

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

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

By: **eTechnology Group@IMRB**

A specialist unit of IMRB International

## Preface

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

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

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

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

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various quarterly periods. IMRB International Auditors carried out Audits across Tamil Nadu, Haryana, Karnataka, West Bengal, Bihar & Jharkhand, Punjab and Uttar Pradesh (East) circles in the period of May – August 2008. **This report details the performance of various service providers in Haryana 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

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

The present report highlights the findings for the Audit module for Haryana 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.



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



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

## **2.0 Objectives and Methodology**

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



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

1. **Verification of the data submitted by service providers:** This involved verification of the quarterly Performance Monitoring Reports (PMR's) and monthly Point of Interconnect (POI) Congestion reports being submitted by various service providers. The raw data in the records maintained by service providers was audited to assess the book keeping methodology.
2. **Live measurement for three days:** Network performance of service providers was assessed for three days in the month in which the Audit was carried out. Live figures from the server/ NMS software were recorded for various network related parameters.
3. **Data verification for the month in which Audits were carried out:** Subsequent to the visits for Audit during the live measurement at various Exchanges/ISP Nodes/Exchanges, data for all the network and Non network related parameters was collected from various service providers for the complete month in which the Audit was carried out. Raw data/records pertaining to these were also verified on sample basis to check the veracity of data provided by the operators.
4. **Drive tests:** Operator assisted and Independent drive test were conducted in three cities as per the norms stated in the tender.
5. **Live calling:** Live testing was done on a sample basis to check efficiency of the customer care, inter operator call assessment, Back check calls for service provisioning and fault repair

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

### **3.0 Sampling methodology**

#### **3.1 Sampling for Basic (Wireline) services**

- For BSNL the sample of exchanges was selected was spread across 10% of SDCA's in the entire service. Overall 56 exchanges (16 Urban and 40 Rural) exchanges were audited.
- For rest of the service providers (TATA, Reliance and Bharti) data was collected pertaining to all the exchanges present in the circle/service area

#### **3.2 Sampling for Cellular Mobile (Wireless) service providers**

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

- Bharti Airtel Ltd. – 4 MSCs
- Vodafone Essar Digilink Ltd.– 3 MSCs
- Tata teleservices ltd – 1 MSC
- Reliance communications – 2 MSCs
- BSNL – 4 MSCs
- IDEA Mobile Communications Ltd. – 2 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 Haryana 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. Also, the data pertaining to network related parameters was obtained by IMRB Auditors at the central node in Bangalore.
- Following Broadband service providers were Audited for Haryana circle: - Bharti Airtel Ltd., Hathaway, Sify, Reliance, BSNL, and You telecom

## **4 Audit methodology**

### **4.1 Basic (Wireline) Services**

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

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

\* In addition to above verification of records for PMR submitted during October to December 2007 was carried out for the entire 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 ASSISTED DRIVE TESTS	INDEPENDENT DRIVE TESTS
<b>A</b>	<b>Network Performance</b>							
<b>A (i)</b>	Accumulated down time of community isolation	Yes	Yes	Yes				
<b>A (ii)</b>	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (iii)</b>	Service Access Delay	Yes	Yes	Yes				
<b>A (iv)</b>	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (v)</b>	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (vi)</b>	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
<b>A (vii)</b>	Service Coverage	Yes	Yes	Yes			Yes	Yes
<b>A (viii)</b>	PoI Congestion	Yes	Yes	Yes				
<b>B</b>	<b>Customer Helpline</b>							
<b>B (i)</b>	Response time to the customer for assistance	Yes	Yes	Yes		Yes		
<b>C</b>	<b>Billing Complaints</b>							
<b>C (i)</b>	Billing complaints per 100 bills issued	Yes	Yes	Yes				
<b>C (ii)</b>	%age of billing complaints resolved within 4 weeks	Yes	Yes	Yes		Yes		
<b>C (iii)</b>	Period of all refunds/payments due to customers from date of resolution as in (ii) above	Yes	Yes	Yes		Yes		

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



### 4.3 Broadband Services

In a nutshell, the audit methodology was as follows:

	Parameters	Verification of PMR	Three day live measurement	Data Verification for one month	Live calling
(i)	Service Provisioning/ Activation time	YES	YES	YES	YES
(ii)	Fault Repair/ Restoration Time	YES	YES	YES	YES
(iii)	Billing Performance				
-	Billing Complaints per 100 Bills issued	YES	YES	YES	
-	%age of billing complaints resolved in four weeks	YES	YES	YES	YES
-	Time taken for refund of deposits after closure	YES	YES	YES	YES
(iv)	Response time to the customer for assistance(Voice to Voice)				
-	<i>Within 60 seconds &gt; 60%</i>	YES	YES	YES	YES
-	<i>Within 90 seconds &gt; 90%</i>	YES	YES	YES	YES
(V)	Bandwidth Utilization/ Throughput:				
▪	<i>A)Bandwidth Utilization</i>				
-	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	
▪	<i>B) Broadband Connection Speed (Download)</i>	YES	YES	YES	YES
(vi)	Service availability / Uptime	YES	YES	YES	
(vii)	Packet Loss	YES	YES	YES	
(viii)	Network Latency for wired broadband access)				
-	<i>User reference point at POP / ISP Gateway Node to International Gateway (IGSP/NIXI)</i>	YES	YES	YES	
-	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	YES	YES	YES	
-	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	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 Haryana circle. The executive summary encapsulates the key findings of the Audit by providing: -

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

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

S.no	Parameters	B'mark	Bharti	BSNL*	RCOM*	TATA teleservices*
1	Provision of telephone after registration of demand					
1.1	Connections completed within 7 days	100%	100%	87%	99%	100%
2	Fault incidence/clearance statistics					
3	Fault incidences(No. of faults/100 subscribers/month)	<3	4.7	24	No faults reported	<1
3.1	Faults repaired within 24 hours	>90%	85%	59%		20%
3.2	Faults repaired within three working days	100%	85%	68%		100%
4	Mean time to Repair (MTTR)	<8 hours	4.80	21.96		28.60
5	Call Completion Rate (CCR)	>55%	98%	83%	DNA	96%
6	Metering and billing credibility					
6.1	Billing complaints per 100 bills issued	<0.1%	0.01%	0.52%	0.02%	NA
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	100%	NA
7	Customer care/helpline promptness					
7.1	<u>Shift requests attended</u>					
	Shift requests attended within 3 days	95%	88%	81%	NA	NA
7.2	<u>Closure request attended</u>					
	Closure within 24 hours	95%	100%	69%	NA	NA
7.3	<u>Supplementary (additional) service requests attended</u>					
	Additional facility provided within 24 hours	95%	96%	90%	100%	57%
8	Response time to customer for assistance					
8.1	% age call answered through IVR in 20 seconds	80%	Not measured by the operator	Centralized call centre, details not available at the exchanges	100%	100%
	% age call answered through IVR in 40 seconds	100%			100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	87%		99%	91%
	% age calls answered by operator in 90 seconds	95%	93%		100%	95%
9	Time taken for refund of deposits after closure					
9.1	%age cases where refund received within 60 days	100%	NA	94%	NA	NA

(\*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of April to July 2008, whereas for rest of the operators figures pertain to all the exchanges present in the circle. Also TATA and RCOM have limited presence in Haryana circle for Basic Wireline services and cater primarily to corporate customers)

\*\* 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 Haryana circle broadly indicates that almost all the service providers are not meeting some of the benchmarks, as mandated by TRAI (Telecom Regulatory Authority of India).

For live measurements conducted to assess Call Completion Rate (CCR) it was found that the operators who are reporting the same to TRAI were meeting the benchmark.

The live calling results (Sample calls made to assess the efficiency of fault repair maintenance, service provisioning, Call centre efficiency) were found to be varying from the 1 month audit data results in certain places. To some extent the difference can be attributed to the smaller sample size undertaken for the live calling.

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 Haryana circle.

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

#### *Provision of telephone after registration of demand*

- TATA teleservices and Bharti were found to be meeting the TRAI benchmark of 100% for provisioning of telephone within 7 working days for the month in which the Audit was carried out. Reliance (99%) and BSNL (87%) fall short of the TRAI specified benchmark. It should be noted that for TATA new connections were provided only at two customer locations during the month of Audit.
- BSNL has scored low on Service provisioning/activation time , one of the reasons for the same was observed to be the fact that the service provider provides connection at all the locations and SDCA's in the circle whereas private service providers normally provide connections in areas which are technically feasible for the operator, especially for retail customers.
- Bharti (90%), RCOM (88%) and BSNL (81%) do fairly well on live calling scores. For TATA live calling sample remained low (only 1 call) as connections were provided only at two customer locations prior to the month in which audit was carried out.

#### *Fault incidence / clearance statistics*

- As per the 1-month audit data findings BSNL, Bharti and TATA teleservices falls short of TRAI specified benchmark of >90% of faults to be repaired within 24 hours. For Reliance there were no faults reported during the month of Audit.
- For fault repair within 3 working days BSNL(68%) and Bharti (85%) fall short of the TRAI specified benchmark of 100%
- Also, BSNL needs to improve on its "fault incidence rate" and Mean Time to Repair (MTTR) as it was found to be way above the benchmark at "24" for the sample exchanges. However, it should be noted that at an individual level some exchanges were found to be complying with the benchmark whereas some were found to be way above the benchmark.

- The live calling scores (for fault repair within 24 hrs) were observed to be highest for Bharti at 37% and lowest for BSNL at 12%. For TATA live calling sample was low owing to very few faults reported by customers during the month of Audit.

#### Traffic statistics (CCR)

- Bharti, BSNL and TATA were found to be meeting TRAI benchmark for Call Completion Rate (CCR) both for one month in which data was obtained and live measurements.
- 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 (except BSNL at 0.52%) 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 (81%) and Bharti (88%) fall short of TRAI specified benchmark of 95%. Also there were no requests for shift for TATA and RCOM due to low subscriber base.
- For closure requests within 24 hours only BSNL with 69% requests attended falls short of the benchmark of 95%
- For supplementary service requests, TATA and BSNL were found to be falling short of meeting the TRAI specified benchmark for the month in which audit was carried out. It should be noted that for TATA there were only 7 such requests received during the month of Audit.

#### Response time to customer for assistance

- For live calling scores BSNL falls short of TRAI specified benchmark for calls answered by the IVR (in 20 and 40seconds) and calls answered by the operator (in 60 and 90 seconds) as only 49% of calls made to IVR were answered in 20 seconds and only 32% of calls were answered by the operator in 60 seconds.
- However, it should be noted that for BSNL live calling was carried out at the main exchanges in Haryana, the benchmark was met when calls were made from Gurgaon but connectivity was found to be poor from smaller cities like Rohtak.
- For live calling results, Reliance also falls short of the TRAI specified benchmark of 80% calls answered by the operator within 60 seconds with a score of 76%.
- For BSNL, call centre data was not available from the exchanges as the service provider has a centralized call centre in Gurgaon.
- 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 the month of Audit Bharti (93%) falls short of TRAI specified benchmark of 95% calls answered by the operator in 90 seconds

Time taken for refund of deposits after closure

- BSNL (by 6%) fall short of TRAI specified benchmark for time taken to refund after closure. Also there were no such cases of refunds for any other operator.

Level 1 service

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, and Railway enquiry) offered by various service providers atleast 150 calls were made each for BSNL, Bharti and TATA to different numbers and time taken to answer the call was noticed. BSNL and TATA emerged out to be the most efficient with 100% of the total calls that were made being answered in 60 seconds. For Bharti 98.8% of calls made to railway enquiry, emergency services etc were answered in 60 seconds.

Also, it was observed that as Reliance communications is catering primarily to corporate customers the only Level 1 services offered by the operator are for emergency services i.e. Fire, Police and Ambulance.

**Summary of Live Measurement Results – Basic Wireline Services**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	Tata
Call Completion Rate (CCR) in the local network	>55%	96%	88%	97%

- For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable.
- All the service providers were comfortably meeting the TRAI specified benchmark, lowest scores during live measurements were observed for BSNL at 88% and highest was observed for TATA at 97%

## 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.	0.00	0.00	0.00	0.00	0.00	15.87
Call Set Up Success Rate (CSSR)	> 95%	98.56%	96.30%	99.91%	97.79%	98.85%	99.28%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	10.40	9.10	13.00	10.00	4.00	10.41
<b>Blocked Call Rate</b>							
<i>SDCCH/Paging Channel Congestion</i>	<1%	0.34%	0.55%	0.02%	0.00%	0.00%	0.34%
<i>TCH Congestion</i>	< 2%	0.29%	1.42%	0.24%	0.09%	0.57%	0.79%
Call drop rate	< 3%	1.07%	2.70%	1.58%	1.15%	1.52%	1.56%
Percentage connections with good voice quality*	> 95%	90.91%	79.36%	96.13%	98.72%	99.43%	95.03%
<b>Service coverage*</b>							
<i>In door</i>	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
<i>In vehicle</i>	>-85dbm						
<i>Out door - in city</i>	>-95dbm						
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied
<b>Calls answered electronically</b>							
Percentage calls answered within 20 seconds	80%	100%	100%	100%	DNP	98%	100%
Percentage calls answered within 40 seconds	95%	100%	100%	100%	DNP	98%	100%
<b>Calls Answered by the operator</b>							
Percentage calls answered within 60 seconds	80%	97%	81%	91%	DNP	81%	96%
Percentage calls answered within 90 seconds	95%	97%	95%	97%	DNP	87%	97%
<b>Billing Complaints</b>							
Billing complaints per 100 bills issued	<0.1%	0.30%	0.20%	0.09%	0.50%	0.08%	0.08%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	100%	100%	100%	DNP	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 Haryana 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	2000 – 2100	2000 – 2100
BSNL	2000 – 2100	2000 – 2100
RCOM	1100 – 1200	2000 – 2100
IDEA	2000 – 2100	2000 – 2100
TATA	1900 – 2000	1900 – 2000
Vodafone	2000 – 2100	2000 – 2100

The TCBH reported by all the service providers except Reliance matched the network busy hour calculated by IMRB auditors for the Haryana circle. During the three day live measurement the busy hour of Reliance was found to be between 2000 – 2100 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 Haryana circle, although there were outages in various BTS across all the service providers, none of them actually led to a community being isolated at a particular point in time except for IDEA. Its outage was found to be 15.87 hours for the month of audit. The operator claimed that there was maintenance work going on in the network which resulted in such a huge accumulated downtime.

#### Call Set-up Success Rate (CSSR):

All the operators were found to be comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Vodafone with 99.91% of their calls getting completed. BSNL had 96.30% 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. CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.



Service Access Delay:

This parameter is reported to TRAI basis the period drive tests that are conducted by the service providers during that quarter. It is measured using a drive test tool kit and a protocol analyzer. All the operators in the Haryana 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 Vodafone with 13.00 seconds followed closely by IDEA at 10.41 and Bharti at 10.40, all of which comfortably met the TRAI benchmark of  $\leq 15$  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 benchmark on the congestion parameters. BSNL relatively has the highest SDCCH congestion at 0.55% while TATA and RCOM do not experience any paging channel congestion. BSNL also has the highest traffic congestion at 1.42% although it comfortably meets the TRAI specified benchmark. TATA leads the way in network congestion parameters with almost negligible traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. There was almost 0 POI congestion on almost all individual POI links between a service provider vis-à-vis other service providers.

Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped (unexpected seizure) to the total number of call attempts for all operators. Also, all of service providers were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of Bharti with only 1.05% call drop and the relative highest (although it easily met the benchmark) was for BSNL with 2.70%.

% 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 Bharti with 90.91% and BSNL with 79.36% 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 where interference and inadequate coverage was recorded (explained in greater detail along with drive test findings).

