

Barometer of mobile Internet connections in Thailand.

Special edition Q1 2020 / Covid-19

The impact of Covid-19 on mobile networks



Publication of
April 20th 2020



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1 Summary

Since the start of the covid-19 epidemic, there has been more demand on mobile telecom networks. On this occasion, nPerf publishes a quarterly report showing the reaction of mobile networks in Thailand since the start of this global crisis situation.

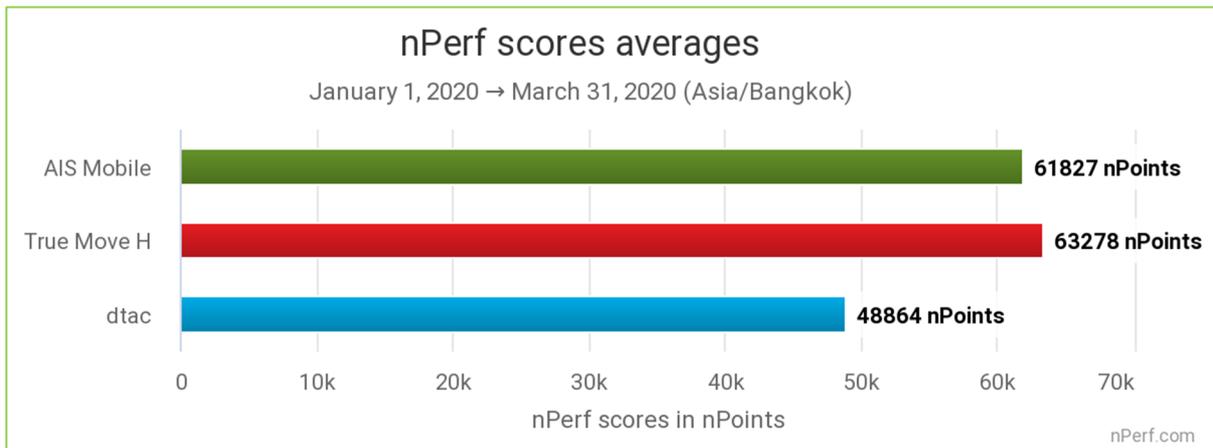
Our study is based on tests carried out during the first quarter of 2020 by users of the nPerf mobile application available on iOS, Android and Windows phone.

Mobile network performances drop but resist

We observe that from the beginning of March the performance of mobile networks drops slightly (at most 10%), especially on web browsing.

The download speeds and the quality of the Streaming remain very acceptable, which allows Thai subscribers to enjoy a very correct user experience, whatever the operator.

Regarding the nPerf scores, True Move still provides the best mobile Internet performances in Q1 2020.



The highest value is the best.

Conclusion

While everyone feared that telecom networks would quickly suffer from the sudden change in internet usage, this is not the case. Indeed, mobile operators have responded by delivering honorable performances despite an unprecedented situation, for the convenience of subscribers.

Hopefully this will last with a possible confinement that promises!

2 Overall results

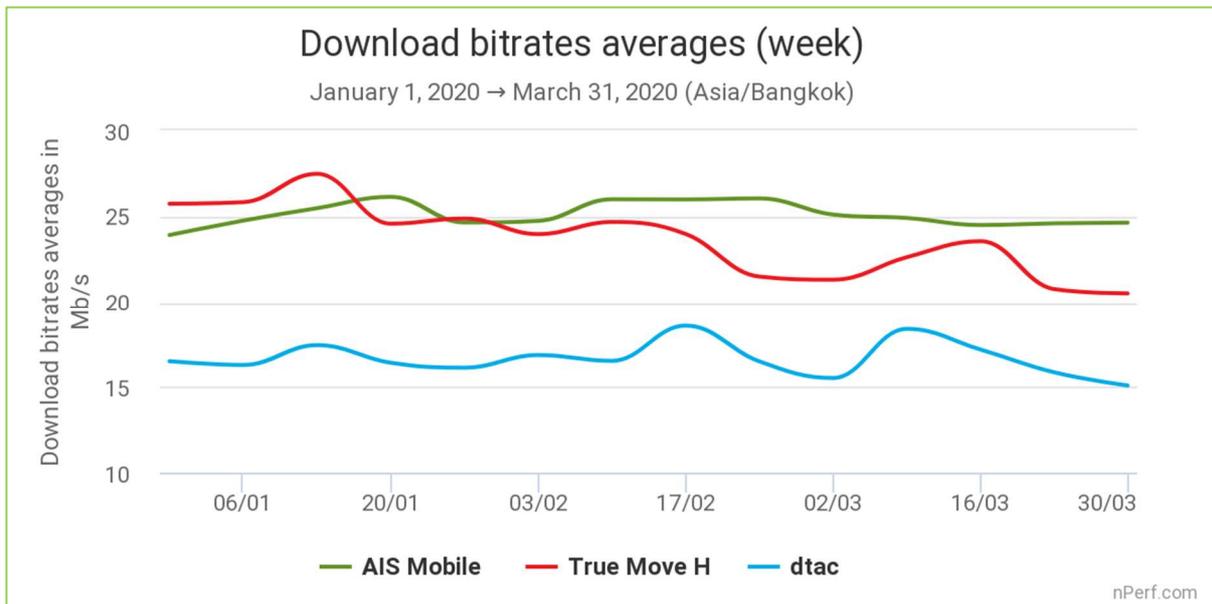
Results from all cell generations taken from tests carried out on 4G-compatible terminals.

