CALL DROP ISSUE'S OF MOBILE PHONES IN INDIA

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***Abstract*:- This paper gives you a detail idea about how the "Call Drop Issue" occur, what are the different factor responsible for causing this, how can we calculate the call Drop for 2G and 3G. that data is completely calculated by TRAI with different service provider. the possible solution for consumer point of view and finally try to give a possible solution for reducing the Call Drop Issue.**

I.INTRODUCTION

India's telecom industry consists of almost a dozen operators. Over the last 15 years, it has transformed the lives of millions of Indians to the point where even the poor can afford a phone and a connection. India now has the second-largest number of phone subscribers in the world at 960 million people, behind China, with 1.29 billion mobile users.

While mobile service quality was good at first, it has dropped over the last decade, and call drops have become a chronic problem in
major cities such as New Delhi and Mumbai over the last year.

The growth story of the telecommunication services market in the country has been impressive. Most of the growth has come from mobile telephony. From a modest mobile tele-density of 1.22 in March, 1999, the mobile tele-density of India leapfrogged to 77.273 in March, 2015. During this period, the average mobile tariff for outgoing calls declined from 16.93 per minute (March, 1999) to 0.50 per minute (March, 2015). With the telecommunication services becoming increasingly affordable, a consumer with low income can also avail the telecommunication services.

The growth in overall demand of the telecommunication services has contributed to the increase in the revenue streams of the TSPs. At the same time, the growth in demand puts an onus on the TSPs to ramp up their supply adequately. As one would intuitively expect, if TSPs do not upgrade their telecommunication networks suitably the service performance would deteriorate and, in turn, consumer expectations from the service delivery would not be met and it results into a call drop issue that is presently arises specially in India.

II.WHAT IS THE MEANING OF "CALL DROP"?

When a call gets disconnected before the user or the customer finishes it's conversation is known as "Call Drop". It is one of the Key Performance Indicator of the telecom companies. Lesser the call drop, better is the performance of the service provider. Call Drop is measured in percentage. It's the fraction of total call. Ideally call drop less than 2% is considered good.

Call drop represents the service provider‟s inability to maintain a call once it has been correctly established. The objective of this parameter is to provide the consumer with an expectation of how successful a mobile network will be at retaining the signal throughout the duration of the call. This parameter includes both incoming calls and outgoing calls which, once they have been established and have an assigned traffic channel (TCH), are dropped or interrupted prior to their normal completion by the user, the cause of the early termination being within the service provider‟s network.

As per „The Standards of Quality of Service of Basic Telephone Service(Wireline) and Cellular Mobile Telephone Regulations, 2009‟, Call Drop Rate (averaged over a calendar month) of any cellular mobile telephone service provider should not exceed 2%. Call Drop Rate is computed as below:

Call Drop Rate = A*100/B

Where,
A = No. of calls interrupted prior to their normal completion (dropped calls)
B= Total number of calls successfully established (where traffic channel is allotted) These measurements have to be taken during the time consistent busy hour (TCBH).

In 3G networks, the Circuit Switched Voice Drop Rate (CSV Drop Rate) is computed as below:

CSV DROP RATE =
100*{1-(RAB Normal release /RAB normal release +RAB abnormal release)}

RAB : Radio Access Bearer.

III.WHY CALLS ARE DROPPED?

Call drops in mobile networks occur due to a variety of reasons. The main
reasons for dropped calls are as below:
(i) lack of radio coverage
(ii) radio interference between neighboring cells
(iii) imperfections in the functioning of the network (such as failed handover or cell-reselection attempts)
(iv) capacity constraints and overload of the different elements of the network(such as cells)
(v) antenna related problems
(vi) transmission media related problems
(vii) unauthorized repeaters etc.

Apart from the afore-mentioned network related reasons, the TSPs have contended that (i) spectrum crunch and (ii) resistance of resident welfare associations (RWAs) against installation of towers in residential colonies have resulted in increase in Call Drop Rates. The TSPs have argued that they are facing shortage of spectrum due to high growth of subscribers; besides there are delays in allocation of additional spectrum by the Government. Regarding the resistance of the RWAs, the TSPs have contended that the RWAs are not letting new mobile towers to come up in residential colonies and are insisting on removal of the existing ones.

