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

Final Report: October - 2008

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

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Preface

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

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

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

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

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various quarterly periods. IMRB International Auditors carried out Audits across Tamil Nadu, Karnataka, West Bengal, Bihar & Jharkhand, Haryana, Punjab and Uttar Pradesh (East) circles in the period of May – August 2008. **This report details the performance of various service providers in Tamil Nadu 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 dated 6th Oct. 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 Tamil Nadu 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

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2.0 Objectives and Methodology

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

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

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

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

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

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

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

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- 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)

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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 100 exchanges (40 Urban and 60 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 Tamil Nadu circle

- Bharti Airtel Ltd. – 12 MSCs
- Aircel – 13 MScs
- Tata teleservices ltd – 2 MSCs
- Reliance communications – 4 MSCs
- BSNL – 5 MSCs
- Vodafone Essar Ltd. – 3 MSC

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 Tamil Nadu and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that atleast 5% of POPs spread across 10% of SDCA's were covered

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

- Following Broadband service providers were Audited in Tamil Nadu circle: - Bharti Airtel Ltd., Hathaway, Sify, Reliance, BSNL and VSNL (TATA communications Ltd.). You telecom which submits its PMR to TRAI for Tamil Nadu circle was found to be present only in Chennai during verification process by IMRB Auditors. Hence the findings presented for the service provider in the report are for Chennai circle. Also for VSNL (TATA communications ltd.) findings are provided for Chennai and Rest of Tamil Nadu (ROTN) as service provider reports it to TRAI cumulatively.

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4 Audit methodology

4.1 Basic (Wireline) Services

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

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

* In addition to above verification of records for PMR submitted during October to December 2007 was carried out for all the network and non network related parameters.

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

4.2 Cellular Mobile Services

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

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

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

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4.3 Broadband Services

In a nutshell, the audit methodology was as follows:

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

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

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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 Tamil Nadu 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%	88%	100%	20%
2	**Fault incidence/clearance statistics**					
3	Fault incidences(No. of faults/100 subscribers/month)	<3	5.7	2.84	1.7	No faults
3.1	Faults repaired within 24 hours	>90%	74%	67%	90%	NA
3.2	Faults repaired within three working days	100%	100%	86%	100%	NA
4	Mean time to Repair (MTTR)	<8 hours	7.80	< 4	<5	NA
5	Call Completion Rate (CCR)	>55%	66%	60%	DNA	92%
6	**Metering and billing credibility**					
6.1	Billing complaints per 100 bills issued	<0.1%	0.71%	0.04%	0.00%	0.00%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	NA	NA
7	**Customer care/helpline promptness**					
7.1	<u>Shift requests attended</u>					
	Shift requests attended within 3 days	95%	100%	69%	100%	NA
7.2	<u>Closure request attended</u>					
	Closure within 24 hours	95%	100%	81%	99%	NA
7.3	<u>Supplementary (additional) service requests attended</u>					
	Additional facility provided within 24 hours	95%	98%	98%	98%	100%
8	**Response time to customer for assistance**					
8.1	% age call answered through IVR in 20 seconds	80%	DNA	DNA	100%	100%
	% age call answered through IVR in 40 seconds	100%	DNA	DNA	100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	93%	DNA	99%	98%
	% age calls answered by operator in 90 seconds	95%	96%	DNA	100%	99%
9	**Time taken for refund of deposits after closure**					
9.1	%age cases where refund received within 60 days	100%	100%	100%	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, TATA teleservices has limited presence and offers Basic (Wireline) services primarily to corporate clients in Tamil Nadu circle}

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

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

The Basic (Wireline) services audit for Tamil Nadu circle broadly indicates that almost all the service providers (except Reliance communications) are not meeting some of the benchmarks, as mandated by TRAI (Telecom Regulatory Authority of India).

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

It should also be noted that Tata teleservices has limited presence in Tamil Nadu circle for Basic (Wireline services) and caters primarily to corporate customers.

Also, results of verification of the records for the period of Oct to December 2008 show that there was variation in the figures reported in the PMR and those found in actual records for BSNL and Bharti. 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 Tamil Nadu circle.

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking) offered by various service providers. Atleast 200 calls were made to different numbers provided by service providers and time taken to answer the call was noticed. Bharti emerged out to be the most efficient with 98% of the total calls that were made being answered in 60 seconds followed by Reliance with 96% calls answered in 60 seconds. BSNL and TATA's score on the same was observed to be 88% and 93% respectively.

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

Provision of telephone after registration of demand

- Bharti and Reliance communications 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.
- For TATA out of 5 customer locations where connections were registered during the month of Audit only at 1 location, connections were provided within 7 days. The reason for the same during verification was observed to be the technical non feasibility at the customers end. Details of number of Direct Exchange Lines (DEL) at each location were not available at the exchange level as the same is being taken care centrally.
- Variation was found in the live calling and audit data findings for all the service providers. The difference was relatively less for Bharti (87% for live calling against 100%) for audit data). For BSNL and Reliance 55% and 47% of respondents called respectively claimed that their connection was provided within 7 days. As mentioned earlier the reason for same can be attributed to low sample sizes for live calling.
- 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.

