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

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

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Preface

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

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

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

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

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various 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 UP(E) circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) and Broadband services

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1.0 **Background**

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

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

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

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

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

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

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

The present report highlights the findings for the Audit module for UP(E) 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 cities as per the norms stated in the tender document

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 84 exchanges (24 Urban and 64 Rural) exchanges were audited.

- For rest of the service providers (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 UP (E) circle

- Bharti Airtel Ltd. – 10 MSCs
- Idea Cellular – 1 MSC
- Tata Teleservices ltd – 2 MSCs
- Reliance communications – 6 MSCs
- BSNL – 11 MSCs
- Vodafone Essar Ltd. – 10 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 UP (E) 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 UP (E) circle: - Bharti Airtel Ltd., Hathaway, Sify, Reliance, BSNL, VSNL (TATA communications Ltd.) and Hathaway.

- For VSNL (TATA communications) one month audit data provided in the report includes data for Kolkata circle, as service provider reports the same to TRAI cumulatively.

- For Hathaway the data provided in the report includes data for UP (W) circle, as service provider reports the same to TRAI cumulatively.

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 UP(E) 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
1	Provision of telephone after registration of demand				
1.1	Connections completed within 7 days	100%	100%	92%	100%
2	Fault incidence/clearance statistics				
3	Fault incidences(No. of faults/100 subscribers/month)	<3	6.9	10.75	9.05
3.1	Faults repaired within 24 hours	>90%	98%	54%	100%
3.2	Faults repaired within three working days	100%	98%	93%	100%
4	Mean time to Repair (MTTR)	<8 hours	6.70	34	<5
5	Call Completion Rate (CCR)	>55%	97%	36%	DNA
6	Metering and billing credibility				
6.1	Billing complaints per 100 bills issued	<0.1%	0.05%	0.10%	0.03%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	89%	100%
7	Customer care/helpline promptness				
7.1	Shift requests attended				
	Shift requests attended within 3 days	95%	88%	51%	NA
7.2	Closure request attended				
	Closure within 24 hours	95%	93%	50%	100%
7.3	Supplementary (additional) service requests attended				
	Additional facility provided within 24 hours	95%	99%	96%	100%
8	Response time to customer for assistance				
8.1	% age call answered through IVR in 20 seconds	80%	Not measured by the operator	Details not available at the exchanges	100%
	% age call answered through IVR in 40 seconds	100%			100%
8.2	% age calls answered by operator in 60 seconds	80%	87%		99%
	% age calls answered by operator in 90 seconds	95%	93%		100%
9	Time taken for refund of deposits after closure				
9.1	%age cases where refund received within 60 days	100%	DNA	97%	100%

{*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

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

The Basic (Wireline) services audit for UP (E) circle broadly indicates that none of the operators is meeting all the benchmarks, as mandated by TRAI (Telecom Regulatory Authority of India). Making a relative comparison Reliance Communications (RCOM) emerges out to be the better performing operator for most of the parameters.

The live calling results were found to below when compared with one 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) BSNL (at 44%) was found to be falling short of TRAI specified benchmark of <55% for sample exchanges covered during the period of Audit. However, when taken at an individual level some exchanges were found to be comfortably 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 UP (E) circle.

The parameter wise key takeouts for the wireline service providers for the UP (E) circle are as under:-

Provision of telephone after registration of demand

- BSNL at 92% falls short of the TRAI specified benchmark. 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 94 of subscribers of Bharti claimed that the connection was provided within the time period of 7 days followed by RCOM (89%) and BSNL (78%).

Fault incidence / clearance statistics

- None of the operator meets the benchmark for fault incidences (number of faults per 100 customers).
- For BSNL fault incidences and Mean Time to Repair (MTTR) was found to be high at some individual exchanges which has resulted in a poor score for the service provider on these parameters.
- As per the 1-month audit data findings, BSNL at 54% 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 100% followed by Bharti at 98%. 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(93%) 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 Bharti at 50% followed by RCOM and BSNL at 20% and 12% respectively. As mentioned earlier

a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit).

- Interestingly, during verification of records at certain exchanges for BSNL it was revealed that rent rebates are being provided to the customers only when the same is claimed by the customer.

Traffic statistics (CCR)

- BSNL was found to be not meeting the benchmark cumulatively for sample exchanges covered during the period of Audit. However, when taken at an individual level there were exchanges which were found to be meeting the benchmark comfortably.
- 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/almost 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", BSNL (51%) and Bharti (88%) fall short of TRAI specified benchmark of 95% for the month in which audit was carried out.
- For closure requests within 24 hours BSNL (50%) and Bharti (93%) again fall short of the benchmark of 95%.
- For supplementary service requests, all the operators 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 not available at the exchanges.
- 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.
- For live calling results carried out to check the efficiency of calls answered by the operator, BSNL marginally falls short of the TRAI specified benchmark both for calls answered within 60 seconds and 90 seconds

Time taken for refund of deposits after closure

- BSNL (by 3%) marginally falls short of TRAI specified benchmark for time taken to refund after closure. For Bharti, operator was unable to provide the details during the audit process. For Reliance there was only one case where refund was to be provided during the month of Audit.

Level 1 Services

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking) offered by BSNL approximately 300 calls were made to different numbers and time taken to answer the call was noticed. 84% of the total calls made were answered in 60 seconds. The connectivity was found to be poor for General enquiry i.e. 197

For Bharti, 165 calls were made to different numbers out of which 84% were answered in 60 seconds. Maximum time was taken for calls made to Railway enquiry where only 8 out of 25 calls made were answered in 60 seconds.

For Reliance total 70 calls were made at different numbers out of which 75% were answered in 60 seconds. As in case with Bharti maximum time was taken for calls made to Railway enquiry.

Summary of Live Measurement Results – Basic Wireline Services

- For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable.
- BSNL falls short of the benchmark with a score of 44% cumulatively for sample 44% of exchanges. Bharti score during live measurements was observed to be 62%.

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	RCOM	IDEA
Accumulated downtime for community isolation	< 24 hrs.	10.16	2.15	0.00	0.00	0.93	18.62
Call Set Up Success Rate (CSSR)	> 95%	95.84%	96.88%	96.17%	98.33%	98.47%	99.06%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	14.19	10.85	6.33	5.11	4.00	20.50
Blocked Call Rate							
SDCCH /Paging Channel Congestion	<1%	0.93%	0.66%	0.70%	0.00%	0.00%	0.17%
TCH Congestion	< 2%	1.96%	1.50%	1.87%	0.00%	0.53%	0.94%
Call drop rate	< 3%	1.54%	1.64%	2.24%	0.97%	0.97%	1.41%
Percentage connections with good voice quality*	> 95%	100.00%	93.03%	91.33%	99.18%	99.91%	96.45%
Service coverage*							
In door	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
In vehicle	>-85dbm						
Out door - in city	>-95dbm						
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied
Calls answered electronically							
Percentage calls answered within 20 seconds	80%	80.00%	81.00%	100.00%	100.00%	97.90%	96.00%
Percentage calls answered within 40 seconds	95%	95.00%	94.00%	100.00%	100.00%	97.90%	Operator does not measure the same
Calls Answered by the operator							
Percentage calls answered within 60 seconds	80%	79.91%	84.00%	96.81%	95.90%	91.57%	95.00%
Percentage calls answered within 90 seconds	95%	82.05%	96.00%	99.11%	96.64%	94.73%	Operator does not measure the same
Billing Complaints							
Billing complaints per 100 bills issued	<0.1%	0.08%	0.10%	0.00%	0.07%	0.10%	0.01%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	100%	99%	100%	NA	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 UP(E) 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	1900 -2000	1900 -2000
BSNL	1900 -2000	1900 -2000
RCOM	1100 – 1200	1900 – 2000
IDEA	1900 -2000	1900 -2000
TATA	1900 -2000	1900 -2000
Vodafone	1900 -2000	1900 -2000

The TCBH reported by all the service providers except Reliance matched the network busy hour calculated by IMRB auditors for the UP (E) 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 UP(E) 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. IDEA 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 10.16 hours for the month of audit. The community isolation of BSNL was just above two hours in the month of audit.

Call Set-up Success Rate (CSSR):

All the operators were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for IDEA with 99.06% of their calls getting completed. Bharti had 95.84% CSSR which was relatively the lowest among all services providers. 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 UP(E) 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 IDEA at more than 20 seconds. Rest all of the operators 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 are meeting the TRAI specified on the congestion parameters. Bharti relatively has the highest SDCCH congestion at 0.93% and TCH congestion at 1.96%. 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.

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 successful 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 & RCOM with only 0.97% call drop and the relative highest (although it easily met the benchmark) was for Vodafone with 2.24%.

% 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 and BSNL 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 except BSNL with only 94% of the calls being answered by the IVR within 40 seconds 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 Bharti (both for 60 as well as 90 seconds) and RCOM (percentage calls answered within 90 seconds) meet the benchmark for the month of audit. IDEA claimed that it has no system of measuring calls answered through IVR within 40 seconds and calls answered by operator within 90 seconds.

Billing performance

BSNL & RCOM was found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. Both score 0.1% on the same. In all cases where customers were due for refund, all the service providers except BSNL meet the TRAI benchmark of 100% with 4 weeks.

Inter operator calls assessment

Inter operator call Assessment (To/From)	Bharti	BSNL	Vodafone	TATA	RCOM	IDEA
Bharti	NA	78%	98%	100%	98%	100%
BSNL	90%	NA	100%	100%	93%	100%
Vodafone	83%	72%	NA	100%	92%	100%
TATA	85%	67%	100%	NA	93%	100%
RCOM	77%	58%	99%	96%	NA	98%
Idea	78%	75%	99%	100%	95%	NA

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. The calls from Bharti to all other service providers were established in the range of 77% to 90%. Similarly BSNL's connectivity with all the operators was found to be not that good where only 58% to 78% of its calls to numbers of other operators got connected. However, Vodafone has maximum difficulty in connecting to a Bharti number with 98% of its calls getting connected. TATA had problems in connecting to RCOM with only 96 out of 100 of its calls getting established. Also, RCOM's connectivity to Vodafone was not good with only 92 out of 100 calls getting connected. BSNL had the most problem in connecting to almost all the operators with only 58% 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 67% and 72% respectively.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the UP(E) circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Lucknow, Barabanki and Mohanlal Ganj. 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 UP(E) 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 UP(E) circle were conducted in the cities of Lucknow, Barabanki and Mohanlal Ganj was conducted along the following route:

Area	Type of Location	Lucknow	Barabanki	Mohanlal Ganj
Outdoor	Periphery of the city	VIP road to Nehria via Airport	Awasvilkas to Faizabad Road via New By pass	Raibarely to Kanpur Road
	Congested Area	Kaiserbagh	Naka Chowk	Mohanlalganj Town
	Across the City	Nehria to Kaiserbagh via Alambagh	Station road to Deva Road	From PGI to Mohan Lal Ganj
Indoor	Office Complex	Shalimar Square	LIC office	Mohanlalganj court
	Shopping Complex	Taj Kumar Plaza	Vishal Megamart	Mohanlalganj Bus stand

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

Drive Test - Lucknow

	Bharti		BSNL		Vodafone		TATA		IDEA		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	100.00%	100.00%	97.91%	89.08%	97.55%	89.97%	99.96%	96.95%	97.52%	91.70%	99.94%	99.94%
CSSR	100.00%	100.00%	100.00%	98.94%	100.00%	100.00%	100.00%	100.00%	97.83%	93.20%	100.00%	100.00%
Call drop rate	0.00%	0.00%	0.00%	3.23%	0.00%	0.00%	0.00%	0.00%	0.00%	2.08%	0.00%	0.00%
Hands off success rate	100.0%	100.0%	100.0%	98.8%	100.0%	100.0%	100.0%	100.0%	100.0%	99.0%	100.0%	100.0%

Drive Test - Barabanki

	Bharti		BSNL		Vodafone		TATA		IDEA		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	100.00%	100.00%	94.44%	89.74%	91.62%	78.31%	99.31%	98.59%	99.26%	96.43%	99.92%	99.91%
CSSR	100.00%	100.00%	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%	0.00%	0.00%	1.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Drive Test – Mohan Lal Ganj

	Bharti		BSNL		Vodafone		TATA		IDEA		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	100.00%	100.00%	99.46%	95.09%	96.43%	90.38%	99.96%	98.91%	99.68%	94.84%	99.84%	99.88%
Call set up Success Rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.97%	100.00%	100.00%
Call drop rate	0.00%	0.00%	0.00%	1.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Not meeting the benchmark

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

ALL SERVICE PROVIDERS

Lucknow: There was interference and low signal strength recorded for all operators in the outdoor areas of Cantonment area, jail road and in the congested area of Latouche road whereas in the indoor areas across all operators there was adequate coverage found.