Customer Care / Helpline Assessment

For the IVR aspect all the service providers meet the TRAI benchmark (TATA however claimed that they would not be able to provide the customer care / helpline assessment details as none of its MSCs in the state / circle has the capability to measure the same). However, in case of Reliance no breakup of IVR calls by circle is present. The figure reported is for all India level. Also, RCOM claims that whatever calls are not answered by the IVR in the first 40 seconds are directly transferred to the agent desk. In case of calls answered by operators, all the service providers except RCOM (percentage calls answered within 90 seconds) meet the benchmark for the month of audit.

Billing performance

Bharti, BSNL and TATA were found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. TATA scores 0.50% on the same with BSNL and Bharti scoring 0.20% and 0.30% respectively. In all cases where customers were due for refund, all the service providers meet the TRAI benchmark of 100% with 4 weeks.

Inter operator calls assessment

Inter operator call Assessment (To/From)	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Bharti	NA	99%	98%	100%	100%	100%
BSNL	93%	NA	97%	99%	95%	96%
Vodafone	100%	97%	NA	99%	99%	99%
TATA	100%	100%	98%	NA	100%	99%
RCOM	98%	99%	100%	100%	NA	99%
Idea	100%	99%	100%	99%	99%	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 other service providers except BSNL (93%) and RCOM (98%) were established 100% of the times. Similarly BSNL's connectivity with all the operators was found to be good except Vodafone where only 97% of calls got connected. Similarly, Vodafone has maximum difficulty in connecting to a BSNL number with only 97% of its calls getting connected. TATA had no problems in connecting to any of the operators with either 99% or 100% of its calls getting established. Also, RCOM's connectivity to BSNL was not good with only 95 out of 100 calls getting connected. IDEA had the most problem in connecting to a BSNL number with only 96 out of 100 calls getting connected.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Haryana circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Ambala, Kurukshetra and Yamuna Nagar. 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 Haryana 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 test in the cities of Ambala, Kurukshetra and Yamuna Nagar was conducted along the following route:

Area Type	Type of Location	Ambala	Yamuna Nagar	Kurukshetra
Outdoor	Periphery of the city	Devinagar, Kalka Chowk, Ambala Cantt Railway station, Maheshnagar, Jagadhri Road	Bus Stand Jagadhari, Kalesar, Jaghadhari	3rd Gate, University, Jhansa Road, Mohan Nagar, PIPLI, I-Bye Pass Road, Brahamsarovar,
	Congested Area	Timber Market, Sadar Bazar, Science Market	Nehru Park, Bus Stand YMR Road, Railway Station	Sector-17 Market, Railway Road, Patel Nagar
	Across the City	Baldev Nagar, Narayanagar Road, Manav Chawk, Hissar Road, Prem Nagar	Jagadhari Road, Fountain Chowk, Bus stand Road	University 3rd gate to PIPLI
Indoor	Office Complex	BSNL Office	BSNL telephone exchange	BSNL telephone exchange
	Shopping Complex	Big Bazaar	NG Mall, Yamuna Nagar	MC Complex Main Bazar

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

**Drive Test - Ambala**

	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	NA	78.10%	86.62%	68.93%	99.09%	95.18%	99.83%	97.66%	96.57%	95.52%	99.89%	98.92%
Call set up Success Rate	NA	99.13%	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%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	0.00%	0.00%	100.00%	68.85%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Drive Test – Yamuna Nagar**

	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	NA	94.87%	90.75%	75.39%	98.16%	95.30%	99.94%	98.81%	99.94%	98.81%	99.74%	99.29%
Call set up Success Rate	NA	97.09%	100.00%	98.99%	96.55%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Call drop rate	NA	1.00%	0.00%	1.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	NA	100%	100.00%	57.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Drive Test - Kurukshetra**

	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	NA	95.66%	92.06%	82.42%	98.49%	94.56%	100.00%	98.48%	95.64%	92.47%	100.00%	99.77%
Call set up Success Rate	NA	100.00%	100.00%	98.89%	100.00%	93.55%	100.00%	98.73%	100.00%	97.80%	100.00%	100.00%
Call drop rate	NA	1.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Not meeting the benchmark, NA: Not Applicable

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

**Ambala:** There was interference and low signal strength recorded for all the operators in the outdoor areas near Baldev Nagar & towards Sambhu border, Lalkurti & region towards Model town, Small patch near Kalka Mode and Hisar road, On NH 1 towards Amritsar, i.e between bus stand and kalka Diversion, Near Round About, while in the indoor area there were no cases of inadequate coverage and interference recorded.

**Yamuna Nagar:** There was interference and low signal strength recorded for all the operators in the outdoor areas near Saharanpur road, Jagadhri road, near Piara Chowk, On road to GovindPuri from Professor Colony, Small Patch Near Brampur while in the indoor area there were no cases of inadequate coverage and interference recorded.


**Kurukshetra:** There was interference and low signal strength recorded for all the operators in the outdoor areas near NIT road, On Kachha Ghera road, Near Central jail area KKR, Near Jyotisar, while in the indoor area there were no cases of inadequate coverage and interference recorded.

#### Conclusions:

1. Bharti & BSNL do not meet the TRAI benchmark on percentage connections with good voice quality during the drive tests for all the three cities.
2. Also, BSNL does not meet the benchmark for call drop rate for the city of Ambala.
3. Vodafone experiences low CSSR in indoor areas of Yamuna nagar and outdoor areas in Kurukshetra
4. BSNL has a problem of handoff in the outdoor areas of the cities of Ambala & Yamuna nagar

#### Summary of Live Measurement Results – Cellular Mobile Services

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	RCOM	IDEA
CSSR	> 95%	98.55%	97.60%	99.93%	98.32%	98.85%	99.11%
SDCCH / Paging Channel Congestion	< 1%	0.41%	0.31%	0.01%	0.00%	0%	0.43%
TCH Congestion	< 2%	0.16%	0.82%	0.15%	0.00%	0.38%	1.04%
POI congestion	< 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Call drop rate	< 3%	1.36%	1.90%	1.62%	0.76%	1.35%	1.36%

 Not meeting the benchmark

During the three day live measurement, all the operators were found to be meeting the TRAI benchmark for all the parameters that were to be measured during the three days. Vodafone led the way on CSSR with a call success rate of 99.93%. Also, CSSR for BSNL was found to be relatively lowest at 97.60% during the live measurement.

Also, 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 IDEA at 0.43%. RCOM and TATA experienced no Paging Channel Congestion. IDEA also relatively had the highest traffic channel congestion with a congestion of 1.04%. Also, there was no POI congestion observed for all individual POI links for any of the operators.

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 BSNL with 1.90% calls getting dropped after establishment. It was followed by Vodafone with 1.62% and Bharti & IDEA both with 1.36% call drop rate. The lowest call drop rate was observed for TATA with only 0.76% 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	RCOM	You telecom
1	<b>Service provisioning uptime</b>							
1.1	Total connections registered		436	1020	19	221	145	556
1.2	Percentage connections provided within 15 days	100%	100%	96%	100%	100%	47%**	100%
2	<b>Fault repair restoration time</b>							
2.1	Total number of faults registered/calls made		373	966	34	97	No faults reported	1063
2.2	Percentage faults repaired by next working days	> 90%	100%	96%	91%	92%		100%
2.3	Percentage faults repaired within three working days	99%	100%	100%	100%	99%		100%
3	<b>Billing performance</b>							
3.1	Total bills generated		7664	8998	Prepaid	All customers are prepaid and billing is taken care by Local cable operator	3	12468
3.2	Billing complaints per 100 bills issued	<2%	0.03%	0.07%			0.00%	0.10%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	100%			No billing complaints reported	100%
3.4	Time taken for refund of deposits after closure	100%	No such cases for these operators				100%	
4	<b>Customer care/helpline assessment</b>							
4.1	Percentage calls answered within 60 seconds	> 60%	56%	Details not available at the POP's/exchanges	100%	DNA	84%	98%
4.2	Percentage calls answered within 90 seconds	>80%	65%		100%		90%	99%
5	<b>Bandwidth utilization/Throughput</b>							
5.1	Total number of intra network links tested		11	BRAS-23,T1-24,T2-610, DSLAM-5456	400	2	5	NA
5.2	Total number if intra network links crossing 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	0	0
	<b>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</b>							
5.3	Total number of upstream links		2	97	28	3	1 (Delhi to NIXI)	1
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%	22%	75%
6	<b>Broadband download speed</b>	>80%	Complied	Complied	Complied	Complied	Complied	Complied
7	<b>Service availability/uptime</b>	>98%	99.93%	100.00%	100.00%	100.00%	100.00%	98.48%
8	<b>Packet loss</b>	<1%	<1%	<1%	<1%	<1%	DNA**	<1%
9	<b>Network Latency</b>							
9.1	POP/ISP Node to NIXI to IGSP	<120msec	46.53	Complied	< 45ms	<20	<40	<40
9.2	ISP node to NAP port	<350msec	91.63	Complied	<250 ms	<20	<250	<300

\*\* 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

- BSNL (at 96%) and Reliance communications (at 47%) fall short of the benchmark for connections provided within 15 days. However, it should be noted that RCOM has limited presence in Haryana circle and includes those cases where it is technically not feasible to provide the connection in 15 days. Ideally such cases should be excluded as per TRAI guidelines.
- All the service providers manage to do well for live calling as  $\geq 90\%$  of subscribers for all the service provider claimed that connection was provided within 15 days.

### Fault Repair/Restoration time

- All the operators meet the TRAI specified benchmark for fault repair within 24 hours and fault repair within 3 working days.
- 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.
- For live calling results for "fault repair within 24 hours" scores are observed to be low for BSNL at 28% followed by You telecom and Sify at 60% and 78% respectively.
- Sify scores the lowest on live calling results for "fault within 3 working days" at 83%. When compared to live calling scores for "fault repaired within 24 hours" You telecom and BSNL do well with scores of 87% and 96% respectively for live calling scores on "fault repair within three working days".

### Billing performance

- All the service providers were found to be meeting the benchmark of 4 weeks for resolution of billing complaints for the month in which data was collected. Sify and Hathaway however claim that all their retail broadband customers are prepaid.
- 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

- For live calling results for calls answered by the operator BSNL falls short of the TRAI specified benchmark with scores of 40% for “calls answered within 60 seconds by the operator” and 58% for “calls answered within 90 seconds by the operator”.
- For one month in which the Audit was carried Bharti falls short of the TRAI specified benchmark with scores of 56% for calls answered by the operator within 60 seconds and 65% for calls answered by the operator within 90 seconds.

### 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 (Bharti, Hathaway) 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 links, data for Sify and BSNL was obtained on all India basis. All the links in the access segment randomly tested by IMRB auditors were found to be less than 90%. 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.
- For Reliance data for Intra network links are obtained from Core Distribution Routers (ROUTER BEING USED FOR AGGREGATION AT CORE/DISTRIBUTION LOCATIONS) to IAG routers (ROUTER USED FOR NLD CONNECTIVITY). None of such links were found to be having more than 90% utilization during month of Audit.
- For Bandwidth utilization on upstream links (From ISP Node to IGSP/NIXI) BSNL, VSNL and meet the TRAI specified benchmark cumulatively for all the gateways present in India. For Bharti and Hathaway, upstream links (to IGSP) are present in Delhi and both the service provider have excess bandwidth available.
- For Reliance the link for upstream connectivity to NIXI is present in Delhi and the bandwidth utilized on the same was found to be less than 25% during the month of Audit. The service provider has international connectivity from Chennai and Mumbai and same has been covered in respective circle reports.

### Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.
- However, no historic data was available for verification of records for month of Audit as well as quarter ending October to December 2007 with all 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 only BSNL was found to be meeting the TRAI benchmark (For

sample calls made to subscribers across different locations in Haryana). Reliance, Hathaway and Bharti marginally fall short of the benchmark specified by TRAI ( $\geq 80\%$ )

#### 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. Bharti 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, 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).
- 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. Ideally the parameter should be measured by conducting ping tests.
- Due to non-availability of the records of old ping tests, verification process could not be 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	RCOM	You telecom
Service Availability Uptime	>98%	99.21%	100.00%	100.00%	100.0%	DNA**	100.00%
No of Intra network links found to be above 90% (Out of sample links tested)		0	0	0	0	0	No separate Core Distribution Router in Haryana
Total Bandwidth utilization at all upstream links	< 80%	20%	71%	74%	68%	20% (Link from Delhi to Nixi)	53%
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	34.25	Complied	<15 ms	<20	<40	23.3
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	88.44	Complied	240 ms	<20	<250	60

\*\* 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 Measurement. 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 utilisation 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

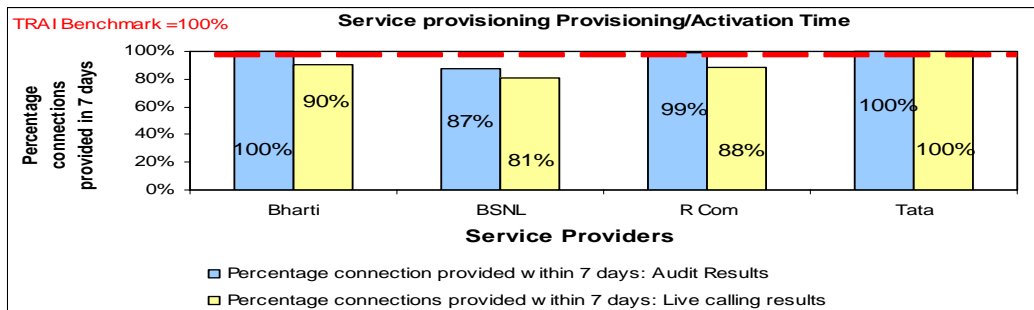
For Bandwidth utilisation on upstream links, most the service providers are meeting the benchmark during the three day live measurement and have excess capacities available on their upstream links. However, it should be noted that for BSNL out of the total 97 gateway links present at different places in India 10 to 20 were found to be > 90 %.

For network latency and packet loss all the service providers comfortably meet the TRAI specified benchmark. The same was measured by conducting ping tests as per the specification prescribed by TRAI (1000 packets of 64 bytes each)

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

### 6.1 Graphical/Tabular Representations for Basic (Wireline) services

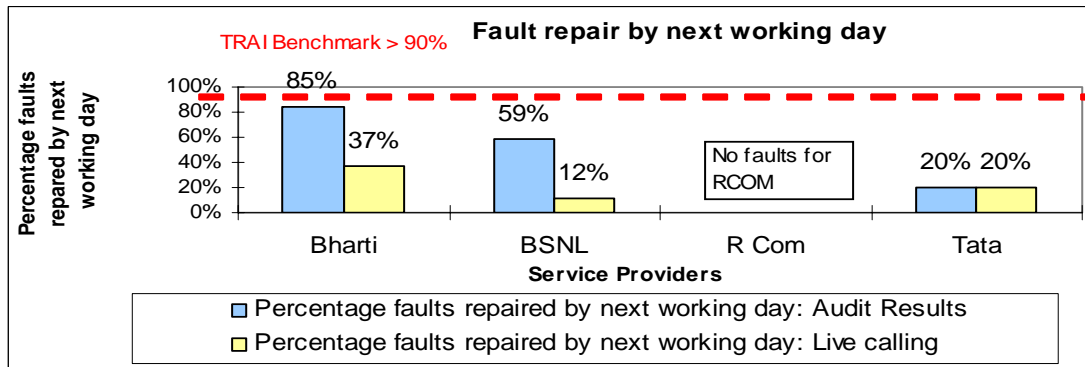
#### Service provisioning / Activation time (Comparison between one month audit results and live calling results)



BSNL (at 87%) and RCOM (at 99%) fall short of TRAI specified benchmark of 100% connections to be registered within 7 days. It should be noted that TATA which scores 100% provided connections only at 2 customer locations.

