REGULATORY AUTHORITY
OF BERMUDA

Annual Market Analysis 2021

Electronic Communications Sector

Date: 18 October 2022

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INTRODUCTION AND METHODOLOGY

Under the Electronic Communications Act 2011, the Regulatory Authority of Bermuda ("RA") is tasked with "supervising, monitoring and regulating the electronic communications sector". This includes "the promotion of effective and sustainable competition, investment and innovation, the management of scarce resources utilized by the sector and the protection of the rights of consumers".

In the RA Work Plan for fiscal 2021-2022, the RA announced that it would conduct an annual market analysis in the Electronic Communications ("EC") sector and publish market data from the sectoral providers. This report covers the 2021 calendar year and is based on data submitted by the sectoral providers in the summer of 2022[1]. Data is additionally sourced from EC sectoral providers' quarterly financial reports to the RA and from the Bermuda Government Department of Statistics.

Going forward, the RA's intention is to provide this market analysis report annually in April for the preceding calendar year.

The 2021 report should consider measures taken by the Bermuda Government to reduce the impact of the Covid 19 virus. Usage of EC services was affected by increased home working, technology solutions that enabled continued communication such as internet-based meetings, fewer travellers both inbound and outbound, and the resumption of office work (return to normalcy).

The RA would like to thank all sectoral providers for their contributions to this report.

[1] The accuracy of the market data provided by the sectoral providers and used in this report is the sole responsibility of the sectoral providers.

OVERVIEW OF THE ELECTRONIC COMMUNICATIONS SECTOR IN 2021

A high-level snapshot of the economic contribution of the EC sector to the Bermuda economy is shown over the next page, followed by an overview of EC consumers.

CONTRIBUTION TO BERMUDA'S ECONOMY IN 2021

Contribution	2019	2020	2021
Total Revenue	$199.10	$183.36	$184.54
Total Contribution to tax (Government, Handsets, Spectrum & Regulatory)	$ 21.04	$ 19.65	$ 20.01
Total staff employed (full time staff equivalents)	351	341	289
Total capital investment	$ 17.79	$ 12.05	$ 11.73
Total broadband subscriptions	38010	38677	35458
Total mobile phone subscriptions	59152	58124	58490

FIGURE 1: CONTRIBUTION TO BERMUDA'S ECONOMY (000'S)

RESIDENTIAL CUSTOMER SNAPSHOT

Average monthly spend per user for mobile post paid		
2019	2020	2021
$ 71.59	$ 62.47	$ 58.97

Average monthly spend per user for broadband		
2019	2020	2021
$140.16	$121.02	$120.34

Average monthly spend per user for mobile prepaid		
2019	2020	2021
$113.05	$ 94.27	$ 87.28

Average broadband subscription speed		
2019	2020	2021
59Mbps	139Mbps	160Mbps

Average monthly spend for fixed voice		
2019	2020	2021
$ 31.14	$ 33.61	$ 36.95

FIGURE 2: RESIDENTIAL CUSTOMER SNAPSHOT

EXECUTIVE SUMMARY

The EC sector in Bermuda had a total of 21 Integrated Communications Operating Licences (ICOL) in place at the end of December 2021[2]. Of these 21 ICOL holders, 2 were issued in September 2020[3] and 4 are currently inactive. This leaves a total of 15 active sectoral providers in the Bermuda market that were solicited to provide information for this analysis.

In the RA's most recent Market Review of the Electronic Communications Sector (September 2020[4]), it was noted that there were "competition concerns in 7 of the 15 markets across four of the six services: broadband, mobile, fixed voice and business connectivity". Two entities (One Communications and Digicel) were identified as having Significant Market Power (SMP) in one or more of these categories[5].

Overall economic impact of the Electronic Communications sector

In 2021, the EC sector (including fixed, mobile, broadband, and business connectivity):

- generated $184.5M in relevant revenue which is a 0.6% increase on the 2020 total. The $183.4M 2020 revenue realized a 7.9% decrease on the 2019 total of $199.1M;
- contributed a total of $16.9M in direct Government fees including Government Administration Fees, handset fees and spectrum fees which is an increase of 3% on the 2020 total of 16.4M. 2019 to 2020 realized a 6.5% decrease on the $17.6M 2019 total;
- contributed $3.1M to the RA in Regulatory Administration Fees which is a decrease of 1.9% on the 2020 total of $3.2M. 2019 to 2020 realized a 6.9% decrease from $3.5M to $3.2M;
- employed 289 full time staff a decrease of 18% from the 2020 total or 341. The full-time staff decreased 3% in 2020 from 351 to 341 in 2020; and
- made capital investments in EC infrastructure and assets of $11.7M in 2021 a 3% decrease on the $12.1M in 2020, and a 32% decrease from 2020 on the 2019 total of $17.8M.

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[2] Annex 1 to this document contains a list of EC sectoral providers as of 31st December 2021. A summary of these licences is also maintained on the RA website at https://www.ra.bm/electronic-communications-authorisation-register/

[3] It is expected that the 2 new ICOL holders (Paradise Mobile and Wave Bermuda) will gradually commence operations over the 2021-2022 period

[4] https://www.ra.bm/documents/2020-09-01_market-review-of-the-electronic-communications-sector-final-report-decision-and-order/?wpdmdl=15146&refresh=61e82da583b4d1642605989

[5] Annex 2 to this document contains a summary of the relevant markets and SMP operators from the 2020 Market Review of the Electronic Communications sector.

ECONOMIC IMPACT OF THE ELECTRONIC COMMUNICATIONS SECTOR

This section of the report presents additional data on the EC sector in Bermuda in 2021. Where possible, the report also presents information about prior years to illustrate any applicable trends in the sector.

Total Revenue

Total revenue for the EC sector in Bermuda (including fixed, mobile, internet, leased lines, and subscription television was $184.5M in 2021, up 0.64% from $183.4M in 2020. Total revenues include revenues associated with Bermuda subscribers while roaming overseas and revenue from visitors to the island.

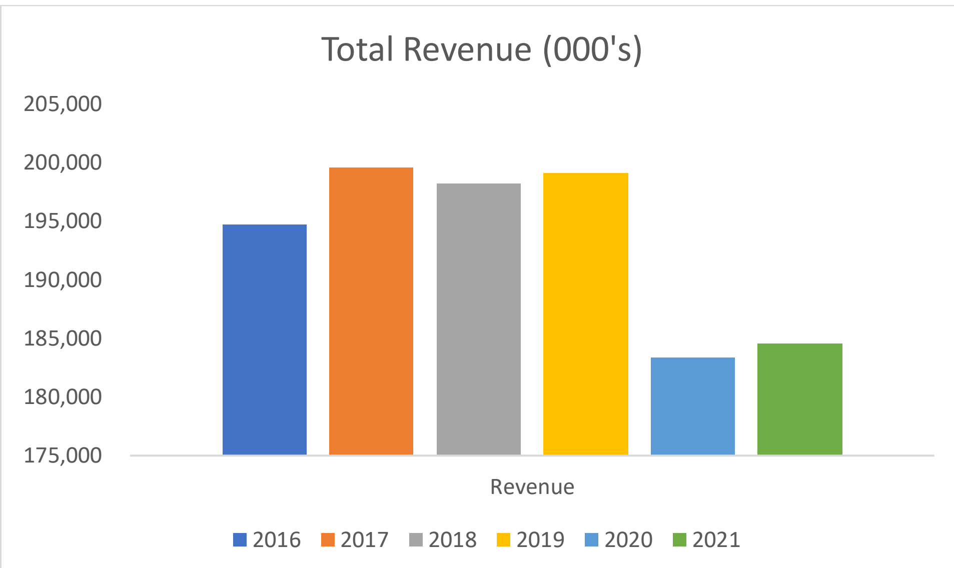

FIGURE 3: TOTAL EC SECTOR REVENUE (2016-2021)

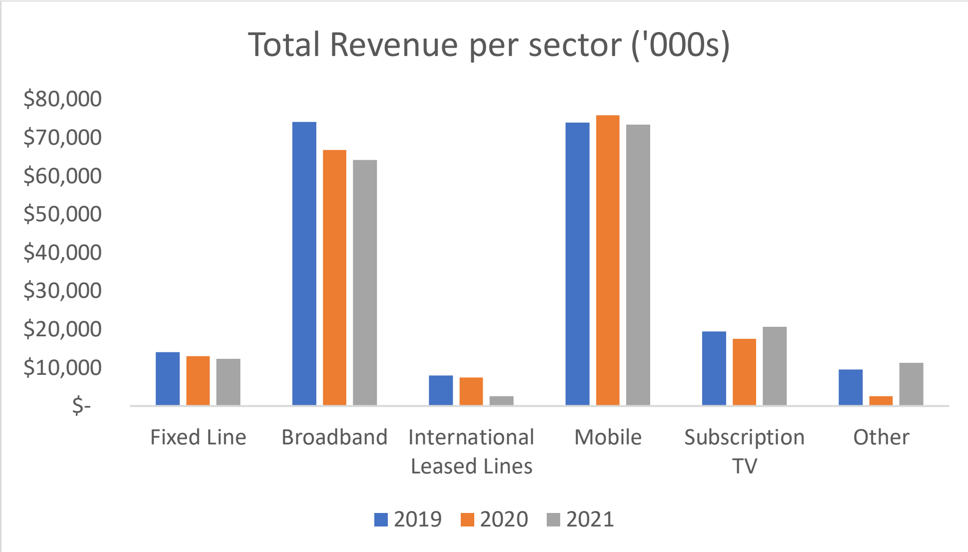

FIGURE 4: REVENUE PER EC SECTOR

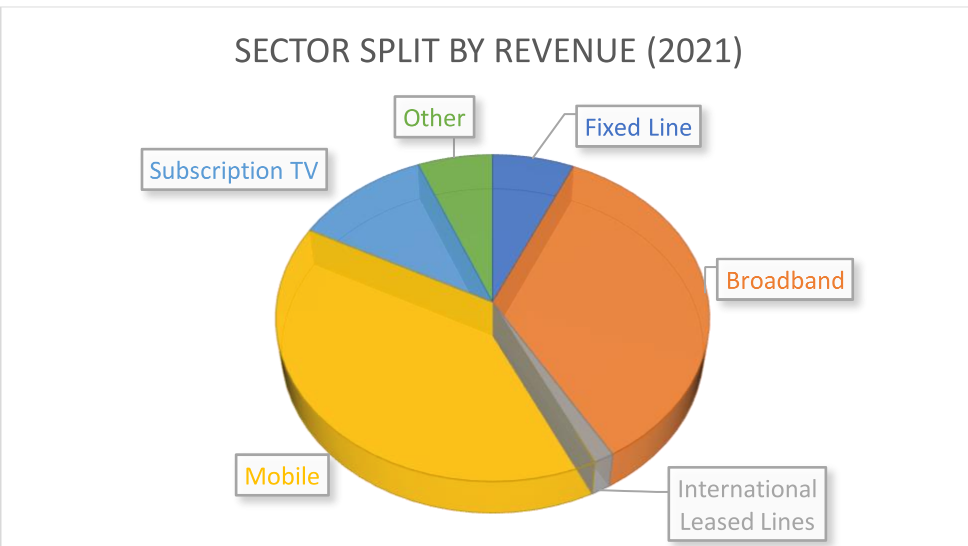

FIGURE 5: EC SECTOR SPLIT BY REVENUE

Sector	2019	2020	2021
Fixed Line	7%	7%	7%
Broadband	37%	36%	35%
International Leased Lines	4%	4%	1%
Mobile	37%	41%	40%
Subscription TV	10%	10%	11%
Other	5%	1%	6%

FIGURE 6: EC SECTOR SPLIT BY % BASED ON REVENUE

Overall Market Share

Overall Market Share for the EC sector in Bermuda (including fixed, mobile, internet, leased lines, and subscription television) is split between the EC sectoral providers as indicated below.

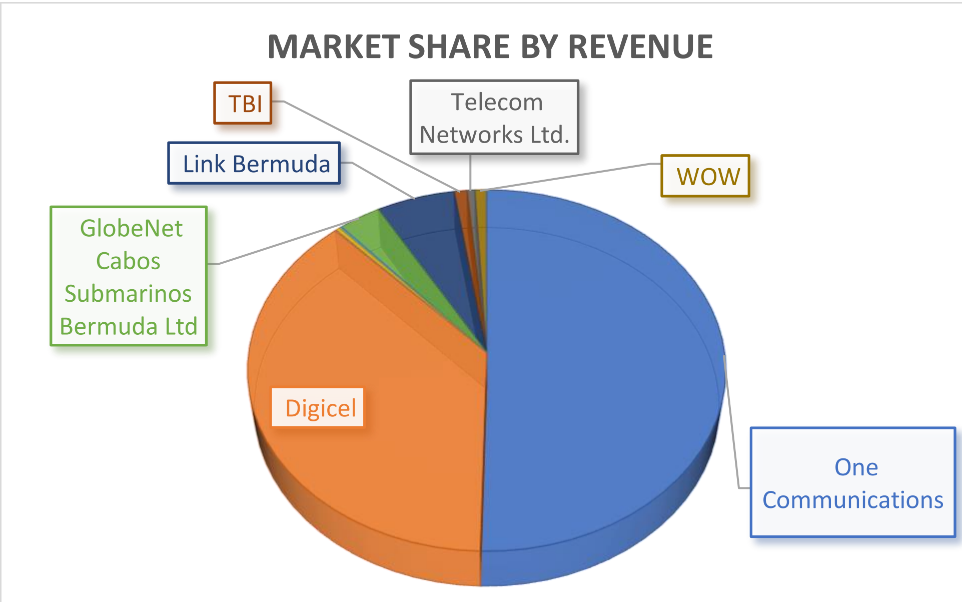

Figure 7: Market Share by Revenue (2021)

