8 Balaji Estate, Guru Ravidass Marg, Kalkaji, New Delhi - 110019
Phone: (91)-11-4269-7800, Fax: (91)-11-42697802
Website: www.imrbint.com

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

Final Report: October - 2008

-

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

By: **eTechnology Group@IMRB**

A specialist unit of IMRB International

IMRB international

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 quarterly periods. IMRB International Auditors carried out Audits across Tamil Nadu, Karnataka, West Bengal, Bihar & Jharkhand, Haryana, Punjab and Uttar Pradesh (East) circles in the period of May – August 2008. This report details the performance of various service providers in Karnataka circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) and Broadband services

Table of contents

Page no.

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'

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

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

The present report highlights the findings for the Audit module for Karnataka circle that was covered in the Quarter 2 (April – June 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 May 2008 – August 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 if 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 city 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 140 exchanges (20 Urban and 120 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 Karnataka circle

- Bharti Airtel Ltd. – 24 MSCs
- Spice Commmunications Pvt. Ltd. – 1 MSC
- Tata teleservices ltd – 5 MSCs
- Reliance communications – 6 MSCs
- BSNL – 5 MSCs
- Vodafone Essar Ltd. – 6 MSCs

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 Karnataka 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 Karnataka circle: - Bharti Airtel Ltd., Hathaway, Sify, Reliance, BSNL, VSNL (TATA communications Ltd.) 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 October to December 2007 was carried out for all the 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 Broadband 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 May 2008 to August 2008 in Karnataka 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 teleservices*
1	Provision of telephone after registration of demand					
1.1	Connections completed within 7 days	100%	97%	90%	99%	100%
2	Fault incidence/clearance statistics					
3	Fault incidences(No. of faults/100 subscribers/month)	<3	5.5	8	1	1
3.1	Faults repaired within 24 hours	>90%	97%	66%	99%	95%
3.2	Faults repaired within three working days	100%	99%	78%	100%	100%
4	Mean time to Repair (MTTR)	<8 hours	5.40	10	<5	5.10
5	Call Completion Rate (CCR)	>55%	58%	64%	DNA	85%
6	Metering and billing credibility					
6.1	Billing complaints per 100 bills issued	<0.1%	0.04%	0.00%	0.00%	0.02%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%
7	Customer care/helpline promptness					
7.1	Shift requests attended					
	Shift requests attended within 3 days	95%	94%	74%	100%	100%
7.2	Closure request attended					
	Closure within 24 hours	95%	100%	94%	98%	100%
7.3	Supplementary (additional) service requests attended					
	Additional facility provided within 24 hours	95%	99%	70%	100%	99%
8	Response time to customer for assistance					
8.1	% age call answered through IVR in 20 seconds	80%	DNA	100%	100%	100%
	% age call answered through IVR in 40 seconds	100%	DNA	100%	100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	94%	99.8%	99%	95%
	% age calls answered by operator in 90 seconds	95%	97%	99.9%	100%	97%
9	Time taken for refund of deposits after closure					
9.1	%age cases where refund received within 60 days	100%	96%	99%	100%	NA

{*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of April to July 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'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

Critics and Key take outs: Basic (Wireline) services

The Basic (Wireline) services audit for Karnataka circle broadly indicates that only TATA tele services meets the benchmarks for all the parameters as mandated by TRAI (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.

Also, results of verification of the records for the period of October to December 2008 show that there was variation in the figures reported in the PMR and those found in actual records for BSNL, the reason can largely be attributed to the fact that BSNL has a decentralized system for Book keeping, and data was verified only for sample 5% of exchanges spread over 10% of Short Distance Charging Area (SDCA's) in Karnataka circle.

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking) offered by various service providers. At least 150 calls were made for each service provider to different numbers and time taken to answer the call was noticed. BSNL and Bharti emerged out to be the most efficient with approximately 98% of the total calls that were made being answered in 60 seconds followed by TATA with only 67% calls answered in 60 seconds. For TATA Level 1 services connectivity was found to be negligible for following numbers 1919 (Lion's International Eye Bank) and 1910 (Blood bank information service). Also, for Reliance it was observed that Level 1 services were provided primarily for emergency services (Fire, Police etc) and hence only limited calls were made.

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

Provision of telephone after registration of demand

- Only TATA teleservices 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. Bharti (97%) and RCOM (99%) marginally fall short of the TRAI specified benchmark
- BSNL has scored low on Service provisioning/activation time (at 90%) , 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 100% of subscribers of TATA teleservices claimed that the connection was provided within the time period of 7 days followed by RCOM (88%), Bharti (76%) and BSNL (70%).

Fault incidence / clearance statistics

- As per the 1-month audit data findings, BSNL at 66% falls 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 and TATA at 97% and 95% respectively. 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 BSNL(78%) and Bharti (99%) fall short of the TRAI specified benchmark of 100%
- The live calling scores (for fault repair within 24 hrs) were observed to be highest for TATA at 77% followed by BSNL at 67%. However relatively lower scores were observed were RCOM and Bharti at 47% and 20% 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)

- Bharti, BSNL and TATA were found to be meeting TRAI benchmark for Call Completion Rate for one month in which data was obtained.
- Significant variation was observed for TATA as during live measurement its CCR was observed to be 61% whereas for the complete month its score was observed to be much higher at 85%.
- 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 network 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

- All the service providers meet 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, Bharti (94%) and BSNL (74%) fall short of TRAI specified benchmark of 95%
- For closure requests within 24 hours only BSNL with 94% 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.

Response time to customer for assistance

- For customer care number through electronic IVR menu parameter, live calling scores for Bharti and R Com were found to be 100% for call answering through IVR in 20 seconds.
- For BSNL, call centre data was available from the main exchange in Bangalore, where the service provider has a centralized call centre.
- During verification of records for Bharti, it was observed that the service provider does not have a mechanism of recording number of calls which are answered by IVR; only the calls answered by the operator are recorded. The service provider does not report the figure in the PMR submitted to TRAI.

- Live calling results carried out to check the efficiency of calls answered by the operator, all the service provider comfortably meet the TRAI specified benchmark both for calls answered within 60 seconds and 80 seconds

Time taken for refund of deposits after closure

- Bharti (by 4%) and BSNL (by 1%) fall short of TRAI specified benchmark for time taken to refund after closure. Also there were no such cases of refunds for TATA teleservices.

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%	59%	64%	61%

- 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 Bharti at 59% and highest was observed for BSNL at 64%

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA Teleservices	RCOM	Spice
Accumulated downtime for community isolation	< 24 hrs.	13.70	9.18	0	0	0.90	18.15
Call Set Up Success Rate (CSSR)	> 95%	92.36%	95.52%	87.27%	98.88%	99.30%	98.26%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	4.15	11.20	2.86	9.05	4.10	11.50
Blocked Call Rate							
SDCCH /Paging Channel Congestion	<1%	0.98%	0.82%	0.89%	0.00%	0.00%	0.30%
TCH Congestion	< 2%	1.98%	1.90%	2.46%	0.04%	0.48%	1.60%
Call drop rate	< 3%	1.84%	0.72%	2.12%	0.35%	0.70%	1.18%
Percentage connections with good voice quality*	> 95%	96.22%	91.30%	91.56%	99.15%	98.59%	89.69%
Service coverage*							
In door	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
In vehicle	>-85dbm						
Out door - in city	>-95dbm						
POI congestion	< 0.5%	0.00%	0.01%	0.00%	0.63%	0.00%	0.08%
Calls answered electronically							
Percentage calls answered within 20 seconds	80%	100%	100%	100.00%	100%	97.90%	100%
Percentage calls answered within 40 seconds	95%	100%	100%	100.00%	100%	97.90%	100%
Calls Answered by the operator							
Percentage calls answered within 60 seconds	80%	84.11%	94.80%	79.21%	95.28%	90.29%	83.70%
Percentage calls answered within 90 seconds	95%	96.89%	96.89%	91.26%	96.65%	93.03%	96.36%
Billing Complaints							
Billing complaints per 100 bills issued	<0.1%	0.00%	0.45%	0.03%	0.04%	0.08%	0.01%
Percentage billing complaints resolved within 4 weeks	100%	NA	100%	100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	NA	No Refunds due	74%	100%	100%	100%

*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 Karnataka circle apart from Reliance Communication whose audit was conducted at their central NOC at Mumbai.

It should be noted that most of the service providers claimed that they were submitting the PMR basis their inference of the QoS parameters. However, we need to take a larger view of the picture and ignore some differences in measurement methodologies. 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 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	1000 – 1100	1000 – 1100
BSNL	1000 – 1100	1000 – 1100
RCOM	1100 – 1200	1900 – 2000
Aircel	1000 – 1100	1000 – 1100
TATA	1000 – 1100	1000 – 1100
Vodafone	1000 – 1100	1000 – 1100

The TCBH reported by all the service providers except Reliance matched the network busy hour calculated by IMRB auditors for the Karnataka circle. During the three day live measurement the busy hour of Reliance was found to be between 1900 – 2000 hours. The auditors came to this conclusion by studying the traffic reports that were generated from the switch during the audit.

Accumulated Downtime:

In the Karnataka circle, there were outages observed in various BTS across all the service providers, actually leading to a community being isolated at a particular point in time except for TATA and Vodafone. Spice had the maximum outage in the month of audit with an outage of more than 18 hours observed. Bharti's outage was found to be 13.7 hours for the month of audit. The operator claimed that there was maintenance work going on in the network which resulted in such a huge accumulated downtime. The community isolation of BSNL was just above nine hours in the month of audit.

Call Set-up Success Rate (CSSR):

All the operators except Bharti and Vodafone were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for TATA with 99.30% of their calls getting completed. Vodafone had 87.27% CSSR which was the lowest among all services providers and was below the benchmark. All the operators were found to be calculating the

parameter as per the norm specified by TRAI. CCSR 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 Karnataka 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. The highest service access delay was observed for Spice at 11.50 seconds followed closely by BSNL at 11.20 seconds, all of which comfortably met the TRAI benchmark of < = 15 seconds for a sample of 100 calls.

Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except Vodafone for Traffic channel congestion & TATA for POI congestion are meeting the TRAI specified on the congestion parameters. Vodafone does not meet the TRAI specified benchmark with a Traffic Channel congestion of 2.46% 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 and very minimal 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 except for TATA which had a POI congestion of 0.63% and was found to be not meeting the benchmark.

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 TATA with only 0.35% call drop and the relative highest (although it easily met the benchmark) was for Vodafone with 2.12%.

% connections with good voice quality:

Almost all of the operators are measuring these parameters 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 Vodafone with 91.56%, BSNL with 91.30% and Spice with 89.69% did not meet 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 were 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 the service providers except RCOM (percentage calls answered within 90 seconds) and Vodafone (both for calls answered with 60 seconds and 90 seconds) meet the benchmark for the month of audit.

Billing performance

BSNL was found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. It scores 0.45% on the same. In all cases where customers were due for refund, all the service providers except Vodafone meet the TRAI benchmark of 100% with 4 weeks. The billing details were not provided by Bharti for the month of audit.

Inter operator calls assessment

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Bharti		89%	95%	94%	88%	95%
BSNL	88%		90%	87%	90%	85%
Vodafone	97%	88%		100%	91%	92%
TATA	92%	89%	96%		86%	90%
RCOM	94%	95%	94%	96%		91%
Spice	79%	92%	71%	69%	66%	

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. The calls from Bharti to all other service providers were established in the range of 88% to 95%. Similarly BSNL's connectivity with all the operators was found to be not that good where only 85% to 90% of its calls to numbers of other operators got connected. However, Vodafone has maximum difficulty in connecting to a BSNL number with only 88% of its calls getting connected. TATA had problems in connecting to RCOM with only 88 out of 100 of its calls getting established. Also, RCOM's connectivity to Spice was not good with only 91 out of 100 calls getting connected. Spice had the most problem in connecting to almost all the operators with only 66% of its calls to a RCOM number getting established. Also, its connectivity with TATA and Vodafone was found to be poor with a call establishment rate of 69% and 71% respectively.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Karnataka circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Coimbatore, Tiruchy and Cuddalor. 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 Karnataka 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 Karnataka circle were conducted in the cities of Bengaluru, Hubli and Mysore was conducted along the following route:

Mysore	Type of Location	Bengaluru	Hubli	Mysore
Outdoor	Periphery of the city	Kamakshipalya Ring Road Junction To 8 Km towards Magdi Road	Towards Tarihal Industrial Area	Towards Madekere
	Congested Area	Brigade Road to Globus Mall via MG Road	Eureka Towers to CBT	Kuvempu Circle to Gandhi Square
	Across the City	Kamakshipalya Ring Road Junction To KR Circle	Towards Bijapur	Gandhi Square to Basweshwara Circle
Indoor	Office Complex	Mittal Towers	Eureka Tower	Madwesha Building
	Shopping Complex	Garuda Mall	Kataria Complex	Commercial Complex

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

Drive Test - Bengaluru

	SPICE		BSNL		Vfone		Reliance		Airtel		Tata	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	91.84%	91.57%	97.70%	87.34%	95.42%	92.09%	99.63%	98.78%	96.34%	94.88%	100.00%	99.43%
CSSR	93.75%	96.43%	100.00%	97.56%	100.00%	88.46%	100.00%	100.00%	100.00%	93.48%	100.00%	100.00%
Call drop rate	0.00%	0.00%	0.00%	5.00%	0.00%	10.14%	0.00%	0.00%	0.00%	2.33%	0.00%	0.00%
Hands off success rate	100.00%	100.00%	100.00%	97.53%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Drive Test - Hubli

	SPICE		BSNL		Vfone		Reliance		Airtel		Tata	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	88.29%	86.72%	95.69%	94.56%	94.35%	93.28%	97.72%	98.28%	95.41%	97.31%	97.60%	99.28%
CSSR	100.00%	96.77%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Call drop rate	0.00%	3.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Drive Test – Mysore

	SPICE		BSNL		Vfone		Reliance		Airtel		Tata	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	88.65%	91.71%	97.96%	86.39%	77.71%	90.23%	99.73%	97.74%	97.94%	97.09%	99.65%	98.82%
Call set up Success Rate	100.00%	100.00%	100.00%	94.44%	100.00%	84.21%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Call drop rate	0.00%	5.00%	0.00%	2.94%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.00%	100.00%	100.00%	98.51%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Not meeting the benchmark

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

ALL SERVICE PROVIDERS

Bengaluru: There was interference and low signal strength recorded for all operators in the outdoor areas after Gollrahati, Near Chennaenahalli School on Magadi Road, Anjana Nagar to Segihalli gate, near Ring road Junction, Sheshadri Road, 1st stage, Cord road, Rajaji Nagar, Kamakshipalya Bus stand, while in the indoor areas across all operators there was adequate coverage found.

