

Measurement based performance analysis of 3G and 4G LTE network



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Aim of Project

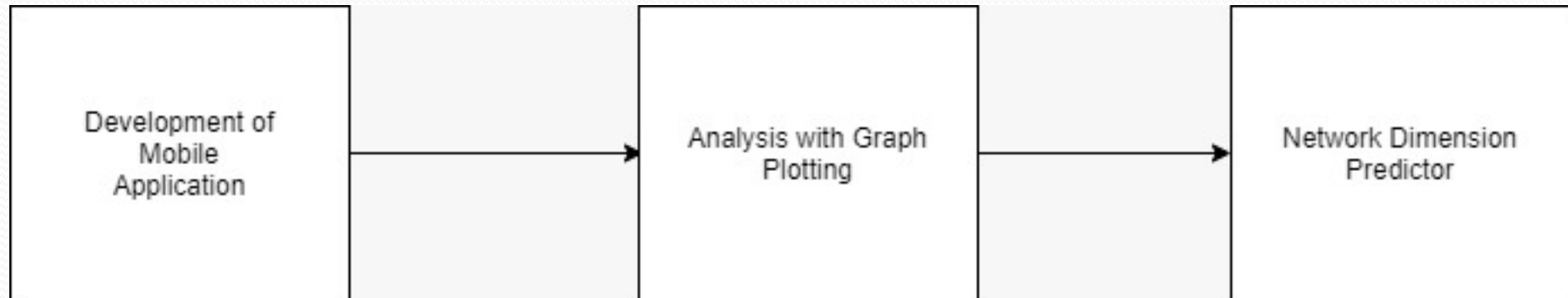
- 1) Analysis of 3G and 4G LTE network in rural areas of India
 - On same operator
 - On different operators
 - On different web platforms.
- 2) To make a predictive model and notification features which notify user.



Introduction

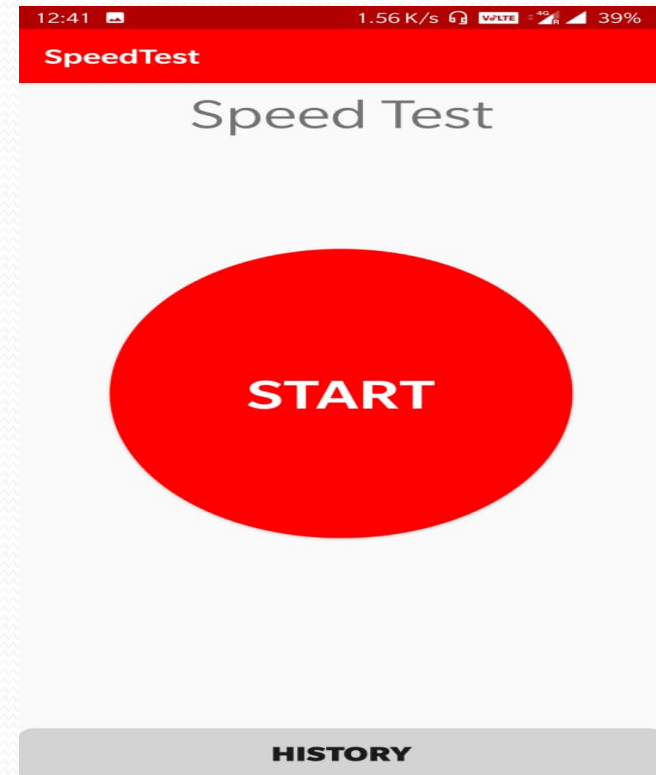
- 1) The society's increased reliance on Mobile networks has led to big challenges for service providers.
- 2) This study aims to understand the actual user MBB experience in rural area of India.
- 3) Having this knowledge allows relevant bodies and agencies to layout plans for sustaining or even refining the current Mobile Broadband services in rural areas of India.
- 4) In addition, this can also help consumers to understand the performance benefits of 4G over 3G and to identify performance differences between different operator's networks.
- 5) Also, this study will contribute significantly to planning 5G networks efficiently.