Barabanki: There was interference and low signal strength recorded for all operators in the outdoor areas of new by pass of Faizabad Road, on town extremities towards Nawabganj Road, Satrikh Naka-towards Haidergarh Road and back towards Faizabad Road, Bus Stop, Laiya Mandi, Barabanki - Gonda road and in the indoor areas across Barabanki there was no interference and inadequate coverage recorded.

Mohan Lal Ganj: There was interference and low signal strength recorded for all the operators in the outdoor areas near Maharana Pratap College while there was no interference or inadequate coverage recorded in the indoor areas

Conclusions:

1. Vodafone (especially for outdoor areas) does not meet the TRAI benchmark on percentage connections with good voice quality during the drive tests for all the three cities.
2. Also, BSNL in Lucknow and Barabanki and IDEA in Lucknow and Mohanlal Ganj does not meet the benchmark for percentage connections with good voice quality especially for outdoor areas.
3. BSNL experienced high call drop rate in the city of Lucknow.
4. In the Cantonment area of Lucknow, because of restriction from cantonment board, no operator is able to deploy the site there; hence RF coverage is not up to the mark.

Summary of Live Measurement Results – Cellular Mobile Services

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	RCOM	IDEA
CSSR	> 95%	96.01%	97.06%	96.16%	98.15%	96.76%	99.22%
SDCCH / Paging Channel Congestion	< 1%	0.87%	0.36%	0.63%	0.00%	0.00%	0.12%
TCH Congestion	< 2%	1.60%	2.77%	1.85%	0.00%	0.47%	0.78%
POI congestion	< 0.5%	0%	0%	0%	0%	0%	0%
Call drop rate	< 3%	1.85%	1.03%	2.60%	1.02%	1.01%	1.34%

Not meeting the benchmark

During the three day live measurement, all the operators were found to be meeting the TRAI benchmark on CSSR. IDEA leads the way with a CSSR of 99.22% while Bharti relatively has the lowest CSSR in the UP (E) circle for the three day live measurement with a call success rate of 96.01%.

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 0.87% followed closely by Vodafone at 0.63%. RCOM and TATA experienced no Paging Channel

Congestion. BSNL did not meet the benchmark on traffic channel congestion with a congestion of 2.77% respectively.

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 2.60% calls getting dropped after establishment followed by Bharti at 1.85%. The lowest call drop rate was observed for RCOM with only 1.01% 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
1	Service provisioning uptime							
1.1	Total connections registered		1280	3015	112	180	477	233
1.2	Percentage connections provided within 15 days	100%	100%	70%	100%	100%	99%**	79%**
2	Fault repair restoration time							
2.1	Total number of faults registered/calls made		1176	2506	126	367	10992	983
2.2	Percentage faults repaired by next working days	> 90%	99%	78%	90%	93%	80%**	100%
2.3	Percentage faults repaired within three working days	99%	100%	94%	100%	99%	93%**	100%
3	Billing performance							
3.1	Total bills generated		17609	26859	Prepaid	135	6013	2413
3.2	Billing complaints per 100 bills issued	<2%	0.03%	0.23%		1.48%	1.18%	0.12%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	75%		100%	100%	100%
3.4	Time taken for refund of deposits after closure	100%	DNA	100%	No cases		100%	100%
4	Customer care/helpline assessment							
4.1	Percentage calls answered within 60 seconds	> 60%	56%	99%	100%	84%	78%	84%
4.2	Percentage calls answered within 90 seconds	>80%	66%	100%	100%	DNA	85%	90%
5	Bandwidth utilisation/Throughput							
5.1	Total number of intra network links tested		49	BRAS-23,T1-24,T2-610, DSLAM-5456	400	9 (4 in Kanpur and 5 in Noida)	16	5 (Links physically located in Delhi NCR)
5.2	Total number if intra network links crossing 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	1	0
	Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)							
5.3	Total number of upstream links		2 (Present in Delhi)	97	28	3	28	1 (Delhi to NIXI)
5.4	Number of links > 90%		0	1	0	0	0	0
5.5	Percentage bandwidth utilised on upstream links	<80%	20%	75%	74%	69%	64%	22%
6	Broadband download speed	>80%						
7	Service availability/uptime	>98%	99.99%	100.00%	100.00%	99.80%	98.35%	100.00%
8	Packet loss	<1%	<1%	<1%	<1%	<1%	<1%	DNA**
9	Network Latency							
9.1	POP/ISP Node to NIXI to IGSP	<120msec	< 60	<120	<45 ms	<30	<80	<40
9.2	ISP node to NAP port	<350msec	< 120	Complied	<250 ms	<100	<180	<250

** 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

- Sify, Hathaway and Bharti are the three operators who manage to meet the TRAI benchmark of 100% connections to be provided within 15 days.
- For Live calling carried out all the service providers were found to be doing well as more than 90% of subscribers for all the service providers claimed that their connection was activated 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), BSNL and Sify are falling below the benchmark for fault repair within next working day.
- For fault repair within three working days Sify (100%), Hathaway (99%) and RCOM (100%) were found to be 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 3% subscribers (for VSNL) and 7% subscribers (for RCOM and Sify) 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 BSNL at 75%) 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 (except Bharti) meet the benchmark for percentage calls answered within 60 and 90 seconds by the operator (Voice to Voice) for the month of Audit.
- For Live calling results for calls answered within 90 and 60 seconds for most of the operators (except Sify which at 80% marginally falls short for calls answered within 90 seconds) meet the TRAI specified benchmark

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 their 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.
- 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%.
- 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 and Sify meet the TRAI specified benchmark cumulatively for all the gateways present in India. For Hathaway and Bharti traffic on upstream links (to IGSP) was observed to be low when compared to the existing capacities. Both the service providers have their upstream links (from ISP Node to IGSP/NIXI) physically located in Delhi.

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 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, Bharti was the only operator found to be meeting the TRAI specified benchmark of greater than 80% speed available (cumulatively for sample calls made to the customers)

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. 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 are meeting the benchmark prescribed by TRAI.

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Service Availability Uptime	>98%	99.86%	100.00%	100.00%	100.0%	98.34%	DNA**
No of Intra network links found to be above 90% (Out of sample links tested)		0	0	0	0	0	0
Total Bandwidth utilization at all upstream links	< 80%	21%	71%	74%	69%	64%	20%
Data Download Speed	> 80%	Complied	Complied	Complied	Complied	Complied	Complied
Packet Loss (Percentage)	< 1%	<1%	<1%	<1%	<1%	<1%	<1%
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	< 55	Complied	<15 ms	<21	<80	<40
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	<110	Complied	240 ms	<100	<230	<250

** Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

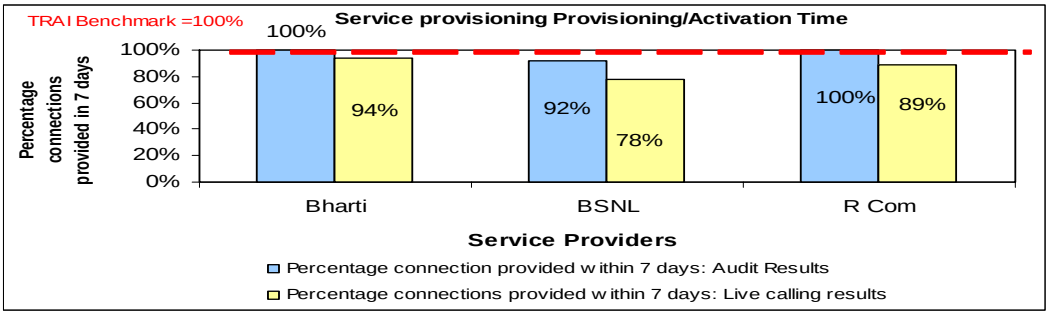
B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

- All the service providers are meeting the benchmark on service availability/uptime for three day live measurements. As explained earlier, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator. 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.
- 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 were 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 network latency all the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements. The same was measured by conducting ping tests as per the TRAI specifications.

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

6.1 Graphical/Tabular Representations for Basic (Wireline) services

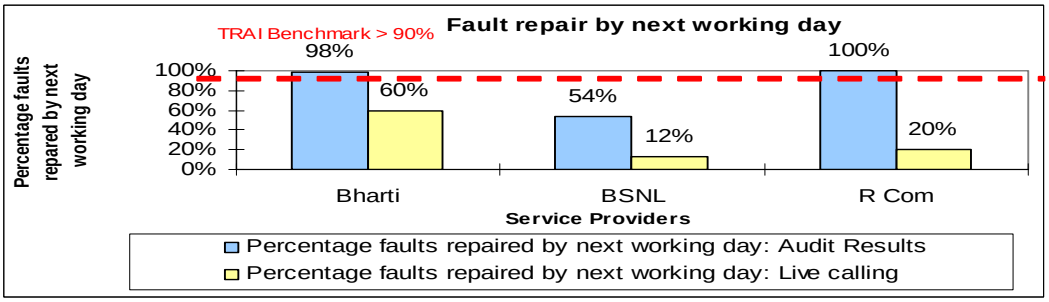
Service provisioning / Activation time (Comparison between one month audit results and live calling results)



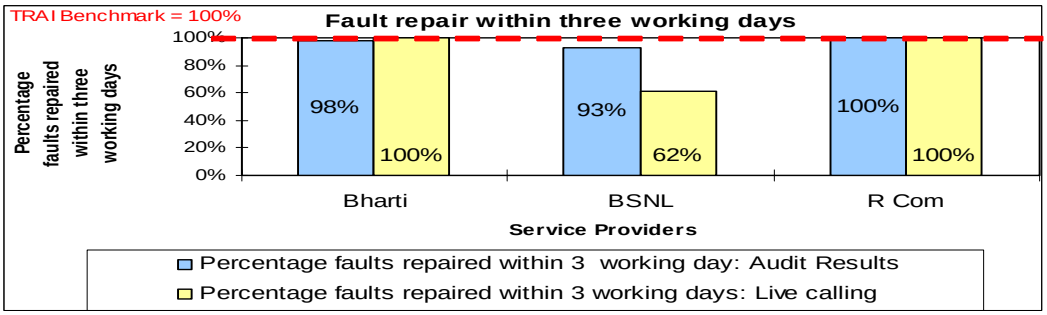
BSNL with 92% connections registered within 7 days falls short of TRAI specified benchmark. But the service provider's score is deemed to be good as BSNL was found to be providing connections in rural as well as urban areas.

Live calling scores are observed to be good with 78% (lowest) subscribers for BSNL and 94% subscribers for Bharti claiming that the connection was activated within 7 days.

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

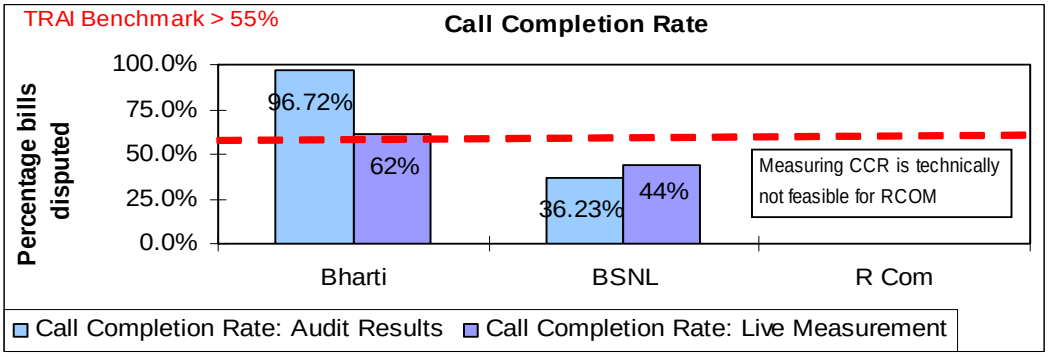


For fault repair by next working day BSNL falls short of the TRAI specified benchmark at 54%. For live calling scores only 12% (lowest) of BSNL and 20% of R Com subscribers called claimed that the faults reported by them where cleared by next working day.