Hubli: There was interference and low signal strength recorded for all the operators in the outdoor areas near Airport road, Pintu circle, Keshapur Circle, Near New KSRTC Bus Depot and in the indoor areas of Eureka towers

Mysore: There was interference and low signal strength recorded for all operators in the outdoor areas near Belwadi industrial area, Near Railway Station, JLB Road and in the indoor areas across Mysore there was no interference and inadequate coverage recorded.

Conclusions:

1. Spice, BSNL & Vodafone do not meet the TRAI benchmark on percentage connections with good voice quality during the drive tests for all the three cities.
2. Also, BSNL & Vodafone does not meet the benchmark for call drop rate for the city of Bengaluru. Also, Vodafone experiences a high call drop rate in the indoor areas of Mysore.
3. Spice experienced high call drop rate in the cities of Mysore and Hubli.
4. Vodafone experiences low CSSR which does not meet the TRAI benchmark in the cities of Bengaluru and Mysore.

Summary of Live Measurement Results – Cellular Mobile Services

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
CSSR	> 95%	93.61%	98.44%	82.75%	98.94%	99.08%	98.70%
SDCCH / Paging Channel Congestion	< 1%	2.06%	2.04%	0.10%	0.00%	0.00%	0.27%
TCH Congestion	< 2%	3.79%	18.95%	2.13%	0.07%	0.46%	1.72%
POI congestion	< 0.5%	0.00%	0.52%	0.00%	0.91%	0.00%	0.09%
Call drop rate	< 3%	1.79%	0.74%	1.84%	0.73%	0.62%	1.13%

Not meeting the benchmark

During the three day live measurement, all the operators except Bharti and Vodafone were found to be meeting the TRAI benchmark on CSSR. RCOM leads the way with a CSSR of 99.08% while Vodafone has the lowest CSSR in the Karnataka circle for the three day live measurement with a call success rate of 82.75%.

Except for Bharti and BSNL, all the operators met the TRAI benchmark on the SDCCH / paging channel congestion parameter. During the live measurements the maximum SDCCH congestion was observed for Bharti at 2.06% followed closely by BSNL at 2.04%. RCOM and TATA

experienced no Paging Channel Congestion. Bharti, BSNL and Vodafone did not meet the benchmark on traffic channel congestion with a congestion of 3.79%, 18.95% and 2.13% respectively. Also, there was POI congestion observed for individual POI links for BSNL and TATA.

Also, during the three days live measurement, all the operators met the benchmark on call drop rates. The maximum call drop rate was observed for Vodafone with 1.84% calls getting dropped after establishment followed closely by Bharti at 1.79%. The lowest call drop rate was observed for RCOM with only 0.62% of total calls getting dropped after establishment.

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

S.No	Parameters	B'mark	Bharti	BSNL	Sify*	H'way	VSNL	RCOM	You telecom
1	Service provisioning uptime								
1.1	Total connections registered		6545	16270	344	1244	2386	1598	196
1.2	Percentage connections provided within 15 days	100%	98%	79%	100%	92%	99%**	91%**	100%
2	Fault repair restoration time								
2.1	Total number of faults registered/calls made		3539	16318	2614	460	13046	1970	790
2.2	Percentage faults repaired by next working days	> 90%	95.5%	96.6%	90.6%	90.4%	83.0%**	99.6%	99.6%
2.3	Percentage faults repaired within three working days	99%	98%	100%	100%	99%	92%**	100%	100%
3	Billing performance								
3.1	Total bills generated		138117	234019	Prepaid	13460	12362	8495	4970
3.2	Billing complaints per 100 bills issued	<2%	0.03%	0.22%		1.90%	1.82%	0.18%	0.28%
3.3	%age of billing complaints resolved within 4 weeks	100%	94%	100%		100%	100%	100%	100%
3.4	Time taken for refund of deposits after closure	100%	No cases			100%	100%	100%	100%
4	Customer care/helpline assessment								
4.1	Percentage calls answered within 60 seconds	> 60%	96%	89%	100%	87%	78%	84%	100%
4.2	Percentage calls answered within 90 seconds	>80%	98%	95%	100%	96%	85%	90%	100%
5	Bandwidth utilisation/Throughput								
5.1	Total number of intra network links tested		772	BRAS-23,T1-24,T2-610, DSLAM-5456	400	No separate core distribution Router	16	2	No separate core distribution Router
5.2	Total number if intra network links crossing 90%		1	Uplink Traffic in Chennai BRAS is > 90%	4		1	0	
	Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)								
5.3	Total number of upstream links		1	97	28	4	28	Upstream connectivity from Mumbai, Chennai and Delhi	1
5.4	Number of links > 90%		0	1	0	1	0		0
5.5	Percentage bandwidth utilised on upstream links	<80%	76%	75%	74%	90%	64%		79%
6	Broadband download speed	>80%	Complied	Complied	Complied	Complied	Complied	Complied	Complied
7	Service availability/uptime	>98%	99.98%	100.00%	100.00%	98.99%	98.37%	99.56%**	98.23%
8	Packet loss	<1%	<1%	<1%	<1%	<2%	<1%	DNA**	<1%
9	Network Latency								
9.1	POP/ISP Node to NIXI to IGSP	<120msec	35 ms	Complied	< 45ms	<100	<80	<40	<40 ms
9.2	ISP node to NAP port	<350msec	266 ms	Complied	<250 ms	<345	<180	<250	<300 ms

** 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 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. Most of the 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, Reliance, 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 seven Broadband service providers are highlighted below

Service provisioning/Activation time

- Only You telecom and Sify manage to meet the TRAI benchmark of 100% connections to be provided within 15 days.
- For Live calling carried out Bharti, Hathaway and Sify are doing exceptionally well with > 95% of subscribers claiming that connection was provided within 15 days. Low scores on the same are observed for BSNL with only 35% of subscribers called claiming that the connection was provided within 15 days.
- As far as the book keeping methodology is concerned it was observed that Reliance is including the cases where it is technically not feasible to provide the connections to the subscriber within 15 days while reporting to TRAI. This is one of the reasons for service provider's low performance on the parameter. Ideally such cases should be excluded as per TRAI guidelines.
- Also, VSNL (TATA communications) considers all types of connections as Broadband which includes connections subscribed with download speed of less than 256Kpbs, which is not in line with the QoS regulation for Broadband.

Fault Repair/Restoration time

- VSNL (TATA communications) is falling below the benchmark for fault repair within next working day.
- For fault repair within three working days only Bharti (at 98%) and VSNL (at 92%) were found to be not meeting the 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.
- None of the service providers were found to be meeting the benchmark for Fault repair/Restoration for live calling results. Scores are as low as only 10% (for Hathaway) subscribers claiming that their fault was repaired within next working day. The reason for low scores can partly be attributed to low sample size (10% of total faults reported in the month prior to visit of Audit)
- As far as book keeping methodology is concerned, TATA Communications (VSNL) was found to be considering even billing complaints as fault complaints while reporting to TRAI.

This may be one of the reasons for service provider's ordinary performance for the parameter.

- All the service providers were found to be providing Rebate as per the norms stipulated by TRAI except TATA communications, where rebate was being provided for the number of days for which the connection was inactive and not as per TRAI guidelines for the same.

Billing performance

- All the service providers (except Bharti) were found to be meeting the benchmark of 4 weeks 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 service providers meet the benchmark (Both for live calling as well as One month data verification results) for percentage calls answered within 60 by the operator (Voice to Voice).
- For Live calling results for calls answered within 90 and 60 seconds for most of the operators, all the calls made were answered by the operator in stipulated period of time.

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. For VSNL (TATA communications) out of 8 POP locations in India, the link running from core router in Chennai to Delhi was found to be above 90%.
- Similarly for BSNL uplink Traffic from Chennai Broadband Remote Access Server (BRAS) was found to be more than 90% during the month for which the data was obtained.
- Karnataka being a category A circle, 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 and Hathaway) 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), BSNL, VSNL (TATA Communications Ltd.) and Sify meet the TRAI specified benchmark cumulatively for all the gateways present in India. For Hathaway traffic on upstream links (to IGSP) was observed to be 90%.

Download speed

- Also, 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.
- However, no historic data was available for verification of records for month of Audit as well as quarter ending October to December 2007 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.
- Hence, IMRB Auditors also carried out live calling to understand the download speed available to the customer, Reliance, You telecom, Sify and Hathaway (marginally by 4%) were found to be not meeting the TRAI benchmark (For sample calls made to subscribers across different locations in Karnataka).

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, Hathaway), 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.
- Also, it was observed that Reliance is calculating total downtime hour's basis Mean Time to Repair (MTTR) for various faults reported by customers, which is not in line with QoS methodology. Ideally, MTTR for repairing various sites or equipments which went down during the period should be considered.

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 and You telecom. However, it should be noted that the network related data for BSNL for verification was obtained from their central node in Bangalore.
- Also, it was observed that Reliance is calculating packet loss basis number of faults reported by customers which was not in line with methodology prescribed by TRAI.
- Also, while conducting ping tests it was observed that service providers (except BSNL) were found to be unaware of the standard prescribed by TRAI i.e. one ping test constitute of 1000 pings of 64 byte packet each to be carried out daily during Time consistent Busy Hour(TCBH).
- Due to non availability of the records of old ping tests, verification process could not conducted for most of the private operators. Only latency graphs (smoke ping tool) could be verified for some of the operators. Smoked ping tool was found to be configured for sending 5 pings of 56 bytes each every 300 seconds.
- However, ping tests conducted/smoked ping results during live measurements revealed that all the service providers (except Hathaway) are meeting the benchmark prescribed by TRAI.
- Making a relative comparison network latency was observed be higher for Hathaway, both during live measurements and one month for which data was obtained.

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Service Availability Uptime	>98%	100.00%	100.00%	100.00%	98.8%	95.73%	DNA**	100.00%
No of Intra network links found to be above 90% (Out of sample links tested)		0	0	0	No separate Core Distribution Router in Karnataka	0	0	No separate Core Distribution Router in Karnataka
Total Bandwidth utilization at all upstream links	< 80%	71%	71%	74%	90%	64%	No gateway in Karnataka	71%
Data Download Speed	> 80%	Complied	Complied	Complied	Complied	Complied		Complied
Packet Loss (Percentage)	< 1%	<1%	<1%	<1%	<4% (International success rate found to be high)	<1%	<1%	<1%
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	59.3 ms	Complied	<15 ms	<110	<80	<40	17.3 ms
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	278.6 ms	Complied	240 ms	320	<230	<250	22 ms

** Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

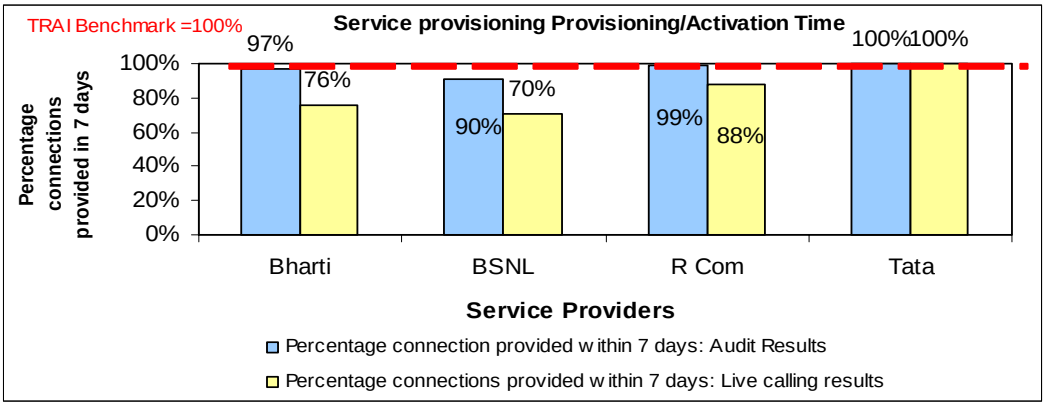
B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

