



Operator Assisted Drive Test Report

SALEM SSA

MARCH 2022

(RO, HYDERABAD)

Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2%. All TSPs have met the Call Setup Success Rate (CSSR) of 95%.

The Operator Assisted Drive Test has been carried out by Regional Office, Hyderabad with the help of Service Providers in Salem City and surrounding areas Namakkal & Mettur from 9:00 AM to 8:00 PM during 14th Mar. to 17th March 2022. The drive test covered drive route of 380Kms & 6 hotspot over a period of 4 days. Approximately 525 calls were made for each of the 7 networks: three 2G networks, one 3G network and three LTE networks covering four TSPs.

Overview

Voice
Summary

Data
Summary

Overview

Regional Office, TRAI Hyderabad conducted Operator Assisted Drive Test from 14th to 17th Mar. 2022 covering various locations in Salem City & surrounding regions Namakkal and Mettur. The performance of Airtel, BSNL, Vodafone Idea and Jio were monitored across various technologies (2G, 3G and 4G). The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services in terms of

Voice: Coverage, Quality, Handover Success Rate, Call Setup Success Rate, Drop Call Rate and Block Call Rate.

Data: Download and Upload Throughputs, Web Browsing Delay and Latency

Drive Test Details :

Voice Tests: Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies. The drive test covered a drive route of approximately 380 KMs over a period of 3 days from 14th to 16th Mar. 2022. Approximately 525 calls were made for each of the 7 networks: Three 2G (Lock Mode) networks, One 3G (Dual mode) network and Three VoLTE networks covering 4 unique TSPs.

Data Tests:

1. Dynamic data test was conducted for 380 kms over a period of 3 days for download throughput for 3G & 4G technologies.

2. Data Tests were performed at 6 static locations for 2G, 3G & 4G technologies.

* For Voice and Data KPI's, 2G measurement is done with UE locked mode, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.

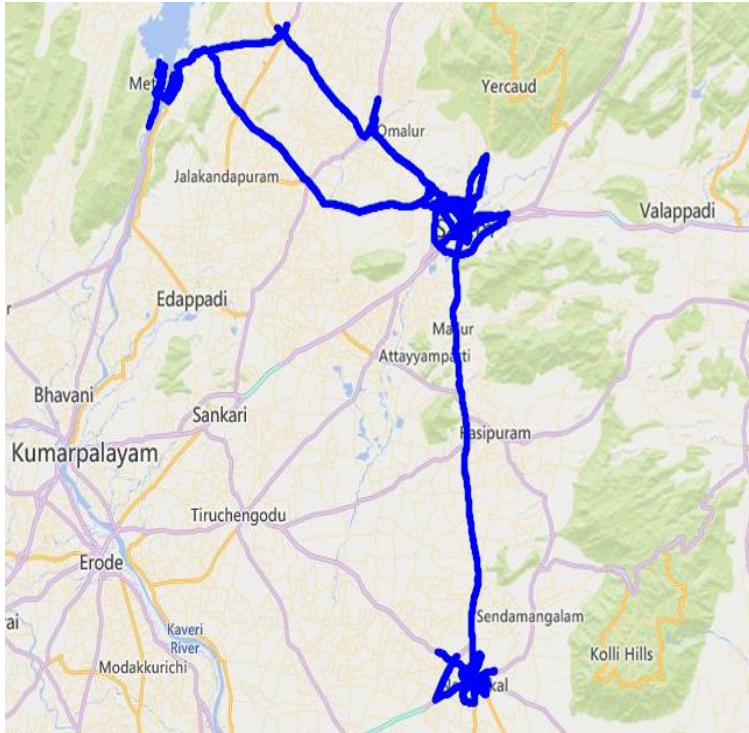
* 3G KPI's which are calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.

* 4G KPI's which are calculated from the UE in Free Mode included samples and events of 2G & 3G.

Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Latency	32 Bytes on www.google.com

Overview

Voice & Dynamic Data Test Drive Route



Areas Covered –Salem Town(Day 1)

Salem Junction	4 Roads
Oldsuramangalam	Collector office
Steelplant	Oldbustand
Mamangam	Ponnamapet
Periyar university	Ammapet
Narsodhipatty	Narayananagar
Shivayanagar	Bazaar Street
5 Roads	Gugai
Saradhacollege	Shevapet
Hasthampatty	Ananthanapatty
Periyakollpatty	Nethimedu
Yercaud Adivaram	Dadagapatty
Kannankurichi	Seelanaikenpatty
Govt arts college	Erumapalayam
Jairam college	Udayapatty
Fairlands	3 Roads
Newsbustand	Kondalampatty

Hotspots for static data test

Static Locations

Namakkal- Anjaneyar temple
Mettur- Park
Bazaar- Salem
Collectorate-Salem
New Bus stand- Salem
Railway Junction-Salem

Areas Covered- Salem to Namakkal (Day 2)

Gajalnaikenpatty	Andavar Nagar
Mallur	Mohanur Road
Andalurgate	Teachers colony
Pavai college	Paramthy Road
Pudansandhai	Angeneyar Temple
Salem Road	Periyapatty
Namakkal Bustand	Vallipuram
Sendhamangalm road	Collector office- Namakkal
Kosavapatty	Nallipalayam
Triuchy Road	Thiruchengode road

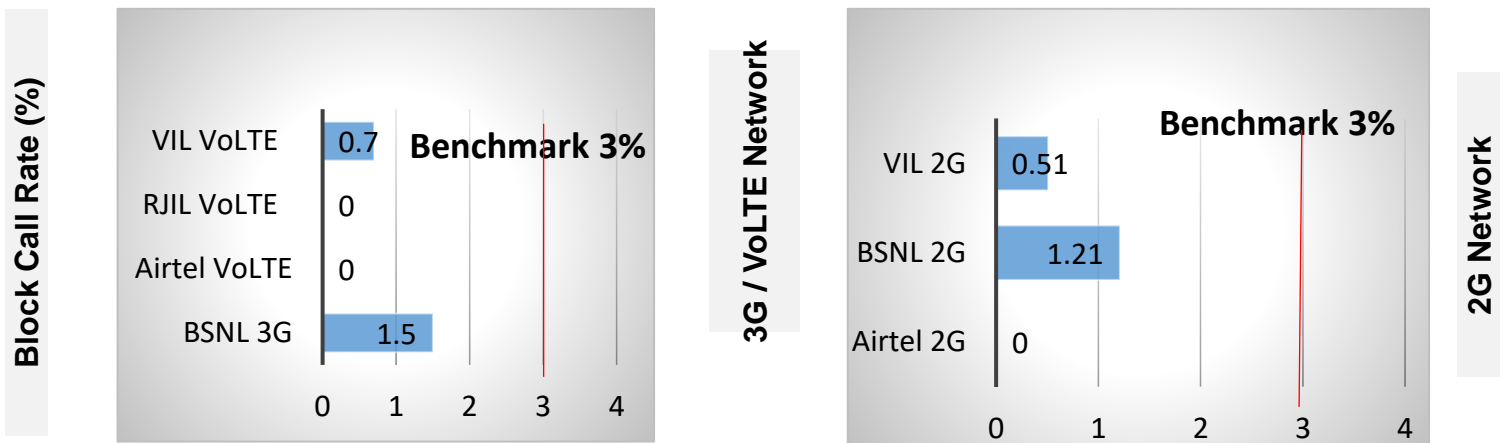
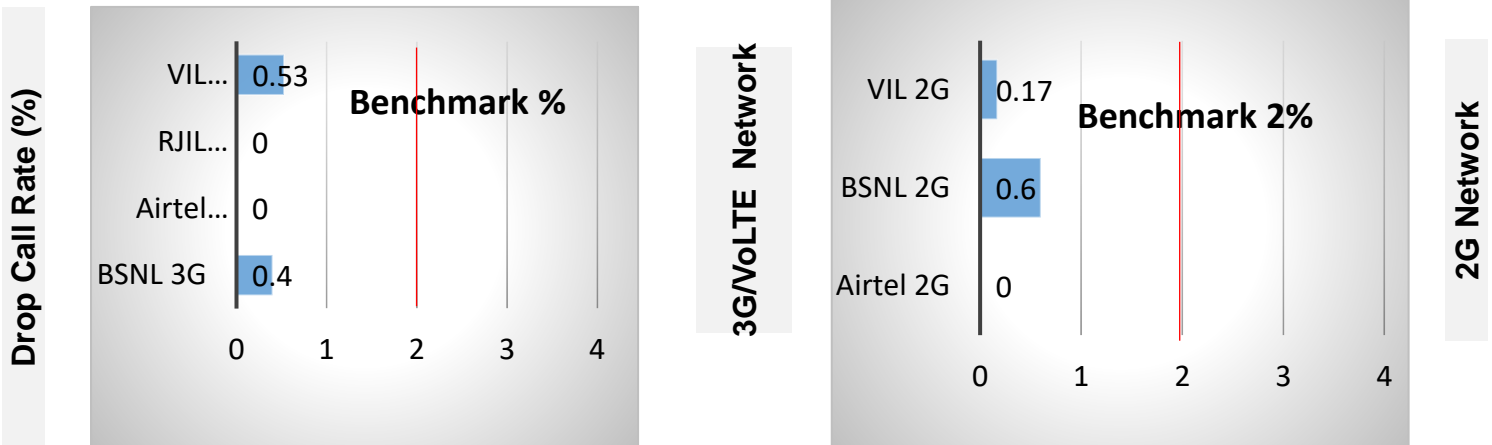
Areas Covered- Salem to Mettur (Day 3)

BSNL Office	Salem RS
AVR Circle	Salem CAMP
Omalur	Madhayankuttai
Salem Airport	Karungalur
Kamalpuram	Chinnamettur
Kamaneri	MetturBustand
Paraigalur	Kulluveranpatty
Mecheri	Thotilpatty
Pottaneri	Mettur Park
Kunjandiyur	Mettur Damroad

Voice Calls

Key Observations

QoS compliance of the TSPs in Salem for Voice across technologies 2G/3G/4G-VoLTE:



KPIs	2G			3G	VoLTE		
	Airtel	BSNL	VIL	BSNL	Airtel	RJIL	VIL
Drop Call Rate %	0	0.60	0.17	0.4	0	0	0.53
Block Call Rate %	0	1.21	0.51	1.5	0	0	0.70

- a) All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%).
- b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's.

Voice Calls

Key Observations

Coverage

a) Percentage of coverage samples for 2G \geq -85 dBm.

