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Objective Assessment of Quality of Services for (QoS) for Basic Wireline, Cellular Mobile (Wireless) and Broadband Service Providers - Andhra Pradesh Circle

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Prepared for: **Telecom Regulatory Authority of India**

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Preface

TRAI, the regulatory watch dog for the Quality of Service for the telecom services – Basic (Wireline), Cellular Mobile (Wireless) and Broadband has commissioned this study with the objective of measuring Quality of Services under the parameters as per the published notifications. The study, from the execution perspective, has been divided into two modules – Survey module and Audit module.

The Survey module has been commissioned with the objective of gauging the subscriber feedback on Quality of Services by way of primary survey and comparing them with quality of service benchmarks stipulated by TRAI. In addition, Survey module would also measure the compliance of 'Telecom Consumer Protection and Redressal of Grievances Regulations, 2007'.

The Audit module would assess the Quality of Service of telecom operators (Basic (Wireline), Cellular Mobile (Wireless) and Broadband services) by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI.

For the ease of execution both the modules have been commissioned as two separate exercises. However, the findings of each module would feed into the justification of the other module.

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various Half Yearly periods. IMRB International Auditors carried out Audits across Rajasthan, Himachal Pradesh, Jammu and Kashmir, Orissa, North East, Assam, Andhra Pradesh and Kerala circles in the second Half Yearly period 2008. **This report details the performance of various service providers in Andhra Pradesh circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) and Broadband services.**

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1.0 Background

The Telecom Regulatory Authority of India (TRAI) has a critical mandate to protect the interest of telecom consumers in addition to various other functions bestowed upon it. As part of the license conditions to telecom operators, it has the power and authority to measure the Quality of Service provided by various govt. (BSNL & MTNL) and private telecom operators. The parameters that need to be measured for Basic (Wireline) and Cellular Mobile (Wireless) services have been specified in the TRAI notification on Quality of Services of Basic (Wireline) and Cellular Mobile (Wireless) services dated 1st July, 2005. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

The study is being conducted broadly in two modules:
(i) Survey module and
(ii) Audit module

IMRB has been engaged by TRAI for a period of 12 months starting January 2008 to assess the quality of services being provided by Basic (Wireline), Cellular Mobile (Wireless) and Broadband service providers.

The study is being conducted broadly in two modules. They are:

Survey module: To obtain subscriber feedback on quality of services by way of primary survey and to check the 'Implementation and effectiveness of Telecom Consumer Protection and Redressal of Grievances Regulations, 2007'

Audit module: To assess the quality of service of telecom operators (Basic (Wireline), Cellular Mobile (Wireless) and broadband services) by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI

This report highlights the Audit Module findings for Andhra Pradesh circle for Basic (Wireline), Cellular Mobile services, and Broadband services

The present report highlights the findings for the Audit module for Andhra Pradesh circle that was covered in the Quarter 3 (July – September 2008). The primary data collection and verification of records maintained by various operators of Basic (Wireline), Cellular Mobile (Wireless) and broadband services was undertaken by IMRB International during the period of October 2008 – December 2008.

2.0 Objectives and Methodology

The primary objective of the Audit module is to Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI). Following are the key activities undertaken by Auditors during the Audit process conducted at the operator's premises

All Network related and Non network related parameters notified by TRAI in various regulations were Audited

1. **Verification of the data submitted by service providers:** This involved verification of the quarterly Performance Monitoring Reports (PMR's) and monthly Point of Interconnect (POI) Congestion reports being submitted by various service providers. The raw data in the records maintained by service providers was audited to assess the book keeping methodology.

2. **Live measurement for three days:** Network performance of service providers was assessed for three days in the month in which the Audit was carried out. Live figures from the server/ NMS software were recorded for various network related parameters.

3. **Data verification for the month in which Audits were carried out:** Subsequent to the visits for Audit during the live measurement at various Exchanges/ISP Nodes/Exchanges, data for all the network and Non network related parameters was collected from various service providers for the complete month in which the Audit was carried out. Raw data/records pertaining to these were also verified on sample basis to check the veracity of data provided by the operators.

4. **Drive tests:** Operator assisted and Independent drive test were conducted in three cities as per the norms stated in the tender.

5. **Live calling:** Live testing was done on a sample basis to check efficiency of the customer care, inter operator call assessment, Back check calls for service provisioning and fault repair

- Any changes or discrepancies found in the methodology were reported to the service providers and changes were suggested by IMRB Auditors.
- Separate formats were designed each for Basic (Wireline), Cellular mobile (Wireless) and Broadband services to collect the information on various parameters (Please refer to Annexure)

3.0 Sampling methodology

3.1 Sampling for Basic (Wireline) services

- For BSNL the sample of exchanges was selected was spread across 10% of SDCA's in the entire service. Overall 50 exchanges (24 Urban and 160 Rural) exchanges were audited.

- For rest of the service providers (TATA, Reliance and Bharti) data was collected pertaining to all the exchanges present in the circle/service area

3.2 Sampling for Cellular Mobile (Wireless) service providers

Data pertaining to 100% of the Gateway MSC's (GMSC's) and Mobile Switching Centres (MSC's) of all the Cellular Mobile Service Providers or Unified Access Service Providers (UASP) was collected and verified in specified circles/service areas. Following are the various operators covered in Andhra Pradesh circle

- Bharti Airtel
- Reliance communications
- BSNL
- TATA Tele services
- Idea Cellular
- Vodafone Essar Ltd.

3.3 Sampling for Broadband service providers

- Audits for various Broadband service providers were conducted at the service provider's central node. Since most of the private operators have a centralized system of monitoring their network data was obtained for all the Point of Presence (POPs) present in the circle.

- For BSNL, Audit was conducted at the central node in Andhra Pradesh and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that atleast 5% of POPs spread across 10% of SDCA's were covered

- For BSNL, the data pertaining to network related parameters was obtained by IMRB Auditors at the central node in Bangalore.

- Following Broadband service providers were Audited in Andhra Pradesh circle: - Bharti Airtel Ltd., Sify, BSNL, VSNL (TATA Communications), Reliance Communications, Hathway and You Telecom.

4 Audit methodology

4.1 Basic (Wireline) Services

Following table explains the audit methodology for Basic (Wireline) services:-

Sl. No.	Parameters	One month data verification	Live measurement	Live calling
1	Provision of telephone after registration of demand	YES	----	YES
2	Fault incidence/clearance related statistic	YES		
2.1	*- Total number of faults registered per month*	YES		YES
2.2	*- Fault repair by next working day*	YES		YES
3	Mean Time to Repair (MTTR)	YES		
4	Call Completion Rate (CCR)	YES	YES	
5	Metering and billing credibility – billing complaints	YES		YES
6	Customer care promptness	YES		
6.1	*- Shifting of telephone line*	YES		YES
6.2	*- Processing closure request*	YES		YES
6.3	*- Processing of additional supplementary services*	YES		YES
7	Response time to customer	YES		
7.1	- While call is electronically answered	YES		YES
7.2	- While call is answered by operator (voice to voice)	YES		YES
8	Time taken to refund of deposits after closure	YES		YES

* In addition to above verification of records for PMR submitted during April to June 2008 was carried out for all network and non network related parameters.

{**Note**: - A more detailed explanation of parameter wise audit methodology for Basic (wireline) services is explained in Annexure II}

4.2 Cellular Mobile Services

In a nutshell the following activities were done while auditing for various parameters for Cellular Mobile Services:

S.no	Parameter	AS REPORTED IN PMR	AS FOUND IN ACTUAL RECORDS AFTER VERIFICATION	AS FOUND IN VERIFICATION FOR THE MONTH OF AUDIT	AS FOUND IN 3 DAY LIVE MEASUREMENT DATA	LIVE CALLING	OPERATOR ASSISSTED DRIVE TESTS	INDEPENDENT DRIVE TESTS
A	**Network Performance**							
A (i)	Accumulated down time of community isolation	Yes	Yes	Yes				
A (ii)	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
A (iii)	Service Access Delay	Yes	Yes	Yes				
A (iv)	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
A (v)	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
A (vi)	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
A (vii)	Service Coverage	Yes	Yes	Yes			Yes	Yes
A (viii)	PoI Congestion	Yes	Yes	Yes				
B	**Customer Helpline**							
B (i)	Response time to the customer for assistance	Yes	Yes	Yes		Yes		
C	**Billing Complaints**							
C (i)	Billing complaints per 100 bills issued	Yes	Yes	Yes				
C (ii)	%age of billing complaints resolved within 4 weeks	Yes	Yes	Yes		Yes		
C (iii)	Period of all refunds/payments due to customers from date of resolution as in (ii) above	Yes	Yes	Yes		Yes		

{Note: A more detailed explanation of parameter wise audit methodology for Cellular Mobile services is explained in Annexure II}

4.3 Broadband Services

In a nutshell, the audit methodology was as follows:

	Parameters	Verification of PMR	Three day live measurement	Data Verification for one month	Live calling
(i)	Service Provisioning/ Activation time	YES	YES	YES	YES
(ii)	Fault Repair/ Restoration Time	YES	YES	YES	YES
(iii)	Billing Performance				
-	Billing Complaints per 100 Bills issued	YES	YES	YES	
-	%age of billing complaints resolved in four weeks	YES	YES	YES	YES
-	Time taken for refund of deposits after closure	YES	YES	YES	YES
(iv)	Response time to the customer for assistance(Voice to Voice)				
-	*Within 60 seconds > 60%*	YES	YES	YES	YES
-	*Within 90 seconds > 90%*	YES	YES	YES	YES
(V)	Bandwidth Utilization/ Throughput:				
▪	*A)Bandwidth Utilization*				
-	POP to ISP gateway Node [Intra – network] Links	YES	YES	YES	
-	ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for international connectivity	YES	YES	YES	
▪	*B) Broadband Connection Speed (Download)*	YES	YES	YES	YES
(vi)	Service availability / Uptime	YES	YES	YES	
vii)	Packet Loss	YES	YES	YES	
(viii)	Network Latency for wired broadband access)				
-	*User reference point at POP / ISP Gateway Note to International Gateway (IGSP/NIXI)*	YES	YES	YES	
-	*User reference point at ISP Gateway Node to International nearest NAP port abroad (Satellite)*	YES	YES	YES	
-	*User reference point at ISP Gateway Node to International nearest NAP port abroad (Satellite)*	YES	YES	YES	

{Note: A more detailed explanation of parameter wise audit methodology for Broadband services is explained in Annexure II}

4.4 Audit Limitations

Despite having a wide scope of work, we have found following problems that may impair the comparison across operators. As mentioned earlier we have suggested changes to operators, which will allow comparison in future. TRAI has already suggested a book keeping methodology and practical ways to the operators (within the spirit of QoS definition), also there has been previous rounds of Audit being conducted by different independent audit agencies (including IMRB) which had enabled comparison of the findings but still some variations were observed in methodologies and understanding of parameters among service providers (especially for Broadband services where Audit was carried out for the first time). Hence, the data reported in here has to be used carefully in the light of variation in testing.

1. **Complete data not being maintained:** In certain cases lack of availability of the data with the service providers rendered verification of raw data unfeasible and verification was done to the extent possible. For e.g. for network related parameters for Broadband services service providers could not produce old raw data files for ping tests, download speed etc

2. **Difference in measurement methodology:** For some cases, calculation methodology for some of the parameters was found to be different across various service providers.

3. **Technical unfeasibility:** There were cases observed where service providers expressed technical unfeasibility to provide the data required as according them their current system does not support the data being maintained/ recorded in the desired form. For e.g. Service providers were unable to provide data on service access delay and signal coverage from OMC for cellular mobile services. Hence, data was collected from the results of recent drive tests being conducted by various service providers

4. **Decentralized system for book keeping:** In certain cases, book keeping of records was found to be decentralized. This was largely observed for call centre performance for BSNL, where required data was not available with the exchanges and hence data could not be collected for the same. Also for some service providers who have call centralized call centres located at places away from ISP Nodes/Exchanges detailed raw data i.e. call by call detail was not available for verification. Hence verification of records was done to the extent possible in such cases.

5. **Difference in level of reporting to TRAI:** Some of the large Broadband service providers were observed to be reporting their performance on various parameters to TRAI at an all India level. They claimed that since they are providing gateway service to other small service providers, they are “Category A” service providers and consider entire India as one circle. Data for some of the parameters was provided by these operators on All India basis.

5 Executive Summary

The objective assessment of Quality of Services (QoS) was carried out by IMRB International for all the Basic (Wireline), Cellular mobile and Broadband service providers during the period starting from October 2008 to December 2008 in Andhra Pradesh circle. The executive summary encapsulates the key findings of the Audit by providing: -

- *"Service provider performance report"* for Basic (Wireline), Cellular mobile and Broadband service , which gives a glimpse of the performance of various operators against the benchmark specified by TRAI, during the month in which the Audit was carried out by IMRB Auditors
- *"Parameter wise critical findings"* for Basic (Wireline), Cellular mobile and Broadband services: This indicates key observations and findings from different activities carried out during the Audit process

5.1 Service provider performance report based on one month data verification – Basic (Wireline) Services

S.no	Parameters	B'mark	Bharti	BSNL	RCOM	TATA
1	**Provision of telephone after registration of demand**					
1.1	Connections completed within 7 days	100%	100%	84%	87%	95%
2	**Fault incidence/clearance statistics**					
3	Fault incidences(No. of faults/100 subscribers/month)	<3	5.5	6.3	1.86	.5
3.1	Faults repaired within 24 hours	>90%	92%	86%	99%	88%
3.2	Faults repaired within three working days	100%	100%	100%	99%	100%
4	Mean time to Repair (MTTR)	<8 hours	10.2	11.6	3.2	7.1
5	Call Completion Rate (CCR)	>55%	87%	65%	Not measured	80%
6	**Metering and billing credibility**					
6.1	Billing complaints per 100 bills issued	<0.1%	0.62%	0.16%	0.01%	0.01%
6.2	%age of billing complaints resolved within 4 weeks	100%	99%	90%	100%	100%
7	**Customer care/helpline promptness**					
7.1	Shift requests attended					
	Shift requests attended within 3 days	95%	96%	77%	98%	84%
7.2	Closure request attended					
	Closure within 24 hours	95%	100%	86%	99%	100%
7.3	Supplementary (additional) service requests attended					
	Additional facility provided within 24 hours	95%	100%	93%	100%	97%
8	**Response time to customer for assistance**					
8.1	% age call answered through IVR in 20 seconds	80%	100%	47%	100%	100%
	% age call answered through IVR in 40 seconds	100%	100%	98%	100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	96%	97%	97%	91%
	% age calls answered by operator in 90 seconds	95%	98%	100%	99%	93%
9	**Time taken for refund of deposits after closure**					
9.1	%age cases where refund received within 60 days	100%	100%	50%	100%	100%

{*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of to September to November 2008, whereas for rest of the operators figures pertain to all the exchanges present in the circle}

** Methodology not in line with QoS Figures provided on All India basis Not meeting the benchmark **B'mar**k = TRAI Benchmark, **DNA** = Details not available, **NA:** Not Applicable

Critical findings and Key take outs: Basic (Wireline) services

The Basic (Wireline) services audit for Andhra Pradesh circle broadly indicates that none of the service provider could meet all the benchmarks as specified by Telecom Regulatory Authority of India.

The live calling results were found to be different from the 1 month audit data collection in certain places. To some extent the difference can be attributed to the smaller sample size undertaken for the live calling. For live measurements conducted to assess Call Completion Rate (CCR) it was found that the operators who are reporting the same to TRAI were meeting the benchmark.

The parameter wise key takeouts for the wireline service providers for the Andhra Pradesh circle are as under:-

Provision of telephone after registration of demand

- Only Bharti was found to be meeting the TRAI benchmark of 100% for provisioning of telephone within 7 working days for the month in which the Audit was carried out. BSNL (84%), RCOM (87%) and TATA (95%) fall short of the TRAI specified benchmark.
- BSNL has scored low on Service provisioning/activation time , one of the reasons for the same was observed to be the fact that the service provider provides connection at all the locations and SDCA's in the circle whereas private service providers normally provide connections in areas which are technically feasible for the operator, especially for retail customers.
- As far as live calling scores are concerned 86% (highest) of subscribers of TATA teleservices claimed that the connection was provided within the time period of 7 days followed by, Bharti (85%), BSNL (73%) and RCOM (77%)

Fault incidence / clearance statistics

- As per the 1-month audit data findings, BSNL at 86% and TATA at 88% fall short of TRAI specified benchmark of >90% of faults to be repaired within 24 hours. Highest score on the same was observed for RCOM at 99% followed by Bharti 92%. The reason for low score by BSNL could be the fact that service providers also has presence in rural areas where fault repair may sometimes take time due to operational difficulties.
- For fault repair within 3 working days RCOM (99%) marginally falls short of TRAI specified benchmark of 100%. All the other operators meet the benchmark
- The live calling scores (for fault repair within 24 hrs) were observed to be highest for Bharti at 90% followed by RCOM at 53%. However low scores were observed were TATA and BSNL at 7% and 21% respectively. As mentioned earlier a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit)

Traffic statistics (CCR)

- All the service providers meet the TRAI specified benchmark for CCR both during live measurements and month in which audit was carried out.
- During Audit process at RCOM, it was observed that service provider does not have the technical capability to measure Call Completion Rate (CCR) as per TRAI norms. The reason primarily is the difference between its networks as compared to BSNL. The

service provider measures and reports to TRAI Answer Seizure Ratio (ASR) which is claimed to be a better indicator of network congestion for the kind network owned by the operator.

Metering and billing credibility

- Bharti and BSNL are not meeting the TRAI specified benchmark of <0.1% billing complaints.
- However during verification of records of service providers namely Reliance and Bharti it was found that definition of billing complaints remains to be lenient as only those cases where an internal ticket is opened i.e. cases where refund is provided by the operator are being taken into consideration. Hence, there is a need felt to have some clarity on the definition of billing complaints.

Customer care/helpline promptness

- For "shift requests attended within 3 days" audit data, BSNL (77%) and TATA (84%) fall short of TRAI specified benchmark of 95%
- For closure requests within 24 hours only BSNL with 86% requests attended, marginally falls short of the benchmark of 95%
- For supplementary service requests, all the operators (except BSNL) were found to be meeting the TRAI specified benchmark for the month in which audit was carried out.