- All the service providers (except VSNL) 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. RCOM is calculating total downtime hour's basis Mean Time to Repair (MTTR) for various faults reported by customers, which is not in line with QoS methodology. Hence the service provider claims that the report for service availability is generated on monthly which rendered live measurements infeasible during the visit by IMRB auditors.
- However, it should be considered that VSNL which does not meet the benchmark is considering all the types of sites (including DSLAM's and Building Nodes) for calculating service availability.
- 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, most 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 97 gateway links present at different places in India 10 to 20 were found to be > 90 %.
- For ping tests conducted during live measurements Hathaway was found to be crossing TRAI specified benchmark of <1% packet loss.
- 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

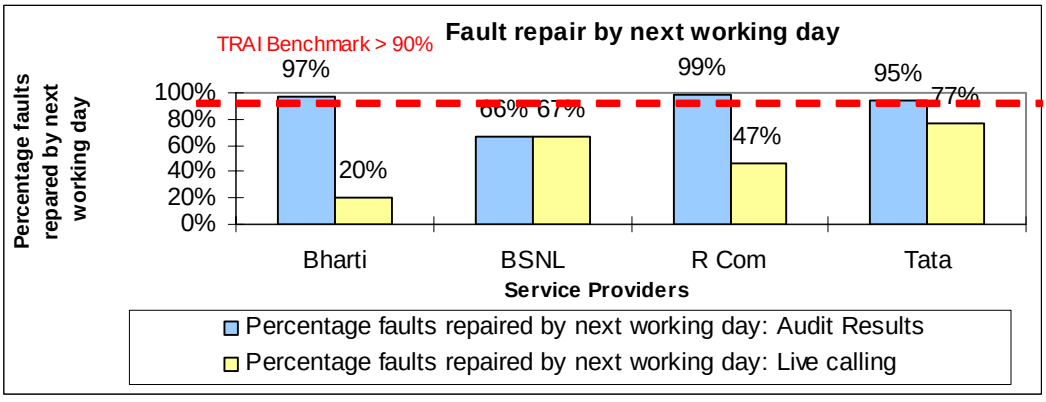
Service provisioning / Activation time (Comparison between one month audit results and live calling results)



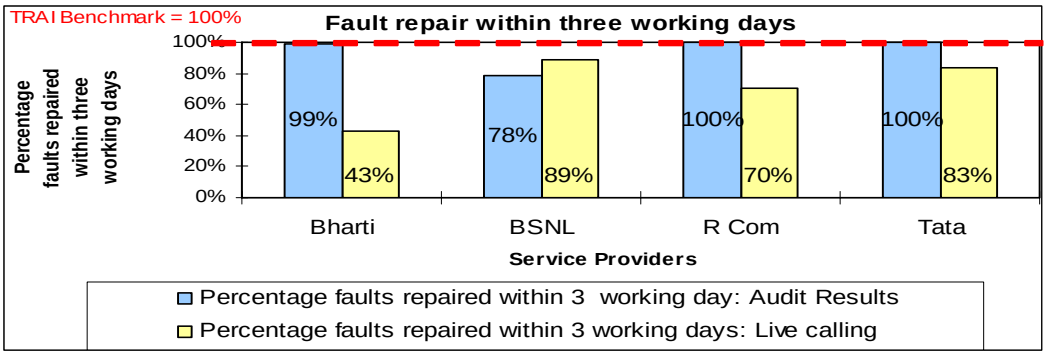
BSNL with 90% connections registered within 15 days falls short of TRAI specified benchmark. But the service provider's score is deemed to be good as BSNL was found to be providing connections in rural as well as urban areas.

Also for TATA all the respondents called during live calling process claimed that their connection was registered within 7 working days followed by Reliance at 88%. Bharti and BSNL scores on live calling were observed to be 76% and 70% respectively.

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

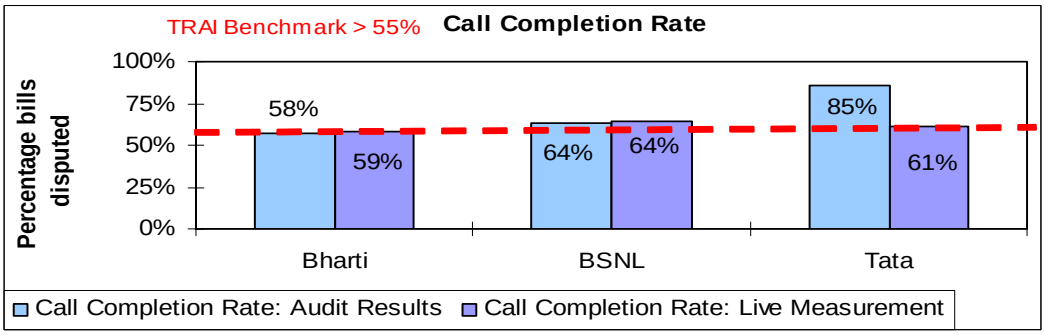


For fault repair by next working day BSNL falls short of the TRAI specified benchmark. For live calling scores only 20% of Bharti subscribers called claimed that the faults reported by them where cleared by next working day. TATA score for live calling is observed to be highest with a score of 77%.



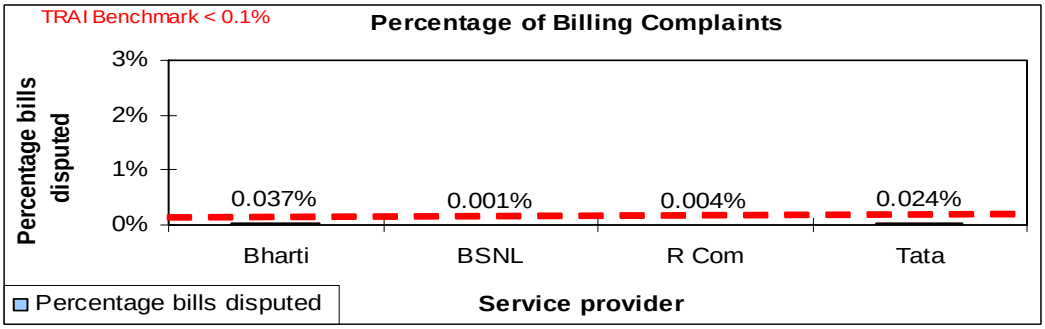
BSNL and Bharti (by 1%) fall short of TRAI specified benchmark for fault repair within 3 working days. Interestingly BSNL leads the way for live calling results with 89% of subscribers claiming that fault was repaired by three working days followed by TATA at 83%

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



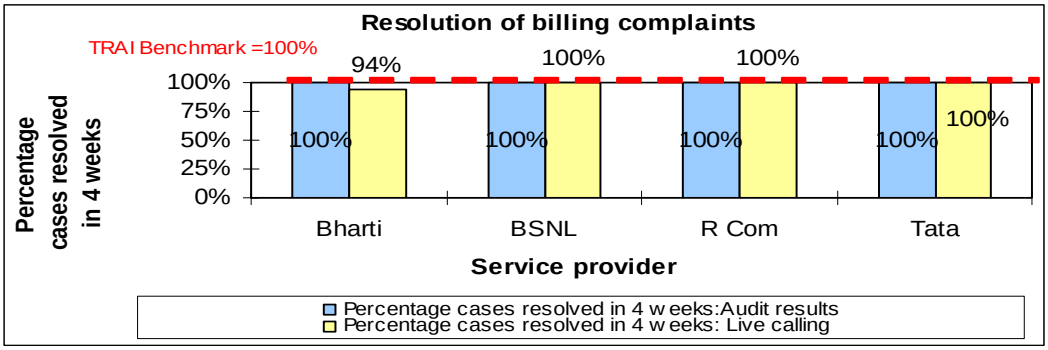
All the service providers were found to be meeting TRAI benchmark (55%) for Call Completion Rate both for live measurements and month in which the audit was carried out. However Bharti scores for live measurement were observed to be lowest in both the cases. Significant variation was observed for TATA as during live measurement its CCR was observed to be 61% whereas for the complete month its score was observed to be much higher at 85%. 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



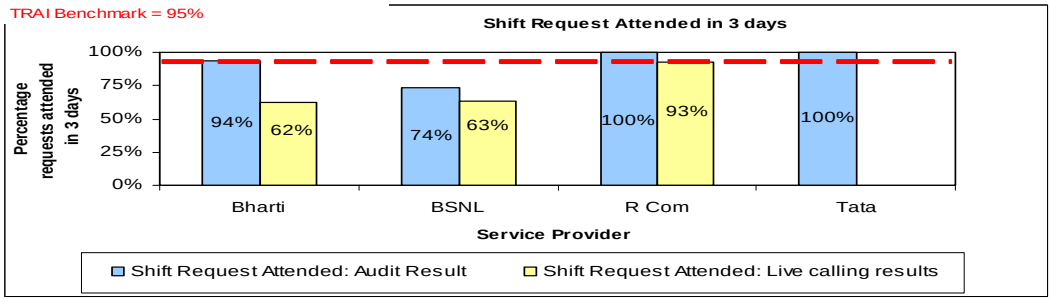
All the subscribers meet the TRAI specified benchmark as percentage billing complaints remain <0.1% for all the operators

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



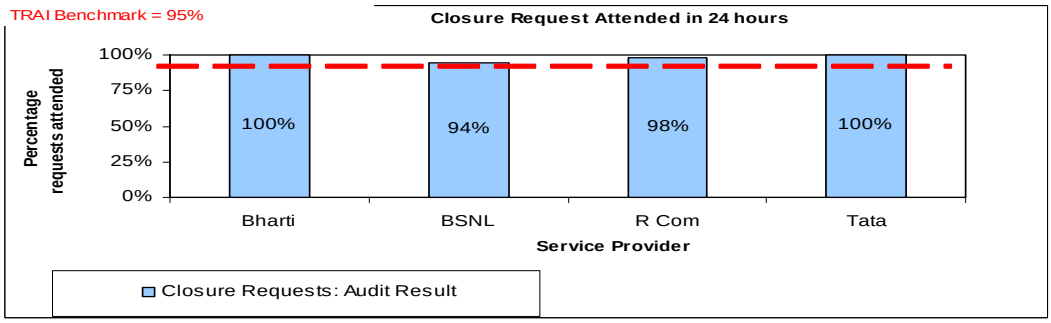
All the service providers meet the TRAI specified benchmark for resolution of billing complaints within 4 weeks. For live calling results 94 % of Bharti subscribers and 100% of BSNL, RCOM and TATA subscribers called claimed that their complain was resolved within 4 weeks. However sample calls made were low (<5) for BSNL, RCOM and TATA owing to less billing complaints reported by customers.

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



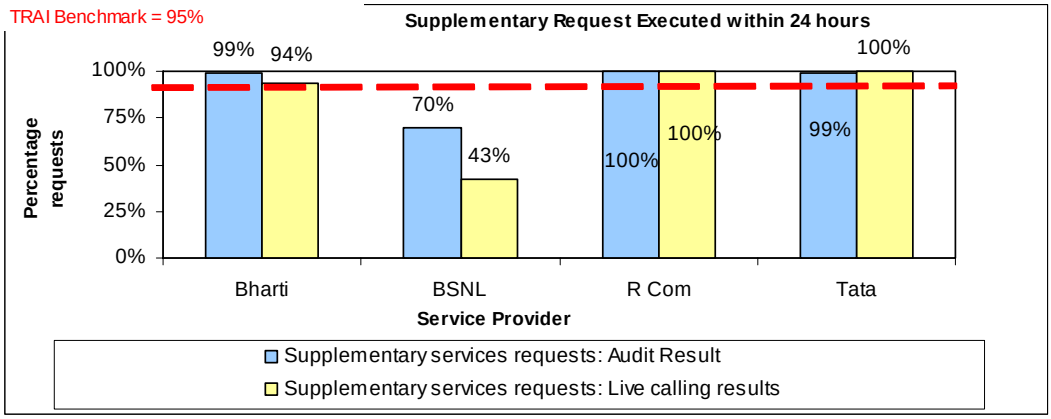
For shift requests attended within 3 days Bharti and BSNL fall short of TRAI specified benchmark. For RCOM and TATA there were only 3 requests each for shifting of connection during the month of audit and all of them were attended within the stipulated period of time. For live calling RCOM leads with 93% (14 calls made) followed by BSNL and Bharti at 63% and 62%.