The nPerf application allows the user to perform a full test* or each test separately. Between January 1, 2020 and March 31, 2020, we counted **547.242** unit tests, distributed as follows, after filtering (see § 5.1.4):

Technology	Speed	Browsing	Streaming
2G/3G/4G	215.852	83.861	64.875

(*) a full test (speed, web browsing, streaming) = 3 unit tests.

2.1 2G/3G/4G download speed

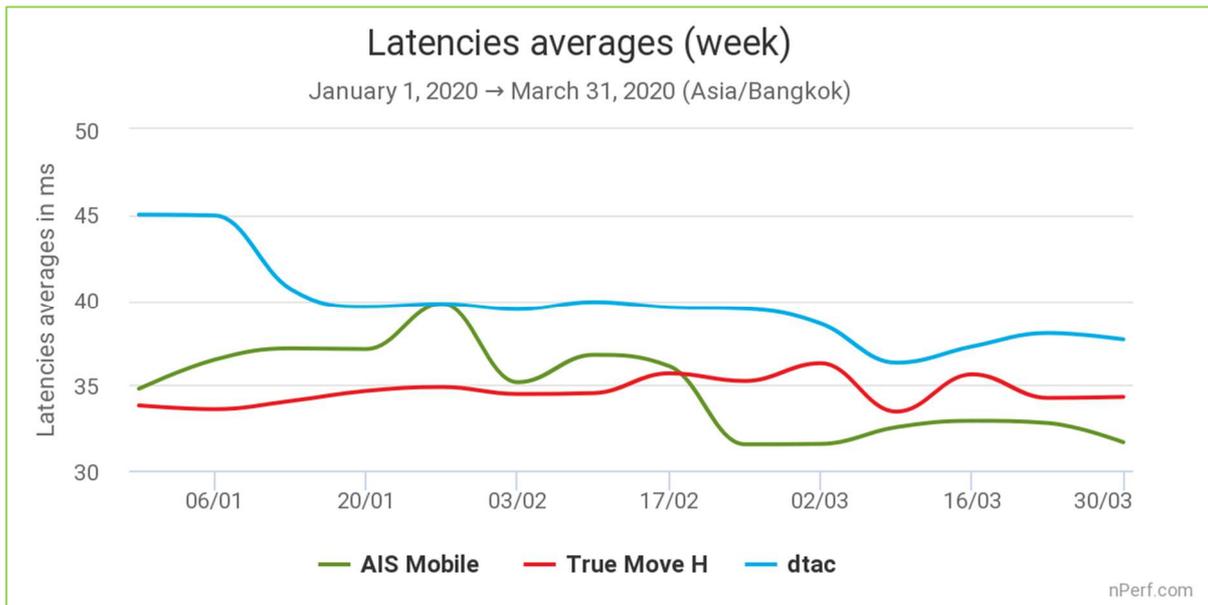


The highest value is the best.

This graph illustrates the ability of providers to maintain a constant download speed during the period, regardless of network load (number of connected end-users).

The download speeds fell between February and March by 10 % on average but remain very acceptable. True Move is the most impacted.

2.2 2G/3G/4G latency



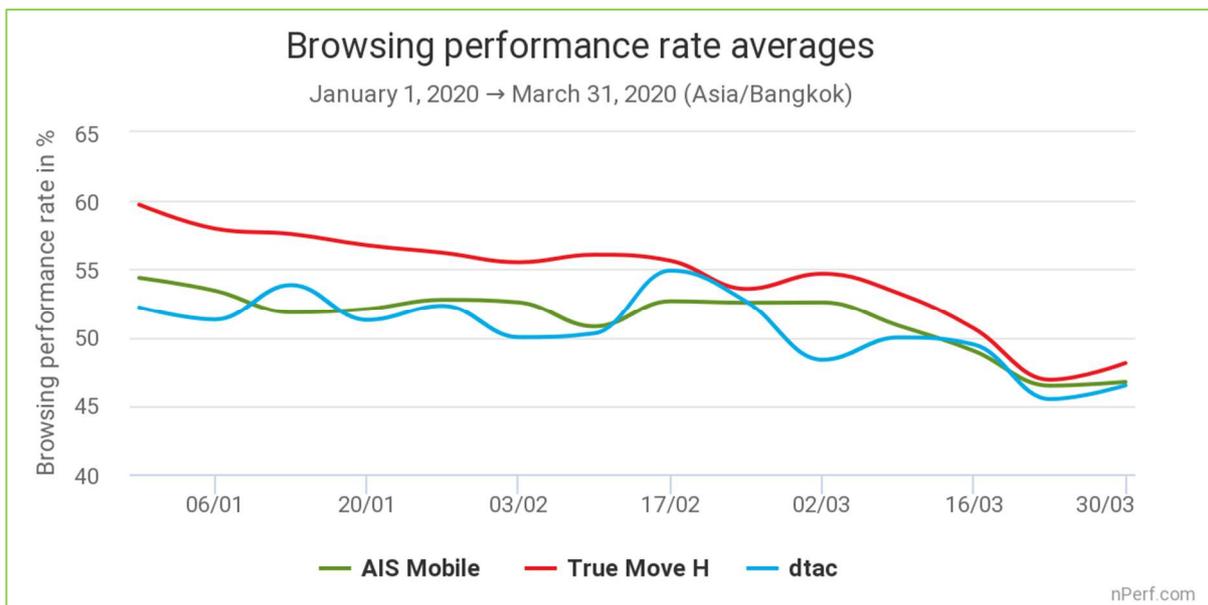
The lowest value is the best.