UUUUUUUUUUUUUUUUUUUUUUUUUUUUResponse time to customer for assistance

- For customer care number through electronic IVR menu parameter all the operators (except BSNL for calls answered in 40 seconds) comfortably meet the benchmark for calls answered within 20 and 40 seconds for one month data
- For customer care number through the operator parameter all the operators (expect TATA for calls answered in 90 seconds) comfortably meet the benchmark for calls answered within 60 and 90 seconds for one month data.
- Live calling results carried out to check the efficiency of calls answered by the operator reveal that all operators meet the TRAI specified benchmark both for calls answered within 60 and 90 seconds

Time taken for refund of deposits after closure

- BSNL falls short of the TRAI specified benchmark with a score of 50% on Time taken for refund of deposits after closure.

Level 1 service

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, Fire, Police, Railways) offered by various service providers. At least 200 calls were made for each service provider to different numbers and time taken to answer the call was noticed. For BSNL and Bharti 98 % of calls made were answered in 60 seconds.

It should be noted that other private operators offer level 1 service primarily for emergency services like fire, police etc

Summary of Live Measurement Results – Basic Wireline Services

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	TATA
Call Completion Rate (CCR) in the local network	>55%	88%	64%	86%

- For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable.
- All the service providers were comfortably meeting the TRAI specified benchmark, lowest scores during live measurements were observed for BSNL at 64% and highest was observed for Bharti at 88%

5.2 Service provider performance report based on one month data verification: Cellular Mobile Services

Parameters	Benchmark	RCOM	Vodafone	IDEA	TATA	Bharti Airtel	BSNL
Accumulated downtime for community isolation	< 24 hrs.	0.00	6.37	10.18	0.00	7.77	19.40
Call Set Up Success Rate (CSSR)	> 95%	99.54%	98.04%	99.75%	98.54%	96.94%	98.00%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	5.00	10.00	8.00	8.00	9.60	7.10
Blocked Call Rate							
SDCCH /Paging Channel Congestion	<1%	0.00%	0.10%	0.39%	0.00%	0.80%	0.48%
TCH Congestion	< 2%	0.45%	0.12%	0.68%	0.06%	1.87%	2.31%
Call drop rate	< 3%	0.56%	1.05%	0.89%	0.80%	1.57%	1.83%
Percentage connections with good voice quality*	> 95%	99.58%	96.89%	97.14%	97.64%	97.35%	99.18%
Service coverage*							
In door	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
In vehicle	>-85dbm						
Out door - in city	>-95dbm						
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied
Calls answered electronically							
Percentage calls answered within 20 seconds	80%	99%	100%	DNP	100%	100%	100%
Percentage calls answered within 40 seconds	95%	99%	100%	DNP	100%	100%	100%
Calls Answered by the operator							
Percentage calls answered within 60 seconds	80%	93%	99%	DNP	91%	95%	62%
Percentage calls answered within 90 seconds	95%	96%	100%	DNP	93%	97%	72%
Billing Complaints							
Billing complaints per 100 bills issued	<0.1%	0.09%	0.06%	0.03%	0.01%	0.00%	0.00%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	100%	100%	100%	100%	NA	64%

*Details pertaining to these are obtained through operator assisted drive tests. Results of the drive tests are explained in greater detail in critical findings

** Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

B'mark = TRAI Benchmark, **DNA** = Details not available, **NA:** Not Applicable

Critical findings: Cellular Mobile Services

The audit for cellular mobile service providers were conducted at their respective MSCs in the Andhra Pradesh circle apart from Reliance Communication whose audit was conducted at their central NOC at Mumbai.

The audit involved a three stage verification process which consisted of auditing the records of the service providers and verifying the data submitted to TRAI. The second step involved a three day live measurement of all the network parameters. Finally basis the three day live measurement the auditors needed to find out the busy hour for the service provider and collect the hourly data for this busy hour for the month in which the audit was conducted.

Busy Hour of Various Service Providers

Service Provider	Reported Time Consistent Busy Hour	Network Busy Hour found in 3 day live measurement
Bharti Airtel	2000 – 2100	2000 – 2100
BSNL	2000 – 2100	2000 – 2100
RCOM	1900 – 2000	1900 – 2000
Idea Cellular	2000 – 2100	2000 – 2100
TATA	2000 – 2100	2000 – 2100
Vodafone	2000 – 2100	2000 – 2100

The TCBH reported by all the service providers matched the network busy hour calculated by IMRB auditors for the Andhra Pradesh circle.

Accumulated Downtime:
In the Andhra Pradesh circle, there were outages that led to a community being isolated at a particular point in time for all the operators except RCOM and TATA. BSNL experienced the highest outage (more than 19) hours in the month of audit.

Call Set-up Success Rate (CSSR):
All the operators were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for IDEA with 99.75% of their calls getting completed. All the operators were found to be calculating the parameter as per the norm specified by TRAI. CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.

Service Access Delay:
This parameter is reported to TRAI basis the period drive tests that are conducted by the service providers during that quarter. It is measured using a drive test tool kit and a protocol analyzer. All the operators in the Andhra Pradesh comfortably meet the TRAI specified benchmark. Also, all the operators follow the TRAI specified mechanism for measuring the parameter. During the drive test, none of the operators were found to be using engineering hand sets.

Network Congestion parameters:
SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except BSNL for Traffic channel congestion are meeting the TRAI specified benchmarks on the congestion parameters. BSNL does not meet the TRAI specified benchmark with a Traffic Channel congestion of 2.31% which was found during the one month data collected for the month of audit. TATA leads the way in network congestion parameters with almost negligible paging as well as traffic channel congestion. The calculation methodology of these

parameters was found to be in complete accordance with what has been specified by TRAI. There was almost 0 POI congestion on almost all individual POI links between a service provider vis-à-vis other service providers.

Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped (unexpected seizure) to the total number of call attempts for all operators. Also, all of service providers were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of RCOM at 0.56% while the highest (although it easily met the benchmark) was for BSNL at 1.83%.

% connections with good voice quality:

All the operators are measuring this parameter via their periodic drive tests. However, for Vodafone these parameters can be obtained at their switch as well. During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. Drive test was conducted by IMRB with the help of service providers to measure this parameter. In the drive test it was found that all the operators met the TRAI benchmark.

Service coverage:

This parameter is reported by the service provider basis the periodic drive tests in a particular circle. The service coverage for all the operators was found to be within the TRAI specified limits for 100% of the drive test route (for which the audit was conducted). However, there were places where interference and inadequate coverage was recorded (explained in greater detail along with drive test findings).

Customer Care / Helpline Assessment

For the IVR aspect all the service providers meet the TRAI benchmark. However, in case of Reliance no breakup of IVR calls by circle is present. The figure reported is for all India level. Also, RCOM claimed that whatever calls cannot be routed to the IVR is directly routed to the voice to voice operator. In case of calls answered by operators, all BSNL (for percentage calls answered within 60 and 90 seconds) and (TATA for percentage calls answered by the operator within 90 seconds) do not meet the benchmark for the month of audit. For IDEA, no detail of customer care parameters was available.

Billing performance

All the operators were found to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued and the benchmark of 100% billing complaints being resolved within 4 weeks. In all cases where customers were due for refund, all the service providers except BSNL meet the TRAI benchmark of 100% with 4 weeks.

Inter operator calls assessment

Inter operator call Assessment (To ↓ / From→)	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
RCOM	N.A	100%	100%	98%	100%	98%
Vodafone	99%	N.A	100%	100%	99%	93%
Idea	100%	99%	N.A	98%	100%	89%
TATA	97%	92%	100%	N.A	92%	99%
Bharti	97%	100%	100%	77%	NA	100%
BSNL	93%	97%	100%	100%	100%	NA

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. Vodafone and Airtel found tough

connecting to a TATA number with only 92 out of 100 calls getting connected. RCOM had difficulty in connecting to a BSNL number with 93% of their calls getting completed. From TATA, only 77 out of 100 calls to a bharti number got connected. BSNL had difficulty in connecting to an Idea number with 89% of calls getting connected.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Andhra Pradesh circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Warangal, Vijaywada and Hyderabad. IMRB auditors were present in vehicles of every operator. A sample of 15 – 30 test calls were made along each of the routes. The holding period for all test calls was between 120 seconds to 180 seconds. The drive test vehicle across all routes plied at a speed of less than 20 km per hour. Taking into consideration the route that was taken for the drive test; most of the major areas of Andhra Pradesh telecom circle were covered.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75dbm for indoor, -85 dms for in-vehile and > -95 dbm outdoor routes.

The drive tests in the Andhra Pradesh circle were conducted in the cities of Warangal, Vijaywada and Hyderabad was conducted along the following route:

	Type of Location	Warangal	Vijaywada	Hyderabad
Outdoor	Periphery of the city	Madhikonda to Autonagar	Ramavarapadu to Gollapadu	Chandranagar to Kakatpally-X-Junction
	Congested Area	Hunter road Bridge to Pochamma Maidan	Kaleshwara Market to PWD Grounds	Pantny to Kachiuda
	Across the City	MGM Road to Hanamkonda Bus Stand	Ratham Center to Bandar Road	Moosapet to Dilsukhnagar
Indoor	Office Complex	Green Square Plaza	NTR Complex	Commercial Tax Building
	Shopping Complex	CP Reddy Complex	Vastralata	Swapanlok

The tables given below gives a glimpse of the results of the operator assisted drive test:

Drive Test – Vijaywada

	RCOM		Vodafone		IDEA		TATA		Bharti Airtel		BSNL	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	99.97%	98.79%	98.39%	98.74%	98.50%	97.42%	99.11%	99.35%	99.81%	96.47%	96.21%	95.16%
CSSR	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.36%	98.90%	100.00%	100.00%	97.84%	97.25%
Blocked Call Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.64%	1.10%	0.00%	0.00%	2.16%	2.75%
Call drop rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.16%	2.75%
Hands off success rate	Complied		Complied		Complied		Complied		Complied		Complied	

Drive Test – Warangal

	RCOM		Vodafone		IDEA		TATA		Bharti Airtel		BSNL	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	100.00%	99.83%	89.86%	95.62%	97.34%	96.49%	96.83%	97.68%	97.78%	95.80%	NA	98.71%
CSSR	100.00%	100.00%	98.46%	98.94%	100.00%	100.00%	98.36%	100.00%	98.46%	100.00%	100.00%	100.00%
Blocked Call Rate	0.00%	0.00%	1.54%	1.06%	0.00%	0.00%	1.64%	0.00%	1.54%	0.00%	0.00%	0.00%
Call drop rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.67%	1.11%
Hands off success rate	Complied		Complied		Complied		Complied		Complied		Complied	

Drive Test – Hyderabad

	RCOM		Vodafone		IDEA		TATA		Bharti Airtel	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	99.30%	99.85%	96.01%	95.09%	98.04%	95.91%	93.77%	99.47%	98.37%	97.34%
CSSR	98.46%	96.91%	100.00%	99.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Blocked Call Rate	1.54%	3.09%	0.00%	0.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Call drop rate	1.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	Complied		Complied		Complied		Complied		Complied	

Not meeting the benchmark

Following were the areas where the signal strength was found to be inadequate for the operators:

ALL SERVICE PROVIDERS

Vijaywada: There was interference and low signal strength recorded for all operators in the outdoor areas near Kanka Durga Temple, Mummarapalem Centre, near Prakasam barrage, Moghalrajpuram, Ayodhyanagar, Police control room circle while in the indoor areas inadequate coverage was not found in any of the areas.

Warangal: There was interference and low signal strength recorded for all the operators in the outdoor areas of Masjid road, Rangsaipeta, Padmakshamma temple, Kazipet, Hanamkonda while in the indoor areas there was no inadequate coverage or interference recorded.

Hyderabad: There was interference and low signal strength recorded for all operators in the outdoor areas of Hitech X Road, Khairatabad and lakadikapool, ESI Hospital, Mosapet Junction, Park Lane road, Chilkalguda, MJ Market while in the indoor areas no interference and inadequate coverage was recorded.

Conclusions:

1. BSNL does not meet the TRAI benchmark on blocked call rate in Vijaywada
2. Idea in Hyderabad while Vodafone in Warangal do not meet the benchmark for voice quality in indoor areas
3. RCOM BSNL does not meet the TRAI benchmark on blocked call rate in Hyderabad

Summary of Live Measurement Results – Cellular Mobile Services

Parameter	Benchmark	RCOM	Vodafone	IDEA	TATA	Bharti Airtel	BSNL
CSSR	> 95%	99.57%	98.42%	99.53%	98.77%	97.69%	98.00%
SDCCH / Paging Channel Congestion	< 1%	0.00%	0.11%	0.31%	0.00%	0.54%	0.48%
TCH Congestion	< 2%	0.44%	0.15%	0.55%	0.06%	1.34%	2.31%
Call drop rate	< 3%	0.53%	1.29%	0.74%	0.43%	1.52%	1.80%
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied

Not meeting the benchmark

During the three day live measurement, all operators except BSNL for Traffic Channel congestion were found to be meeting the TRAI benchmark on all the parameters.

5.3 Service provider performance report based on one month data Verification – Broadband Services

S.No	Parameter	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
1	**Service provsioning uptime**								
1.1	Total connections registered/calls made		3468	4213	816	2625	2940	1050	601
1.2	Percentage connections provided within 15 days	100%	100%	80%	100%	100%	98%	100%	99%
2	**Fault repair restoration time**								
2.1	Total number of faults registered/calls made		1585	2448	3299	8872	16475	730	1720
2.2	Percentage faults repaired by next working days	> 90%	93%	82%	91%	87%	94%	96%	98%
2.3	Percentage faults repaired within three working days	99%	98%	98%	100%	100%	99%	99%	100%
3	**Billing performance**								
3.1	Total bills generated/calls made		43587	68958	All Prepaid customers	21897	19419	29150	7924
3.2	Billing complaints per 100 bills issued	<2%	0.61%	0.08%		1.96%	0.90%	0.21%	0.08%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	77%		100%	100%	100%	100%
3.4	Time taken for refund of deposits after closure	100%	100%	92%		100%	100%	100%	100%
4	**Customer care/helpline assessment**								
4.1	Percentage calls answered within 60 seconds	> 60%	96%	97%	97%	100%	95%	81%	94%
4.2	Percentage calls answered within 90 seconds	>80%	98%	88%	100%	100%	97%	85%	96%
5	**Bandwidth utilisation/Throughput**								
5.1	Total number of intra network links tested		85	23 BRAS, TI 24, T2624,DSLAM 5960	412	0	16	NA	2
5.2	Total number if intra network links crossing 90%		0	0	0	0	0	NA	0
	Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)								
5.3	Total number of upstream links		1	141	27	5	50	4	NA
5.4	Number of links > 90%		0	8	0	1	0	0	NA
5.5	Percentage bandwidth utilised on upstream links	<80%	89%	70%	79%	90%	60%	77%	NA
6	**Broadband download speed**	>80%	Complied	Complied	Complied	Complied	Complied	Complied	Complied
7	**Service availability/uptime**	>98%	100.00%	100.00%	100.00%	98.92%	98.22%	99.40%	99.49%
8	**Packet loss**	<1%	<1%	<1%	<1%	<1%	<1%		<1%
9	**Network Latency**								
9.1	POP/ISP Node to NIXI to IGSP	<120msec	<100	<120	Complied	<100	Complied	<50	Complied
9.2	ISP node to NAP port	<350msec	<248	Complied	Complied	<250	Complied	<300	Complied

Critical findings and Key take outs: Broadband services

Before concluding the Audit findings for Broadband services we would like to accentuate the fact that the Broadband audit process was being carried out for the first time by an independent audit agency in the circles being audited in the second half yearly period. Some service providers claimed that they were submitting the PMR basis their inference of the QoS parameters. Also, there were differences observed in level of reporting for e.g. Sify, and BSNL (for network related parameters) claimed to be category "A" service provider and consider all India as one circle. In fact the findings reported herewith for some of the parameters for these operators are on an all India basis.

However, we need to take a larger view of the picture and ignore some differences in measurement methodologies and level of reporting. We believe that book keeping is bound to get better as more such Audits will be carried out in subsequent quarters as mandated by TRAI.

The key conclusions (Parameter wise) emerging out from the Audit exercise of six Broadband service providers are highlighted below

Service provisioning/Activation time

- BSNL (80%) falls short of TRAI benchmark of 100% connections to be provided within 15 days for one month data
- For Live calling carried out BSNL scores the lowest with 76% subscribers claiming that connection was provided within 15 days. For rest of the service providers scores are observed to be >90%.

Fault Repair/Restoration time

- BSNL (82%) and Hathaway are falling below the benchmark for fault repair within next working day.
- For fault repair within three working days Bharti and BSNL marginally fall short (@ 98%)of the TRAI specified benchmark.
- TRAI can consider including Mean Time to Repair (MTTR) for faults as one of the parameters for measuring Quality of Services (QoS) in future for Broadband services as well.
- Also, Sify was found to be reporting only those fault complaints which are booked at the call centre. All the fault complaints booked at the cable operator's end are not taken into consideration while reporting in PMR

Billing performance

- All the service providers were found to be meeting the benchmark of percentage billings complaints received and time taken for resolution of billing complaints for the month in which data was collected. Sify however claim that all its retail broadband customers are prepaid and hence there are no billing complaints for Sify.
- It should also be noted that the definition of billing complaints/disputes can be considered as lenient as service providers namely Bharti and Reliance include only those complaints where an internal ticket is opened and refund is made to the customer. Hence there is a need felt to have some clarity on the definition of billing complaints.