Process flow diagram



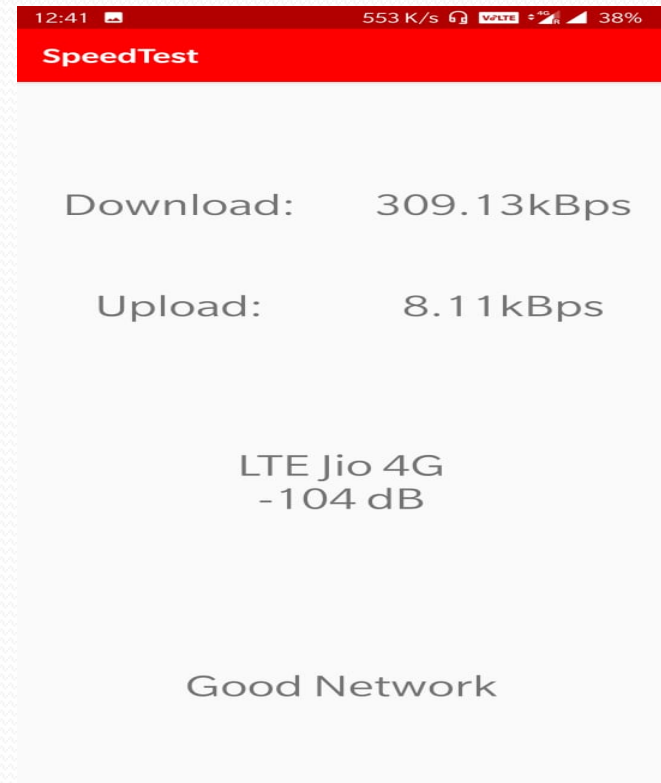
Development of mobile application

- ❑ USE:
 - Java
 - Android Studio
 - Sqlite
- ❑ Fig. show **SPEED TEST** APP interface,
- ❑ When clicked on “START” gives Upload and Download speed of operator.
- ❑ When clicked on “HISTORY” gives detailed history about speed and time along with date.



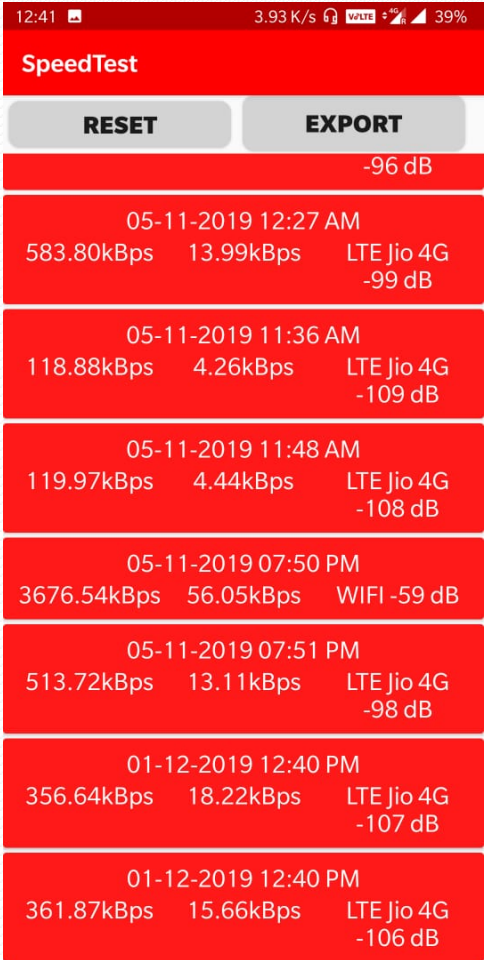
Development of mobile application

- ❑ Fig. show Running-interface of **SPEED TEST** App.
- ❑ Gives Download And Upload Speed in KBps of a operator.
- ❑ Gives Name of Operator used for Speed testing purpose along with gives Signal Strength of that operator.
- ❑ These speed and date/ time store in local storage i.e sqlite.