This graph illustrates the ability of providers to maintain a constant latency during the period, regardless of network load (number of connected end-users).

No worries about the latencies of mobile networks during confinement, they even improved with certain operators between February and March.

2.3 2G/3G/4G browsing test

Average performance of the loading times of the 5 websites most frequented by Thai Internet users (excluding YouTube).



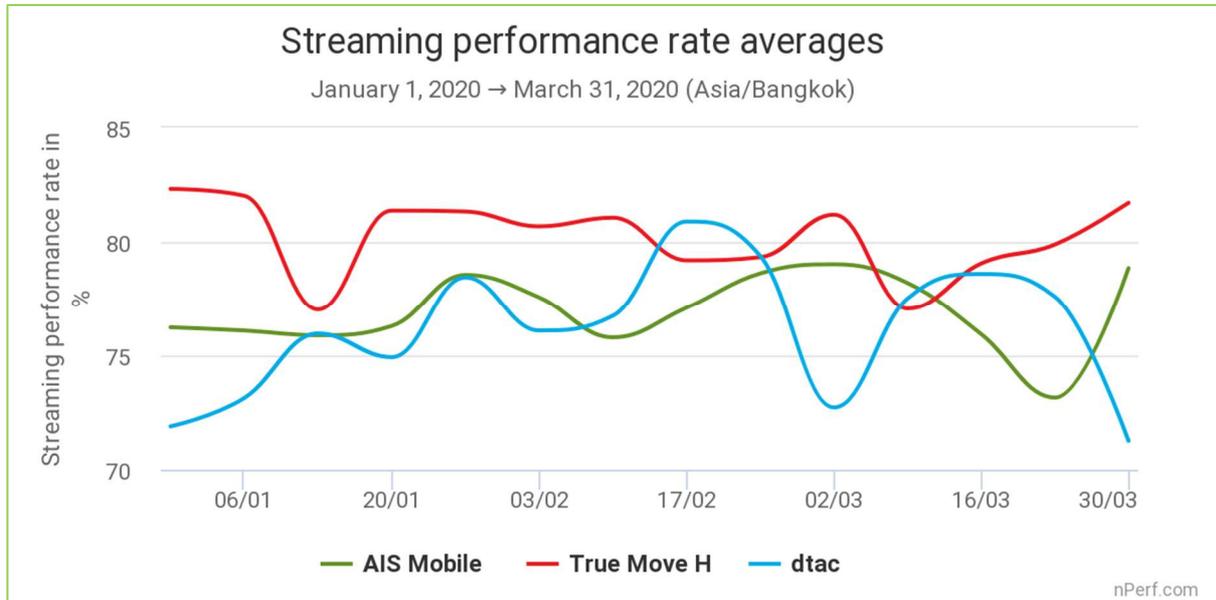
The highest value is the best.

This graph illustrates the ability of providers to maintain a constant browsing performance during the period, regardless of network load (number of connected end-users).

The browsing performances of all operators fell between February and March by 10 points on average and become middling. It means that web pages need 1 more second than before to be fully downloaded.

2.4 2G/3G/4G streaming test

Measuring the quality of watching a video on the YouTube streaming platform.



The highest value is the best.

This graph illustrates the ability of providers to maintain a constant streaming performance during the period, regardless of network load (number of connected end-users).