Customer Care/Helpline Assessment

- All the operators meet the TRAI specified benchmark for calls answered by the operator in 60 and 90 seconds for the month in which audit was carried out and for live calling carried out during the audit process

Bandwidth Utilisation:

- All the service providers were found to be using Multiple Router Traffic Grapher (MRTG) to measure the bandwidth utilisation at intra network links.
- However, it was noticed that some of the service providers are reporting Average bandwidth utilised during the complete period to TRAI instead of Bandwidth utilised during Time Consistent Busy Hour (TCBH) as they claim that the peak hours generally range from 11.00AM in the morning to 4.00 PM in the evening owing to high corporate usage during the period. Also, it was observed that there are multiple links and busy hour may vary for each link.
- All the service providers were found to be reporting combined bandwidth utilisation for corporate and household customers as there is no mechanism available to provide it separately for different users.
- For Intra network link, data for Sify, BSNL and VSNL (TATA Communications) was obtained on all India basis. None of the links tested for these operators was found to be having above 90% bandwidth utilization for the month in which audit was carried out
- Also It was observed that all the links (tested during three day live measurement) in the access segment for most of the service providers were found be below 80%.
- Infact for large service providers having Metro E network, bandwidth utilisation during peak hours was found to less than 50% during peak hours for some if the links randomly tested during three days live measurement.
- Also, service providers distributing services through cable operators (Sify) claim that it is not possible to measure the Bandwidth available from Cable operator to their base stations. Hence, it is believed that last mile experience may suffer as operators have relatively less control over the operations of cable operator.
- For Bandwidth utilisation on upstream links (From ISP Node to IGSP/NIXI), all the operators (except Hathaway) meet the TRAI specified benchmark. For RCOM upstream links to NIXI and IGSP all physically located in Mumbai and Delhi

Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer. These measurements were carried out by IMRB auditors on a sample basis during visits at PoPs and ISP Node
- However, no historic data was available for verification of records for month of Audit as well as quarter ending April to June 2008 with the service providers. Most of them claimed that they are reporting to TRAI basis live tests conducted at customer premises during field visits and tests conducted at POPs/ISP Node.

Service Availability/Uptime:

- All the service providers are meeting the benchmark on service availability/uptime for the month in which audit was carried out.
- However, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator.
    - For e.g. TATA communications (VSNL) considers all the sites in the access network (including DSLAM, Building Nodes etc) for calculating network uptime whereas BSNL does not consider downtime for DSLAM's while reporting to TRAI. Again for service providers distributing through cable operators (Sify), it was observed that downtime for equipment at the cable operator's premises is not being taken into consideration for calculating service availability.
    - The same is in line with the guideline provided by TRAI as service availability aims at measuring time for which Broadband access network (Including ISP Node) was not in a state of failure for all users.
    - However, it should be noted that parameter ignores cases in which Broadband access network may be in state of failure for some/part users. Hence it is recommended that TRAI can take into consideration including *"Customer uptime"* as a parameter for measuring Quality of Services (QoS) for various service providers.

Packet Loss and Network Latency

- It was observed that almost all the service providers are measuring packet loss and latency by conducting random ping tests for their internal performance measurement, but there are no records being maintained or book keeping methodology was non existent for all the operators except BSNL. However, it should be noted that the network related data for BSNL for verification was obtained from their central node in Bangalore.
- Due to non availability of the records of old ping tests, verification process could not conducted for most of the private operators.
- However, ping tests conducted/smoked ping results during live measurements revealed that all the service providers are meeting the benchmark prescribed by TRAI.

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify	Hathaway	VSNL	You Telecom	RCOM
Service Availability Uptime	**>98%**	100.0%	100.00%	100.0%	98.9%	98.2%	100%	99.5%
No of **Intra network links** found to be above 90% (Out of sample links tested)		0	0	0	NA	0	NA	0
Total Bandwidth utilization at all upstream links	**< 80%**	85%	83%	68%	90%	60%	75%	NA
Data Download Speed	**> 80%**	Complied	Complied	Complied	Complied	Complied	Complied	Complied
Packet Loss (Percentage)	**< 1%**	<1%	<1%	<1%	<1%	<1%		<1%
From user reference point at POP/ISP Node to IGSP NIXI (msec)	**<120msec**	<50	Complied	Complied	83	Complied	<50	Complied
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	**<350msec**	<250	Complied	Complied	<250	Complied	<300	Complied

** Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

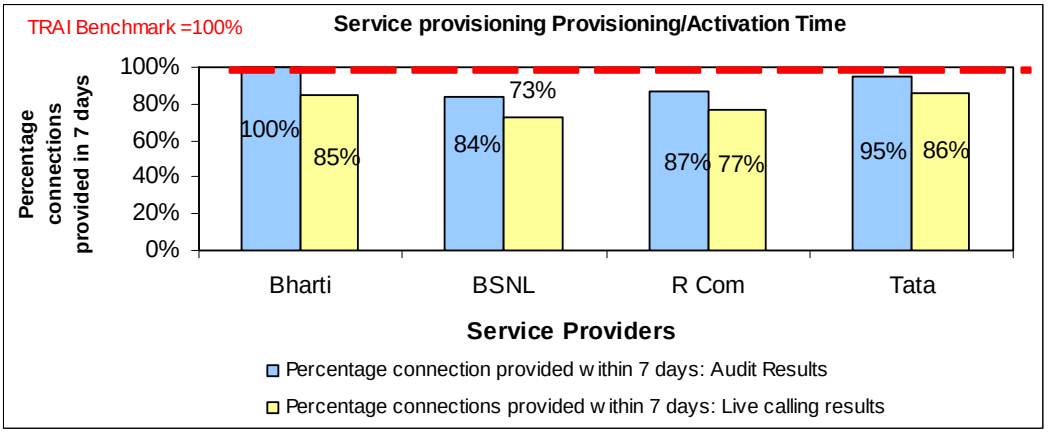
B'mark = TRAI Benchmark, **DNA** = Details not available, **NA:** Not Applicable

- All the service providers are meeting the benchmark on service availability/uptime for three day live measurements. As explained earlier, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator.
- The testing for Bandwidth utilization during live measurement was carried out on sample basis by IMRB auditors for intra network links. There were no intra network links that were found to have a utilization of more than 90% for all of the operators
- For Bandwidth utilization on upstream links, all the service providers (except Hathaway) are meeting the benchmark during the three day live measurement and have excess capacities available on their upstream links.
- However, it should be noted that for BSNL out of the total 141 gateway links present at different places in India 19 were found to be > 90 %.
- For network latency all the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements.

6. Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection

6.1 Graphical/Tabular Representations for Basic (Wireline) services

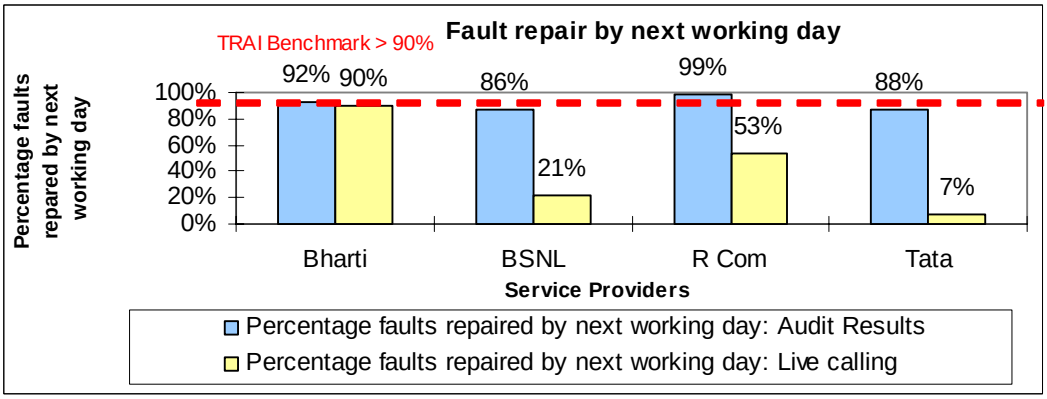
Service provisioning / Activation time (Comparison between one month audit results and live calling results)



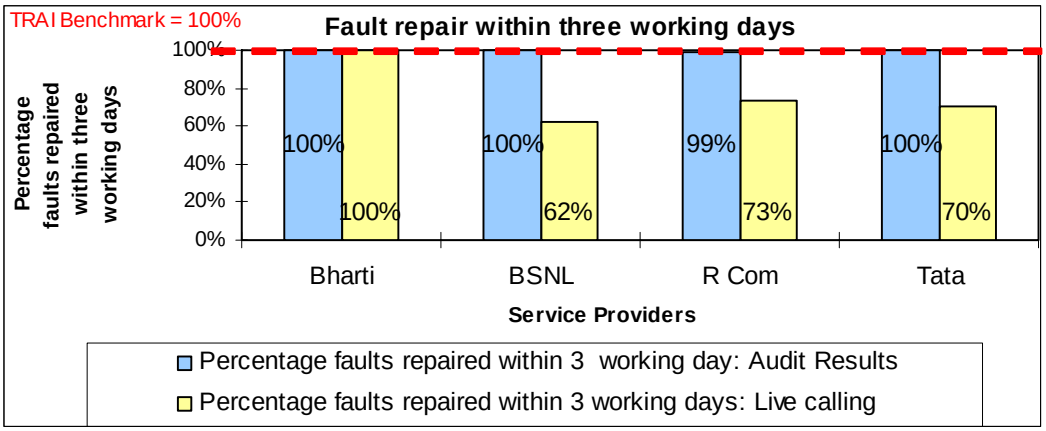
BSNL (84%) and RCOM (87%) fall short of TRAI specified benchmark for connections registered within 7 days. It should be noted that BSNL's score is deemed to be good as BSNL was found to be providing connections in rural as well as urban areas.

Live calling scores for all the operators were observed to be varying from 73% (BSNL) to 86% for TATA

Fault repair/Restoration time (Comparison between one month audit results and live calling results)

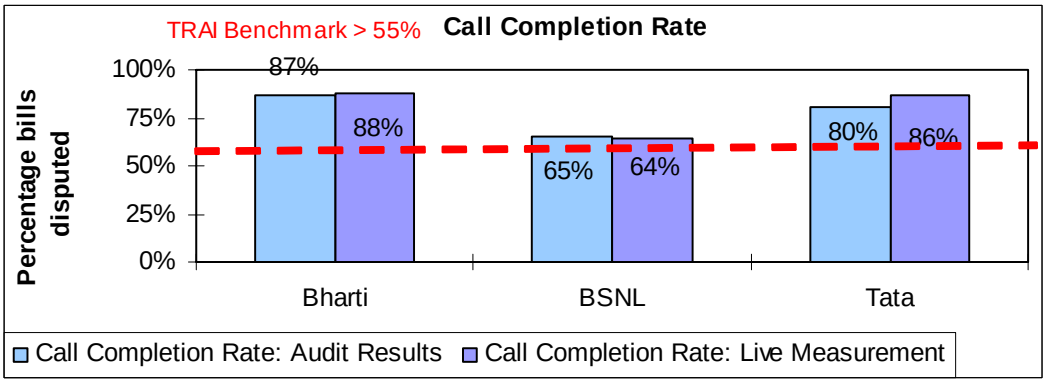


For fault repair by next working day BSNL and TATA fall short of the TRAI specified benchmark. For live calling scores only 7% of TATA subscribers called claimed that the faults reported by them where cleared by next working day. Bharti score for live calling is observed to be highest with a score of 90%.



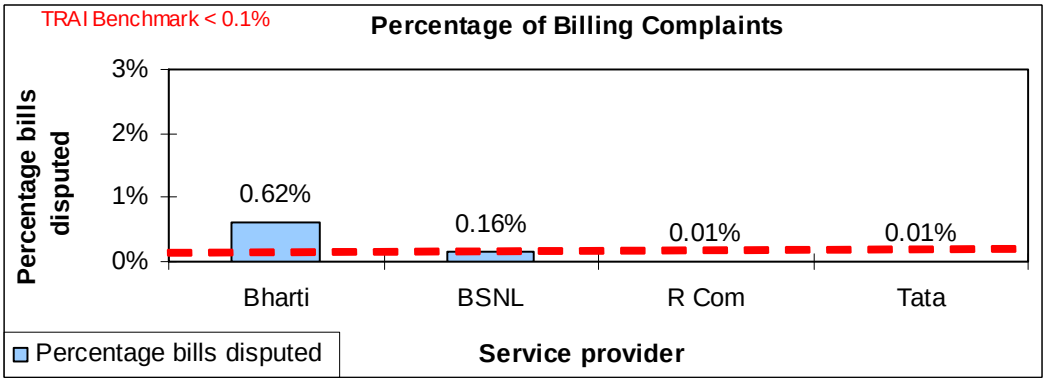
RCOM (By 1%) fall short of TRAI specified benchmark for fault repair within 3 working days.

Call completion rate (Comparison between one month audit results and three day live measurement)



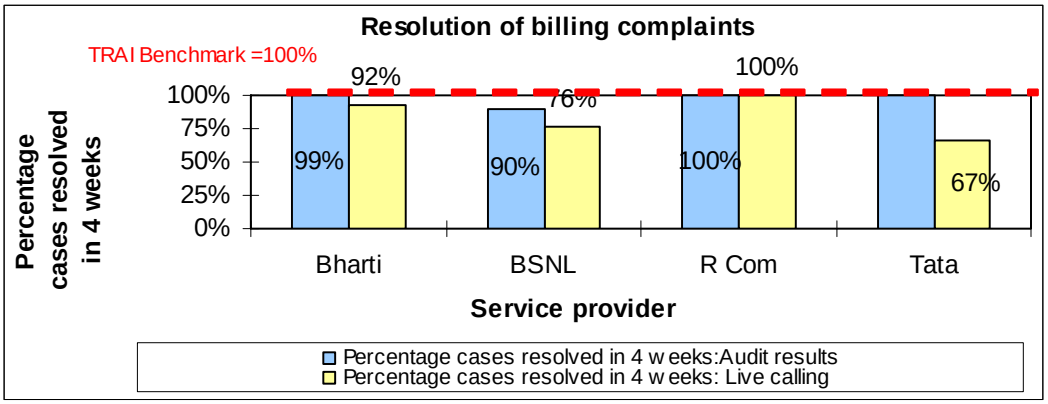
All the service providers were found to be meeting TRAI benchmark (55%) for Call Completion Rate both for live measurements and month in which the audit was carried out. As mentioned earlier Reliance does not have the technical capability to measure CCR and does not even report the same to TRAI.

Percentage bills disputed



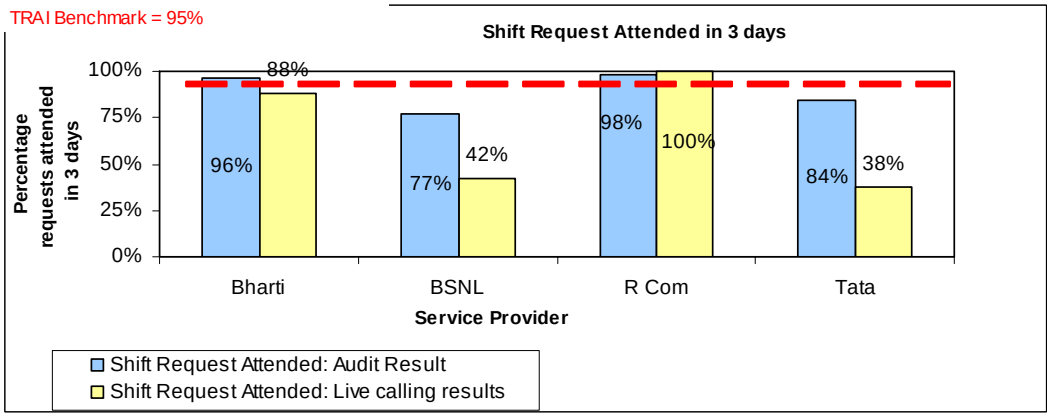
All the service providers meet the TRAI specified benchmark as percentage billing complaints remain <0.1% for all the operators

Resolution of billing complaints (Comparison between one month audit results and live calling results)



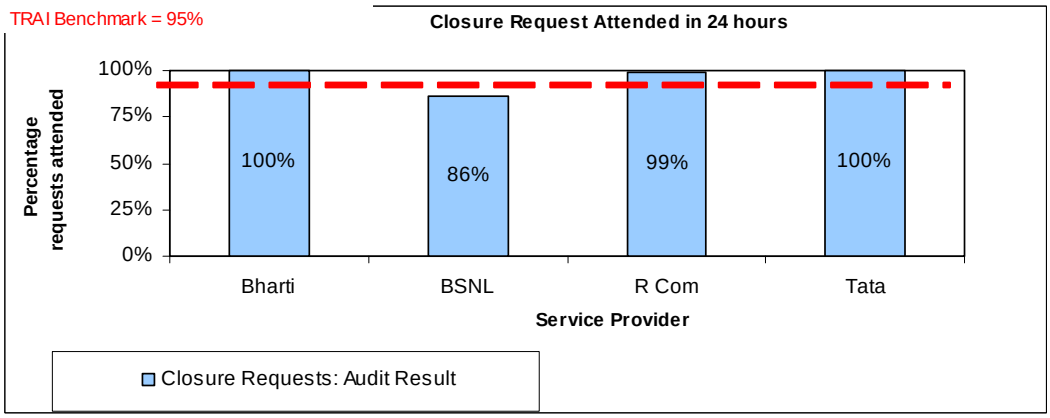
Service providers (except BSNL and Bharti at 99%) meet the TRAI specified benchmark for resolution of billing complaints within 4 weeks for the month of audit.

Shift requests attended (Comparison between one month audit results and live calling results)



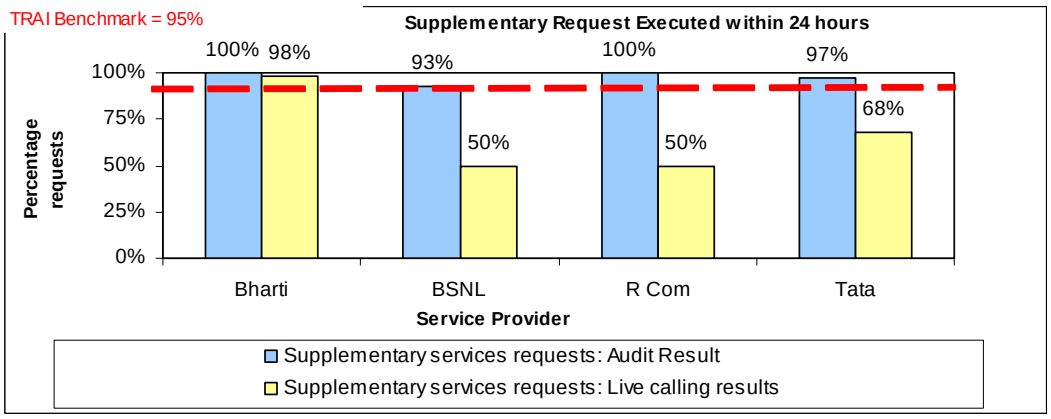
For shift requests attended within 3 days BSNL and TATA fall short of TRAI specified benchmark. For live calling Bharti and RCOM lead with 100% subscribers claiming that request was attended in stipulated time.