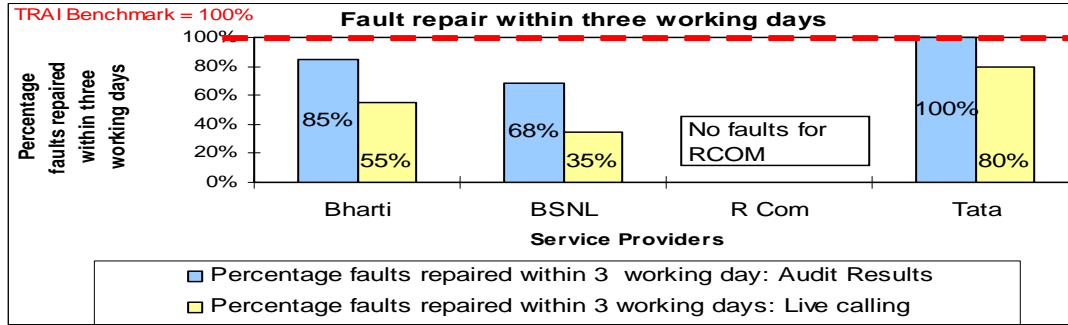
Live calling scores remain reasonably good with scores for TATA, Bharti, RCOM and BSNL observed to be 100%, 90%, 88% and 81% respectively. It should be noted that there was only one call made for TATA as the connections were provided only at two customer locations.

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



All the service providers fall short of the TRAI specified benchmark of 90% faults to be repaired by next working day. Scores are observed to be highest for Bharti at 85% followed by BSNL at 59%. It should be noted that for TATA there were only 5 faults reported in the month of Audit.

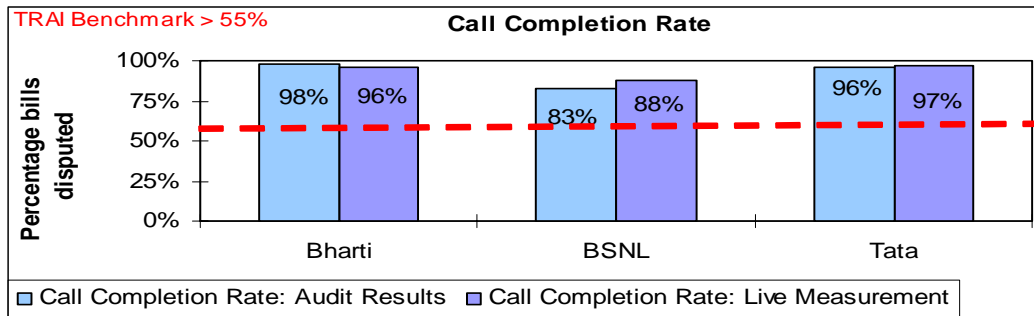
Live calling scores are also observed to be low highest was observed for Bharti at 37% followed by TATA (1out of 5 cases resolved in one day) and BSNL (at 12%).



Only TATA meets the TRAI specified benchmark for faults repair within three working days as all the 5 faults reported in the month of Audit were repaired within the stipulated time. Bharti and BSNL scores are observed to be 85% and 68% respectively.

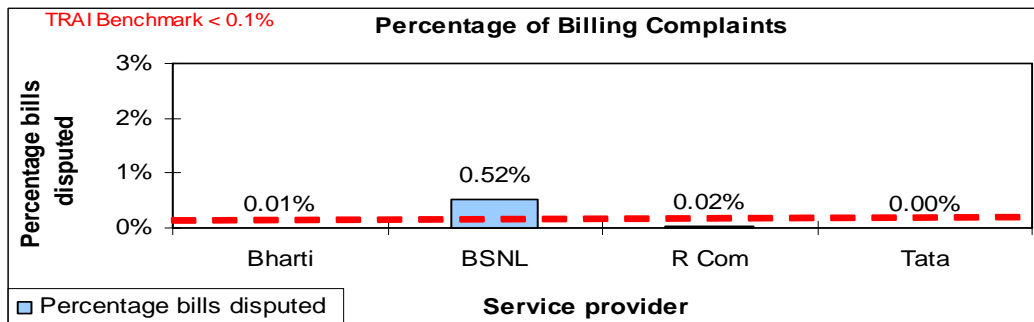
Live calling scores are observed to be lowest for BSNL as only 35% of total customers called claimed that fault reported by them was repaired within 3 working days.

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



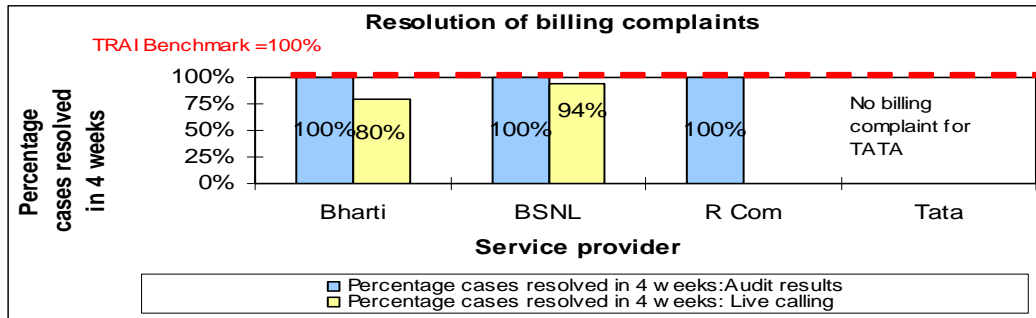
All the service providers meet the TRAI specified benchmark for the month of Audit as well as during the live measurements carried out during the visits by IMRB Auditors.

**Percentage bills disputed**



Only BSNL falls short of TRAI specified benchmark of <0.1% billing complaints/disputes at .052%

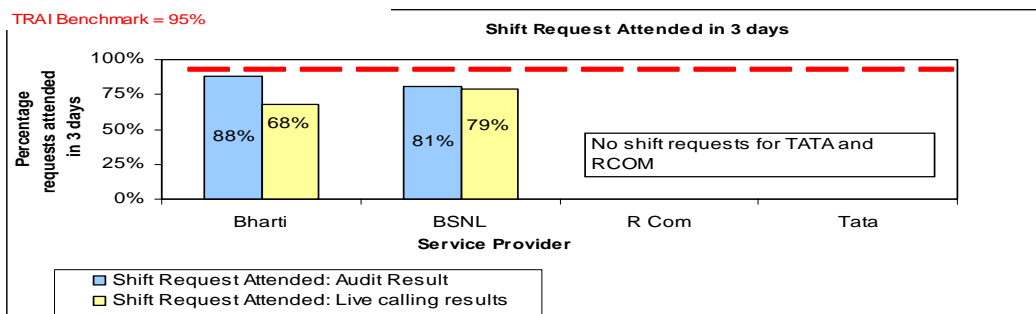
**Resolution of billing complaints (Comparison between one month audit results and live calling results)**



As per audit data findings, all the billing related complaints were resolved by the service providers within the stipulated period of time.

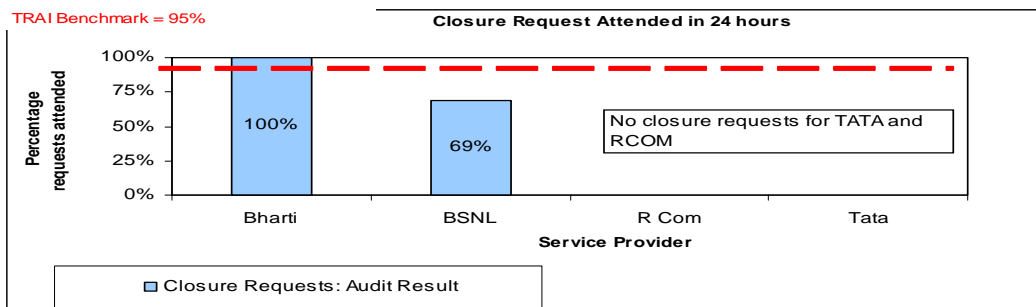
Live calling result show that for 94% of BSNL customers and 80% of Bharti customers claimed that their complaint was resolved within 4 weeks. For RCOM live calling was not carried out as there was only one case of dispute reported during the month prior to visit of Audit

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



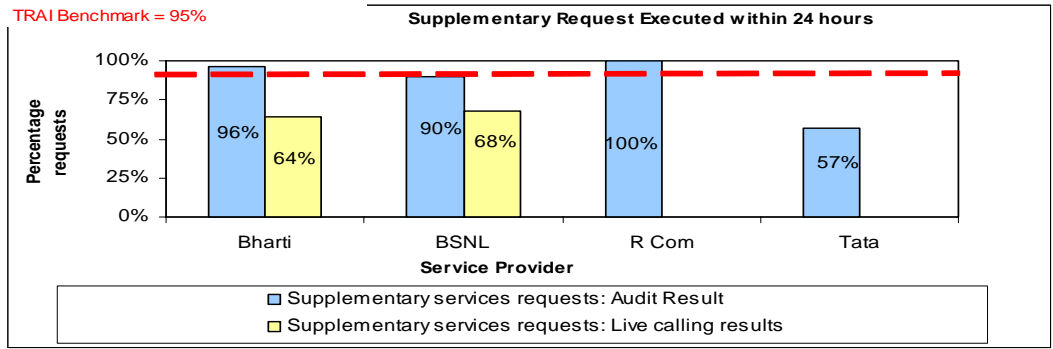
Both BSNL (at 81%) and Bharti (at 88%) fall short of TRAI specified benchmark of 95% shift requests to be attended within 3 days. Live calling scores are observed to 79% for BSNL followed by Bharti at 68%.

**Closure requests attended within 24 hours**



BSNL (at 69%) falls short of TRAI specified benchmark of 95% closure requests to be attended within 24 hours

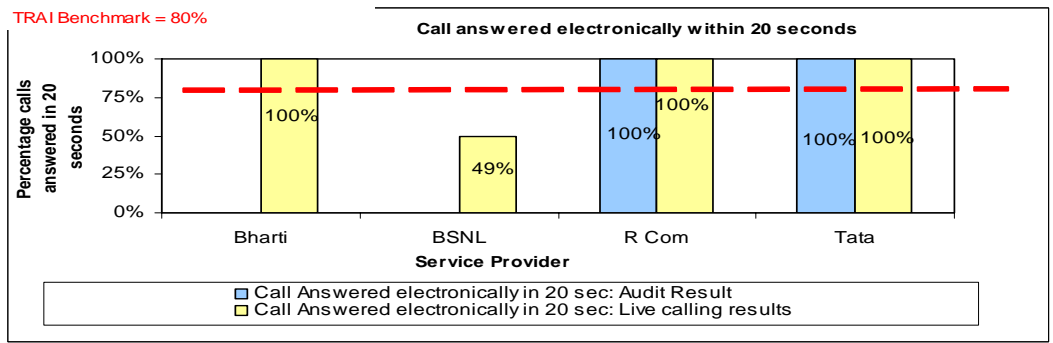
**Supplementary requests (Additional services) attended within 24 hours (Comparison between one month audit results and live calling results)**



BSNL and TATA fall short of TRAI specified benchmark for additional services requests to be attended within 24 hours. It should be noted that for TATA and Reliance(7 in each case) there were very few such requests due to low subscriber base.

For live calling results 68% of BSNL customers claimed that the request made by them was attended in 24 hours followed by 64% such customers for Bharti.

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

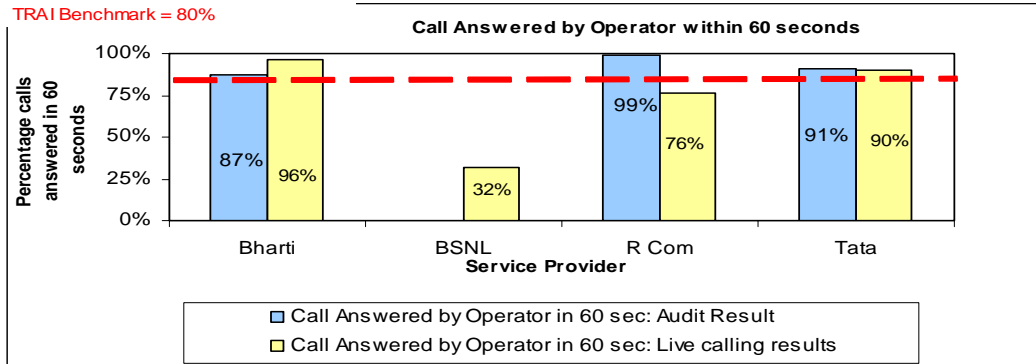


All the service providers except BSNL meet the TRAI specified benchmark for calls answered by the IVR within 20 seconds for live calling results.

It should be noted that for BSNL live calling was carried out at the main exchanges in Haryana, the benchmark was met when calls were made from Gurgaon but connectivity was found to be poor from other cities like Rohtak.

As mentioned earlier Bharti does not record calls received by IVR and does not even report the same to TRAI

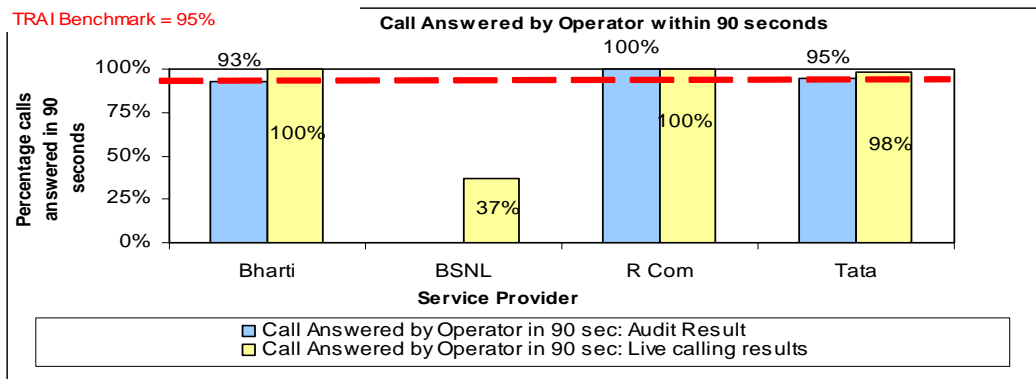
**Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)**



For calls answered by the operator within 60 seconds all the service provider meet the TRAI specified benchmark for the month in which Audit was carried out. Details of call centre were not available at the exchanges for BSNL. However, RCOM (at 76%) and BSNL (at 32%) fall short of TRAI specified benchmark for live calling results.

It should be noted that for BSNL live calling was carried out at the main exchanges in Haryana, the benchmark was met when calls were made from Gurgaon but connectivity was found to be poor from other cities like Rohtak. As mentioned earlier Bharti does not record calls received by IVR and does not even report the same to TRAI

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

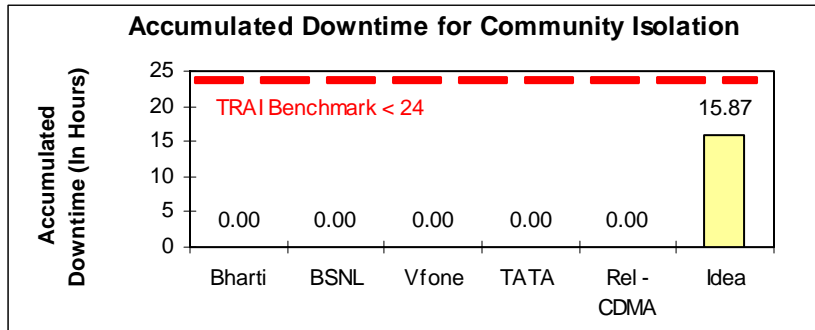


Only BSNL (at 37%) falls short of TRAI specified benchmark of 95% calls to be answered by the operator within 90 seconds for live calling results.