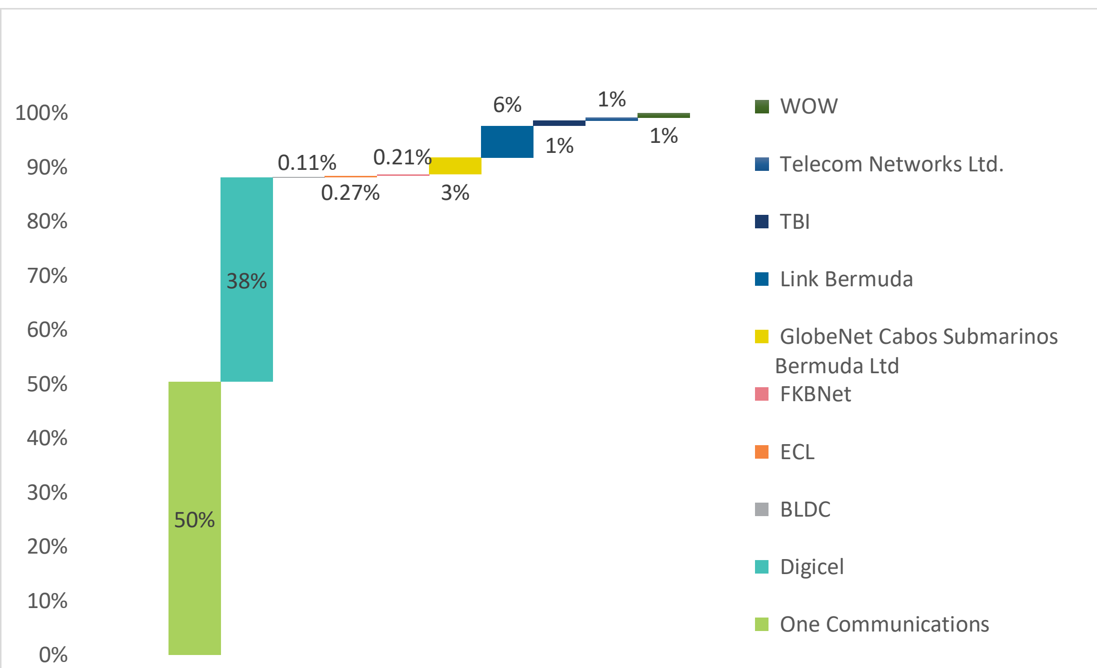

Figure 8: Market Share by Revenue (2021)

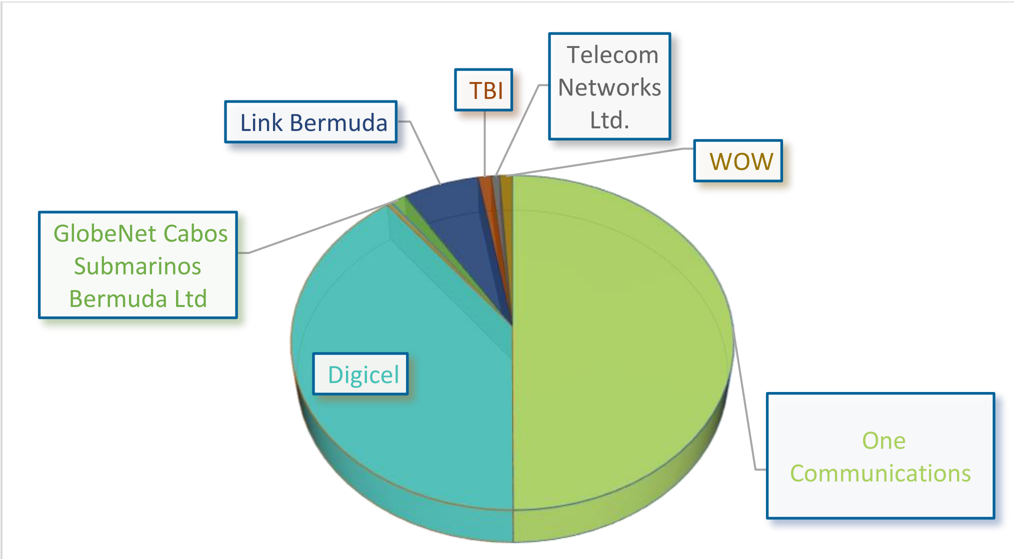

FIGURE 9: MARKET SHARE BY REVENUE (2020)

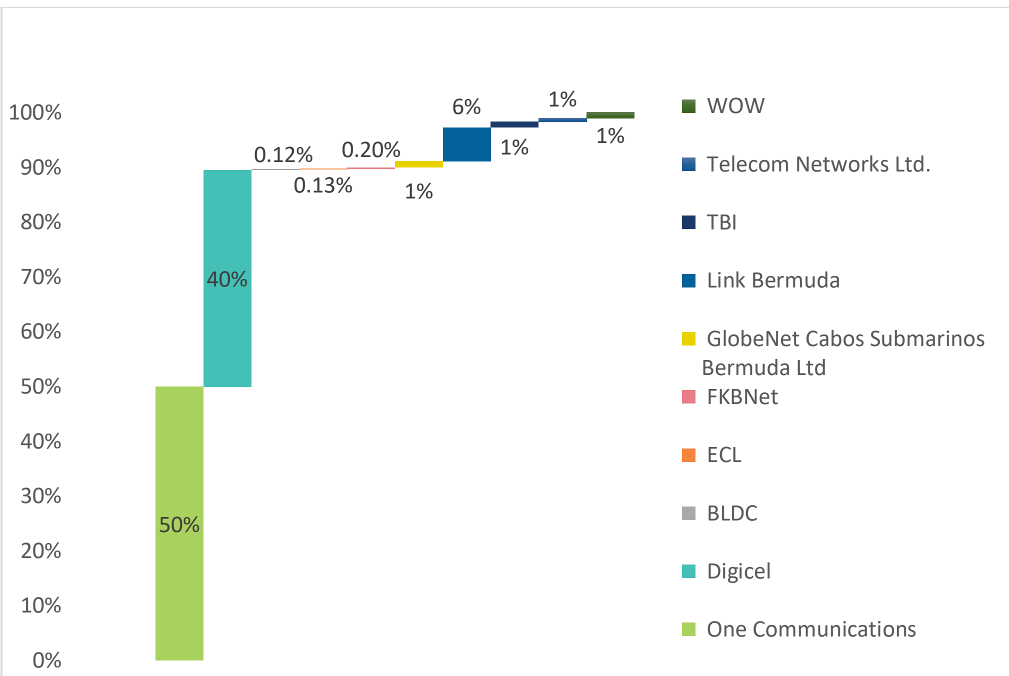

FIGURE 10: MARKET SHARE BY REVENUE (2020)

Employment

Figure 12 shows the number of full-time equivalent staff employed in the EC sector in 2019, 2020 and 2021. At the end of 2021, the EC Sector employed 289 full time staff which was a decrease of 18% from the 2020 total of 341.

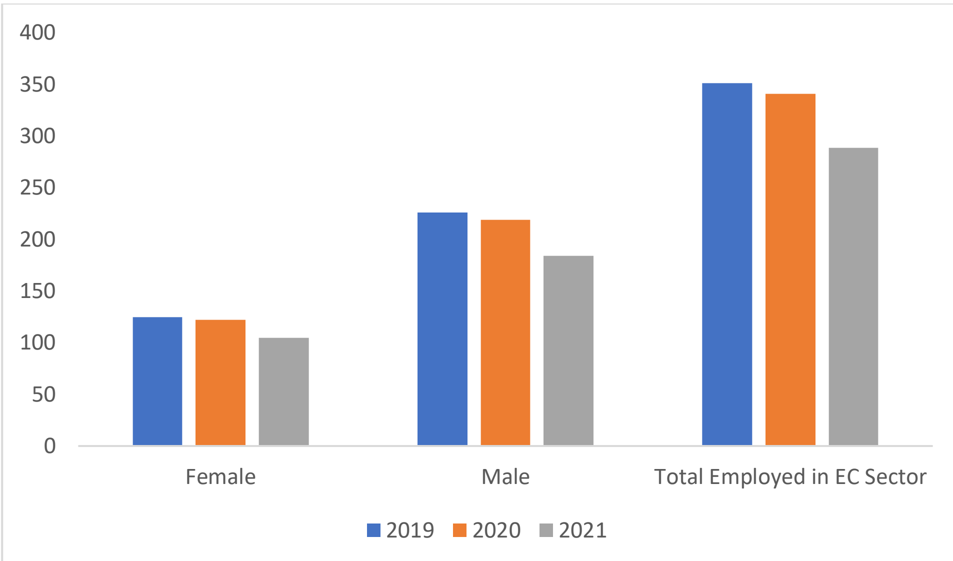

FIGURE 41: EMPLOYMENT IN THE EC SECTOR

Taxation contributions

The EC sector contributes to the Bermuda Government in the form of:

- direct licence fees (sometimes referred to as Government Authorization Fees) which are assessed as a percentage of revenue based on the licence type;
- mobile handset fees based on the number of active handsets in use per quarter; and
- spectrum fees based on sectoral providers' use of specified high demand spectrum.

The following charts illustrate the total fees provided to the Bermuda Government over the last three years. The EC sector contributed a total of $16.9M in 2021, a 3% increase from the $16.4M in 2020, which decreased 6.5% from the 2019 total of $17.6M.

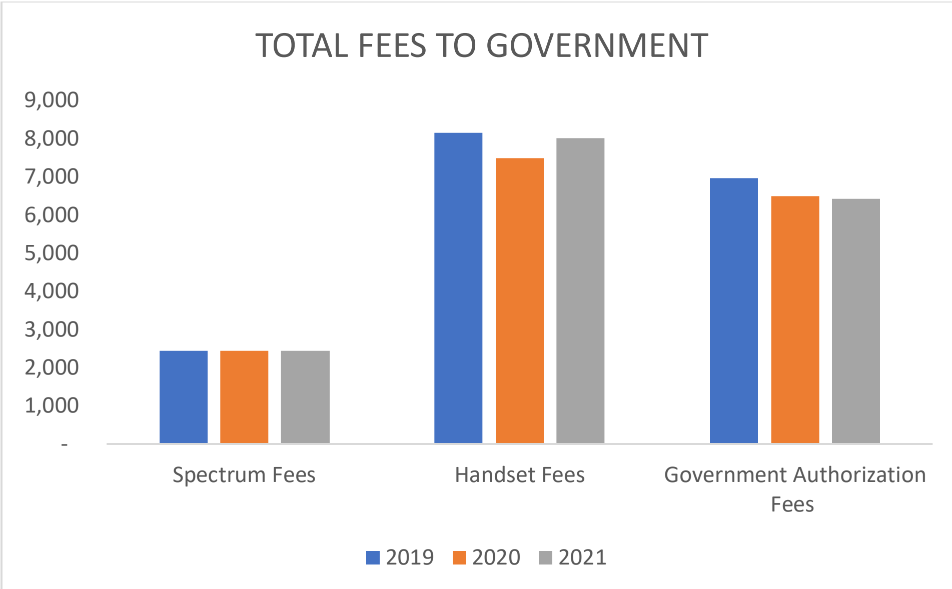

FIGURE 12: TOTAL CONTRIBUTION TO GOVERNMENT ('000S)

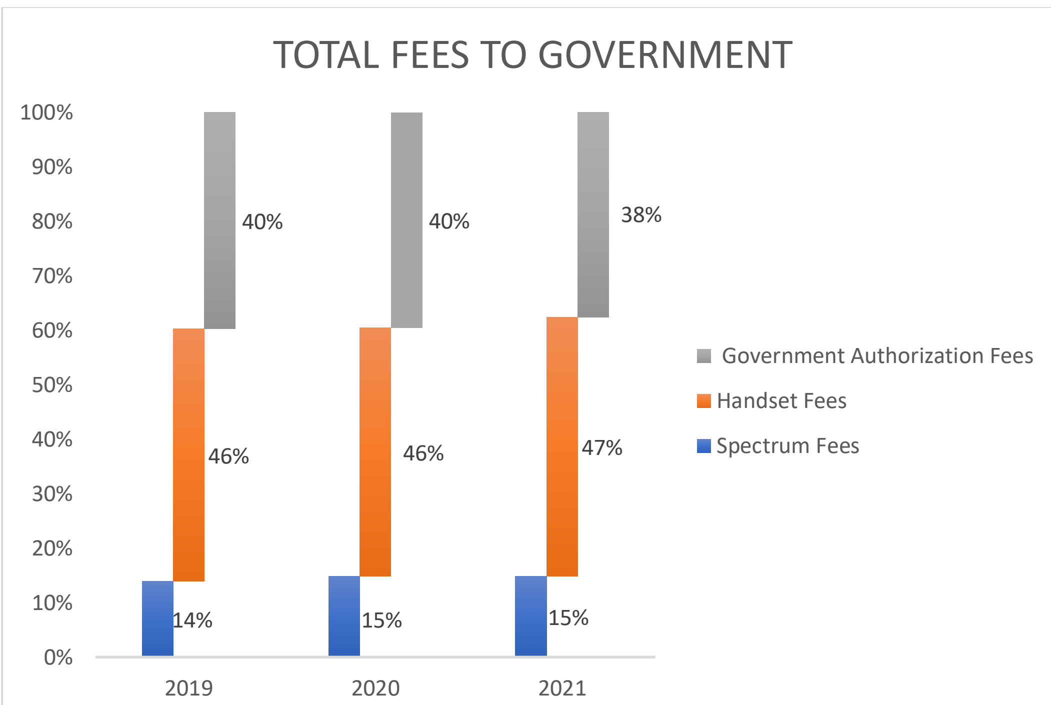

FIGURE 13: % MAKEUP OF CONTRIBUTION TO GOVERNMENT

In addition to fees paid to the Bermuda Government, the EC sector also contributes funding for the RA itself in the form of EC Regulatory Authority Fees. These fees are also assessed as a percentage of revenue based on the licence type.

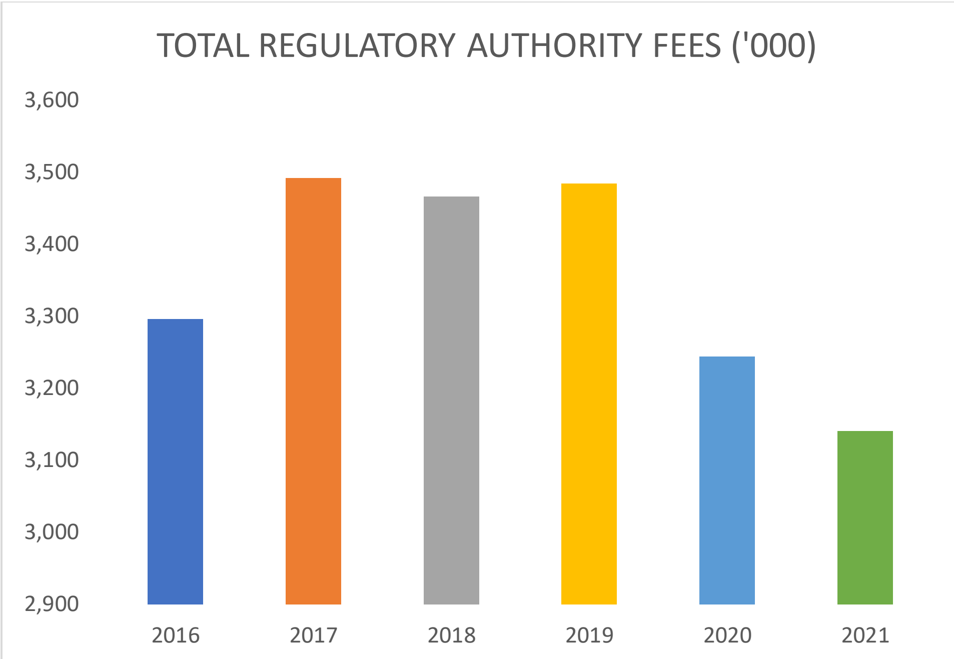

FIGURE 54: EC REGULATORY AUTHORITY FEES ('000S)

Capital Investment

Capital investment expenditure in the EC sector in 2021 was $11.7M, a decrease of 3% from the $12M in 2020. The 2020 figure decreased 32% from $17.8M in 2019.