Closure requests attended within 24 hours



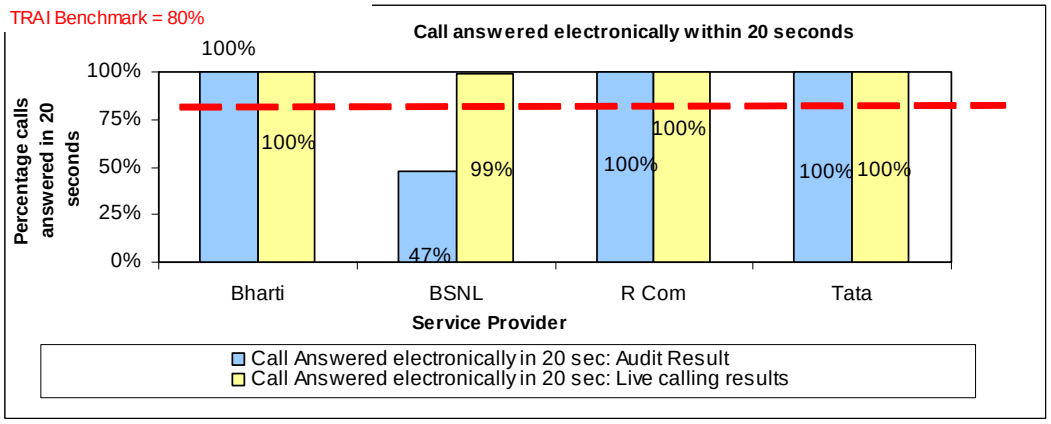
BSNL (at 86%), falls short of the benchmark of 95% closure requests attended within 24 hours for the month of Audit

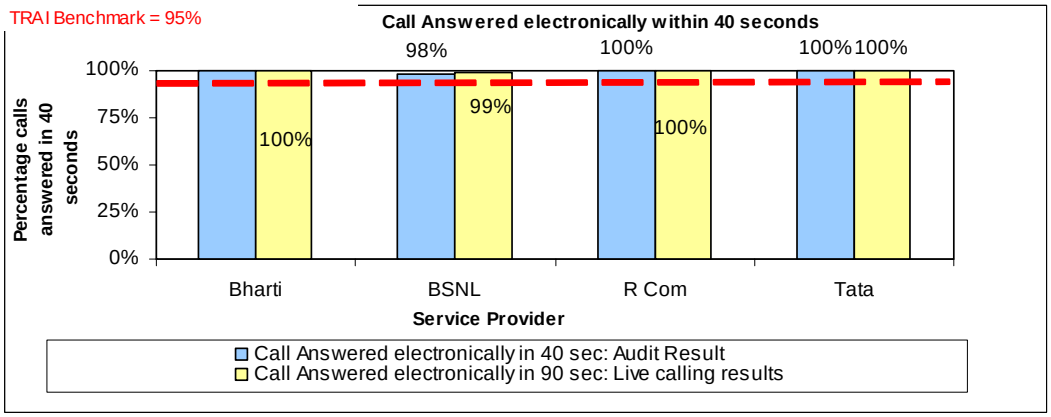
Supplementary requests (Additional services) attended within 24 hours (Comparison between one month audit results and live calling results)



BSNL falls short of the TRAI specified benchmark of 95% "requests for additional services" to be attended within 24 hours for the month of Audit.

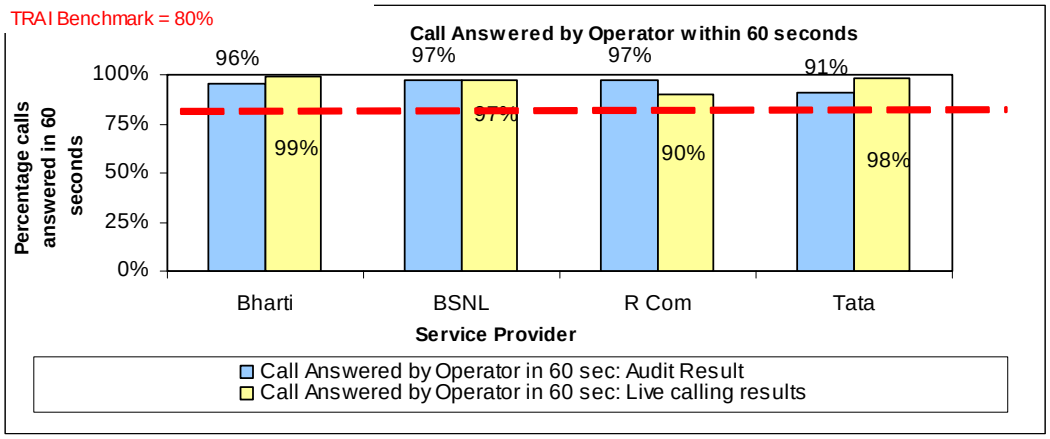
Response time to customer for assistance - Calls answered electronically within 20 and 40 seconds (Comparison between one month audit live calling results)





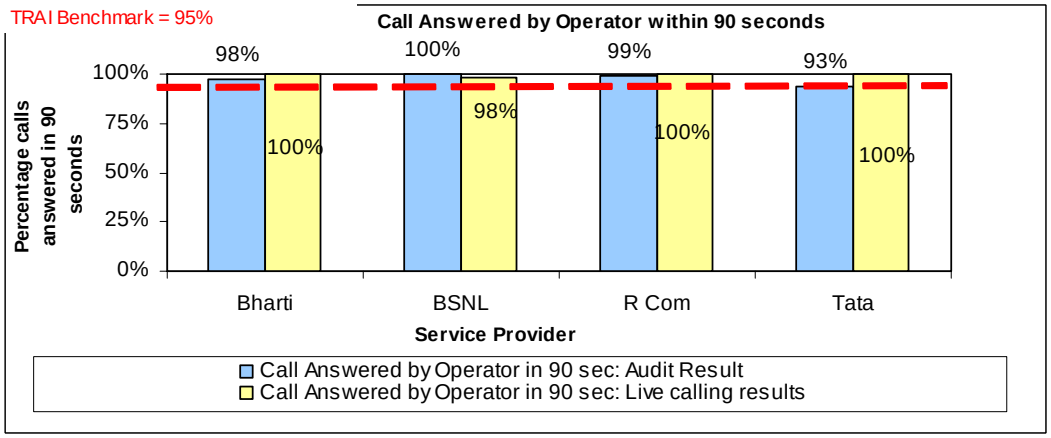
BSNL falls short of TRAI specified benchmark for live calling scores for calls answered electronically within 20.

Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)



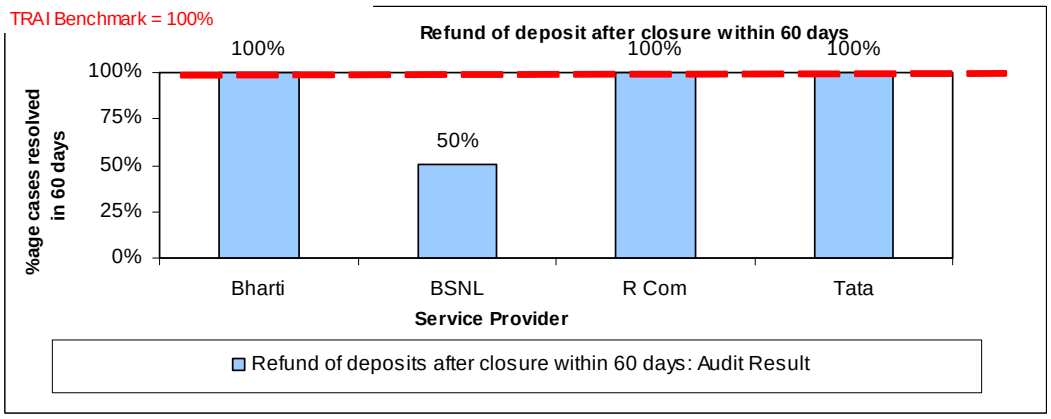
All operators meeting benchmark

Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)



All operators meeting benchmark

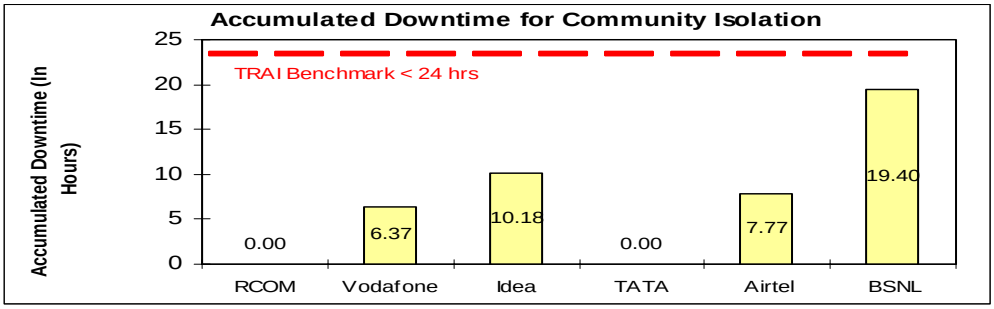
Time taken to refund of deposits after closure



All operators except BSNL meet the TRAI specified Benchmark.

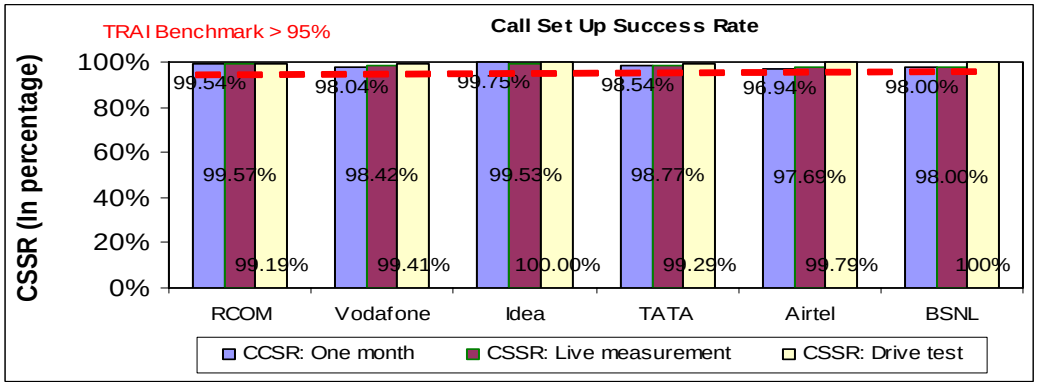
6.2 Graphical/Tabular Representations for Cellular Mobile Services

Accumulated Downtime



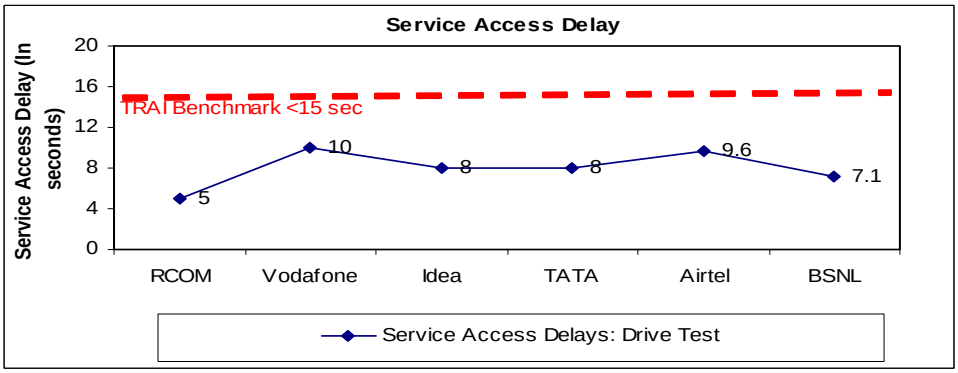
Except TATA and RCOM all other operators experienced a downtime in the Andhra Pradesh circle in the month of audit. The highest downtime observed was for BSNL at 19.40 hours.

Call Set-up Success Rate (CSSR)



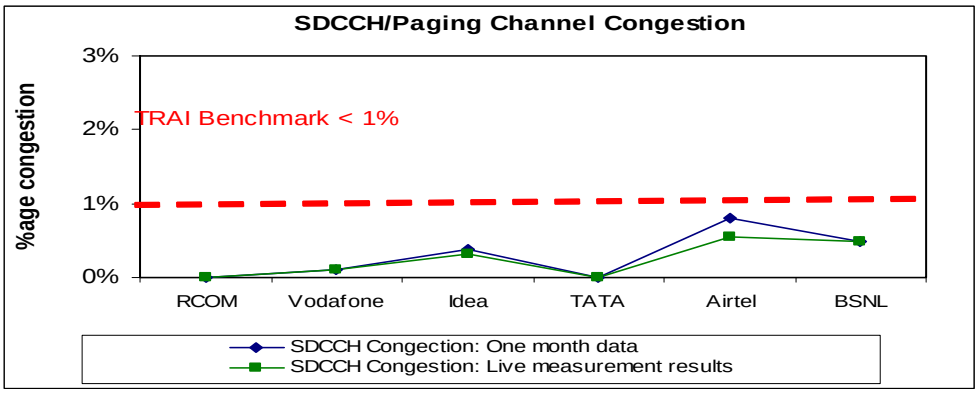
All the are meeting the benchmark for the audit month, live measurement as well as the drive test.

Service Access Delay



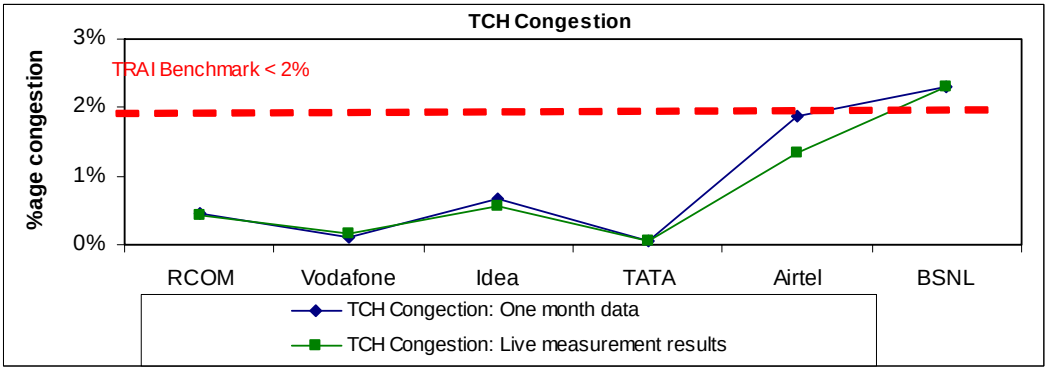
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit. The highest service access delay was measured for Vodafone at 10 seconds and the lowest was for RCOM at 5 seconds.

SDCCH / Paging Channel Congestion



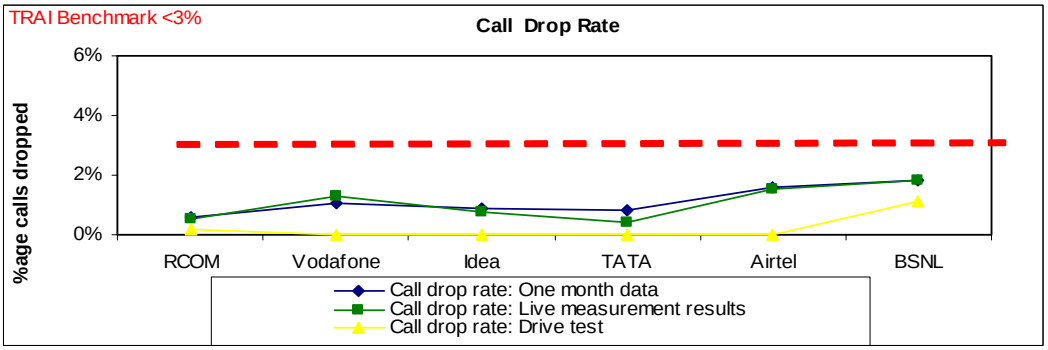
All the operators meet the benchmark for the month and the three day live measurement period. During the monthly measurements and verification TATA and RCOM do not record any paging channel congestion.

TCH Congestion



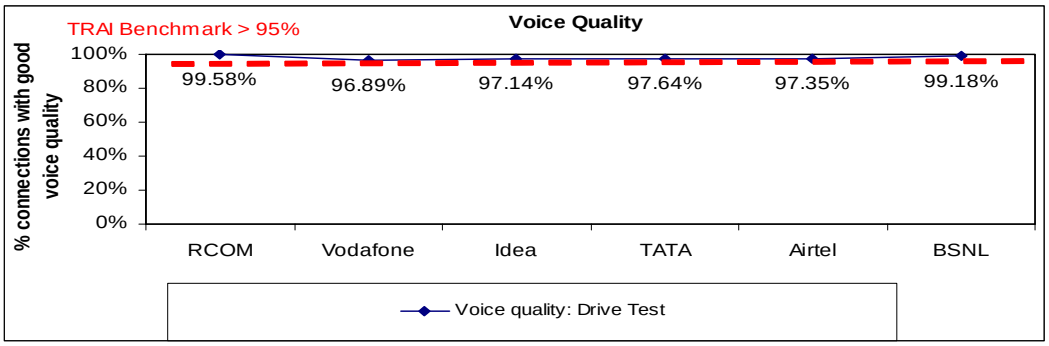
All the operators except BSNL both for one month data collection and verification and three day live measurement meet the TRAI benchmark. On an overall basis, the relatively lower congestion is observed for Vodafone, TATA and RCOM.

Call Drop Rate



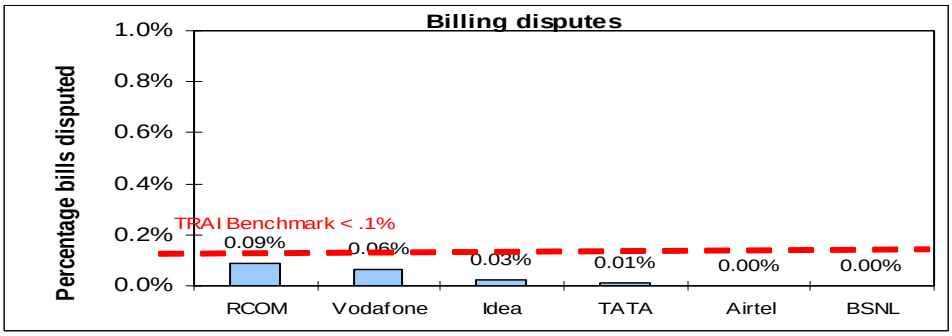
All the operators meet the TRAI benchmark. The operators with the least call drop rates taking into consideration the figures for drive tests, live measurement and the month of audit are IDEA, RCOM and TATA.

