam 7	Beam 1	Beam 6
Beam 14	Beam 22	Beam 11	Beam 12	Beam 8
Beam 24	Beam 30	Beam 28	Beam 15	Beam 46
Beam 26	Beam 33	Beam 32	Beam 47	Beam 51
Beam 52	Beam 44	Beam 39	Beam 72	Beam 53
Beam 55	Beam 48	Beam 40	Beam 76	Beam 62
Beam 58	Beam 54	Beam 73	Beam 84	Beam 67
Beam 60	Beam 82	Beam 79	Beam 98	Beam 74
Beam 61	Beam 87	Beam 85	Beam 100	
Beam 70	Beam 88	Beam 86		
Beam 71	Beam 91	Beam 96		
	Beam 95	Beam 99		
	Beam 97	Beam 101		
Geraldton WA	**Kalgoorlie WA TT&C Site**	**Roma QLD**	**Waroona WA**	**Merimbula NSW TT&C Site**
Beam 5	Beam 10	Beam 9	Beam 2	**Standby site**
Beam 21	Beam 13	Beam 18	Beam 16	Merimbula can assume control of beams from any other gateway to provide service in the event of catastrophic failure
Beam 23	Beam 20	Beam 29	Beam 17	
Beam 25	Beam 34	Beam 35	Beam 19	
Beam 27	Beam 36	Beam 37	Beam 38	
Beam 31	Beam 43	Beam 50	Beam 41	
Beam 42	Beam 56	Beam 57	Beam 66	
Beam 45	Beam 64	Beam 59	Beam 69	
Beam 49	Beam 68	Beam 63	Beam 75	
Beam 77		Beam 65		
Beam 78		Beam 80		
Beam 89		Beam 81		
Beam 90		Beam 83		
Beam 92		Beam 93		
Beam 94				

Telemetry, tracking, and command (TT&C) sites monitor & control the spacecrafts health and location.

Reliability: SkyMuster vs POTS

"Any fault finding and repair of a Sky Muster VoIP service requires intensive involvement by the customer and the provider often for extended periods, with repair times measured in weeks and not days. The end user is intricately involved in the troubleshooting required to solve the issue, a fault cannot be lodged by the provider until this fault finding session (usually occurring over a POTS landline) occurs. A neighbour or friend cannot simply report the service as out of order, and an end user needs to be physically at the location of the installation with a reliable voice service in order to troubleshoot.