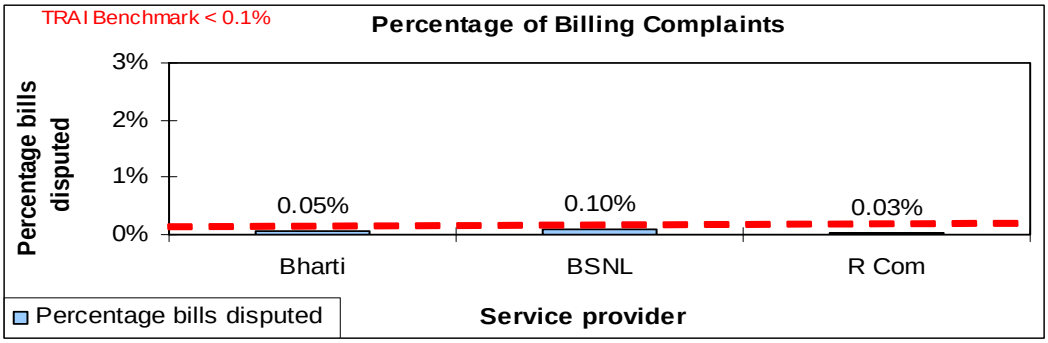
BSNL (by 7%) and Bharti (by 2%) fall short of TRAI specified benchmark for fault repair within 3 working days. Interestingly both BSNL (at 62%) and Reliance (at 100%) have improved their scores on live calling when compared with results on fault repair within 24 hours.

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



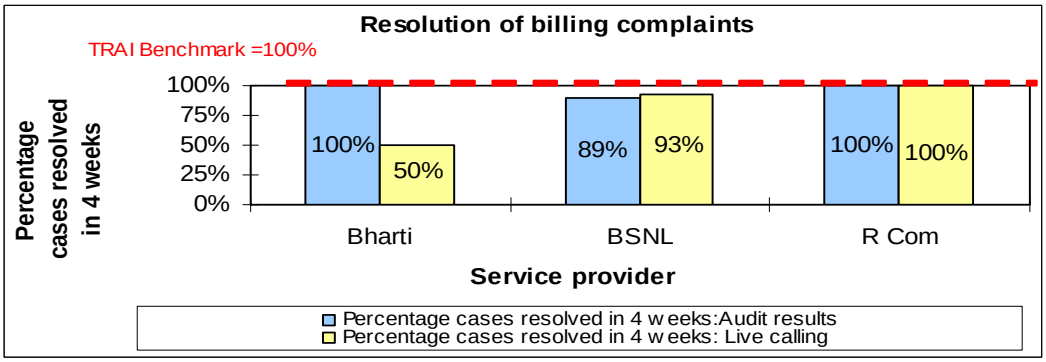
BSNL falls short of TRAI specified benchmark for CCR both for live measurements and one month data collection for sample 5% of exchanges covered for Audit. It should however be noted that service providers score remained low for some of the exchanges whereas some exchanges were comfortably meeting the benchmark. 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



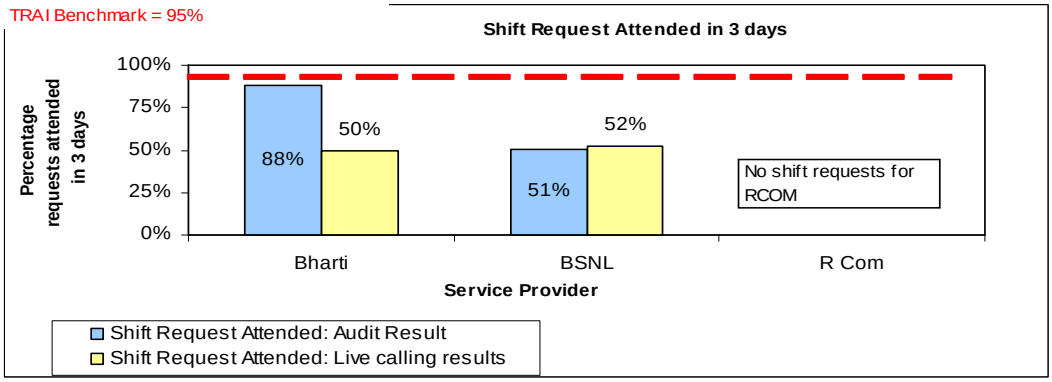
All the subscribers meet/almost meet the TRAI specified benchmark as percentage billing complaints remain <0.1% for all the operators

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



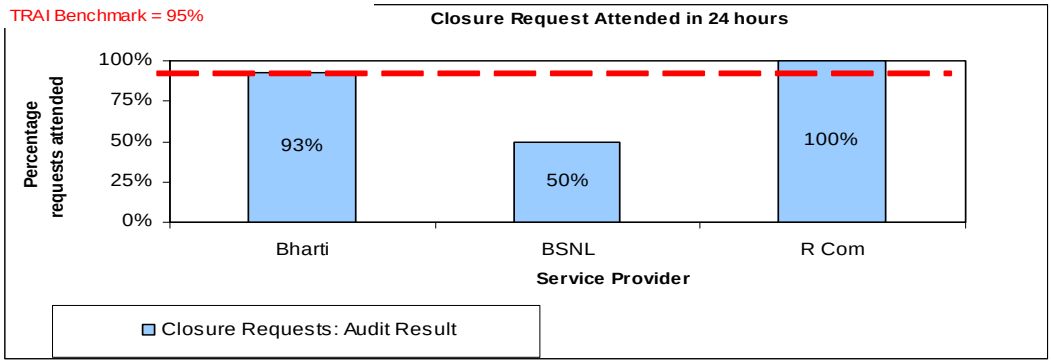
All the service providers (except BSNL) meet the TRAI specified benchmark for resolution of billing complaints within 4 weeks. For live calling results 93 % of BSNL subscribers and 50% of Bharti, subscribers called claimed that their complain was resolved within 4 weeks. However sample calls made were low (<5) for RCOM and owing to less billing complaints reported by customers.

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



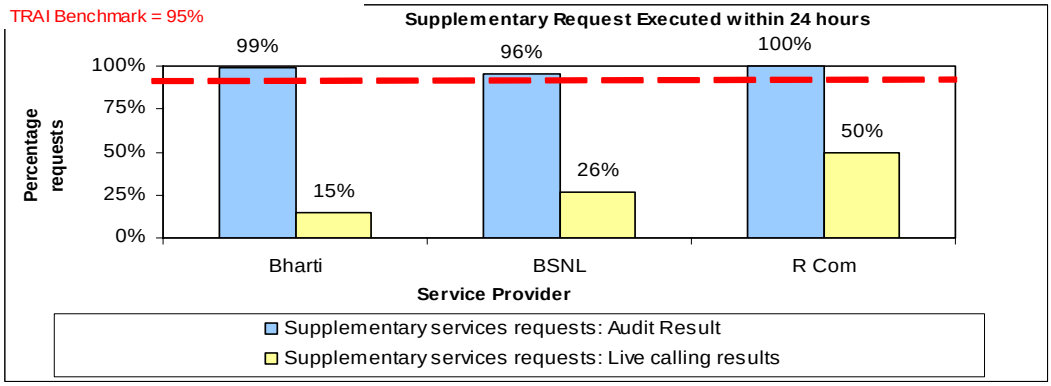
For shift requests attended within 3 days Bharti and BSNL fall short of TRAI specified benchmark for the month of audit. Live calling scores are observed to be low for both Bharti and BSNL.

Closure requests attended within 24 hours



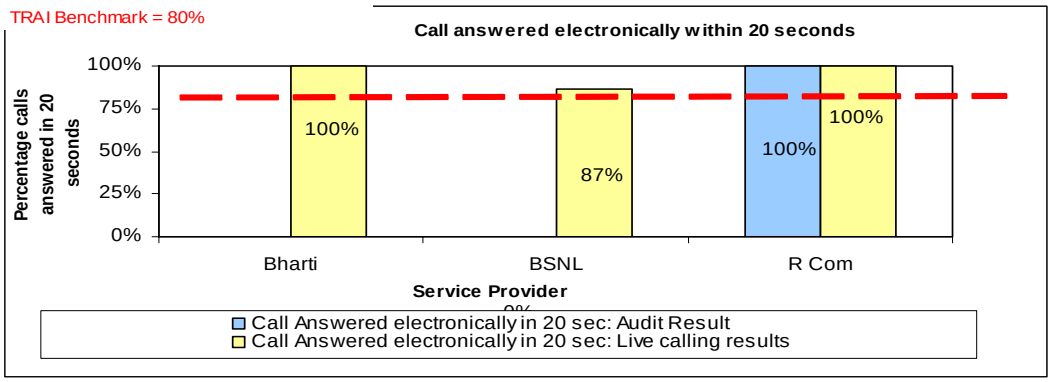
BSNL (at 50%) and Bharti (at 93%) fall short of the benchmark of 95% closure requests attended within 24 hours for the month of Audit

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

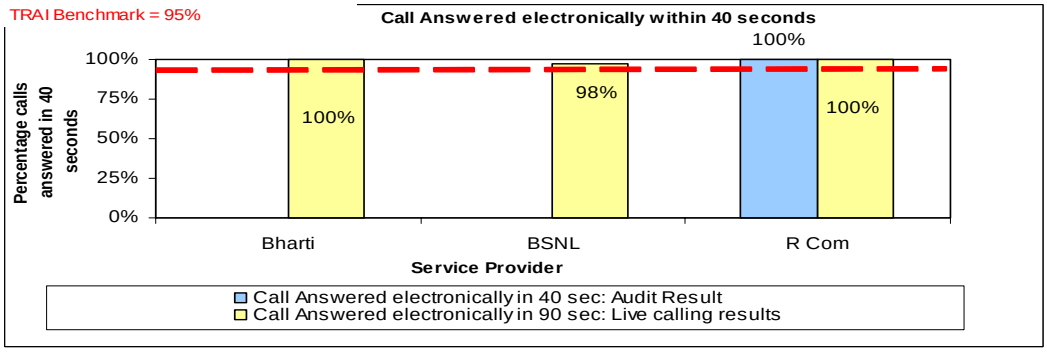


All the service providers comfortably meet the TRAI specified benchmark for "requests for additional services" to be attended within 24 hours Live calling results remain low for all the service providers.

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

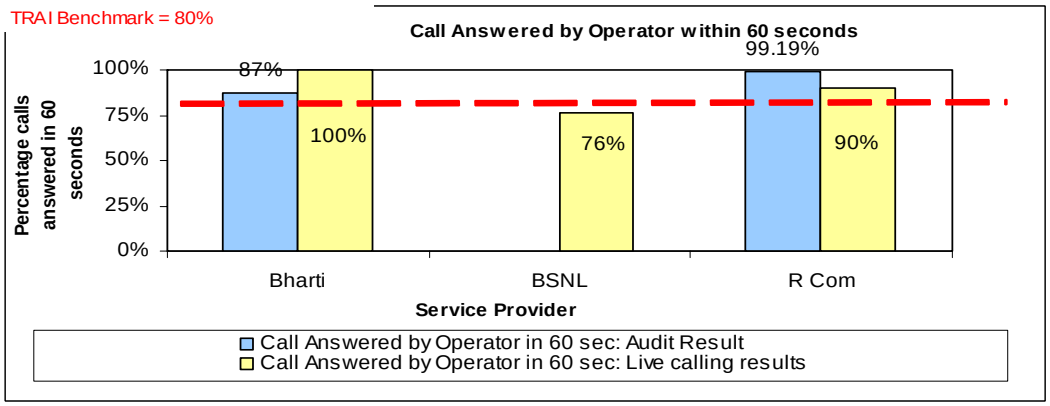


All the service providers meet the TRAI specified benchmark for calls answered electronically within 20 seconds for live calling results.