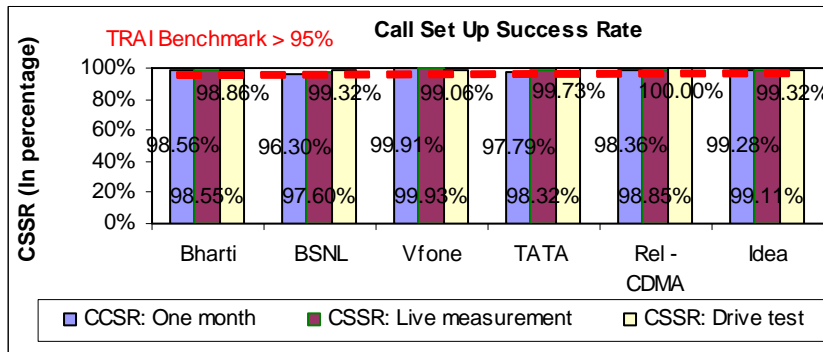
## 6.2 Graphical/Tabular Representations for Cellular Mobile Services

### Accumulated Downtime



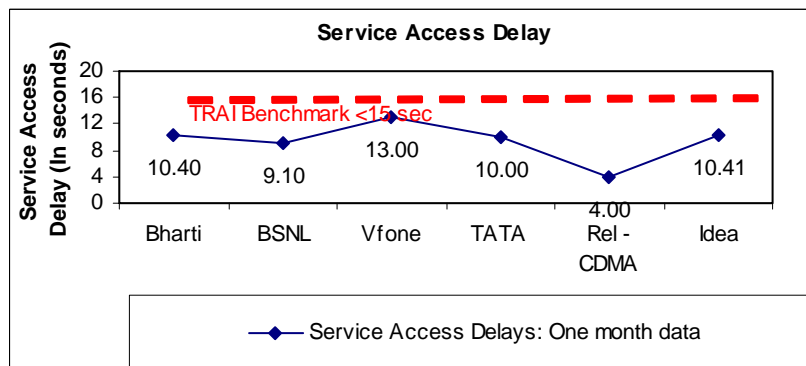
Only IDEA experienced a downtime in the Haryana circle in the month of audit. All other operators did not experience any downtime in the network.

### Call Set-up Success Rate (CSSR)



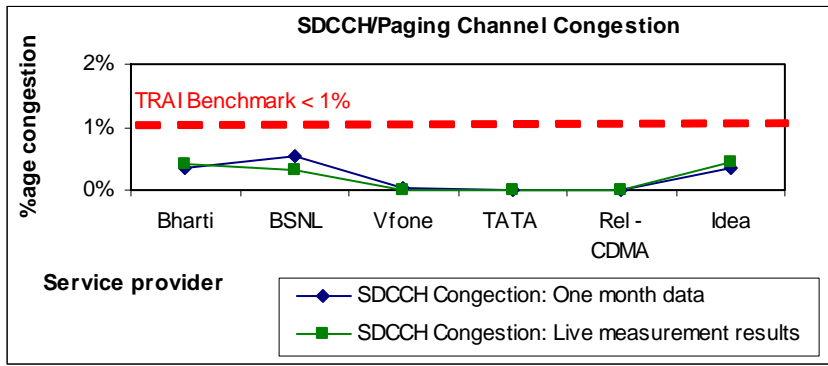
All the operators are meeting the benchmark for the audit month, live measurement as well as the drive test. Vodafone, relatively is the best performing operator on this parameter in the Haryana circle.

### Service Access Delay



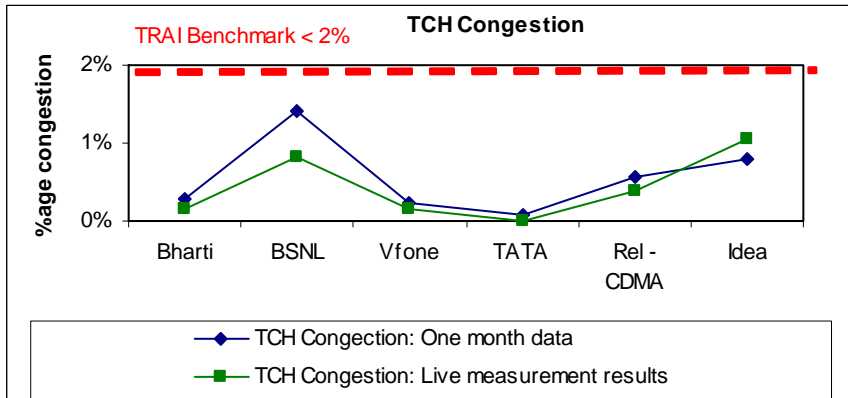
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit.

**SDCCH / Paging Channel Congestion**



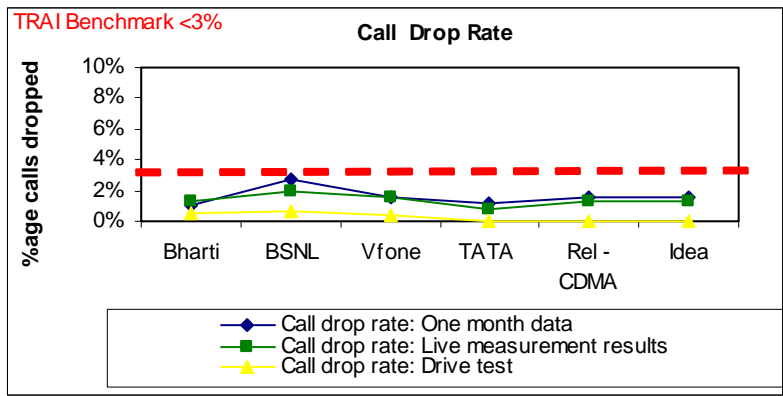
All the operators meet the benchmark both for the month of audit as well as the three day live measurement.

**TCH Congestion**



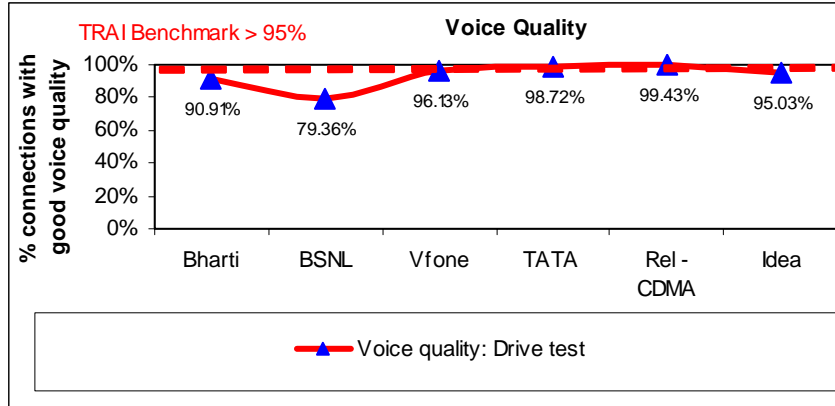
All the operators, for both the live measurement and audit period meet the TRA I specified benchmark. The minimum TCH congestion observed is for TATA with the highest being of BSNL.

**Call Drop Rate**



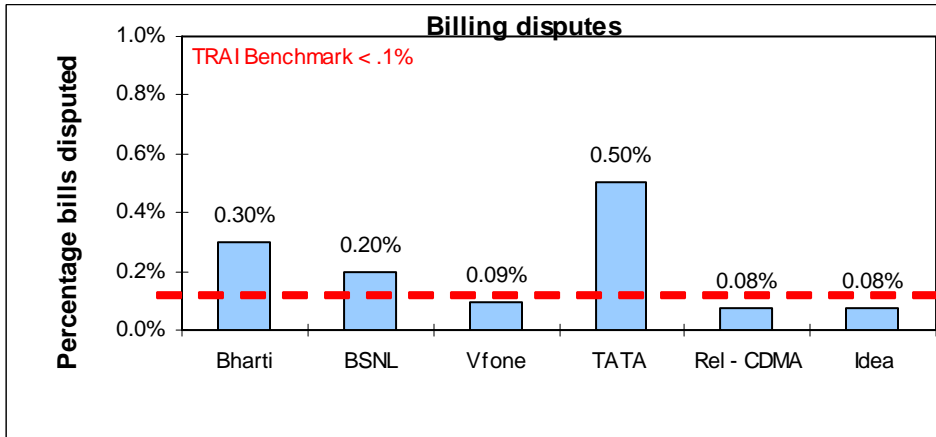
All the operators meet the TRAI benchmark. The operator with the least call drop rate taking into consideration the figures for live measurement and the month of audit is TATA while the operator with relatively the highest call drop rate is BSNL.

**Voice quality**

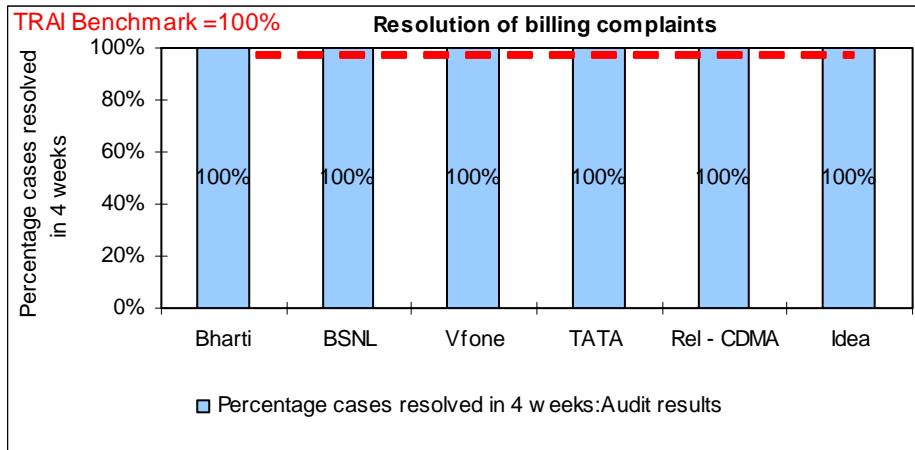


Bharti and BSNL do not meet the TRAI benchmark as found out during the drive test. BSNL has the lowest number of connections with good voice quality at only 79.36% while the same is 90.91% for Bharti. The operator with highest percentage of connections with good voice quality is RCOM at 99.43%.

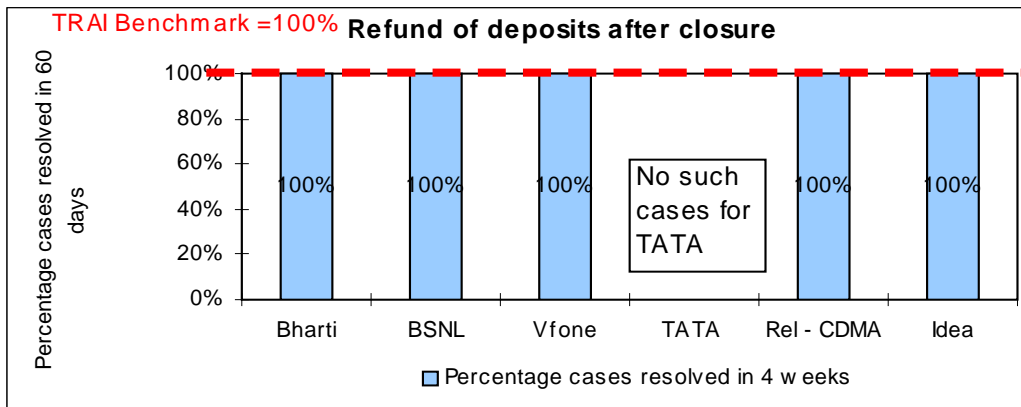
**Billing Disputes**



TATA, Bharti and BSNL do not meet the TRAI benchmark. TATA has the highest number of billing complaints per 100 bills issued. Also, the remaining operators are only just meeting the benchmark on this parameter.



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. No data for refund of billing complaints is provided by TATA as the operator claimed that none of its subscriber were due a refund in the circle during the monthly period of audit.

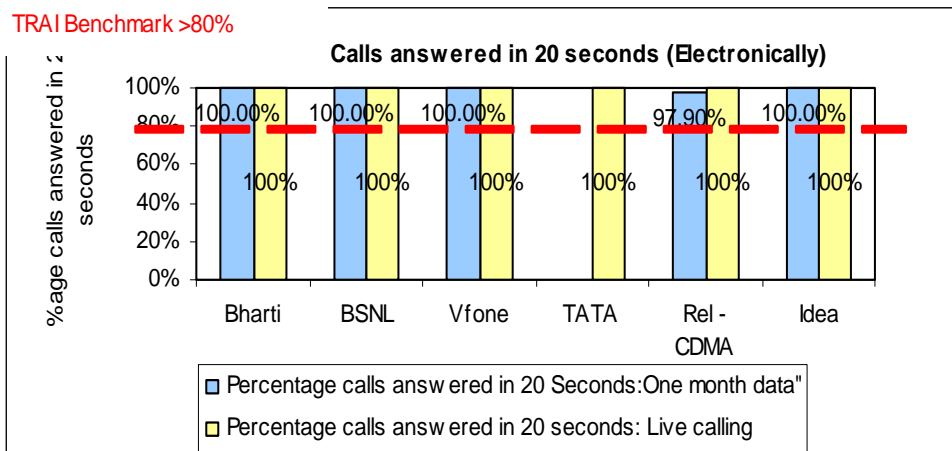
**Live calling for billing Complaints**

Resolution of billing complaints	Bharti	BSNL	Vfone	TATA	RCOM
Total Number of calls made	100	100	16	100	100
Number of cases resolved in 4 weeks	95	78	16	91	91
Percentage cases resolved in four weeks	95%	78%	100%	91%	91%

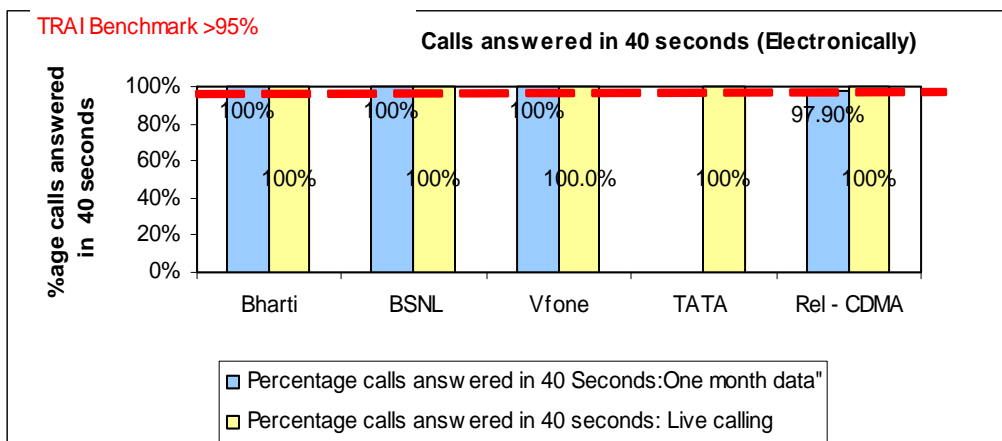
Except for Vodafone none of the operators were able to meet the TRAI benchmark for the live calling aspect. Only 78% of RCOM subscribers say that their complaints were resolved within 4 weeks. The database of IDEA subscribers who have made a complaint was not provided to the auditors by the operator.