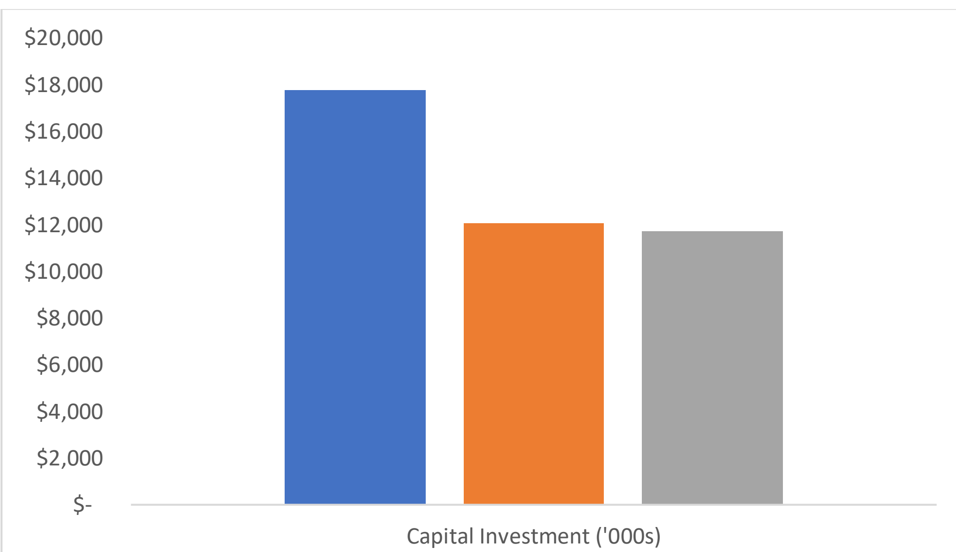

FIGURE 65: CAPITAL INVESTMENT ('000S)

FIXED NETWORK MARKET

The fixed network market is characterized by consumer equipment that is in a fixed geographic location and used to make/receive voice calls, send/receive faxes and to support broadband services. Information on broadband is contained in later sections of this report.

The fixed line market made up 7.14% of the overall EC market by revenue in 2020 which was a minimal change from 7.02% in 2019.

Total number of lines and subscriptions

The chart below shows the total number of fixed line subscriptions during the period 2019, 2020 and 2021. The total number of fixed line subscriptions in 2021 was 28,617 a decrease of 0.54% from the 2020 figure which was 28,772, down 5% from 30,329 in 2019.

Total residential subscriptions decreased 17% from 14,821 in 2021 to 17,276 in 2020. There was a 9% decrease from 19,048 in 2019 to 17,276 in 2020. During the same period, commercial subscriptions increased 17% in 2021 from 11,496 to 13,796 and 2% from 11,281 in 2019 to 11,496 in 2020.

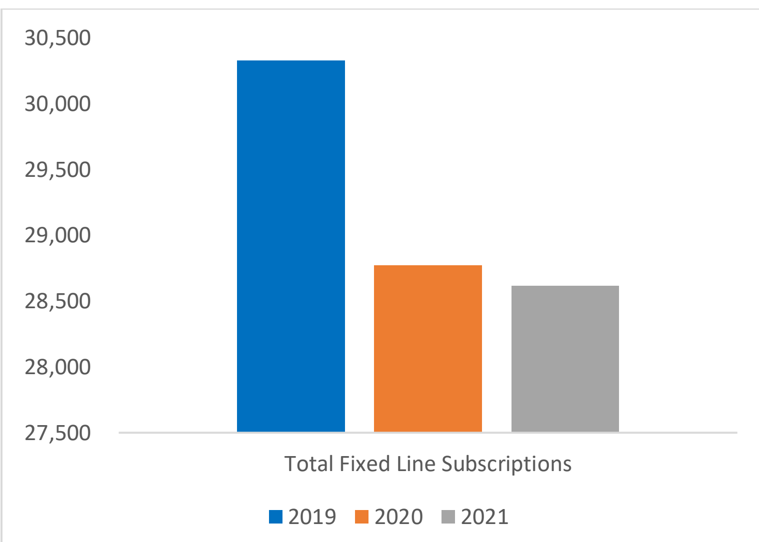

FIGURE 76: TOTAL NUMBER OF FIXED LINE SUBSCRIPTIONS

Market Share

The EC sector has 5 sectoral providers that participated in the provision of fixed network services in 2019, 2020 and 2021. The market share split is illustrated below.

The Digicel group (including the Bermuda Telephone Company) has approximately 72% of the fixed market as of 31st December 2021[6]. One Communications has increased its share in the market from 16.43% in 2020 to 24.61% in 2021. The remaining market was split between Link (3%), Telebermuda International (TBI) (<1%) and Fort Knox Bermuda (FKB) (<1%), however TBI and Fort Knox did not submit 2021 figures.

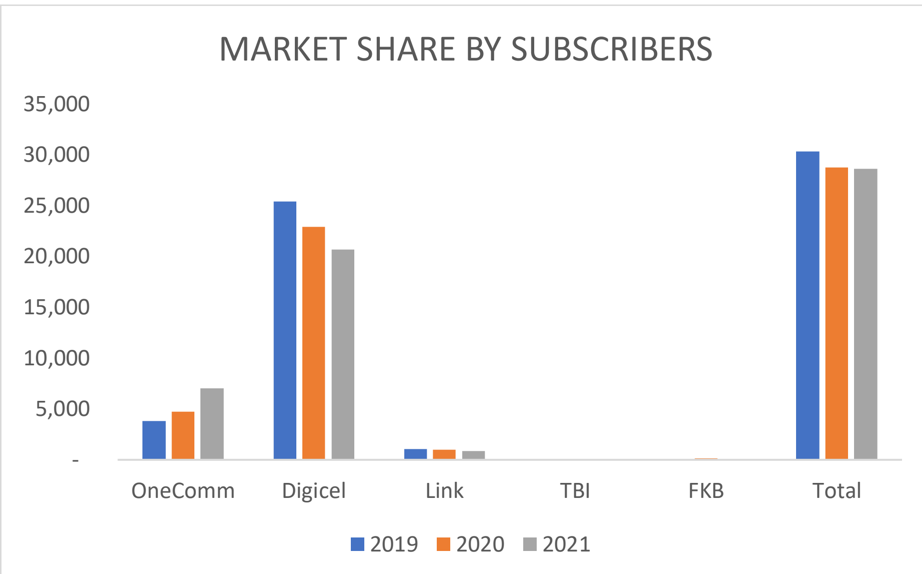

FIGURE 17: FIXED LINE MARKET SHARE BY NUMBER OF SUBSCRIBERS

[6] Calculated by number of subscribers

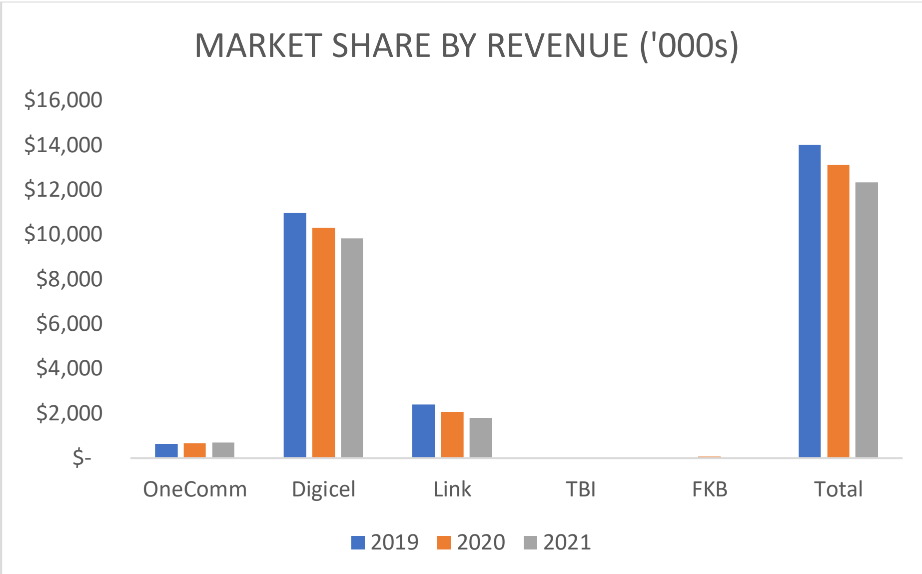

FIGURE 18: FIXED LINE MARKET SHARE BY REVENUE ('000S)

Fixed telephony minutes

There was insufficient information provided by the collective sectoral providers to establish the volume of voice traffic associated with the fixed line market for the period. This will be explored further in the next Annual Market Analysis.

Penetration rates

The residential fixed line market penetration rate for Bermuda[7] reduced from 68% in 2019 to 61% in 2020 and 53% in 2021.

[7] Using the Bermuda Government Department of Statistics 2016 Census – Total number of Dwelling Units was 28,192

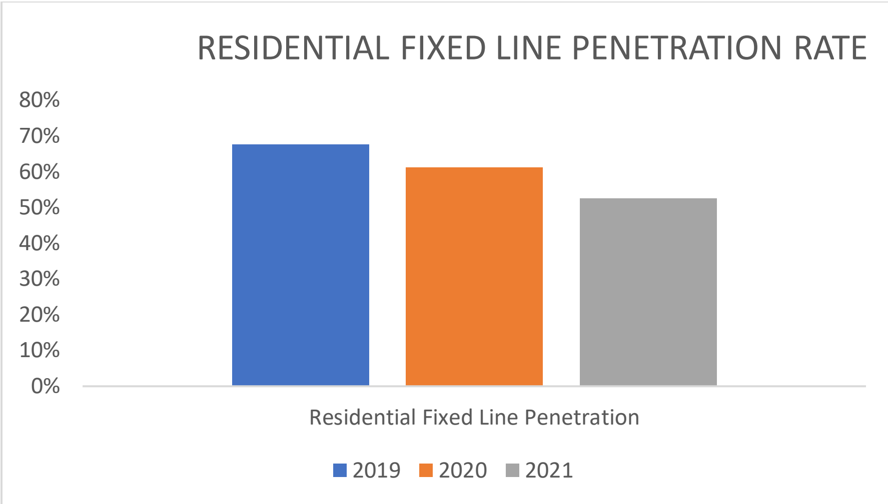

FIGURE 19: FIXED LINE RESIDENTIAL PENETRATION RATE

Revenues

Total fixed line revenue in 2021 was $12.3M a decrease of 6% from 2020. Total fixed line revenue in 2020 was $13.1M which was a decrease of 6% from $14.0M in 2019.

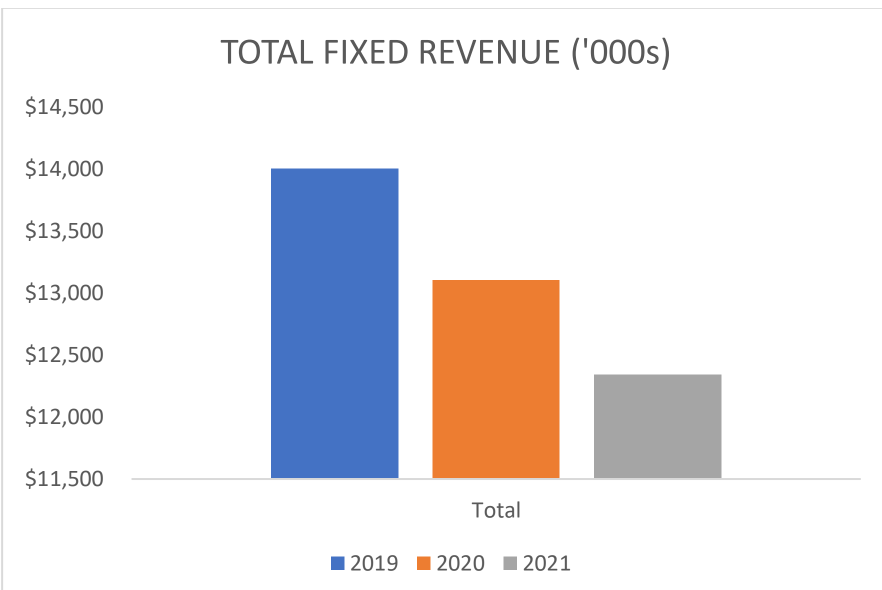

FIGURE 80: FIXED LINE TOTAL REVENUE (‘000S)

The fixed line revenue per EC provider is presented below:

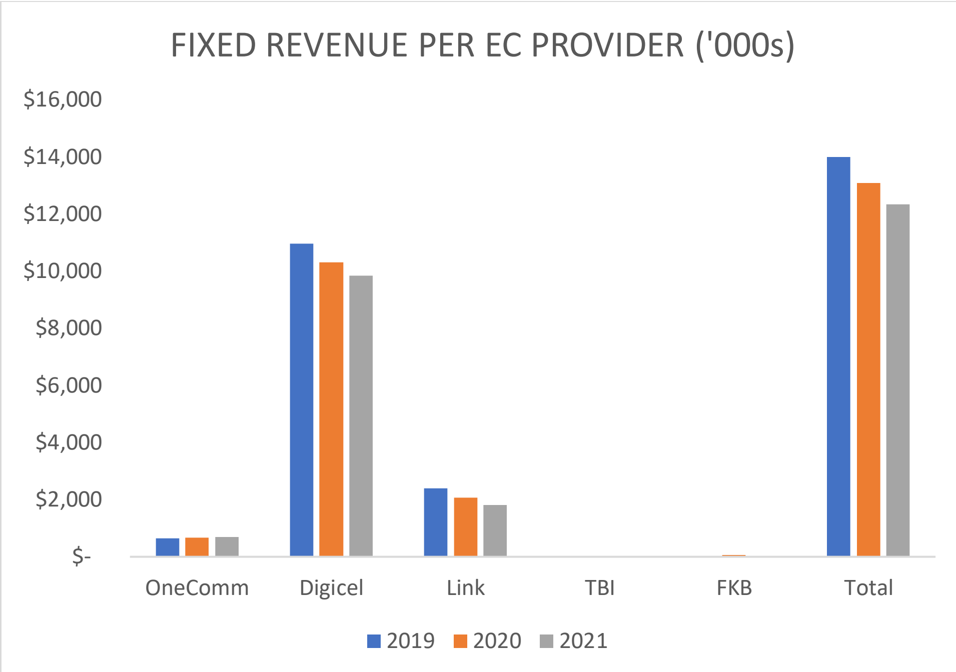

FIGURE 91: FIXED LINE REVENUE PER EC PROVIDER

Average revenue per user

Average revenue per residential subscriber per month increased 9% in 2021 from $33.61 to $36.95. The figure in 2020 increased 8% to $33.61 from $31.14 in 2019.

