

Connectivity in Bermuda

The State of the Island's Mobile Networks as 4G Roll-Out Commences

(Phase 1 – West End Deployment) «complete

(Phase 2 – Interim Coverage Obligations) «complete



Summary

Mobile connectivity has never been more important in our lives. This report sets out the current levels of mobile connectivity in Bermuda. This is a time of rapid change for the Island's mobile networks as they start their 4G deployment, initially concentrating on the areas around the Great Sound as part of the licence obligations¹ imposed to ensure the America's Cup was delivered with world-class connectivity.

The key findings are that Bermuda has excellent voice connectivity, implemented using the existing 2G and 3G mobile networks. Coverage is near-universal, call dropping very rare compared to international norms and the quality of voice is nearly always high.

Data connectivity remains a work in progress. The legacy 3G network provides good levels of coverage but with speeds that are typically in the region of 4Mbits/s. 4G or LTE, where deployed, increases that speed to above 20Mbits/s and delivers a

much-improved experience with shorter delays.

We anticipate that in the short term, some reduction in 4G coverage in the Great Sound may occur as temporary sites set up for the America's Cup are decommissioned post event. However, the operators should then turn quickly to deploying more permanent sites throughout the Island. Their 4G licence requires them to achieve 99.9% coverage by May 2018.

Once deployed, their work is not done. Data consumption is growing rapidly around the world and network capacity needs frequent enhancement to accommodate this growth. Hence, the Regulatory Authority (the Authority) will continue to monitor and report on connectivity for the foreseeable future, and specifically for the 50% and 99.9% coverage obligations.

¹ See <http://www.rab.bm/index.php/spectrum-menu/spectrum-licenses/bdc/864-bdc-radio-spectrum-licence-10-30-14/file> and [\[menu/spectrum-licenses/tbwi-digicel/877-tbwi-mobile-radio-spectrum-licence-10-30-14/file\]\(http://www.rab.bm/index.php/spectrum-menu/spectrum-licenses/tbwi-digicel/877-tbwi-mobile-radio-spectrum-licence-10-30-14/file\)](http://www.rab.bm/index.php/spectrum-</p></div><div data-bbox=)

Voice

Voice calling may be on the decline but is still a critical part of the mobile experience for all. Key is:

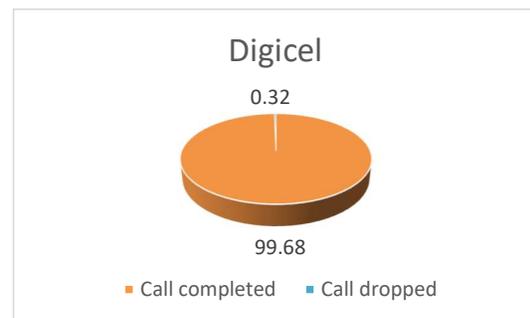
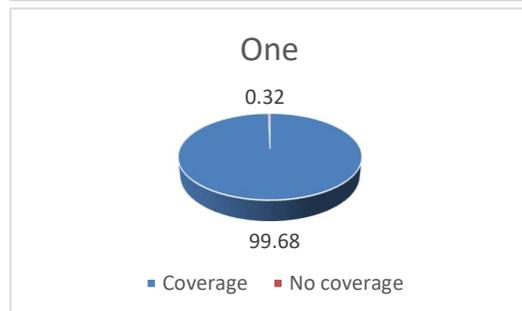
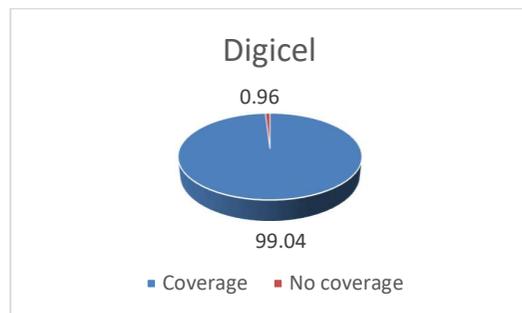
- Can I make a call when I need to?
- Will the call be free of dropping allowing me to complete it?
- Will the quality of the voice be high enough for a pleasurable experience?