1. TRAI is regularly monitoring the performance of Telecom Service Providers (TSP) against the benchmarks for the various Quality of Service (QoS) parameters laid down by the Authority. TSPs submit Performance Monitoring Reports to TRAI every quarter.
2. TRAI also undertakes audit and assessment of Quality of Service through independent agencies to verify the Quality of Service claimed. The Audit agencies conduct sample „Drive tests" across various cities all over the country as part of audit and assessment of the TSPs" performance. The audit reports of these agencies are published on the website of TRAI.

IV.WHAT IS A DRIVE TEST?

Drive Test is a test performed to evaluate the performance of various cellular networks on
Predetermined parameter. A Drive test is performance oriented and therefore technology neutral.
A Drive test is conducted by driving a vehicle at a steady speed over the selected route. The vehicle carries the testing equipment which measures the key performance indicators (KPI)by repeatedly making calls, establishing the call, recording the quality of connection, measuring dropped
Calls, etc. in accordance with the predetermined parameters.

The Drive test, equipment consists of:
(i) A laptop computer - or other similar device
(ii) Data collecting software installed on the laptop
(iii) A Security Key - Dongle - common to these types of software
(iv) One mobile phone for each mobile network that is being tested; and
(v) One GPS antenna.

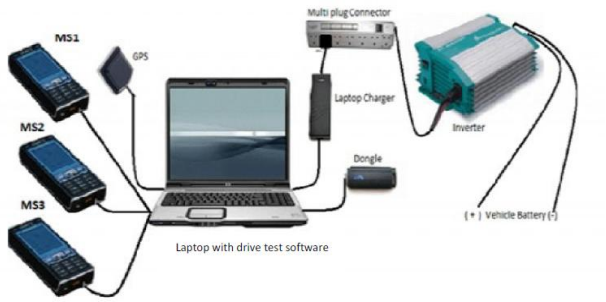

Fig 1.Std Setup Used in Test Drive

Determining the Drive Test routes is the first and the most important step. The route is defined on the basis of several factors that include - areas from where call drop complaints are commonly received; areas of heavy usage; residential areas away from arterial roads; office areas; areas where previous Drive tests showed network issues; etc.

The number of BTS count and the subscriber base of the target networks are given below:

Operator	Technology	Band (MHz)	BTS Count	Subscribers* (Prepaid + Postpaid)	Subscribers / BTS
Aircel	GSM	1800	1829	2830137	1547
Airtel	GSM	900 & 1800	4034	4014057	995
Idea	GSM	1800	3485	4771764	1369
Reliance (GSM)	GSM	1800	2178	2814521	1292
Tata(GSM)	GSM	1800	2886	2428169	841
Vodafone	GSM	900 & 1800	4512	8620251	1911

*Subscribers data of Mumbai circle on 31 March 2015 taken from CSD audit.

Fig 2. BTS count per subscriber

Radio Frequency (RF) Coverage relates to the geographical footprint within an area that has sufficient RF signal strength to allow for a call/data session. The RF Coverage rate of an operator is calculated on the basis of % of samples in which the receive level (Rx) is better than **-85 dbm** at street level. The test results obtained in Mumbai on the drive test route (approx. 300 km) are as follows:

Operator	Coverage Rate Rx Level 0 to -85dBm	Coverage Rate Rx Level 0 to -95dBm
Aircel	93.63%	99.60%
Airtel	95.13%	99.29%
Idea	95.40%	99.98%
Reliance (GSM)	89.49%	98.54%
Tata(GSM)	97.07%	99.76%
Vodafone	91.08%	98.90%

Fig 3.coverage rate Rx level

Accessibility is monitored by measuring the Call Setup Success Rate (CSSR).The CSSR is defined as the ratio of Established Calls to number of Call Attempts. When a user "A" initiates a call
to user "B" in the same network, a Stand Alone Dedicated Control Channel (SDCCH)is allocated for setting up the call. Once the call is setup, a Traffic Channel(TCH) is allocated for the call. Non
availability of control channel or traffic channel will lead to congestion which is measured through the SDCCH congestion and the TCH congestion. The SDCCH congestion and TCH congestion are monitored through the „Blocked Call rate" parameter in the Drive test.