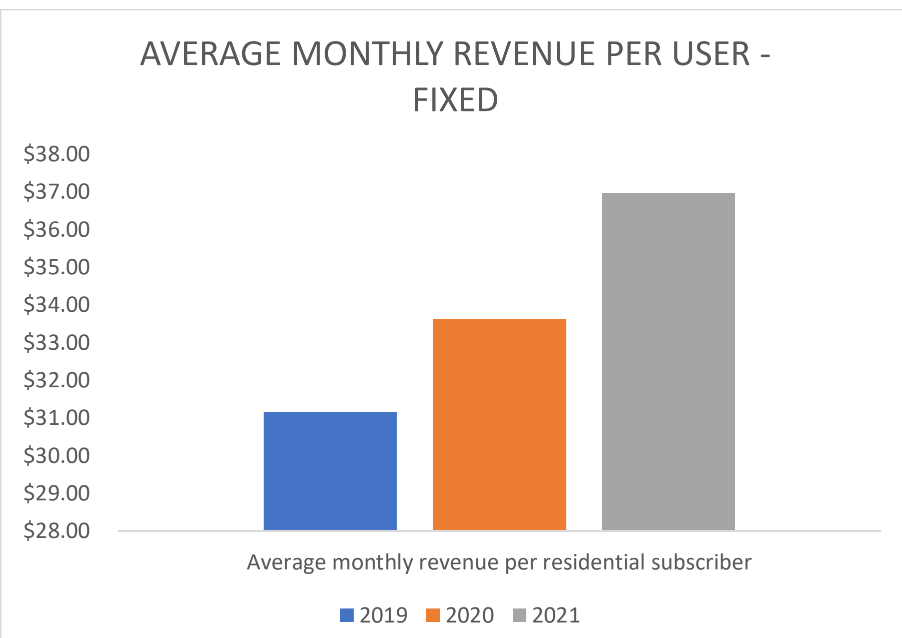

FIGURE 102: FIXED LINE AVERAGE MONTHLY REVENUE PER USER

BROADBAND MARKET

Broadband services are defined in the Market Review as being an internet service or connection generally defined as being “always on”, providing a bandwidth greater than narrowband. Narrowband services include services provided over the Public Switched Telecommunications Network (PSTN) or Integrated Services for Digital Network (ISDN).

The broadband market made up 34.8% of the overall EC market revenue in 2021, 36.4% in 2020 and 37.23% in 2019.

Total number of subscriptions

The number of fixed broadband subscribers increased by 8% in 2021 from 34,618 to 37,827. In 2020 the figure increased 7% to 34,618 from 32,337 in 2019. The number of residential fixed broadband subscribers declined 3% to from 27,381 in 2021 to 28,073 in 2020.

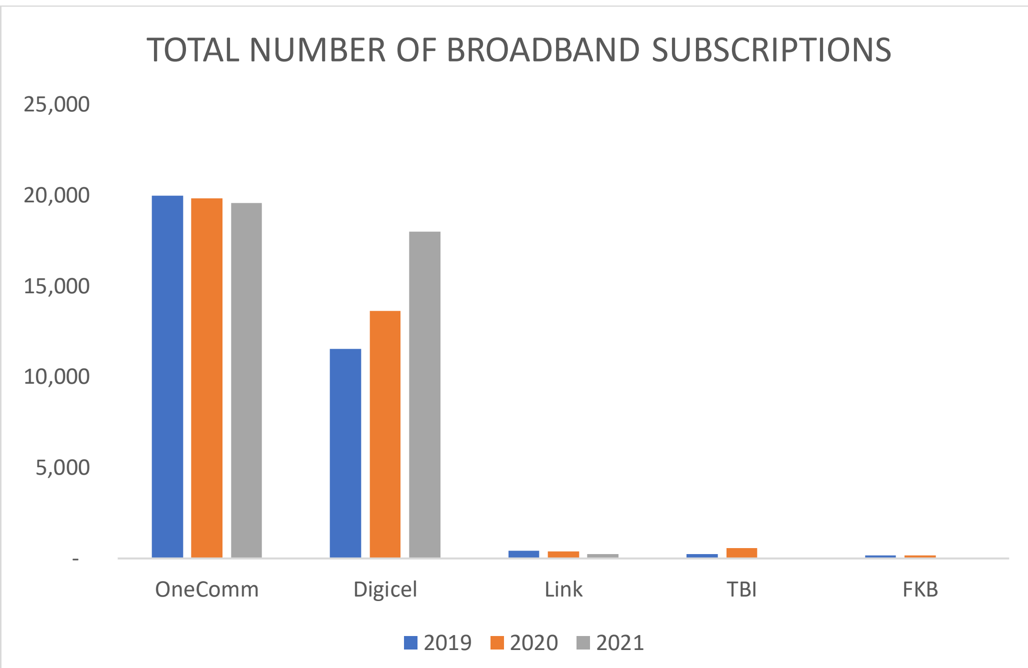

FIGURE 113: BROADBAND TOTAL NUMBER OF SUBSCRIPTIONS PER EC PROVIDER

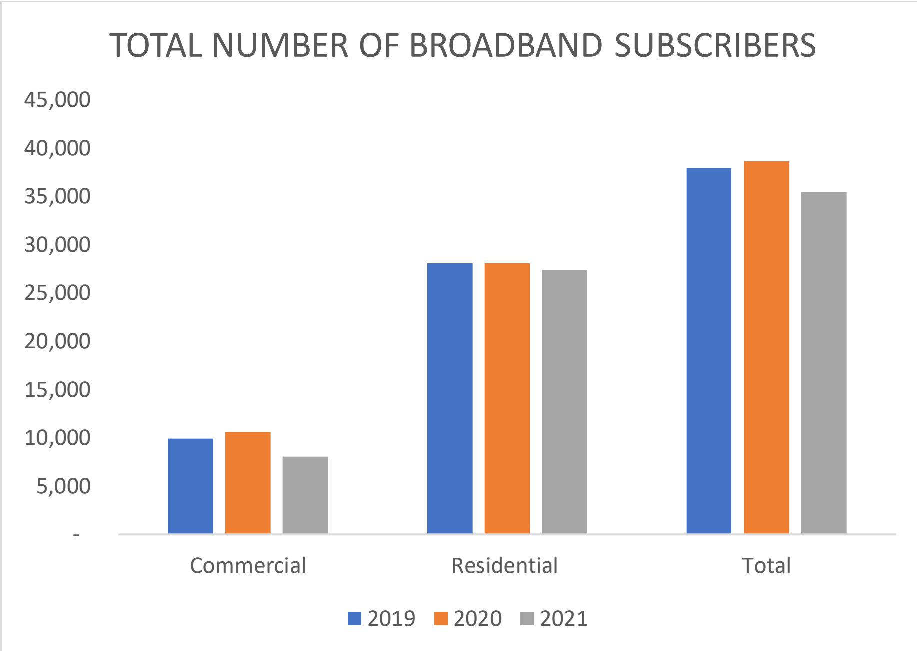

FIGURE 124: BROADBAND RESIDENTIAL/COMMERCIAL SPLIT BY SUBSCRIPTIONS

Penetration rates

The fixed broadband penetration rates for Bermuda[8] was 97.07%, 96.79% and 96.99% in 2021, 2020 and 2019 respectively.

[8] Using the Bermuda Government Department of Statistics 2016 Census – Total number of Dwelling Units was 28,192

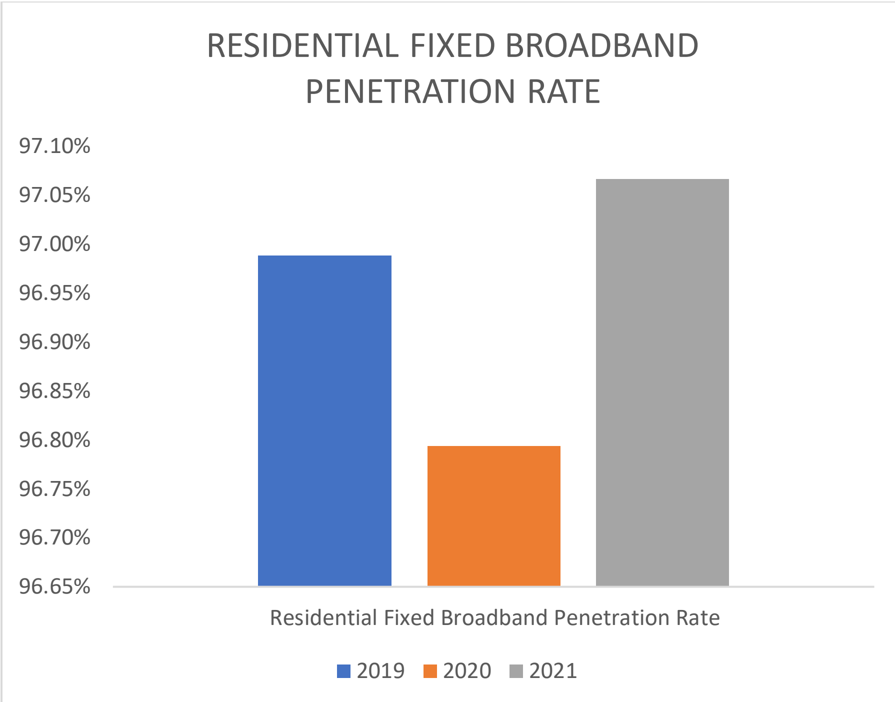

FIGURE 25: FIXED BROADBAND RESIDENTIAL PENETRATION RATE

Market Share by subscription

The broadband market in 2021[9] was dominated by One Communications (51.73%) and Digicel (47.59%). The remaining market was split between TBI, Link (0.68%) and FKB. Similarly, the market in 2020 was dominated by One Communications (57.29%) and Digicel (39.43%) with the remainder split between Link (1.15%), TBI (1.66%) and FKB (0.47%).

[9] Calculated by number of subscribers

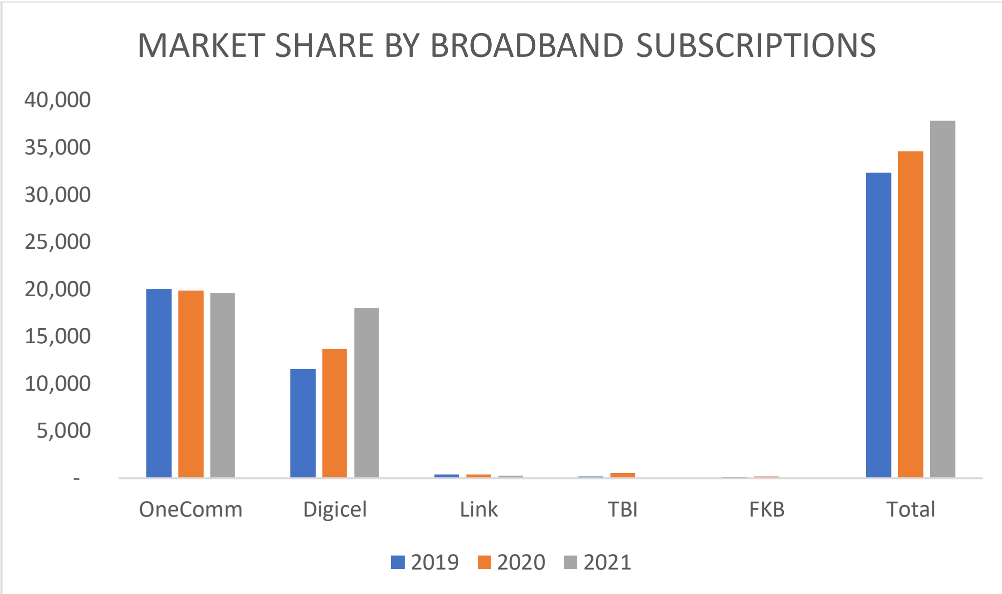

FIGURE 136: BROADBAND MARKET SHARE BY SUBSCRIPTION

Download subscriptions by speed

Average broadband subscription speed increased to 160 Mbps in 2021 from 139 Mbps in 2020 and 59 Mbps in 2019.

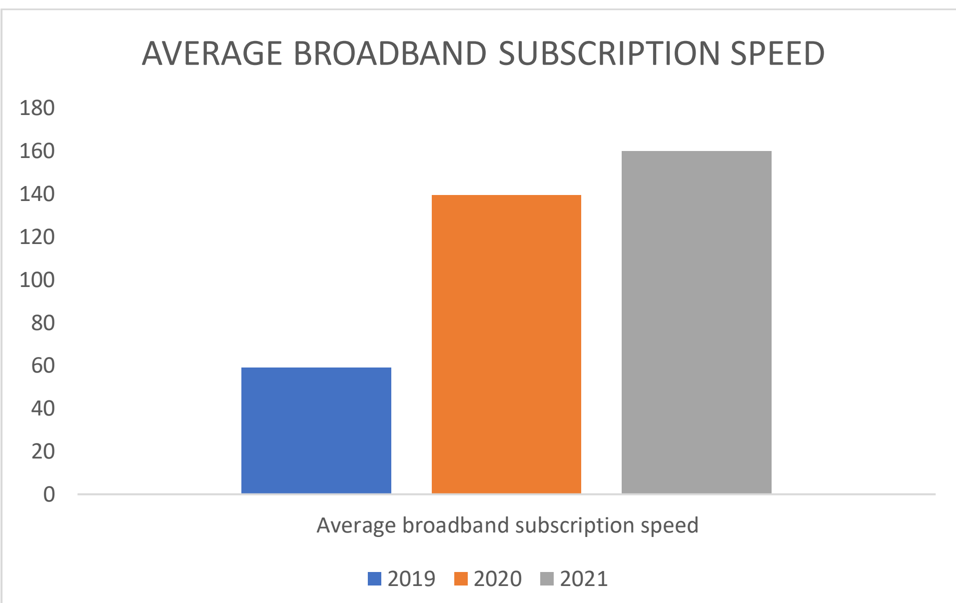

FIGURE 147: BROADBAND AVERAGE SUBSCRIPTION SPEED

Revenues

Total broadband revenues decreased in 2021 by 5% from \$67.5M to \$64.2M. In 2020 revenues decreased 9.68% to \$67.5M from \$74.1M in 2019.