Closure requests attended within 24 hours



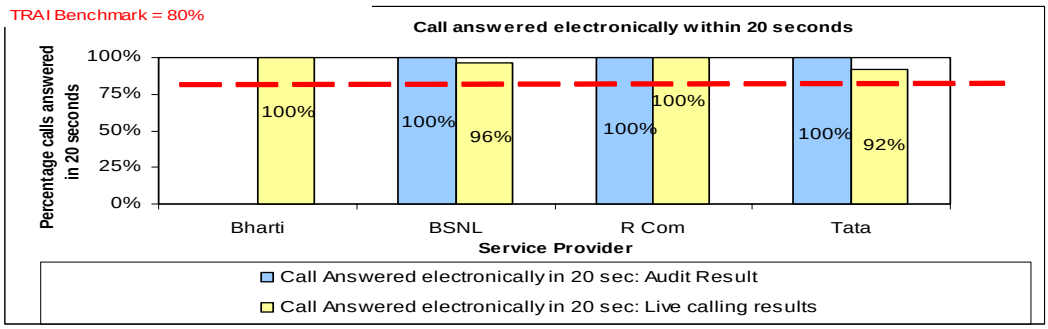
BSNL (at 94%) ,marginally falls short of the benchmark of 95% closure requests attended within 24 hours for the month of Audit

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



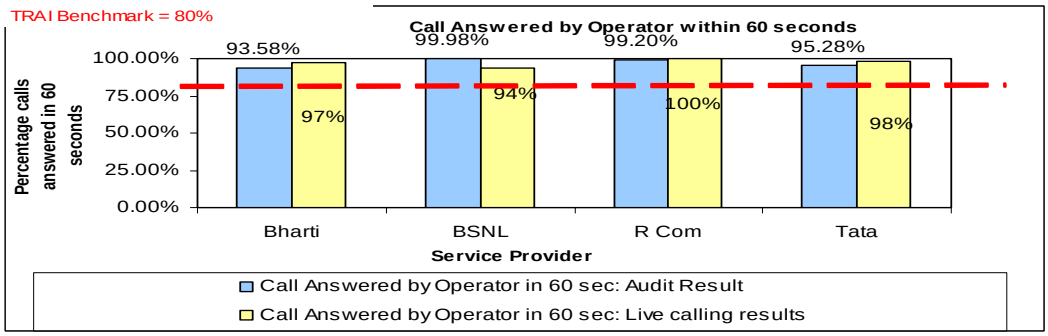
BSNL falls short of the TRAI specified benchmark of 95% "requests for additional services" to be attended within 24 hours at 70% for the month of Audit. For Live calling results as well BSNL score is observed to be the lowest with only 43% of the total customers called claiming that the requests made by them were attended within 24 hours.

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



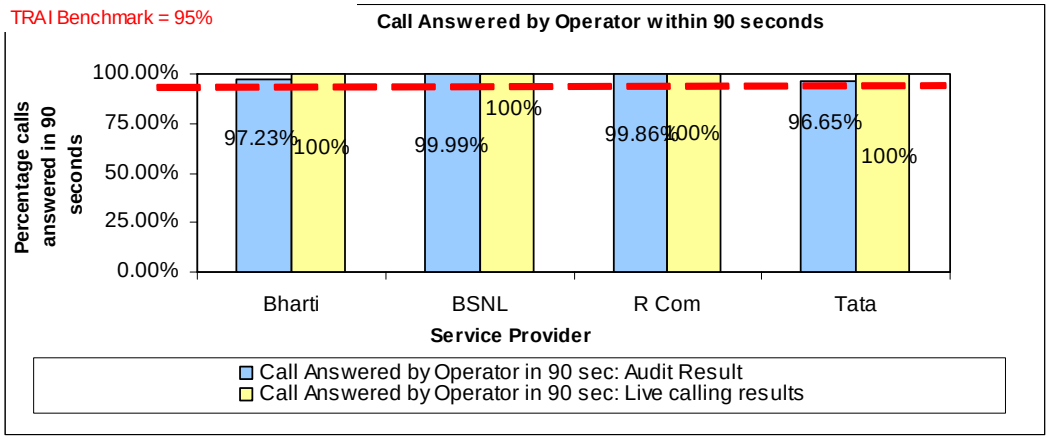
All the service providers meet the TRAI specified benchmark for calls answered electronically within 20 seconds

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



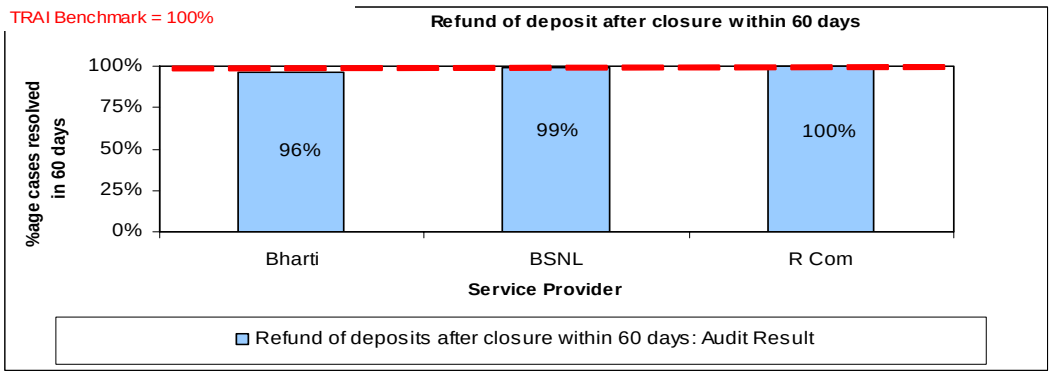
All the service providers comfortably meet the TRAI specified benchmark for calls answered by the operator within 60 seconds both for live calling and the month in which audit was carried out

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



As per live calling results, the score on the parameter call answered by operator within 90 seconds for all the operators is observed to be 100%

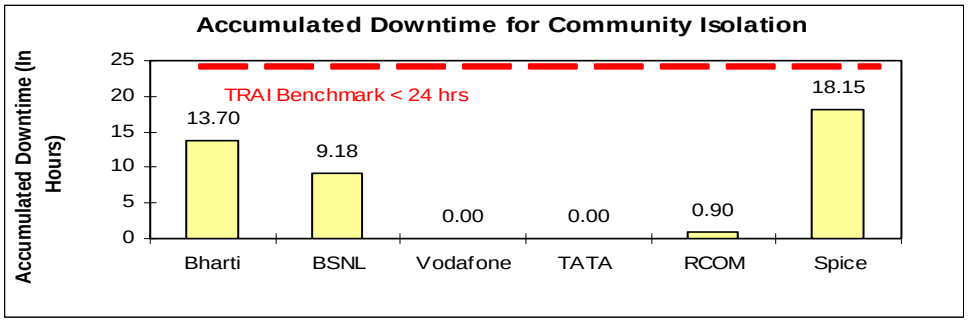
Time taken to refund of deposits after closure



Bharti (by 4%) and BSNL (1%) fall short of TRAI specified benchmark for time taken to refund after closure. Also there were no such cases for TATA teleservices.

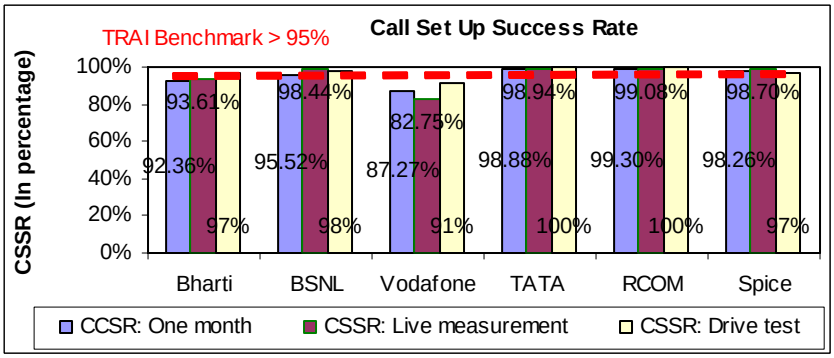
6.2 Graphical/Tabular Representations for Cellular Mobile Services

Accumulated Downtime



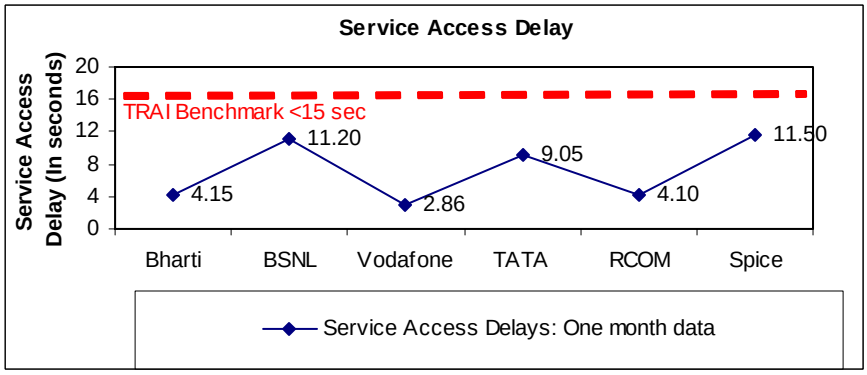
Only Vodafone & TATA did not experience a downtime in the Karnataka circle in the month of audit. All other operators experienced a downtime in their network ranging from 0.90 hours for RCOM to 18.15 hours for Spice.

Call Set-up Success Rate (CSSR)



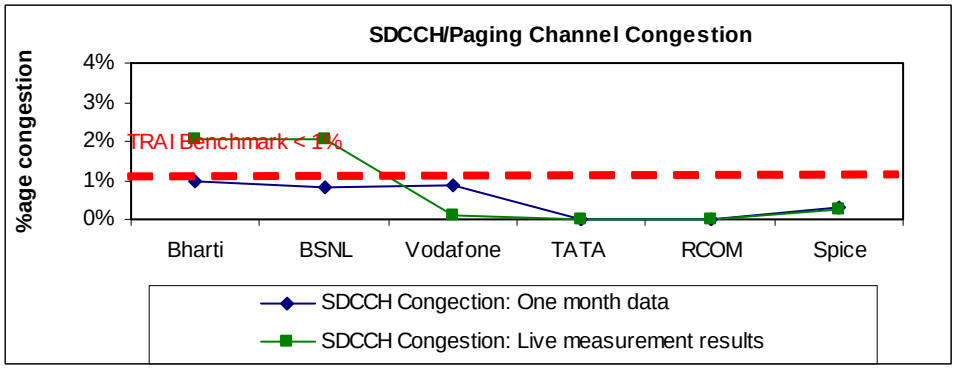
All the operators except, BSNL & Vodafone for the month of Audit and live measurement, are meeting the benchmark for the audit month, live measurement as well as the drive test.

Service Access Delay



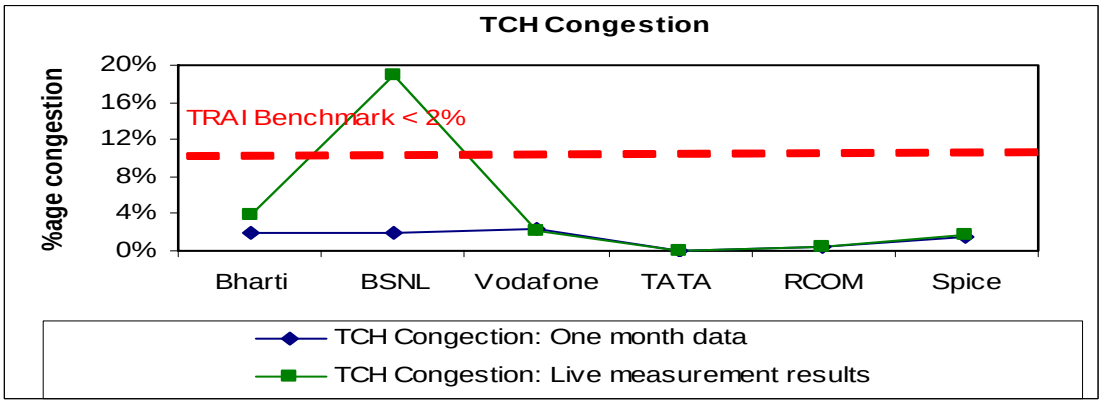
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit. The highest service access delay was measured for Spice at 11.50 seconds and the lowest was for Vodafone at 2.86 seconds.

SDCCH / Paging Channel Congestion



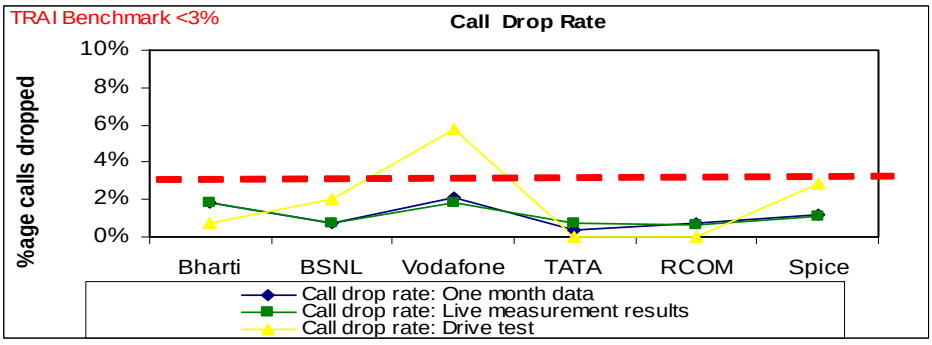
All the operators meet the benchmark for the month three day live measurement period. However, during the monthly measurements and verification both Bharti and BSNL do not meet the TRAI benchmark of less than 1% SDCCH congestion.

TCH Congestion



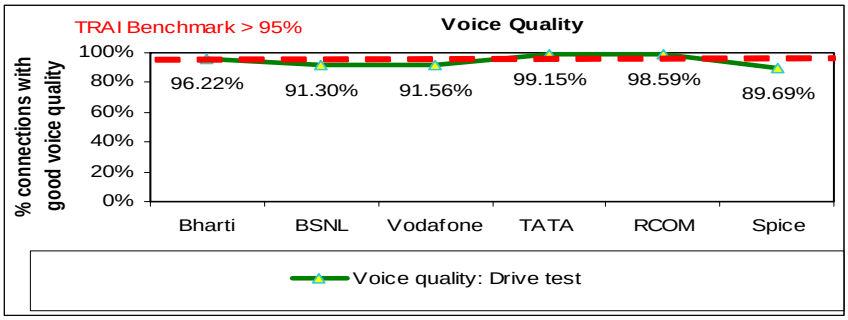
All the operators expect Vodafone meet the TRAI benchmark for the monthly audit period. However, Vodafone along with Bharti and BSNL do not meet the TRAI specified benchmark for the three day live measurement period.