**Customer Care / Helpline:**

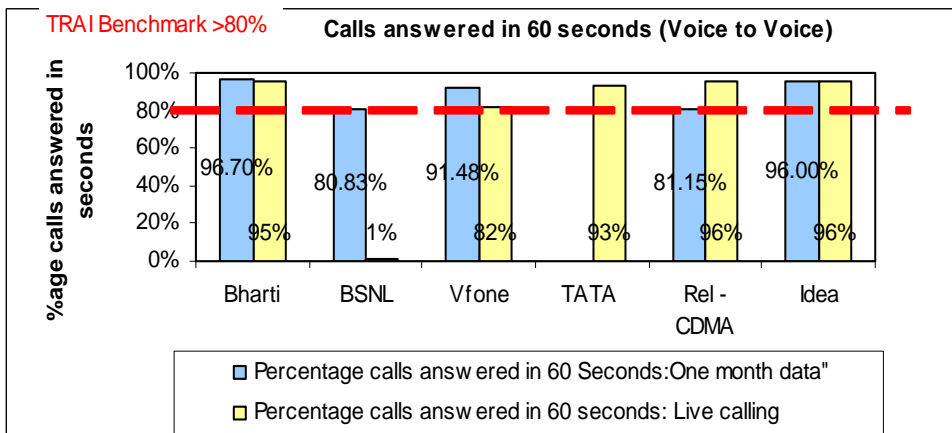
TRAI Benchmark >80%



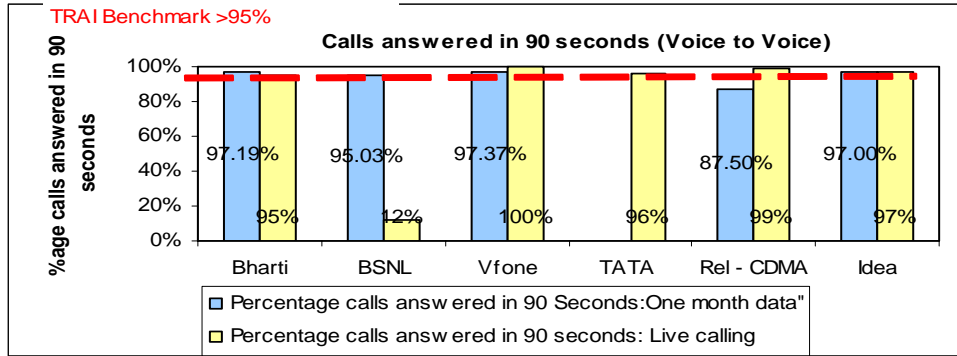
All the operators meet the TRAI benchmark for IVR (Electronic) answering of customers' calls for the one month data. However, the IMRB auditors found out that TATA was not able to report the figures of customer care / helpline details from any of their switches in the circle.



All the service providers meet the TRAI specified benchmark.



All operators meet the TRAI benchmark for the one month data for voice to voice calls answered within 60 seconds. For live calling, only 1 out of 100 calls to a BSNL call center was answered within the first 60 seconds. all operators meet the TRAI specified benchmark



Except for RCOM all other operators meet the TRAI benchmark for the one month data for voice to voice calls answered within 90 seconds. For live calling all, only 13% calls made to a BSNL call center were answered by the operator within the first 90 seconds

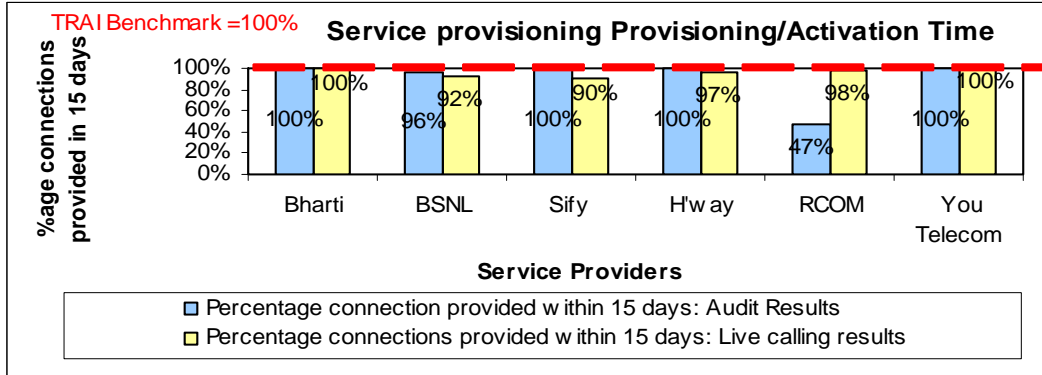
Inter operator calls assessment

Inter operator call Assessment (To/From)	Bharti	BSNL	Vfone	TATA	RCOM	Idea
Bharti	NA	99%	98%	100%	100%	100%
BSNL	93%	NA	97%	99%	95%	96%
Vodafone	100%	97%	NA	99%	99%	99%
TATA	100%	100%	98%	NA	100%	99%
RCOM	98%	99%	100%	100%	NA	99%
Idea	100%	99%	100%	99%	99%	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 other service providers except BSNL (93%) and RCOM (98%) were established 100% of the times. Similarly BSNL's connectivity with all the operators was found to be good except Vodafone where only 97% of calls got connected. Similarly, Vodafone has maximum difficulty in connecting to a BSNL number with only 97% of its calls getting connected. TATA had no problems in connecting to any of the operators with either 99% or 100% of its calls getting established. Also, RCOM's connectivity to BSNL was not good with only 95 out of 100 calls getting connected. IDEA had the most problem in connecting to a BSNL number with only 96 out of 100 calls getting connected.

### 6.3 Graphical/Tabular Representations for Broadband services

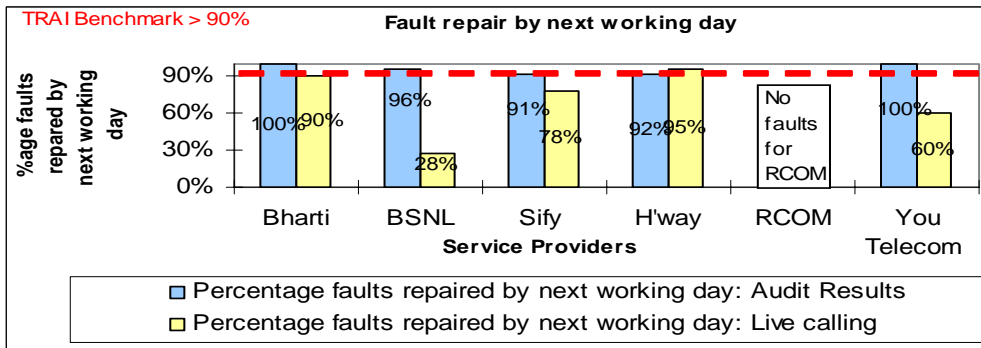
#### Service provisioning/Activation time (Comparison between one month audit results and live calling results)



Reliance and BSNL fall short of TRAI specified benchmark. 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 Sify (90%) and highest are observed for Bharti and You telecom at 100 %.

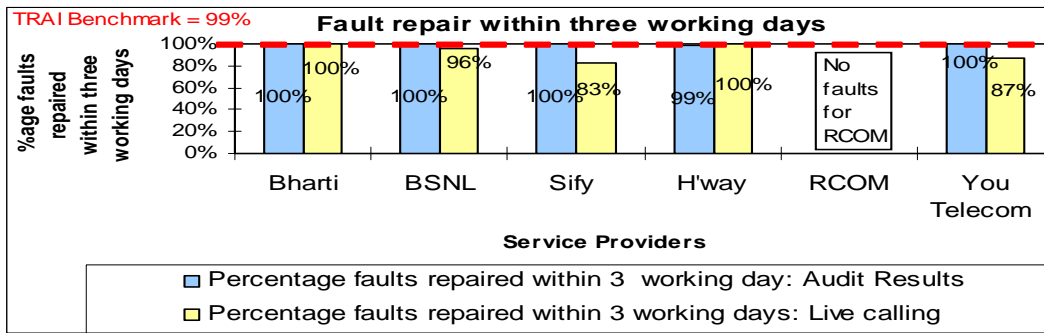
#### Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results



All the service providers meet the TRAI specified benchmark for the month in which Audit was carried out.

Live calling scores are observed to be lowest for BSNL as only 28% of subscribers called claimed that the fault was repaired by next working day. Next lowest scores are observed for You telecom at 60%

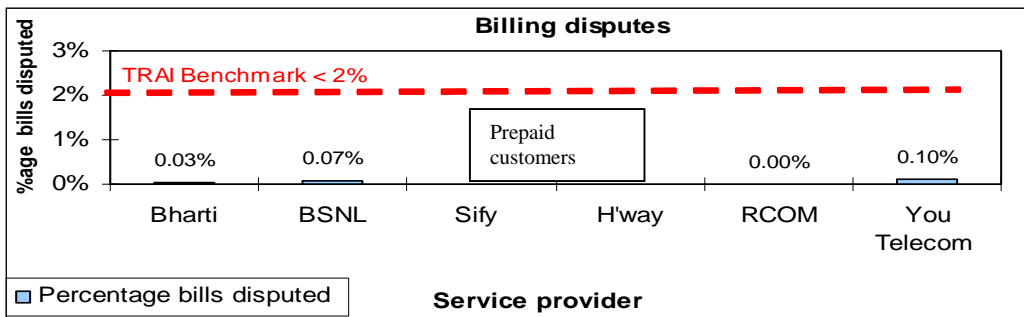
**Fault repair/Restoration time within three working days (Comparison between one month audit results and live calling results)**



All the service providers comply with the benchmark for the month of Audit.

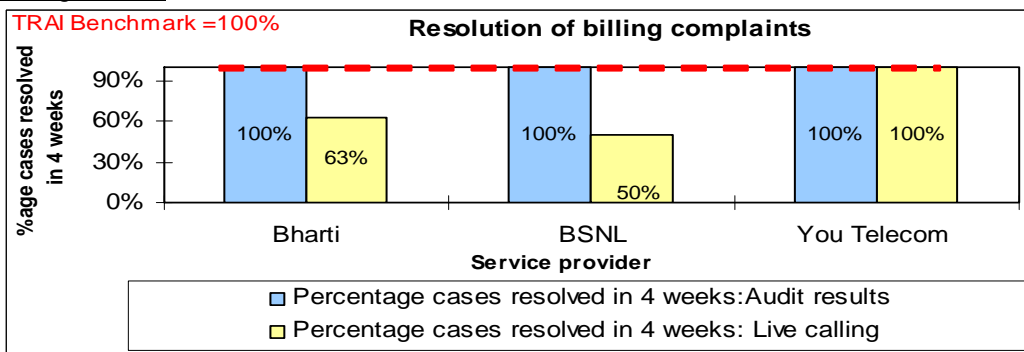
BSNL and You telecom have made phenomenal improvement in the live calling scores as 96% and 87% of the subscribers called respectively claimed that fault was repaired within 3 working days.

**Percentage bills disputed**



All the operators meet the benchmark on percentage bills disputed in Haryana circle. Sify and Hathaway claim that all its retail customers are prepaid customers and hence there are no billing complaints. For RCOM there were no billing complaints/disputes as service provider has low penetration in Haryana circle.

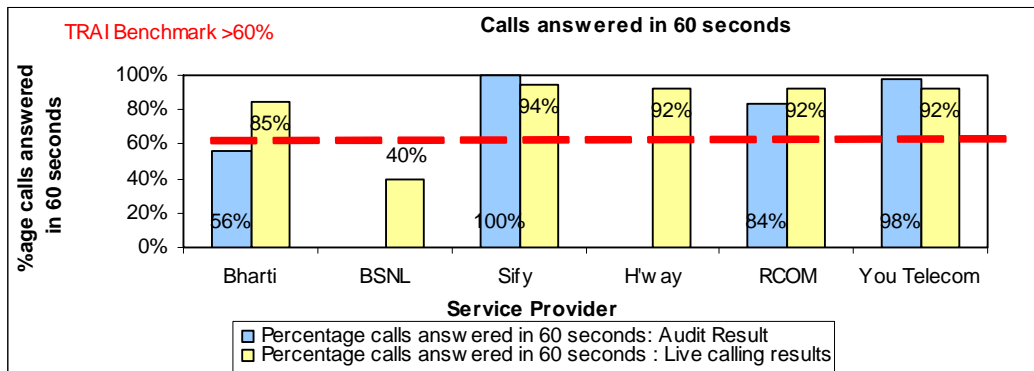
**Resolution of billing complaints (Comparison between one month audit results and live calling results)**





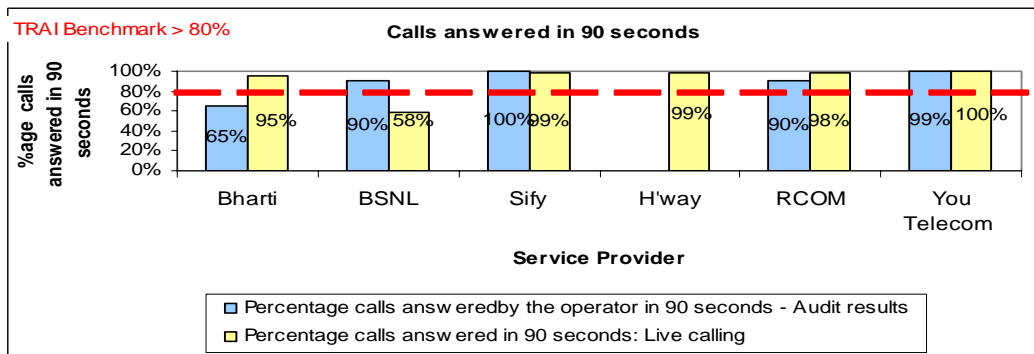
All the operators meet the TRAI specified benchmark for Percentage billing complaints resolved within four weeks during the month of Audit. BSNL and Bharti score low on live calling results at 50% and 63% respectively. For Reliance there was no live calling carried out as there were no cases of billing complaints/disputes in the month prior to visit of Audit.

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



BSNL at 40% falls short of the TRAI specified benchmark for live calling results for calls answered by the operator within 60 seconds.

**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 at 58% again falls short of the TRAI specified benchmark for live calling results for calls answered by the operator within 60 seconds.

**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	RCOM	You telecom
<b>One month Audit results</b>							
Total number of intra network links		11	BRAS-23,T1-24,T2-610, DSLAMS-5456	400	2	5 (From CDR in Delhi to IAG)	No separate core distribution router in Haryana
No of Intra network found to be above 90%	<80%	0	Uplink Traffic in Chennai BRAS is > 90%*	4	0	0	
<b>Live measurement results</b>							
No of Intra network Links tested		11	20* (Bandwidth checked for all uplinks from BRAS^ to core router)	37	2	5	No separate core distribution router in Haryana
No of Intra network found to be above 90%	<80%	0	0*	0	0	0	

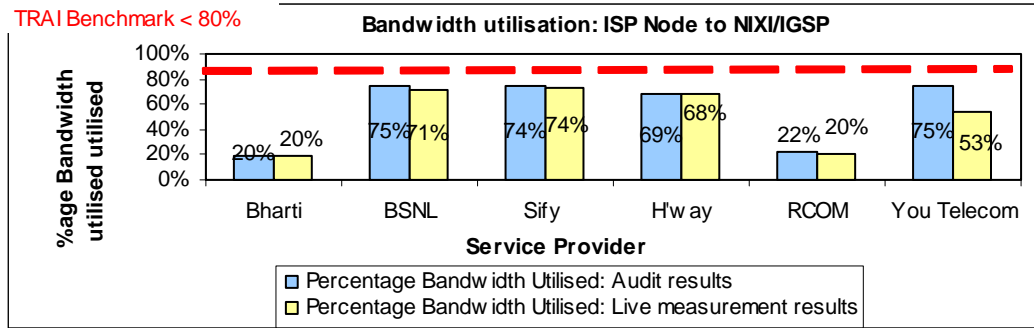
\*Reported on All India Basis, ^ BRAS: Broadband Remote Access Server

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

However, the level from which the bandwidth utilization at Intra network links is being reported varied because of the difference in networks. For e.g. Bharti was found to be reporting Bandwidth from links running from each RSU (Collection of DSLAM's) to the main node in a circle. Whereas Reliance Communications considers the links between IAG routers (ROUTER BEING USED FOR NLD INTERNET CONNECTIVITY) to CAG / CDR routers (ROUTER BEING USED FOR AGGREGATION AT CORE/DISTRIBUTION LOCATIONS) as the Intra network links.

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

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



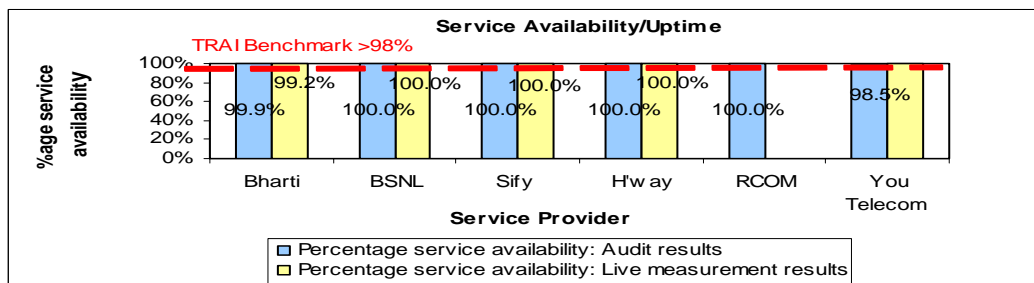
All the service providers comply with the TRAI specified benchmark. For Sify and BSNL findings are reported cumulatively for all gateways in India.