TSPs	2G		
	Airtel	BSNL	VIL
Coverage %	94.10	98.30	85.98

b) Percentage of coverage samples for 3G \geq -90 dBm & LTE \geq -110 dBm

TSPs	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Coverage %	95.50	99.90	99.49	98.51

c)) Percentage of time spent on 3G/VoLTE network

TSPs	3G	VoLTE		
	BSNL	Airtel	VIL	JIO
Time Spent on 3G/4G %	32	100	92.89	100

Data Services Static

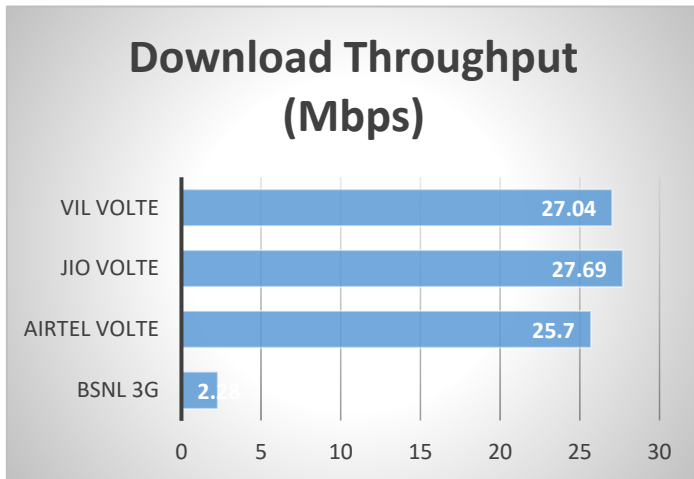
Key Observations (Average of 6 Hotspots)

Data was tested at 6 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), and Web browsing delay (Flipkart, Amazon, PayTm)

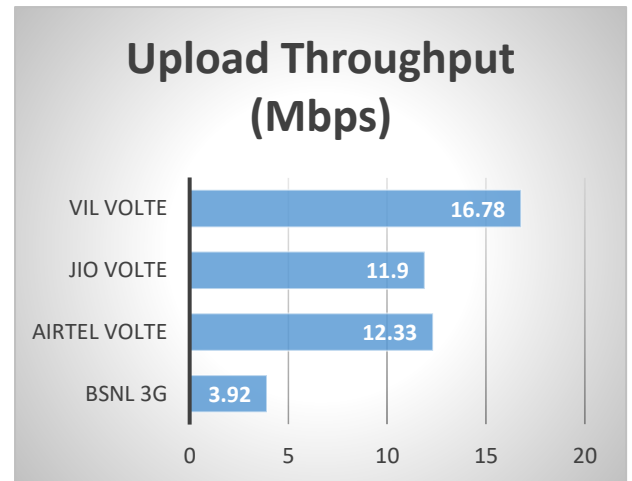
Data Download and Upload Performance (Mbps)

3G/4G/ Network:

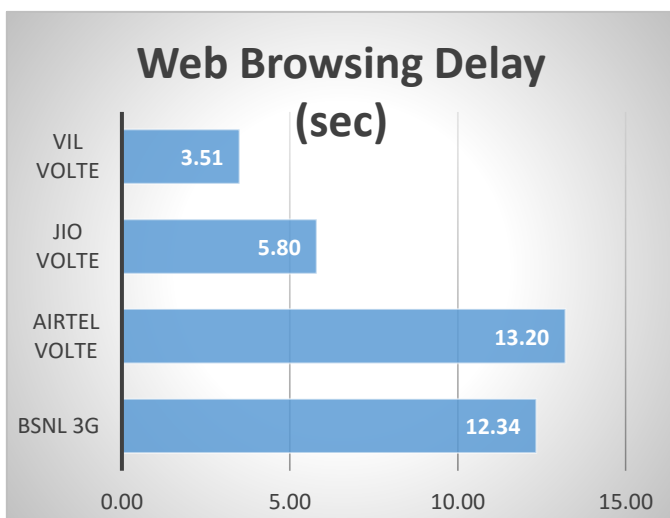
Download Throughput (Mbps)



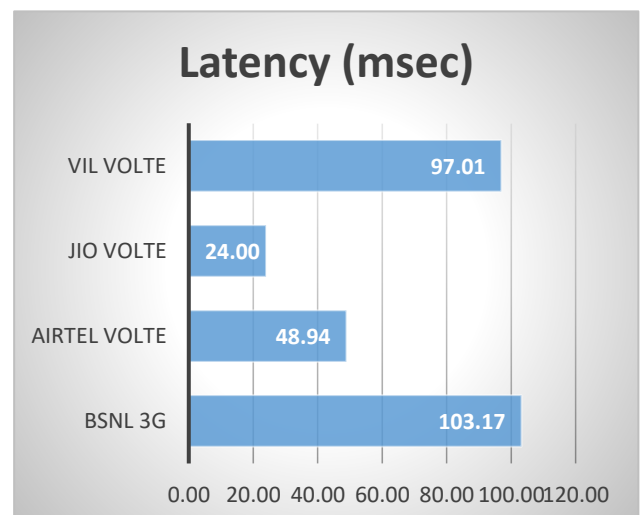
Upload Throughput (Mbps)



Web Browsing delay (Sec)



Latency (ms)



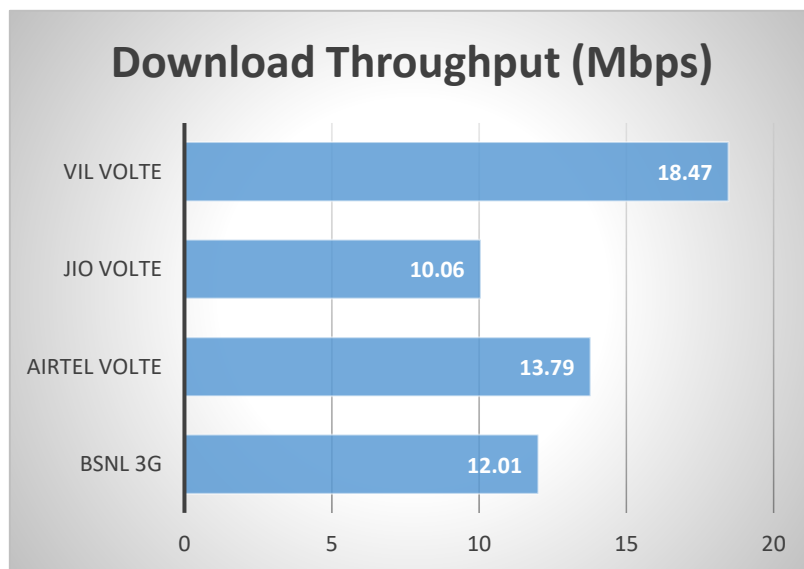
Data Services Dynamic

Key Observations

Dynamic Data was tested for 380 Kms. Download Throughput was tested.

Data Download Performance (kbps) - Dynamic

3G/4G/ Network:



Data Services Static Dynamic	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Download Throughput (Mbps)	12.01	13.79	10.06	18.47

Summary

SSA Level Summary-Voice

Voice Call	2G		
	Airtel	BSNL	VIL
Call Attempt	546	496	589
Blocked Call Rate (%)	0.00	1.2	0.51
CSSR% (Accessibility)	100%	98.80	99.49
Drop Call Rate (%)	0.00	0.6	0.17
Mobility HOSR (%)	100%	98.14	99.83
Rx Quality (%)	96.4%	97.20	98.93%

Voice Call	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Call Attempt	498	550	444	571
Blocked Call Rate (%)	1.5	0	0	0.70
CSSR% (Accessibility)	98.5	100%	99.10	99.47
Drop Call Rate (%)	0.40	0	0	0.53
Mobility HOSR (%)	98.3	100%	98.80	100
Rx Quality (%)	96.3	83.8%	93.52	96.09

Summary

SSA Level Summary- (Average of 6 hotspots)- Data Services

Data Services Static	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	158.73	176.69	178.26
Upload Throughput (kbps)	87.57	67.55	103.075
Web Browsing Delay (sec)	7.6	50.73	8.90
Latency (msec)	316.06	273.38	191.32

Data Services Static	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Download Throughput (Mbps)	2.28	25.70	27.69	27.04
Upload Throughput (Mbps)	3.92	12.33	11.90	16.78
Web Browsing Delay (sec)	12.34	13.20	5.8	3.50
Latency (msec)	103.17	48.94	24	97.00

Namakkal Sree Anjaneyar Temple	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	166.6	171.25	170.2
Upload Throughput (kbps)	69.76	75.84	110.13
Web Browsing Delay (sec)	7.12	67.01	9.23
Latency (msec)	180.45	282.83	180.45
Mettur Dam Park	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	176.83	181.65	176.34
Upload Throughput (kbps)	109.23	87.61	95.87
Web Browsing Delay (sec)	7.11	49.62	7.83
Latency (msec)	237.4	291.33	194.2

Salem-Big Bazaar Market	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	157.56	115.75	210.45
Upload Throughput (kbps)	74.1	55.28	123.6
Web Browsing Delay (sec)	7.90	56.62	8.41
Latency (msec)	253.12	258.83	179.56

Salem New Bus Stand	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	163.86	244.46	213.6
Upload Throughput (kbps)	104.8	42.17	100.87
Web Browsing Delay (sec)	8.98	35.62	8.98
Latency (msec)	185.8	172	178.5

Salem-Collectorate	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	143.7	165.39	143.7
Upload Throughput (kbps)	89.4	80.07	89.4
Web Browsing Delay (sec)	10.4	40.73	10.4
Latency (msec)	284.3	228.33	210.23

Salem Railway Station	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	178.16	181.67	155.3
Upload Throughput (kbps)	103.3	64.33	98.58
Web Browsing Delay (sec)	8.12	54.8	8.56
Latency (msec)	199.13	407	205.0

Data Services static

SSA Level Summary(contd.)

Namakkal Sree Anjaneyar Temple	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	0.51	27.23	34.69	26.72
Upload Throughput (Mbps)	0.55	9.22	12.53	21.25
Web Browsing Delay (sec)	16.67	2.12	5.70	2.87
Latency (msec)	116.67	49.51	26.50	109.01

Mettur Dam Park	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	1.35	16.64	20.10	31.13
Upload Throughput (Mbps)	0.44	11.85	5.80	5.64
Web Browsing Delay (sec)	13.22	2.75	6.10	3.82
Latency (msec)	66.00	51.21	23.20	94.00

Salem-Big Bazaar Market	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	6.23	28.95	32.98	32.39
Upload Throughput (Mbps)	6.82	14.12	13.85	26.09
Web Browsing Delay (sec)	9.65	3.10	6.70	3.80
Latency (msec)	92.33	39.10	25.60	84.00

Summary

SSA Level Summary(contd.)