Fault incidence / clearance statistics

- As per the 1-month audit data findings, Bharti, BSNL and Reliance scores were 74%, 67%, and 90% respectively for the 'Faults repaired within 24 hours'.
- For TATA there were no faults reported in the month of Audit. The reason is primarily the low subscriber base and corporate clientele.
- The live calling scores for the fault repair within 24 hours for Bharti, BSNL, RCOM were found to be 57%, 25% and 3% respectively. As mentioned earlier a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit).
- For BSNL, It was observed that data on fault repair and maintenance registers are not being maintained properly or maintained in conventional ways at some of the exchanges in Tamil Nadu circle.
- In some exchanges Auditors discovered during live calling that fault data provided for Wireline included Broadband faults complaints and the same was not segregated. This was discovered during the live calling process where respondents claimed that they had not made a complain for Wireline but for Broadband services.
- Interestingly, it was observed that for BSNL rebate activities are being taken care by some of the main exchanges.

Traffic statistics (CCR)

- Bharti, BSNL and TATA were found to be meeting TRAI benchmark for Call Completion Rate for one month in which data was obtained.
- The difference between live measurement data and audit data for this parameter was found to be less as compared to other parameters for live calling results.
- During Audit process at Reliance, 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

- Among the service providers, Bharti with 0.71% billing complaint billing complaint was not found to be meeting the benchmark of less than 0.1% billing complaints of the total number of bills issued.
- It should be noted that TATA teleservices and RCOM claimed to have no billing complaints/disputes. For TATA reason for the same was found to be low subscriber base for the service provider with prime focus on corporate customers.
- 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.
- As per audit data findings for one month, Bharti and BSNL were found to be complying the sub-parameter '%age of billing complaints resolved within 4 weeks'.

Customer care/helpline promptness

- For "shift requests attended within 3 days" audit data, Bharti, BSNL and RCOM have scored 100%, 69% and 100% respectively. For TATA teleservices there was no request for shift received during the month in which audit was carried out.
- For closure requests within 24 hours only BSNL with 81% requests attended, falls short of the benchmark.
- For supplementary service requests, all the operators were found to be meeting the TRAI specified benchmark for the month in which audit was carried out. However for TATA there were only three cases where such request was made.

Response time to customer for assistance

- For customer care number through electronic IVR menu parameter, live calling scores for Bharti, BSNL, TATA and R Com were found to be 100% for call answering through IVR in 20 seconds.
- For BSNL, call centre data was not available for most of the exchanges as service provider claimed that data is managed centrally at Bangalore.
- During verification of records for Bharti, it was observed that the service provider does not have a mechanism of recording number of calls which are answered by IVR; only the calls answered by the operator are recorded. The service provider does not report the figure in the PMR submitted to TRAI.
- Live calling results carried out to check the efficiency of calls answered by the operator, BSNL falls short of TRAI specified benchmark of calls answered by the operator in 60 seconds with a score of 62%. For calls answered within 90 seconds all the operators meet the TRAI specified benchmark

Time taken for refund of deposits after closure

- The audit data score on 'time taken for refund of deposit after closure' parameter for BSNL and Bharti was 100%
- Also it was observed that in many exchanges details of refund was not available since accounting activities are carried out by some main exchanges. However, some exchanges were able to provide the details by referring numbers to account department in main exchanges.

Summary of Live Measurement Results – Basic Wireline Services

- For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable.
- Bharti and BSNL meet the TRAI benchmark (>55%) for live measurement on CCR with a score of 66% and 78% respectively.
- Live measurements for TATA teleservices were not possible as exchanges in Tamil Nadu circle do not have technical capability to measure CCR. For reporting purposes the same is being obtained from main exchange in Chennai circle.