Voice quality

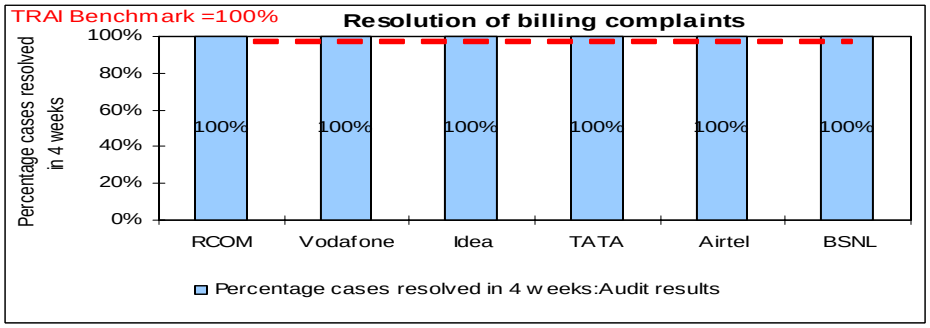


All the operators meet the TRAI benchmark as found out during the drive test.

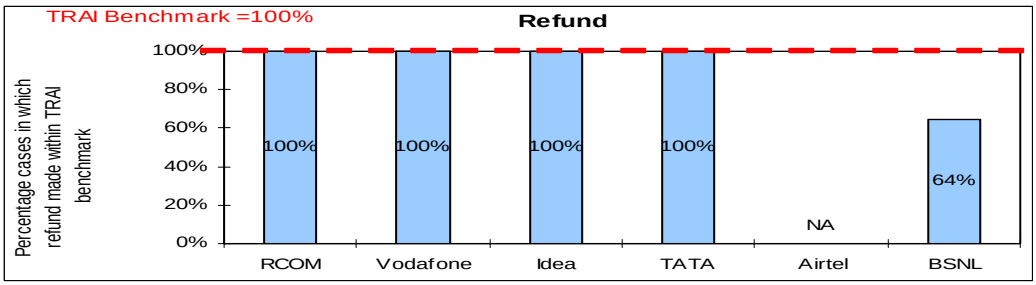
Billing Disputes



All the operators meet the TRAI benchmark on percentage billing disputes per 100 bills. Bharti out of more than five lakh bills generated received only 11 billing complaints while BSNL received only 4 complaints out of more than 167000 bills generated during the month of audit.



All the operators meet the TRAI benchmark of resolving 100% of the cases related to resolution of billing complaints for the month in which data was collected. However, the operators consider only those as billing complaints where they have issued an internal ticket which essentially means that a refund is due to the customer.



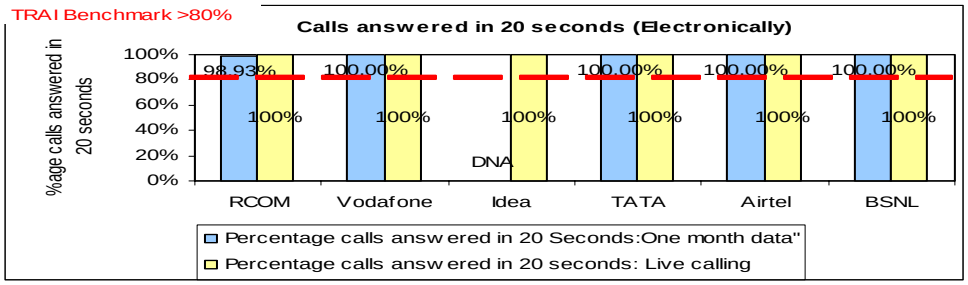
All the operators except BSNl at 64% were found to giving the refunds to their subscribers within the stipulated time period.

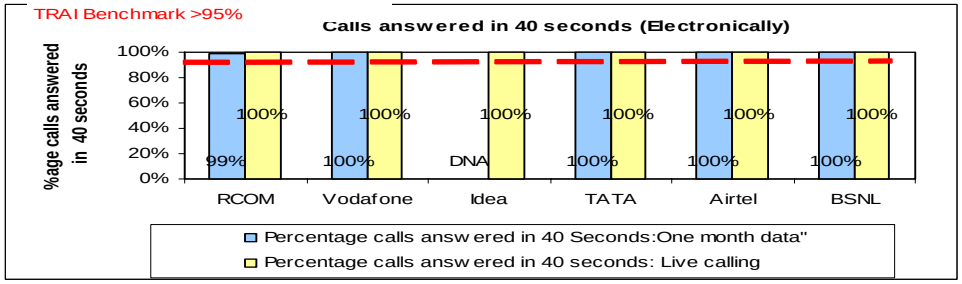
Live calling for billing Complaints

Resolution of billing complaints	RCOM	Vodafone	IDEA	TATA	Bharti Airtel	BSNL
Total Number of calls made	52	100	28	100	6	100
Number of cases resolved in 4 weeks	38	59	23	49	6	27
Percentage cases resolved in four weeks	73%	59%	82%	49%	100%	27%

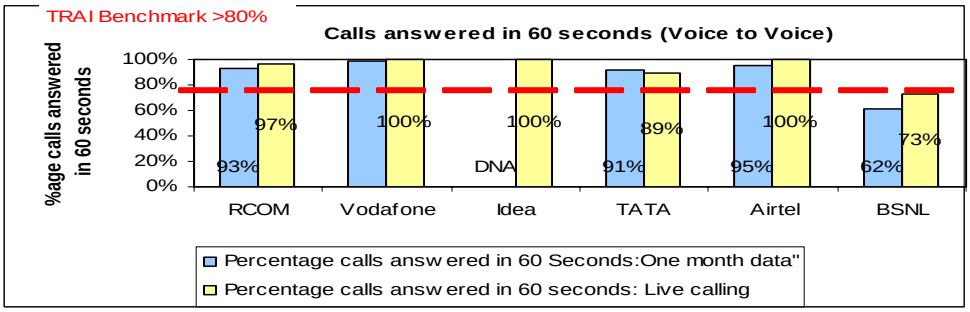
None of the operators (except Bharti) were able to meet the TRAI benchmark for the live calling aspect. Only 27% BSNL and 49% Tata subscribers say that their complaints were resolved within 4 weeks.

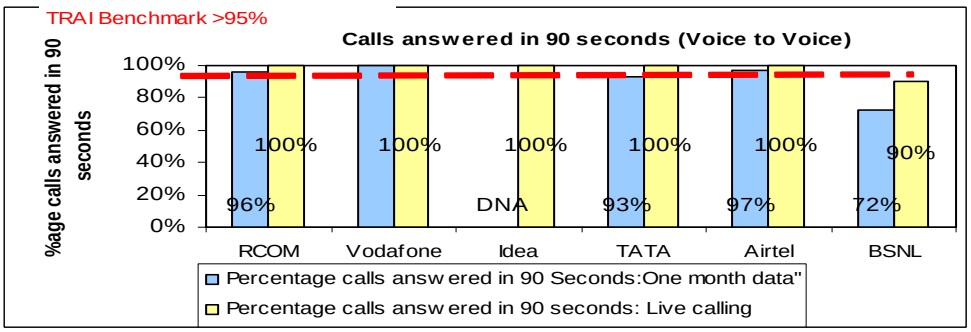
Customer Care / Helpline:





All the operators meet the TRAI benchmark for IVR (Electronic) answering of customers' calls for the one month data as well as the live calling that was carried out during the audit.





Except for BSNL for both live calling and one month audit for 60 as well as 90 seconds, all other operators meet the TRAI benchmark for both the one month data as well as the live calling for voice to voice calls answered within 60 seconds.

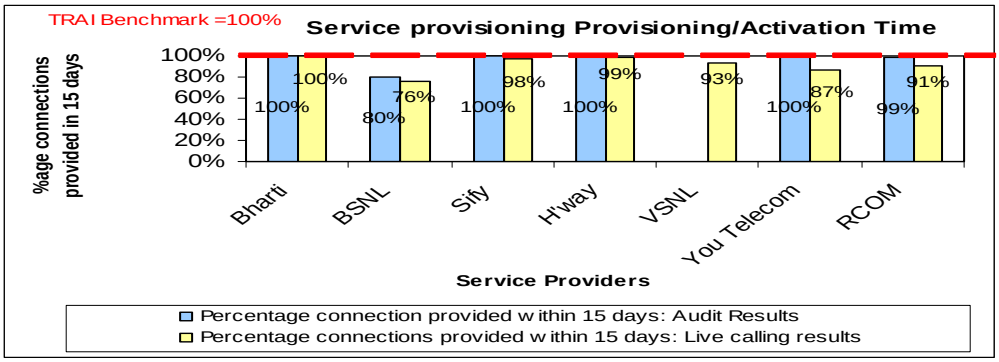
Inter operator calls assessment

Inter operator call Assessment (To ↓ / From→)	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
RCOM	N.A	100%	100%	98%	100%	98%
Vodafone	99%	N.A	100%	100%	99%	93%
Idea	100%	99%	N.A	98%	100%	89%
TATA	97%	92%	100%	N.A	92%	99%
Bharti	97%	100%	100%	77%	NA	100%
BSNL	93%	97%	100%	100%	100%	NA

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. Vodafone and Airtel found tough connecting to a TATA number with only 92 out of 100 calls getting connected. RCOM had difficulty in connecting to a BSNL number with 93% of their calls getting completed. From TATA, only 77 out of 100 calls to a bharti number got connected. BSNL had difficulty in connecting to an Idea number.

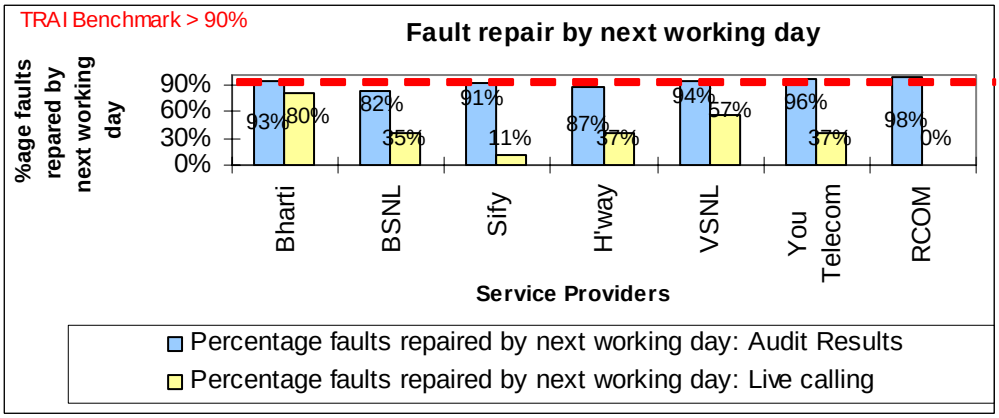
6.3 Graphical/Tabular Representations for Broadband services

Service provisioning/Activation time (Comparison between one month audit results and live calling results)



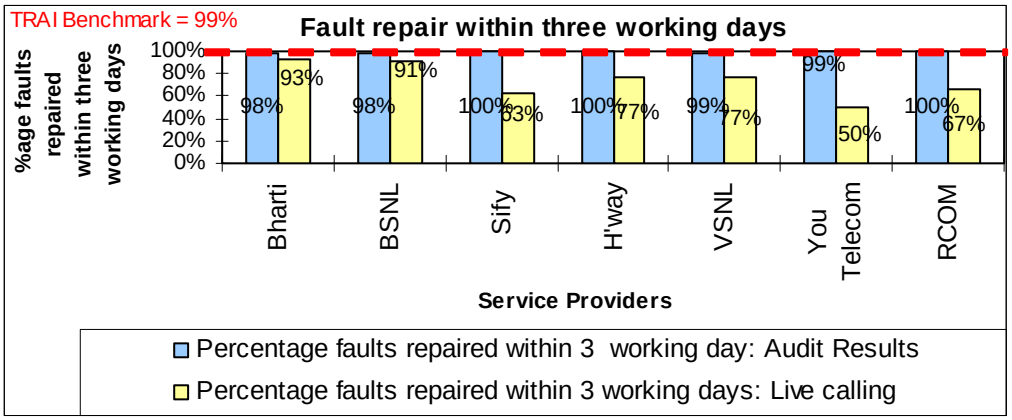
BSNL falls short of the benchmark for the month of Audit. Lowest live calling scores are observed for BSNL at 76% and Highest is observed for Bharti at 100%

Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results



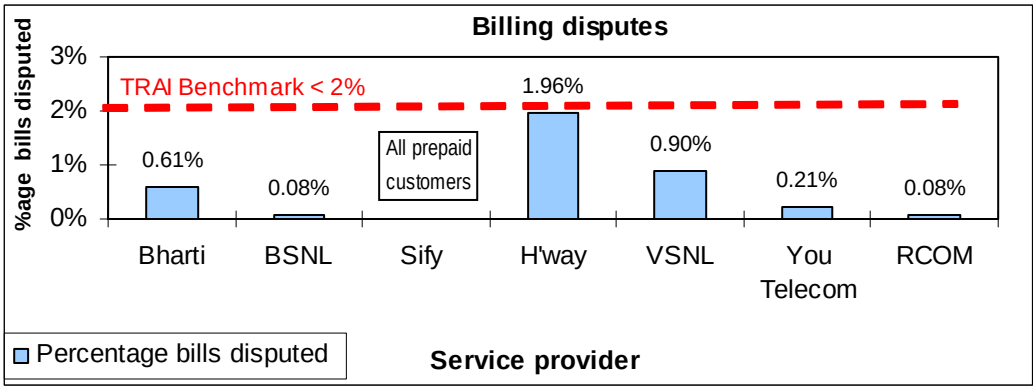
Highest scores on live calling are observed for Bharti at 80%. For all the other operators (except VSNL at 57%) live calling scores are observed to be below 40%

Fault repair/Restoration time within three working days (Comparison between one month audit results and live calling results



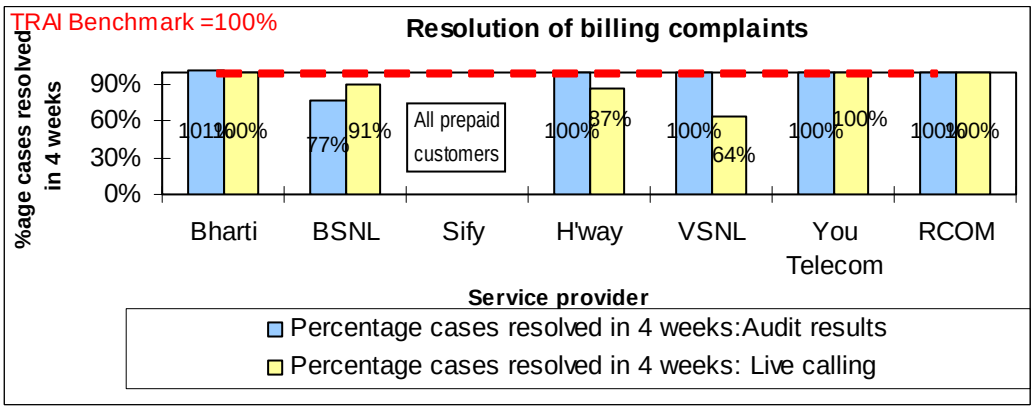
All the service providers are meeting the benchmark both for one month data audit. Live calling scores have also shown considerable improvement when compared to scores observed for live calling for fault repair by next working day

Percentage bills disputed



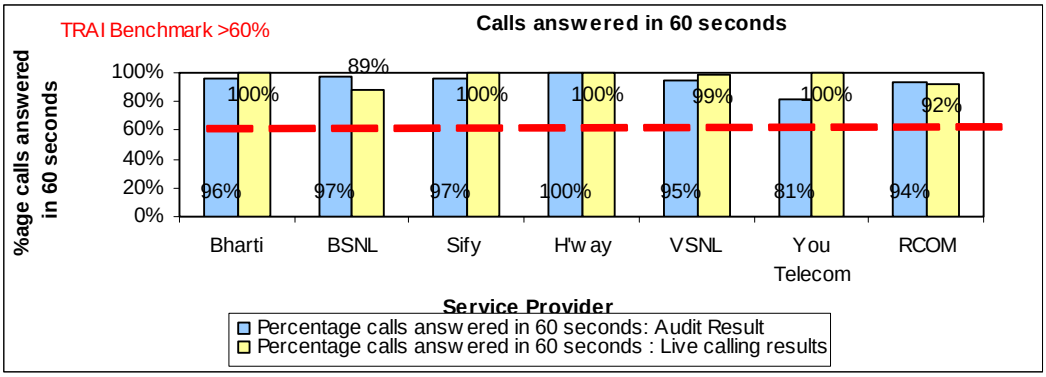
All the operators except (BSNL) meet the benchmark on percentage bills disputed, Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints.