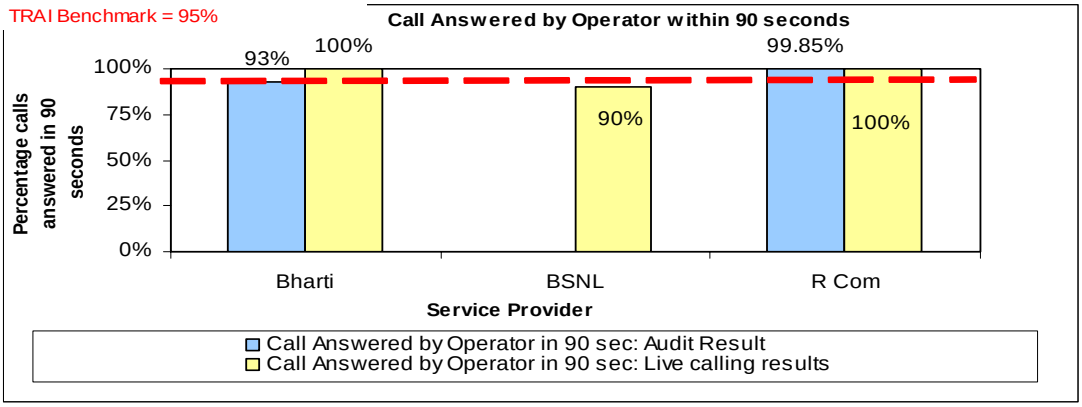
All the service providers meet the TRAI specified benchmark for calls answered electronically within 40 seconds for live calling results.

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



BSNL falls short of the TRAI specified benchmark (by 4%) for calls answered by the operator within 60 seconds for live calling carried out by IMRB Auditors.

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



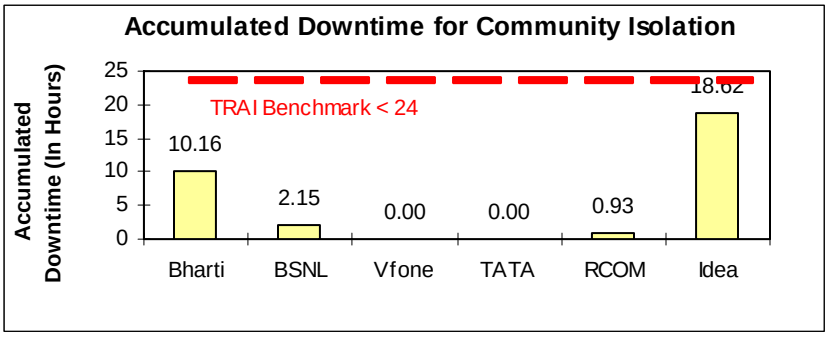
BSNL falls short of the TRAI specified benchmark (by 5%) for calls answered by the operator within 90 seconds for live calling carried out by IMRB Auditors.

Time taken to refund of deposits after closure

BSNL (by 3%) fall short of TRAI specified benchmark for time taken to refund after closure. Also there were no such cases for other operators.

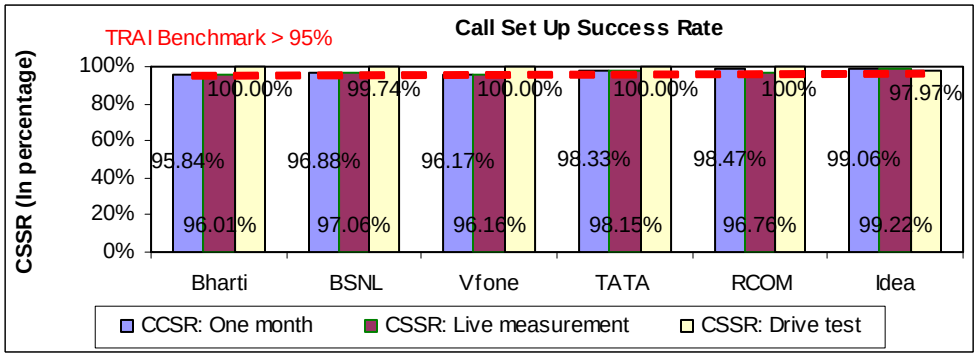
6.2 Graphical/Tabular Representations for Cellular Mobile Services

Accumulated Downtime



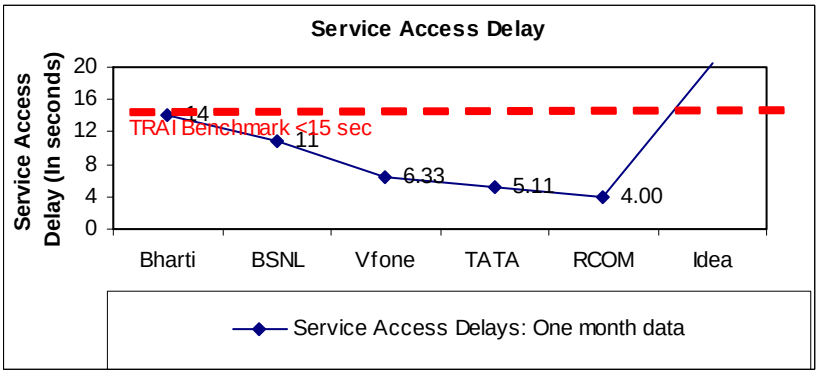
Only Vodafone & TATA did not experience a downtime in the UP(E) circle in the month of audit. All other operators experienced a downtime in their network ranging from 0.93 hours for RCOM to more than 18 hours for IDEA.

Call Set-up Success Rate (CSSR)



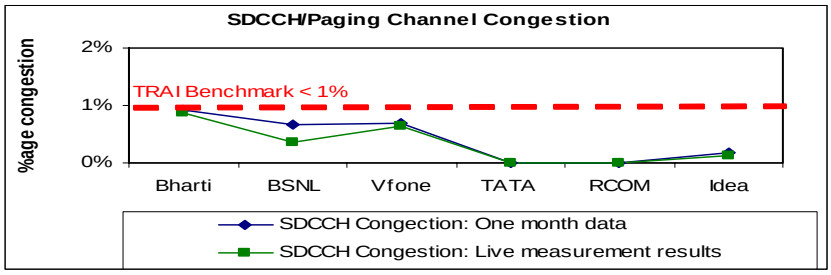
All the operators are found to be meeting the TRAI benchmark of CSSR greater than 95% for the audit month, live measurement as well as the drive test.

Service Access Delay



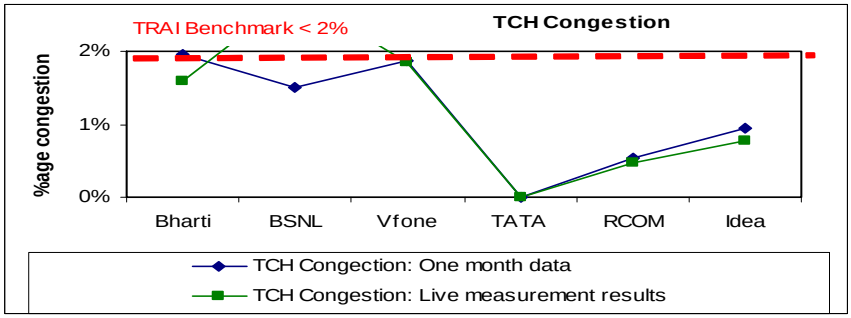
All the operators except IDEA are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit. The highest service access delay was measured for IDEA at more than 20 seconds and the lowest was for Vodafone at 2.86 seconds.

SDCCH / Paging Channel Congestion



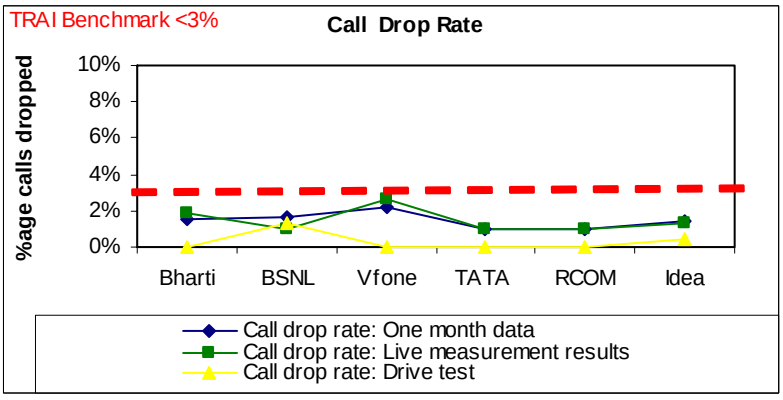
All the operators meet the benchmark for the three day live as well as the monthly measurement period. The highest congestion was observed for Bharti followed by Vodafone and BSNL while the lowest congestion was for TATA closely followed by RCOM.

TCH Congestion



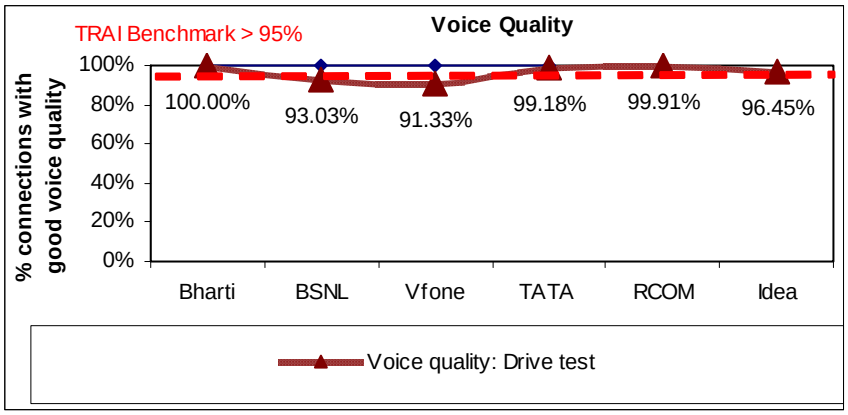
All the operators meet the TRAI benchmark for the monthly audit period. However, Vodafone BSNL does not meet the TRAI specified benchmark for the three day live measurement period.

Call Drop Rate



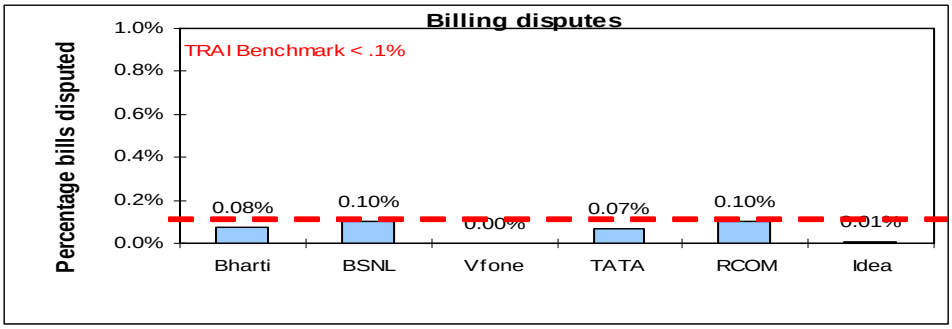
All the operators meet the TRAI benchmark. The operator with the least call drop rates taking into consideration the figures for drive tests, live measurement and the month of audit are TATA and RCOM.

Voice quality

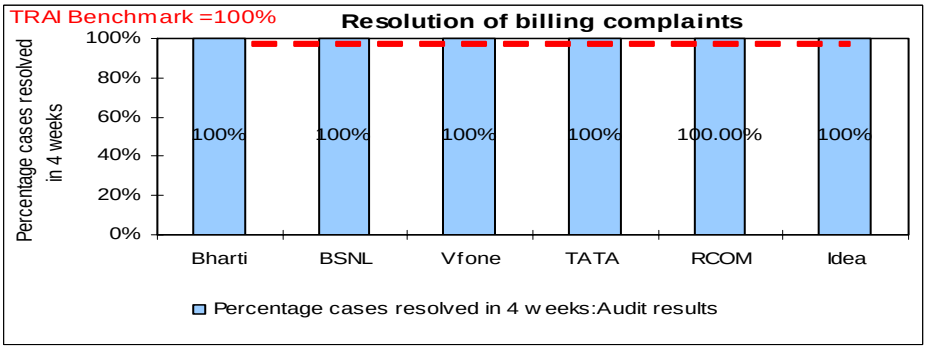


BSNL and Vodafone do not meet the TRAI benchmark as found out during the drive test. The lowest percentage of connections with good voice quality was observed across Vodafone with 91.33% followed BSNL at 93.03%. Bharti has the highest number of connections with good voice quality at 100%.

