

Connectivity in Bermuda

The State of the Island's Mobile Networks
as 4G Roll-Out Commences
(Phase 1 – West End Deployment)



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 the network operators, Bermuda Digital Communications Limited ("One Communications") and Telecommunications (Bermuda & West Indies) Limited ("Digicel"), start their 4G deployment, initially concentrating on the areas around the Great Sound as part of the licence obligations¹ imposed by the Regulatory Authority (the "Authority") to ensure the America's Cup was delivered with world-class connectivity.

The Authority's 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.

The Authority anticipates 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. The operators' 4G licences requires them to achieve 99.9% coverage by May 2018.

Once deployed, the operators' work is not done. Data consumption is growing rapidly around the world

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=)

and network capacity needs frequent enhancement to accommodate this growth. Hence, the Authority will continue to monitor and report on connectivity for the foreseeable future, and specifically for the 50% and 99.9% coverage obligations.

Voice

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

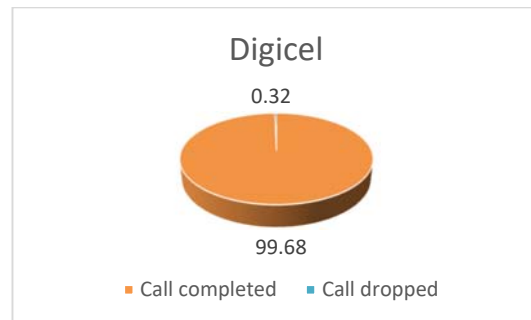
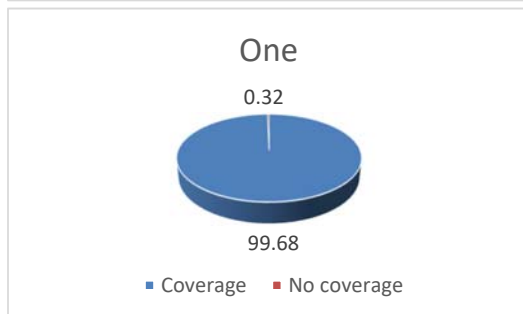
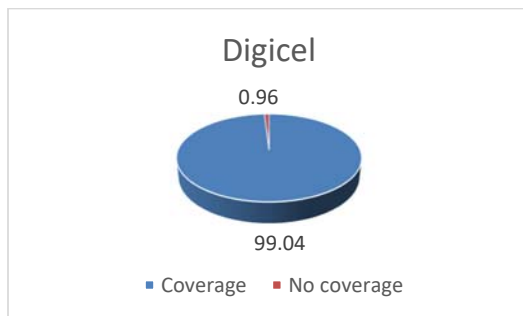
- Can I make a call when I need to?
- Will the call be free of dropping allowing me to complete it?
- Will the quality of the voice be high enough for a pleasurable experience?

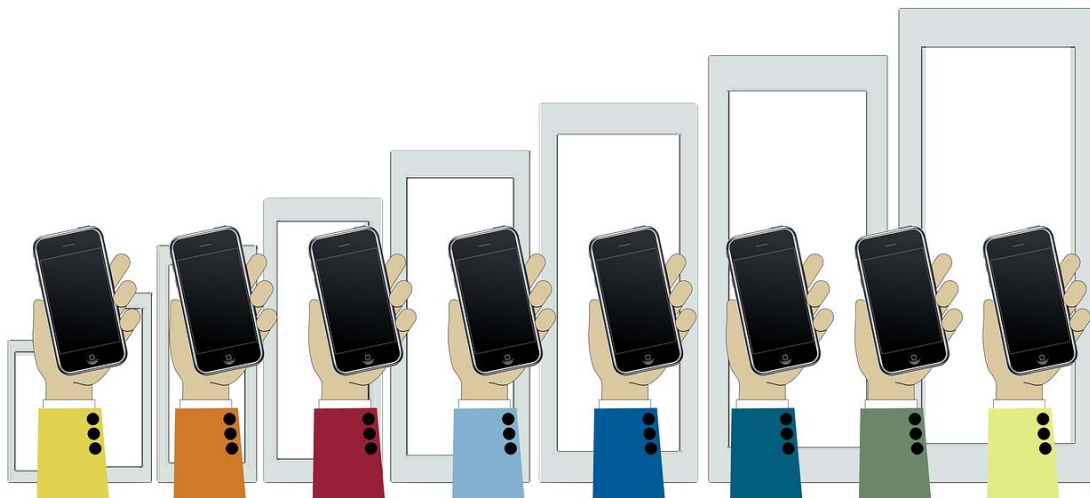
4G networks are optimised for data. They can carry voice, using a similar solution to that adopted by Skype and WhatsApp, but initially operators prefer to use 2G and 3G networks for voice calling. That is currently the case in Bermuda where

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

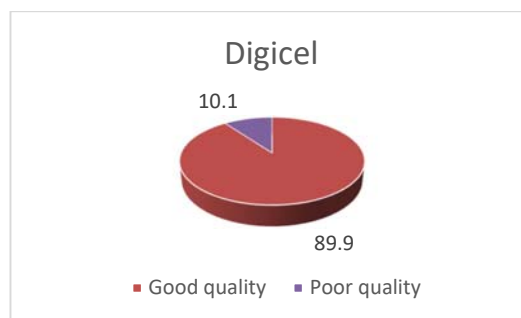
Indeed, these numbers are so close to 100% that it only takes one unusual event – such as a cruise ship docking during a time of unusually high network usage, for the statistics to be impacted. The Authority observed just such a situation when measuring.