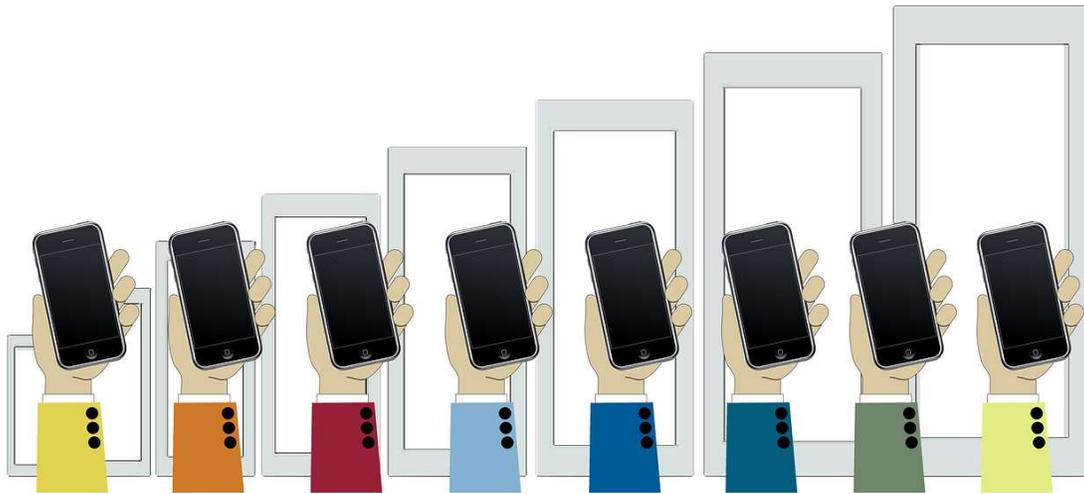
4G networks are optimised for data. They can carry voice, using a similar solution to that adopted by Skype and WhatsApp, but initially operators prefer to use 2G and 3G networks for voice calling. That is currently the case in Bermuda.

Coverage is close to 100% as is the percentage of calls completed.

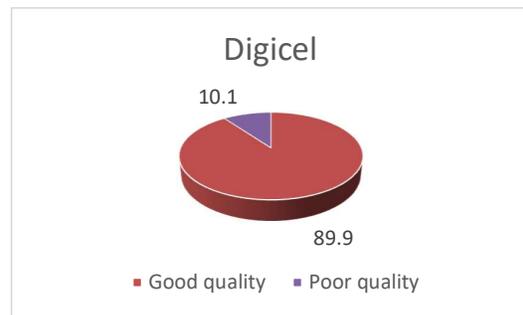
Indeed, these numbers are so close to 100% that it only takes one unusual event – such as a cruise ship docking during a time of unusually high network usage, for the statistics to be impacted. The Authority observed such a situation when measuring.

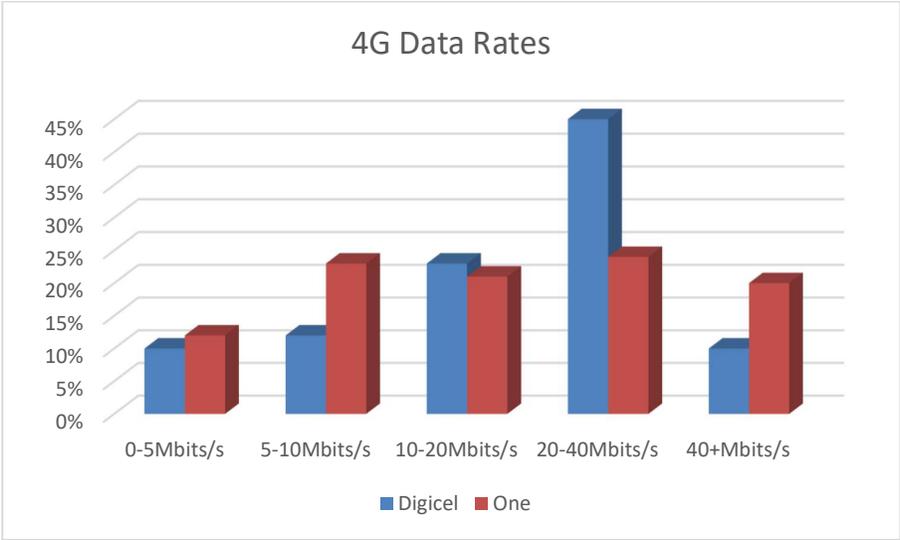
Note that these measurements were made outdoors. The experience within buildings may well be worse as the signal is often weaker indoors.