Resolution of billing complaints (Comparison between one month audit results and live calling results)



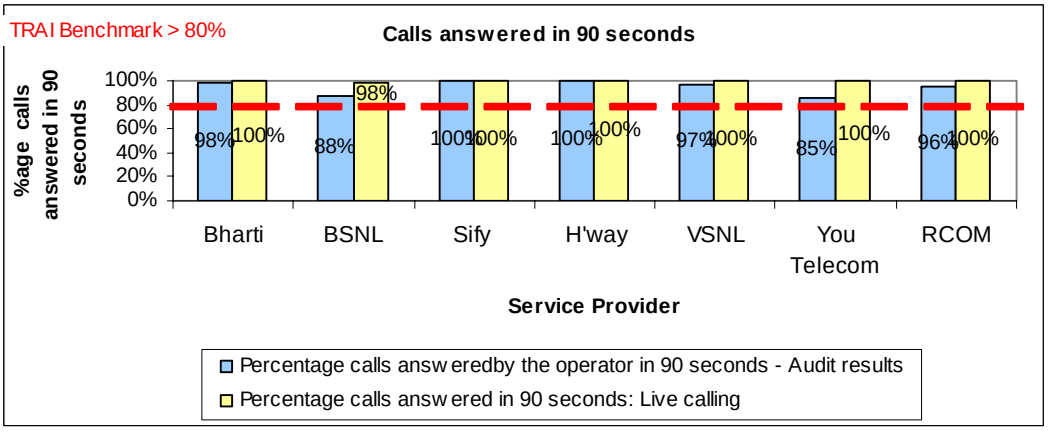
BSNL falls short of TRAI benchmark for one month audit

Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)



All operators meeting benchmark

Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)



All operators meeting benchmark

Bandwidth utilization at Intra network links (Comparison between one month audit results and live measurement results)

Bandwidth Utilization	B'mark	Bharti	BSNL	Sify	Hathaway	VSNL	You Telecom	RCOM
Total number of intra network links		85	23 BRAS, TI 24, T2624,DSLAM 5960	412	No Core Distribution Routers	16	N0 Core Distribution Routers	2
No of Intra network found to be above 90%	**<80%**	0	0	0		0		0
No of Intra network Links tested		85	23 BRAS	412		16		2
No of Intra network found to be above 90%	**<80%**	0	0	0		0		0

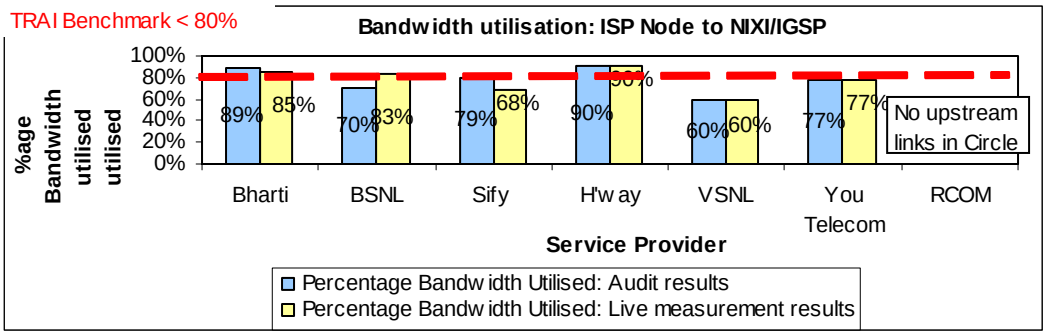
**Reported on All India Basis ,^BRAS: Broadband Remote Access Server*

As far as bandwidth utilization on the intra network links is concerned all the operators seem to performing well as all the sample intra network links (Access segment) tested during live measurement were found to be below 90%.

However, the level from which the bandwidth utilization at Intra network links is being reported varied because of the difference in networks. For e.g. Bharti was found to be reporting Bandwidth from links running from each RSU (Collection of DSLAM's) to the main node in a circle. Whereas VSNL (TATA Communications) considers the links between core distribution routers (lo9cated at 8 locations in India) and Routers being used for National long distance connectivity (Located at Chennai, Ernakkulam and Mumbai)

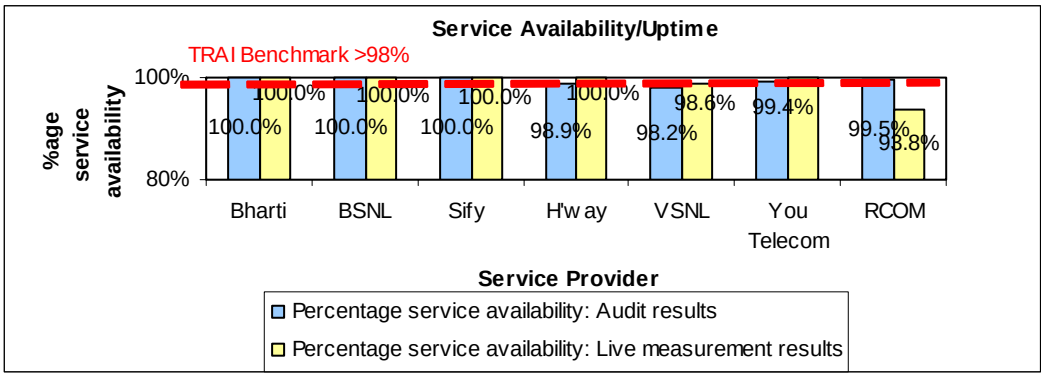
For operators distributing through cable operators, bandwidth utilisation at the end customer level (from POP to cable operator) remains unreported which may be a concern as some cable operators may be distributing more connections then their equipped capacity.

Bandwidth utilization at Upstream links (Comparison between one month audit results and live measurement results)



Sify, BSNL and VSNL (TATA Communications) meet the TRAI specified benchmark cumulatively for all gateways in India. For RCOM upstream links (to IGSP/NIXI) are physically located in Mumbai and Delhi.

Service availability/Uptime (Comparison between one month audit results and live measurement results)



All operators meet the TRAI specified benchmark

Compliance reports: Results of Verification of Records for April to June 2008

7.1 Basic (Wireline) services

			Bharti		BSNL		RCOM		TATA	
			PMR	IMRB	PMR	IMRB*	PMR	IMRB	PMR	IMRB
1	**Provision of telephone after registration of demand**									
1.1	Percentage connections completed within 7 days	100%	99%	99%	86%	80%	80%	80%	98%	71%
2	**Fault incidence/clearance statistics**									
2.1	Fault incidence	<5	6	5.6	3.92	7.3	4.3	4.3	1.3	1.3
2.2	Faults repaired within 24 hours	>90%	91%	91%	91%	85%	97%	97%	99%	99%
2.3	Mean time to repair	<8 hrs	10.9	10.9	13.5	14.3	3.07	3.2	6.9	6.9
3	Call Completion Rate (CCR)	>55%	61%	61%	63%	66%	Not Measured		92%	82%
4	**Metering and billing credibility**									
4.1	Billing complaints per 100 bills issued	<0.1%	0.10%	0.10%	0.01%	0.14%	0.00%	0.00%	0.01%	0.00%
4.2	%age of billing complaints resolved within 4 weeks	100%	-	-	0%	18%	100%	100%	100%	100%
5	**Customer care/helpline promptness**									
5.1	Shift requests (Total number received)									
	Percentage shift requests attended within 3 days	95%	96%	96%	77%	58%	96%	96%	96%	84%
5.2	Closure request attended (Total number received)									
	Closure within 24 hours	95%	100%	100%	94%	88%	98%	98%	96%	96%
5.3	Supplementary (additional) service requests attended (Total number received)									
	Additional facility provided within 24 hours	95%	97%	97%	89%	97%	99%	99%	94%	94%
6	**Response time to customer**									
6.1	% age call answered through IVR in 20 seconds	80%	100%	100%	100%	60%	100%	100%	100%	100%
	% age call answered through IVR in 40 seconds	100%	100%	100%	100%	99%	100%	100%	100%	100%
6.2	% age calls answered by operator in 60 seconds	80%	93%	93%	83%	80%	96%	94%	95%	94%
	% age calls answered by operator in 90 seconds	95%	96%	96%	92%	92%	98%	97%	97%	96%
7	%age cases where refund received within 60 days	100%	100%	100%	100%	49%	100%	100%	100%	100%

* These have been calculated cumulatively on the basis of figures reported by various exchanges

Figures do not match with those reported in PMR

Figures verified on all India basis

B'mark = TRAI Benchmark, DNA = Details not available, NA = Not Applicable

7.2 Cellular Mobile services

S. No.	Parameter	SERVICE PROVIDER											
		RCOM		IDEA		Vodafone		BSNL		TATA		Bharti Airtel	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
A	**Network Performance**												
1	Accumulated Downtime	0.12	0.12	23.16	23.16	13.3	13.3	6.05	6.05	N.A	N.A	12.82	12.82
2	Call set up success rate	99.15%	99.15%	99.56%	99.56%	98.28%	98.28%	97.37%	97.37%	99.62%	99.62%	99.38%	99.38%
3	Service Access delay	3.68	3.68	12.93	12.93	11.69	11.69	5.5	5.5	5.18	5.18	11.15	11.15
4	Blocked call rate												
	SDCCH Congestion	0.00%	0.00%	0.49%	0.49%	0.007	0.007	0.26	0.29%	0.00%	0.00%	0.03%	0.03%
	TCH Congestion	0.00%	0.00%	0.84%	0.84%	0.008	0.008	3.40%	3.20%	0.00%	0.00%	0.29%	0.29%
5	Call drop rate	0.74%	0.74%	1.34%	1.34%	1.05%	1.05%	1.30%	1.30%	0.57%	0.57%	1.11%	1.11%
6	%age connections with good voice quality	99.82%	99.82%	Complied		Complied		99.00%	99.00%	98.62%	98.62%	92.43%	92.43%
7	Service coverage	Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	Complied		Complied		Complied		Complied		Complied		Complied	
B	**Customer Care**												
	Calls answered electronically												
	Within 20 seconds	99.30%	99.30%	80.00%	80.00%	100.00%	100.00%	100%	100%	100.00%	100.00%	100.00%	100.00%
	Within 40 seconds	99.30%	99.30%	95.00%	95.00%	100.00%	100.00%	100%	100%	100.00%	100.00%	100.00%	100.00%
	Calls answered by the operator												
	Within 60 seconds	75.22%	75.22%	80%	80%	95.27%	95.27%	82%	82%	93%	93%	75%	75%
	Within 90 seconds	84.70%	84.70%	95%	95%	100.00%	100.00%	87%	87%	95%	95%	83%	83%
C	**Billing complaints**												
	Billing complaints/100 bills	0.07%	0.07%	0.86%	0.86%	0.0049%	0.0049%	0.0008%	0.0008%	0.02%	0.02%	0.08%	0.08%
	%age complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Period of refunds due to customers	100%	100%	100%	100%	100%	100%	100%	100%	N.A	N.A	N.A	N.A

Figures do not match with those reported in PMR

Figures verified on all India basis

Not meeting benchmark

B'mark = TRAI Benchmark, DNA = Details not available

7.3 Broadband services

Parameter	B'mark	Bharti		BSNL		Sify		VSNL	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning									
Percentage connections provided within 15 days	100%	99%	100%	99%	90%	100%	100%	100%	100%
Fault repair restoration time									
Percentage faults repaired by next working days	> 90%	93%	93%	96%	89%	87%	87%	75%	75%
Percentage faults repaired within three working days	99%	100%	98%	100%	100%	94%	94%	89%	89%
Billing performance									
Billing complaints per 100 bills issued	<2%	0.00%	0.61%	0.10%	0.10%	Prepaid		2.02%	2.02%
%age of billing complaints resolved in 4 weeks	100%	99%	100%	96%	96%			100%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%	100%	100%	97%	97%			-	-
Customer care/helpline assessment (Voice to Voice)									
Percentage calls answered within 60 seconds	> 60%	92%	96%	89%	89%	86%	86%	85%	85%
Percentage calls answered within 90 seconds	> 80%	94%	98%	94%	94%	94%	94%	92%	92%
Bandwidth utilization/Throughput									
Intra network links (POP to ISP Node)									
Total number of intra network links > 90%		0	0	NR	0	5	5	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)									
Percentage bandwidth utilized on upstream links	< 80%	75%	75%	NR	78%	85%	85%	60%	60%
Broadband download speed		**No raw data available for verification**							
Service availability/uptime	> 98%	99.93%	100%	NR	100%	100%	100%	97%	97%
Packet loss	<2%	No raw data available for old ping test results		NR	Complied*	No raw data available old ping test results			
Network Latency									
POP/ISP Node to NIXI	< 120 msec			NR	Complied*				
ISP node to NAP port (Terresrtrial)	< 350 msec			NR	Complied*				

^^ Methodology not in Line with QoS regulation, Data verified on All India basis, NR – Not reported DNA- Details Not Available for verification, B'mark = TRAI Benchmark Figures do not match those in PMR

{*For BSNL records pertaining to network latency and packet loss were verified for the period of April – June 2008 at the central node in Bangalore},

Broadband services…..Ctd

Parameter	Benchmark	Hathaway		You Telecom		RCOM	
		PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning time							
Percentage connections provided within 15 days	100%	100%	100%	100%	100%	46%	46%
Fault repair restoration time							
Percentage faults repaired by next working days	> 90%	90%	92%	97%	97%	100%	100%
Percentage faults repaired within three working days	99%	99%	99%	99%	99%	100%	100%
Billing performance							
Billing complaints per 100 bills issued	<2%	1.4%	0.94%	0.15%	0.16%	0.23%	0.23%
%age of billing complaints resolved in 4 weeks	100%	100%	100%	100%	100%	100%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%	100%	99%	97.00%	97.00%	100%	100%
Customer care/helpline assessment (Voice to Voice)							
Percentage calls answered within 60 seconds	> 60%	85%	85%	86%	86%	87%	87%
Percentage calls answered within 90 seconds	> 80%	NA	NA	88%	88%	91%	91%
Bandwidth utilisation/Throughput							
Intra network links (POP to ISP Node)						0	0
Total number of intra network links > 90%		NA	NA	NA	NA	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)							
Percentage bandwidth utilised on upstream links	< 80%	85%	85%	77%	77%	<80%	<80%
Broadband download speed		No details Available for Verification					
Service availability/uptime	> 98%	100%	100%	98.00%	98.00%	97.82%	97.82%
Packet loss	<2%	No details Available for Verification					
Network Latency							
POP/ISP Node to NIXI	< 120 msec						
ISP node to NAP port (Terresrtrial)	< 350 msec						

^^ Methodology not in Line with QoS regulation, Data verified on All India basis, DNA- Details Not Available for verification, B'mark = TRAI Benchmark Figures do not match those in PMR {*For BSNL records pertaining to network latency and packet loss were verified for the period of Oct – Dec 2008 at the central node in Bangalore),

7.4 Conclusions

7.4.1 Basic Wireline Services

1. For RCOM parameters related to customer care are reported on an all India level
2. Variation observed in figures for BSNL is owing to the fact that only 5% of the total exchanges were audited for the operator whereas the data provided in the PMR is basis all the exchanges in the circle
3. By and large not much variation is observed in the data reported by the operators and those verified by IMRB

7.4.2 Cellular Mobile services

1. The figures reported by all the operators on all parameters completely match the figures obtained on verification except for BSNL on TCH congestion
2. Bharti does not meet the benchmark for percentage connections with good voice quality and calls answered by the operator in 60 and 90 seconds
3. RCOM also fails to meet the benchmark for percentage calls answered by the operator in 60 and 90 seconds
4. BSNL does not meet the benchmark on TCH congestion and for percentage calls answered within 90 seconds by the operator.

7.4.3 Broadband services

1. Complete data for Sify was verified on an all India level
2. For BSNL there is slight variation observed in for some parameters when compared to the figures reported in PMR. But the reason is largely the fact that data was obtained for sample 5% of exchanges whereas reporting is done for 100% of exchanges.
3. Most of the service providers (except BSNL) were also found to be unaware of TRAI specified guideline for carrying out ping tests of 1000 packets of 64 bytes each.
4. Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was not available for verification for all the service providers except BSNL
5. Although all the service providers claimed that they conduct random ping tests and latency to check the packet loss but there is no book keeping which is maintained at their end. Records of old ping tests were found to be maintained only by BSNL

8. Annexure - I

8.1 Parameter wise performance reports for Basic Wireline services

One month data verification results for Service provisioning

Service provisioning/Activation time	Benchmark	Bharti	BSNL	R Com	Tata
Number of connections registered during the period		5880	1124	1787	2239
Total number of connections provided within 7 days		5880	948	1549	2137
Percentage of connections provided within 7 days	100%	100%	84%	87%	95%

Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration calls made		100	731	100	100
Number of cases in which connection was provided in 7 Days		85	533	77	86
Percentage cases in which connection was provided in 7 days	100%	85%	73%	77%	86%

One month data verification results for Fault repair/Restoration time

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com	Tata
Total number of faults registered during the period		3794	8601	1400	586
Total number of faults repaired by next working day		3504	7424	1381	513
Percentage of faults repaired by next working day	>90%	92%	86%	99%	88%
Total number of fault reparied within three working days		3794	8601	1381	586
Percentage faults repaired within three working days	100%	100%	100%	99%	100%

Live calling results for Fault repair/Restoration time

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	893	30	30
Number of cases where fauls were repaired by next working day		27	189	16	2
Percentage cases where faults were repaired by next working day	>90%	90%	21%	53%	7%
Number of cases where faults were repaired within 3 days		30	554	22	21
Percentage cases where faults were repaired within 3 days	100%	100%	62%	73%	70%

One month data verification results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		1488842	824228	DNA	661417
Total number of successful local calls		1293439	534551	DNA	530114
Call Completion Rate (CCR) in the local network	>55%	87%	65%	DNA	80%

Live measurement results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		115079	201432	DNA	250446
Total number of successful local calls		101564	128605	DNA	216577
Call Completion Rate (CCR) in the local network	>55%	88%	64%	DNA	86%

One month data verification results for Billing performance

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
Billing disputes					
Total bills generated during the period		89424	84438	36878	97563
Total number of bills disputed		553	134	2	9
Percentage bills disputed	0.10%	0.62%	0.16%	0.01%	0.01%
Resolution of billing complaints					
Total complaints resolved in 4 weeks from date of receipt		549	120	2	9
Percentage complaints resolved within 4 weeks of date of receipt	100%	99%	90%	100%	100%

Live calling results for billing performance

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		50	294	1	6
Number of cases resolved in 4 weeks		46	223	1	4
Percentage cases resolved in four weeks	100%	92%	76%	100%	67%

One month data verification for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of shift requests received		470	637	52	738
Total number requests attended in 3 days		451	491	51	622
Total number requests attended beyond 3 days		19	140	1	116
Shifts not attended		0	5	0	0
Percentage of requests attended in 3 days	95%	96%	77%	98%	84%
Percentage of requests attended beyond 3 days		4%	22%	2%	16%
Percentage of shifts not attended		0%	1%	0%	0%

Live calling results for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total number of call to shift requests		50	322	1	50
Total number of requests attended in 3 days	95%	44	136	1	19
Total number of requests attended beyond 3 days		6	180	0	29
Shifts not attended		0	5	0	2
Percentage of requests attended in 3 days		88%	42%	100%	38%
Percentage of requests attended beyond 3 days		12%	56%	0%	58%
Percentage of shifts not attended		0%	2%	0%	4%

One month data verification Audit results for Customer Care – Closures

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of closure requests received		2754	857	659	2027
Total closure attended within 24 hours	95%	2754	741	651	2027
Total number of requests attended beyond 24 hours		0	115	8	0
Closure requests not attended		0	1	0	0
Percentage of closure attended within 24 hours		100%	86%	99%	100%
Percentage of closure attended beyond 24 hours		0%	13%	1%	0%
Percentage of closures not attended		0%	0%	0%	0%