Development of mobile application

- ❑ Fig. show History-interface of **Speed Test** App.
- ❑ Each row give detail information about
 - A. DATE and Time of Speed Testing,
 - B. Download And Upload Speed in KBps
 - C. Name of Operator and Signal Strength of that operator.
- ❑ **RESET**: used to clear data from storage.
- ❑ **EXPORT** : used to retrieve the data stored in local storage to a .csv file whenever required.



The screenshot displays the 'SpeedTest' app interface. At the top, there's a status bar with the time 12:41, network speed 3.93 K/s, and battery level 39%. Below the status bar, the app title 'SpeedTest' is shown. Two buttons, 'RESET' and 'EXPORT', are visible. The main content area lists several test results, each in a red box. Each entry includes a timestamp, download and upload speeds in KBps, the network operator, and the signal strength in dB.

Timestamp	Download Speed (KBps)	Upload Speed (KBps)	Operator	Signal Strength (dB)
05-11-2019 12:27 AM	583.80	13.99	LTE Jio 4G	-96 dB
05-11-2019 11:36 AM	118.88	4.26	LTE Jio 4G	-99 dB
05-11-2019 11:48 AM	119.97	4.44	LTE Jio 4G	-108 dB
05-11-2019 07:50 PM	3676.54	56.05	WIFI	-59 dB
05-11-2019 07:51 PM	513.72	13.11	LTE Jio 4G	-98 dB
01-12-2019 12:40 PM	356.64	18.22	LTE Jio 4G	-107 dB
01-12-2019 12:40 PM	361.87	15.66	LTE Jio 4G	-106 dB