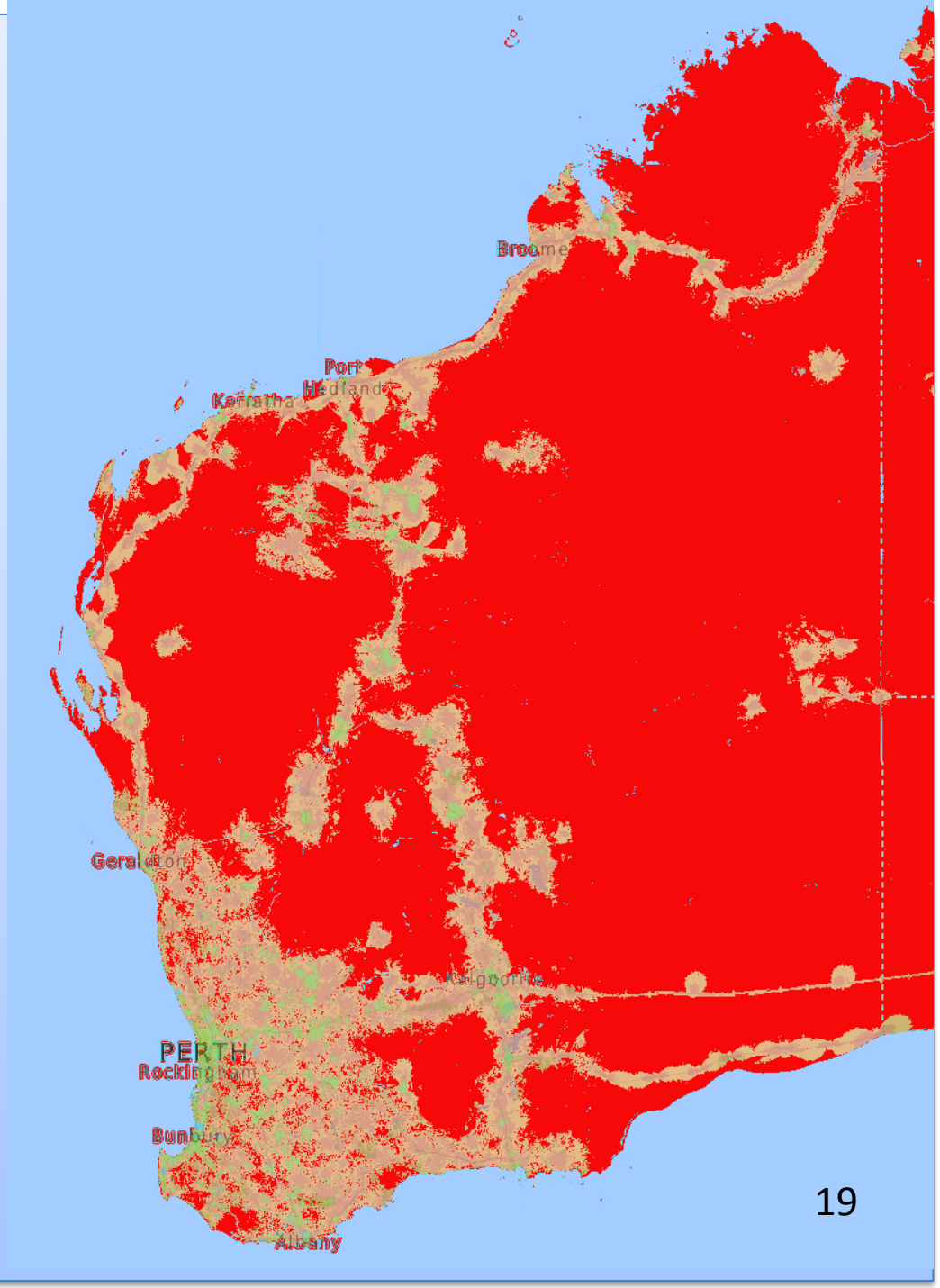
In contrast the maintenance and support of a POTS, is very straightforward. For a POTS service the customer first ensures that their handset is not faulty at the first point of entry and then calls Telstra or their provider. One call and the fault is lodged. The customer does nothing until the fault is relatively promptly repaired."[1]

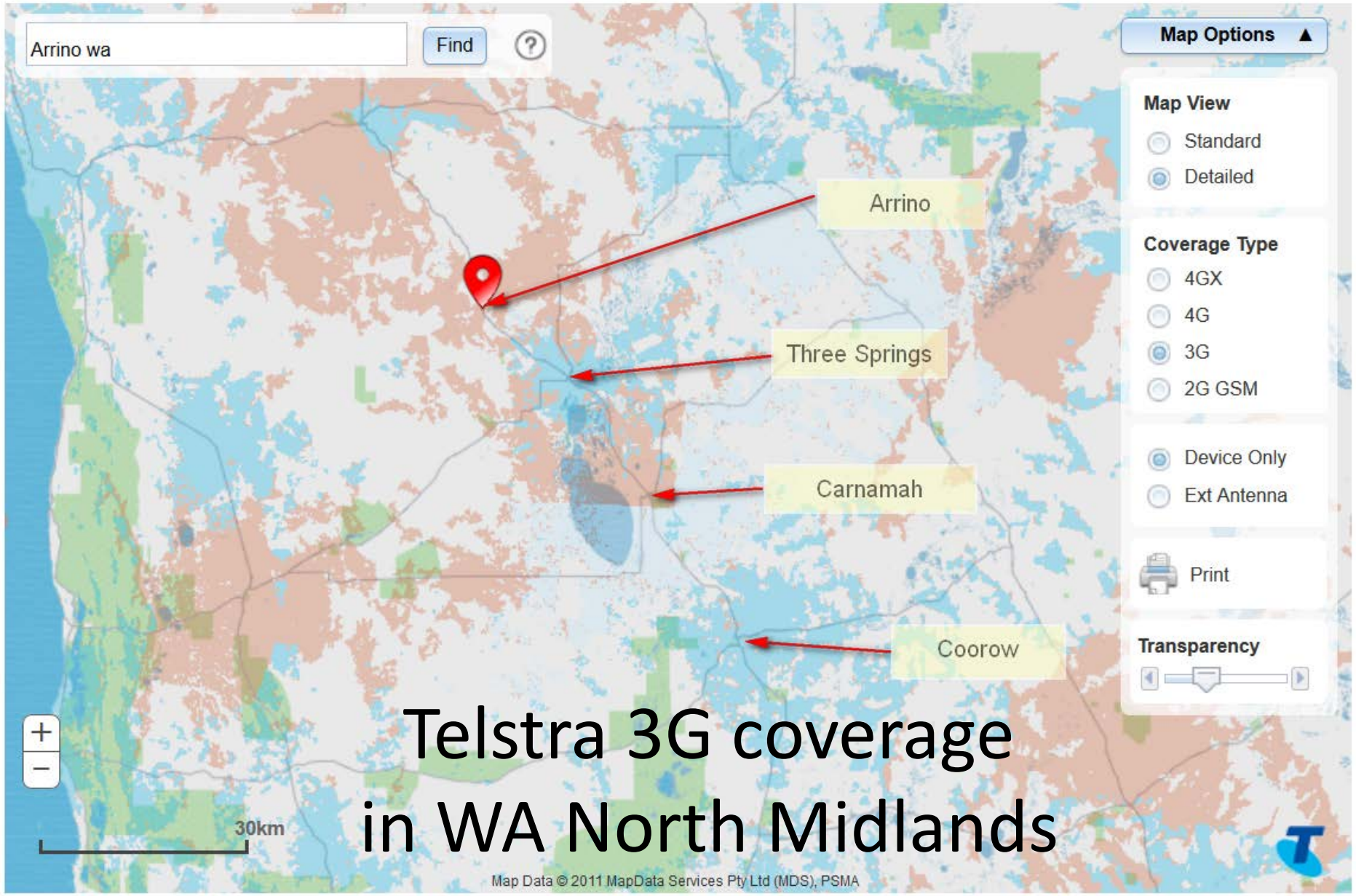
"During October 2016 the average time for Sky Muster complaints to be resolved was 21.4 days."
Senate Estimates, 2016[1]