Call Drop Rate



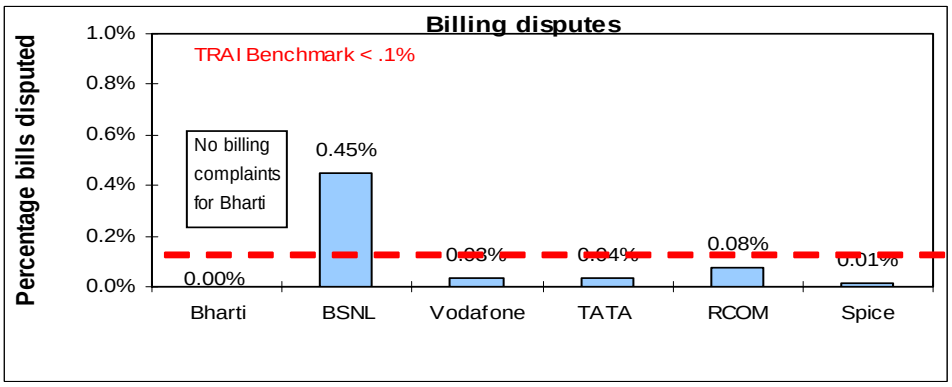
All the operators except Vodafone during the drive tests meet the TRAI benchmark. The operator with the least call drop rates taking into consideration the figures for drive tests, live measurement and the month of audit are TATA and RCOM.

Voice quality

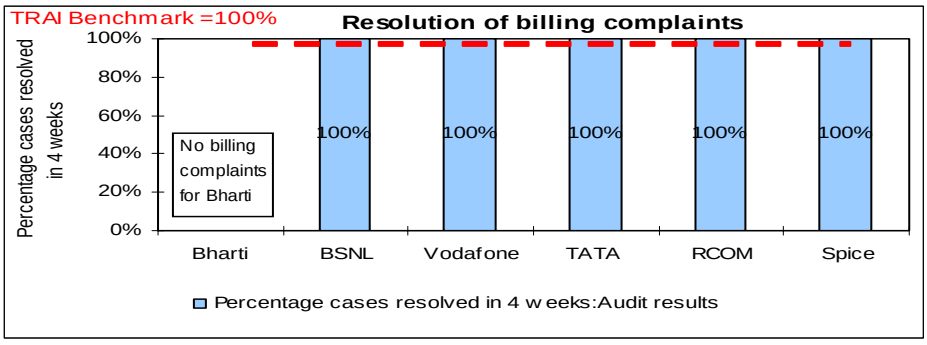


BSNL, Vodafone & Spice do not meet the TRAI benchmark as found out during the drive test. The lowest percentage of connections with good voice quality was observed across Spice with 89.69% followed BSNL at 91.30% and Vodafone at 91.56%. TATA has the highest number of connections with good voice quality at 99.15%.

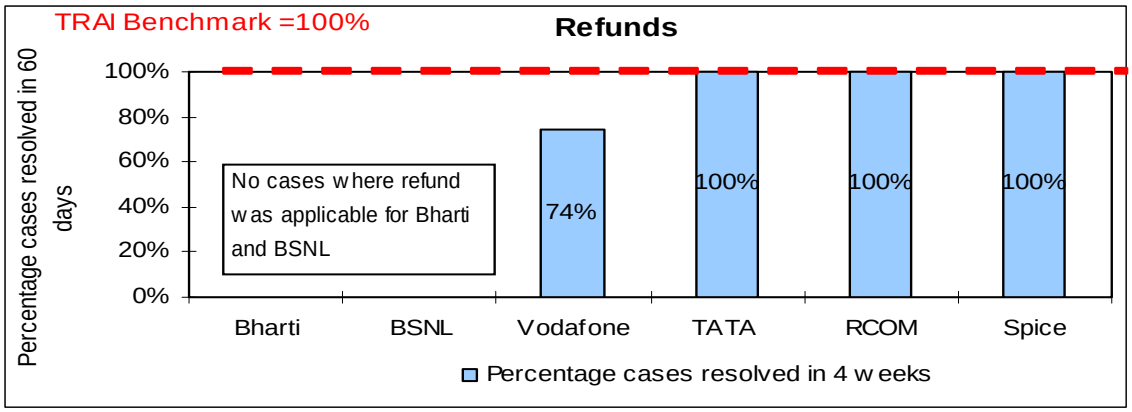
Billing Disputes



BSNL does not meet the TRAI benchmark on percentage billing disputes per 100 bills. Bharti did not report the figures of the month of audit to the auditors.



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.



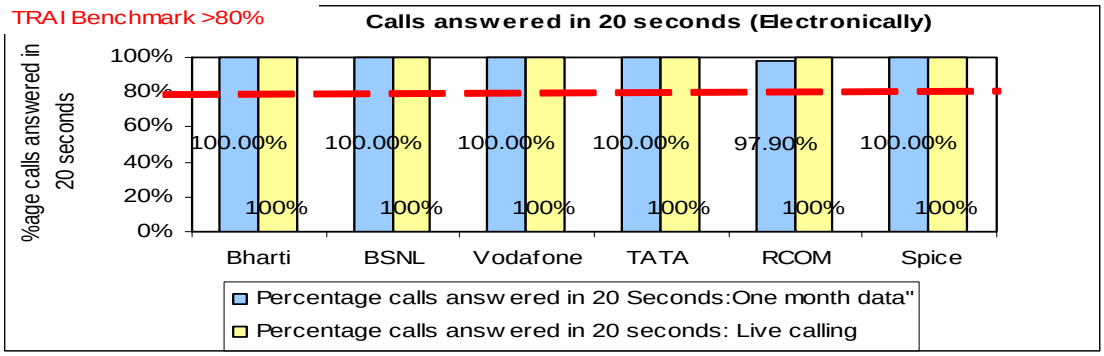
All the operators were found to giving the refunds to their subscribers within the stipulated time period except Vodafone. Only 74% of Vodafone subscribers who were due a refund claim to have been given the refund within the time stipulated by TRAI.

Live calling for billing Complaints

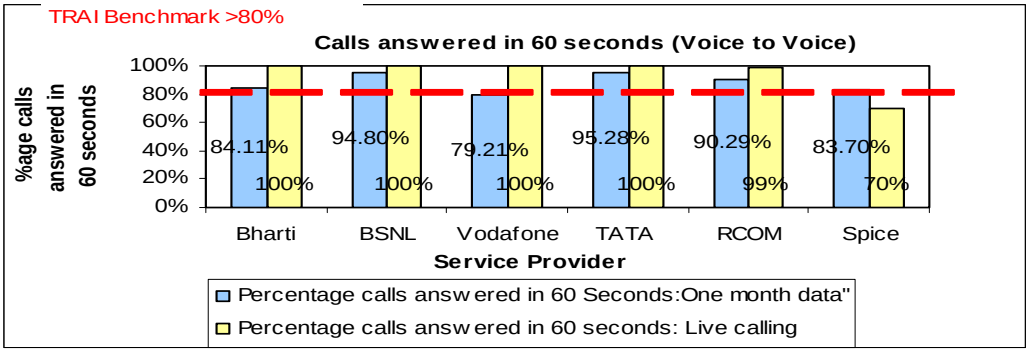
Resolution of billing complaints	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls made	100	100	29	30	100
Number of cases resolved in 4 weeks	100	100	28	28	99
Percentage cases resolved in four weeks	100.00%	100.00%	96.55%	93.33%	99.00%

Except for BSNL and Vodafone, none of the operators were able to meet the TRAI benchmark for the live calling aspect. Only 93.33%% of RCOM subscribers say that their complaints were resolved within 4 weeks.

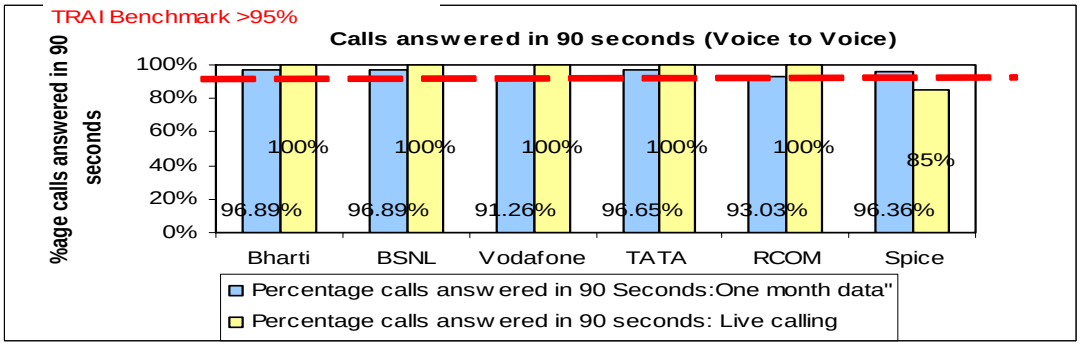
Customer Care / Helpline:



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.



However, except for Spice for the live calling aspect and Vodafone for one month data, 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.



Except for Spice (85% calls answered by the operator in 90 seconds) for the live calling aspect and RCOM and Vodafone for the month period at 93.03% and 91.2% respectively, 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 90 seconds.

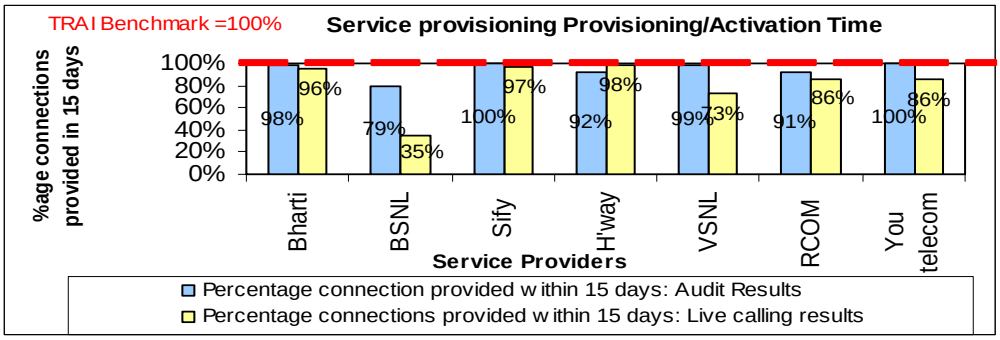
Inter Operator Call Assessment

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Bharti		89%	95%	94%	88%	95%
BSNL	88%		90%	87%	90%	85%
Vodafone	97%	88%		100%	91%	92%
TATA	92%	89%	96%		86%	90%
RCOM	94%	95%	94%	96%		91%
Spice	79%	92%	71%	69%	66%	

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. The calls from Bharti to all other service providers were established in the range of 88% to 95%. Similarly BSNL's connectivity with all the operators was found to be not that good where only 85% to 90% of its calls to numbers of other operators got connected. However, Vodafone has maximum difficulty in connecting to a BSNL number with only 88% of its calls getting connected. TATA had problems in connecting to RCOM with only 88 out of 100 of its calls getting established. Also, RCOM's connectivity to Spice was not good with only 91 out of 100 calls getting connected. Spice had the most problem in connecting to almost all the operators with only 66% of its calls to a RCOM number getting established. Also, its connectivity with TATA and Vodafone was found to be poor with a call establishment rate of 69% and 71% respectively.

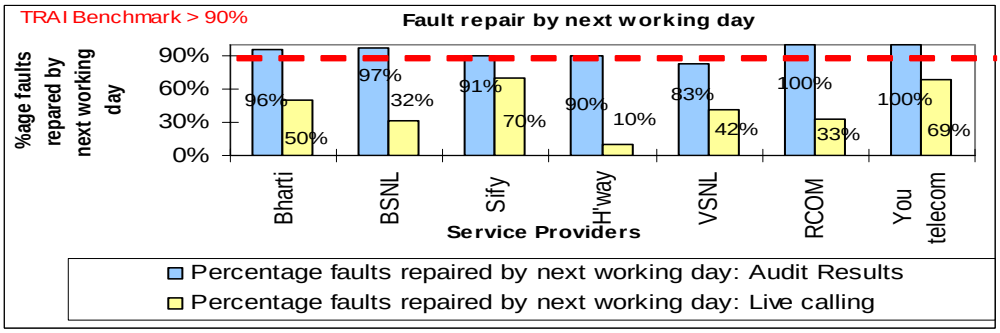
6.3 Graphical/Tabular Representations for Broadband services

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



Only Sify and You telecom meet the TRAI specified benchmark for the month in which Audit was carried out. Although, Reliance scores below the benchmark of 100% connections to be provided within 15 days one month data collection, verification of records reveals that most of the delayed connections are either for the internal customers or due to the non availability of equipment at the customers end. For live calling lowest scores are observed for BSNL (35%) followed by VSNL at 73%.