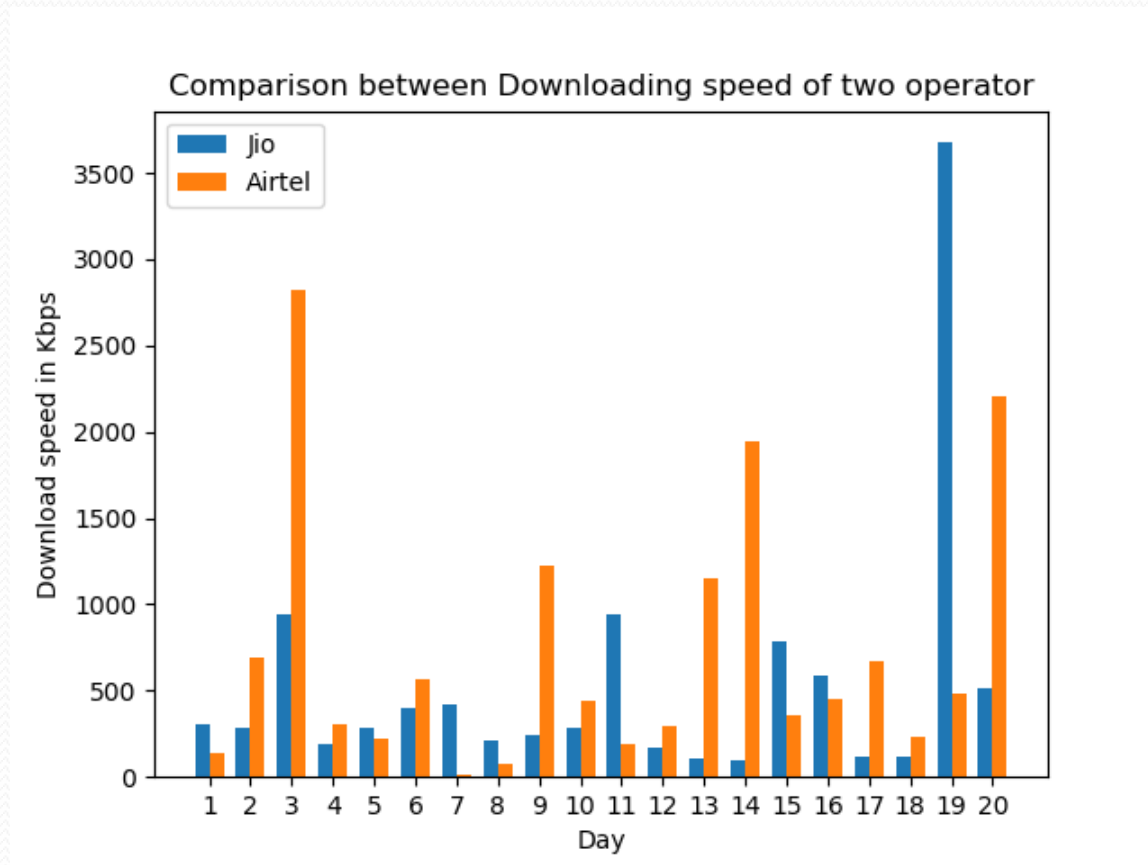
Methodology

- Our test processes were designed with the following assumptions and settings :
 1. Each network was tested concurrently to ensure that environmental conditions were the same for each service operator.
 2. Identical handsets were used for each network.

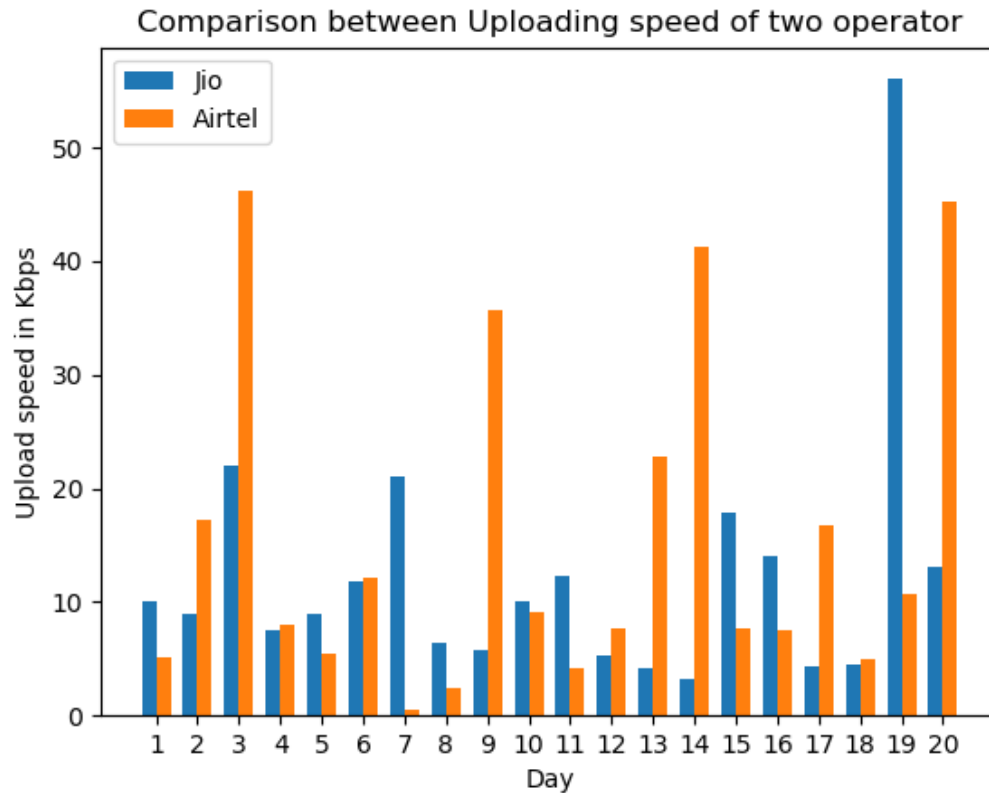
Steps for Analysis

1. We have collected data (upload and download speed) for the whole month in an interval of 15 minutes.
2. Average of the all the intervals into a single value (discarded last few days).
3. Usage of RegEx to recover the values from the text of the csv files.
4. Separation of the files on the basis of:
 - Operator names
 - Operations performed i.e upload, download speed etc.
 - On the basis of platforms used.
 - On the basis of network type i.e 3G, 4G etc.