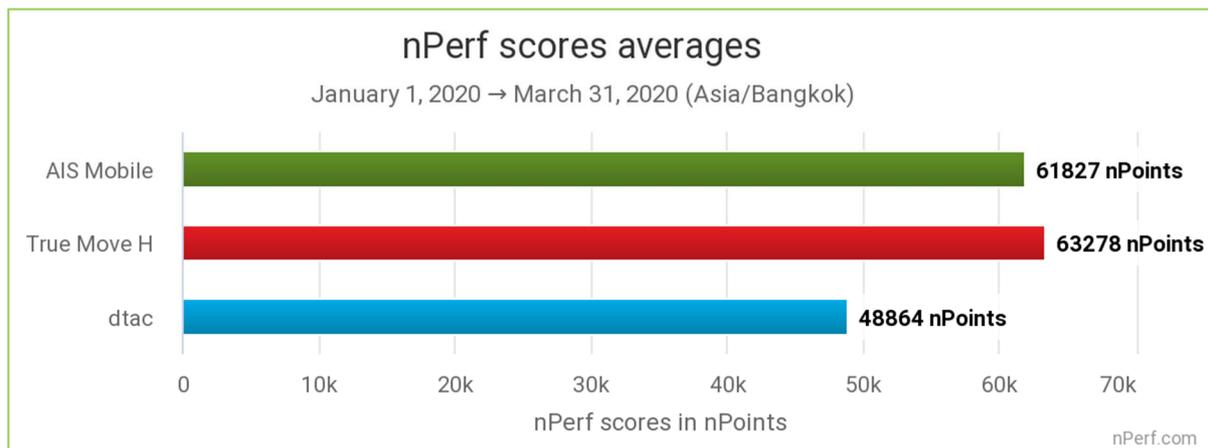
The browsing performances of all operators remain stable in average between February and March.

2.5 2G/3G/4G nPerf score

The nPerf score, expressed in nPoints, gives an overall picture of the quality of a connection. It takes into account measured speed (2/3 download + 1/3 upload), latency and is equally affected by QoE tests (web browsing/streaming). The value of the points concerning throughputs and latency is calculated on a logarithmic scale to better represent the perception of the user.

Thus, this score reflects the overall quality of the connection **felt by the end-user**.

The results below consider all the previous indicators and therefore all the tests carried out. As technologies are grouped together, the proportion of tests in different technologies strongly impacts this global trend. This shows a general ranking of providers for the whole of Thailand.



The highest value is the best.

True Move still provides the best mobile Internet performances in Q1 2020.



Thanks to the nPerf application, find this global indicator directly on your smartphone or tablet via the « Compare » function at the end of the full test. It is updated in real time over 14 rolling days.

3 You too, participate in the nPerf panel!

To participate in the panel, simply use the nPerf application, available for free on the Apple AppStore for iPhone and iPad, on Google Play for Android devices and on the Windows Store for Windows 10 Mobile phones.

Download the nPerf App	
Android	http://android.nperf.com/
iOS	http://ios.nperf.com/
Windows Phone	http://wp.nperf.com/

Also participate in the Fixed Connections Barometer panel by testing your DSL, cable or fiber optic connection at www.nPerf.com or at <http://speedtest.adslthailand.com/>

4 Custom analysis & contact

Do you need further study or want to get the raw data, punctually or automatically, to compile it yourself?

You can contact nPerf via www.nPerf.com "Contact Us" section or directly from the mobile app.

Phone contact: +33 482 53 34 11

Address: nPerf SAS, 87 rue de Sèze, 69006 LYON, France

Stay in touch with us, follow us!



5 Appendices

5.1 Methodology

5.1.1 The panel

nPerf offers a free application for testing the quality of the Internet connection, downloadable on Android, iOS (Apple) and Windows Phone mobile devices.

Everyone is free to use this app to measure the quality of their mobile connection. All users of the nPerf application form the panel of this study.

Thus, the nPerf study is based on the tens of thousands of tests carried out each month exclusively by the operators' end customers., making it the "crowdsourcing" study with the largest panel in Thailand.

5.1.2 Definitions and objectives

5.1.2.1 Success rate

The success rate is the number of successful tests compared to the number of tests performed.

5.1.2.2 Speed and latency tests

The purpose of the nPerf Speed Test is to measure the maximum capacity of the connection in terms of bit rate and latency.

To achieve this, nPerf simultaneously establishes multiple connections to saturate the bandwidth to accurately measure it.

The speed measurements thus reflect **the maximum capacity** of the connection. This rate may not be representative of the user experience experienced during normal use of the Internet because it is measured only on nPerf servers.

The user experience will be measured by quality of service (QoS) tests.

5.1.2.3 nPerf servers

To ensure maximum user bandwidth at all times, nPerf relies on a network of servers dedicated to this task.

These servers are located with hosts in Thailand and abroad. nPerf has also installed dedicated servers directly at Thai operators AIS, dtac and True Move to maximize measurement reliability.

The total bandwidth available for Thailand is greater than 350 Gb/s.

5.1.2.4 The browsing test

The browsing test allows the user to accurately measure the loading time of the 5 websites most frequented by Thai Internet users (YouTube is excluded from this test as it is subject to the following test).

This indicator reflects the quality of navigation perceived by the user. It can however be negatively impacted by the performance of the terminal used, especially if it is old.

It is calculated considering the loading time of the page. A page loaded in 10 seconds or more gets a 0% performance rate and a page loaded instantly gets a performance rate of 100%. For example, a page loaded in 2 seconds will get a performance rate of 80%.

5.1.2.5 YouTube streaming test

The goal of the streaming test is to measure the quality of video viewing on the most popular streaming platform in Thailand and around the world: YouTube.