Live calling results for Customer Care – Supplementary requests

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		50	274	4	44
Total number requests attended within 24 hours	95%	49	137	2	30
Total number requests attended beyond 24 hours		1	132	2	14
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		98%	50%	50%	68%
Percentage of requests attended beyond 24 hours		2%	48%	50%	32%
Percentage of supplementary requests not attended		0%	0%	0%	0%

Live calling results for calls answered electronically

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		300	450	100	100
Calls answered within 20 seconds					
Total Number of calls answered by IVR in 20 seconds	80%	300	445	100	100
Percentage calls answered in 20 seconds		100%	99%	100%	100%
Calls answered within 40 seconds					

Total Number of calls answered by IVR in 40 seconds	95%	300	445	100	100
Percentage calls answered in 40 seconds		100%	99%	100%	100%

Live calling results for calls answered by the operator

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		300	450	100	100
Calls answered within 60 seconds					
Total Number of calls answered by operator in 60 seconds	80%	297	438	90	98
Percentage calls answered in 60 seconds		99%	97%	90%	98%
Calls answered within 90 seconds					
Total Number of calls answered by operator in 90 seconds	95%	300	442	100	100
Percentage calls answered in 90 seconds		100%	98%	100%	100%

One month data verification Audit results for Refund of deposits after closure

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		387	4945	9	36
Number of cases where refund was made in < 60 days		387	2486	9	36
Percentage cases where refund was made in < 60 days	100%	100%	50%	100%	100%

8.2 Parameter wise performance reports for Cellular Mobile services

Accumulated Downtime	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Downtime (In hours)	0.00	6.37	10.18	0.00	7.77	19.40

Audit Results for CSSR

CSSR	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of call attempts	130672398	5808829	3.412E+09	98205828	15743609	DNP
Total number of successful calls	130075916	5694689	3.403E+09	96773732	15261923	DNP
CSSR	99.54%	98.04%	99.75%	98.54%	96.94%	98.00%

Live measurement results for CSSR

CSSR	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of call attempts	149760081	17161828	454430662	9952883	14971089	DNP
Total number of successful calls	149120866	16889948	452289090	9830588	14624831	DNP
CSSR	99.57%	98.42%	99.53%	98.77%	97.69%	98.00%

Drive test results for CSSR (Average of three drive tests)

CSSR	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of call attempts	495	510	450	424	466	180
Total number of successful calls	491	507	450	421	465	180
CSSR	99.19%	99.41%	100.00%	99.29%	99.79%	100%

*DNP: Details Not Provided

Service Access Delay	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
One month data collection	5	10	8	8	9.6	7.1

Audit results for SDCCH and TCH Congestion

Traffic Statistics	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
SDCCH Congestion						
Total number of SDCCH Attempts	47904910	6083786	17035044	36960440	34035964	1063821
Total Number of SDCCH Congestions	0	6084	66437	0	272288	5106
Percentage SDCCH Congestion	0.00%	0.10%	0.39%	0.00%	0.80%	0.48%
TCH Congestion						
Total number of TCH Attempts	135261286	5308570	7768324	98205828	15743609	967952
Total Number of TCH Congestions	608676	6370	52825	58923	294405	22360
Percentage TCH Congestion	0.45%	0.12%	0.68%	0.06%	1.87%	2.31%

Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
SDCCH Congestion						
Total number of SDCCH Attempts	56620937	18255646	50710039	36960440	32498551	1063821
Total Number of SDCCH Congestions	0	20081	157201	0	175492	5106
Percentage SDCCH Congestion	0.00%	0.11%	0.31%	0.00%	0.54%	0.48%
TCH Congestion						
Total number of TCH Attempts	149760081	16336086	22789928	98205828	14971089	967952
Total Number of TCH Congestions	658944	24504	125345	58923	200613	22360
Percentage TCH Congestion	0.44%	0.15%	0.55%	0.06%	1.34%	2.31%

Audit Results for Call drop rate

Call drop rate	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of calls established	130075916	5694689	205381175	96773732	15743609	DNP
Total number of calls dropped	729134	59634	1831187	777006	247883	DNP
Call drop rate	0.56%	1.05%	0.89%	0.80%	1.57%	1.83%

Live measurement results for Call drop rate

Call drop rate	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of calls established	149120866	16889947	22789928	9830588	14624831	DNP
Total number of calls dropped	783155	217185	168853	42592	221771	DNP
Call drop rate	0.53%	1.29%	0.74%	0.43%	1.52%	1.80%

Drive test results for Call drop rate (Average of three drive tests)

Call drop rate	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of calls established	495	507	450	421	466	180
Total number of calls dropped	1	0	0	0	0	2
Call drop rate	0.20%	0.00%	0.00%	0.00%	0.00%	1.11%

Drive test results for Voice quality (Average of three drive tests)

Voice quality	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total number of sample calls	59905	676064	532572	88771	317193	82434
Total number of calls with good voice quality	59654	655037	517364	86679	308774	81760
%age calls with good voice quality	99.58%	96.89%	97.14%	97.64%	97.35%	99.18%

Audit Results for POI Congestion

POI congestion	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
POI traffic offered on all individual POI's	DNP	96825.4	DNP	DNP	204215	DNP
Served traffic for all individual POI's	DNP	67057.87	DNP	DNP	138393	DNP
Traffic failed on all individual POI's	Complied	Complied	Complied	Complied	Complied	Complied

Live measurement results for POI congestion

POI congestion	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
POI traffic offered on all individual POI's	DNP	293702	DNP	DNP	205132	DNP
Served traffic for all individual POI's	DNP	189213.49	DNP	DNP	114802	DNP
Traffic failed on all individual POI's	Complied	Complied	Complied	Complied	Complied	Complied

*DNP: Details Not Provided

Inter operator call Assessment (To/From)	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
RCOM	N.A	100%	100%	98%	100%	98%
Vodafone	99%	N.A	100%	100%	99%	93%
Idea	100%	99%	N.A	98%	100%	89%
TATA	97%	92%	100%	N.A	92%	99%
Bharti	97%	100%	100%	77%	NA	100%
BSNL	93%	97%	100%	100%	100%	NA

Audit results for customer care (Electronically)

Customer Care Assessment	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Number of calls received by IVR	32484741	5369944	DNP	1293635	29264190	DNP
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	32135956	5369944	DNP	1293635	29264190	DNP
Percentage calls answered in 20 seconds	98.93%	100.00%	DNP	100.00%	100.00%	100.00%

Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	32135956	5369944	DNP	1293635	29264190	DNP
Percentage calls answered in 40 seconds	98.93%	100.00%	DNP	100.00%	100.00%	100.00%

Live calling results for customer care (Electronically)

Customer Care Assessment	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Number of calls received by IVR	100	100	100	100	100	100
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	100	100	100	100	100	100.00
Percentage calls answered in 20 seconds	100%	100%	100%	100%	100%	100%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	100	100	100	100	100	100.00
Percentage calls answered in 40 seconds	100%	100%	100%	100%	100%	100%

Audit results for customer care (Voice to Voice)

Customer Care Assessment	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Number of calls received by the operator	135856	1616115	DNP	267582	4131415	DNP
Calls answered within 60 seconds						
Total Number of calls answered in 60 seconds	126227	1595209	DNP	244084	3916218	DNP
Percentage calls answered in 60 seconds	92.91%	98.71%	DNP	91.22%	94.79%	0.62
Calls answered within 90 seconds						
Total Number of calls answered in 90 seconds	130093	1616115	DNP	249746	3994402	DNP
Percentage calls answered in 90 seconds	95.76%	100.00%	DNP	93.33%	96.68%	72.28%

Live calling results for customer care (Voice to Voice)

Customer Care Assessment	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Number of calls made	100	100	100	100	100	100
Calls answered within 60 seconds						
Number calls answered within 60 seconds	97	100	100	89	100	73
Percentage calls answered in 60 seconds	97%	100%	100%	89%	100%	73%
Calls answered within 90 seconds						
Number calls answered within 90 seconds	100	100	100	100	100	90
Percentage calls answered in 90 seconds	100%	100%	100%	100%	100%	90%

*DNP: Details Not Provided

Audit Results for Billing performance

Billing Performance	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Billing disputes						
Total bills generated during the period	144611	228381	256224	220118	500452	167001
Total number of bills disputed	130	148	66	27	11	4
Percentage bills disputed	0.09%	0.06%	0.03%	0.01%	0.00%	0.00%
Resolution of billing complaints						
Total complaints resolved in 4 weeks from date of receipt	130	148	66	27	11	4
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%	100%
Refund of deposits after closure						
Total number of cases requiring refund of deposits	130	145	1527	27	0	42
Total number of cases where refund was made within 60 days	130	145	1527	27	NA	27
Percentage cases in which refund was receive within 60 days	100%	100%	100%	100%	NA	64%

Live calling results for resolution of billing complaints

Resolution of billing complaints	RCOM	Vodafone	Idea	TATA	Airtel	BSNL
Total Number of calls made	52	100	28	100	6	100
Number of cases resolved in 4 weeks	38	59	23	49	6	27
Percentage cases resolved in four weeks	73%	59%	82%	49%	100%	27%

8.3 Parameter wise performance reports for Broadband services

One month data verification results for Service provisioning

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
No of connections registered during the period		3468	4213	816	2625	2940	1050	601
Total number registered during 15 days		3468	3379	816	2625	2881.2	1050	594
Percentage of connections provided within 15 days	100%	100.0%	80.2%	100.0%	100%	NA	100.0%	98.8%

Live calling results for Service provisioning

Sevice Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	VSNL	You Telecom	RCOM
Total Number of calls made		100	750	100	100	100	70	100
Number of cases in which connection was provided in 15 Days		100	571	98	99	93	61	91
Percentage cases in which connection was provided in 15 days	**100%**	100%	76%	98%	99%	93%	87%	91%

One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total number of faults registered during the period		1585	2448	3299	8872	16475	730	1720
Total number of faults repaired by next working day		1480	2013	2991	7719	15452	701	1694
Percentage of faults repaired by next working day	**>90%**	93%	82%	91%	87%	94%	96%	98%
Total number of faults repaired within three working days		1551	2400	3299	8872	16320	726	1720
Percentage of faults repaired within three working days	**>99%**	98%	98%	100%	100%	99%	99%	100%

Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total Number of calls made		30	152	27	30	30	30	30
Number of cases in which faults were repaired by next working day		24	53	3	11	17	11	0
Percentage cases in which faults were repaired by next working day	**>90%**	80%	35%	11%	37%	57%	37%	0%
Number of cases in which faults were repaired within three working days		28	138	17	23	23	15	20

Percentage cases in which faults were repaired within three working days	**>99%**	93%	91%	63%	77%	77%	50%	67%

One month data verification results for billing performance

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Billing diputes								
Total bills generated during the period		43587	68958	Prepaid	21897	19419	29150	7924
Total number of bills disputed		266	57		430	174	60	6
Percentage bills disputed	**<2%**	0.61%	0.08%		1.96%	0.90%	0.21%	0.08%
Resolution of billing complaints								
Total complaints resolved in 4 weeks from date of receipt		269	44	Prepaid	430	174	60	6
Percentage complaints resolved within 4 weeks of date of receipt	**100%**	101%	77%		100%	100%	100%	100%
Refund of deposits after closure								
Total number of cases requiring refund of deposits		129	153	Prepaid	44	3	0	7
Total number of cases where refund was made within 60 days		129	141		44	3	0	7
Percentage cases in which refund was receive within 60 days	**100%**	100%	92%		100%	100%	100%	100%

Live calling results for billing complaints

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total Number of calls made		100	132	Prepaid	70	100	23	2
Number of cases resolved in 4 weeks		100	120		61	64	23	2
Percentage cases resolved in four weeks	**100%**	100%	91%		87%	64%	100%	100%

Live calling results for call centre

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total Number of calls made		100	450	50	50	100	50	100
Calls answered within 60 seconds								
Number calls answered within 60 seconds		100	399	50	50	99	50	92
Percentage calls answered in 60 seconds	**>60%**	100%	89%	100%	100%	99%	100%	92%
Calls answered within 90 seconds								
Number calls answered within 90 seconds		100	440	50	50	100	50	100
Percentage calls answered in 90 seconds	**>80%**	100%	98%	100%	100%	100%	100%	100%

One month data verification results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total Operational Hours		720	53568	744	744	1848240	11525304	720
Total Downtime		0.003	2	0	7.56	32856	74818	3.68
Total time when the service was available		720	53566	744	736	1815384	11450486	716.32
Service Availability Uptime in Percentage	**>98%**	100.0%	100.00%	100.0%	98.9%	98.2%	99.4%	99.5%

Three day live measurement results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Total Operational Hours		72	5184	72	72	183744	1089288	72
Total Downtime		0	0	0	0.32	2494	0	4.43
Total time when the service was available		72	5184	72	72	181250	1089288	67.57
Service Availability Uptime in Percentage	**>98%**	100.00%	100.00%	100.00%	100.0%	98.64%	100.00%	93.85%

One month data verification results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Intra-network links (POP to ISP Node)								
Total number of intra network links		85	23 BRAS, TI 24, T2624,DSLAM 5960	412	0	16	NA	2
No of Intra network found to be above 90%		0	0	0	0	0	NA	0
International Bandwidth								
Total number of upstream links		1	141	27	5	50	4	NA
No of Intra network found to be above 90%		0	8	0	1	0	0	NA
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		1222	27048	2830	198	39974	35	NA
Total International Bandwidth utilised during peak hours		1085	18934	2238	179	23939	27	NA
Percentage Bandwidth utilisation during peak hours (In mpbs)	**>90%**	89%	70%	79%	90%	60%	77%	NA

Live measurement results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	You Telecom	RCOM
Intra-network links								
Total number of intra network links		85	0	412	NA	16	NA	2
No of Intra network Links tested		85	0	0	NA	0	NA	0
No of Intra network found to be above 90%		0	0	0	NA	0	NA	0
International Bandwidth								
Total number of upstream links		1	141	27	5	50	4	NA
No of Intra network found to be above 90%		0	19	0	1	0	0	NA
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		1222	22010	2830	220	39974	35	NA
Total International Bandwidth utilised during peak hours		1041	18326	1934	198	23930	27	NA
Percentage Bandwidth utilisation during peak hours (In mpbs)	**>90%**	85%	83%	68%	90%	60%	77%	NA

9 Annexure – II Detailed Explanation of Audit methodology (Parameter wise)

9.1 For Basic wireline services

1. Provision of telephone after registration of demand	
Computational Methodology as per QoS definition	Percentage connections provided within 7 working days = (No. of connections provided within seven working days/ Total number of connections registered during the period of 3 months) * 100 Technically Non Feasible (TNF) cases such as unavailability of telephone infrastructure/ equipment in the Area or Spare Capacity for activating telephone connection shall be excluded from the calculation of this parameter.
Benchmark	100% cases in <7 days, subject to technical feasibility
Audit Procedure	IMRB Auditors verified and collected data pertaining to number of applications received at the service provider's level in the following time frames:- - Number of connections provided within 7 days - Number of connections provided after 7 days - Number of connections were request is still pending **Live calling : -** - Interviewers ensured that operator should provide list of all new numbers added in one month prior to IMRB staff visit. - Live calling team called up at least 10% of the customers who applied for new connections during the month prior to Audit - Checked and Recorded whether the connection was provided within 7 days of registration on demand

2. Fault incidence/clearance related statistic	
Computational Methodology	**Fault incidence** = (No. of faults reported by the customer per month/ Total Number of Subscribers for that particular month)*100
Benchmark	Total number of faults registered per month: By 31st March 2007: <5 and By 31st March 2008: <3, averaged over the quarter Fault repair by next working day: By next working day: >90% and within 3 days: 100%, averaged over a month.
Audit Procedure	IMRB Auditors to verify and collect data pertaining to number of fault received at the service provider's level in the following time frames:- Number of faults cleared within 24 hours Number of cleared in more than 1 day but less than 3 days Number of cleared in more than 3 days but less than 7 days Number of cleared in more than 7 days but less than 15 days Number of cleared in more than 15 days **Live calling : -** -Live calling to be done to verify 'Fault repair by next working day' parameter -Interviewers ensured that operator provided a list of all the subscribers who reported faults in one month prior to IMRB staff visit. -Calls were made to up to 10% or 30 complainants for the concerned exchange, whichever is less - Auditors checked and recorded whether the fault was corrected within the timeframes as mentioned in the benchmark.