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 as 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.

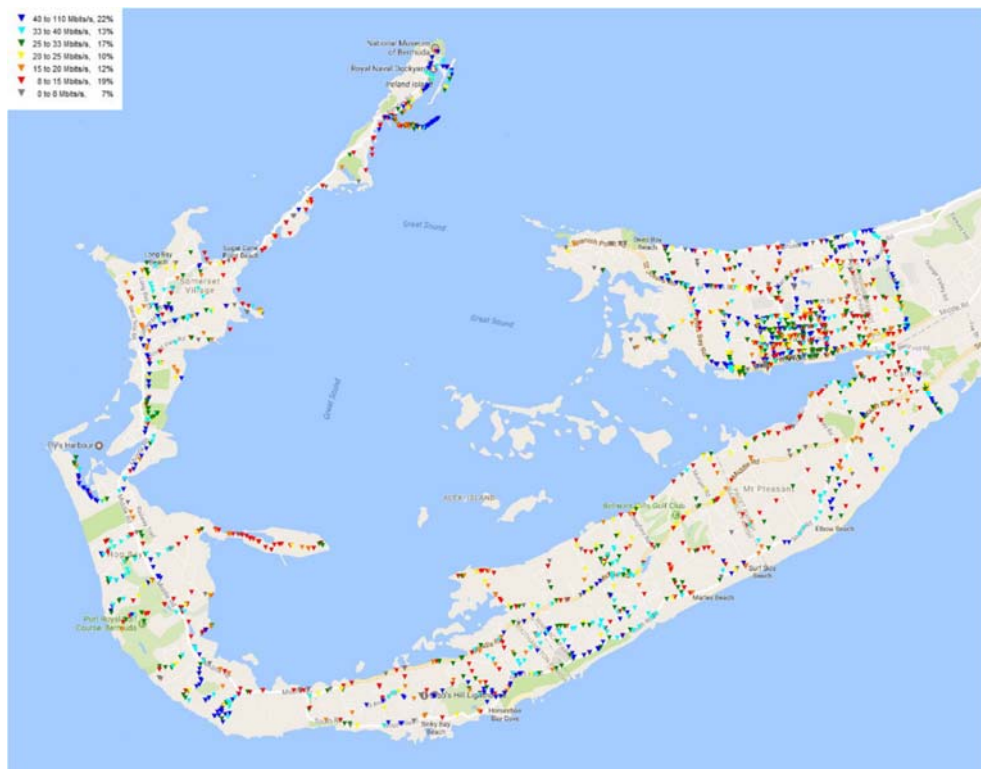


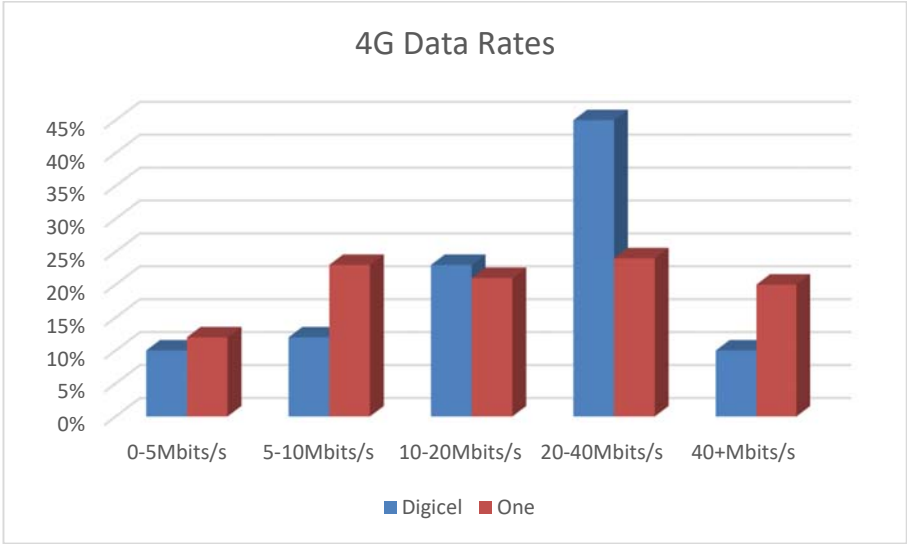
Data

The mobile experience tends to be better when it is faster. Web pages download more quickly. Apps work better. Emails appear immediately. 4G provides a significant increase in data rate compared to 3G. Both operators achieve a near-identical average data rate of 27Mbits/s, with one exhibiting peak speeds of over 80Mbits/s. Often, once speeds exceed around 10Mbits/s it is other factors, such as the time for a message to reach a server in the US, that dominate the experience. Hence, these average speeds are

comfortably higher than most will need for normal data usage patterns.