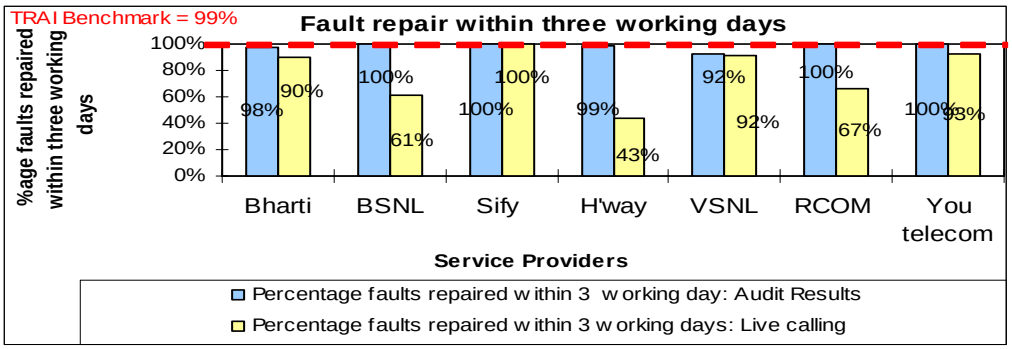
Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results



Sify, BSNL, Hathaway, Bharti and You telecom meet the benchmark for the month of Audit. Highest scores on live calling are observed for Sify at 70% followed You telecom at 69%. All the other service providers perform poorly on live calling results with scores being lowest for Hathway at 10%.

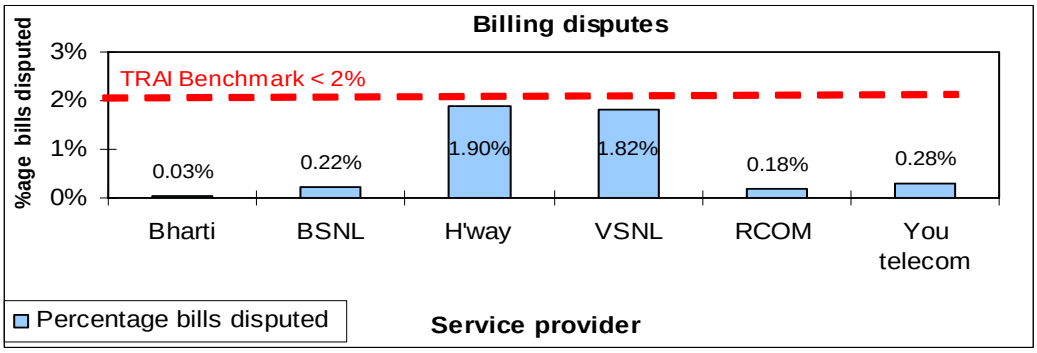
It should be noted that VSNL (TATA communications) which does not meet the benchmark for one month data collection includes billing complaints while calculating percentage faults repaired within three working days.

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



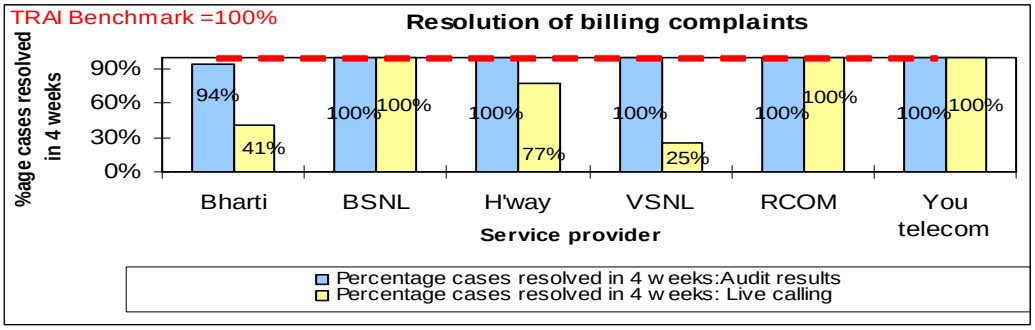
VSNL (TATA communications) and Bharti fall short of TRAI specified benchmark of 99% faults to be repaired within three working days for one month audit results. For live calling results Reliance, Hathaway, RCOM and BSNL again perform poorly on the parameter with scores ranging from 43% for Hathaway to 67% for Reliance.

Percentage bills disputed



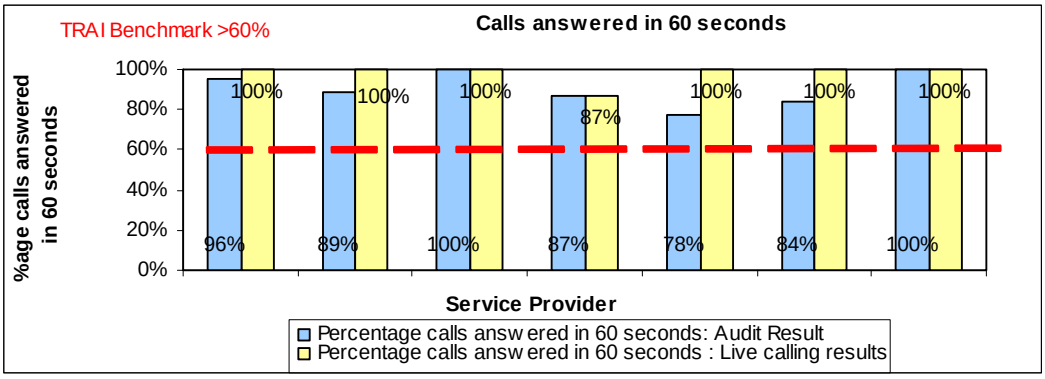
All the operators meet the benchmark on percentage bills disputed in Karnataka circle. Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints.

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



All the operators (except Bharti) meet the TRAI specified benchmark for Percentage billing complaints resolved within four weeks during the month of Audit. VSNL (TATA communications) and Bharti score low on live calling results at 25% and 41%. Partly it could be attributed to low sample sizes for live calling.

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

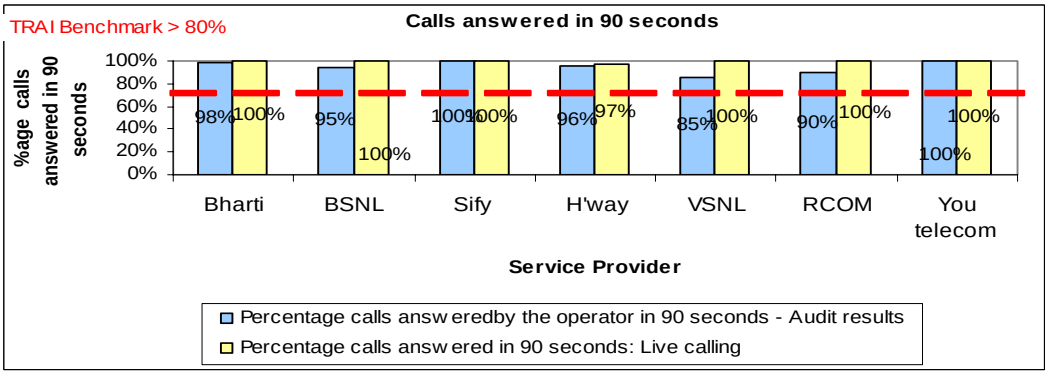


All the service providers meet the benchmark as more that 80% of the calls made to customer care were answered by the operator in 60 seconds both for live calling and the month in which Audit was carried out.

.

Also, as Reliance and VSNL have a centralized call centre, the results shown are combined for all the circles in which they are operating.

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 the service providers meet the benchmark as more that 80% of the calls made to customer care were answered by the operator in 90 seconds both for live calling and the month in which Audit was carried out.

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

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
One month data Verification Results								
Total number of intra network links		772	BRAS-23,T1-24, T2-610, DSLAM-5456*	400*	No separate POP/Router.	16*	2	No separate POP/Router. Direct connectivity to Gateway
No of Intra network found to be above 90%	<80%	1	Uplink Traffic in Chennai BRAS is > 90%	4*		1	0	
Live Measurement Results								
No of Intra network Links tested		40	20* (Bandwidth checked for all uplinks from BRAS^ to core router)	37*	No separate POP/Router.	10*	2	No separate POP/Router. Direct connectivity to Gateway
No of Intra network found to be above 90%	<80%	0	0	0		0	0	

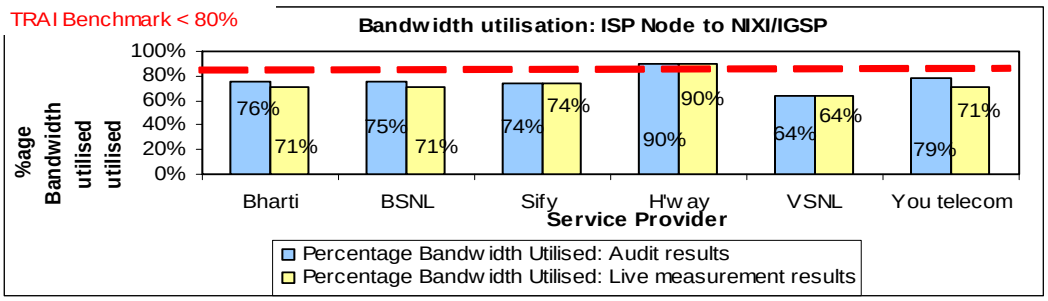
**Reported on All India Basis ,^BRAS: Broadband Remote Access Server*

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 Reliance Communications considers the links between IAG routers (ROUTER BEING USED FOR NLD INTERNET CONNECTIVITY) to CAG / CDR routers (ROUTER BEING USED FOR AGGREGATION AT CORE/DISTRIBUTION LOCATIONS) as the Intra network links.

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)



Hathaway is the only service provider found to be crossing TRAI specified Benchmark of <80% bandwidth utilization both for live measurement and month in which audit was carried out. BSNL, Sify and VSNL (TATA Communications) meet the TRAI specified benchmark cumulatively for all gateways in India

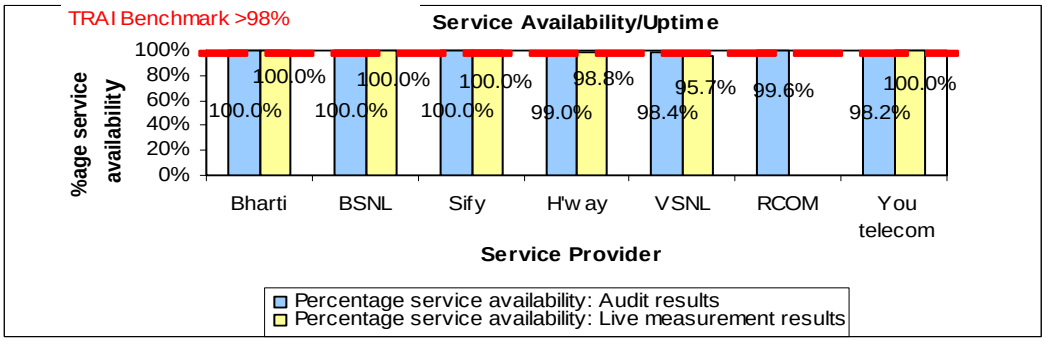
Broadband connection speed available to sample subscribers – Live calling results

Download Speed	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You Telecom
Percentage speed observed cumulatively for sample calls made	>80%	85%	89%	64%	76%	90%	63%	63%

All the service providers are meeting the benchmark for one month data collection and live measurements conducted at POPs/ISP Node. Since verification of records was not possible because of unavailability of historic data with the operators, IMRB auditors also conducted live calling to check speed available at the last mile.

Live calling results reveal that Sify, Reliance, You telecom and Hathaway (marginally by 4%) fall short the TRAI specified benchmark on download speed available to the customer.

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



All the service providers meet the benchmark with uptime of more than 98% for the month of Audit. VSNL (TATA communications) marginally falls short of the benchmark during live measurements.

However it should be considered that the service provider is taking into consideration all types of sites (including DSLAM, Building Nodes) for calculating downtime.

Also, live measurement details could not be obtained for RCOM has different methodology (based on faults reported by the customer and not network or site downtime) for calculating the above parameter and hence three day live measurement was not possible for the service provider.