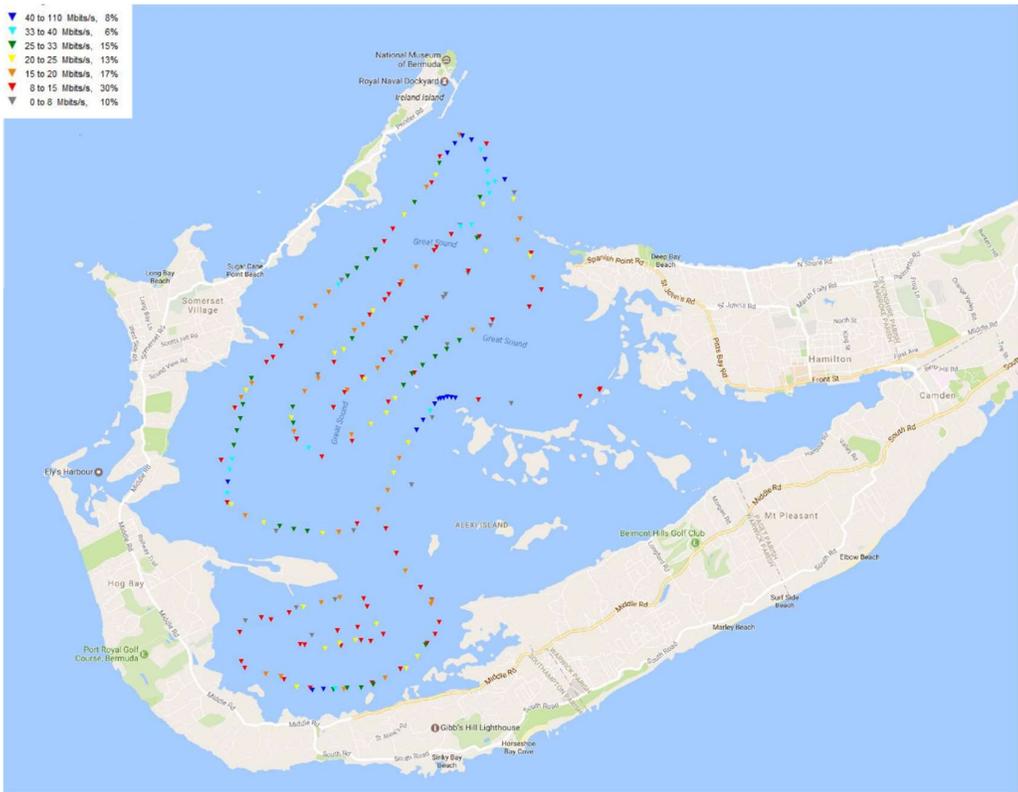
Voice quality is not quite so high as availability, but still very respectable. Between 80% and 90% of calls reach a quality level that users tend to judge as “good”. The Authority will monitor both networks carefully to make sure voice quality stays high as traffic migrates to 4G.





For those on the water speeds are also generally high. Streaming a

movie while cruising the Great Sound should be entirely possible.