Salem New Bus Stand	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	2.10	21.03	30.20	25.57
Upload Throughput (Mbps)	4.28	15.08	11.73	19.28
Web Browsing Delay (sec)	11.56	2.91	6.00	3.70
Latency (msec)	130.83	45.13	19.40	102.01

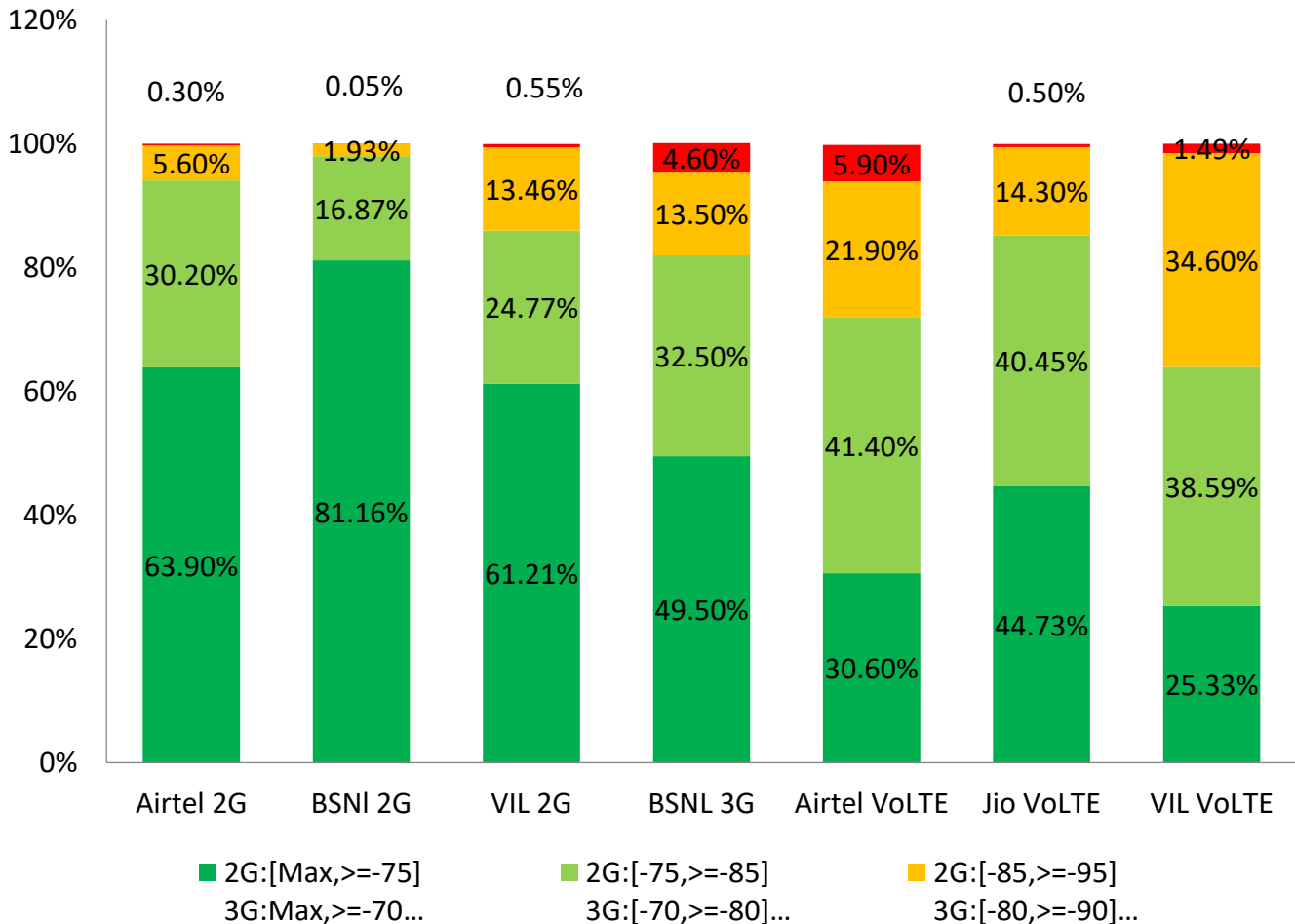
Salem-Collectorate	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	1.06	36.07	24.91	27.40
Upload Throughput (Mbps)	4.21	13.13	15.57	11.16
Web Browsing Delay (sec)	10.52	3.11	5.50	3.18
Latency (msec)	95.66	34.06	24.50	84.00

Salem Railway Station	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	2.42	24.40	23.24	19.03
Upload Throughput (Mbps)	7.24	11.09	11.92	17.27
Web Browsing Delay (sec)	12.43	3.41	5.00	3.66
Latency (msec)	117.50	41.73	25.00	109.01

I. Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call session. The Coverage rate is calculated on the basis of % of samples in which the Rx level ≥ -85 dBm, RSCP is ≥ -90 dBm & RSRP ≥ -110 dBm. The details are as follows.

TSP	Coverage Rate %
Airtel 2G	94.10
BSNI 2G	98.30
VIL 2G	85.98
BSNL 3G	95.50
Airtel VoLTE	99.90
Jio VoLTE	99.49
VIL VoLTE	98.51

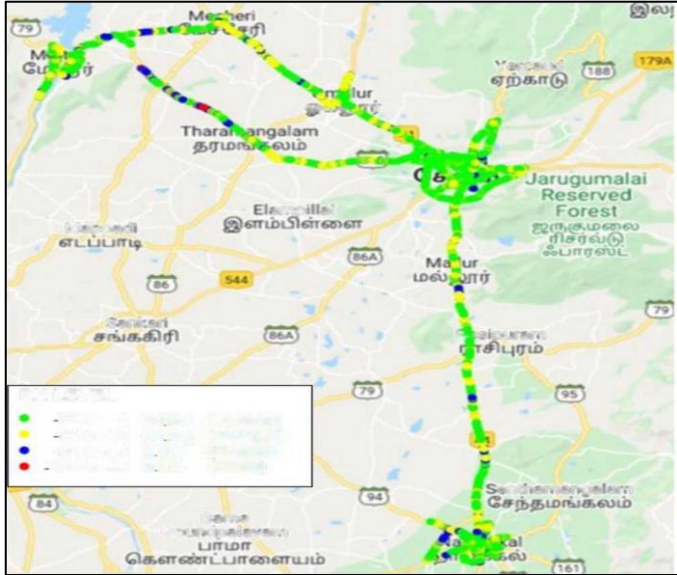


I. Coverage Details

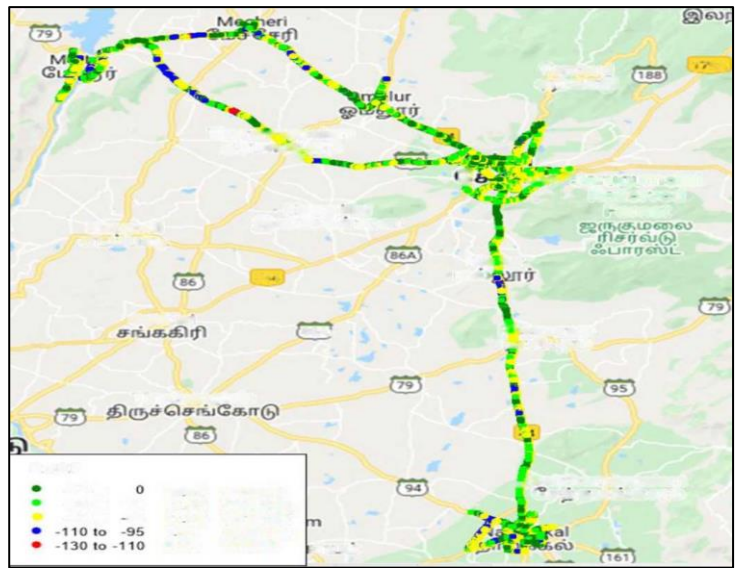
AIRTEL

Technology	Coverage Rate %
2G	94.10
VoLTE	99.90

2G



VoLTE



2G		
Overall RxLevel	# Samples	%
[Max, >=-75]	7424080	63.9%
[-75, >=-85)	3504124	30.2%
[-85, >=-95)	652605	5.6%
[-95, >=Min)	36890	0.3%
Total	11617699	100 %

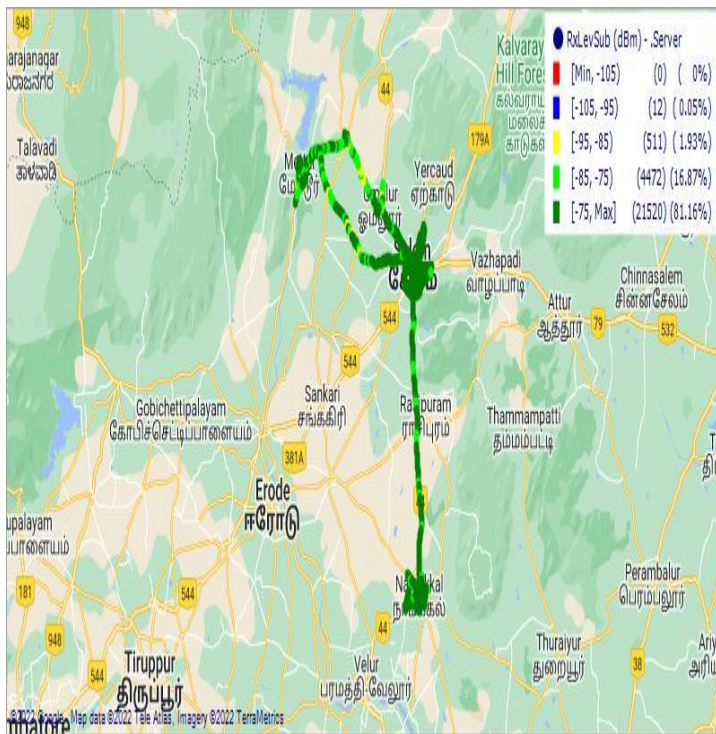
VoLTE		
Overall RSRP	# Samples	%
-75 to 0	446589	30.60%
-85 to -75	6072436	41.40%
-95 to -85	3218445	21.90%
-110 to -95	864417	5.90%
-130 to -110	20019	0.1%
Total	10468943	100%

I. Coverage Details

BSNL

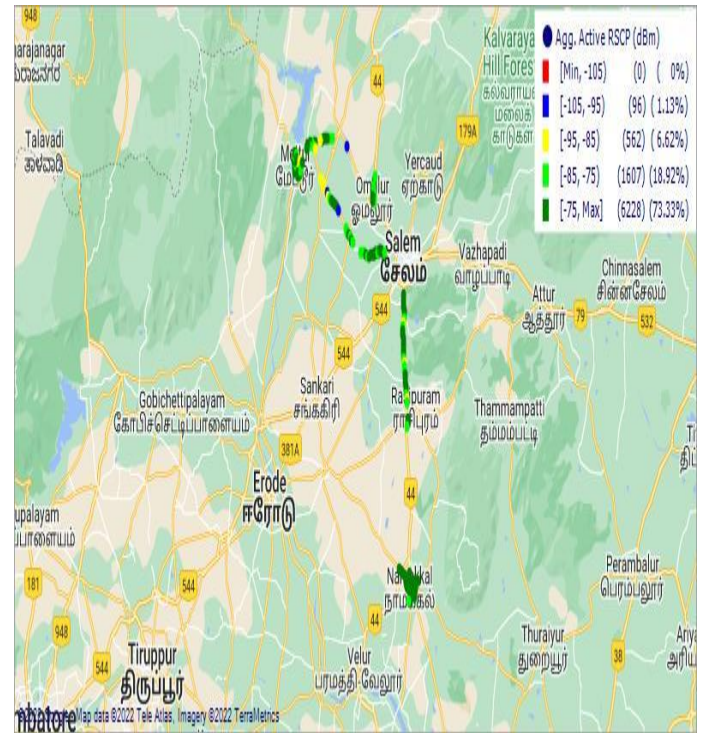
Technology	Coverage Rate %
2G	98.3
3G	95.5

2G



2G		
RXLEVEL Samples	Samples	%
[Min, -105]		
[-105, -95]	12	0.05
[-95, -85]	511	1.93
[-85, -75]	4472	16.87
[-75, Max]	21520	81.16