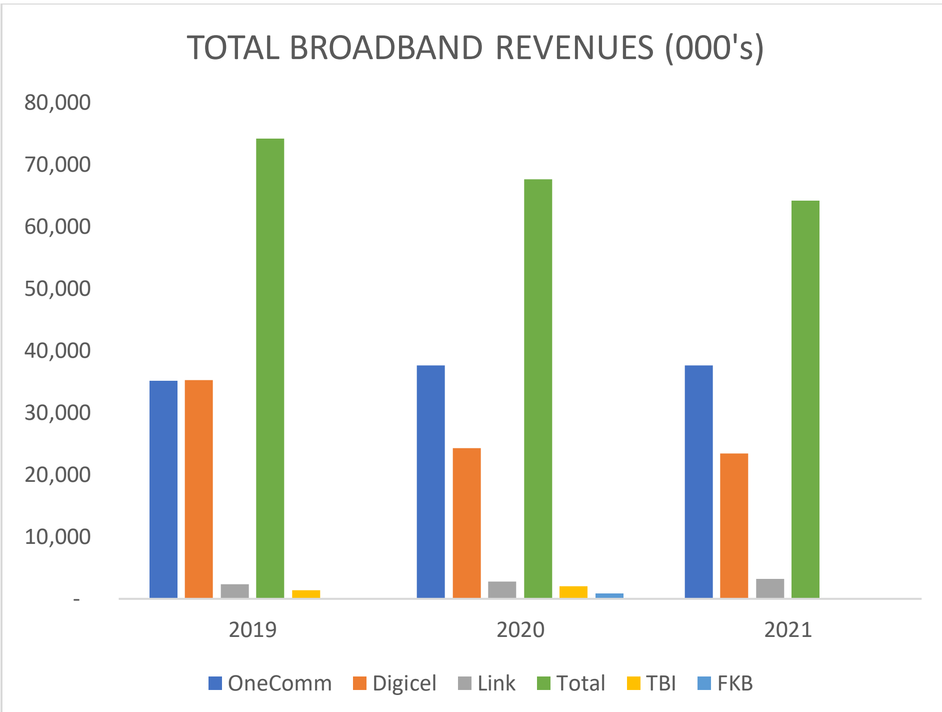

FIGURE 158: BROADBAND REVENUE BY EC PROVIDER

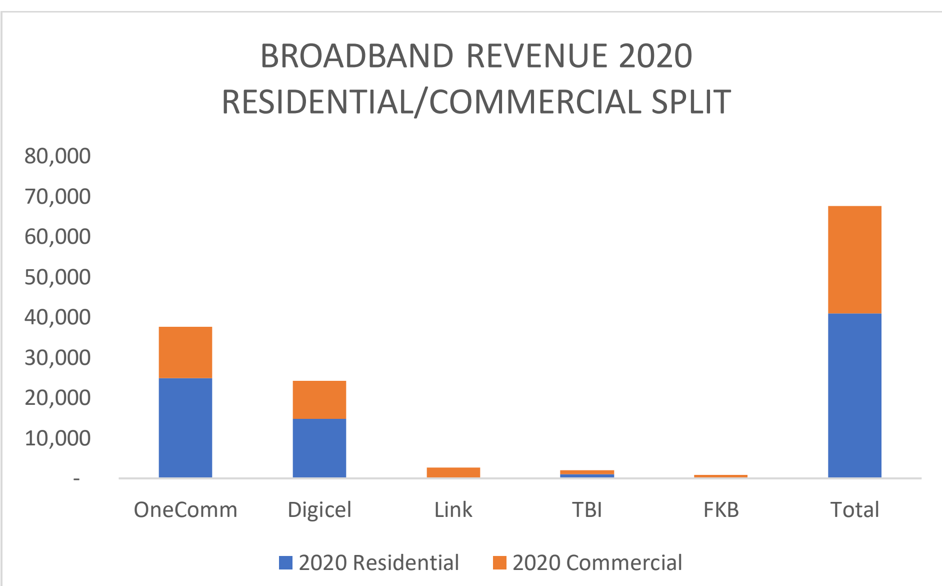

FIGURE 2916: BROADBAND RESIDENTIAL/COMMERCIAL SPLIT BY REVENUE FOR 2020

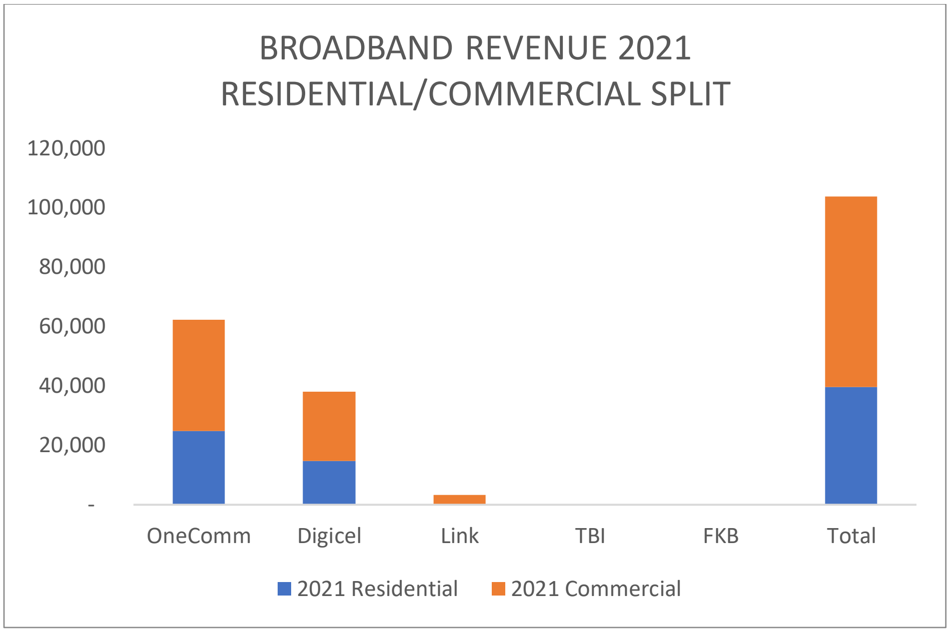

FIGURE 170: BROADBAND RESIDENTIAL/COMMERCIAL SPLIT BY REVENUE FOR 2021

Average Revenue per user

Average monthly revenue per residential fixed broadband subscriber in 2021 was $120.34, a 0.57% decrease from 2020. In 2020 the average monthly revenue per subscriber was $121.02, a decrease of 13.66% on $140.16 in 2019.

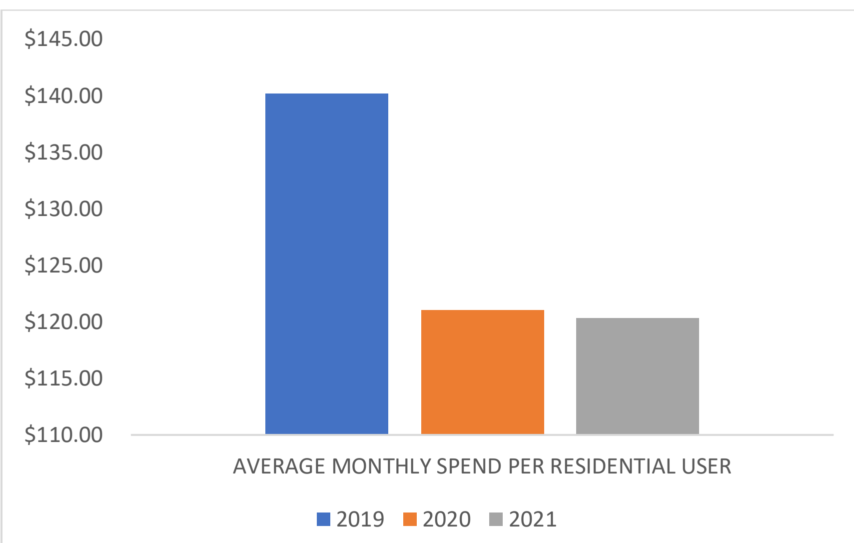

FIGURE 181: FIXED BROADBAND AVERAGE MONTHLY SPEND PER RESIDENTIAL USER

LEASED LINE MARKET

Revenues

Due to several sectoral providers not being able to provide granular information for this period, the reporting for this section is incomplete. This will be rectified in the next report period.

Data for Link Bermuda captures a 9% decrease over the year from 2020 to 2021 from $2.8M to $2.6M. One Communications decreased 26% over the year from $3.4M to $2.7M. This market made up 4.05% of the overall EC market by revenue in 2020 which was a small increase over 3.99% in 2019. The market represents 1% of the overall EC market revenue in 2021.

Data for One Communications was classified as international in 2020; it was reclassified and captured in the domestic leased line markets in 2021.

Market Share by Revenue

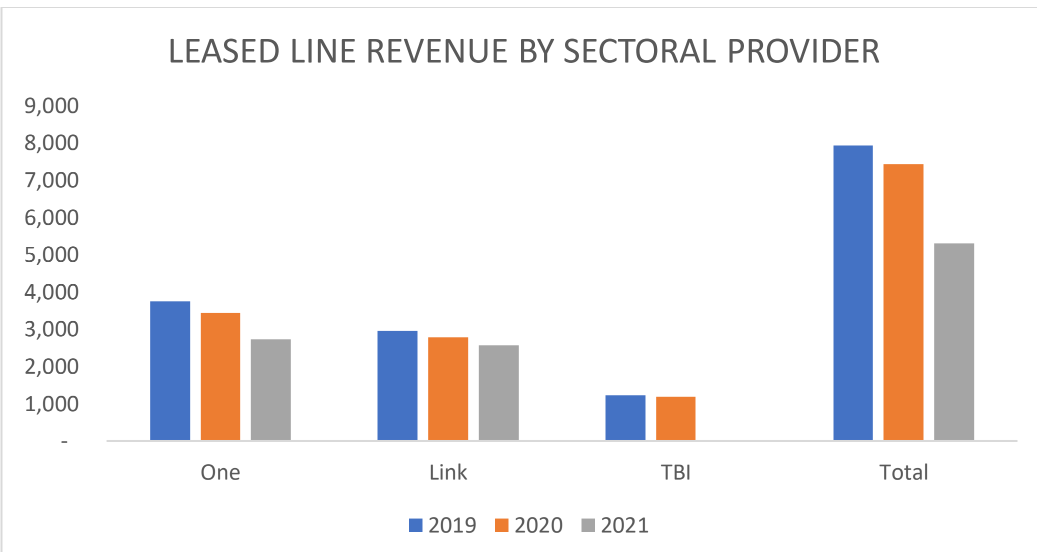

FIGURE 192: LEASED LINE MARKET SHARE BY REVENUE

MOBILE MARKET

The mobile sector represented 39.8% of the EC Sector Revenue in 2021. This represents a decrease of 4% from the 2020 representation. The mobile sector represented 41.39% of the overall EC market revenue in 2020, and 37.12% in 2019.

Total number of mobile subscriptions

The total number of subscribers in 2021 was 58,498. There was a slight increase in the number of subscribers – 0.63%. There was a total of 58,124 subscribers at the end of 2020 which was a decrease of 2% over the 2019 total of 59,192. This represents approximately 90 subscriptions per 100 inhabitants[10].

The subscriber base was split into residential and commercial subscriptions. The residential subscriptions remain relatively unchanged. The commercial subscription base decreased 12% in 2020 and increased 4% in 2021.

Subscriber	2019	2020	2021
Residential	52316	52119	52249
Commercial	6836	6005	6241

FIGURE 203: TOTAL NUMBER OF MOBILE SUBSCRIPTIONS

The total number of "handsets" in the market (based on the Bermuda Government Handset fees collected by the sectoral providers) was 164,630 in 2021. This represents a 4% decrease from the 2020 data. The total number of handsets stayed essentially unchanged (-0.02%) at 171,491 for 2020 from 171,524 for 2019.