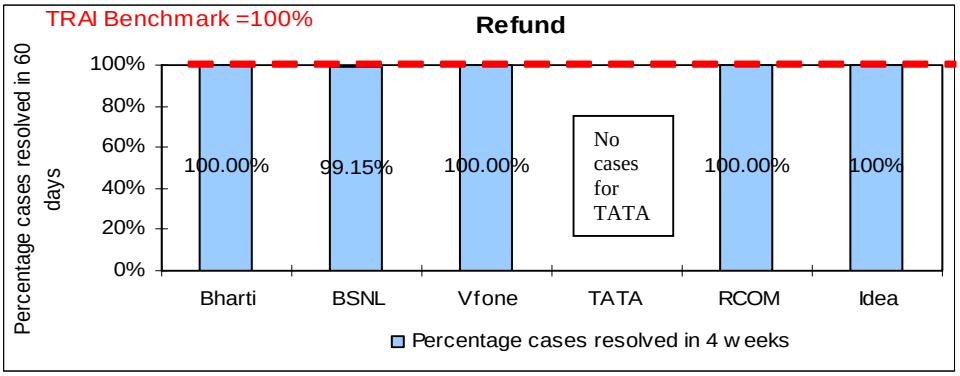
Billing Disputes



BSNL & RCOM only just do not meet the TRAI benchmark on percentage billing disputes per 100 bills.



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.



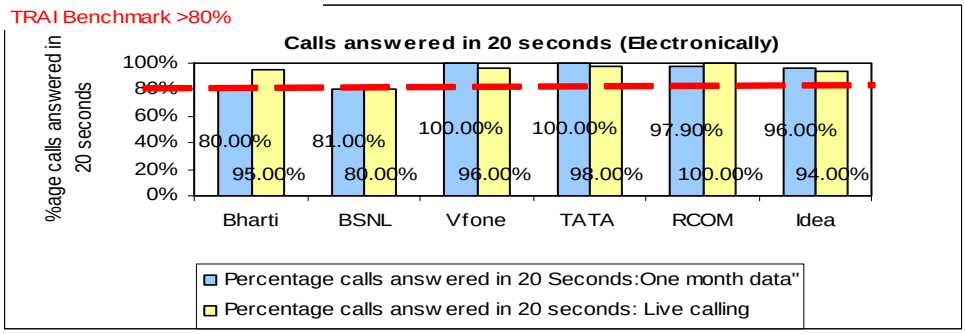
All the operators were found to giving the refunds to their subscribers within the stipulated time period except BSNL.

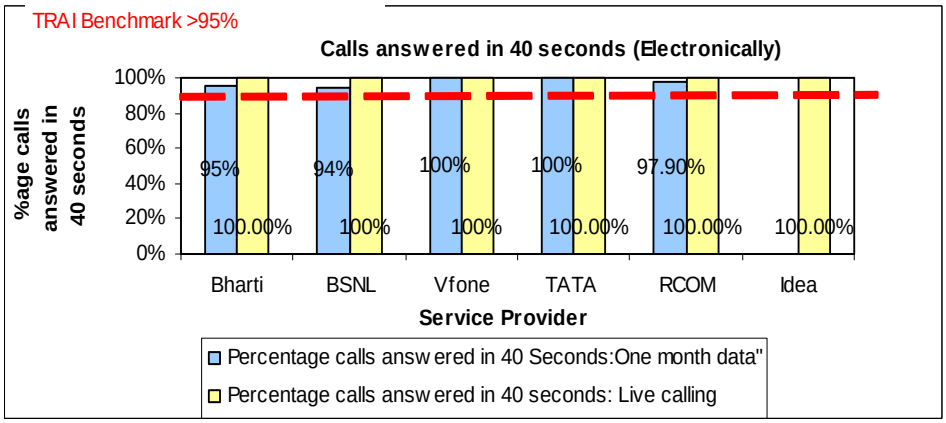
Live calling for billing Complaints

Resolution of billing complaints	Bharti	BSNL	Vodafone	TATA	RCOM	Idea
Total Number of calls made	100	9	100	100	52	5
Number of cases resolved in 4 weeks	100	9	No one responded	68	52	5
Percentage cases resolved in four weeks	100%	100%	Not applicable	68%	100%	100%

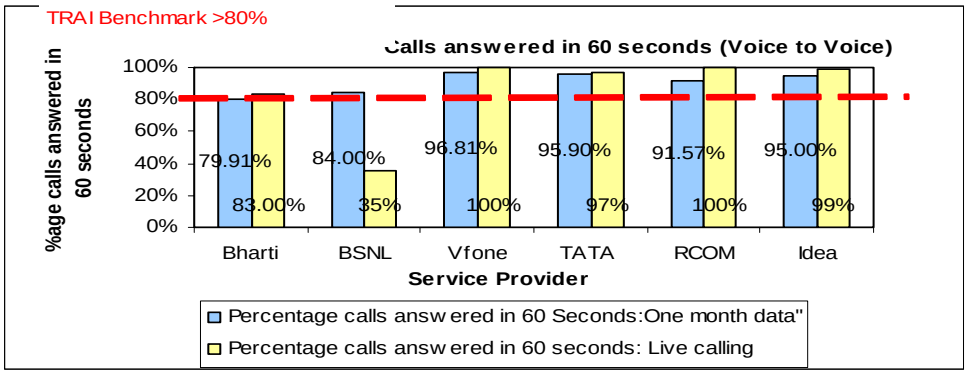
Except for TATA, all of the operators were able to meet the TRAI benchmark for the live calling aspect. Only 68% of TATA subscribers say that their complaints were resolved within 4 weeks.

Customer Care / Helpline:

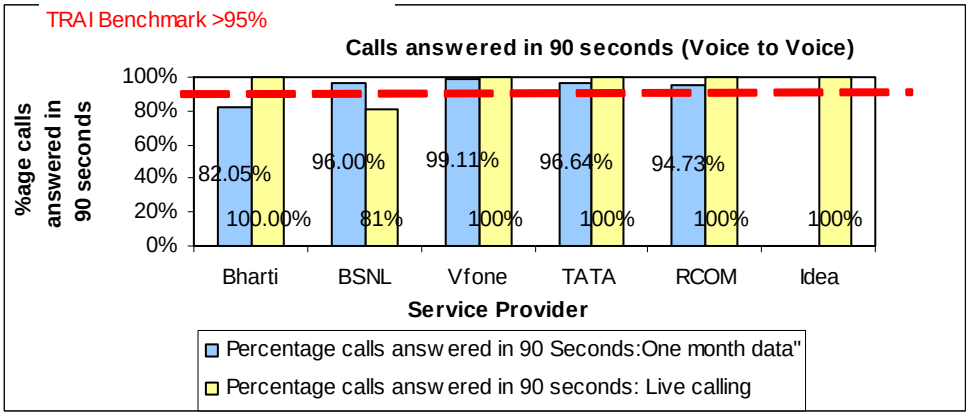




All the operators meet the TRAI benchmark for IVR (Electronic) answering of customers' calls for the one month data as well as the live calling that was carried out during the audit. However, IDEA claimed that their system does not have the capability to measure the parameter 'calls answered by the IVR within 40 seconds'.



However, except for Bharti for the monthly measurement and for BSNL for the live calling aspect, 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 Bharti and RCOM for monthly measurement and for BSNL during live calling, 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.

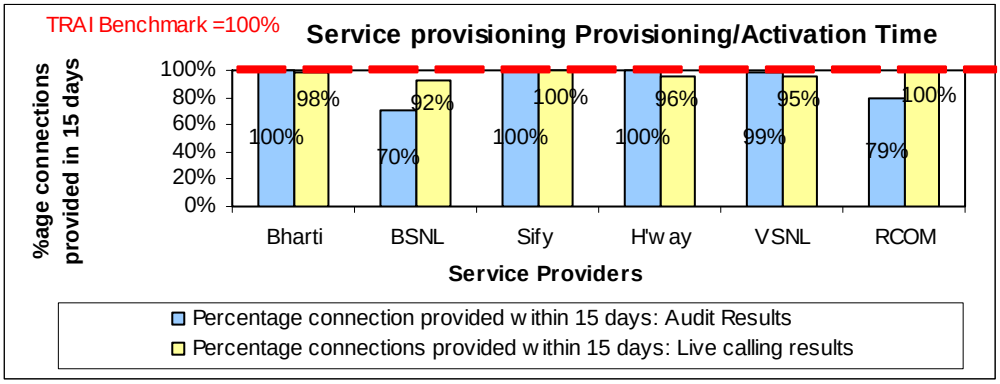
Inter Operator Call Assessment

Inter operator call Assessment (To/From)	Bharti	BSNL	Vodafone	TATA	RCOM	IDEA
Bharti	NA	78%	98%	100%	98%	100%
BSNL	90%	NA	100%	100%	93%	100%
Vodafone	83%	72%	NA	100%	92%	100%
TATA	85%	67%	100%	NA	93%	100%
RCOM	77%	58%	99%	96%	NA	98%
Idea	78%	75%	99%	100%	95%	NA

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. The calls from Bharti to all other service providers were established in the range of 77% to 90%. Similarly BSNL's connectivity with all the operators was found to be not that good where only 58% to 78% of its calls to numbers of other operators got connected. However, Vodafone has maximum difficulty in connecting to a Bharti number with only 98% of its calls getting connected. TATA had problems in connecting to RCOM with only 96 out of 100 of its calls getting established. Also, RCOM's connectivity to Vodafone was not good with only 92 out of 100 calls getting connected. BSNL had the most problem in connecting to almost all the operators with only 58% 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 67% and 72% respectively.

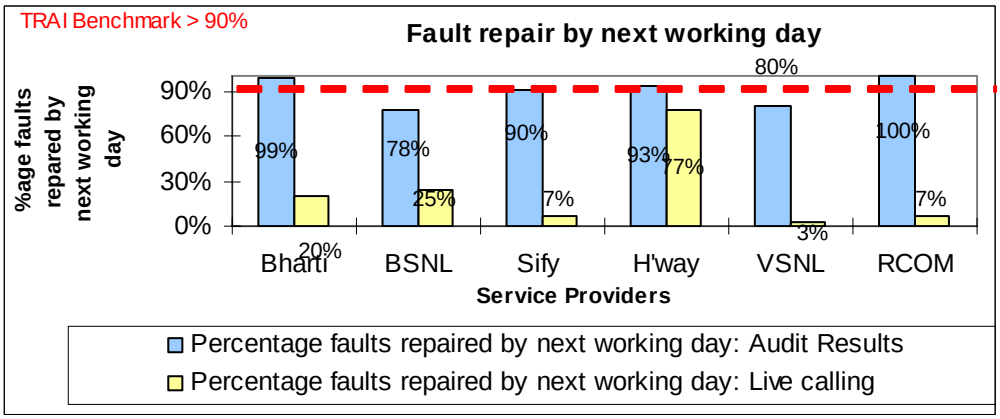
6.3 Graphical/Tabular Representations for Broadband services

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



Sify, Bharti, Hathaway 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 (92%) followed by VSNL at 95%

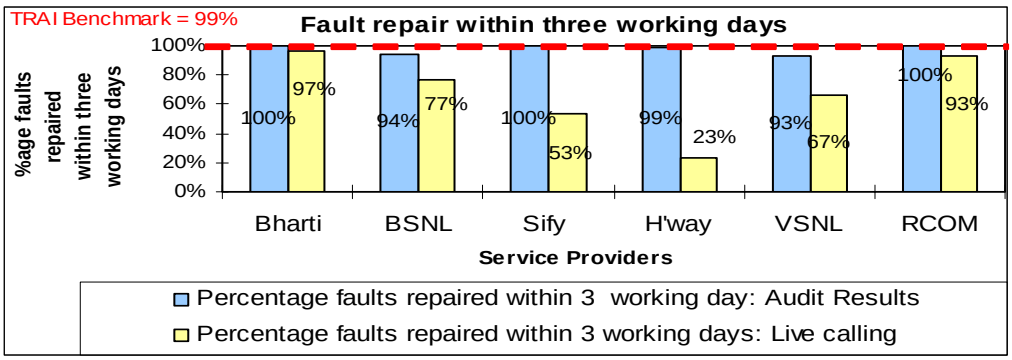
Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results



VSNL (TATA Communications) and BSNL do not comply with the TRAI specified benchmark of >90% faults repaired by next working day. Highest scores on live calling are observed for Hathaway at 77% followed. All the other service providers perform poorly on live calling results with scores being lowest for VSNL at 3%. Partly the same can be attributed to low sample sizes for live calling.