1. *"Better Internet for Rural, Regional and Remote Australia."* Submission to the Productivity Commission (PC) DRAFT Telecommunications Universal Service Obligation (TUSO) Report. P. 24. 3 Feb 2017.

Areas of WA <u>without</u> mobile coverage

(RED)





Telstra 3G coverage in WA North Midlands

3G typical download speeds 1.1 to 20Mbps

3G typical download speed 550 kbps to 8 Mbps

3G typical download speed 550 kbps to 3 Mbps

This is approximate coverage only. Speed and performance depends on your location and device and can be improved with an external antenna

Voice is available over all the defined coverage areas

Issues with mobile phones as USO voice solution:

- **Impossible to define reliable geographic boundaries where mobile networks could be guaranteed to deliver USO service**
- Projected coverage areas do not always accurately reflect actual service areas.
- Not all populated areas of regional Australia have mobile service
- Impossible to guarantee service accessibility even in ‘covered’ areas
- Coverage area is impacted by traffic loads, congestion, interference, weather, air quality, etc.

High Capacity Radio Concentrator Services

Presently used by Telstra to provide USO telephone service to the majority of remote premises in Regional Australia

- **Provides a high-quality, PSTN-grade voice service to remote Australians**

High Capacity Radio Concentrator Network (WA)

(YELLOW)

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High Capacity Radio Concentrator Network (NATIONAL)