Comparison of download speeds in 4G between Airtel and Jio Operators



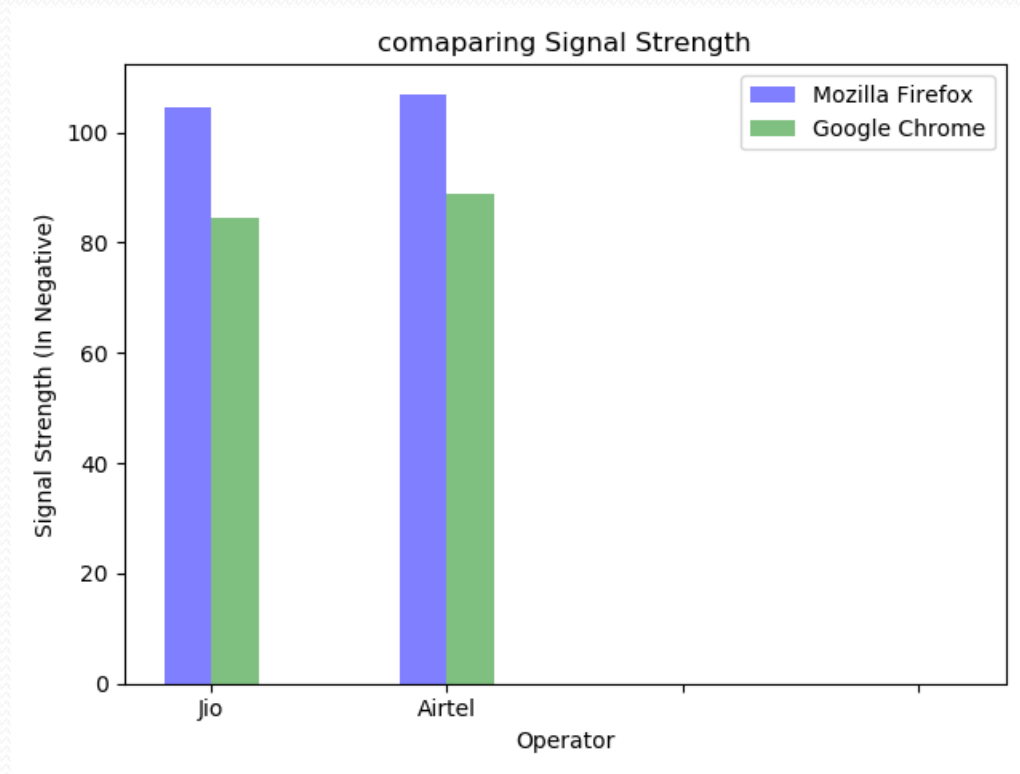
Comparison of upload speeds in 4G between Airtel and Jio operators



Analysis of Comparison of Download and Upload Speed Graph

- ❑ In some days, Jio performs better than Airtel while in other days, Airtel performs better.
- ❑ In this analysis, Airtel 4G and Jio 4G LTE has been used.
- ❑ It can be seen that LTE is not the fastest kind of 4G when comparing with a different operator.