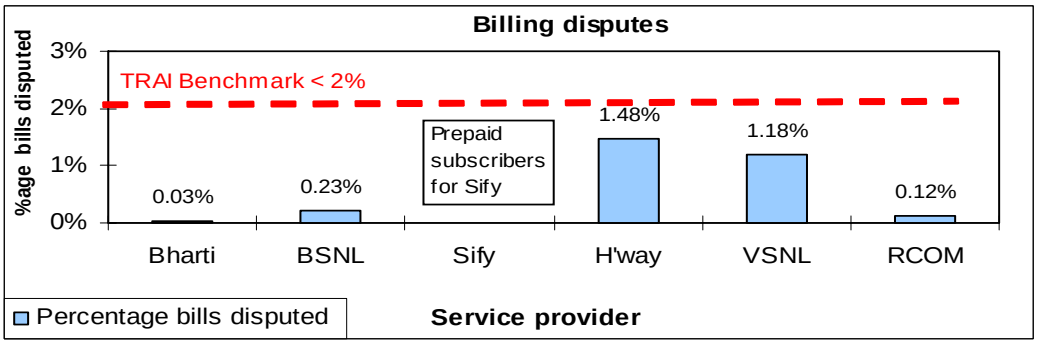
It should be noted that VSNL (TATA communications) which does not meet the benchmark for one month data collection includes billing complaints while calculating percentage faults repaired within three working days.

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



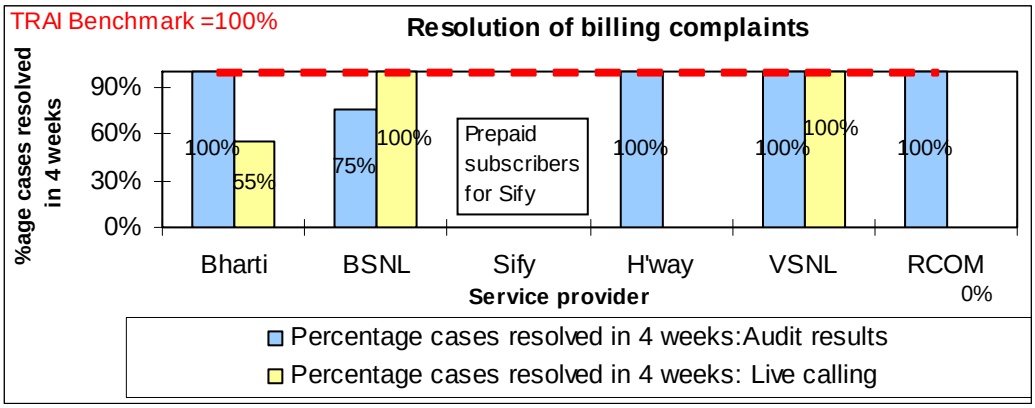
VSNL (TATA communications) and BSNL fall short of TRAI specified benchmark of 99% faults to be repaired within three working days for one month audit results. For live calling results lowest scores are observed for Hathaway at 23% whereas, BSNL (77%) and VSNL (67%) have substantially improved their live calling scores when compared to their performance on fault repair within next working day.

Percentage bills disputed



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

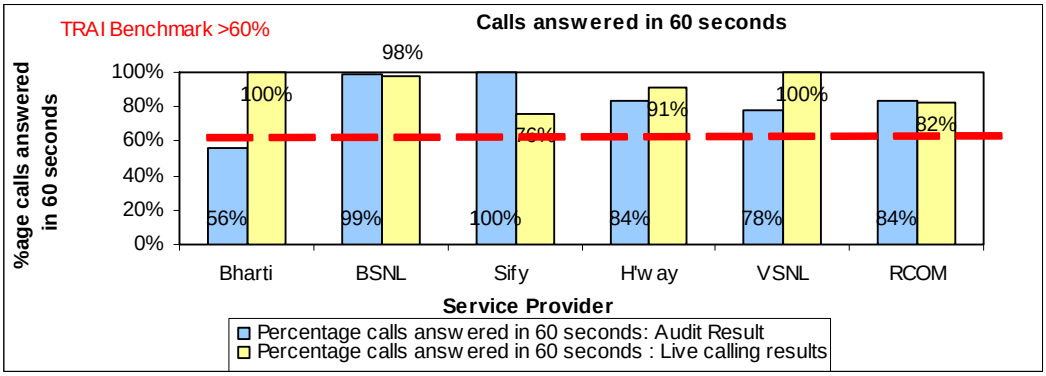
Resolution of billing complaints (Comparison between one month audit results and live calling results)



All the operators (except BSNL) meet the TRAI specified benchmark for Percentage billing complaints resolved within four weeks during the month of Audit. BSNL does well as all its customers called claimed that the complaint made by them was resolved in 4 weeks. Live calling

could not be carried out for some operators owing to very few billing complaints reported by customers.

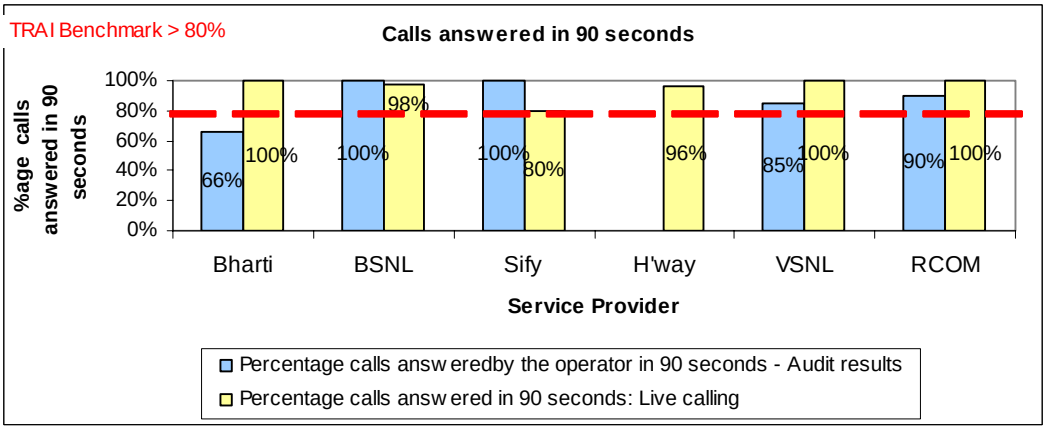
Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)



All the service providers (except Bharti for one month results) meet the benchmark as more that 60% 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 (except Bharti for one month results and Sify for live calling) meet the benchmark as more than 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 Utilization	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
One month data verification results							
Total number of intra network links		49	BRAS-23,T1-24, T2-610, DSLAM-5456*	400*	9 (4 in Kanpur and 5 in Noida)	16*	5 (Links physically located in Delhi NCR)
No of Intra network found to be above 90%	<80%	0	Uplink Traffic in Chennai BRAS is > 90%	4*	0	1	0
Live measurements results							
No of Intra network Links tested		10	20* (Bandwidth checked for all uplinks from BRAS^ to core router)	37*	9	10*	5(Links physically located in Delhi NCR)
No of Intra network found to be above 90%	<80%	0	0	0	0	0	0

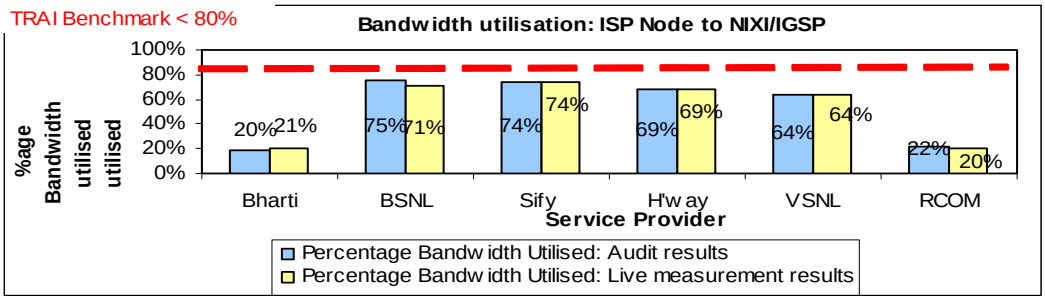
**Reported on All India Basis ,^BRAS: Broadband Remote Access Server*

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)



Both Hathaway and Bharti have their upstream links (to IGSP) physically located in Delhi. For Reliance the upstream link connecting to NIXI from Delhi was found to be having excess bandwidth both during three day live measurement and month in which data was obtained. However it should be noted that the service provider has it gateways for international peering located physically in Mumbai and Chennai circles.

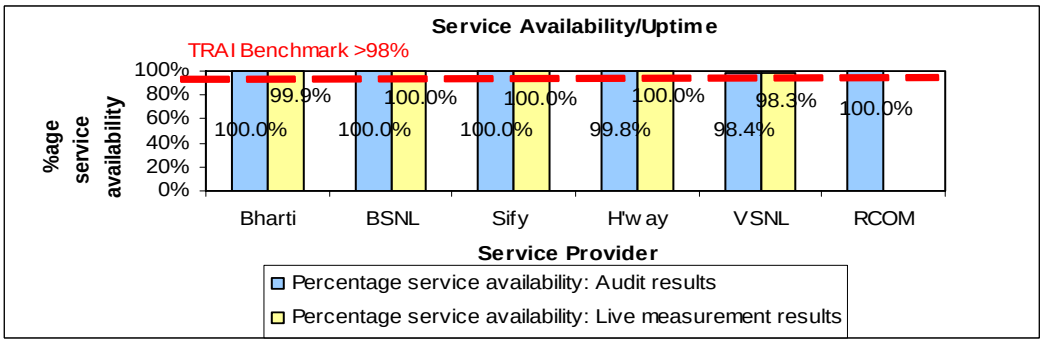
BSNL, Sify and VSNL (TATA Communications) meet the TRAI specified benchmark cumulatively for all gateways in India.

Broadband connection speed available to sample subscribers – Live calling results

Download Speed	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Percentage speed observed cumulatively for sample calls made	>80%	89%	57%	67%	66%	70%	53%

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 Bharti is the only service provider found to be meeting the TRAI specified benchmark. (Cumulatively for sample calls made to the customers)

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. 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	
			PMR	IMRB	PMR	IMRB	PMR	IMRB
1	Provision of telephone after registration of demand							
1.1	Percentage connections completed within 7 days	100%	95%	95%	99%	95%	68%	68%
2	Fault incidence/clearance statistics							
2.1	Fault incidence	<5	7.42	7.41	6.3	7.0	NP	NP
2.2	Faults repaired within 24 hours	>90%	94%	94%	93%	80%	100%	100%
2.3	Mean time to repair	<8 hrs	11.3	11.3	6.6	29.55	4.37	4.37
3	Call Completion Rate (CCR)	>55%	63%	63%	64%	33%	Not reported by operator	
4	Metering and billing credibility							
4.1	Billing complaints per 100 bills issued	<0.1%	0.00%	0.00%	0.02%	0.00%	NP	NP
4.2	%age of billing complaints resolved within 4 weeks	100%	100%	DNA	99%	97%	98%	98%
5	Customer care/helpline promptness							
5.1	Shift requests (Total number received)							
	Percentage shift requests attended within 3 days	95%	98%	98%	97%	29%	100%	100%
5.2	Closure request attended (Total number received)							
	Closure within 24 hours	95%	78%	78%	98%	31%	98%	98%
5.3	Supplementary (additional) service requests attended (Total number received)							
	Additional facility provided within 24 hours	95%	96%	96%	100%	68%	99%	99%
6	Response time to customer							
6.1	% age call answered through IVR in 20 seconds	80%	Not recorded by the operator		100%	Details not available at the exchanges	98%	98%
	% age call answered through IVR in 40 seconds	100%			100%		99%	99%
6.2	% age calls answered by operator in 60 seconds	80%	97%	97%	100%		97%	97%
	% age calls answered by operator in 90 seconds	95%	99%	99%	100%		99%	99%
7	%age cases where refund received within 60 days	100%	41%	41%	100%	99%	100%	100%