It operates under conditions similar to the direct use of YouTube and therefore takes into account the quality of the network between the user and the YouTube servers.

It is calculated considering all the time required to load the video (before or during playback). If the ratio between the duration of the video and the overall reading time (reading + loading) tends to 1 then the performance index will tend towards 100%. And conversely, the more the ratio moves away from 1, the more the index will tend towards 0%.

5.1.3 Statistical accuracy

With regard to the total volume of unit tests, the statistical precision used in this publication is:

- ✓ 2% for absolute values
- ✓ 1 point for percentages

If, for a given indicator, one or more operators have results very close to the best, in the confidence interval defined above, these will be share first place.

5.1.4 Filtering of test results

The results obtained are subject to automatic and manual checks to avoid duplication and to rule out possible abusive or fraudulent use (massive tests, robots ...). The exclusive nPerf algorithm retains only the relevant tests, thus eliminating biases related to the overrepresentation of certain terminals, users or test locations.

The results are classified by provider. The results for each provider include the tests performed on the partner networks (roaming, pooling).

5.1.4.1 Filtering of devices

In order not to introduce any bias related to the capabilities of the terminals, only the tests carried out on the 4G compatible terminals are retained. The exhaustive list is provided in the appendix.

5.2 Complete list of 4G terminals selected for Q1 2020

Samsung Galaxy S4 LTE, Samsung Galaxy S3 LTE, LG Nexus 5, Samsung Galaxy Note 3 LTE, Sony Xperia SP, Sony Xperia Z1, Samsung Galaxy Mega 6.3 LTE, HTC One M7, Samsung Galaxy Note II LTE, Sony Xperia Z, Samsung Galaxy Express, HTC One mini, Samsung Galaxy S4 LTE+, Samsung Galaxy S4 Mini LTE, LG G2, Samsung Galaxy Note LTE 10.1, Samsung Galaxy Tab 3 10.1 LTE, HTC One X+, Bouygues Telecom Ulytm 4, LG Optimus G, HTC One SV, Asus Nexus 7, Samsung Galaxy S4 LTE (Google), Sony Xperia Z Ultra, Samsung Galaxy S4 Active, LG Optimus True HD, HTC Desire 601, Samsung Galaxy Ace 3 LTE, Samsung Galaxy S4 LTE Advanced, Samsung Galaxy Note II LTE, Alcatel One Touch Idol S, Samsung Galaxy Note II LTE, Bouygues Telecom BS501, Sony Xperia V, Samsung Galaxy Note II LTE, LG Optimus F6, HTC One max, Apple iPhone 5, Apple iPhone 5S, Apple iPhone 5C, Apple iPad Air, Apple iPad mini 2, Apple iPad 4, Nokia Lumia 920, Nokia Lumia 925, Nokia Lumia 1020, Nokia Lumia 820, Nokia Lumia 625, Nokia Lumia 1520, Nokia Lumia 1320, Sony Xperia Z1 Compact, Huawei Ascend G740, Samsung Galaxy S5, Sony Xperia Z2, HTC One M8, HTC One VX, Motorola Moto X, RIM BlackBerry Z10, LG G3, Nokia Lumia 930, Motorola Moto G 4G, Nokia Lumia 635, Sony Xperia M2, HTC One mini 2, HTC Desire 610, Alcatel One Touch Idol 2 S, Samsung Galaxy S5 LTE-A, HTC Desire 816, Samsung Galaxy S5 LTE-A, ZTE Grand S Flex, Apple iPhone 6, Apple iPhone 6+, Sony Xperia Z3, Sony Xperia Z3 Compact, Samsung Galaxy Alpha LTE-A, Samsung Galaxy Alpha LTE, Samsung Galaxy Note 4 LTE, Samsung Galaxy Note 4 LTE-A, Motorola Moto X 2014, OnePlus One, Motorola Nexus 6, Apple iPad Air 2, Apple iPad mini 3, Wiko WAX LTE, Samsung Galaxy Core LTE, Samsung Galaxy S5 mini, Samsung Galaxy Note 3 Lite, Samsung Galaxy S4 VE, Wiko Rainbow 4G, Archos 50 Helium 4G, Archos 50b Helium 4G, Archos 45 Helium 4G, Archos 45b Helium 4G, Samsung Galaxy Grand