Operator	Total Call Attempts	Total Call Success	Total Calls Blocked	Blocked Call Rate (%)	CSSR (%)
Aircel	550	526	24	4.36%	95.64%
Airtel	529	513	16	3.02%	96.98%
Idea	570	513	57	10.00%	90.00%
Reliance (GSM)	575	396	179	31.13%	68.87%
Tata(GSM)	546	521	25	4.58%	95.42%
Vodafone	535	514	21	3.93%	96.07%

Fig 4.Blocked Call Rate

TRAI has laid down the QoS benchmarks for CSSR >95%; SDCCH congestion at 1% and TCH congestion at 2% respectively [the blocked call rate at 3%].The test results obtained are as follows:

Operator	Total Calls Established	Total Calls Dropped	Call Drop Rate%	Retainability
Aircel	533	17	3.19%	96.81%
Airtel	513	5	0.97%	99.03%
Idea	540	30	5.56%	94.44%
Reliance (GSM)	393	9	2.29%	97.71%
Tata (GSM)	526	29	5.51%	94.49%
Vodafone	497	24	4.83%	95.17%

Fig 5.Call Drop Rate

V.Mobility

In a cellular system a base station has only a limited coverage area. Hence it is possible for a moving subscriber to be out of range of a base station while making a call or during a call. The process by which a mobile telephone call is transferred from one base station to another as the subscriber passes the boundary of a cell is called a Handover. A Handover success rate (HOSR) more than 95% is considered to be good. The various operators" performance observed during the Drive Test was:

Operator	Total HO Attempt	Total HO Success	HO Success Rate%
Aircel	795	770	96.86%
Airtel	1258	1217	96.74%
Idea	984	963	97.87%
Reliance (GSM)	1004	984	98.01%
Tata(GSM)	1435	1369	95.40%
Vodafone	1750	1707	97.54%

Fig 6.Hand Over success rate

VI. Rx Quality

For measuring voice quality, Rx Qual samples on a scale from 0 to 7 for GSM operators are measured. As per the TRAI QoS norms, Rx Qual between 0- 5 for GSM operators is considered to be good, whereas Rx Qual beyond this benchmark is considered to be poor. TRAI has set down the QoS norm requiring connections with good voice quality to be >95%. Accordingly the RxQuality is determined
and as can be seen from the table below:

Operator	Rx Quality Samples (0-7)	Rx Quality Samples (0-5)	Rx Quality Samples (0-5)%
Aircel	676587	579177	85.60%
Airtel	675609	615556	91.11%
Idea	649800	561789	86.46%
Reliance (GSM)	573717	490682	85.53%
Tata (GSM)	711097	636451	89.50%
Vodafone	600552	537860	89.56%

Fig 7.Rx Quality sample in %

VI. Overall Operator Analysis

KPI	Aircel	Airtel	Idea	Reliance (GSM)	Tata (GSM)	Vodafone
Coverage	93.63%	95.13%	95.40%	89.49%	97.07%	91.08%
Accessibility	95.64%	96.98%	90.00%	68.87%	95.42%	96.07%
Retainability	96.81%	99.03%	94.44%	97.71%	94.49%	95.17%
Mobility	96.86%	96.74%	97.87%	98.01%	95.40%	97.54%
Rx Quality	85.60%	91.11%	86.46%	85.33%	89.50%	89.56%
C/I	68.13%	64.83%	66.67%	83.44%	69.75%	65.23%

Fig 8.The results of these Key Performance Indicators is summarized

The Drive test results revealed that most of the operators are not meeting the benchmarks of the network related parameters. They failed to achieve the benchmarks due to High Block Call Rate, High Drop Call Rate, Low Call Setup Success Rate &poor Rx Quality. However, as mentioned earlier, this result reflects only the network conditions on the

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route followed by the Test vehicles and as determined during the day and time of the Drive test.