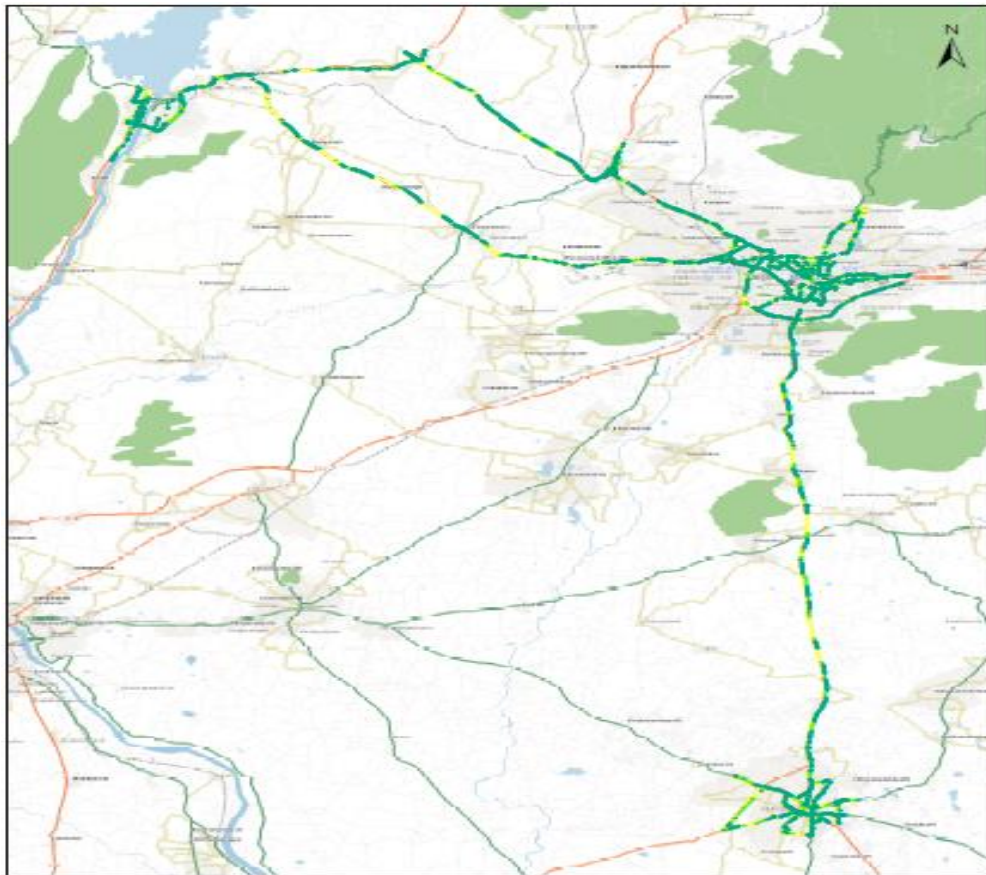
3G



3G		
RSCP Samples	Samples	%
[Min, -90]	782	4.6
[-90, -80]	2282	13.5
[-80, -70]	5505	32.5
[-70, Max]	8386	49.5

I. Coverage Details

JIO	
Technology	Coverage Rate %
VoLTE	99.50



VoLTE		
Overall RSRP	# Samples	%
[Max, >=-80]	22055	44.73%
[-80, >=-90)	1994	40.45%
[-90, >=-110)	7053	14.30%
[-110, >=Min)	251	0.50%
Total	49304	100%

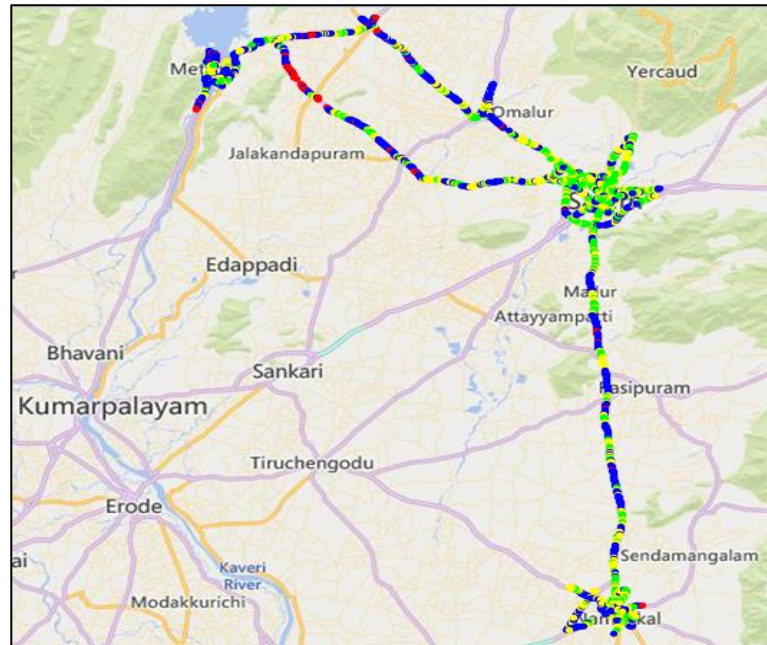
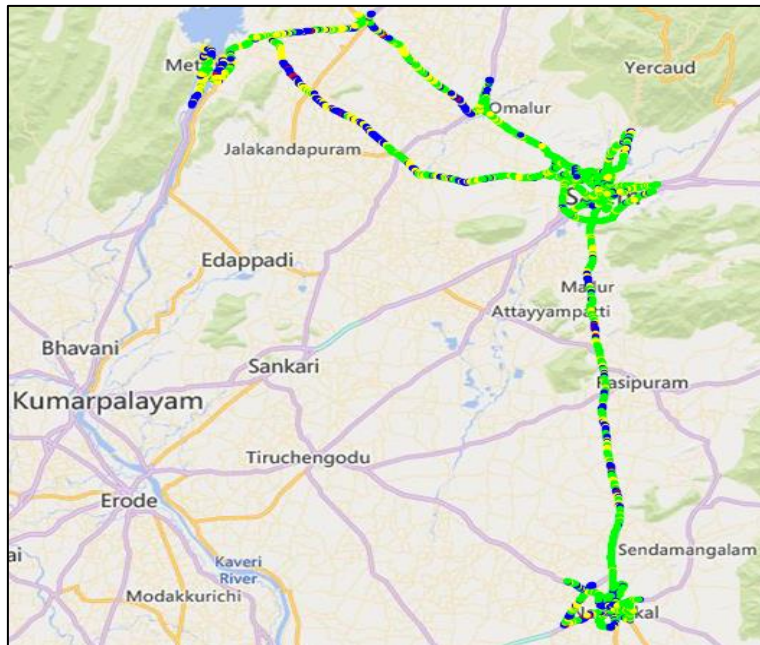
I. Coverage Details

VIL

Technology	Coverage Rate %
2G	85.98
VoLTE	97.26

2G

VoLTE



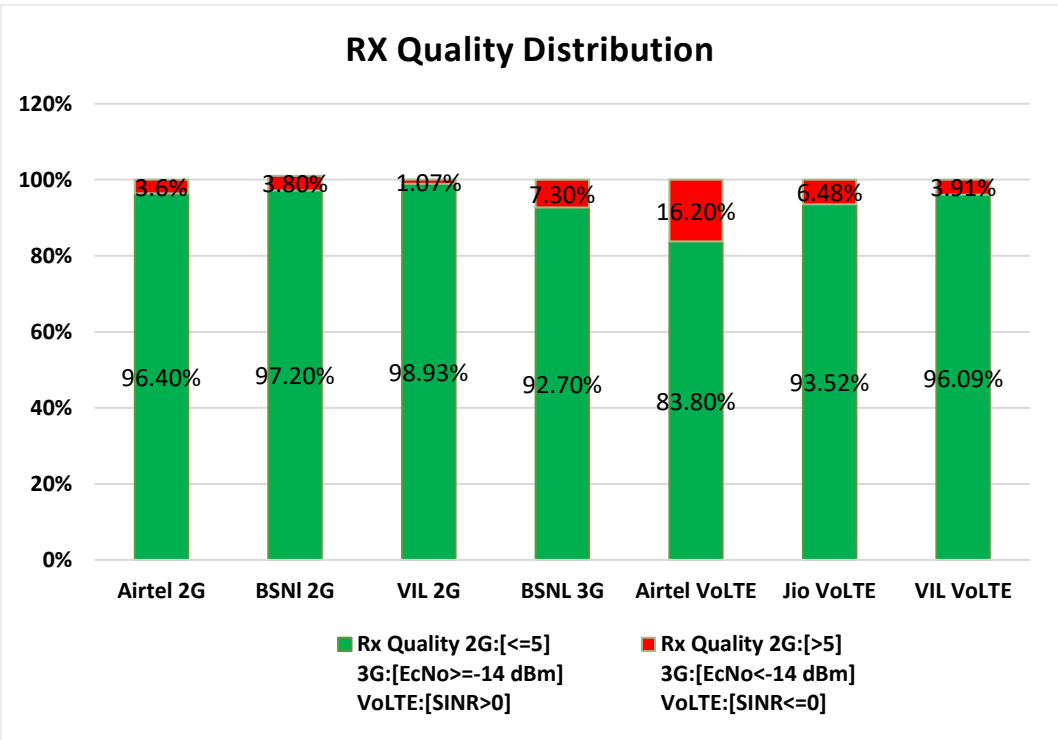
Overall Rx Level	# Samples	%
[Max, >=-75]	18862	61.21%
[-75, >=-85)	7632	24.77%
[-85, >=-95)	4148	13.46%
[-95, >=Min)	171	0.55%
Total	30813	100%

Overall RSRP	# Samples	%
[Max, >=-80]	7248	25.33%
[-80, >=-90)	11042	38.59%
[-90, >=-110)	9900	34.60%
[-110, >=Min)	425	1.49%
Total	28615	100%

II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 5 for GSM TSPs, EcNo ≥ -14 dBm for 3G TSP sand SINR >0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be $\geq 95\%$.