II LTE, Nokia Lumia 735, Nokia Lumia 830, Nokia Lumia 822, Nokia Lumia 928, Nokia Lumia 636, Motorola Droid Turbo, Samsung Galaxy Note Edge, Samsung Galaxy S5 Active, Huawei Ascend Mate 7, Huawei Honor 6, Huawei Ascend G620s, Samsung Galaxy Ace Style LTE, Meizu MX4, Meizu MX4 Pro, Sony Xperia E3, Sony Xperia T3, Wiko Birdy, Wiko Highway 4G, Samsung Galaxy S6, Samsung Galaxy S6 Edge, HTC One M9, Asus Zenfone 2, Samsung Galaxy Grand Prime, Archos 50 Diamond, LG G3 S, Samsung Galaxy A3, Samsung Galaxy Tab 4 10.1" LTE, Samsung Galaxy Tab S 10.5" LTE, Samsung Galaxy Core Prime, Samsung Galaxy A5, Wiko Ridge Fab 4G, Wiko Ridge 4G, Motorola Moto G2, Microsoft Lumia 640 XL LTE Dual SIM, Huawei Ascend G7, OnePlus Two, Apple iPhone 6s, Apple iPhone 6s+, Samsung Galaxy Note 5, Samsung Galaxy J2, Samsung Galaxy J7, Samsung Galaxy J5, Samsung Galaxy J1 Ace, Samsung Galaxy A8, Motorola Moto X Style, Motorola Moto X Pure Edition, Motorola Moto G3, Samsung Galaxy S6 Edge+, Sony Xperia Z3+, LG G4, Huawei Honor 7, LG Nexus 5X, Huawei Nexus 6P, Hisense Andromax R, Hisense PureShot+, Hisense PureShot, Huawei P8lite, Huawei P8, Sony Xperia Z5 Cat6, Sony Xperia M4 Aqua Dual, Sony Xperia Z5 Compact Cat6, Sony Xperia M4 Aqua, Sony Xperia M2 Aqua, Sony Xperia C5, Sony Xperia E4g, Samsung Grand Prime VE, Samsung Galaxy S5 Neo, Samsung Galaxy A7, Samsung Galaxy Tab S 8.4" LTE, Alcatel One Touch Idol 3 5.5", Alcatel One Touch Idol 3 4.7", Alcatel One Touch Pop 2 Premium, Orange Nura, Alcatel One Touch Pop S7, Lenovo A7000, Lenovo A6000, Xiaomi Redmi Note 2, Xiaomi Redmi Note 3, Xiaomi Mi 4i, Xiaomi Mi 4, Microsoft Lumia 950, Microsoft Lumia 950 XL, Samsung Galaxy S7, Samsung Galaxy S7 Edge, Wiko Tommy 4G, LG G Flex 2, Apple iPad mini 4, Apple iPad Pro 10", Apple iPad Pro 13", Apple iPhone SE, Wiko Fever, Motorola Moto X Play, OnePlus X, Microsoft Lumia 640 LTE, Microsoft Lumia 640 LTE Dual SIM, Microsoft Lumia 550 LTE, Microsoft Lumia 1330, Microsoft Lumia 650, Microsoft Lumia 650 Dual SIM, Microsoft Lumia 640 XL LTE, Microsoft Lumia 638, Nokia Lumia 929, Smartfren Andromax E2, Samsung Galaxy A5 2016, Huawei Honor 4X, Samsung Galaxy A3 2016, Huawei Honor 5X, Huawei Ascend Mate 8, Sony Xperia Z5 Premium, Sony Xperia X, LG G5, LG V10, Samsung Galaxy A7 2016, Apple iPhone 7, Apple iPhone 7+, Sony Xperia X Performance, Samsung Galaxy Note 7, OnePlus 3, Huawei Y560, Samsung Galaxy Tab A 9.7" LTE, Motorola Moto G4, Asus Zenfone 5, Huawei P9, Huawei P9 Lite, Huawei Honor 5C, LeEco Le Max 2 X820, BlackBerry Priv, Motorola Moto E2, Motorola Moto E3, Motorola Moto Maxx, Samsung Galaxy J3, Asus Zenfone Max, Xiaomi Redmi 3, Xiaomi Mi 5, HTC 10, Huawei Honor 8, Lenovo Vibe K5, Smartfren Andromax Q, Smartfren Andromax R2, Xiaomi Redmi 3s, Lenovo Vibe K4 Note, LG K10, Meizu M2 Note, Samsung Galaxy A9 Pro, Xiaomi Mi Max, Sony Xperia XZ, Motorola Moto G4 Play, Huawei P9 Plus, Huawei Mate 9, Wiko Pulp 4G, Meizu M3 Note, Samsung Galaxy J7 Prime, Samsung Galaxy J2 Prime, Samsung Galaxy Tab A 10.1" LTE, Samsung Galaxy Tab S2 9.7" LTE, Samsung Galaxy Xcover 3, Oppo F1s, Oppo A37, Oppo F1, Oppo F1 Plus, Oppo A33, Xiaomi Redmi Note 4, Xiaomi Redmi Note 4X, Xiaomi Redmi 4, Xiaomi Redmi 4a, Xiaomi Redmi 4X, Asus Zenfone 3 Max, Asus Zenfone 3, Asus Zenfone Go LTE, Asus Zenfone 3 Deluxe, Motorola Moto Z Play, Motorola Moto Z, Motorola Moto X Force, Alcatel Flash Plus 2, Vivo V3Max, Vivo V3, Smartfren Andromax A, Smartfren Andromax E2 Plus, Smartfren Andromax L, Wiko U Feel, Huawei Y6 II, Huawei Mate S, Huawei Honor 6X, Huawei G8, Huawei P8 