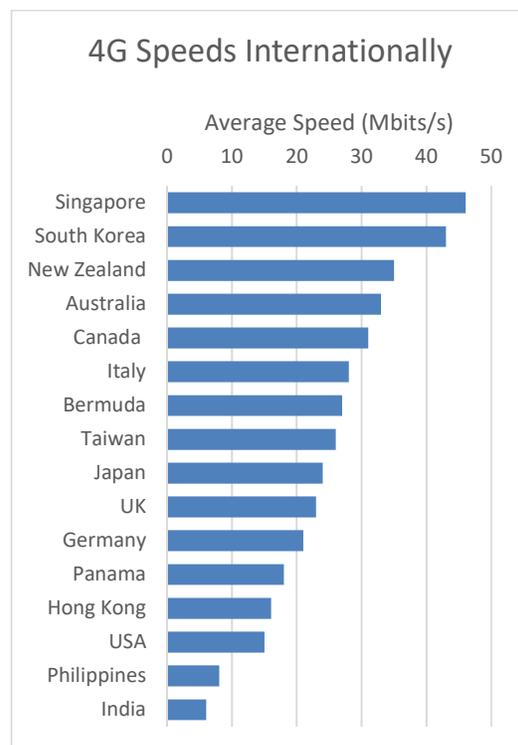
Looking Ahead

We anticipate rapid change in mobile connectivity over the coming year as 4G is deployed to meet licence obligations. For One these are to reach 50% already and 99.9 % coverage by November 2017. For Digicel the targets are 50% by August 2017 and 99% by May 2018. Data rates of 15 Mbps are mandated. As a result, we expect to see speeds above this or perhaps 25Mbps/s delivered across the Island, albeit not in every location and not all the time. As the chart shows, this would place Bermuda about mid-table in terms of global mobile speeds – a good position given its small size and limited wireless technology industry. We anticipate rapidly increasing use of mobile data with associated benefits to productivity and quality of life. The Authority will measure these improvements regularly and report on them.

There is still much to do. Mobile networks cannot realistically reach deep into every building and we will need to use other solutions such as Wi-Fi in these cases, to free up precious mobile data resources. Ensuring interference-free WiFi

systems and making them as widely available as possible will be a key element of future connectivity.

While Bermuda deploys 4G, some other countries are contemplating 5G. It is still far from clear when 5G will be ready and what benefits it will bring, but we will monitor closely and move decisively once it is clear that the technology is mature enough for local deployment.



Adapted from OpenSignal report. Bermuda added. Note methodologies differ so results may not be directly comparable.

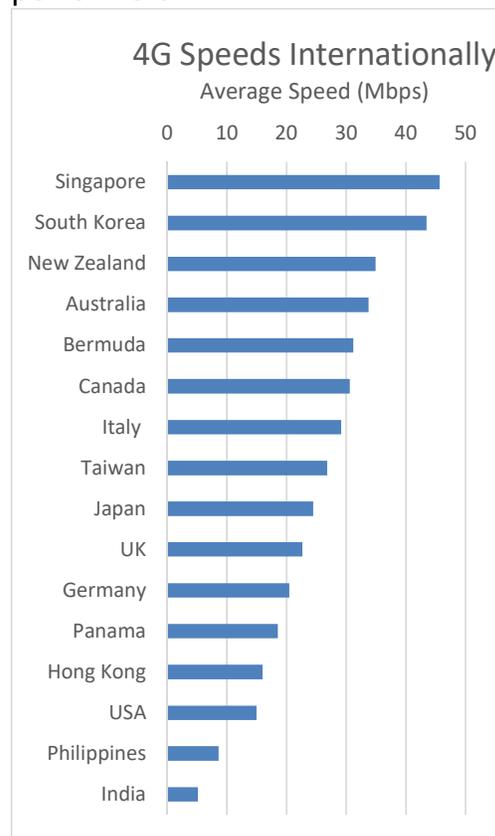
Phase 2 – Interim Coverage

During the week of 20 August 2017, the Authority continued its phased testing of both One and Digicel’s 4G networks. These tests were carried out concurrently, with a 75% coverage requirement for One and a 50% coverage requirement for Digicel.

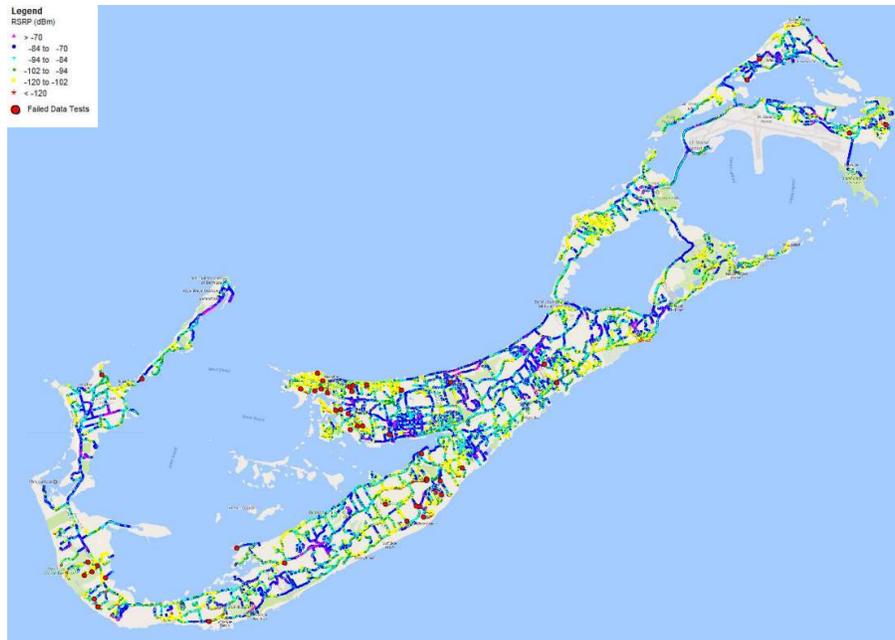
It should be noted that this phase was focused solely on 4G data testing noting that the users mobile quality of experience tends to be better when it is faster. 4G broadband mobile technologies have been designed with different Quality of Service (QoS) frameworks to enable delivery of the evolving Internet applications. Specifically, it is a fundamental requirement to provide satisfactory service delivery to users and also to manage network resources. Both operators achieve a near-identical average download data rates of 31Mbps/s, with one exhibiting peak speeds of over 90Mbps/s.