TSP	Rx Quality %
Airtel 2G	96.4
BSNI 2G	97.20
VIL 2G	98.93
BSNL 3G	92.70
Airtel VoLTE	83.8
Jio VoLTE	93.52
VIL VoLTE	96.09

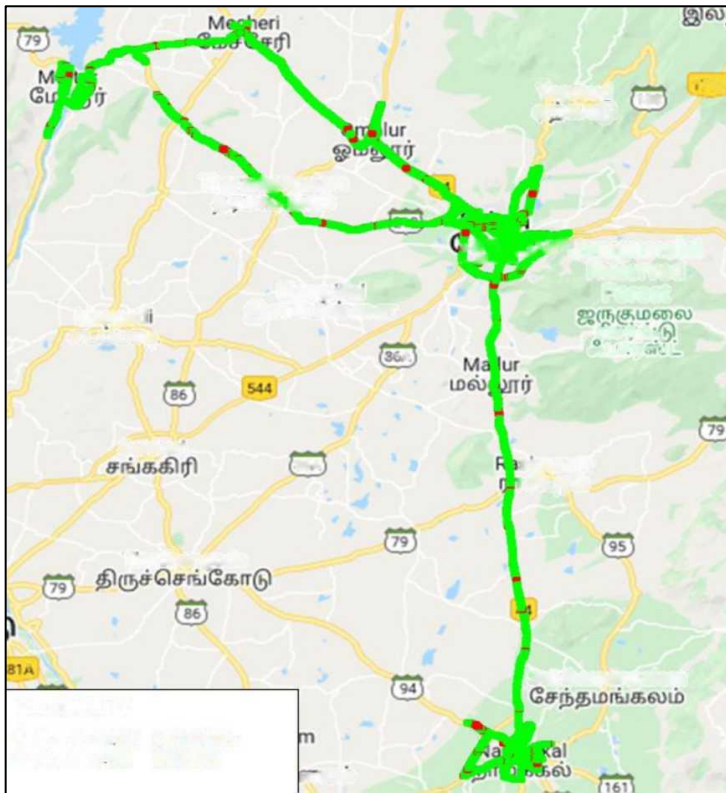


II. Quality Details

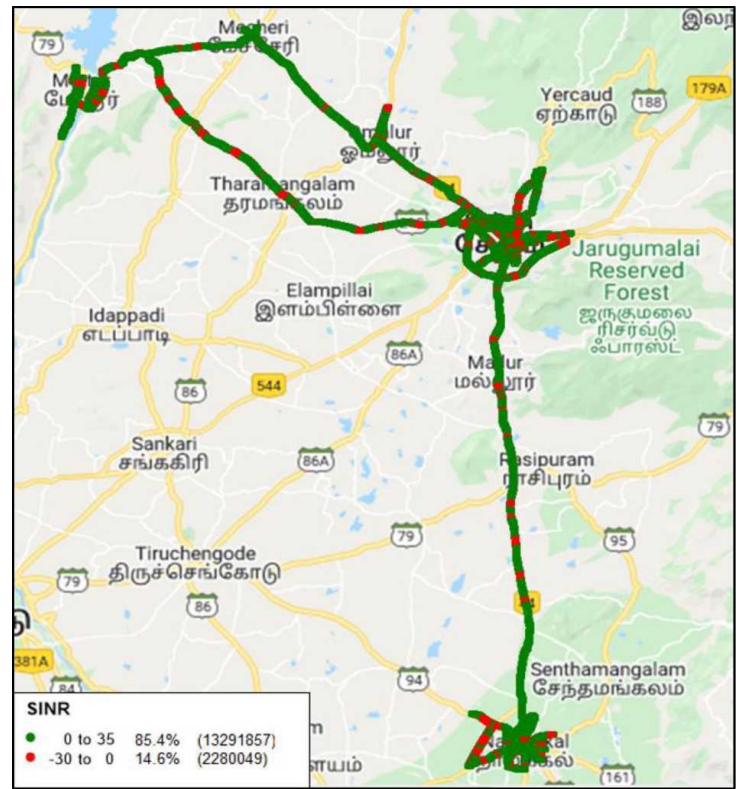
Airtel

Technology	Rx Quality %
2G	96.4
VoLTE	85.4

2G



VoLTE



Overall Rx Quality	# Samples	%
0-5	11193944	96.4%
>5	423755	3.60%

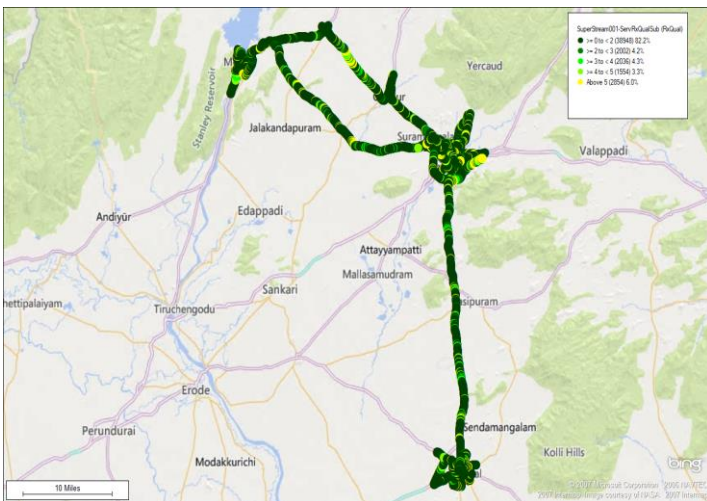
Overall SINR	# Samples	%
0-30	13291857	85.4%
<0	2280049	14.6%

II. Quality Details

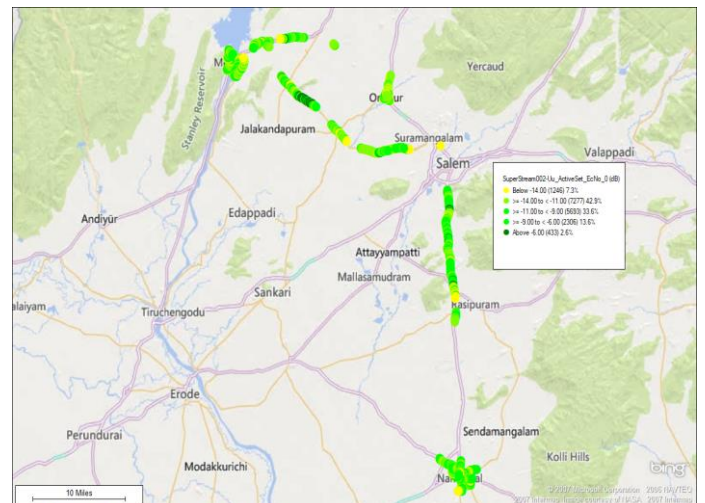
BSNL

Technology	Rx Quality %
2G	97.20
3G	92.70

2G



3G



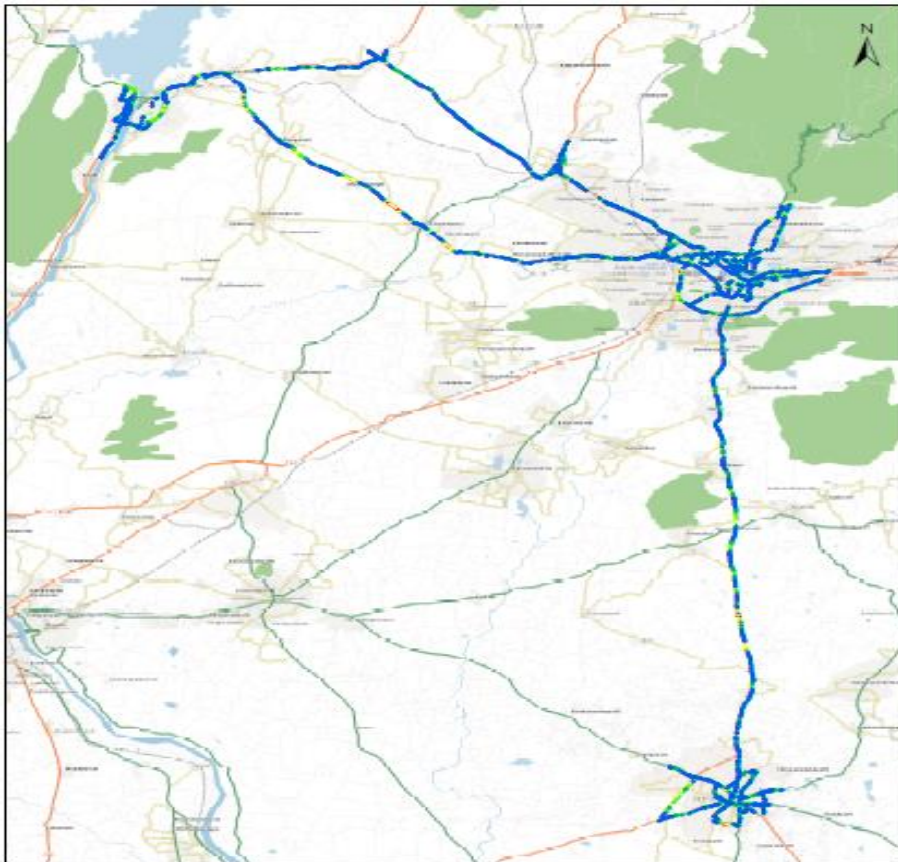
Overall Rx Quality	# Samples	%
(Min, <=2)	169716	86.92463315
(2, <=3)	10850	5.557120541
(3, <=4)	5458	2.795462112
(4, <=5)	3725	1.907859356
(5, <=Max)	5496	2.814924838
Total	195245	100

Overall EcNo	# Samples	%
(Max, <=-6)	433	2.553819
(-6, <=-9)	2306	13.60071
(-9, <=-11)	5693	33.57712
(-11, <=-14)	7277	42.91949
(-14, <= Min)	1246	7.348865
Total	16955	100

II. Quality Details

JIO

Technology	Rx Quality %
VoLTE	93.52



VoLTE		
Overall SINR	# Samples	%
(Min, <=0)	3190	6.47%
(0, <=5)	7429	15.27%
(5, <=10)	11671	23.67%
(10, <=15)	12212	24.76%
(15, <=Max)	14702	29.8%
Total	49304	100%

II. Quality Details

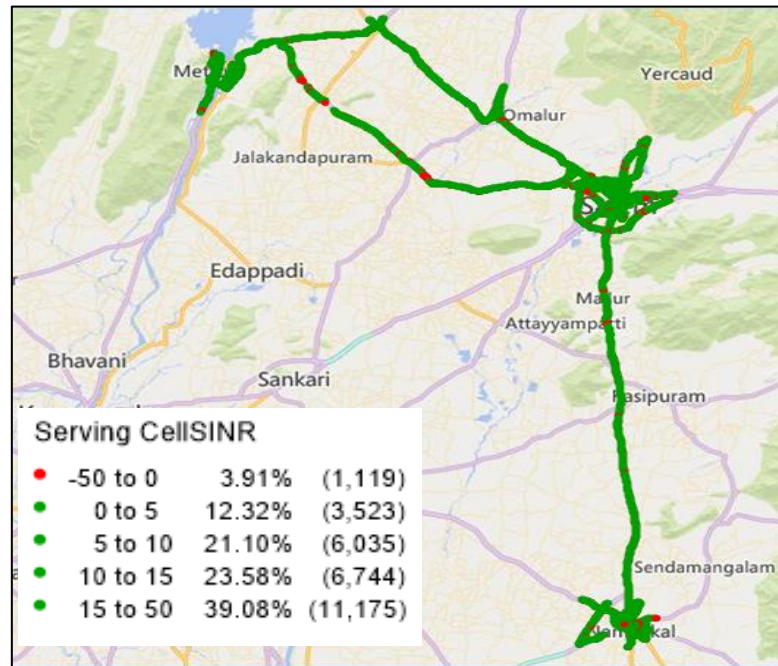
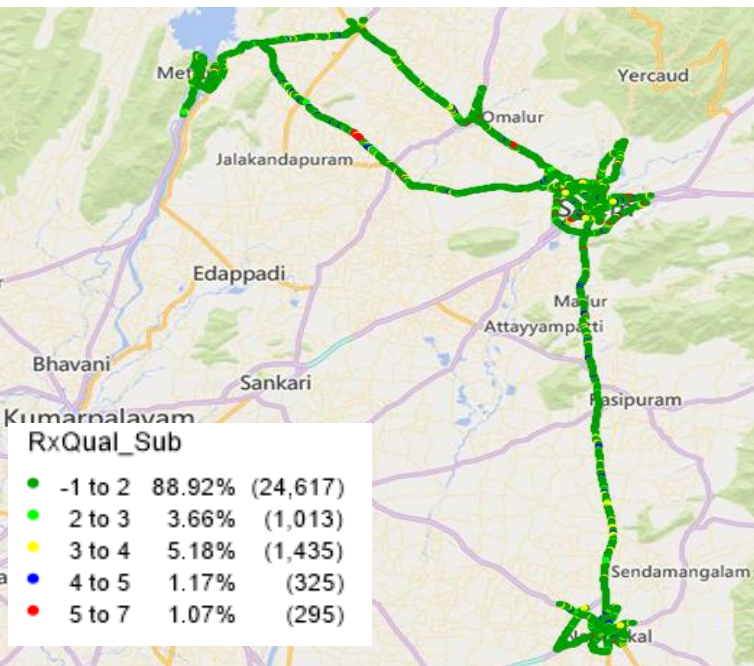
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VIL