Lite 2017, Lenovo A2010, Lenovo Vibe P1m, Lenovo Vibe K5 Note, Lenovo P70, Sony Xperia E5, Sony Xperia XA, Sony Xperia X Compact, LG V20, LG X power, LG K8, LG Magna, Google Pixel, Google Pixel XL, OnePlus 3T, Samsung Galaxy S8, Samsung Galaxy S8+, Sony Xperia XZ Premium, Samsung Galaxy A7 2017, Samsung Galaxy A3 2017, Samsung Galaxy J5 Prime, Samsung Galaxy Grand Prime Plus, Samsung Galaxy Tab S2 9.7" VE, Samsung Galaxy Tab A 7" LTE, Samsung Galaxy Tab S2 8.0" LTE, Samsung Galaxy Tab S2 8.0" VE, Motorola Moto G5, Motorola Moto G5 Plus, Huawei P10, Huawei P10 Lite, Huawei P10 Plus, Huawei Mediapad M3 LTE, Huawei Nova, Huawei Mate 9 Pro, Huawei Y5II, ZTE Axon 7, Lenovo P2, Lenovo C2, Lenovo K6, Lenovo Vibe K6 Note, Xiaomi Mi 5s, Xiaomi Redmi 3X, Xiaomi Mi 5s Plus, Asus Zenfone Go ZB500KL, Xiaomi Redmi 2, Xiaomi Redmi Pro, LG G4 Stylus, LG G5 SE, Meizu M3s, Apple iPhone 8, Apple iPhone 8+, Apple iPhone X, ZTE V9820, Samsung Galaxy S8 Active, OnePlus 5, LG G6, Oppo A57, Oppo A39, Samsung Galaxy Note 8, Samsung Galaxy J7 Pro, True SMART 4G Octa 5.5, Huawei Mate 10 Pro, OnePlus 5T, Samsung Galaxy J5 2017, HTC U11, HTC U11 Life, HTC U11+, Motorola Z2 Play, Sony Xperia XZ1, Sony Xperia XZ1 Compact, Google Pixel 2, Google Pixel 2 XL, Samsung Galaxy A5 2017, Xiaomi Mi A1, Motorola Moto G5S Plus, Motorola Moto G5S, Motorola Moto E4 Plus, Motorola Moto E4, Motorola Moto X4, Xiaomi Redmi Note 5A, Xiaomi Mi Max 2, Xiaomi Mi 6, Xiaomi Mi Mix 2, Xiaomi Redmi 5A, Xiaomi Redmi Note 5, Huawei Honor 9, Huawei Mate 10 Lite, Huawei Honor 8 Pro, Huawei Honor 7X, Huawei Honor View 10, Asus Zenfone 4 Max, Asus Zenfone Live, Asus Zenfone 2 Laser, Vivo 1606, Vivo V5s, Vivo V5 Lite, Vivo V7, Vivo Y55s, Vivo Y55L, Samsung Galaxy J7 Nxt, Samsung Galaxy A8 2018, Samsung Galaxy S9+, Samsung Galaxy S9, Samsung Galaxy Note FE, Samsung Galaxy C9 Pro, Samsung Galaxy J3 2017, Samsung Galaxy C7 2017, Samsung Galaxy Tab S3 9.7" LTE, ZTE Blade Q Lux, Oppo F5, Oppo F3, Oppo A71, Oppo R9s, LG X power2, LG Q6, LG X style, Vivo V5 Plus, Wiko U Feel Lite, Lenovo Vibe P1 Turbo, Vivo V7+, Lenovo Vibe C, Sony Xperia XA1 2CA, Sony Xperia XA1, Sony Xperia XA1 Ultra, Motorola Moto C Plus, OnePlus 6, Huawei P20 Pro, Huawei P20, Huawei P20 Lite, Huawei P Smart, Huawei Honor 10, Nokia 7 Plus, Nokia 8, Samsung Galaxy A8+ 2018, Wiko Wim Lite, Wiko Wim, Xiaomi Mi Mix 2S, Xiaomi Mi Note 2, Sony Xperia XZ2, Sony Xperia XA2 Ultra, Sony Xperia XA2, Sony Xperia XZ2 Compact, Oppo F7, Oppo A71 2018, Oppo A83, Oppo F3 Plus, Oppo F5 Youth, Oppo R9s Plus, Asus Zenfone Max Plus M1, Asus Zenfone 4 Selfie, Asus Zenfone Go, Asus Zenfone 4, Huawei Honor 7i, Huawei Honor 9 Lite, Huawei Y9 2018, Huawei Y7 Prime, Huawei Y7, Huawei Y5 2017, Nokia 6, Nokia 5, Nokia 3, Xiaomi Redmi Note 5 Pro, Xiaomi Redmi 5, Xiaomi Mi Note 3, Essential PH-1, LG V30, ZTE Blade A452, Vivo V9, Vivo Y51, Vivo V9 Youth, Vivo Y65, Sony Xperia L1, Samsung Galaxy J2 2016, Samsung Galaxy J2 Pro 2018, Samsung Galaxy Xcover 4, Samsung Galaxy J7 Max, True SMART 4G MAX 5.0, True SMART 4G MAX 5.5, True SMART 4G MAX 4.0, True SMART 4G M1 Plus, True SMART MAX 4.0 PLUS, Bittium Tough Mobile, Telma NAVTECH 4GEN, Vivo Y69, Advan S5E, Advan i5C, Infinix X573B, Motorola Moto C, Samsung Galaxy Note 9, Samsung Galaxy A6+ 2018, Samsung Galaxy A6 2018, Samsung Galaxy J6 2018, Samsung Galaxy J6+ 2018, Asus ZenFone Max Pro M1, Xiaomi Redmi S2, Xiaomi Mi 8, Xiaomi Pocophone F1, Huawei Nova 3i, Vivo Y71, Motorola Moto G6 Plus, Lenovo K8 Note, Oppo A3s, Apple iPhone Xs, Apple iPhone Xs Max, Apple iPhone