[10] Using the Bermuda Government Department of Statistics 2016 Census – Total inhabitants was 64,486

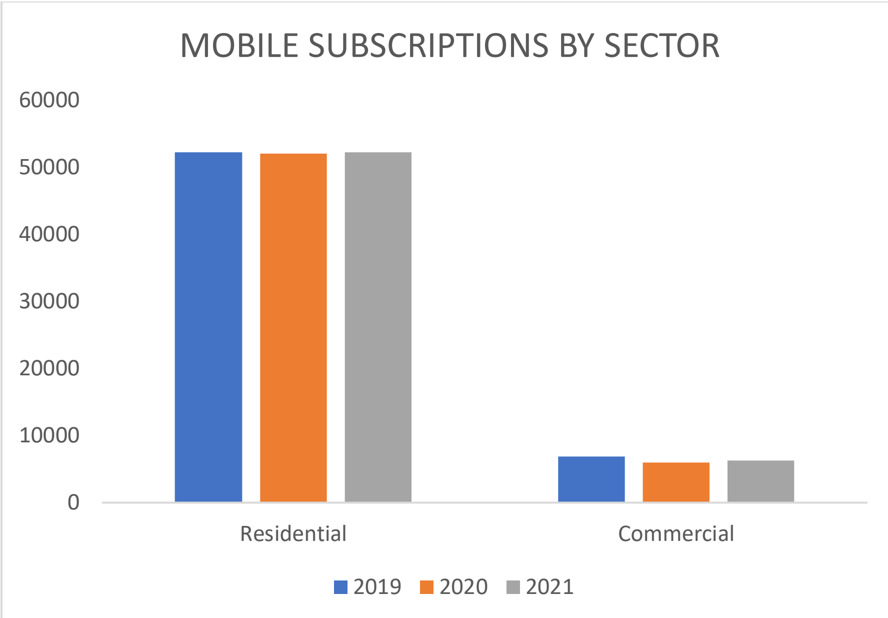

Figure 21: Mobile Residential/Commercial Split by Subscriptions

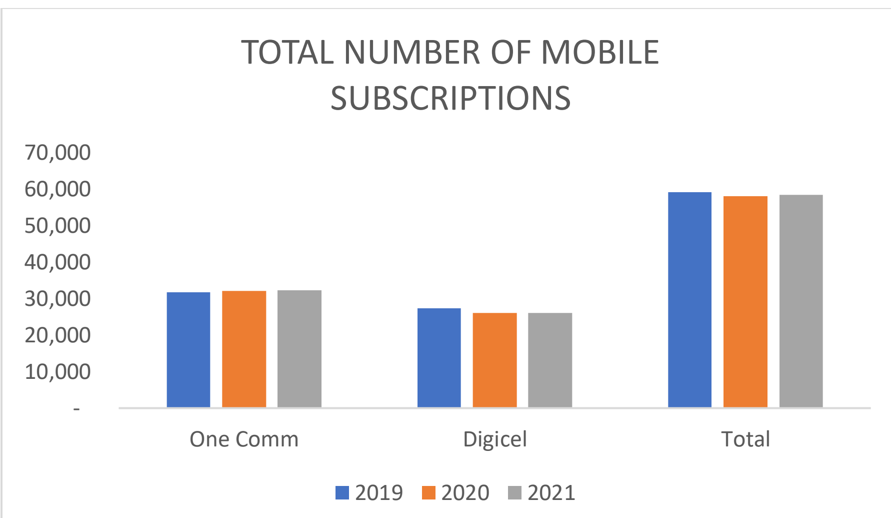

Figure 22: Mobile Subscriptions

Market Share by subscription

For the period under review, there were only two active sectoral providers in this market. In 2021, One Communications held 55% of the market[11] and Digicel held 45% unchanged from 2020. The market split in 2019 was 54% to One Communications and 46% to Digicel.

[11] Calculated by number of subscribers

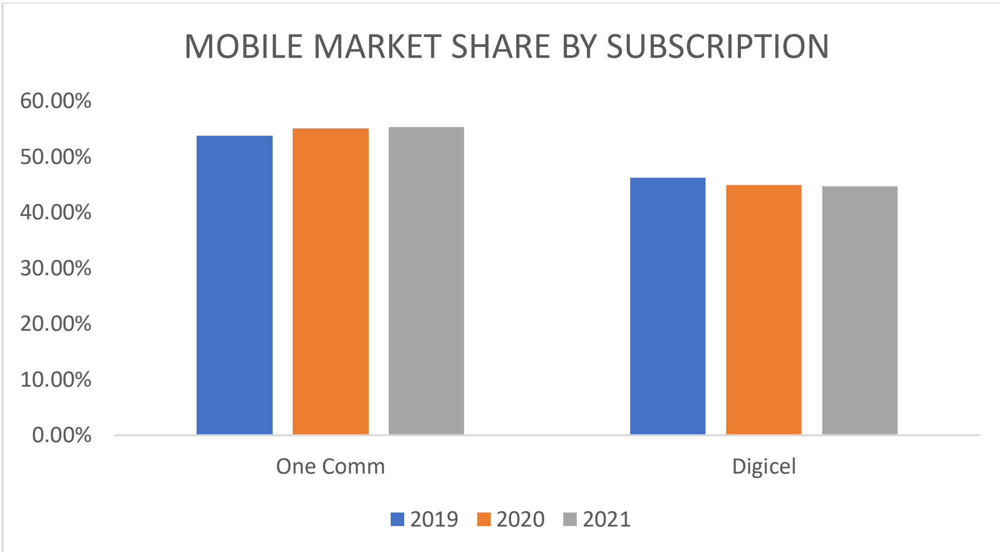

FIGURE 23: MOBILE MARKET SHARE BY SUBSCRIPTION %

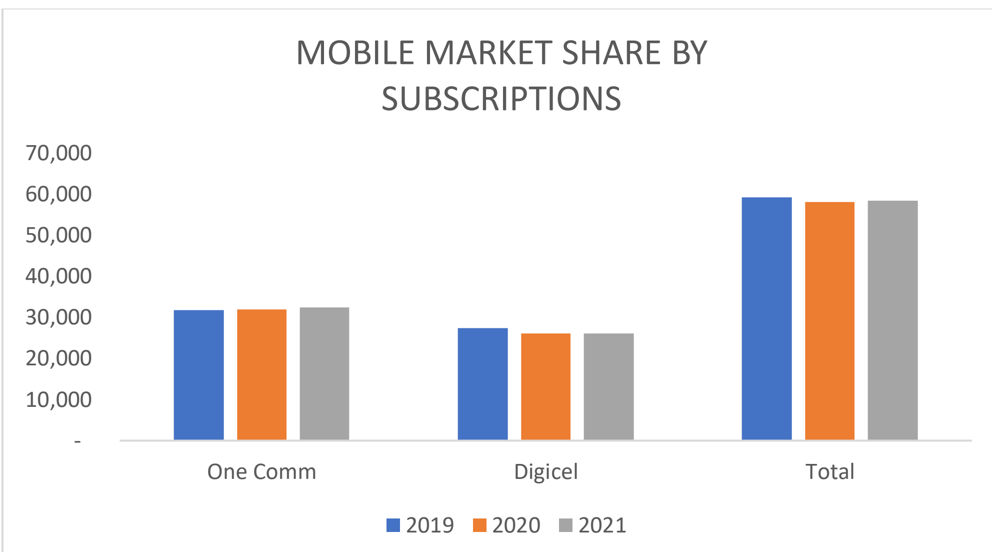

FIGURE 24: MOBILE MARKET SHARE BY SUBSCRIPTIONS

Roaming

The revenue from roaming services increased by 56% from $1M in 2020 to $2.3M in 2021. There was a decline of 69% in revenue from roaming where $1M was collected in 2020 and $3.3M in 2019.

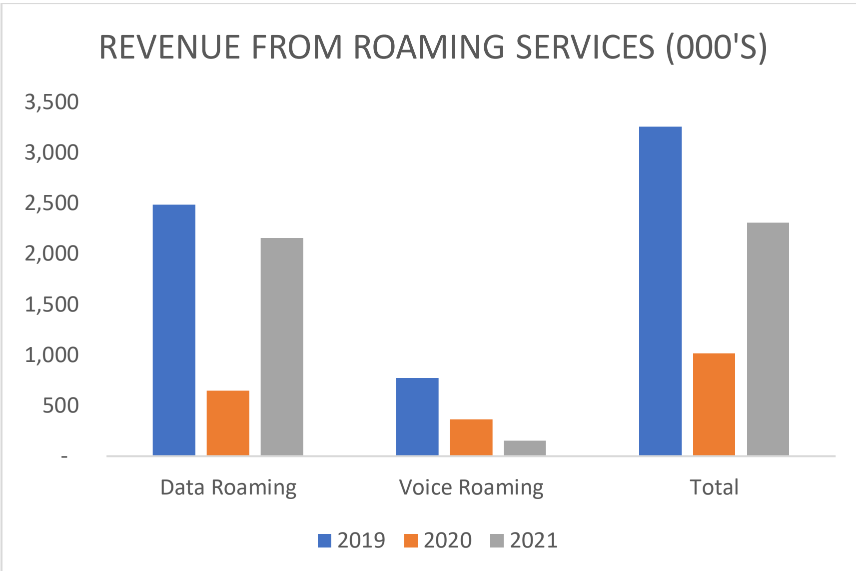

FIGURE 25: MOBILE REVENUE FROM ROAMING SERVICES

Revenues

Total revenue from mobile networks decreased 3% from $75.9M to $73.4M from 2020 to 2021. The decrease is driven by the decrease in residential mobile revenue from $42.2M to $39.4M. Total revenue from mobile networks increased 3% in 2020 to $75.9M from $73.9M in 2019. The majority of the increase was attributable to commercial mobile revenue which was up 38% to $33.6M from $24.4M in 2019. This was offset by a decline of 15% to $42.3M from $49.5M in the residential mobile market.

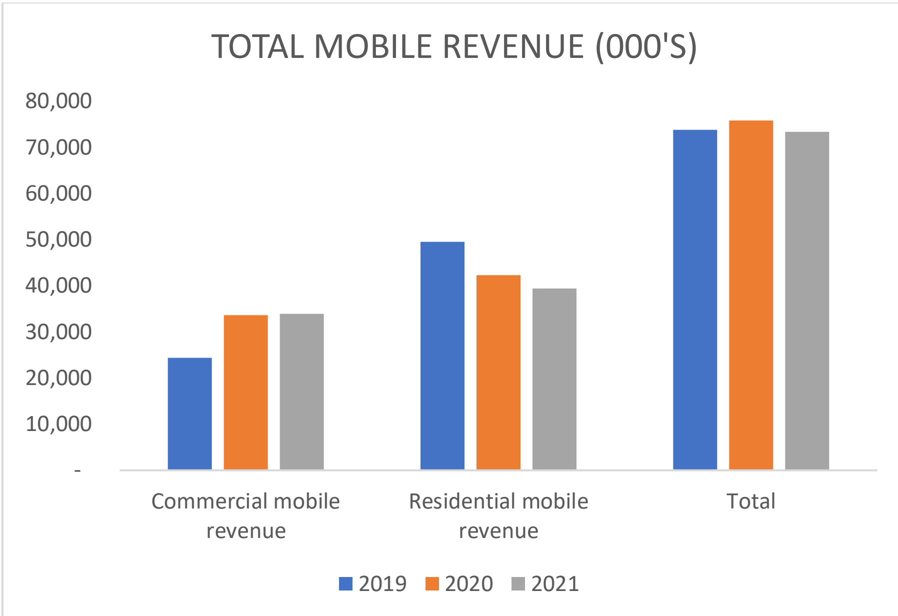

FIGURE 26: MOBILE RESIDENTIAL/COMMERCIAL SPLIT BY REVENUE

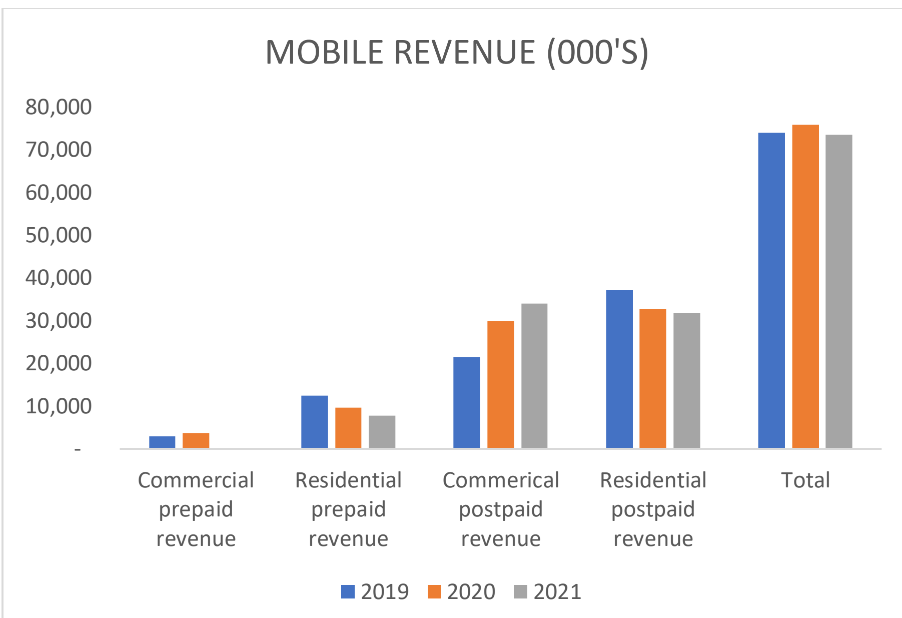

FIGURE 27: MOBILE RESIDENTIAL/COMMERCIAL REVENUE SPLIT BY PRE AND POST PAID

Average revenue per user

The average monthly revenue per residential subscriber saw a 7% decrease from 2021 to 2020, from $67.65 to $62.97. Average monthly revenue per residential mobile subscriber in 2020 was $67.65 which was a decrease of 14% on $78.88 in 2019.

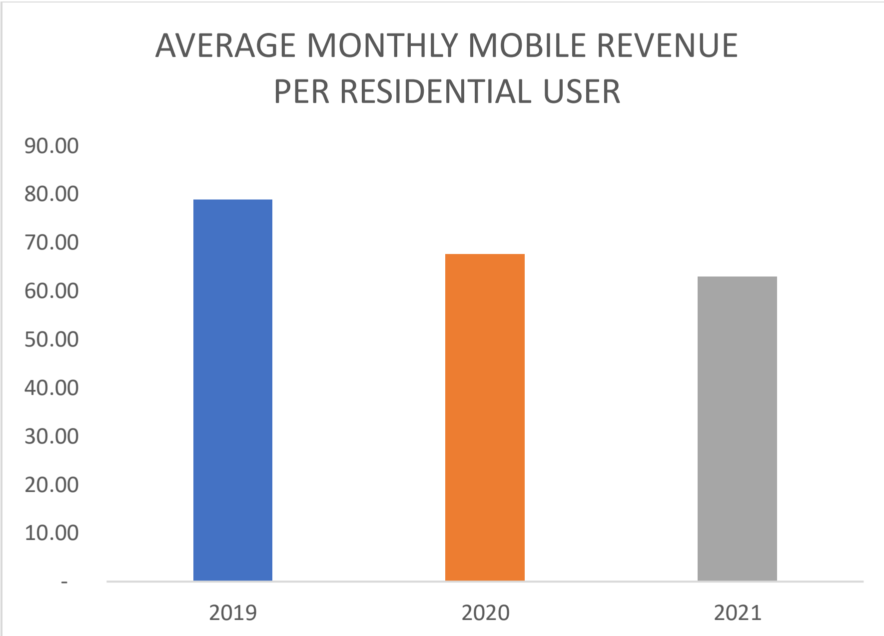

FIGURE 28: MOBILE AVERAGE MONTHLY REVENUE PER RESIDENTIAL USER

Average monthly revenue per prepaid residential mobile subscriber was $87.28 in 2021. A decrease of 8% from 2020. The monthly revenue in 2020 was $94.27 which was a 17% decrease from $113.05 in 2019. Average monthly revenue per post-paid residential mobile subscriber was $58.97 in 2021. A decrease of 6% from 2020. The monthly revenue in 2020 was $62.47 which was a 13% decrease from $71.59 in 2019.