**Broadband connection speed available to sample subscribers – Live calling results**

Download Speed	Benchmark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Percentage speed observed cumulatively for sample calls made	>80%	78%	84%	73%	78%	79%	63%

All the service providers are meeting the benchmark for one month data collection and live measurements conducted at POPs/ISP Node. **Since verification of records was not possible because of unavailability of historic data with the operators**, IMRB auditors also conducted live calling to check speed available at the last mile. Live calling results reveal only BSNL meet the TRAI specified benchmark. Bharti, Hathaway and RCOM are marginally falling short of the benchmark. You telecom is the lowest scorer at 63%.

**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%. 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.

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

### 7.1 Basic (Wireline) services

	Parameter	B'mark	Bharti		BSNL		RCOM		TATA	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
<b>1</b>	<b>Provision of telephone after registration of demand</b>									
1.1	Percentage connections completed within 7 days	100%	100%	100%	100%	89%	100%	100%	No connections provided	
<b>2</b>	<b>Fault incidence/clearance statistics</b>									
2.1	Fault incidence	<5	5.27	5.26	5.4	8.8	NA	NA	0	0
2.2	Faults repaired within 24 hours	>90%	94%	94%	95%	43%	NA	NA	87%	87%
2.3	Mean time to repair	<8 hrs	12.2	12.2	7.5	5.7	NA	NA	24.93	24.9
3	Call Completion Rate (CCR)	>55%	63%	63%	74%	51%	DNA		0%	100%
<b>4</b>	<b>Metering and billing credibility</b>									
4.1	Billing complaints per 100 bills issued	<0.1%	0.00%	0.00%	0.01%	0.49%	No complaints		No complaints	
4.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	87%	100%				
<b>5</b>	<b>Customer care/helpline promptness</b>									
5.1	Shift requests (Total number received)									
	Percentage shift requests attended within 3 days	95%	100%	96%	100%	89%	No requests		No requests	
5.2	Closure request attended (Total number received)									
	Closure within 24 hours	95%	74%	74%	100%	83%	No requests		No requests	
5.3	Supplementary (additional) service requests attended (Total number received)									
	Additional facility provided within 24 hours	95%	98%	98%	100%	91%	No requests		No requests	
<b>6</b>	<b>Response time to customer</b>									
6.1	% age call answered through IVR in 20 seconds	80%	Details not recorded in the system		100%	Details not available at the exchange	98%	98%	100%	Details not available for verification
	% age call answered through IVR in 40 seconds	100%			100%		99%	99%	100%	
6.2	% age calls answered by operator in 60 seconds	80%	97%	97%	100%		97%	97%	83%	
	% age calls answered by operator in 90 seconds	95%	99%	99%	100%		99%	99%	84%	
7	%age cases where refund received within 60 days	100%	82%	DNA	100%	100%	100%	100%	NA	NA

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



Figures do not match with those reported in PMR




Figures verified on all India basis


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

### 7.2 Cellular Mobile services

	Parameter	B'mark	SERVICE PROVIDER											
			Bharti		BSNL		Vodafone		TATA		RCOM		IDEA	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
<b>A</b>	<b>Network Performance</b>													
1	Accumulated Downtime	< 24 hrs.	11.38 hr	11.38 hr	1 hr	1 hr	3.45 hr	3.45 hr	0.33hr	1 hr	0 hr	0 hr	16.24 hr	16.24 hr
2	Call set up success rate	> 95%	99.16%	99.16%	95.40%	95.40%	99.95%	99.95%	98.37%	98.37%	99.40%	99.40%	99.98%	99.98%
3	Service Access delay	9 to 20 seconds	2.90	2.90	4.10	4.10	9.00	9.00	5.04	5.04	4.00	4.00	9.30	9.30
4	Blocked call rate													
	SDCCH Congestion	< 1 %	0.44%	0.44%	0.80%	0.80%	0.16%	0.16%	0.00%	0.00%	0.00%	0.00%	0%	0%
	TCH Congestion	< 2 %	0.36%	0.36%	1.80%	1.80%	0.42%	0.42%	0.06%	0.06%	0.00%	0.00%	0.69%	0.69%
5	Call drop rate	< 3 %	0.89%	0.89%	2.80%	2.80%	1.64%	1.64%	0.91%	0.91%	0.80%	0.80%	1.50%	1.50%
6	%age connections with good voice quality	> 95%	100%	100%	95.8%	No data available for verification	95.8%	No data available for verification	98.85%	98.85%	97.50%	97.50%	99.04%	99.04%
7	Service coverage		Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	< 0.5%	Complied		Complied		Complied		Complied		Complied		Complied	
<b>B</b>	<b>Customer Care</b>													
	Calls answered electronically													
	Within 20 seconds	> 80%	100%	100%	100%	No data available for verification	100.00%	100.00%	100.0%	No data available for verification	97.30%	97.30%	100%	100%
	Within 40 seconds	> 95%	100%	100%	100%	No data available for verification	100.00%	100.00%	100.0%	No data available for verification	97.30%	97.30%	100%	100%
	Calls answered by the operator													
	Within 60 seconds	> 80%	98.20%	98.20%	80%	No data available for verification	98.36%	98.36%	83.00%	No data available for verification	89.60%	89.60%	91.00%	91.00%
	Within 90 seconds	> 95%	99.60%	99.60%	95%	No data available for verification	99.03%	99.03%	84.40%	No data available for verification	93.30%	93.30%	97.00%	97.00%
<b>C</b>	<b>Billing complaints</b>													
	Billing complaints/100 bills	< 0.1	0.02%	0.02%	0.00%	0.00%	0.09%	0.09%	0.06%	0.06%	0.06%	0.06%	0.07%	0.07%
	%age complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Period of refunds due to customers	100%	100%	100.0%	100%	100%	100%	100%	100%	100%	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		H'way	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
<b>Service provisioning</b>									
Percentage connections provided within 15 days	100%	100%	100%	95%	95%	100%	100%	100%	100%
<b>Fault repair restoration time</b>									
Percentage faults repaired by next working days	> 90%	97%	97%	97%	97%	91%	91%	90%	DNA
Percentage faults repaired within three working days	99%	99%	99%	100%	100%	99%	99%	99%	
<b>Billing performance</b>									
Billing complaints per 100 bills issued	<2%	0.001%	0.001%	0.24	0.20%	All retail customers are Prepaid		Not reported by the service provider as it is taken care by local cable operators	
%age of billing complaints resolved in 4 weeks	100%	100%	100%	100%	100%				
%age cases in which refund of deposits after closure was made in 60 days	100%	NA	NA	100%	100%				
<b>Customer care/helpline assessment (Voice to Voice)</b>									
Percentage calls answered within 60 seconds	> 60%	91%	91%	Details not available		88%	88%	80-90%	80-90%
Percentage calls answered within 90 seconds	> 80%	95%	95%			98%	98%	NR	NR
<b>Bandwidth utilization/Throughput</b>									
<b>Intra network links (POP to ISP Node)</b>									
Total number of intra network links > 90%		0	0	NR	0	5	5	NR	NR
<b>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</b>									
Percentage bandwidth utilized on upstream links	< 80%	87%	87%	NR	78%	85%	85%	NR	NR
<b>Broadband download speed</b>		No raw data available for verification							
Service availability/uptime	> 98%	99.00%	99.97%	NR	100%	100%	100%	99.68%	99.68%
Packet loss	<2%	No raw data available for old ping test results		NR	Complied*	No raw data available old ping test results			
<b>Network Latency</b>									
POP/ISP Node to NIXI	< 120 msec			NR	Complied*				
ISP node to NAP port (Terrestrial)	< 350 msec			NR	Complied*				

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

### 7.4 Broadband services....Ctd

Parameter	Benchmark	RCOM		You Telecom		
		PMR	IMRB	PMR	IMRB	
<b>Service provisioning time</b>						
Percentage connections provided within 15 days	100%	68%^^	68%^^	100%	100%	
<b>Fault repair restoration time</b>						
Percentage faults repaired by next working days	> 90%	93%	93%	100%	100%	
Percentage faults repaired within three working days	99%	100%	100%	100%	100%	
<b>Billing performance</b>						
Billing complaints per 100 bills issued	<2%	0.41%	0.41%	0.09%	0.09%	
%age of billing complaints resolved in 4 weeks	100%	100%	100%	100%	100%	
%age cases in which refund of deposits after closure was made in 60 days	100%	100%	100%	100%	100%	
<b>Customer care/helpline assessment (Voice to Voice)</b>						
Percentage calls answered within 60 seconds	> 60%	73%	73%	98%	98%	
Percentage calls answered within 90 seconds	> 80%	87%	87%	99%	99%	
<b>Bandwidth utilization/Throughput</b>						
<i>Intra network links (POP to ISP Node)</i>						
Total number of intra network links > 90%		0	0	Only one intra network link used for internal purpose		
<i>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</i>						
Percentage bandwidth utilized on upstream links	< 80%	69%	69%	77%	77%	
Broadband download speed	> 80%	No raw data available for verification				
Service availability/uptime	> 98%	99%	99%	98.50%	98.00%	
Packet loss	<2%	0.54%	0.54%^^	<1%	Results of historic ping tests not available	
<b>Network Latency</b>						
POP/ISP Node to NIXI	< 120 msec	33.5	Old latency graphs verified	<40 ms		
ISP node to NAP port (Terresrtial)	< 350 msec	275.4		<300 ms		

^^ Methodology not in Line with QoS regulation,   Data verified on All India basis, DNA- Details Not Available for verification, B'mark = TRAI Benchmark (\*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),

  Figures do not match those in PMR

## 7.4 Conclusions

### 7.4.1 Basic Wireline Services

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

### 7.4.2 Cellular Mobile services

1. The figures for TATA do not match for accumulated downtime,
2. All the other figures across all operators match when IMRB auditors verified the records of the service providers.
3. However, both BSNL and TATA do not have any past records of data with them so as to enable the auditors to verify the records pertaining to customer care / helpline assessment
4. It was observed that all the service providers Audited in Haryana circle were using drive tests to measure Service coverage, Signal strength and Voice quality. They still do not have the facility to measure the same form raw counters at OMC

### 7.4.3 Broadband services

1. Complete data for Sify and Reliance was verified on an all India level
2. As mentioned earlier, it was observed that Reliance follows a different methodology for calculating packet loss which is based on faults reported by the customers. The same is not in line with QoS methodology.
3. 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.
4. Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was not available for verification for all the service providers except BSNL.
5. Although all the service providers claimed that they conduct random ping tests and latency to check the packet loss but there is no book keeping which is maintained at their end. Records of old ping tests were found to be maintained only by BSNL



## 8. Annexure - I

### 8.1 Parameter wise performance reports for Basic Wireline services

#### One month data verification results for Service provisioning

Service provisioning/Activation time	Benchmark	Bharti	BSNL	R Com	Tata
Number of connections registered during the period		746	247	257	60
Total number of connections provided within 7 days		746	215	254	60
Percentage of connections provided within 7 days	100%	100%	87%	99%	100%
Total number of connections provided after 7 days		0	32	3	0
Percentage of connections provided after 7 days		0%	13%	1%	0%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration made		100	187	100	1
Number of cases in which connection was provided in 7 Days		90	151	88	1
Percentage cases in which connection was provided in 7 days	100%	90%	81%	88%	100%
Number of cases in which connection was provided after 7 days		10	36	12	1
Percentage cases in which connection was provided after 7 days		10%	19%	12%	100%
Percentage cases in which connection was provided after 7 days		10%	19%	12%	100%

#### One month data verification results for Fault repair/Restoration time

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com	Tata
Total number of faults registered during the period		808	11158	0	5
Total number of faults repaired by next working day		685	6534	0	1
Percentage of faults repaired by next working day	> 90%	85%	59%	NA	20%
Total number of fault repaired within 3 days		685	7574	0	5
Percentage of fault repaired within 3 days		85%	68%	NA	100%

#### Live calling results for Fault repair/Restoration time

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		100	835	0	5
Number of cases where faults were repaired by next working day		37	97	0	1
Percentage cases where faults were repaired by next working day	> 90%	37%	12%	NA	20%
Number of cases where faults were repaired within 3 days		55	293	0	4
Percentage cases where faults were repaired within 3 days		55%	35%	NA	80%

**One month data verification results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		11389911	317848	DNA	23139
Total number of successful local calls		11144510	263736	DNA	22171
Call Completion Rate (CCR) in the local network	> 55%	98%	83%	DNA	96%

**Live measurement results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		1233911	32082	DNA	2817
Total number of successful local calls		1184005	28147	DNA	2732
Call Completion Rate (CCR) in the local network	> 55%	96%	88%	DNA	97%

**One month data verification results for Billing performance**

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
<b>Billing disputes</b>					
Total bills generated during the period		12424	27950	4316	153
Total number of bills disputed		1	144	1	0
Percentage bills disputed	<0.1%	0.01%	0.52%	0.02%	NA
<b>Resolution of billing complaints</b>					
Total complaints resolved in 4 weeks from date of receipt		1	144	1	0
Percentage complaints resolved within 4 weeks of date of receipt		100%	100%	100%	NA

**Live calling results for Billing performance**

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		50	72	0	0
Number of cases resolved in 4 weeks		40	68	0	0
Percentage cases resolved in four weeks		80%	94%	NA	NA

**One month data verification for Customer Care – Shifts**

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of shift requests received		156	90	0	0
Total number requests attended in 3 days	95%	137	73	0	0
Total number requests attended beyond 3 days		19	17	0	0
Shifts not attended		0	0	0	0
Percentage of requests attended in 3 days		88%	81%	NA	NA
Percentage of requests attended beyond 3 days		12%	19%	NA	NA
Percentage of shifts not attended		0%	0%	NA	NA

**Live calling results for Customer Care – Shifts**

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total number of call to shift requests		50	103	0	0
Total number of requests attended in 3 days	95%	34	81	0	0
Total number of requests attended beyond 3 days		16	22	0	0
Shifts not attended		0	17	0	0
Percentage of requests attended in 3 days		68%	79%	NA	NA
Percentage of requests attended beyond 3 days		32%	21%	NA	NA
Percentage of shifts not attended		0%	17%	NA	NA

**One month data verification Audit results for Customer Care – Closures**

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of closure requests received		583	358	0	0
Total closure attended within 24 hours	95%	583	246	0	0
Total number of requests attended beyond 24 hours		0	113	0	0
Closure requests not attended		0	0	0	0
Percentage of closure attended within 24 hours		100%	69%	NA	NA
Percentage of closure attended beyond 24 hours		0%	32%	NA	NA
Percentage of closures not attended		0%	0%	NA	NA

**One month data verification results for Supplementary Requests**

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		542	305	7	7
Total number of requests attended within 24 hours	95%	520	274	7	4
Total number of requests attended beyond 24 hours		22	31	0	3
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		96%	90%	100%	57%
Percentage of requests attended beyond 24 hours		4%	10%	0%	43%
Percentage of supplementary requests not attended		0%	0%	0%	0%

**Live calling results for Customer Care – Supplementary requests**

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		50	234	0	0
Total number requests attended within 24 hours	95%	32	158	0	0
Total number requests attended beyond 24 hours		18	67	0	0
Supplementary requests not attended		0	5	0	0
Percentage of requests attended within 24 hours		64%	68%	NA	NA
Percentage of requests attended beyond 24 hours		36%	29%	NA	NA
Percentage of supplementary requests not attended		0%	2%	NA	NA

**Live calling results for calls answered electronically**

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	295	100	100
<b>Calls answered within 20 seconds</b>					
Total Number of calls answered by IVR in 20 seconds	80%	100	145	100	100
Percentage calls answered in 20 seconds		100%	49%	100%	100%
<b>Calls answered within 40 seconds</b>					
Total Number of calls answered by IVR in 40 seconds	95%	100	145	100	100
Percentage calls answered in 40 seconds		100%	49%	100%	100%

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

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	295	100	100
<b>Calls answered within 60 seconds</b>					
Total Number of calls answered by operator in 60 seconds	80%	96	93	76	90
Percentage calls answered in 60 seconds		96%	32%	76%	90%
<b>Calls answered within 90 seconds</b>					
Total Number of calls answered by operator in 90 seconds	95%	100	108	100	98
Percentage calls answered in 90 seconds		100%	37%	100%	98%

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

Refund of deposits after closure	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		0	868	0	0
Number of cases where refund was made in < 60 days	100% within 60 days	0	815	0	0
Percentage cases where refund was made in < 60 days		NA	94%	NA	NA

**Level 1 Services**

Level 1 services	Bharti	BSNL	TATA
TOTAL Calls Made	170	300	300
Answered in 60 seconds	168	300	300
Percentage calls answered in 60 seconds	98.8%	100%	100%

## 8.2 Parameter wise performance reports for Cellular Mobile services

Accumulated Downtime	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Downtime (In hours)	0.00	0.00	0.00	0.00	0.00	15.87

### Audit Results for CSSR

CSSR	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of call attempts	DNP	DNP	1067521834	32020778	DNP	3622206
Total number of successful calls	DNP	DNP	1066558872	31311787	DNP	3596017
CSSR	98.56%	96.30%	99.91%	97.79%	98.36%	99.28%

### Live measurement results for CSSR

CSSR	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of call attempts	DNP	DNP	127829937	54196943	DNP	3354632
Total number of successful calls	DNP	DNP	127742657	53285734	DNP	3324871
CSSR	98.55%	97.60%	99.93%	98.32%	98.85%	99.11%

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

CSSR	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of call attempts	438	292	530	369	361	293
Total number of successful calls	433	290	525	368	361	291
CSSR	98.86%	99.32%	99.06%	99.73%	100.00%	99.32%

DNP – the figure was obtained directly from the system.