Compliance reports: Results of Verification of Records for October to December 2007

7.1 Basic (Wireline) services

	Parameter	B'mark	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%	97%	97%	100%	86%	36%	36%	98%	98%
2	Fault incidence/clearance statistics									
2.1	Fault incidence	<5	3.98	4.0	6	15.79	NR	0.69	0.1	0.06
2.2	Faults repaired within 24 hours	>90%	96%	96%	92%	85%	100%	0%	99%	95%
2.3	Mean time to repair	<8 hrs	3.72	3.7	7.8	4.8	4.88	4.88	11.9	11.9
3	Call Completion Rate (CCR)	>55%	56%	56%	65%	64%	DNA		84%	84%
4	Metering and billing credibility									
4.1	Billing complaints per 100 bills issued	<0.1%	0.20%	0.20%	0.03%	0.05%	NP	0.07%	NR	0.00%
4.2	%age of billing complaints resolved within 4 weeks	100%	9%	9%	99%	94%	100%	100%	100%	100%
5	Customer care/helpline promptness									
5.1	Shift requests (Total number received)									
	Percentage shift requests attended within 3 days	95%	90%	90%	100%	75%	98%	98%	57%	57%
5.2	Closure request attended (Total number received)									
	Closure within 24 hours	95%	99%	99%	100%	93%	97%	97%	100%	100%
5.3	Supplementary (additional) service requests attended (Total number received)									
	Additional facility provided within 24 hours	95%	83%	83%	100%	69%	99%	99%	98%	98%
6	Response time to customer									
6.1	% age call answered through IVR in 20 seconds	80%	NA	NA	100%	100%	98%	98%	100%	100%
	% age call answered through IVR in 40 seconds	100%	NA	NA	100%	100%	99%	99%	100%	100%
6.2	% age calls answered by operator in 60 seconds	80%	82%	82%	100%	100%	97%	97%	95%	95%
	% age calls answered by operator in 90 seconds	95%	89%	89%	100%	100%	99%	99%	96%	96%
7	%age cases where refund received within 60 days	100%	96%	100%	100%	100%	No cases		NA	NA

Note: - For BSNL, verification process was carried out at 5% of the total exchanges spread across 10% of SDCA's. This may be one of the reasons for variation in figures reported in PMR as figures reported are basis sample and not complete universe. Also key takeouts from verification of records has already been explained in Critical findings}

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

	Parameter	B'mark	SERVICE PROVIDER											
			Bharti		BSNL		Vodafone		TATA		Reliance		Spice	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
A	Network Performance													
1	Accumulated Downtime	< 24 hrs.	9.8 hr	9.8 hr	5.63 hr	5.63 hr	23.12 hrs	23.12 hr	0.60hrs	0.60hrs	0.83hrs	0.83hrs	20.77hrs.	22.57 hrs
2	Call set up success rate	> 95%	99.50%	99.47%	97.40%	94.12%	98.49%	98.25%	98.09%	98.05%	99.40%	99.40%	99.37%	99.37%
3	Service Access delay	9 to 20 seconds	6.5 sec	6.5 sec	4.67 sec	4.67 sec	10.23 sec	10.23 sec	5.06 sec	5.06 sec	4.1sec	4.1sec	8.33 sec	8.33 sec
4	Blocked call rate													
	SDCCH Congestion	< 1 %	0.92%	0.91%	0.75%	0.74%	0.10%	0.12%	0.00%	0.00%	0.00%	0.00%	0.50%	0.50%
	TCH Congestion	< 2 %	0.93%	0.96%	2.00%	2.03%	1.41%	1.96%	0.07%	0.07%	0.00%	0.00%	1.52%	1.52%
5	Call drop rate	< 3 %	1.40%	1.36%	1.19%	1.19%	1.24%	1.69%	0.93%	0.93%	0.60%	0.60%	1.19%	1.19%
6	%age connections with good voice quality	> 95%	94.03%	94.03%	97.67%	97.67%	98.43%	98.43%	97.31%	97.31%	99.90%	99.90%	99.07%	99.07%
7	Service coverage		Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	< 0.5%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.70%	0.70%	0.08%	0.08
B	Customer Care													
	Calls answered electronically													
	Within 20 seconds	> 80%	100%	100%	99.83%	99.83%	100%	100%	100%	100%	97.30%	97.30%	100%	100%
	Within 40 seconds	> 95%	100%	100%	99.83%	99.83%	100%	100%	100%	100%	97.30%	97.30%	100%	100%
	Calls answered by the operator													
	Within 60 seconds	> 80%	76.70%	72.00%	76.29%	71.97%	88.97%	88.97%	55.50%	55.50%	82.80%	82.80%	93.40%	93.40%
	Within 90 seconds	> 95%	86.00%	81.30%	83.60%	81.67%	96.40%	96.40%	60.50%	60.50%	87.60%	87.60%	98.10%	98.10%
C	Billing complaints													
	Billing complaints/100 bills	< 0.1	0.00%	0.00%	0.09%	0.09%	0.06%	0.06%	0.04%	0.04%	0.06%	0.06%	< 0.02%	< 0.02%
	%age complaints resolved within 4 weeks	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100%	100.00%	100.00%	100.00%	100.00%
	Period of refunds due to customers	100%	Complied	Complied	Complied	Complied	Complied	Complied	Complied	Complied	Complied	Complied	Complied	Complied

Figures do not match with those reported in PMR

Figures verified on all India basis

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

7.3 Broadband services

Parameter	B'mark	Bharti		BSNL		Sify		H'way	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning									
Percentage connections provided within 15 days	100%	99%	99%	21%	21%	100%	100%	100%	100%
Fault repair restoration time									
Percentage faults repaired by next working days	> 90%	95%	95%	97%	97%	91%	91%	99%	99%
Percentage faults repaired within three working days	99%	96%	96%	100%	100%	99%	99%	100%	100%
Billing performance									
Billing complaints per 100 bills issued	<2%	Not reported in PMR		0.17%	0.17%	Prepaid		1.83%	1.89%
%age of billing complaints resolved in 4 weeks	100%			100.00%	100.00%			100%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%			100%	100%			99%	100%
Customer care/helpline assessment (Voice to Voice)									
Percentage calls answered within 60 seconds	> 60%	83%	83%	43.00%	43.00%	88%	88%	80-90%	80-90%
Percentage calls answered within 90 seconds	> 80%	90%	90%	49.00%	49.00%	98%	98%	NR	NR
Bandwidth utilization/Throughput									
Intra network links (POP to ISP Node)									
Total number of intra network links > 90%		12	12	NR	0	5	5	NR	NR
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)									
Percentage bandwidth utilized on upstream links	< 80%	87%	87%	NR	78%	85%	85%	90%	90%
Broadband download speed		No raw data available for verification							
Service availability/uptime	> 98%	99.00%	99.97%	NR	100%	100%	100%	99.68%	99.68%
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 Oct – Dec 2008 at the central node in Bangalore},

7.4 Broadband services…..Ctd

Parameter	Benchmark	VSNL		RCOM		You Telecom	
		PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning time							
Percentage connections provided within 15 days	100%	99%^^	99%^^	68%^^	68%^^	100%	100%
Fault repair restoration time							
Percentage faults repaired by next working days	> 90%	80%^^	80%^^	93%^^	93%^^	100%	100%
Percentage faults repaired within three working days	99%	92%^^	92%^^	100%^^	100%^^	100%	100%
Billing performance							
Billing complaints per 100 bills issued	<2%	2.51%	2.51%	0.41%	0.41%	0.07%	0.11%
%age of billing complaints resolved in 4 weeks	100%	99.29%	99.29%	100%	100%	100%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%	100%	100%	100%	100%	85%	85%
Customer care/helpline assessment (Voice to Voice)							
Percentage calls answered within 60 seconds	> 60%	86%	86%	73%	73%	100%	100%
Percentage calls answered within 90 seconds	> 80%	90%	90%	87%	87%	100%	100%
Bandwidth utilisation/Throughput							
Intra network links (POP to ISP Node)							
Total number of intra network links > 90%		0	0	0	0	NA	
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)							
Percentage bandwidth utilised on upstream links	< 80%	73%	73%	69%	69%	77%	77%
Broadband download speed		>80%	No historic data available for verification				
Service availability/uptime	> 98%	97.82%	97.82%	99%	99%	98%	98%
Packet loss	<2%	No raw data available for verification		0.54%	0.54%^^	<1%	<1%
Network Latency							
POP/ISP Node to NIXI	< 120 msec			33.5	Old latency graphs verified	<40 ms	<40 ms
ISP node to NAP port (Terresrtrial)	< 350 msec			275.4		<300 ms	<300 ms

^^ 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. The figures for BSNL vary because the audit was conducted only in sample exchanges (5% spread across 10% of SDCA's) and the PMR figure is reported by the operator on the overall circle level.
2. For RCOM parameters related to customer care are reported on an all India level
3. During verification process carried out at exchanges it was observed that customer care data is not maintained at the exchanges as service provider has a centralized call centre.

7.4.2 Cellular Mobile services

1. The figures for Bharti and BSNL do not match for customer care (voice to voice).
2. Also, figures for BSNL (CSSR) and Spice (Accumulated downtime) did not match during the verification process.
3. TATA and RCOM do not meet the TRAI benchmark for customer care (voice to voice)
4. RCOM does not meet the benchmark for POI congestion
5. Bharti does meet the TRAI benchmark for voice quality while BSNL does not meet the benchmark for TCH congestion

7.4.3 Broadband services

1. Complete data for Sify and Reliance was verified on an all India level
2. As mentioned earlier, it was observed that Reliance follows a different methodology for calculating packet loss which is based on faults reported by the customers and is not in line with QoS methodology.
3. VSNL was found to be including even billing complaints while reporting fault repair which has resulted in average performance by the service provider on this parameter. Also it was observed that the service provider considers all the connections less than 256kpbs as Broadband connections which is not in line with QoS methodology.
4. Most of the service providers were also found to be unaware of TRAI specified guideline for carrying out ping tests of 1000 packets of 64 bytes each.
5. 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 and You telecom
6. 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 and You telecom.

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		13799	743	1020	1733
Total number of connections provided within 7 days		13359	672	1009	1733
Percentage of connections provided within 7 days	100%	97%	90%	99%	100%
Total number of connections provided after 7 days		415	59	11	0
Percentage of connections provided after 7 days		3%	8%	1%	0%

Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration made		100	420	75	100
Number of cases in which connection was provided in 7 Days		76	295	66	100
Percentage cases in which connection was provided in 7 days	100%	76%	70%	88%	100%
Number of cases in which connection was provided after 7 days		24	64	9	0
Percentage cases in which connection was provided after 7 days		24%	15%	12%	0%

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		18833	13299	888	38
Total number of faults repaired by next working day		18301	8826	877	36
Percentage of faults repaired by next working day	> 90%	97%	66%	99%	95%
Total number of fault repaired within 3 days		18661	10395	888	38
Percentage of fault repaired within 3 days		99%	78%	100%	100%

Live calling results for Fault repair/Restoration time

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	1352	30	30
Number of cases where faults were repaired by next working day		6	901	14	23
Percentage cases where faults were repaired by next working day	> 90%	20%	67%	47%	77%
Number of cases where faults were repaired within 3 days		13	1206	21	25
Percentage cases where faults were repaired within 3 days		43%	89%	70%	83%

One month data verification results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		29018104	3352077	DNA	277497
Total number of successful local calls		16728066	2130208	DNA	236544
Call Completion Rate (CCR) in the local network	> 55%	58%	64%	DNA	85%

Live measurement results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		1027312	603949	DNA	36914
Total number of successful local calls		602289	386101	DNA	22648
Call Completion Rate (CCR) in the local network	> 55%	59%	64%	DNA	61%

One month data verification results for Billing performance

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
Billing disputes					
Total bills generated during the period		559613	82876	28546	4230
Total number of bills disputed		206	1	1	1
Percentage bills disputed	<0.1%	0.04%	0.00%	0.00%	0.02%
Resolution of billing complaints					
Total complaints resolved in 4 weeks from date of receipt		206	1	1	1
Percentage complaints resolved within 4 weeks of date of receipt		100%	100%	100%	100%

Live calling results for Billing performance

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		50	3	5	4
Number of cases resolved in 4 weeks		47	3	5	4
Percentage cases resolved in four weeks		94%	100%	100%	100%

One month data verification for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of shift requests received		964	435	3	3
Total number requests attended in 3 days	95%	902	320	3	3
Total number requests attended beyond 3 days		62	114	0	0
Shifts not attended		0	0	0	0
Percentage of requests attended in 3 days		94%	74%	100%	100%
Percentage of requests attended beyond 3 days		6%	26%	0%	0%
Percentage of shifts not attended		0%	0%	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	239	14	NA
Total number of requests attended in 3 days	95%	31	151	13	NA
Total number of requests attended beyond 3 days		19	86	1	NA
Shifts not attended		0	1	0	NA
Percentage of requests attended in 3 days		62%	63%	93%	NA
Percentage of requests attended beyond 3 days		38%	36%	7%	NA
Percentage of shifts not attended		0%	0%	0%	NA

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		3639	1033	1298	257
Total closure attended within 24 hours	95%	3639	972	1275	257
Total number of requests attended beyond 24 hours		0	58	23	0
Closure requests not attended		0	0	0	0
Percentage of closure attended within 24 hours		100%	94%	98%	100%
Percentage of closure attended beyond 24 hours		0%	6%	2%	0%
Percentage of closures not attended		0%	0%	0%	0%

One month data verification results for Supplementary Requests

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		3765	1524	1971	147
Total number of requests attended within 24 hours	95%	3719	1063	1968	146
Total number of requests attended beyond 24 hours		46	460	3	1
Supplementary requests not attended		0	1	0	0
Percentage of requests attended within 24 hours		99%	70%	100%	99%
Percentage of requests attended beyond 24 hours		1%	30%	0%	1%
Percentage of supplementary requests 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	406	31	50
Total number requests attended within 24 hours	95%	47	173	31	50
Total number requests attended beyond 24 hours		3	167	0	0
Percentage of requests attended within 24 hours		94%	43%	100%	100%
Percentage of requests attended beyond 24 hours		6%	41%	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		100	50	50	50
Calls answered within 20 seconds					
Total Number of calls answered by IVR in 20 seconds	80%	100	48	50	46
Percentage calls answered in 20 seconds		100%	96%	100%	92%
Calls answered within 40 seconds					
Total Number of calls answered by IVR in 40 seconds	95%	100	50	50	50
Percentage calls answered in 40 seconds		100%	100%	100%	100%

Live calling results for Calls Answered by Operator (Voice to voice)

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	50	50	50
Calls answered within 60 seconds					
Total Number of calls answered by operator in 60 seconds	80%	97	47	50	49
Percentage calls answered in 60 seconds		97%	94%	100%	98%
Calls answered within 90 seconds					
Total Number of calls answered by operator in 90 seconds	95%	100	50	50	50
Percentage calls answered in 90 seconds		100%	100%	100%	100%