YELLOW

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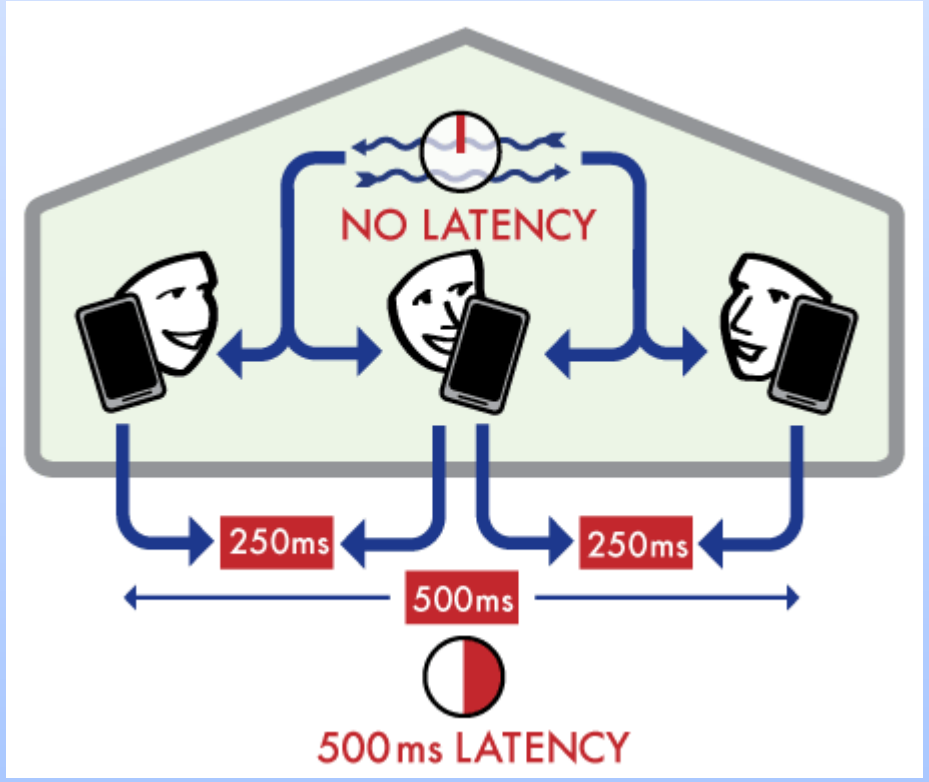
LATENCY