Service Access Delay	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
One month data collection	10.40	9.10	13.00	10.00	4.00	10.41

Traffic Statistics	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	3772138	4748891	154543052	16521737	DNP	4945446
Total Number of SDCCH Congestions	12825	26119	27818	0	DNP	16815
Percentage SDCCH Congestion	0.34%	0.55%	0.02%	0.00%	0.00	0.34%
<b>TCH Congestion</b>						
Total number of TCH Attempts	1978586	2264347	87750987	32020778	DNP	3227635
Total Number of TCH Congestions	5738	32154	210602	27324	DNP	25498
Percentage TCH Congestion	0.29%	1.42%	0.24%	0.09%	0.57%	0.79%

### Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	51033351	2180082	17501745	25513621	DNP	4777455
Total Number of SDCCH Congestions	209237	6758	1400	0	DNP	20543
Percentage SDCCH Congestion	0.41%	0.31%	0.01%	0.00%	0%	0.43%
<b>TCH Congestion</b>						
Total number of TCH Attempts	22266289	905574	9542288	54196943	DNP	2949662
Total Number of TCH Congestions	35626	7426	14313	433	DNP	30676
Percentage TCH Congestion	0.16%	0.82%	0.15%	0.00%	0.38%	1.04%

DNP – the figure was obtained directly from the system.

**Audit Results for Call drop rate**

Call drop rate	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of calls established	1974362	1907836	81430229	31311787	DNP	3202059
Total number of calls dropped	21168	51511	1285678	359469	DNP	50093
Call drop rate	1.07%	2.70%	1.58%	1.15%	1.52%	1.56%

**Live measurement results for Call drop rate**

Call drop rate	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of calls established	22042556	841281	103332997	53285734	DNP	2918810
Total number of calls dropped	298873	15984	1669550	404939	DNP	39590
Call drop rate	1.36%	1.90%	1.62%	0.76%	1.35%	1.36%

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

Call drop rate	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of calls established	403	290	520	368	361.00	272
Total number of calls dropped	2	2	2	0	0.00	0
Call drop rate	0.50%	0.69%	0.38%	0.00%	0.00%	0.00%

DNP – the figure was obtained directly from the system.

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

Voice quality	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total number of sample calls	946477	684587	833955	21121	21472.00	646418
Total number of calls with good voice quality	860475	543301	801705	20851	21349.00	614286
%age calls with good voice quality	90.91%	79.36%	96.13%	98.72%	99.43%	95.03%

**Audit Results for POI Congestion**

POI congestion	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
POI traffic offered on all individual POI's	0	1754258	497909.78	272509.9	DNP	DNP
Served traffic for all individual POI's	0	1754258	0	270998.38	DNP	DNP
Traffic failed on all POI's	0.00%	0.00%	0.00%	0.00%	0.00% (Some problems observed with links of Vodafone)	0.00%

**Live measurement results for POI congestion**

POI congestion	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
POI traffic offered on all individuals POI's	0	765790	658409.1	395397.75	DNP	DNP
Served traffic for all individual POI's	0	765790	0	394778.16	DNP	DNP
Traffic failed on all individual POI's	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

DNP – the figure was obtained directly from the system.

Inter operator call Assessment (To/From)	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Bharti	NA	99%	98%	100%	100%	100%
BSNL	93%	NA	97%	99%	95%	96%
Vodafone	100%	97%	NA	99%	99%	99%
TATA	100%	100%	98%	NA	100%	99%
Rel – CDMA	98%	99%	100%	100%	NA	99%
Idea	100%	99%	100%	99%	99%	NA

**Audit results for customer care (Electronically)**

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Number of calls received by	39123	1440435	4438504	DNP	40324997.00	2877722
Total Number of calls answered in 20 seconds	39123	1440435	4438504	DNP	39476257.00	2877722
Percentage calls answered in 20 seconds	100.00%	100.00%	100.00%	DNP	97.90%	100.00%
Total Number of calls answered in 40 seconds	39123	1440435	4438504	DNP	39476257.00	2877722
Percentage calls answered in 40 seconds	100%	100%	100%	DNP	97.90%	100%

**Live calling results for customer care (Electronically)**

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Number of calls received by the operator	100	100	100	100	100.00	100.00
Total Number of calls answered in 20 seconds	100	100	100	100	100.00	100.00
Percentage calls answered in 20 seconds	100%	100%	100%	100%	100%	100%
Total Number of calls answered in 40 seconds	100	100	100	100	100.00	100.00
Percentage calls answered in 40 seconds	100%	100%	100.0%	100%	100%	100%

**Audit results for customer care (Voice to Voice)**

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Number of calls received by the operator	35673	842212	1646008	DNP	738844.00	1197458
Total Number of calls answered in 60 seconds	34496	680773	1505764	DNP	599542.00	1149559
Percentage calls answered in 60 seconds	96.70%	80.83%	91.48%	DNP	81.15%	96.00%
Total Number of calls answered in 90 seconds	34670	800325	1602661	DNP	646484.00	1161534
Percentage calls answered in 90 seconds	97.19%	95.03%	97.37%	DNP	87.50%	97.00%

**Live calling results for customer care (Voice to Voice)**

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Number of calls made	100	100	100	100	100	100
Number calls answered within 60 seconds	95	1	82	93	96.00	96
Percentage calls answered in 60 seconds	95%	1%	82%	93%	96%	96%
Number calls answered within 90 seconds	95	13	100	96	99.00	97
Percentage calls answered in 90 seconds	95%	13%	100%	96%	99%	97%

DNP – the figure was obtained directly from the system.

**Audit Results for Billing performance**

Billing Performance	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
<b>Billing disputes</b>						
Total bills generated during the period	41351	25220	27022	72652	114752.00	53197
Total number of bills disputed	124	50	25	365	87.00	40
Percentage bills disputed	0.30%	0.20%	0.09%	0.50%	0.08%	0.08%
<b>Resolution of billing complaints</b>						
Total complaints resolved in 4 weeks from date of receipt	124	50	25	365	87.00	40
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%	100%
<b>Refunds</b>						
Total number of cases requiring refund of deposits	4	50	25	DNP	87.00	36
Total number of cases where refund was made within 60 days	4	50	25	DNP	87.00	36
Percentage cases in which refund was receive within 60 days	100%	100%	100%	DNP	100%	100%

**Live calling results for resolution of billing complaints**

Resolution of billing complaints	Bharti	BSNL	Vfone	TATA	Rel - CDMA	Idea
Total Number of calls made	100	100	16	100	100	DNP
Number of cases resolved in 4 weeks	95	78	16	91	91	DNP
Percentage cases resolved in four weeks	95%	78%	100%	91%	91%	DNP

DNP – the figure was obtained directly from the system.



### 8.3 Parameter wise performance reports for Broadband services

#### One month data verification results for Service provisioning

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
No of connections registered during the period		436	1020	19	221	145	556
Total number registered during 15 days		436	981	19	221	68	556
Percentage of connections provided within 15 days	100%	100.0%	96.2%	100.0%	100%	46.9%	100.0%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	RCOM	You Telecom
Total Number of calls made		100	100	40	100	50	100
Number of cases in which connection was provided in 15 Days		100	92	36	97	49	100
Percentage cases in which connection was provided in 15 days	100%	100%	92%	90%	97%	98%	100%

#### One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total number of faults registered during the period		373	966	34	97	0	1063
Total number of faults repaired by next working day		373	928	31	89	0	1063
Percentage of faults repaired by next working day	>90%	100%	96%	91%	92%	NA	100%
Total number of faults repaired within three working days		373	966	34	96	0	1063
Percentage of faults repaired within three working days	>99%	100%	100%	100%	99%	NA	100%

**Live calling results for fault repair**

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total Number of calls made		30	100	18	21	0	30
Number of cases in which faults were repaired by next working day		27	28	14	20	0	18
Percentage cases in which faults were repaired by next working day	>90%	90%	28%	78%	95%	NA	60%
Number of cases in which faults were repaired within three working days		30	96	15	21	0	26
Percentage cases in which faults were repaired within three working days	>99%	100%	96%	83%	100%	NA	87%

**One month data verification results for billing performance**

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
<b>Billing disputes</b>							
Total bills generated during the period		7664	8998	Prepaid	DNA	3	12468
Total number of bills disputed		2	6		DNA	0	12
Percentage bills disputed	<2%	0.03%	0.07%		DNA	0.00%	0.10%
<b>Resolution of billing complaints</b>							
Total complaints resolved in 4 weeks from date of receipt		2	6	Prepaid	DNA	0	12
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%		DNA	NA	100%
<b>Refund of deposits after closure</b>							
Total number of cases requiring refund of deposits		0	0	0	DNA	0	21
Total number of cases where refund was made within 60 days		0	0	0	DNA	0	21
Percentage cases in which refund was receive within 60 days	100%	NA	NA	NA	DNA	NA	100%

**Live calling results for billing complaints**

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total Number of calls made		16	6	NA	DNA	NA	2
Number of cases resolved in 4 weeks		10	3	NA	DNA	NA	2
Percentage cases resolved in four weeks	100%	63%	50%	NA	DNA	NA	100%

**Live calling results for call centre**

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total Number of calls made		100	100	100	100	100	100
<b>Calls answered within 60 seconds</b>							
Number calls answered within 60 seconds		85	40	94	92	92	92
Percentage calls answered in 60 seconds	>60%	85%	40%	94%	92%	92%	92%
<b>Calls answered within 90 seconds</b>							
Number calls answered within 90 seconds		95	58	99	99	98	100
Percentage calls answered in 90 seconds	>80%	95%	58%	99%	99%	98%	100%

**One month data verification results for Service Availability/Uptime**

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total Operational Hours		5487000	53568	744	744	27413280	9034764
Total Downtime		3828	2	0	0	335	137400
Total time when the service was available		5483172	53566	744	744	27412945	8897364
Service Availability Uptime in Percentage	>98%	99.9%	100.0%	100.0%	100.0%	100.0%	98.5%

**Three day live measurement results for Service Availability/Uptime**

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
Total Operational Hours		503256	5184	72	72	DNA	290268
Total Downtime		3993	0	0	0	DNA	0
Total time when the service was available		499263	5184	72	72	DNA	290268
Service Availability Uptime in Percentage	>98%	99.21%	100.00%	100.00%	100.00%	DNA	100.00%

**One month data verification results for Bandwidth utilisation**

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
<b>Intra-network links (POP to ISP Node)</b>							
Total number of intra network links		11	BRAS-23,T1-24,T2-610, DSLAM-5456	400	2	5	NA
No of Intra network found to be above 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	0	NA
<b>International Bandwidth</b>							
Total number of upstream links		2	97	28	3	1	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	1000	10
Total International Bandwidth utilized during peak hours		3910	12877	2097	68	219	7.5
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	20%	75%	74%	69%	22%	75%

**Live measurement results for Bandwidth utilisation**

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	RCOM	You Telecom
<b>Intra-network links</b>							
Total number of intra network links		11	BRAS-23,T1-24,T2-610, DSLAMS-5456	400	2	5	NA
No of Intra network Links tested		0	20	37	2	5	NA
No of Intra network found to be above 90%		0	0	0	0	0	NA
<b>International Bandwidth</b>							
Total number of upstream links		2	97	28	3	1	1
No of Intra network found to be above 90%		0	10 to 20	0	0	0	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		20000	18157	2830	99	1000	12
Total International Bandwidth utilised during peak hours		3910	12909	2082	67	200	6.4
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	20%	71%	74%	68%	20%	53%

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

### **9.1 For Basic wireline services**

<b>1. Provision of telephone after registration of demand</b>	
<b>Computational Methodology as per QoS definition</b>	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.
<b>Benchmark</b>	100% cases in <7 days, subject to technical feasibility
<b>Audit Procedure</b>	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 where request is still pending  <b>Live calling :-</b> - 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

<b>2. Fault incidence/clearance related statistic</b>	
<b>Computational Methodology</b>	<b>Fault incidence</b> = (No. of faults reported by the customer per month/ Total Number of Subscribers for that particular month)*100
<b>Benchmark</b>	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.
<b>Audit Procedure</b>	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 <b>Live calling :-</b> -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	<p>Percentage incidence of billing complaints = (No. of billing complaints reported by the customer per month/ Total Number of Subscribers for that particular month)*100</p> <p>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</p>
Benchmark	<p>Percentage incidence of billing complaints: Not more than 0.1% of the bills issued</p> <p>Percentage resolution of billing complaints: 100% within a period of 4 weeks</p>
Audit Procedure	<p>IMRB Auditors to verify and collect data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of Billing complaints received at the service provider's level</li> <li>- Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled.</li> <li>- Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills</li> <li>- 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.</li> </ul> <p><b>Live calling :</b> -</p> <ul style="list-style-type: none"> <li>- IMRB Auditors collected the list of all the subscribers who have made billing complaints in the month prior to the Audit.</li> <li>- 100 such subscribers per service provider were called to check the time taken to resolve the billing complaint. However, in some cases where number of billing complaints were less the sample size could not be achieved</li> </ul>

5. Customer care promptness (Shifts, Closures and Additional facility)	
Computational Methodology	<p>Supplementary (Additional) services requests: A few of the supplementary services that are considered for the audit purpose:</p> <p>Clip (caller line identification presentation) facility , STD, ISD, Call forwarding, Voice Mail etc.</p>
Benchmark	<p>Shifting of telephone line : Less than 3 days</p> <p>Processing of closure request: Less than 24 hours</p> <p>Supplementary (Additional) services requests: Less than 24 hours</p>
Audit procedure	<p><b>IMRB Auditors collected and verified data pertaining to</b></p> <p><b>Shifting Request: (Following key points were taken care of while verifying the data)</b></p> <ul style="list-style-type: none"> <li>- Date of filing form should be at least 3 working days after the date of month appraised.</li> <li>- All the holidays are excluded and only working days are considered</li> <li>- The number of shift requests per month does not include the pending connections of the previous months.</li> </ul> <p><b>Processing of closure request (Following key points were taken care of while verifying the data)</b></p> <ul style="list-style-type: none"> <li>- The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange.</li> <li>- DNP (due to Non – payment) cases are excluded</li> <li>- All holidays are excluded for calculating 24 hours.</li> <li>- Closure requests attended in the previous months are excluded</li> <li>- The period for closure starts from the time of submission of application by the subscriber.</li> </ul> <p><b>Supplementary (Additional) services requests</b></p> <ul style="list-style-type: none"> <li>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</li> <li>- Do not include holidays.</li> <li>- Collect the list of all cases of all subscribers requested for additional facility in past 48 hours prior to IMRB staff visit.</li> <li>- The period starts from the time of submission of application by the subscriber.</li> </ul> <p>Live calling was done in 10% of such cases to check the time taken to attend all such requests</p>

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. <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.