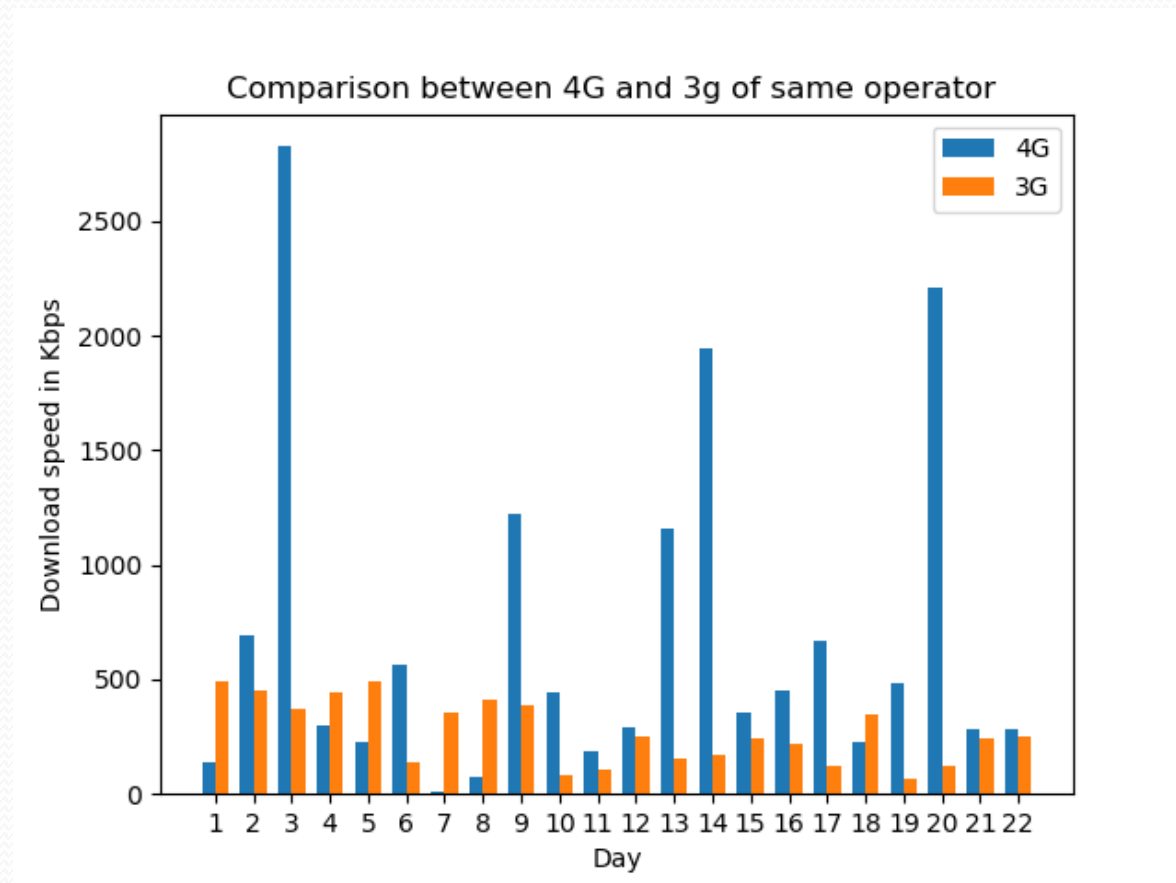
Comparison of Signal strengths in Google Chrome And Firefox platforms using Airtel and Jio operators