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		IDEA		RCOM	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
A	Network Performance													
1	Accumulated Downtime	< 24 hrs.	22.83 hr	22.83 hr	22 hr	8.42hr	0.00	0.00	1hr	1 hr	10.13 hr	10.13 hr	0.18	0.18
2	Call set up success rate	> 95%	98.31%	98.31%	98.00%	96.87%	96.99%	96.99%	98.12%	98.18%	99.18%	99.13%	99.30%	99.30%
3	Service Access delay	9 to 20 sec	10.34	10.34	11.2 sec	11.2 sec	9 sec	9 sec	5.04 sec	5.04 sec	12 sec	12 sec	4	4
4	Blocked call rate													
	SDCCH Congestion	< 1 %	0.88%	0.88%	0.90%	0.73%	0.18%	0.12%	0.00%	0%	0.14%	0.14%	0%	0%
	TCH Congestion	< 2 %	1.51%	1.51%	1.80%	1.68%	1.27%	0.99%	0.16%	0.00%	0.89%	0.89%	0%	0%
5	Call drop rate	< 3 %	2.14%	2.14%	2.20%	1.94%	2.00%	Raw data NA	1.13%	0.91%	1.55%	1.36%	0.70%	0.70%
6	%age connections with good voice quality	> 95%	previous data not available with the operator due to system limitation		98.00%	98.00%	97.05%	97.05%	98.10%	99.20%	96.90%	96.90%	99.80%	99.80%
7	Service coverage		Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	< 0.5%	Complied		Complied		Complied		Complied		Complied		Complied	
B	Customer Care													
	Calls answered electronically													
	Within 20 seconds	> 80%	previous data not available with the operator due to system limitation		81.00%	79.00%	99.93%	100%	100.00%	100.00%	100.00%	94.00%	97.30%	97.30%
	Within 40 seconds	> 95%			94.00%	93.00%	99.97%	100%	100.00%	100.00%	100.00%	96.00%	97.30%	97.30%
	Calls answered by the operator													
	Within 60 seconds	> 80%	previous data not available with the operator due to system limitation		71.00%	79.00%	97.43%	99.73%	86.80%	86.83%	94.00%	87.00%	90.80%	90.80%
	Within 90 seconds	> 95%			86.13%	94.20%	99.77%	99.73%	87.20%	87.18%	97.00%	No calls answered after 60 seconds	93.50%	93.50%
C	Billing complaints													
	Billing complaints/100 bills	< 0.1	previous data not available with the operator due to system limitation		0.07%	0.11%	0.00%	0.00%	0.03%	0.04%	0.09%	0.09%	0.09%	0.09%
	%age complaints resolved within 4 weeks	100%			100.00%	100%	100.00%	100.00%	100.00%	100%	100.00%	100.00%	100%	100%
	Period of refunds due to customers	100%			All within 4 weeks	98.71%	15 days	100%	Parameter not included in TRAI report		100%	100%	100%	100%

Figures do not match with those reported in PMR

Figures verified on all India basis

Not meeting benchmark

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

7.3 Broadband services

Parameter	B'mark	Bharti		BSNL		Sify		VSNL		RCOM	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning											
Percentage connections provided within 15 days	100%	100%	100%	100%	71%	100%	100%	100%^^	100%^^	68%^^	68%^^
Fault repair restoration time											
Percentage faults repaired by next working days	> 90%	97%	97%	99%	61%	91%	91%	88%^^	88%^^	93%	93%
Percentage faults repaired within three working days	99%	99%	99%	100%	72%	99%	99%	97%^^	97%^^	100%	100%
Billing performance											
Billing complaints per 100 bills issued	<2%	0.01%	0.00%	0.08%	0.31%	Prepaid		0.69%	0.69%	0.69%	0.41%
%age of billing complaints resolved in 4 weeks	100%	100%	100%	100.00%	100.00%			100.00%	100.00%	100.00%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%	47.00%	Data not available	100%	100%			100%	100%	100%	100%
Customer care/helpline assessment (Voice to Voice)											
Percentage calls answered within 60 seconds	> 60%	91%	91%	100.00%	82.00%	88%	88%	86%	86%	73%	73%
Percentage calls answered within 90 seconds	> 80%	95%	95%	Not reported by the operator		98%	98%	90%	90%	87%	87%
Bandwidth utilization/Throughput											
Intra network links (POP to ISP Node)											
Total number of intra network links > 90%		0	0	NR	0	5	5	0	0	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)											
Percentage bandwidth utilized on upstream links	< 80%	All links in Delhi		NR	78%	85%	85%	73%	73%	69%	69%
Broadband download speed		No raw data available for verification									
Service availability/uptime	> 98%	99.00%	99.97%	NR	100%	100%	100%	99.08%	99.08%	99%^^	99%^^
Packet loss	<2%	No raw data available for old ping test results		NR	Complied*	Results of Old ping tests not available for verification				Methodology needs correction. Reporting is done basis faults currently	
Network Latency											
POP/ISP Node to NIXI	< 120 msec			NR	Complied*					33.5	Old latency graphs verified
ISP node to NAP port (Terrestrial)	< 350 msec			NR	Complied*					275	

^^ 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 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. For BSNL it was observed that in some of the exchanges CCR was measured only on last day of every month during bust hour. Ideally same should be measured daily during Time Consistent Busy Hour (TCBH)
4. During verification process carried out at BSNL exchanges it was observed that customer care data is not maintained at the exchanges as service provider has a centralized call centre.
5. Also Fault incidences, CCR and MTTR were found to be high for some of the exchanges for BSNL which has resulted in a high average on these parameters.

7.4.2 Cellular Mobile services

1. The figures for BSNL do not match for customer care (voice to voice) and billing complaints.
2. Also, figures for BSNL (Accumulated downtime) did not match during the verification.
3. IDEA and TATA figures do not match for call drop rate
4. IDEA figures also do not match for percentage of calls answered by IVR within 20 and 40 seconds and also for the calls answered by the operator within 60 seconds
5. RCOM figures for IVR are reported on an all India basis.

7.4.3 Broadband services

1. For BSNL there was variation observed in the results. Prime reason for same is that the audit was carried out for sample POP's whereas the figures reported are for all the POP's in the circle.
2. Verification of records was not carried out for Hathaway as the service provider could not produce historic data for the period of October to December 2007.
3. For BSNL at some of the PoP's it was observed that fault registers are maintained in conventional ways.
4. Complete data for Sify and Reliance was verified on an all India level
5. 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.
6. 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.
7. 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.
8. 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
9. 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
Number of connections registered during the period		1813	307	832
Total number of connections provided within 7 days		1813	283	832
Percentage of connections provided within 7 days	100%	100%	92%	100%
Total number of connections provided after 7 days		0	23	0
Percentage of connections provided after 7 days		0%	7%	0%

Live calling results for Service provisioning

Sevice Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com
Total Number of service registration calls made		100	317	100
Number of cases in which connection was provided in 7 Days		94	248	89
Percentage cases in which connection was provided in 7 days	100%	94%	78%	89%
Number of cases in which connection was provided after 7 days		6	64	11
Percentage cases in which connection was provided after 7 days		6%	20%	11%
Percentage cases in which connection was provided after 7 days		6%	20%	11%

One month data verification results for Fault repair/Restoration time

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com
Total number of faults registered during the period		1560	13197	3016
Total number of faults repaired by next working day		1533	7099	3015
Percentage of faults repaired by next working day	>90%	98%	54%	100%
Total number of fault reparied within three working days		1533	12240	3016
Percentage faults repaired within three working days	100%	98%	93%	100%

Live calling results for Fault repair/Restoration time

Fault Repair	Benchmark	Bharti	BSNL	R Com
Total Number of calls made		5	1503	30
Number of cases where fauls were repaired by next working day		3	186	6
Percentage cases where faults were repaired by next working day	>90%	60%	12%	20%
Number of cases where faults were repaired within 3 days		5	927	30
Percentage cases where faults were repaired within 3 days	100%	100%	62%	100%

One month data verification results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com
Total local call attempts		19901600	219149	DNA
Total number of successful local calls		19249626	79394	DNA
Call Completion Rate (CCR) in the local network	>55%	97%	36%	DNA

Live measurement results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com
Total local call attempts		175909	37115	DNA
Total number of successful local calls		108339	16267	DNA
Call Completion Rate (CCR) in the local network	>55%	62%	44%	DNA

One month data verification results for Billing performance

Billing Performance	Benchmark	Bharti	BSNL	R Com
Billing disputes				
Total bills generated during the period		8575	66015	25529
Total number of bills disputed		4	64	7
Percentage bills disputed	0.10%	0.05%	0.10%	0.03%
Resolution of billing complaints				
Total complaints resolved in 4 weeks from date of receipt		4	57	7
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	89%	100%

Live calling results for billing performance

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com
Total Number of calls made		66	94	4
Number of cases resolved in 4 weeks		33	87	4
Percentage cases resolved in four weeks	100%	50%	93%	100%

One month data verification for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com
Total Number of shift requests received		108	69	0
Total number requests attended in 3 days		95	35	0
Total number requests attended beyond 3 days		13	34	0
Shifts not attended		0	0	0
Percentage of requests attended in 3 days	95%	88%	51%	NA
Percentage of requests attended beyond 3 days		12%	49%	NA
Percentage of shifts not attended		0%	0%	NA

Live calling results for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com
Total number of call to shift requests		24	46	0
Total number of requests attended in 3 days	95%	12	24	0
Total number of requests attended beyond 3 days		12	28	0
Shifts not attended		0	0	0
Percentage of requests attended in 3 days		50%	52%	NA
Percentage of requests attended beyond 3 days		50%	61%	NA
Percentage of shifts not attended		0%	0%	NA

One month data verification Audit results for Customer Care – Closures

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com
Total Number of closure requests received		606	478	897
Total closure attended within 24 hours	95%	562	237	895
Total number of requests attended beyond 24 hours		44	201	2
Closure requests not attended		0	0	0
Percentage of closure attended within 24 hours		93%	50%	100%
Percentage of closure attended beyond 24 hours		7%	42%	0%
Percentage of closures not attended		0%	0%	0%

One month data verification for Customer Care – Supplementary requests

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com
Total Number of supplementary requests received		501	551	1251
Total number of requests attended within 24 hours	95%	496	527	1247
Total number of requests attended beyond 24 hours		5	24	4
Supplementary requests not attended		0	0	0
Percentage of requests attended within 24 hours		99%	96%	100%
Percentage of requests attended beyond 24 hours		1%	4%	0%
Percentage of supplementary requests not attended		0%	0%	0%

Live calling results for Customer Care – Supplementary requests

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com
Total Number of supplementary requests received		20	152	38
Total number requests attended within 24 hours	95%	3	40	19
Total number requests attended beyond 24 hours		14	97	19
Supplementary requests not attended		3	1	0
Percentage of requests attended within 24 hours		15%	26%	50%
Percentage of requests attended beyond 24 hours		70%	64%	50%
Percentage of supplementary requests not attended		15%	1%	0%

Live calling results for calls answered electronically

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com
Total Number of calls dialed on toll free number		50	4350	50
Calls answered within 20 seconds				
Total Number of calls answered by IVR in 20 seconds	80%	50	3775	50
Percentage calls answered in 20 seconds		100%	87%	100%
Calls answered within 40 seconds				
Total Number of calls answered by IVR in 40 seconds	95%	50	4244	50
Percentage calls answered in 40 seconds		100%	98%	100%

Live calling results for calls answered by the operator

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com
Total Number of calls dialed on toll free number		50	4350	50
Calls answered within 60 seconds				
Total Number of calls answered by operator in 60 seconds	80%	50	3324	45
Percentage calls answered in 60 seconds		100%	76%	90%
Calls answered within 90 seconds				
Total Number of calls answered by operator in 90 seconds	95%	50	3930	50
Percentage calls answered in 90 seconds		NA	90%	100%

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

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com
Total Number of cases requiring refund		DNA	635	1
Number of cases where refund was made in < 60 days		DNA	614	1
Percentage cases where refund was made in < 60 days	100%	DNA	97%	100%

Level 1 services	Bharti	BSNL	RCOM
TOTAL Calls Made	165	300	70
Answered in 60 seconds	140	252	53
Percentage calls answered in 60 seconds	84%	84%	75%

8.2 Parameter wise performance reports for Cellular Mobile services

Accumulated Downtime	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Downtime (In hours)	10.16	2.15	0.00	0.00	0.93	18.62

CSSR	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of call attempts	DNP	93274088	10241958	1624517	DNP	2280390
Total number of successful calls	DNP	90359998	9849500	1597351	DNP	2258922
CSSR	95.84%	96.88%	96.17%	98.33%	98.47%	99.06%

Live measurement results for CSSR

CSSR	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of call attempts	DNP	69561935	9942629	1586181	DNP	6797690
Total number of successful calls	DNP	67515700	9561170	1556874	DNP	6744570
CSSR	96.01%	97.06%	96.16%	98.15%	96.76%	99.22%

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

CSSR	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of call attempts	390	391	375.00	432	388	443
Total number of successful calls	390	390	375.00	432	388	434
CSSR	100.00%	99.74%	100.00%	100.00%	100%	97.97%

DNP – the figure was obtained directly from the system.