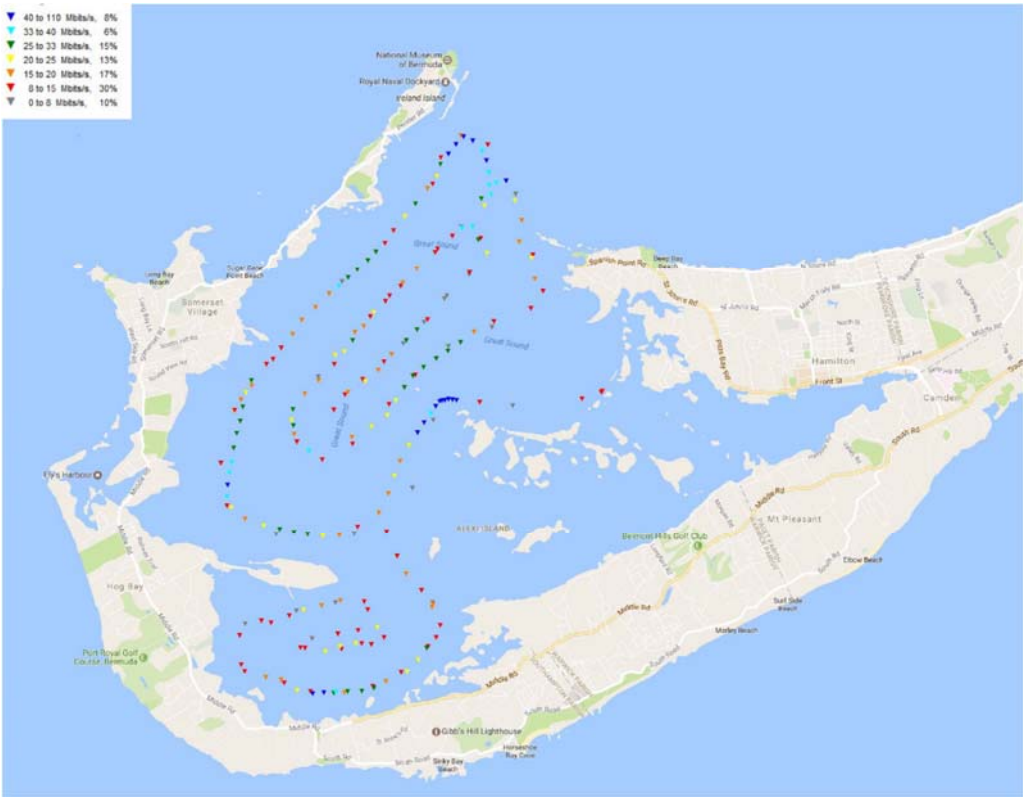
However, as the map and chart shows, speeds are far from uniform, being much higher, for example, in Hamilton and in something like 5% of cases falling to typical 3G rates. Speeds can also fall over time as network congestion grows – this is now occurring in some networks in countries like the UK. Also, 4G may not currently be available at all to those in the east end of Bermuda.





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

movie while cruising the Great Sound should be entirely possible.



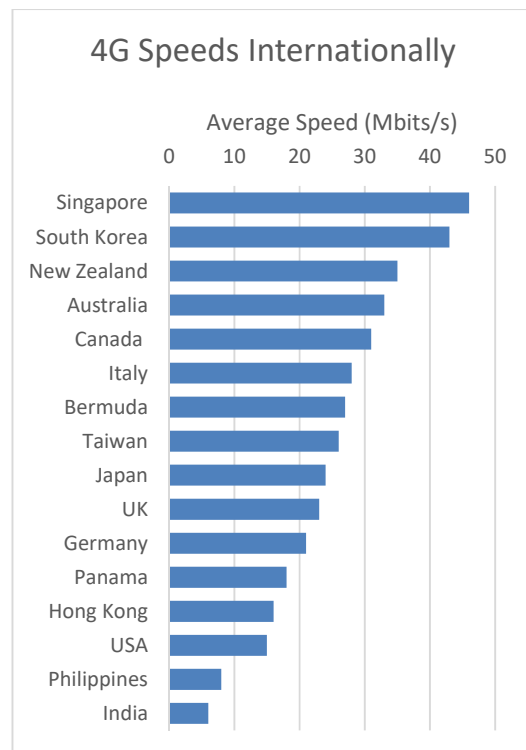
Looking ahead

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% coverage already and 99.9% coverage by November 2017. For Digicel the targets are 50% by August 2017 and 99.9% by May 2018. Data rates of 15Mbits/s are mandated. As a result, we expect to see speeds above this of perhaps 25Mbits/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 Wi-Fi

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.

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 2017.

The Authority, after conferring with Digicel and One Communications, agreed testing methodologies with both operators. These methodologies form the basis for results referenced in this document, and will be used to verify both 50% and 99.9% coverage obligations at later dates.

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