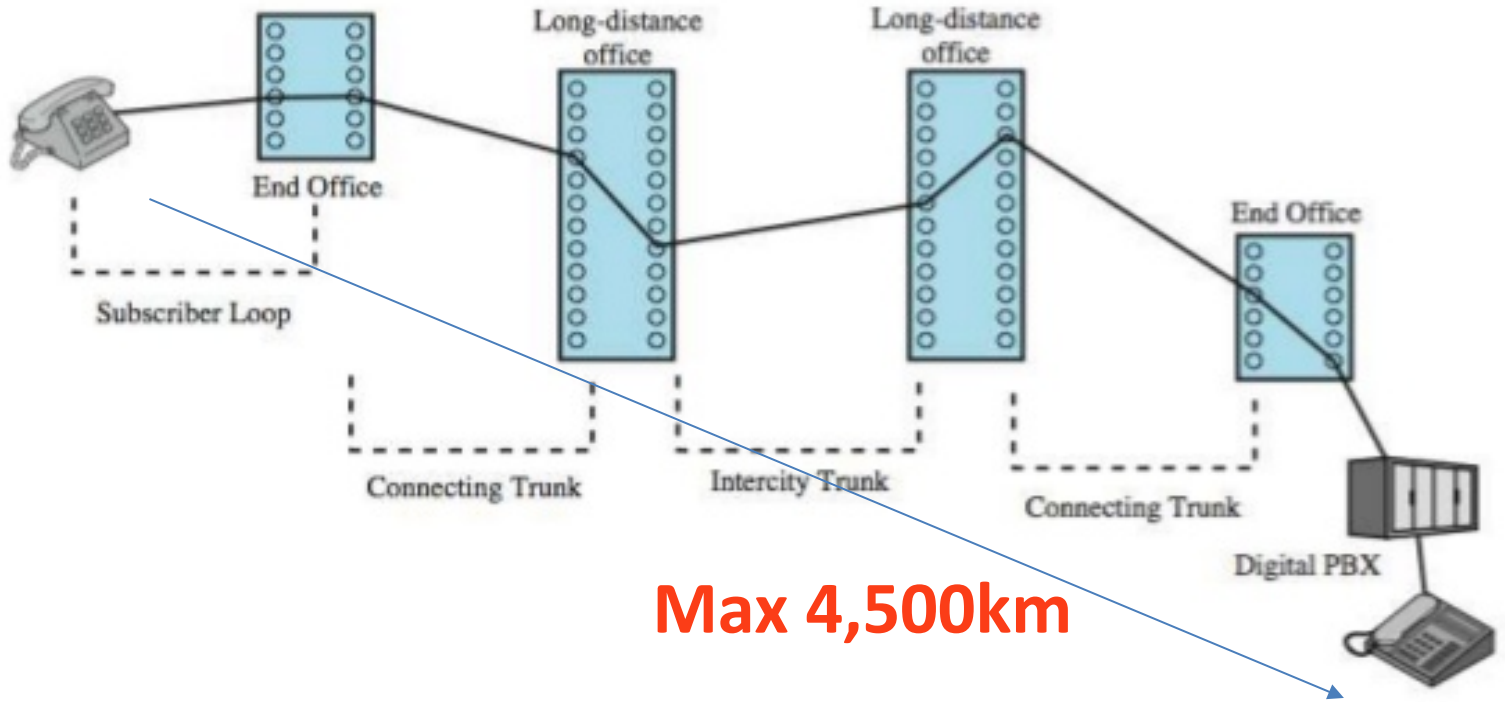


1-hop vs 2-hop

- When only **ONE** end of a voice call is on a SkyMuster managed VoiP service, in the majority of circumstances, the call quality is **acceptable**.
- However, if **BOTH** parties are on a SkyMuster managed VOiP services, even if “nbn TC-1” packet priority is employed, the theoretical minimum (best) latency renders the call quality **unacceptable**.

Standard Voice Call Latency

A Typical
Public Circuit Switched Network (PSTN)



Minimum theoretical latency: **2-25ms**

SkyMuster Latency

Theoretical minimum one-direction latency on a **2-hop**

SkyMuster call: **492 ms**

35,786 km

SkyMuster satellite

119 ms **1.**

119 ms **5.**

119 ms **2.**

119 ms **4.**

"Hello"

Caller on SkyMuster

"Hello"

Called Party on Sky Muster

Regional nbn Earth Station

15 ms **3.**

Up to 4,500 km nbn Network

Sydney nbn Earth Station

Note: Propagation latencies only -- does not include any software, network or equipment latencies