Service Access Delay	Bharti	BSNL	Vfone	TATA	RCOM	Idea
One month data collection	14.19	10.85	6.33	5.11	4.00	20.5

Audit results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vfone	TATA	RCOM	Idea
SDCCH Congestion						
Total number of SDCCH Attempts	19683023	19591125.7	22055833	618271	DNP	4396806
Total Number of SDCCH Congestions	DNP	DNP	DNP	DNP	DNP	DNP
Percentage SDCCH Congestion	0.93%	0.66%	0.70%	0.00%	0.00%	0.17%
TCH Congestion						
Total number of TCH Attempts	10632316	14212938	10247055	25445879	DNP	2280390
Total Number of TCH Congestions	DNP	DNP	DNP	DNP	DNP	DNP
Percentage TCH Congestion	1.96%	1.50%	1.87%	0.00%	0.53%	0.94%

Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vfone	TATA	RCOM	Idea
SDCCH Congestion						
Total number of SDCCH Attempts	20608279	44577512	22704844	599722	DNP	13083396
Total Number of SDCCH Congestions	DNP	DNP	DNP	DNP	DNP	DNP
Percentage SDCCH Congestion	0.87%	0.36%	0.63%	0.00%	0.00%	0.12%
TCH Congestion						
Total number of TCH Attempts	11027471	51182560	9988499	22526261	DNP	6797690
Total Number of TCH Congestions	DNP	DNP	DNP	DNP	DNP	DNP
Percentage TCH Congestion	1.60%	2.77%	1.85%	0.00%	0.47%	0.78%

DNP – the figure was obtained directly from the system.

Audit Results for Call drop rate

Call drop rate	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of calls established	10424982.49	41284222	9849500	1766489	DNP	2258922
Total number of calls dropped	160723.2	677222	220368	17134	DNP	31799
Call drop rate	1.54%	1.64%	2.24%	0.97%	0.97%	1.41%

Live measurement results for Call drop rate

Call drop rate	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of calls established	10850466.59	51425936	9561170	1757832	DNP	6744570
Total number of calls dropped	200455.54	529688	248161	17929	DNP	90171
Call drop rate	1.85%	1.03%	2.60%	1.02%	1.01%	1.34%

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

Call drop rate	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of calls established	390	390	375.00	423		434
Total number of calls dropped	0	5	0.00	0		2
Call drop rate	0.00%	1.28%	0.00%	0.00%	0.00%	0.46%

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

Voice quality	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total number of sample calls	677384	98321	336896.00	26018	49244	737940
Total number of calls with good voice quality	677384	91467	307671.00	25805	49199	711723
%age calls with good voice quality	100.00%	93.03%	91.33%	99.18%	99.91%	96.45%

Audit Results for POI Congestion

POI congestion	Bharti	BSNL	Vfone	TATA	RCOM	Idea
POI traffic offered on all individual POI's	104379	71589.7	127949	DNP	DNP	DNP
Served traffic for all individual POI's	79665	60012.48	75490	DNP	DNP	DNP
Traffic failed on all individual POI's	0%	0%	0%	0%	0%	0%

Live measurement results for POI congestion

POI congestion	Bharti	BSNL	Vfone	TATA	RCOM	Idea
POI traffic offered on all individual POI's	320094	48871	127949	DNP	DNP	DNP
Served traffic for all individual POI's	242181	30958	73948	DNP	DNP	DNP
Traffic failed on all individual POI's	0%	0%	0%	0%	0%	0%

DNP – the figure was obtained directly from the system.

Audit results for customer care (Electronically)

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Number of calls received by	DNP	2886542	17280023	2437210	40324997.00	3724305
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	DNP	2338099.02	17279768	2437210	39476257.00	3575333
Percentage calls answered in 20 seconds	80.00%	81.00%	100.00%	100.00%	97.90%	96.00%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	DNP	2713349	17279956	2437210	39476257.00	DNP
Percentage calls answered in 40 seconds	95%	94%	100%	100%	97.90%	DNP

Live calling results for customer care (Electronically)

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Number of calls received by the operator	100	100	100	100	100.00	100
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	95	80	96	98	100.00	94
Percentage calls answered in 20 seconds	95.00%	80.00%	96.00%	98.00%	100.00%	94.00%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	100	100	100	100	100	100
Percentage calls answered in 40 seconds	100.00%	100%	100%	100.00%	100.00%	100.00%

Audit results for customer care (Voice to Voice)

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Number of calls received by the operator	2585197	1637514	5068713	876099	574239.00	**1172738**
Calls answered within 60 seconds						
Total Number of calls answered in 60 seconds	2065878	1375512	4906896	840207	525840.00	**1114102**
Percentage calls answered in 60 seconds	79.91%	84.00%	96.81%	95.90%	91.57%	95.00%
Calls answered within 90 seconds						
Total Number of calls answered in 90 seconds	2121058	1572013	5023426	846637	543982.00	DNP
Percentage calls answered in 90 seconds	82.05%	96.00%	99.11%	96.64%	94.73%	DNP

Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Number of calls made	100	100	100	100	100.00	100
Number calls answered within 60 seconds	83	35	100	97	100.00	99
Percentage calls answered in 60 seconds	83.00%	35%	100%	97%	100%	99%
Calls answered within 90 seconds						
Number calls answered within 90 seconds	100	81	100	100	100.00	100
Percentage calls answered in 90 seconds	100.00%	81%	100%	100%	100%	100%

DNP – the figure was obtained directly from the system.

Audit Results for Billing performance

Billing Performance	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Billing diputes						
Total bills generated during the period	38483	247393	118383	60733	104268.00	15582
Total number of bills disputed	29	249	4	41	103.00	1
Percentage bills disputed	0.08%	0.10%	0.00%	0.07%	0.10%	0.01%
Resolution of billing complaints						
Total complaints resolved in 4 weeks from date of receipt	29	249	4	41	103.00	1
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100.00%	100%
Refund of deposits after closure						
Total number of cases requiring refund of deposits	521	827	183	Parameter not included in TRAI report	103.00	3
Total number of cases where refund was made within 60 days	521	820	183		103.00	3
Percentage cases in which refund was receive within 60 days	100.00%	99.15%	100.00%		100.00%	100%

Live calling results for resolution of billing complaints

Resolution of billing complaints	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Total Number of calls made	100	9	100	100	52.00	5
Number of cases resolved in 4 weeks	100	9	no one responded	68	52.00	5
Percentage cases resolved in four weeks	100.00%	100.00%	NA	68.00%	100%	100.00%

Inter operator call Assessment (To/From)	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Bharti	NA	78%	98%	100%	98%	100%
BSNL	90%	NA	100%	100%	93%	100%
Vodafone	83%	72%	NA	100%	92%	100%
TATA	85%	67%	100%	NA	93%	100%
RCOM	77%	58%	99%	96%	NA	98%
Idea	78%	75%	99%	100%	95%	NA

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
No of connections registered during the period		1280	3015	112	180	477	233
Total number registered during 15 days		1280	2844	112	180	472.23	184
Percentage of connections provided within 15 days	100%	100.0%	70.0%	100.0%	100%	99.0%	79.0%

Live calling results for Service provisioning

Sevice Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	VSNL	RCOM
Total Number of calls made		100	408	100	100	41	100
Number of cases in which connection was provided in 15 Days		98	376	100	96	39	100
Percentage cases in which connection was provided in 15 days	100%	98%	92%	100%	96%	95%	100%
Number of cases in which connection was provided beyond 15 days		2	32	0	4	2	100
Percentage cases in which connection was provided after 15 days		2%	8%	0%	4%	5%	100%

One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total number of faults registered during the period		1176	2506	126	367	10992	983
Total number of faults repaired by next working day		1164	1948	114	341		981
Percentage of faults repaired by next working day	>90%	99%	78%	90%	93%	80%	100%
Total number of faults repaired within three working days		1176	183	126	363		983
Percentage of faults repaired within three working days	>99%	100%	94%	100%	99%	93%	100%

Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		30	163	30	30	30	30
Number of cases in which faults were repaired by next working day		6	40	2	23	1	2
Percentage cases in which faults were repaired by next working day	>90%	20%	25%	7%	77%	3%	7%
Number of cases in which faults were repaired within three working days		29	126	16	7	20	28
Percentage cases in which faults were repaired within three working days	>99%	97%	77%	53%	23%	67%	93%

One month data verification results for billing performance

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Billing disputes							
Total bills generated during the period		17609	26859	Prepaid	135	6013	2413
Total number of bills disputed		6	61		2	71	3
Percentage bills disputed	<2%	0.03%	0.23%		1.48%	1.18%	0.12%
Resolution of billing complaints							
Total complaints resolved in 4 weeks from date of receipt		6	46	Prepaid	2	71	3
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	75%		100%	100%	100%
Refund of deposits after closure							
Total number of cases requiring refund of deposits		NR	6	0	0	430	1
Total number of cases where refund was made within 60 days		NR	6	0	0	430	1
Percentage cases in which refund was receive within 60 days	100%	DNA	100%	NA	NA	100%	100%

Live calling results for billing complaints

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		20	41	Prepaid	0	10	0
Number of cases resolved in 4 weeks		11	41		0	10	0
Percentage cases resolved in four weeks	100%	55%	100%		NA	100%	NA

Live calling results for call centre

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		50	300	50	100	50	50
Calls answered within 60 seconds							
Number calls answered within 60 seconds		50	293	38	91	50	41
Percentage calls answered in 60 seconds	>60%	100%	98%	76%	91%	100%	82%
Calls answered within 90 seconds							
Number calls answered within 90 seconds		50	293	40	96	50	50
Percentage calls answered in 90 seconds	>80%	100%	98%	80%	96%	100%	100%

One month data verification results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Operational Hours		12703800	53568	744	744	1060944	27413280
Total Downtime		1497	2	0	1.5	17455	335
Total time when the service was available		12702303	53566	744	742.5	1043489	27412945
Service Availability Uptime in Percentage	>98%	100.0%	100.0%	100.0%	99.8%	98.4%	100.0%

Three day live measurement results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Operational Hours		2336104	1728	72	72	522130	DNA
Total Downtime		3273	0	0	0	8678	DNA
Total time when the service was available		2332831	1728	72	72	513452	DNA
Service Availability Uptime in Percentage	>98%	99.86%	100.00%	100.00%	100.0%	98.34%	DNA

One month data verification results for Bandwidth utilisation

Bandwidth Utilization	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Intra-network links (POP to ISP Node)							
Total number of intra network links		49	BRAS-23,T1-24,T2-610, DSLAM-5456	400	9	16	5
No of Intra network found to be above 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	1	0
International Bandwidth							
Total number of upstream links		2	97	28	3	28	1
No of Intra network found to be above 90%		0	1	0	0	0	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		20000	17233	2830	99	29462	1000
Total International Bandwidth utilised during peak hours		3910	12877	2097	68	18720	219
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	20%	75%	74%	69%	64%	22%

Live measurement results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Intra-network links							
Total number of intra network links		49	BRAS-23,T1-24,T2-610, DSLAMS-5456	400	9	16	5
No of Intra network Links tested		10	20	37	9	10	5
No of Intra network found to be above 90%		0	0	0	0	0	0
International Bandwidth							
Total number of upstream links		2	97	28	3	10	1
No of Intra network found to be above 90%		0	10 t0 20	0	0	0	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		20000	18157	2830	99	29462	1000
Total International Bandwidth utilised during peak hours		4200	12909	2082	68	18720	200
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	21%	71%	74%	69%	64%	20%

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. <u>Live calling: -</u> - 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* ** *<u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.*
Benchmark	< 0.1% billing complaints per 100 bills
Audit Procedure	IMRB auditors collected and verified data pertaining to - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

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

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

9.3 For Broadband services

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

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

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

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

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

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

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

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

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

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

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

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