Notwithstanding the most recent tests carried out for both 50 & 75 % (Digicel & One respectively), there is still ground to be made up before

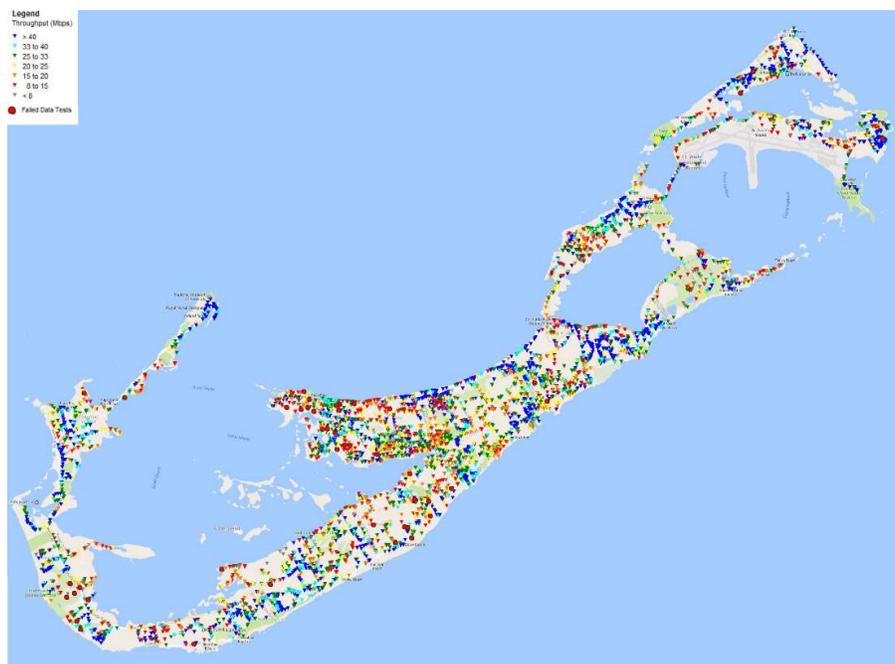
Phase 3² testing commences for both carriers. The Authority, during its latest testing, witnessed failed data tests by both carriers. It is envisioned, that by the time the Phase 3 measurements are carried out, both networks will be better optimised thus delivering less failed data tests. All in all, Bermuda is well on its way to having 4G networks that are amongst the upper tier performers.



² 99.9% Island-wide coverage with minimum user data rate of 4 Mbps and minimum average user data rate of 15 Mbps.



The above image is that of the of the Reference Signal Received Power (RSRP). This is a good indication of signal strength, and can be referenced in the legend (Top Left-hand Corner of Drawing).



The above image is that of the of the Through-Put in (Mbps). This is a good indication of download speeds one can expect in any given part of the island, and can be referenced in the legend (Top Left-hand Corner of Drawing).

The Regulatory Authority of Bermuda

This report has been prepared by the Authority, based on measurements conducted on its behalf by Score Technologies. The voice measurements were made in January 2017 while the data measurements were made in May (America's Cup Obligation) and August 2017 (Interim Coverage Obligation).

The Authority, after conferring with each licensee, agreed testing methodologies with both operators. These methodologies form the basis for results referenced in this document, and will be used to verify both 99.9% coverage obligations at later dates.

If you have any questions about this report, or any aspects of the work of the RAB, you can contact us at: info@rab.bm