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 <u>Live calling :</u> - - 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 $CCR = [(Call\ attempts - Calls\ blocked)/Call\ attempts] \times 100$
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	<p>The total time for which the network is down for a particular service provider resulting in a community isolation</p> <p><b>Computational Methodology: Accumulated downtime = Summation of Significant Downtime*</b>                      * 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</p>
Benchmark	< 24 hrs
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to:</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> </ul>

2. Call Set-Up Success Rate (CSSR)	
Computational Methodology as per QoS definition	<p>The ratio of calls established to total calls is known CSSR.                      Call Established means the following events have happened in call setup:-</p> <ul style="list-style-type: none"> <li>↳ call attempt is made</li> <li>↳ the TCH is allocated</li> <li>↳ the call is routed to the outward path of the concerned MSC</li> </ul> <p>Computational Methodology: <math>\text{Calls Established} / \text{Total Call Attempts} * 100</math></p>
Benchmark	> 95%
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>↳ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors</li> <li>↳ CSSR calculation was measured using OMC generated data only</li> <li>↳ Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week</li> </ul>



3. Service Access Delay	
Computational Methodology as per QoS definition	<p>Service Access delay is a summation of following parts in the call flow:</p> <ul style="list-style-type: none"> <li>↳ Time to connect calls</li> <li>↳ Time to confirm instruction to connect</li> <li>↳ Time to release calls</li> <li>↳ Time to alert mobile set</li> </ul> <p><b>Computational Methodology:</b>  <u>Time to connect calls</u> = Time between "<u>Origination</u>" and "<u>Service Connect</u>" message from BTS to Mobile  <u>Time to confirm instruction to connect</u>* = Time between "<u>Origination</u>" and "Base Station Acknowledgment"                      Note: Time measured here is a sub-part of first measurement  <u>Time to release call</u> = Time between "<u>Release on Reverse Link</u>" and "<u>Release on Forward Link</u>"  <u>Time to alert a mobile</u> = This is measured as a mean of two measurements (i+ii/2):</p> <ul style="list-style-type: none"> <li>● First paging attempt = Time between receiving a call request at PLMN and alerting the mobile</li> <li>● Final paging attempt = Time between receiving a call request at PLMN and hearing start of "Not reachable" announcement</li> </ul>
Benchmark	Between 9 to 20 seconds depending on number of paging attempts (Average of 100 calls < = 15 sec.)
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ 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</li> <li>↳ Validating that at least <b>100 sample</b> calls should have been by the service provider made during <b>Time consistent busy hour (TCBH)</b> for the quarter using standard drive test equipment. (Note: measurement using engineering handsets was not deemed acceptable)</li> <li>↳ The component 'first paging attempt' was checked whether it was measured by the operator using a protocol analyser.</li> </ul>

4. Network Congestion Parameters	
Computational Methodology as per QoS definition	<p>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:</p> <ul style="list-style-type: none"> <li>↳ SDCCH Level: Stand-alone dedicated control channel</li> <li>↳ TCH Level: Traffic Channel</li> <li>↳ POI Level: Point of Interconnect</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ <b>SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) + ..... + (An x Cn)] / (A1 + A2 + ... + An)</b> <ul style="list-style-type: none"> <li>● Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1</li> <li>● C1 = Average SDCCH / TCH Congestion % on day 1</li> <li>● A2 = Number of attempts to establish SDCCH / TCH made on day 2</li> <li>● C2 = Average SDCCH / TCH Congestion % on day 2</li> <li>● An = Number of attempts to establish SDCCH / TCH made on day n</li> <li>● Cn = Average SDCCH / TCH Congestion % on day n</li> </ul> </li> <li>↳ <b>POI Congestion% = [(A1 x C1) + (A2 x C2) + ..... + (An x Cn)] / (A1 + A2 + ... + An)</b> <ul style="list-style-type: none"> <li>● Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1</li> <li>● C1 = Average POI Congestion % on day 1</li> <li>● A2 = POI traffic offered on all POIs (no. of calls) on day 2</li> <li>● C2 = Average POI Congestion % on day 2</li> <li>● An = POI traffic offered on all POIs (no. of calls) on day n</li> <li>● Cn = Average POI Congestion % on day n</li> </ul> </li> </ul>
Benchmark	<p>SDCCH Congestion: &lt; 1%                      TCH Congestion: &lt; 2%                      POI Congestion: &lt; 0.5%</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) was conducted</li> <li>↳ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH</li> <li>↳ The POI details were verified from the switch for all the links of the operators</li> </ul>

5. Call Drop Rate	
Computational Methodology as per QoS definition	<p>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</p> <ul style="list-style-type: none"> <li>↳ <b>Total calls dropped</b> = All calls ceasing unnaturally i.e. due to handover or due to radio loss</li> <li>↳ <b>Total calls established</b> = All calls that have TCH allocation during busy hour</li> </ul> <p><b>Computational Methodology:</b>                      Total Calls Dropped / Total Calls Established x 100</p>
Benchmark	< 3%
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted.</li> <li>↳ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter</li> </ul>

6. Percentage Connections with Good Voice Quality	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> <li>↳ for GSM service providers the calls having a value of 0 – 4 are considered to be of good quality (on a seven point scale)</li> <li>↳ 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 its FER value lies between 0 – 4 %</li> </ul> <p>Computational Methodology:</p> <ul style="list-style-type: none"> <li>↳ <math>\% \text{ Connections with good voice quality} = (\text{No. of voice samples with good voice quality} / \text{Total number of samples}) \times 100</math></li> </ul>
Benchmark	> 95%
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b>                      Audit would be conducted based on the details of periodic drive tests conducted at different parts 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</p> <ul style="list-style-type: none"> <li>↳ Operator to conduct <u>at least one</u> drive test using standard drive test equipment every week during TCBH</li> <li>↳ Each drive test should evenly cover the following 5 types of locations:</li> <li>↳ <b>3 Outdoor</b> (Periphery of the city, Congested Area, Across the City), and <b>2 Indoor</b> (Office Complex and Shopping Complex)</li> <li>↳ 2 minute long calls to be initiated and held throughout the drive test</li> <li>↳ 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</li> <li>↳ RxQual / FER samples generated during the drive test collected by the operator were verified</li> <li>↳ <i>Measurements using Engineering handsets were not acceptable</i></li> <li>↳ All the operators were not maintaining this data at the switch level</li> </ul>

7. Service Coverage	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> <li>↳ The level of signal available in a particular part of a city is known as signal strength.</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ Service Coverage for route type x = <math>[(N1 \times CSS1) + (N2 \times CSS2) + \dots + (Nn \times CSSn)] / (N1 + N2 + \dots + Nn)</math></li> <li>↳ Where:- N1 = Number of calls on type of route x made in drive test 1</li> <li>↳ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm)</li> <li>↳ N2 = Number of calls on type of route x made in drive test 2</li> <li>↳ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm)</li> <li>↳ Nn = Number of calls on type of route x made in drive test n</li> <li>↳ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)</li> </ul>
Benchmark	<p>Indoor <math>\geq</math> -75 dBm                      In-vehicle <math>\geq</math> -85 dBm                      Outdoor – in city <math>\geq</math> -95 dBm</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ 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.</li> <li>↳ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-                             <ul style="list-style-type: none"> <li>↳ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH).</li> <li>↳ Each drive test should evenly cover the following 5 types of locations: –                                     <ul style="list-style-type: none"> <li>↳ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and</li> <li>↳ 2 Indoor (Office Complex and Shopping Complex)</li> </ul> </li> </ul> </li> </ul> <p>↳ <i>Measurements using Engineering handsets were not acceptable</i></p>

8. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	<p><b>To connect to IVR:</b> The time taken to connect a person (as soon as he presses call) to the IVR of the service provider</p> <p><b>To connect to operator:</b> The time taken to connect a person (as soon as he presses 9) to the customer care executive</p> <p><b>Computational Methodology:</b>                      Percentage of calls answered in a specified time = <math>(\text{Total no. of calls answered within that specified time} / \text{Total no. of calls dialed for a particular service}) \times 100</math></p>
Benchmark	<p>(i) %age of calls answered (electronically):</p> <ul style="list-style-type: none"> <li>↳ within 20 seconds = 80%</li> <li>↳ within 40 seconds = 95%</li> </ul> <p>(ii) %age of calls answered by operator (voice to voice):</p> <ul style="list-style-type: none"> <li>↳ within 60 seconds = 80%</li> <li>↳ within 90 seconds = 95%</li> </ul>

<p><b>Audit Procedure</b></p>	<p>-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.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p> <p>- 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.</p> <p><b>Live calling: -</b></p> <p>- 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</p> <p>- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p>
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9.1 Billing complaints per 100 bills issued	
<p><b>Computational Methodology as per QoS definition</b></p>	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Local call charges billed as STD/ISD or vice-versa</li> <li>• Toll free numbers charged</li> <li>• Wrong roaming charges</li> <li>• Call made/received disputed</li> <li>• Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.)</li> <li>• 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)</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p><i>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</i></p> <p><i>** 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.</i></p>
<p><b>Benchmark</b></p>	<p>&lt; 0.1% billing complaints per 100 bills</p>
<p><b>Audit Procedure</b></p>	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

9.2 Resolution of billing complaints	
Computational Methodology as per QoS definition	<p><b>%age of billing complaints resolved within 4 weeks</b>=(Complaints resolved in 4 weeks from date of receipt / Total billing complaints received during the relevant period) x 100</p> <p><i>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.</i></p> <p><i>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.</i></p>
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	<p><b>IMRB Auditors collected and verified data pertaining to</b></p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p><b>Live calling :-</b>  <b>Overall 100 number of live calls</b> 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 than 100</p>

9.3 Period of refunds / payments due to customers	
Computational Methodology as per QoS definition	<p>Period of all refunds = Maximum value of 'Time taken to refund'</p> <p>where:-Time taken to refund = Date of refund – date of lodging complaint</p>
Benchmark	100% cases in less than 4 weeks
Audit Procedure	<p><b>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.</b></p> <p><b>Operator to provide details of:-</b></p> <ul style="list-style-type: none"> <li>• <u>Dates of lodging</u> of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator</li> <li>• <u>Dates of refund</u> pertaining to all billing complaints received during the relevant quarter</li> </ul> <p><b>Also random live checks of all subscribers entitled for refund were conducted</b></p>

### 9.3 For Broadband services

1. Service provisioning/Activation time	
Computational Methodology as per QoS definition	<p>Service provisioning time refers to the time taken from the date of receipt of an application to the date when the service is activated</p> <p><b>Percentage connections provided within X working days =</b>                      No of connections provided within X working days/ Total number of connections registered during the period * 100</p> <p><b>Technically Non Feasible (TNF)</b> 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.</p> <p>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.</p>
Benchmark	100 % cases in =<15 working days.
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>-Number of applications received at the service provider's level</li> <li>-Number of connections provided within 15 days</li> <li>-Number of connections provided after 15 days</li> </ul> <p><b>Live calling</b> : 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</p>

2. Fault repair/Restoration time	
Computational Methodology as per QoS definition	<p>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</p> <p><b>Percentage faults repaired in X working days =</b> (Total no of faults repaired in X working days /Total number of faults reported during the period)*100</p> <p>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</p> <p>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</p>
Benchmark	By next working day: > 90% and within 3 working days: 99%
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>-Number of applications received at the service provider's level</li> <li>-Number of connections provided within 15 days</li> <li>-Number of connections provided after 15 days</li> </ul> <p><b>Live calling</b> : 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</p>

3. Billing complaints per 100 bills issued	
Computational Methodology as per QoS definition	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Wrongly charged extra for some service</li> <li>• Cheque submitted on time but charged penalty for paying beyond due date</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p><i>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</i></p> <p><i>** 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.</i></p>
Benchmark	< 2% billing complaints per 100 bills
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

3.1. Resolution of billing complaints	
Computational Methodology as per QoS definition	<p><b>%age of billing complaints resolved within 4 weeks</b>=(Complaints resolved*** in 4 weeks from date of receipt / Total billing complaints** received during the period 2008 ) x 100</p> <p><i>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.</i></p> <p><i>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.</i></p>
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	<p>IMRB Auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p>Live calling :-</p> <ul style="list-style-type: none"> <li>-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 than 100</li> </ul>



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	<b>IMRB Auditors collected and verified data pertaining to</b> -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	<b>%age of calls answered by operator (voice to voice) within n seconds</b> = (Number of calls where <u>time taken for operator to respond</u> * >= n sec / Total number of calls where an attempt to route to the operator was made) x 100  <u>Time taken for operator to respond</u> = 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	<b>IMRB Auditors collected and verified call centre records pertaining to</b> -Number of calls received by the operator -Number and %age calls answered within <b>60 seconds</b> -Number and percentage calls answered within <b>90 seconds</b> <b>Live calling : -</b> Overall <b>100 number</b> of live calls at <b>different points of time</b> 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	<b>IMRB Auditors collected and verified call centre records pertaining to</b> <b>(1)POP to ISP gateway Node [Intra – network] Links</b> -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 <b>(ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity</b> -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	<p><b>Live calling :</b> -</p> <ul style="list-style-type: none"> <li>-Details of live customer were obtained from the service providers</li> <li>-Overall <b>50 number</b> 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</li> <li>-Details of total committed download speed and speed available to the users were recorded for each of the subscriber</li> <li>- Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers*100</li> </ul>

Service availability/Uptime	
Computational Methodology as per QoS definition	<p>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</p> <p>Service availability/Uptime = <math>(\text{Total operational hours} - \text{Total Downtime hrs}) * 100 / \text{Total operational hours}</math></p> <p>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</p> <p>Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime</p>
Benchmark	<ul style="list-style-type: none"> <li>- 90% for quarter ending June 2007</li> <li>- 98% with effect from quarter ending September 2007 and onwards</li> </ul>
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>-Total operational hrs</li> <li>-Total downtime hrs</li> </ul> <p>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</p>

Packet loss	
Computational Methodology as per QoS definition	<p>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</p> <p>The packet loss is measured by computing the percent packet loss of <b>1000 pings of 64 byte packet each</b>.</p> <p>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</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required  <b>Hence Packet loss is computed by the formula - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100</b></p>
Benchmark	<1 %
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>- Records maintained for ping tests conducted during the period of July to September 2007</li> <li>- Smoked ping test (wherever available) results for the period of July to September 2007</li> <li>- Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)</li> <li>- Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle</li> </ul>

Network Latency	
Computational Methodology as per QoS definition	<p>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 <b>1000 pings of 64 bytes each</b> (Pings are to be sent subsequent to acknowledgement received for the same for previous ping)</p> <p>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</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required  <b>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</b></p>
Benchmark	<p>&lt; 120 msec from user reference point at POP/ISP Node to International Gateway                  &lt; 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial)                  &lt; 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Sattelite)</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>- Records maintained for ping tests conducted during the period of July to September 2007</li> <li>- Smoked ping test (wherever available) results for the period of July to September 2007</li> <li>- Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)</li> <li>- Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle</li> </ul>

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