XR, Apple iPad 9.7" 2017 WiFi+Cell, Apple iPad Pro 12.9" 2017 WiFi+Cell, Apple iPad Pro 10.5" 2017 WiFi+Cell, Apple iPad 9.7" 2018 WiFi, Apple iPad Pro 11" 2018 WiFi+Cell, Apple iPad Pro 12.9" 2018 WiFi+Cell, Oppo F9, Huawei Mate 20 Pro, Huawei Mate 20 X, Huawei Honor 8X, Huawei Mate 20 Lite, Huawei Honor Play, Huawei Y5 Prime 2018, Huawei Y9 2019, OnePlus 6T, Xiaomi Mi A2 Lite, Xiaomi Mi Max 3, Xiaomi Mi A2, Xiaomi Redmi Note 6 Pro, LG K4 2017, Motorola Moto G6 Play, Nokia 6.1, Samsung Galaxy J8 2018, Samsung Galaxy J4 2018, Asus Zenfone 5Z, Vivo V11, Xiaomi Mi 8 Lite, Xiaomi Redmi 6, Xiaomi Redmi 6A, Xiaomi Mi Mix 3, Samsung Galaxy S10, Samsung Galaxy S10+, Samsung Galaxy A7 2018, Samsung Galaxy J4+, Samsung Galaxy J6+, Samsung Galaxy A9, Huawei Mate 20, Motorola Moto G6, Huawei Nova 3, Google Pixel 3, Google Pixel 3 XL, Huawei Mate 20 X 5G, Xiaomi Mi Mix 3 5G, Samsung Galaxy S10 5G, OnePlus 7 Pro 5G, OnePlus 7, Xiaomi Redmi Note 7, Xiaomi Redmi Note 7 Pro, Xiaomi Mi 9, Samsung Galaxy A50, Samsung Galaxy A30, Samsung Galaxy S10e, Huawei P30 Pro, Huawei P Smart 2019, Huawei P30, Huawei Honor View 20, Huawei Y7 Pro 2019, Vivo V11i, Vivo Y91, Myria Grand 4G, Oppo A7, Oppo Realme C1, Oppo F11 Pro, Asus ZenFone Max Pro M2, Motorola Moto G7 Power, Motorola One, ZTE Axon 10 Pro 5G, Apple iPhone 11, Apple iPhone 11 Pro, Apple iPhone 11 Pro Max, Apple iPad Air 3, Apple iPad Mini 5, Samsung Galaxy Note 10+, Samsung Galaxy A40, Samsung Galaxy A70, Samsung Galaxy A10, Samsung Galaxy A20, Samsung Galaxy M20, Samsung Galaxy Note 10, Samsung Galaxy Note 10+ 5G, Samsung Galaxy A50s, Samsung Galaxy A80, Xiaomi Redmi Note 8 Pro, Xiaomi Mi 9T Pro, Xiaomi Redmi Note 8, Xiaomi Redmi Note 8T, Xiaomi Redmi 7, Xiaomi Redmi 7A, Xiaomi Mi 8 Pro, Xiaomi Redmi K20 Pro, Oppo A5s, Oppo Reno, Oppo A9, Oppo A5, Oppo F11, Oppo A1k, Sony Xperia XZ2 Premium, Sony Xperia 1, Huawei Honor 20, Huawei P30 Lite, Huawei Y9 Prime 2019, Huawei Nova 4, Huawei Honor 7A, Huawei Honor 10 Lite, Realme 3 Pro, Realme 3, Realme C2, Realme 5 Pro, Realme 5, Vivo V15, Vivo Y12, Vivo Y17, Vivo Y91i, Vivo V15 Pro, Vivo Y95, Vivo Y83 Pro, Vivo S1, Vivo Y93, Vivo Z1 Pro, Vivo Y81, OnePlus 7T Pro, Google Pixel 3a, Google Pixel 3a XL, Motorola One Vision, Motorola Moto G7 Play, Motorola Moto G7 Plus, Motorola Moto Z3 Play, LG G7 ThinQ, LG V50 ThinQ 5G, Nokia 6.1 Plus, Nokia 5.1 Plus