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

Refund of deposits after closure	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		2318	9669	16	0
Number of cases where refund was made in < 60 days	100% within 60 days	2224	9555	16	0
Percentage cases where refund was made in < 60 days		96%	99%	100%	NA

Level 1 Services

Level 1 services	Bharti	BSNL	TATA
TOTAL Calls Made	200	250	150
Answered in 60 seconds	196	248	100
Percentage calls answered in 60 seconds	98%	99%	67%

8.2 Parameter wise performance reports for Cellular Mobile services

Accumulated Downtime	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Downtime (In hours)	13.70	9.18	0	0	0.90	18.15

CSSR	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of call attempts	17032557	27190158	14347096	104084059	DNP	3095427.355
Total number of successful calls	15731155	25971263	12520505	102913815	DNP	3041713.806
CSSR	92.36%	95.52%	87.27%	98.88%	99.30%	98.26%

Live measurement results for CSSR

CSSR	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of call attempts	31770	19322886	15804519	5730880	DNP	4368651.333
Total number of successful calls	29740	19022114	13077646	5669849	DNP	4311815
CSSR	93.61%	98.44%	82.75%	98.94%	99.08%	98.70%

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

CSSR	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of call attempts	143	155	171	203	121.00	108
Total number of successful calls	139	152	156	203	121.00	105
CSSR	97%	98%	91%	100%	100%	97%

Service Access Delay	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
One month data collection	4.15	11.20	2.86	9.05	4.10	11.50

Traffic Statistics (One month verification)	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
SDCCH Congestion						
Total number of SDCCH Attempts	35156873	4195293	11497812	706194	DNP	5730587
Total Number of SDCCH Congestions	344537.36	34401.40	DNP	0	DNP	17192
Percentage SDCCH Congestion	0.98%	0.82%	0.89%	0.00%	0%	0.30%
TCH Congestion						
Total number of TCH Attempts	17032557	764171	4931071	1763130	DNP	3095427
Total Number of TCH Congestions	337244.63	14519.25	DNP	705.252	DNP	49527
Percentage TCH Congestion	1.98%	1.90%	2.46%	0.04%	0.48%	1.60%

Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
SDCCH Congestion						
Total number of SDCCH Attempts	35683860	9159085	11132914	1966730	DNP	5681742
Total Number of SDCCH Congestions	735088	DNP	DNP	0	DNP	15341
Percentage SDCCH Congestion	2.06%	2.04%	0.10%	0.00%	0%	0.27%
TCH Congestion						
Total number of TCH Attempts	17054280	8965411	4960983	2700535	DNP	4359243
Total Number of TCH Congestions	646357	1698945	105669	1890	DNP	74979

Percentage TCH Congestion	3.79%	18.95%	2.13%	0.07%	0.46%	1.72%

DNP – the figure was obtained directly from the system.

Audit Results for Call drop rate

Call drop rate	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of calls established	15731155	948262228	4766484	102913815	DNP	5768771
Total number of calls dropped	289066	6853462	100964	361253	DNP	68247
Call drop rate	1.84%	0.72%	2.12%	0.35%	0.70%	1.18%

Live measurement results for Call drop rate

Call drop rate	Bharti	BSNL	Vfone	TATA	RCOM	Spice
Total number of calls established	48759374	100391794	4831004	5669849	DNP	6153753
Total number of calls dropped	874311	739621	88774	41243	DNP	69593
Call drop rate	1.79%	0.74%	1.84%	0.73%	0.62%	1.13%

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

Call drop rate	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of calls established	138	152	156	203	121.00	105
Total number of calls dropped	1	3	9	0	0.00	3
Call drop rate	0.72%	1.97%	5.77%	0.00%	0.00%	2.86%

DNP – the figure was obtained directly from the system.

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

Voice quality	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total number of sample calls	182355	214822	177249	5620	7538	95059
Total number of calls with good voice quality	175462	196124	162291	5572	7432	85257
%age calls with good voice quality	96.22%	91.30%	91.56%	99.15%	98.59%	89.69%

Audit Results for POI Congestion

POI congestion	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
POI traffic offered on all individual POI's	From system	From system	From system	From system	From system	From system
Served traffic for all individual POI's	From system	From system	From system	From system	From system	From system
Traffic failed on all individual POI's	0.00%	0.01%	0.00%	0.63%	0.00%	0.08%

Live measurement results for POI congestion

POI congestion	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
POI traffic offered on all individual POI's	From system	From system	From system	From system	From system	From system
Served traffic for all individual POI's	From system	From system	From system	From system	From system	From system
Traffic failed on all individual POI's	0.00%	0.52%	0.00%	0.91%	0.00%	0.09%

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Bharti		89%	95%	94%	88%	95%
BSNL	88%		90%	87%	90%	85%
Vodafone	97%	88%		100%	91%	92%
TATA	92%	89%	96%		86%	90%

RCOM	94%	95%	94%	96%		91%
Spice	79%	92%	71%	69%	66%	

Audit results for customer care (Electronically)

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls received by	26677698	2309789	26677698	467590	40324997	DNP
Total Number of calls answered in 20 seconds	26677698	2309789	26677698	467590	39478172	DNP
Percentage calls answered in 20 seconds	100.00%	100.00%	100%	100.00%	97.90%	100.00%
Total Number of calls answered in 40 seconds	26677698	2309789	26677698	467590	39478172	DNP
Percentage calls answered in 40 seconds	100.00%	100.00%	100.00%	100.00%	97.90%	100%

Live calling results for customer care (Electronically)

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls received by the operator	100	50	100	100	100	100
Total Number of calls answered in 20 seconds	100	50	100	100	100	100
Percentage calls answered in 20 seconds	100%	100%	100%	100%	100%	100%
Total Number of calls answered in 40 seconds	100	50	100	100	100	100
Percentage calls answered in 40 seconds	100.00%	100.00%	100.00%	100.00%	100%	100%

Audit results for customer care (Voice to Voice)

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls received by the operator	3866130	775970	3155740	87552	74083	1284249
Total Number of calls answered in 60 seconds	3251987	735620	**2499694**	83418	66893	**1074916**
Percentage calls answered in 60 seconds	84.11%	94.80%	79.21	95.28%	90.29%	83.70%
Total Number of calls answered in 90 seconds	35866692	751848	2879951	84621	68916	**1236732**
Percentage calls answered in 90 seconds	96.89%	96.89%	90.26	96.65%	93.03%	96.36%

Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls made	100	50	100	100	100.00	100
Number calls answered within 60 seconds	100	50	100	100	99.00	70
Percentage calls answered in 60 seconds	100.00%	100%	100.00%	100.00%	99%	70%
Number calls answered within 90 seconds	100	50	100	100	100.00	85
Percentage calls answered in 90 seconds	100.00%	100%	100.00%	100.00%	100%	85%

Billing Performance	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Billing disputes						
Total bills generated during the period	36745	150520	331005	142610	173441.00	1596947
Total number of bills disputed	0	674	103	53	131.00	205
Percentage bills disputed	0.00%	0.45%	0.03%	0.04%	0.08%	0.01%
Resolution of billing complaints						
Total complaints resolved in 4 weeks from date of receipt	NA	674	103	53	131.00	205
Percentage complaints resolved within 4 weeks of date of receipt	NA	100%	100%	100%	100%	100%
Refund of deposits after closure						
Total number of cases requiring refund of deposits	NA	0	43	53	131.00	44
Total number of cases where refund was made within 60 days	NA	0	32	53	131.00	44
Percentage cases in which refund was receive within 60 days	NA	NA	74%	100%	100%	100%

5.10.2 Live calling results for resolution of billing complaints

Resolution of billing complaints	Bharti	BSNL	Vodafone	TATA	RCOM	Spice
Total Number of calls made	NA	100	100	29	30	100
Number of cases resolved in 4 weeks	NA	100	100	28	28	99
Percentage cases resolved in four weeks	NA	100.00%	100.00%	96.55%	93.33%	99.00%

DNP – the figure was obtained directly from the system.

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	RCOM	You telecom
No of connections registered during the period		6545	16270	344	1244	2386	1598	196
Total number registered during 15 days		6425	12878	344	1147	2362	1460	196
Percentage of connections provided within 15 days	100%	98.2%	79.2%	100%	92%	99.0%	91.4%	100.0%

Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	VSNL	RCOM	You telecom
Total Number of calls made		100	86	35	100	15	71	100
Number of cases in which connection was provided in 15 Days		96	30	34	98	11	61	86
Percentage cases in which connection was provided in 15 days	100%	96%	35%	97%	98%	73%	86%	86%
Number of cases in which connection was provided beyond 15 days		4	54	1	2	2	10	
Percentage cases in which connection was provided after 15 days		4%	63%	3%	2%	13%	14%	

One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total number of faults registered during the period		3539	16318	2614	460	13046	1970	790
Total number of faults repaired by next working day		3380	15763	2367	416	10828	1962	787
Percentage of faults repaired by next working day	>90%	96%	97%	91%	90%	83%	100%	100%
Total number of faults repaired within three working days		3468	16269	2604	454	12002	1970	789
Percentage of faults repaired within three working days	>99%	98%	100%	100%	99%	92%	100%	100%

Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		30	41	10	30	12	30	29
Number of cases in which faults were repaired by next working day		15	13	7	3	5	10	20
Percentage cases in which faults were repaired by next working day	>90%	50%	32%	70%	10%	42%	33%	69%
Number of cases in which faults were repaired within three working days		27	25	10	13	11	20	27
Percentage cases in which faults were repaired within three working days	>99%	90%	61%	100%	43%	92%	67%	93%

One month data verification results for billing performance

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Billing diputes								
Total bills generated during the period		138117	234019	Prepaid	Prepaid	13460	12362	8495
Total number of bills disputed		35	506	Prepaid	Prepaid	256	225	15
Percentage bills disputed	<2%	0.03%	0.22%	Prepaid	Prepaid	1.90%	1.82%	0.18%
Resolution of billing complaints								
Total complaints resolved in 4 weeks from date of receipt		33	506	Prepaid	Prepaid	256	225	15
Percentage complaints resolved within 4 weeks of date of receipt	100%	94%	100%	Prepaid	Prepaid	100%	100%	100%
Refund of deposits after closure								
Total number of cases requiring refund of deposits		0	NR	0	38	430	16	90
Total number of cases where refund was made within 60 days		0	NR	0	38	430	16	90
Percentage cases in which refund was receive within 60 days	100%	NA	NR	NA	100%	100%	100%	100%

Live calling results for billing complaints

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		83	100	Prepaid	Prepaid	100	20	25
Number of cases resolved in 4 weeks		34	100	Prepaid	Prepaid	77	5	25
Percentage cases resolved in four weeks	100%	41%	100%	Prepaid	Prepaid	77%	25%	100%

Live calling results for call centre

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		50	50	50	100	50	50	50
Calls answered within 60 seconds								
Number calls answered within 60 seconds		50	50	50	87	50	50	50
Percentage calls answered in 60 seconds	>60%	100%	100%	100%	87%	100%	100%	100%
Calls answered within 90 seconds								
Number calls answered within 90 seconds		50	50	50	97	50	50	50
Percentage calls answered in 90 seconds	>80%	100%	100%	100%	97%	100%	100%	100%

One month data verification results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Operational Hours		105079584	53568	744	744	860400	27413280	2877048
Total Downtime		25944	2	0	7.5	14057	335	51007
Total time when the service was available		105053640	53566	744	736.5	846343	0	2826041
Service Availability Uptime in Percentage	>98%	100.0%	100.0%	100.0%	99.0%	98.4%	99.6%	98.2%

Three day live measurement results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Operational Hours		10369272	1728	72	72	414390	DNA	24
Total Downtime		0	0	0	49	17682	DNA	0
Total time when the service was available		10369272	1728	72	71.1	396708	DNA	24
Service Availability Uptime in Percentage	>98%	100.00%	100.00%	100.00%	98.8%	95.73%	DNA	100.00%

One month data verification results for Bandwidth utilisation

Bandwidth Utilization	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Intra-network links (POP to ISP Node)								
Total number of intra network links		772	BRAS-23,T1-24,T2-610, DSLAM-5456	400	NA	16	2	NA
No of Intra network found to be above 90%		1	Uplink Traffic in Chennai BRAS is > 90%	4	NA	1	0	NA
Upstream Links (ISP Node to IGSP/NIXI/NAP)								
Total number of upstream links		1	97	28	4	28	NA	1
No of Intra network found to be above 90%		0	1	0	1	0	NA	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		3285	17233	2830	86.5	29462	NA	14
Total International Bandwidth utilised during peak hours		2483	12877	2097	78	18720	NA	11
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	76%	75%	74%	90%	64%	NA	79%

Live measurement results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Intra-network links								
Total number of intra network links		772	BRAS-23,T1-24,T2-610, DSLAMS-5456	400	NA	16	2	NA
No of Intra network Links tested		40	20	37	NA	10	0	NA
No of Intra network found to be above 90%		0	0	0	NA	0	0	NA
International Bandwidth (ISP Node to IGSP/NIXI/NAP)								
Total number of upstream links		1	97	28	4	10	NA	1
No of Intra network found to be above 90%		0	10 t0 20	0	1	0	NA	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		3694	18157	2830	86.5	29462	NA	14
Total International Bandwidth utilised during peak hours		2629	12909	2082	78	18720	NA	10
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	71%	71%	74%	90%	64%	NA	71%

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

*****