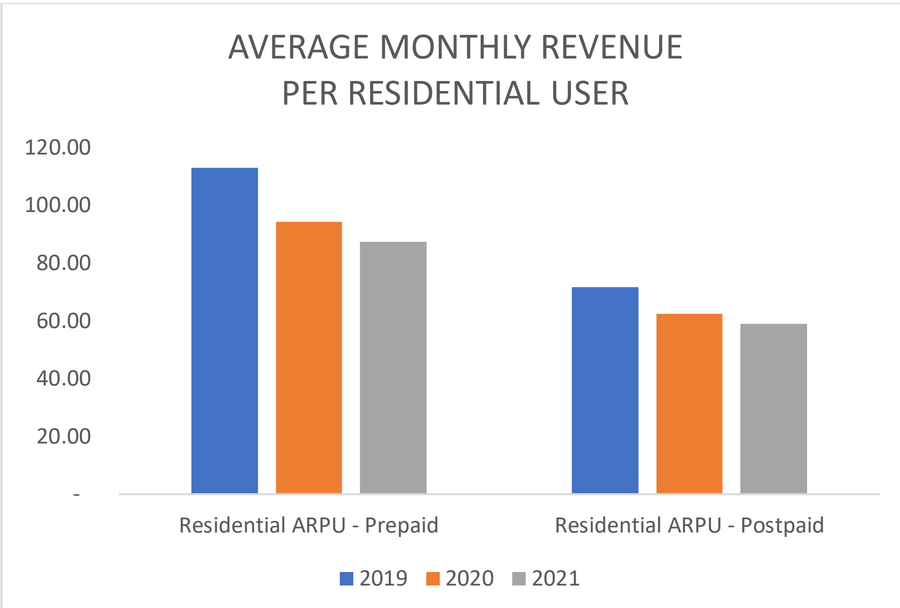

FIGURE 29: MOBILE AVERAGE MONTHLY REVENUE PER RESIDENTIAL PRE AND POST-PAID USERS

SUBSCRIPTION TV

The subscription TV market made up 11.2% of the overall EC market revenue in 2021, 9.61% in 2020 and 9.82% in 2019.

Revenue

Total revenue from subscription TV increased 15% in 2021 to $20.7M. It decreased 11% in 2020 to $17.62M from $19.54M in 2019.

It should be noted that despite reporting subscribers in each period, several sectoral providers were unable to provide revenue figures associated with those subscribers. This has caused some anomalies in the reporting data for 2020.

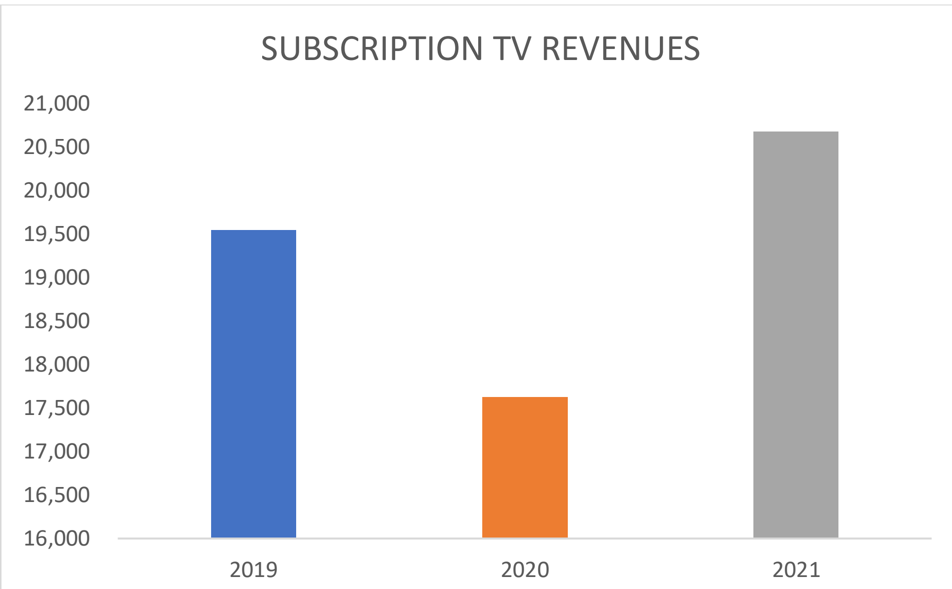

FIGURE 30: SUBSCRIPTION TV REVENUES

Subscriptions

The total number of subscriptions decreased by 13% from 11910 to 10554 in 2021. It also decreased 8.15% from 16,385 in 2019 to 15,049 in 2020.

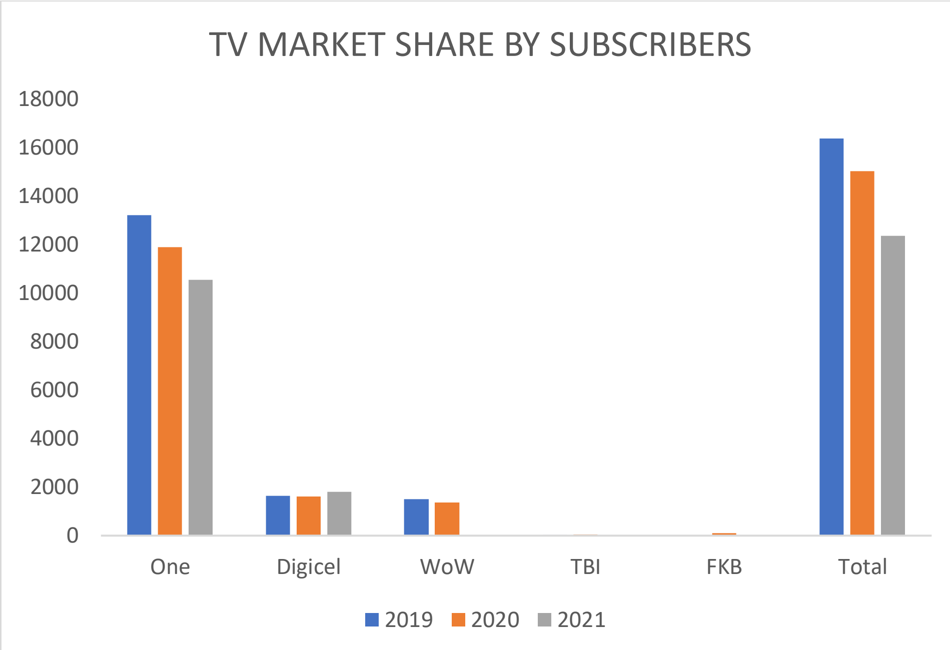

FIGURE 31: SUBSCRIPTION TV SUBSCRIPTIONS

Market Share

For the period under review, there were five sectoral providers in this market. One Communications holds 85% and Digicel holds 15% of the market in 2021. Lack of data submissions does not allow for WOW, TBI and FKB to be included in the 2021 analysis. In 2020, One Communications held 79.14% of the market[12], Digicel held 10.75%, WoW held 9.02% and TBI and FKB each held less than 1%. This is little changed from 2019 when One Communications held 81%, Digicel held 10% and WoW held 9%.

[12] Calculated by number of subscribers

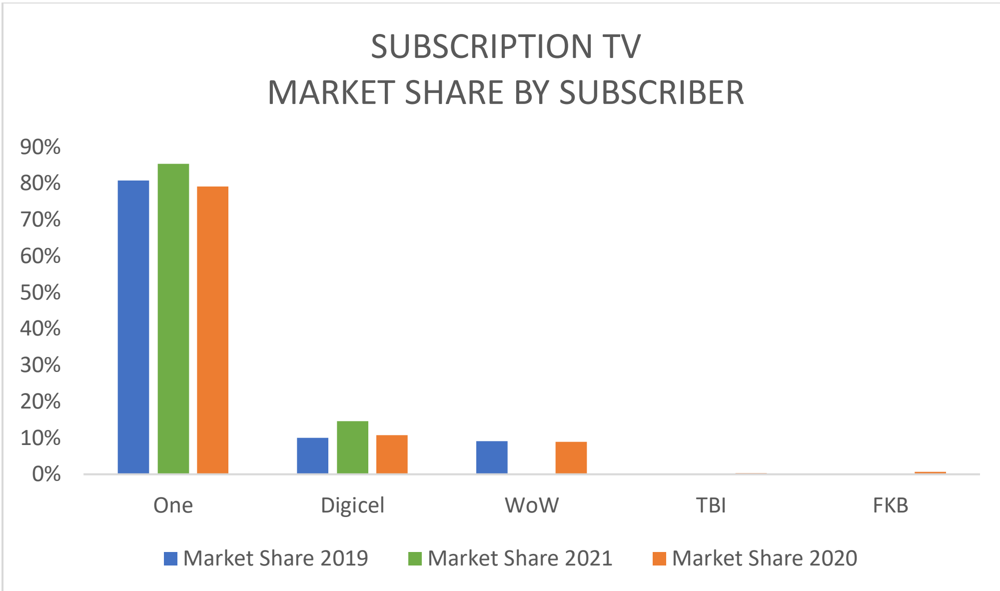

Figure 32: Subscription TV Market Share by Subscriber

Average revenue per user

For the period under review, there were five sectoral providers in this market. WOW, FKB and TBI did not complete the 2021 submission, thus their data is not reflected above.

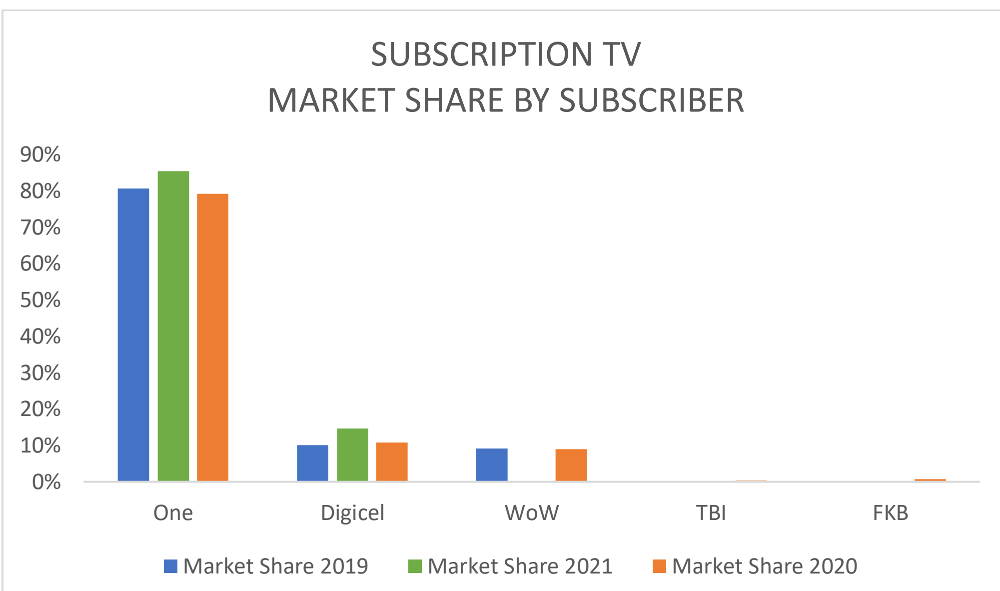

Figure 33: Subscription TV Average Monthly Revenue per User

LOCAL NUMBER PORTABILITY

Local number portability is the ability for residential and business telephone subscribers to retain their existing telephone numbers when switching from one telephone or mobile carrier to another. Local number portability was introduced to Bermuda in 2014.

Porting Statistics:

The following table provides statistics from 2014 through 2021.

TABLE 1: LOCAL NUMBER PORTABILITY PORTING STATISTICS

Year	Total	Successful	Refused	Timed out	Cancelled A	Cancelled B	Not finalised	Other incomplete
2014	2402	1596	384	0	0	418	3	1
2015	2763	1564	855	0	1	340	2	1
2016	2633	1661	568	0	0	393	9	2
2017	2133	1148	610	227	1	142	4	1
2018	3426	2303	721	312	0	69	21	0
2019	4285	2794	796	550	1	51	92	1
2020	2647	1670	629	204	0	99	44	1
2021	1654	1102	345	8	19	44	91	45
Total	**21943**	**13838**	**4908**	**1301**	**22**	**1556**	**266**	**52**

Notes:

1. The “Recipient” network operator is the entity that a subscriber contracts with to provide their telephone service after “porting” or migrating away from their existing service provider (also referred to as the “Donor” network operator.
2. The Block network operator is the original network provider that “owns” the number range that the subscriber’s telephone number falls under.
3. Successful means that the whole process has been completed.
4. Cancelled A means that the transaction was cancelled by the Recipient network operator before a response was received from the Donor network operator.
5. Cancelled B means that the transaction was cancelled by the Recipient network operator after the initial response from the Donor network operator but before the final Instruction was sent.
6. Not finalised means that the Instruction has been sent and the ported number added to the list of ported numbers but the Donor and/or Block operators have not finalised the process.

There were 1,654 porting requests in 2021, down 38% from 2,647 in 2020. Of these requests, 1,102 or 67% were successful while the remainder were either refused (21%), timed out (0.5%) or cancelled (4%).