Technology	Rx Quality %
2G	98.93
VoLTE	96.09

2G

VoLTE

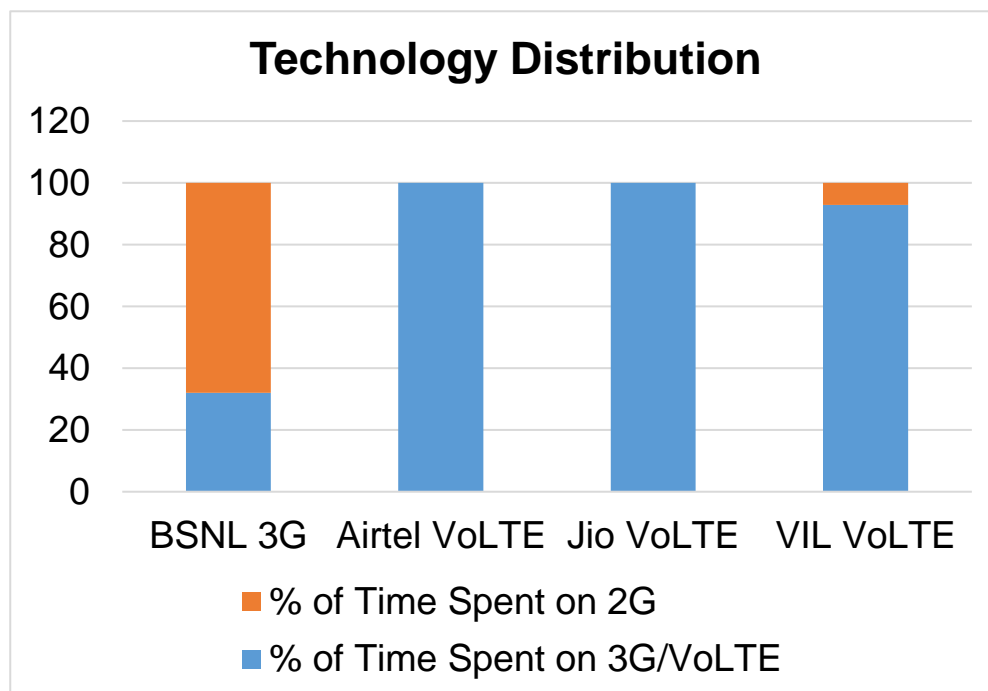


Overall Rx Quality	# Samples	%
(Min, ≤ 2)	24617	88.92
(2, ≤ 3)	1013	3.66
(3, ≤ 4)	1435	5.18
(4, ≤ 5)	325	1.17
(5, \leq Max)	295	1.07
Total	27685	100.00%

Overall SINR	# Samples	%
(Min, ≤ 0)	1119	3.91
(0, ≤ 5)	3523	12.32
(5, ≤ 10)	6035	21.10
(10, ≤ 15)	6744	23.58
(15, \leq Max)	11175	39.08
Total	28596	100%

III. Technology Details

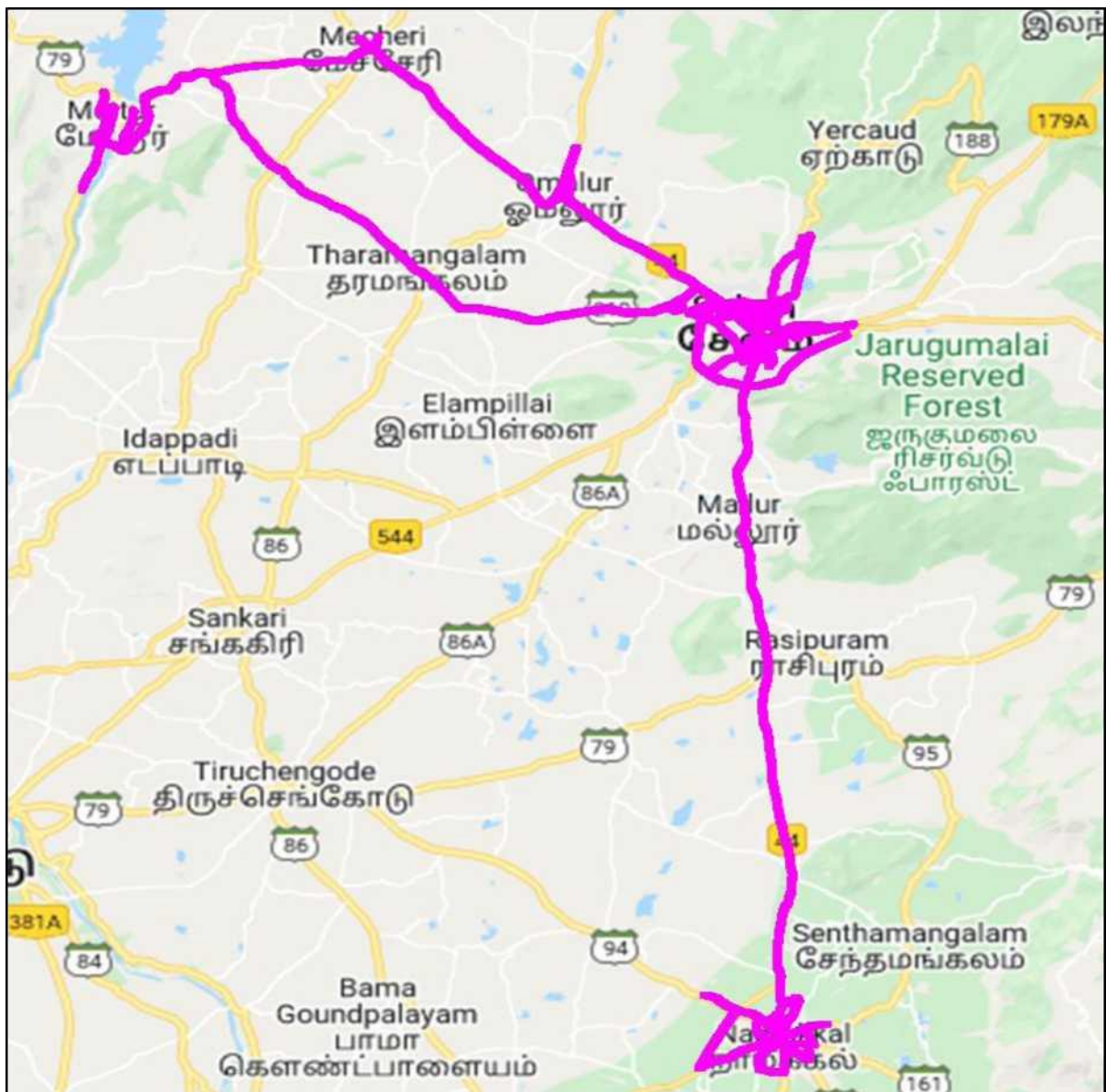
TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	32
Airtel VoLTE	100
Jio VoLTE	100
VIL VoLTE	92.89