KPI	Aircel	Airtel	Idea	Reliance (GSM)	Tata (GSM)	Vodafone
Call Attempt	550	529	570	575	546	535
Blocked Call Rate (<3%)	4.36%	3.02%	10.00%	31.13%	4.58%	3.93%
Call Setup Success Rate (>=95%)	95.64%	96.98%	90.00%	68.88%	95.425	96.07%
Dropped Call Rate (<=2%)	3.19%	0.97%	5.56%	2.29%	5.51%	4.83%
Rx Quality (0-5) (>=95%)	85.60%	91.11%	86.46%	85.53%	89.50%	89.56%
Handover Success Rate (>=95%)	96.86%	96.74%	97.87%	98.01%	95.40%	97.54%

Fig 9.overall analysis operator wise

The TSPs have claimed that following are the main reasons contributing to frequent call drops:
a. Spectrum related issues such as limited spectrum; delay in allocation of spectrum;
Reduction in 2G frequency band after the spectrum auction; and major changeover of

Frequencies within and across the 900 MHz and 1800 MHz bands on the live networks for some TSPs.

b. Poor coverage due to non-availability of sites for BTS in some areas; sealing of existing sites; forced closure of existing sites by local bodies. During the last six months around **801 sites** in Mumbai and **523 site s**een Delhi were shut-down due to various reasons (sealing of sites by municipal authorities, RWA,EMF related issues, owner issues).The closure of each site impacts three to four neighboring sites which could result in increased call drops at such locations.
c. EMF radiation issues causing fear in the minds of general public.
d. Interference issues caused by illegal repeaters, private wide band repeaters, and other
wireless devices installed by individuals.

The government has blamed operators for failing to use their spectrum wisely, diverting spectrum from voice to data where there is more profit, while telecom operators said that the problem is a lack of towers and spectrum.

Recently government announces that from 1 January 2016 for call drop refund will be added to customer prepaid account and for postpaid customer refund amount will be adjusted in next month bill as a penalty for service provider.
as a service engineer or as a telecom engineer it is the challenge for us to resolve this problem with efficient planning of allocated spectrum with maximize the number of tower to tackle this call drop situation.

VIII. SOLUTION TO ENSURE NO "CALL DROPS"

Despite implicit limitations like spectrum shortage, operators must own the responsibility and ideally devise innovative practices to solve the Call Drops issue. Here is a list of what operators can consider for which Government can possibly lend support –

1. Optimize the networks and improve planning approaches –
   - The adoption of Self-Organizing Networks (SON) can mean real-time capacity adjustments in an automated manner. This approach plays a key role in HetNets i.e., Heterogeneous networks where macro cells, small cells etc. co-exist and interference can cause trouble.
   - Improved planning means usage of modern approaches like GIS for network planning. In addition to finding the location for newer towers (where citizens can also collaborate), Telco"s can use 3D map data to study changing cityscapes and realign the network.
2. Allay Radiation Fears: With radiation scare causing major concerns, just like Airtel CEO reached out to customers, other Telco"s can take the same route. Ideally Telco"s can take a collaborative route and use print, digital media to spread awareness. This will naturally result in citizens coming forward and proposing locations for newer towers as it involves monetary benefits
3. Use Analytics: We have heard about multiple cases, where subscribers had to escalate call drop issues for months to get an acceptable resolution. This must not be the case, and customers must not have to undergo hardships to solve call drop issues. Through the use of sophisticated analytics, operators must be in a position to assess the health of their networks, measure the quantum of call drops and address them accordingly.
4. On the LTE front: With LTE offering more benefits in terms of spectral efficiency (VoLTE has up to three times more voice and data capacity than 3G UMTS and up to six times more than 2G GSM), Telco"s can opt for faster migration. This would also mean larger Capex but in the longer run, with unprecedented levels of data usage growth in India, the bets can pay off. Additionally, VoLTE deployment would mean no need to maintain legacy voice networks.
5. Technologies Wi-Fi offloading must be rolled out in a faster manner
6. Indoor coverage: Indoor coverage has always been a problem, especially with higher frequencies. Just like foreign operators, Indian Telco"s can consider offering free signal boosters.
7. Offset power failures
   - Operators need to look for better, environment-friendly alternatives than diesel generators. This is being done, in the form solar energy but at a really small scale.

- A robust small cell network might even mean no need for a bigger power source.

8. E-Clearance for new cell towers: The Government, in association with TRAI or DoT could set up a new single-channel website with appropriate revenue sharing model (state, local bodies) for faster clearance of new cell towers. This can also help reduce corruption at lower levels.
9. Compensation for dropped calls: This is the last in our list as we believe it can only be a stop-gap arrangement. Compensation by the way of a free minute won‟t really serve the purpose as for a caller it would be important to get a point across. Interestingly enough, some of the business users are switching to the landline to avoid ruining a conversation.

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