ITU-Standard G.114

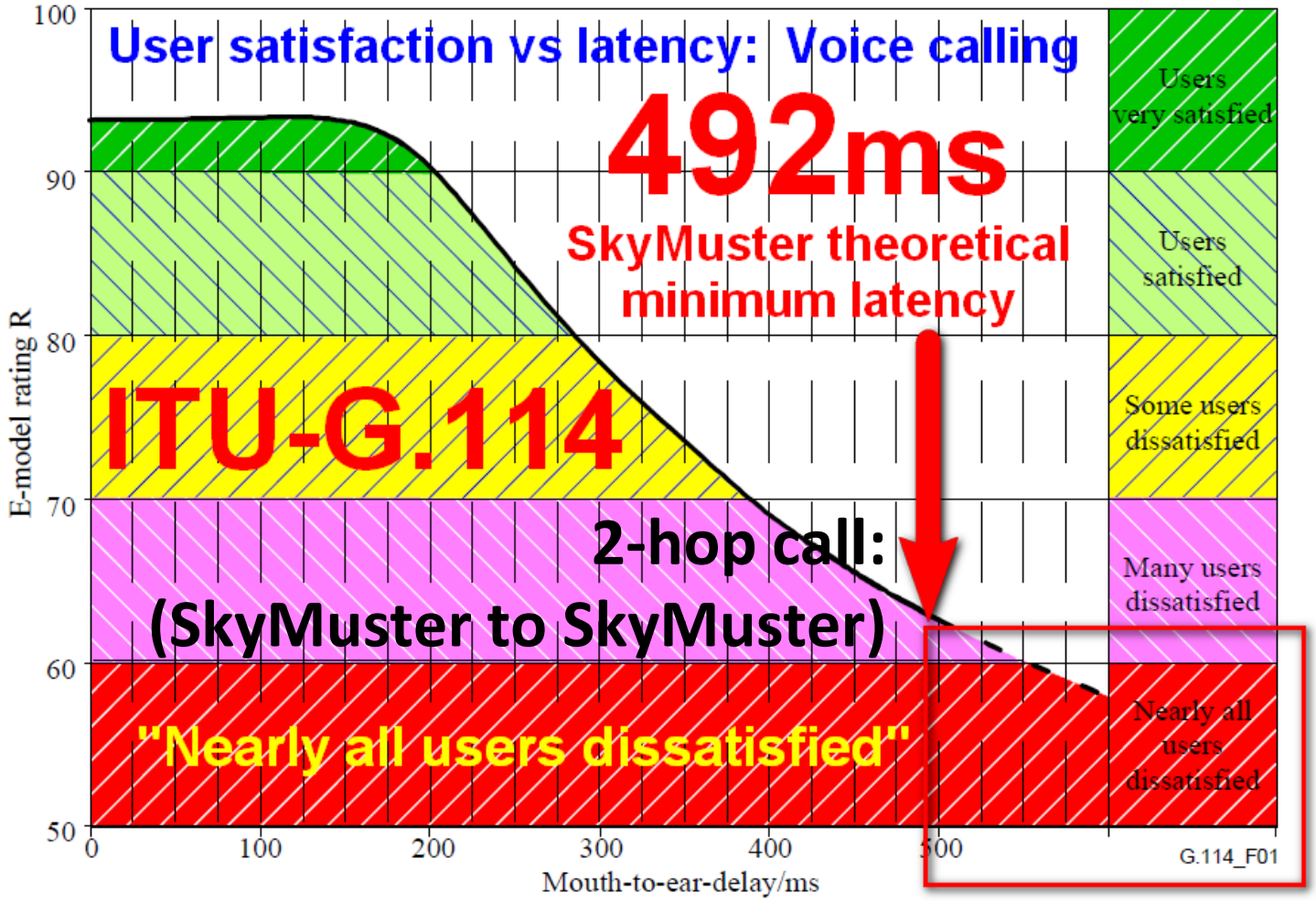


Figure 1/G.114 – Determination of the effects of absolute delay by the E-model

Real World Latency (1.0)

- In a real-world environment, latency on a single SkyMuster hop (to the satellite and back) can (routinely) be in excess of 500ms: 2X the 238ms (119 X 2) theoretical minimum.

SkyMuster Ping/Speedtest

Real World Latency (2.0)

- On a **two-hop** SkyMuster voice call, one-way latency can realistically be in excess of 1,000ms – or more than 2X the ITU-T G.114 recommendation.

SkyMuster Ping/Speedtest

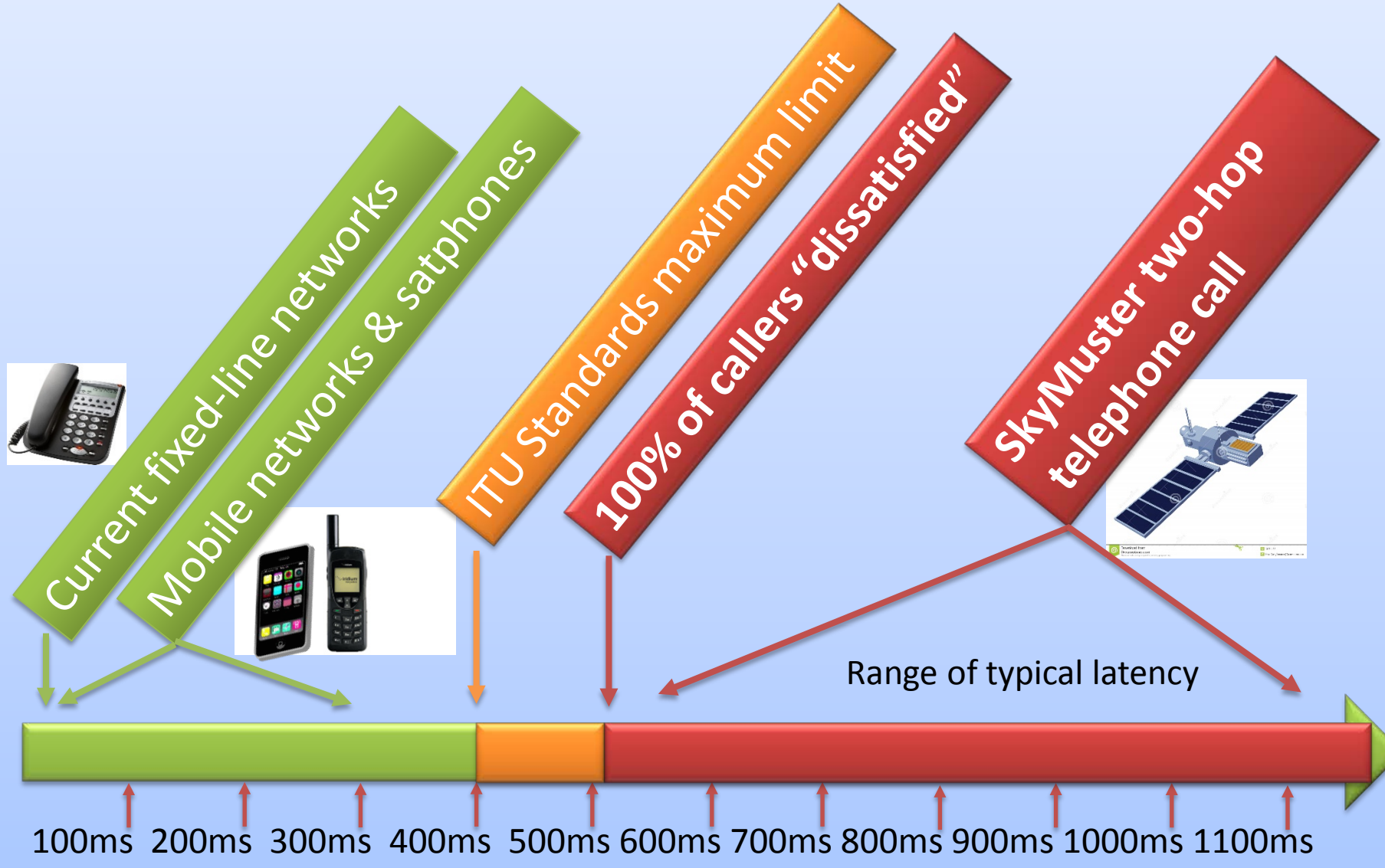
Managed VOIP over SkyMuster ≠ voice call on a satellite phone