III. Technology Details

Airtel

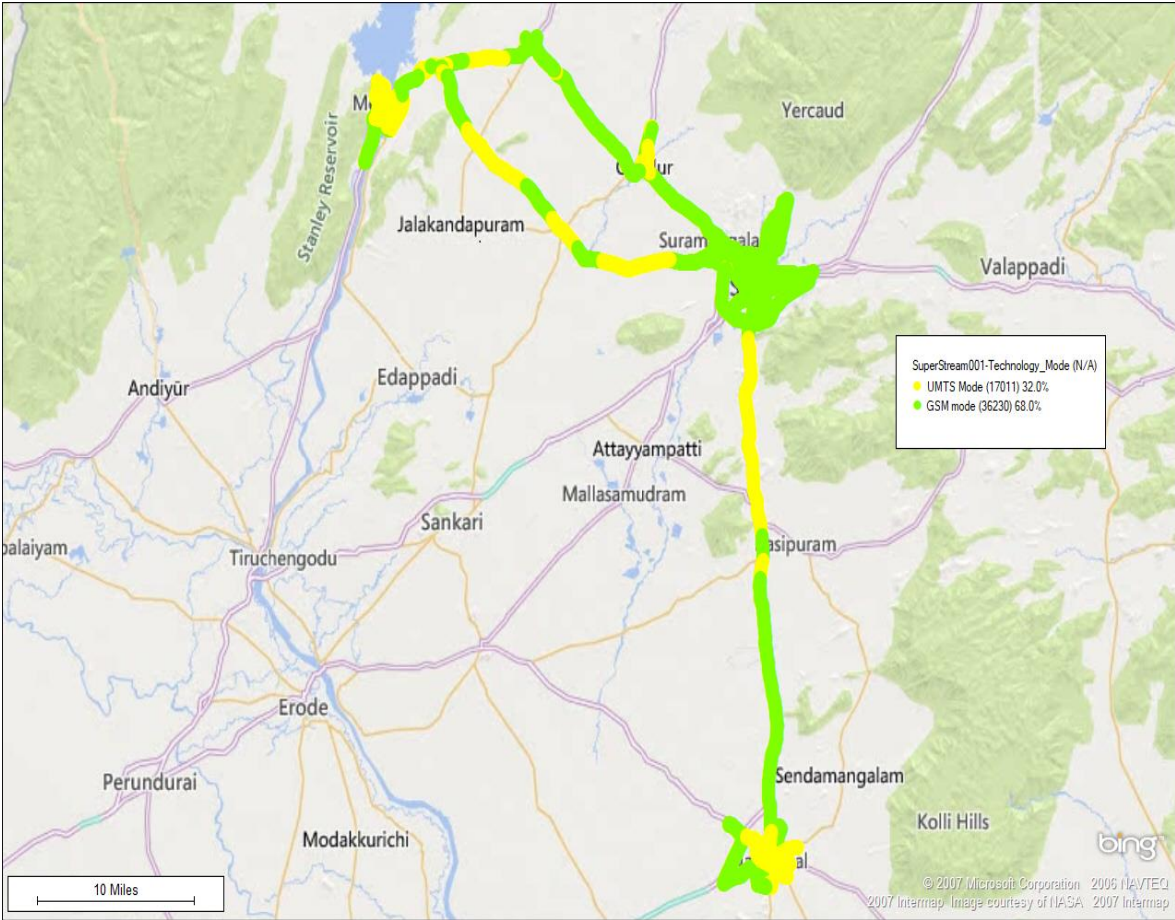
Technology	Time Spent on 4G
4G	100%



III. Technology Details

BSNL

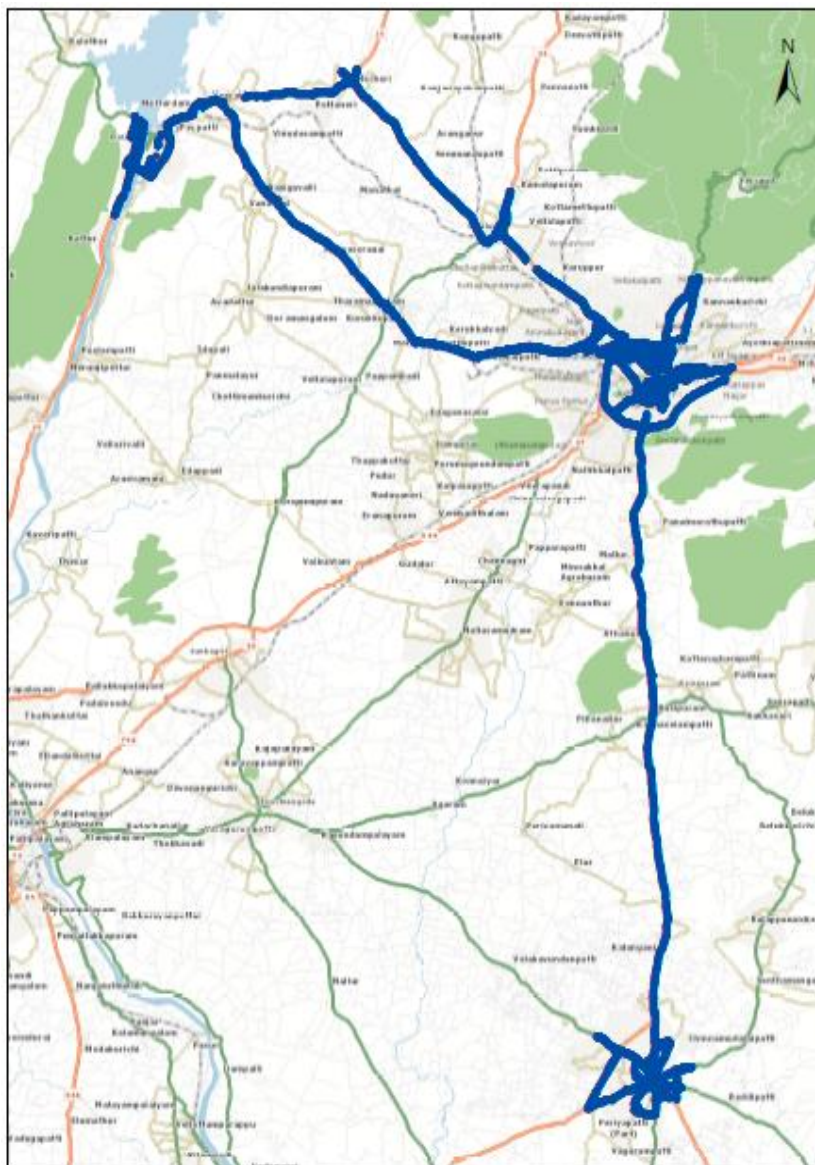
Technology	Time Spent on 3G
3G	32%



III. Technology Details

JIO

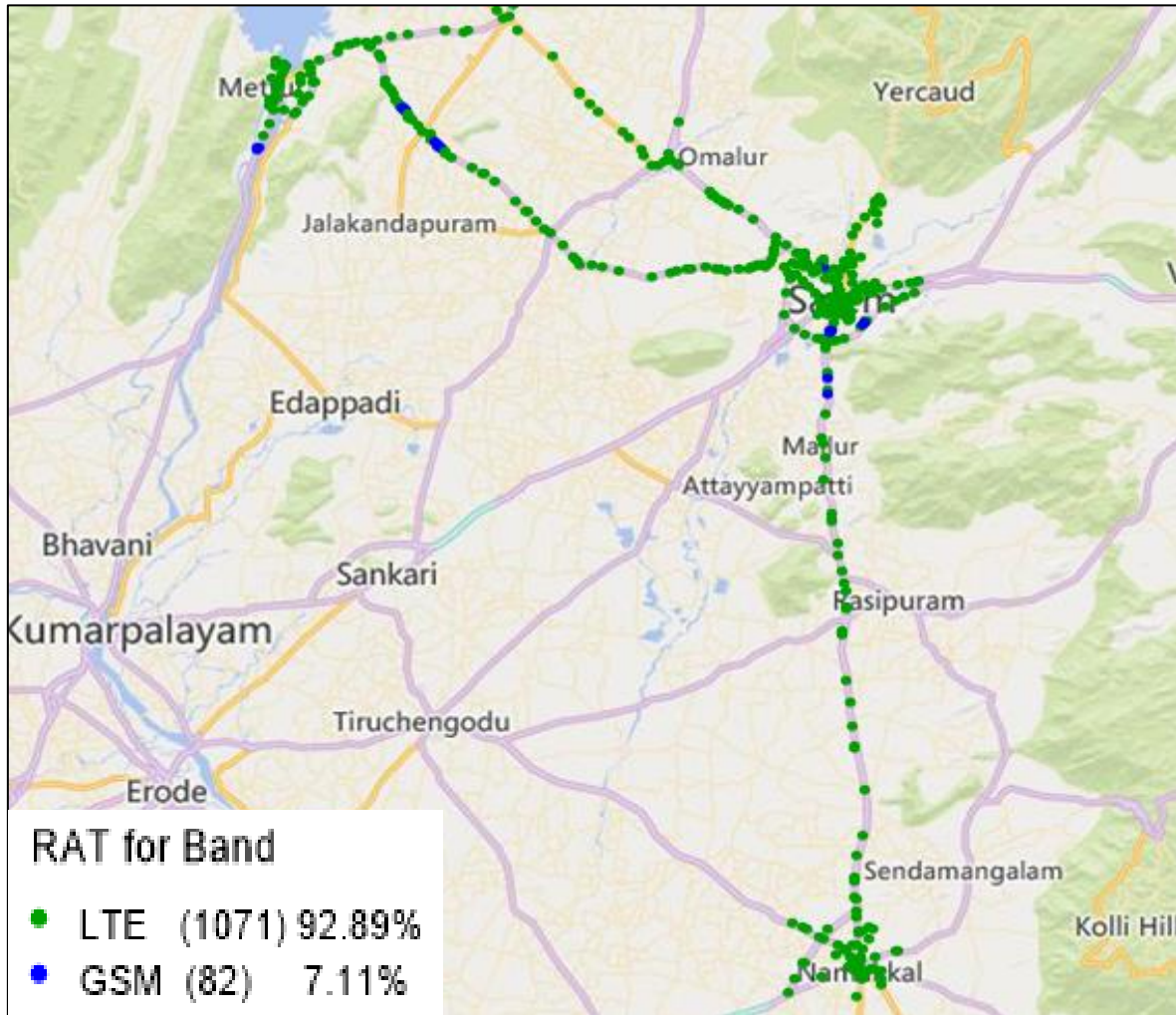
Technology	Time Spent on 4G
4G	100%



III. Technology Details

VIL

Technology	Time Spent on 4G
4G	92.89%

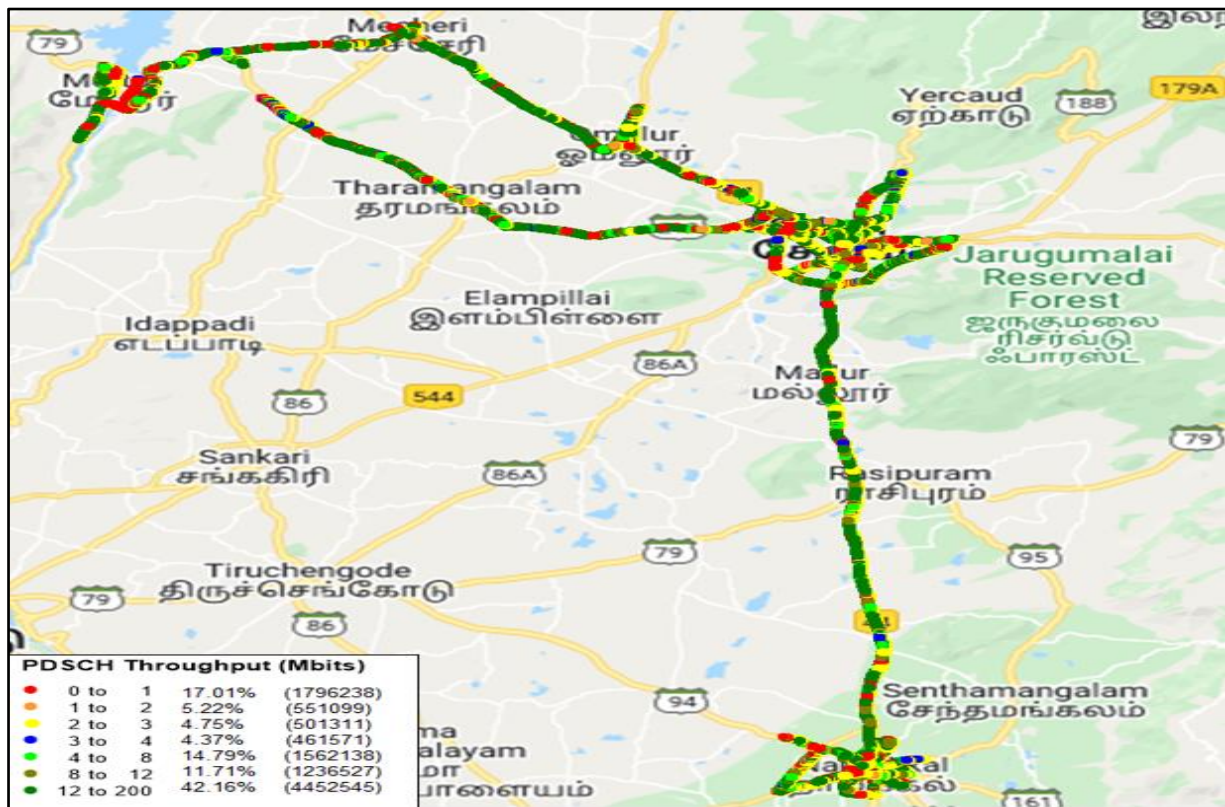


IV. Dynamic Data Test- 4G DL Details

Airtel

Data Statistics - Dynamic Complete SSA - 375 Kms

Data KPIs – Overall	4G
Download Throughput (Mbps)	13.79



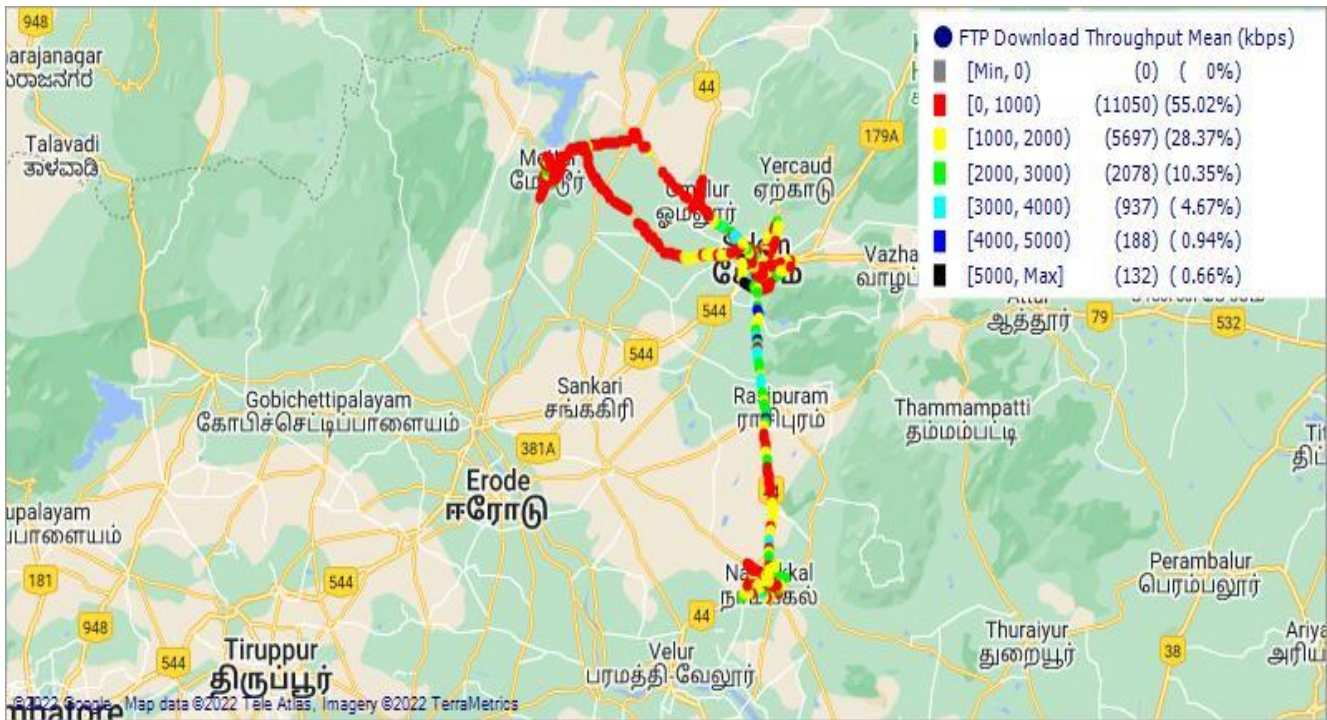
DL throughput	No of Sample	%
0 to 1 Mbps	1796238	17.01
1 to 2 Mbps	551099	5.22
2 to 3 Mbps	501311	4.75
3 to 4 Mbps	461571	4.37
4 to 8 Mbps	1562138	14.79
8 to 12 Mbps	1236527	11.71
>12 Mbps	4452545	42.16
Total	10561429	100

IV. Dynamic Data Test- 3G DL Details

BSNL

Data Statistics - Dynamic Complete SSA 380 Kms

Data KPIs - Overall	3G
Download Throughput (Mbps)	1.20



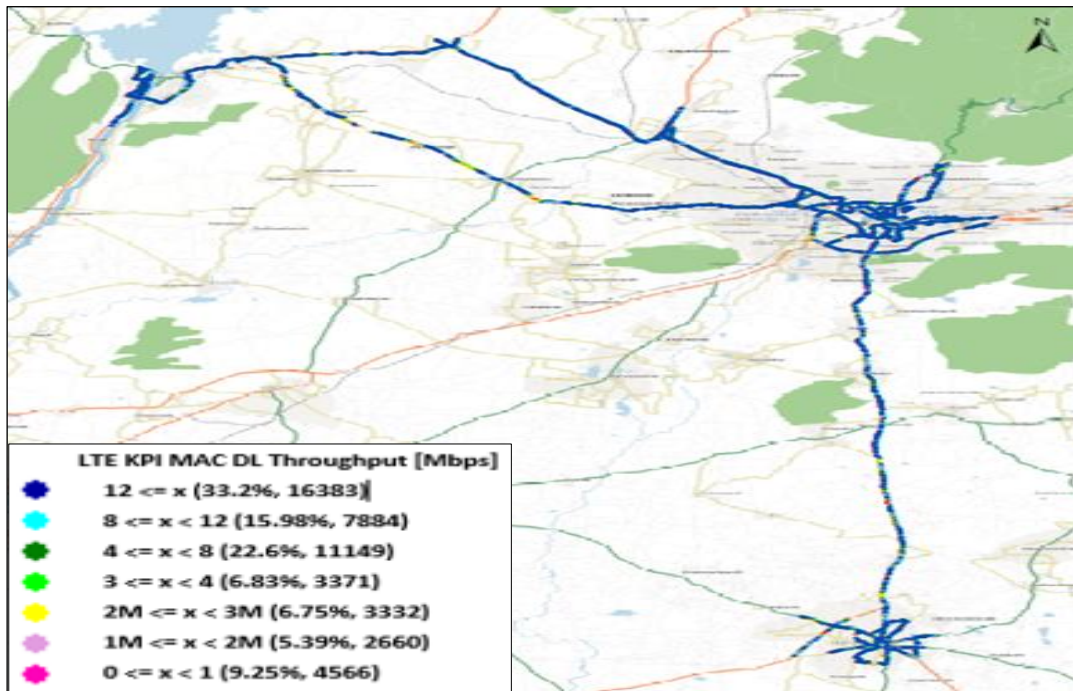
DL throughput	No of Sample	%
[Min, 0)		
0 to 1Mbps	11050	55
1 to 2Mbps	5697	28.4
2 to 3Mbps	2078	10.4
3 to 4Mbps	937	4.67
4 to 5Mbps	188	0.94
> 5Mbps	132	0.66

IV. Dynamic Data Test- 4G DL Details

JIO

Data Statistics - Dynamic Complete SSA - 375 Kms

Data KPIs - Overall	4G
Download Throughput (Mbps)	10.06



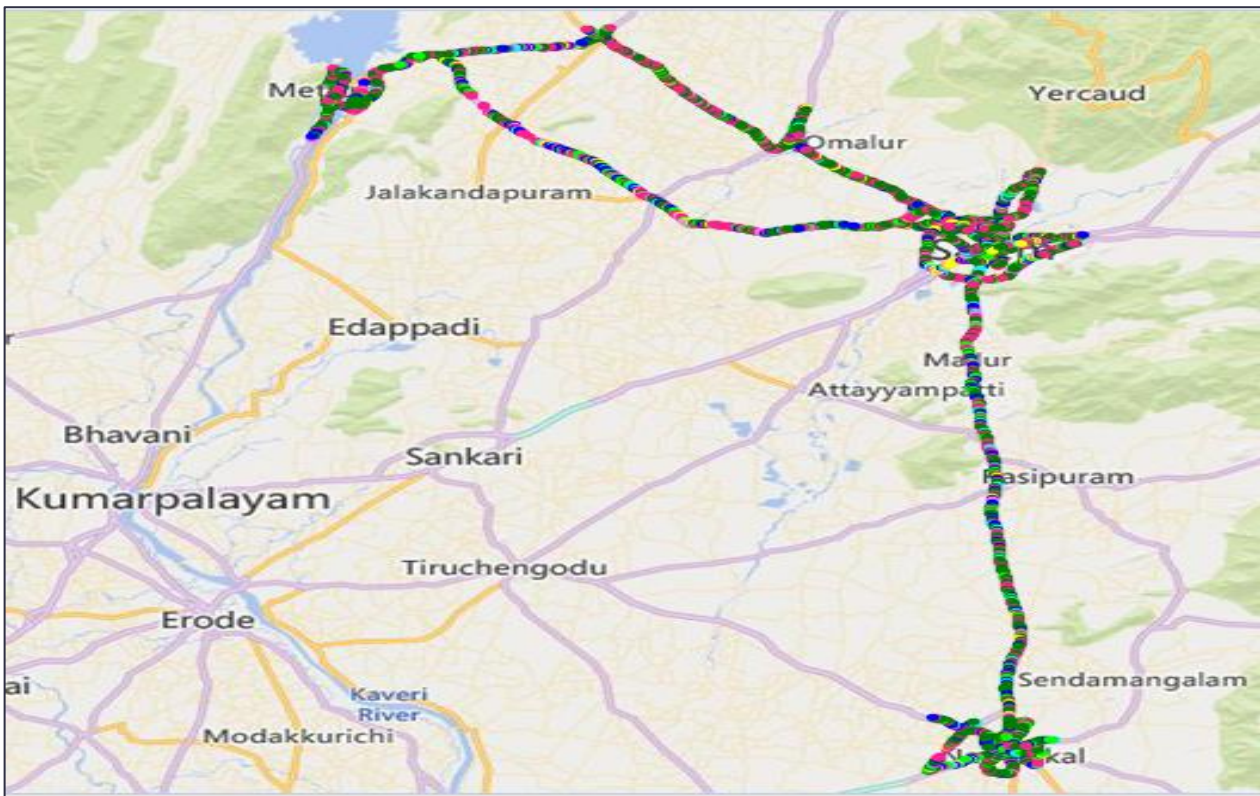