4. Metering and billing credibility – billing complaints	
Computational Methodology	Percentage incidence of billing complaints = (No. of billing complaints reported by the customer per month/ Total Number of Subscribers for that particular month)*100 Percentage resolution of billing complaints = (No. of billing complaints resolved over a particular period of time/Total No. of billing complaints of that period of time)*100
Benchmark	Percentage incidence of billing complaints: Not more than 0.1% of the bills issued Percentage resolution of billing complaints: 100% within a period of 4 weeks
Audit Procedure	IMRB Auditors to verify and collect data pertaining to - Number of Billing complaints received at the service provider's level - Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled. - Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills - Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Late receipt of bills/ Not received at all, Wrong name and address, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc. **Live calling : -** - IMRB Auditors collected the list of all the subscribers who have made billing complaints in the month prior to the Audit. -100 such subscribers per service provider were called to check the time taken to resolve t he billing complaint. However, in some cases where number of billing complaints were less the sample size could not be achieved

5. Customer care promptness (Shifts, Closures and Additional facility)	
Computational Methodology	Supplementary (Additional) services requests: A few of the supplementary services that are considered for the audit purpose: Clip (caller line identification presentation) facility , STD, ISD, Call forwarding, Voice Mail etc.
Benchmark	Shifting of telephone line : Less than 3 days Processing of closure request: Less than 24 hours Supplementary (Additional) services requests: Less than 24 hours
Audit procedure	**IMRB Auditors collected and verified data pertaining to** **Shifting Request: (Following key points were taken care of while verifying the data)** - Date of filing form should be at least 3 working days after the date of month appraised. - All the holidays are excluded and only working days are considered - The number of shift requests per month does not include the pending connections of the previous months. **Processing of closure request (Following key points were taken care of while verifying the data)** - The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange. - DNP (due to Non – payment) cases are excluded - All holidays are excluded for calculating 24 hours. - Closure requests attended in the previous months are excluded - The period for closure starts from the time of submission of application by the subscriber. **Supplementary (Additional) services requests** - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - Do not include holidays. - Collect the list of all cases of all subscribers requested for additional facility in past 48 hours prior to IMRB staff visit. - The period starts from the time of submission of application by the subscriber. **Live calling was done in 10% of such cases to check the time taken to attend all such requests**

6. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100
Benchmark	(i) % age of calls answered (electronically): within 20 seconds = 80% of the calls over a period within 40 seconds = 95% of the calls over a period (ii) % age of calls answered by operator / voice to voice): within 60 seconds = 80% of the calls over a period within 90 seconds = 95% of the calls over a period
Audit Procedure	-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator. **Live calling: -** - Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS - Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

7. Time taken to refund of deposits after closure	
Computational Methodology	Percentage of cases needing refund in a specified time = (Total no. of cases where refund was made within a particular time / Total no. of cases requiring refunds)*100
Benchmark	Time taken to refund = 100% within 60 days
Audit Procedure	IMRB Auditors verified and collected data pertaining to - Cases requiring refund of deposits after closure are to be included - Time taken starts from the date on which the closure is made by the service provider and ends at the date on which refund is received by the customer **Live calling : -** - Collect the details of all the cases for which the refund was provided by the operator prior to the month of Audit - Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider (Distributed across number of exchanges selected)

8. Call completion rate	
Computational Methodology	Call Completion Rate: Call Completion Rate (CCR) is defined as the percentage of total calls that are connected out of the total calls presented to exchange. This could be due to:- Other exchange not working / lines blocked Calling exchange is blocked CCR = [(Call attempts – Calls blocked)/Call attempts] X 100
Benchmark	Call Completion Rate (CCR) within local network: More than 55%
Audit Procedure	IMRB Auditors verified and collected data pertaining to Sample Traffic Data during Time Consistent Busy Hour (TCBH). These details were collected separately for -Three days in which live measurement was carried out - For the complete month in which audit was carried out

9.2 For Cellular Mobile services

1. Accumulated Downtime of the Network	
Computational Methodology as per QoS definition	The total time for which the network is down for a particular service provider resulting in a community isolation **Computational Methodology: Accumulated downtime = Summation of Significant Downtime*** *** Significant Downtime to be defined as duration of network outages that result in groups of customers in PLMN being isolated for more than an hour at a stretch. Planned outages during low/ no traffic hours for maintenance/ modernisation/ network enhancement work etc. should be ignored**
Benchmark	< 24 hrs
Audit Procedure	**IMRB** auditors collected and verified data pertaining to: • The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) used for arriving at the benchmark reported to TRAI were audited • Outages could be in MSC, BSC, BTS or in trunk. In case of BTS failure we have included only those that resulted in community isolation

2. Call Set-Up Success Rate (CSSR)	
Computational Methodology as per QoS definition	The ratio of calls established to total calls is known CSSR. Call Established means the following events have happened in call setup:- ↳ call attempt is made ↳ the TCH is allocated ↳ the call is routed to the outward path of the concerned MSC Computational Methodology: Calls Established / Total Call Attempts * 100
Benchmark	> 95%
Audit Procedure	**IMRB** auditors collected and verified data pertaining to ↳ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors ↳ CSSR calculation was measured using OMC generated data only ↳ Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week

3. Service Access Delay	
Computational Methodology as per QoS definition	Service Access delay is a summation of following parts in the call flow: ↳ Time to connect calls ↳ Time to confirm instruction to connect ↳ Time to release calls ↳ Time to alert mobile set **Computational Methodology:** **Time to connect calls** = Time between "Origination" and "Service Connect" message from BTS to Mobile **Time to confirm instruction to connect*** = Time between "Origination" and "Base Station Acknowledgment" Note: Time measured here is a sub-part of first measurement **Time to release call** = Time between "Release on Reverse Link" and "Release on Forward Link" **Time to alert a mobile** = This is measured as a mean of two measurements (i+ii/2): ● First paging attempt = Time between receiving a call request at PLMN and alerting the mobile ● Final paging attempt = Time between receiving a call request at PLMN and hearing start of "Not reachable" announcement
Benchmark	Between 9 to 20 seconds depending on number of paging attempts (Average of 100 calls < = 15 sec.)
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: ↳ Audit of the details of Layer 3 Message diagnostics generated from periodic Drive tests conducted at different parts of the network used to arrive at the benchmarks reported to TRAI was conducted ↳ Validating that at least **100 sample** calls should have been by the service provider **made** during **Time consistent busy hour** (TCBH) for the quarter using standard drive test equipment. (Note: measurement using engineering handsets was not deemed acceptable) ↳ The component 'first paging attempt' was checked whether it was measured by the operator using a protocol analyser.

4. Network Congestion Parameters	
Computational Methodology as per QoS definition	It means a call is not connected because there is no free channel to serve the call attempt. This parameter represents congestion in the network. It happens at three levels: ➢ SDCCH Level: Stand-alone dedicated control channel ➢ TCH Level: Traffic Channel ➢ POI Level: Point of Interconnect **Computational Methodology:** ➢ **SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +…….+ (An x Cn)] / (A1 + A2 +…+ An)** ● Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1 ● C1 = Average SDCCH / TCH Congestion % on day 1 ● A2 = Number of attempts to establish SDCCH / TCH made on day 2 ● C2 = Average SDCCH / TCH Congestion % on day 2 ● An = Number of attempts to establish SDCCH / TCH made on day n ● Cn = Average SDCCH / TCH Congestion % on day n ➢ **POI Congestion% = [(A1 x C1) + (A2 x C2) +…….+ (An x Cn)] / (A1 + A2 +…+ An)** ● Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1 ● C1 = Average POI Congestion % on day 1 ● A2 = POI traffic offered on all POIs (no. of calls) on day 2 ● C2 = Average POI Congestion % on day 2 ● An = POI traffic offered on all POIs (no. of calls) on day n ● Cn = Average POI Congestion % on day n
Benchmark	**SDCCH Congestion: < 1%** **TCH Congestion: < 2%** **POI Congestion: < 0.5%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: ➢ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) was conducted ➢ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH ➢ The POI details were verified from the switch for all the links of the operators

5. Call Drop Rate	
Computational Methodology as per QoS definition	The dropped call rate is the ratio of successfully originated calls that were found to drop to the total number of successfully originated calls that were correctly released ➢ **Total calls dropped** = All calls ceasing unnaturally i.e. due to handover or due to radio loss ➢ **Total calls established** = All calls that have TCH allocation during busy hour **Computational Methodology:** Total Calls Dropped / Total Calls Established x 100
Benchmark	**< 3%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: ➢ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted. ➢ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter

6. Percentage Connections with Good Voice Quality	
Computational Methodology as per QoS definition	Definition: ↳ for GSM service providers the calls having a value of 0 – 4 are considered to be of good quality (on a seven point scale) ↳ For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when it FER value lies between 0 – 4 % **Computational Methodology:** ↳ **% Connections with good voice quality =** (No. of voice samples with good voice quality / Total number of samples) x 100
Benchmark	**> 95%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI. Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited ↳ Operator to conduct at least one drive test using standard drive test equipment every week during TCBH ↳ Each drive test should evenly cover the following 5 types of locations: ↳ **3 Outdoor** (Periphery of the city, Congested Area, Across the City), and **2 Indoor** (Office Complex and Shopping Complex) ↳ 2 minute long calls to be initiated and held throughout the drive test ↳ The speed of the vehicle should be kept at around 50km/hr. (around 30 km/hr in case of geographically small cities) – This was ensured during the drive tests conducted by IMRB Auditors ↳ RxQual / FER samples generated during the drive test collected by the operator were verified ↳ *Measurements using Engineering handsets were not acceptable* ↳ All the operators were not maintaining this data at the switch level

7. Service Coverage	
Computational Methodology as per QoS definition	Definition: ➢ The level of signal available in a particular part of a city is known as signal strength. **Computational Methodology:** ➢ Service Coverage for route type x = [(N1 x CSS1) + (N2 x CSS2) + …..+ (Nn x CSSn)] / (N1 + N2 +……..+Nn) ➢ Where:-N1 = Number of calls on type of route x made in drive test 1 ➢ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm) ➢ N2 = Number of calls on type of route x made in drive test 2 ➢ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm) ➢ Nn = Number of calls on type of route x made in drive test n ➢ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)
Benchmark	**Indoor >= -75 dBm** **In-vehicle >= -85 dBm** **Outdoor – in city >= -95 dBm**
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to**: ➢ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI. ➢ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:- ➢ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH). ➢ Each drive test should evenly cover the following 5 types of locations: – ➢ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and ➢ 2 Indoor (Office Complex and Shopping Complex) ➢ *Measurements using Engineering handsets were not acceptable*

8. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	**To connect to IVR:** The time taken to connect a person (as soon as he presses call) to the IVR of the service provider **To connect to operator:** The time taken to connect a person (as soon as he presses 9) to the customer care executive **Computational Methodology:** Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100
Benchmark	(i) %age of calls answered (electronically): ➢ within 20 seconds = 80% ➢ within 40 seconds = 95% (ii) %age of calls answered by operator (voice to voice): ➢ within 60 seconds = 80% ➢ within 90 seconds = 95%

Audit Procedure	-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator. **Live calling: -** - Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS - Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

9.1 Billing complaints per 100 bills issued	
Computational Methodology as per QoS definition	Billing complaints includes any of the following complaints related to billing from the point of view of customer: • Local call charges billed as STD/ISD or vice-versa • Toll free numbers charged • Wrong roaming charges • Call made/received disputed • Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.) • Cheque submitted on time but charged penalty for paying beyond due date (in case customer is not at fault i.e. all those that operator cannot prove that he/she is not lying) • Payment made but not reflected (may be wrongly adjusted to another customer etc.) **Billing complaints per 100 bills issued =** Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter * *All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included* ** *Only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.*
Benchmark	< 0.1% billing complaints per 100 bills
Audit Procedure	**IMRB** auditors collected and verified data pertaining to - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

9.2 Resolution of billing complaints	
Computational Methodology as per QoS definition	**%age of billing complaints resolved within 4 weeks=**(Complaints resolved in 4 weeks from date of receipt / Total billing complaints received during the relevant period) x 100 *Only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.* *Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.*
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	**IMRB Auditors collected and verified data pertaining to** - Total number of billing complaints/bills disputed - Number of complaints resolved in 4 weeks **Live calling : -** **Overall 100 number of live calls** made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than100

9.3 Period of refunds / payments due to customers	
Computational Methodology as per QoS definition	**Period of all refunds = Maximum value of 'Time taken to refund'** where:-Time taken to refund = Date of refund – date of lodging complaint
Benchmark	100% cases in less than 4 weeks
Audit Procedure	**Audit of refund details and complaints (only those resulting in refunds) resolution details used for arriving at the figures reported to TRAI to be conducted.** **Operator to provide details of:-** • **Dates of lodging of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator** • **Dates of refund pertaining to all billing complaints received during the relevant quarter** **Also random live checks of all subscribers entitled for refund were conducted**

9.3 For Broadband services

1. Service provisioning/Activation time	
Computational Methodology as per QoS definition	Service provisioning time refers to the time taken from the date of receipt of an application to the date when the service is activated **Percentage connections provided within X working days** = No of connections provided within X working days/ Total number of connections registered during the period * 100 **Technically Non Feasible (TNF**) cases such as unavailability of Broadband infrastructure/ equipment in the Area or Spare Capacity i.e. Broadband Ports including equipment to be installed at the customer premises for activating Broadband connection shall be excluded from the calculation of this parameter. Also, problems relating to customer owned equipment such as PC, LAN Card/ USB Port and internal wiring or non-availability of such equipment shall be excluded from the calculation of this parameter.
Benchmark	100 % cases in =<15 working days.
Audit Procedure	**IMRB** auditors collected and verified data pertaining to -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days **Live calling :** Atleast 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

2. Fault repair/Restoration time	
Computational Methodology as per QoS definition	This refers to the time taken to restore the existing customer service to operational level from the time that a problem or fault is reported **Percentage faults repaired in X working days** = (Total no of faults repaired in X working days /Total number of faults reported during the period)*100 The time period for fault repair starts from the time when the fault is reported to the service provider either through customer care help line or in person by the subscriber Only the complaints registered till the close of the business hours of the day are to be taken into account. All the complaints registered after the business hours are to be considered as being registered in the next day business hours
Benchmark	By next working day: > 90% and within 3 working days: 99%
Audit Procedure	**IMRB** auditors collected and verified data pertaining to -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days **Live calling :** Atleast 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

3. Billing complaints per 100 bills issued	
Computational Methodology as per QoS definition	Billing complaints includes any of the following complaints related to billing from the point of view of customer: • Wrongly charged extra for some service • Cheque submitted on time but charged penalty for paying beyond due date • Payment made but not reflected (may be wrongly adjusted to another customer etc.) **Billing complaints per 100 bills issued =** Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter * *All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included* ** *Only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.*
Benchmark	< 2% billing complaints per 100 bills
Audit Procedure	**IMRB** auditors collected and verified data pertaining to - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

3.1. Resolution of billing complaints	
Computational Methodology as per QoS definition	**%age of billing complaints resolved within 4 weeks=**(Complaints resolved*** in 4 weeks from date of receipt / Total billing complaints** received during the period 2008) x 100 *Only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.* *Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.*
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	**IMRB Auditors collected and verified data pertaining to** - Total number of billing complaints/bills disputed - Number of complaints resolved in 4 weeks **Live calling : -** **-Overall 100 number of live calls** are to be made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than100

3.2 Time taken to refund after closure	
Computational Methodology as per QoS definition	Time taken to refund = Date of refund – Date of closure Date of closure is considered to be the date on which the connection is discontinued in the service provider database of active customers
Benchmark	100% cases in less than 60 days
Audit Procedure	**IMRB Auditors collected and verified data pertaining to** -Number of cases requiring refund of deposits -Number of cases where refund was made within 60 days -%age cases where refund was made within 60 days

4. Response time to customer for assistance	
Computational Methodology as per QoS definition	**%age of calls answered by operator (voice to voice) within n seconds** = (Number of calls where time taken for operator to respond* >= n sec / Total number of calls where an attempt to route to the operator was made) x 100 Time taken for operator to respond = Time when an operator responds to a call – Time when the relevant code to reach the operator is dialled
Benchmark	Calls answered within 60 seconds > 60 % Calls answered within > 80%
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** -Number of calls received by the operator -Number and %age calls answered within **60 seconds** -Number and percentage calls answered within **90 seconds** **Live calling : -** Overall **100 number** of live calls at **different points of time** were made in a licensed service area/circle for each service provider to assess the efficiency of the call centre

5. Bandwidth Utilization	
Computational Methodology as per QoS definition	Percentage Bandwidth available on the link = Total Bandwidth* utilised in TCBH for the period/ Total Bandwidth Available during the period*100 Multi Router Traffic Grapher (MRTG) is to be used to measure the details of Bandwidth utilisation by service providers
Benchmark	-- < 80% link(s)/route bandwidth utilization during peak hours (TCBH). -- If on any link(s)/route bandwidth utilization exceeds 90%, then network is considered to have congestion. For this additional provisioning of bandwidth on immediate basis, but not later than one month is mandated.
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** **(I)POP to ISP gateway Node [Intra – network] Links** -Auditors to verify and collect data pertaining to Total Bandwidth available and Total Bandwidth utilised during TCBH at some of the sample intra network links (POP to ISP Node) on each of the three days of live measurement separately - Total Bandwidth available and Total bandwidth utilised during at the sample links TCBH for the complete month of audit - Total number of intra network links having >90% bandwidth utilisation during the month of Audit **(ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity** -Total number of upstream links for International connectivity -Total number of links having Bandwidth > 90%Total Bandwidth available and Total Bandwidth utilised on all the upstream links during TCBH (POP to ISP Node) on each of the three days of live measurement separately -Total Bandwidth available and Total bandwidth utilised at all the international links during TCBH for the complete month of audit (Also obtain details separately for the days)

Broadband download speed	
Computational Methodology as per QoS definition	This refers to the ratio of size of the file to be downloaded and total time required for error free transmission of the file
Benchmark	Subscribed broadband connection speed to be met >80% from ISP Node to user
Audit Procedure	**Live calling : -** -Details of live customers were obtained from the service providers -Overall **50 number** of live calls at were made during peak hours in a licensed service area/circle for each service provider to assess the download speed available to subscribers. Tool provided by the on the service providers website was used for the same -Details of total committed download speed and speed available to the users were recorded for each of the subscriber - Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers*100

Service availability/Uptime	
Computational Methodology as per QoS definition	Service availability/uptime is the measure of the degree to which the broadband access network including ISP Node is operable and not in a state of failure or outage at any point of time for all users Service availability/Uptime = (**Total operational hours – Total Downtime hrs)*100 / Total operational hours** Total downtime for all users, including the LAN switches, Routers, Servers, Etc at ISP Node and connectivity to upstream service provider are to be included Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime
Benchmark	- 90% for quarter ending June 2007 - 98% with effect from quarter ending September 2007 and onwards
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** -Total operational hrs -Total downtime hrs The above mentioned data was obtained and verified separately for three days in which the live measurement was carried out, Month in which audit was carried out Also, verification of old records(July to September 2007) was verified

Packet loss	
Computational Methodology as per QoS definition	Packet loss is the percentage of packets lost to total packets transmitted between two designated Customer Premises Equipments/Router ports. It is the measurement of packet lost from the broadband customer (User) configuration/User reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NAP port abroad The packet loss is measured by computing the percent packet loss of **1000 pings of 64 byte packet each**. Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI Minimum sample reference points for each service area shall be three in number or multiple reference points if required **Hence Packet loss is computed by the formula - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100**
Benchmark	<1 %
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** - Records maintained for ping tests conducted during the period of July to September 2007 - Smoked ping test (wherever available) results for the period of July to September 2007 - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours) - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Network Latency	
Computational Methodology as per QoS definition	Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/Customer Premises Equipment (CPE). The round trip delay for the ping packets from ISP premises to the IGSP premises to the IGSP/NIXI gateway and to the nearest NAP port abroad are measured by computing delay for **1000 pings of 64 bytes each** (Pings are to be sent subsequent to acknowledgement received for the same for previous ping) Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI Minimum sample reference points for each service area shall be three in number or multiple reference points if required **Hence the formula for network latency would be Network latency for X days= Total round trip time for all the ping packets transmitted in X days /No of days during the period**
Benchmark	< 120 msec from user reference point at POP/ISP Node to International Gateway < 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial) < 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Sattelite)
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** - Records maintained for ping tests conducted during the period of July to September 2007 - Smoked ping test (wherever available) results for the period of July to September 2007 - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours) - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

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