SkyMuster
ORBIT: **35,786 km**
300% of Earth diameter
Geosynchronous (GEO) satellite

(119ms latency/leg)

Satphones:
ORBIT: **600-1,100 km**
10-20% of Earth diameter
Low Earth Orbit (LEO) satellites **(5ms/leg)**

Latency Comparisons



Special services and disability services potentially impacted

• 000 Emergency	• Has not been addressed
• Emergency phones in lifts	• No information
• TTY services	• Inoperable on satellite
• National Relay Service	• Inoperable on satellite
• Text Emergency Relay Service	• Inoperable on satellite
• EFTPOS service/terminals	• ?
• Emergency Call buttons	• Impact unknown
• Others?	• ?

NATIONAL RELAY SERVICE

A phone solution for people who are deaf or have a hearing or speech impairment

CONCLUSIONS:

- **MWDC would support changes to the USO only if they could be conclusively demonstrated to improve the customer experience in regional, rural and remote Australia.**
- On a 2-hop conversation, latency accumulation on SkyMuster will **always** violate ITU-G.114 recommendations for voice transmission.
- Reliability, complexity, repair-ability and time-to-repair, make SkyMuster managed VOiP unsuitable for USO.
- Mobile service in many locations is not sufficiently ubiquitous, predictable or reliable to replace existing USO voice services.
- SkyMuster may be unable to deliver some essential services (e.g., disability/ safety services, healthcare services)
- **IN SUMMARY: On the current evidence, even using nbn TC-1 packet prioritisation and managed VOiP, neither SkyMuster satellite nor the mobile phone network can be shown to maintain or improve the customer experience for voice services in regional, rural and remote Australia.**

THANK YOU.

Presenter: Mr. Robert Smallwood

Government of **Western Australia**
Mid West Development Commission

Supplementary information: Satphone vs SkyMuster

Satphone

- LEO satellites close to earth
- Network optimised for voice calls
- Dedicated equipment for call routing and switching
- MANY satellites (60+)
- Generally immune to most interference.
- Latency on one-way double hop: <100ms

SkyMuster

- GEO satellites far from earth
- Cannot be fully optimised for voice calls
- Potential network contention. No dedicated circuits for call routing and switching
- Two satellites
- Susceptible to interference including hills, trees, etc.
- Typical latency on one-way double hop: >600ms

Supplementary information:

Other factors contributing to latency/performance degradations

- Software delays (e.g., echo cancellation)
- Jitter
- Serialisation delay
- TCP ‘acks’ and error correction
- Network equipment
- Network congestion
- Atmospheric conditions (weather: rain, dust, humidity, storms, etc.)
- Debris, leaves, birds

- 26-40GHz transmission frequency of Ka-band satellite spectrum is highly sensitive to any form of interference:
  - Drop-outs
  - Difficulty reconnecting, re-negotiating and re-authorising