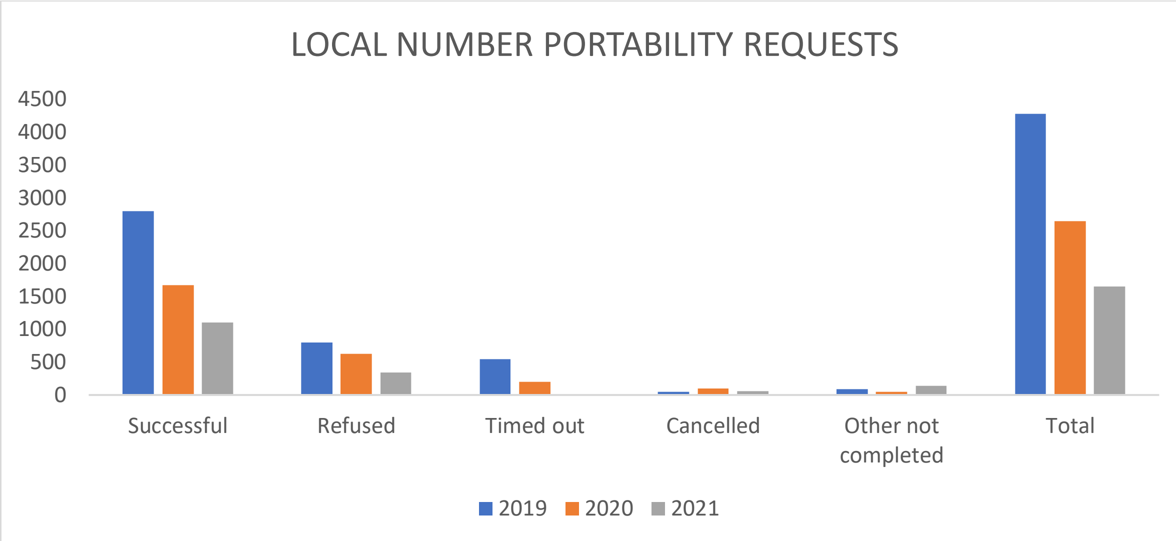

FIGURE 34: LOCAL NUMBER PORTABILITY REQUESTS

Net Ports by Operator (Ports In minus Ports Outs)

TABLE 2: LOCAL NUMBER PORTABILITY PORTS PER EC PROVIDER

Year	CellOne	Digicel	BTC	Fort Knox	Logic	Quantum / LinkBermuda	Telebermuda
2014	-205	206	-59	10	-3	0	51
2015	-130	147	-141	30	-14	16	92
2016	-14	98	-363	100	110	20	49
2017	-319	313	-116	18	10	85	9
2018	184	567	-898	41	43	54	9
2019	394	514	-1235	56	278	-14	7
2020	361	-256	-428	67	224	19	13
2021	182	-41	-370	45	162	15	7
Total	**453**	**1548**	**-3610**	**367**	**810**	**195**	**237**

Average time to port:

The average time to complete a successful port in 2021 was 4.9 days which is a 20% increase from 3.9 days in 2020. The typical[13] target porting time is 2 days.

TABLE 3: LOCAL NUMBER PORTABILITY AVERAGE TIME TO PORT

Year	Days to Authorisation Response	Days to Instruction	Days to Completion
2014	0.7	2.2	3.2
2015	0.8	2.9	6.4
2016	0.9	2.5	3.8
2017	0.7	2.6	3.8
2018	0.7	2	5.2
2019	0.7	2	6
2020	0.9	2.3	3.9
2021	0.9	3.5	4.9

Refusal reasons:

The following table shows the incidence of the different refusal reasons that are permitted.

TABLE 4: LOCAL NUMBER PORTABILITY REFUSAL REASONS

Year	Total reasons	Number of Account Number wrong	Number of Payments overdue	Numbers not active on donor	Internet service not active on this number	Subscriber already suspended	Pre-pay / post-pay is incorrect	Refusal requested by Recipient	Number blocked as lost or stolen
2014	403	74	183	107	12	12	14	0	1
2015	928	242	479	105	44	5	53	0	0
2016	626	144	264	108	66	6	38	0	0
2017	678	166	247	163	72	2	25	2	1
2018	766	240	318	132	14	4	28	30	0
2019	849	258	392	128	0	7	44	18	2
2020	705	169	303	124	0	19	68	18	4
2021	380	144	90	81	0	0	30	35	0

[13] Typical would be where all the documentation is in order, no new line installation is needed and there are no outstanding bills owed by the customer at the donor sectoral provider.

OFF-ISLAND CONNECTIVITY (CORRECT UPDATES)

Bermuda is fortunate to have a total of 5 submarine fibre optic cables with diverse landing points in Bermuda. These cables connect Bermuda to the USA (New Jersey and Rhode Island), the British Virgin Islands (Tortola) and Brazil. Two of the links are part of a larger ring topology system that can automatically protect traffic in the event of a single segment failure.

These cables have all been in place for over a decade and have more than sufficient capacity for Bermuda's immediate and medium-term connectivity requirements.

(https://submarine-cable-map-2021.telegeography.com/, 2021)

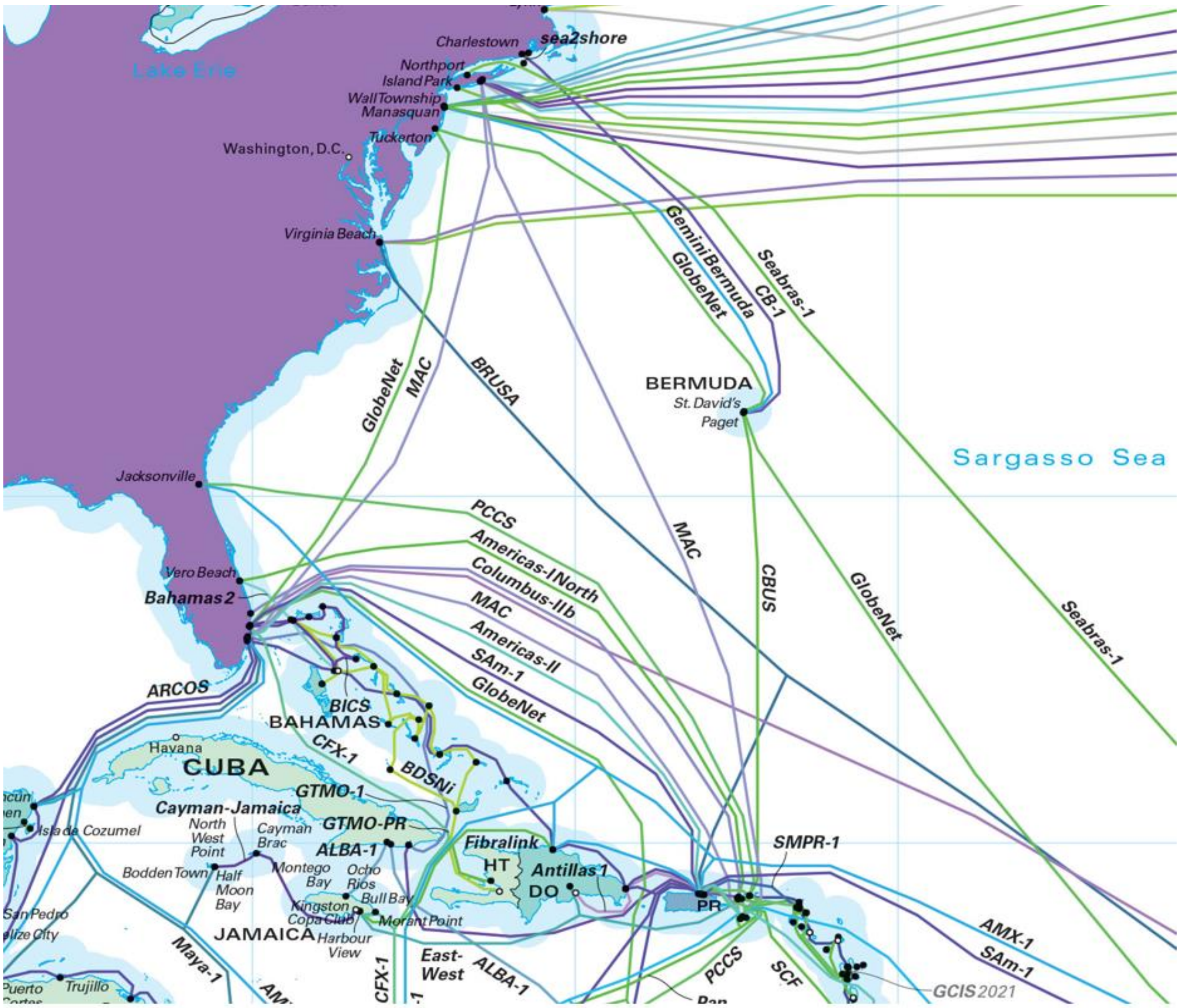

FIGURE 35: SUBMARINE CABLE MAP (COURTESY OF TELEGEOGRAPHY.COM)

Cable systems connected to Bermuda

Globenet Cable System

The Globenet Cable System is a 23,500 km ring cable system with landing points in the United States (Boca Raton, Florida and Tuckerton, New Jersey), Bermuda (Annie's Bay, St. George's), Colombia, Brazil, and Venezuela.

The Globenet cable system has been in service since 2000/2001.

Challenger CB-1

The Challenger Cable System (also known as CB-1) has landing points in the United States (Charlestown, Rhode Island) and Bermuda (Devonshire Bay, Devonshire).

The Challenger cable has been in service since 2008.

Caribbean – US Cable System (CBUS)

Segment 1: Gemini Bermuda-US

Segment 1 of the CBUS Cable has landing points in the United States (Manasquan, New Jersey) and Bermuda (Devonshire Bay, Devonshire).

Segment 1 has been in service since 2007.

Segment 2: CBUS Bermuda - BVI

Segment 2 of the CBUS Cable has landing points in the British Virgin Islands (Tortola) and Bermuda (Devonshire Bay, Devonshire).

Segment 2 has been in service since 2009.

Cable system capacities and utilization

The following table and graph illustrate that Bermuda is currently well served by submarine cable connectivity and has the ability to provide substantially more bandwidth if needed.

TABLE 5: SUBMARINE CABLE CONNECTIVITY - CABLE CAPACITY

Description	Capacity in Terabytes		
	As of 31 December 2019	As of 31 December 2020	As of 31 December 2021
Total System Design Capacity	63	63	64
Total Activated Capacity (includes Bermuda terminating capacity)	12	13	11
% utilized	19%	20%	17%
Total capacity activated and terminating in Bermuda	0.38	0.38	0.38

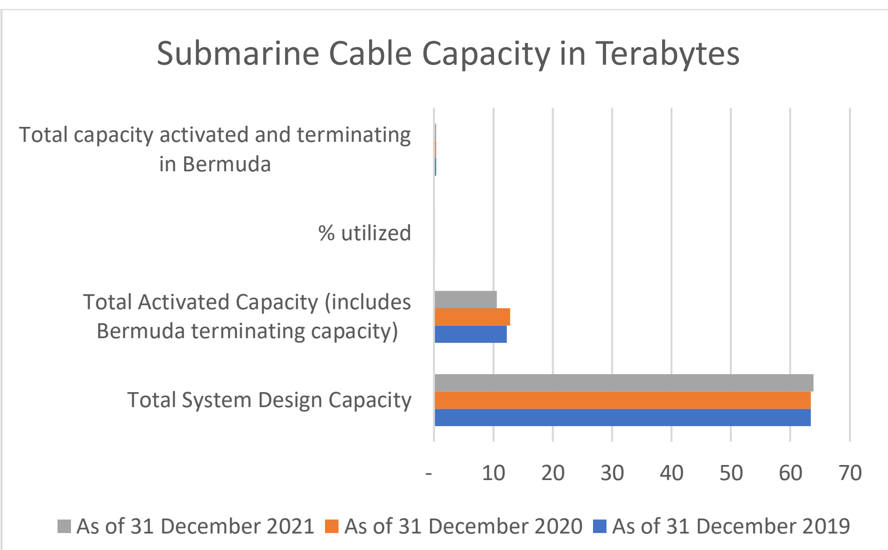

FIGURE 36: SUBMARINE CABLE CAPACITY IN TERABYTES

ANNEX 1: ELECTRONIC COMMUNICATIONS SECTORAL PROVIDERS AS OF 31 DEC 2021

TABLE 6: ANNEX 1: EC SECTORAL PROVIDERS AS OF 31 DEC 2021

Authorisation Holders	Parent Organization (if applicable)	Type of Licence
Bermuda Digital Broadband Ltd.		ICOL
Bermuda Cablevision Ltd.	One Communications Ltd	ICOL
Bermuda Telephone Company Limited	Digicel	ICOL
Bermuda Digital Communications Limited	One Communications Ltd	ICOL
Bermuda Land Development Company Ltd.		ICOL
Globenet Cabos Submarinos Bermuda Ltd.		ICOL
Cable Co. Ltd.	One Communications Ltd	ICOL
Deltronics Limited		ICOL
Digital Mobile Television Limited		ICOL
Electronic Communications Limited		ICOL
FKB Net Ltd.		ICOL
iTech (Bermuda) Limited		ICOL
Logic Communications Ltd.	One Communications Ltd.	ICOL
LinkBermuda Ltd.		ICOL
Paradise Mobile Ltd.		ICOL
TeleBermuda International Ltd.	East End Group	ICOL
TeleCommunications (Bermuda & West Indies) Ltd.	Digicel	ICOL
Transact Ltd.	Digicel	ICOL
TeleCommunications Network Ltd.	East End Group	ICOL
Wave Bermuda Ltd.		ICOL
WOW Ltd.		ICOL
Quovadis Service Ltd.		COL

Key	
ICOL	Integrated Communications Operating Licence
COL	Communications Operating Licence

ANNEX 2: RELEVANT MARKETS AND SMP OPERATORS – MARKET REVIEW SEPT 2020

The following information has been reproduced from the Market Review of the Electronic Communications Sector, Final Report, Decision & Order: 1 September 2020[14]

TABLE 7: ANNEX 2: RELEVANT MARKETS AND SMP OPERATORS - MARKET REVIEW SEPT 2020

Service type	Market #	Relevant markets	SMP operator(s)
Broadband	1	Retail provision of fixed broadband Internet connectivity, provided over any technology, and for any speed, on an island wide basis	OneComm and Digicel Group
	2	Wholesale provision of fixed broadband Internet connectivity, provided over any technology, and for any speed, on an island wide basis	OneComm and Digicel Group
Mobile	3	The island wide provision of retail mobile services (voice, text and data)	OneComm and Digicel Group
	4	The island wide provision of wholesale mobile access	OneComm and Digicel Group
Fixed voice	5	The island wide provision of retail fixed voice services (i.e. voice call origination from a fixed location)	Digicel Group
Subscription television	6	The island wide provision of retail subscription television services	-
Business connectivity	7	Retail low-speed leased lines in the City of Hamilton (25 Mbps and below)	–
	8	Retail low-speed leased lines outside of the City of Hamilton (25 Mbps and below)	–
	9	Wholesale low-speed leased lines in the City of Hamilton (25 Mbps and below)	–
	10	Wholesale low-speed leased lines outside of the City of Hamilton (25 Mbps and below)	–
	11	Retail high-speed leased lines in the City of Hamilton (above 25 Mbps)	–
	12	Retail high-speed leased lines outside of the City of Hamilton (above 25 Mbps)	Digicel Group
	13	Wholesale high-speed leased lines in the City of Hamilton (above 25 Mbps)	–
	14	Wholesale high-speed leased lines outside of the City of Hamilton (above 25 Mbps)	Digicel Group
Off-island connectivity	15	The provision of off-island connectivity (i.e. international data transmission)	–

14 https://www.ra.bm/documents/2020-09-01_market-review-of-the-electronic-communications-sector-final-report-decision-and-order/?wpdmdl=15146&refresh=61d8628389353164157094