DL throughput	No. of samples	%
0 to 1 Mbps	4566	9.25
1 to 2 Mbps	2660	5.39
2 to 3 Mbps	3332	6.75
3 to 4 Mbps	3371	6.83
4 to 8 Mbps	11149	22.60
8 to 12 Mbps	7884	15.98
>12 Mbps	16383	33.20

IV. Dynamic Data Test- 4G DL Details

VIL

Data Statistics - Dynamic Complete SSA - 375 Kms

Data KPIs - Overall	4G
Download Throughput (Mbps)	18.47



DL throughput	No of Sample	%
0 to 1 Mbps	1267	5.79
1 to 2 Mbps	1144	5.23
2 to 3 Mbps	1085	5.23
3 to 4 Mbps	1031	4.71
4 to 8 Mbps	3211	14.68
8 to 12 Mbps	2072	9.48
>12 Mbps	12057	55.14
Total	21867	100

V. TRAI MySpeed App

Airtel

Technology -4G	Namakkal	Mettur	Big Bazar Salem	Bus stand Salem	Collectorate Salem	Railway Station Salem
Download in Mbps	31.83	38.27	47.68	44.44	57.63	44.96
Upload in Mbps	7.5	6.51	26.96	20.99	26.30	25.80

BSNL

Technology -4G	Namakkal	Mettur	Big Bazar Salem	Bus stand Salem	Collectorate Salem	Railway Station Salem
Download in Mbps	1.46	1.49	4.6	7.79	1.38	5.05
Upload in Mbps	2.12	1.55	1.3	7.3	2.28	6.18

JIO

Technology -4G	Namakkal	Mettur	Big Bazar Salem	Bus stand Salem	Collectorate Salem	Railway Station Salem
Download in Mbps	48.56	27.23	42.30	47.18	92.96	41.44
Upload in Mbps	8.87	5.78	9.29	5.41	27.59	21.95

VIL

Technology -4G	Namakkal	Mettur	Big Bazar Salem	Bus stand Salem	Collectorate Salem	Railway Station Salem
Download in Mbps	33.58	34.57	34.90	33.06	33.84	43.22
Upload in Mbps	20.82	10.14	21.75	17.13	14.38	20.14