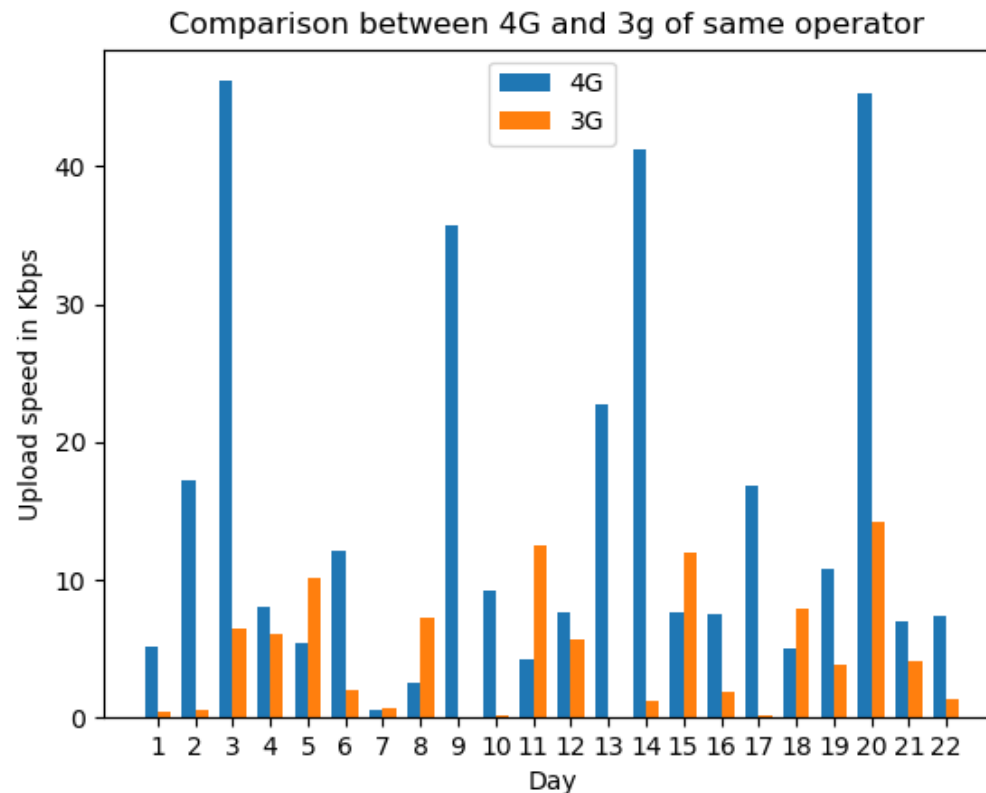
Analysis of Comparison of Signal strengths in Google Chrome And Firefox platforms

- ❑ According to the analysis, Google Chrome performs better in both the network operators.
- ❑ Measured in Signal strength is measured in negative i.e less negative, better performance in number of web access cycles.
- ❑ Jio is performing better in average in the range of 22-25 days .
- ❑ So conclude that Jio has better performance than Airtel in web platforms.

Comparison of download speeds in 3G and 4G using a single operator.



Comparison of upload speeds in 3G and 4G using a single operator



Analysis of Comparison of Download and Upload Speed Graph in Airtel-3G and Airtel-4G

- ❑ It shows that in every aspects, 4G beats 3G in terms of speed, signal strength etc.
- ❑ It can be seen that for a day or two, 3G performs better than 4G i.e 2/22 which has a probability of 9%, can be neglected.
- ❑ This analysis is based on a single operator. This does not mean that 4G network of one carrier will always be faster than 3G network of another.



Factors affecting Internet Speed

- your location from tower and base server station
- the number of people sharing the connection i.e the traffic.
- the device you use.
- transfer technology
- tower capacity
- transfer packet specification etc.

Factors affecting speed on different browser with same operator

- Hardware you use.
- RAM used by browser
- Number of downloads of particular browser.
- Depend on packet types you send
- Transfer technology.
- Authenticity of the platforms.

Future Goals and Aspects

- ❑ To make a predictive model which can predict the dimensions of the network.
- ❑ To make a notification feature which will notify the users.
- ❑ To make analysis of mobile broadband services delivered to other devices and the performance of mobile virtual network operators (MVNOs).

Conclusion

- ❑ The present work has been carried out to measure the mobile broadband and to provide a comparison 3G and 4G, different web platforms etc.
- ❑ Two metrics parameters, namely network signal strength and speed are considered in this analysis.
- ❑ Our results says that on average, 4G networks performed much better than 3G networks throughout across all the measurement areas considered.

References and Bibliography

- ❑ Python 2.7.14 documentation: <https://docs.python.org/2/>
- ❑ Matplotlib: <https://matplotlib.org/>
- ❑ Stackoverflow: <https://stackoverflow.com/>
- ❑ Wikipedia: <https://www.wikipedia.org/>
- ❑ Performance Analysis of Mobile Broadband Networks in Rural Areas: 5G and Beyond Trends by Ibraheem Shayea, Dalia Nandi, Aymen Alsalah.



THANK YOU