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA Teleservices	Aircel	RCOM
Accumulated downtime for community isolation	< 24 hrs.	0.00	0.00	0.00	3.17 hr	107 hr	0.00
Call Set Up Success Rate (CSSR)	> 95%	97.22%	92.62%	98.89%	99.71%	98.54%	98.36%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	13.51	9.79	11.06	13.09	13.03	1.40
Blocked Call Rate							
SDCCH /Paging Channel Congestion	<1%	0.48%	0.51%	0.20%	0.00%	0.02%	0.00%
TCH Congestion	< 2%	0.66%	2.03%	1.81%	0.22%	1.50%	0.57%
Call drop rate	< 3%	1.11%	0.94%	1.41%	0.78%	0.46%	1.52%
Percentage connections with good voice quality*	> 95%	91%	88%	99%	97%	86%	99%
Service coverage*							
In door	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
In vehicle	>-85dbm						
Out door - in city	>-95dbm						
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied
Calls answered electronically							
Percentage calls answered within 20 seconds	80%	100%	100%	100%	100%	100%	96%
Percentage calls answered within 40 seconds	95%	100%	100%	100%	100%	100%	96%
Calls Answered by the operator							
Percentage calls answered within 60 seconds	80%	97%	81%	98.09	56%	98%	95%
Percentage calls answered within 90 seconds	95%	98%	85%	98.69	56%	DNA	98%
Billing Complaints							
Billing complaints per 100 bills issued	<0.1%	0.00%	Details not provided by the operators	0.32%	0.07%	0.06%	0.08%
Percentage billing complaints resolved within 4 weeks	100%	NA		100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	NA		100%	100%	100%	100%

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

** Methodology not in line with QoS   ▢ Figures provided on All India basis   ▢ Not meeting the benchmark   **B'mar**k = 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 Tamil Nadu 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	1900 – 2000	1900 – 2000
RCOM	1100 – 1200	1900 – 2000
Aircel	2000 – 2100	2000 – 2100
TATA	1900 – 2000	1900 – 2000
Vodafone	1900 – 2000	1900 – 2000

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

Accumulated Downtime:

In the Tamil Nadu 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 TATA and Aircel. Aircel's outage was found to be 107 hours for the month of audit. The operator claimed that there was maintenance work going on in the network which resulted in such a huge accumulated downtime. The community isolation of TATA was just above three hours in the month of audit.

Call Set-up Success Rate (CSSR):

All the operators except BSNL were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for TATA with 99.71% of their calls getting completed. BSNL had 92.62% CSSR which was the lowest among all services providers and was below the benchmark. All the operators were found to be calculating the parameter as per the norm

specified by TRAI. CCSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.

Service Access Delay:

This parameter is reported to TRAI basis the period drive tests that are conducted by the service providers during that quarter. It is measured using a drive test tool kit and a protocol analyzer. All the operators in the Tamil Nadu 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 Bharti with 13.51 seconds followed closely by TATA at 13.09 and Aircel at 13.03, all of which comfortably met the TRAI benchmark of < = 15 seconds for a sample of 100 calls.

Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except BSNL for Traffic channel congestion are meeting the TRAI specified on the congestion parameters. BSNL does not meet the TRAI specified benchmark with a Traffic Channel congestion of 2.03% which was found during the one month data collected for the month of audit. TATA leads the way in network congestion parameters with almost negligible paging and very minimal traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. There was almost 0 POI congestion on almost all individual POI links between a service provider vis-à-vis other service providers.

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 Aircel with only 0.46% call drop and the relative highest (although it easily met the benchmark) was for RCOM with 1.52%.

% 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 91%, BSNL with 88% and Aircel with 86% did not meet the TRAI benchmark.

Service coverage:

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

Customer Care / Helpline Assessment

For the IVR aspect all the service providers meet the TRAI benchmark. However, in case of Reliance no breakup of IVR calls by circle is present. The figure reported is for all India level. In case of calls answered by operators, all the service providers except BSNL (percentage calls answered within 90 seconds) and TATA teleservices meet the benchmark for the month of audit. Also, for Aircel, the operator claimed that they do not have a system to measure calls answered within 90 seconds. The system is so configured that is measures calls answered within 120 seconds.

Billing performance

Vodafone was found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. Vodafone scores 0.32% on the same. In all cases where customers were due for refund, all the service providers meet the TRAI benchmark of 100% with 4 weeks. The billing details were not provided by BSNL as they told the IMRB auditors that the same is being maintained centrally.

Inter operator calls assessment

Inter operator call Assessment (From/To)	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Bharti		100%	100%	100%	100%	100%
BSNL	100%		77%	100%	100%	100%
Vodafone	100%	99%		92%	100%	97%
TATA	100%	100%	100%		100%	100%
Aircel	99%	96%	94%	96%		100%
RCOM	86%	100%	88%	100%	98%	

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. The calls from Bharti to all other service providers were established 100% of the times. Similarly BSNL's connectivity with all the operators was found to be good except Vodafone where only 77% of calls got connected. However, Vodafone has maximum difficulty in connecting to a TATA number with only 92% of its calls getting connected. TATA had no problems in connecting to any of the operators with all 100 of its calls getting established. Also, Aircel's connectivity to Vodafone was not good with only 94 out of 100 calls getting connected. RCOM had the most problem in connecting to a Bharti number with only 86 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 Tamil Nadu circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Coimbatore, Tiruchy and Cuddalor. IMRB auditors were present in vehicles of every operator. A sample of 15 – 30 test calls were made along each of the routes. The holding period for all test calls was between 120 seconds to 180 seconds. The drive test vehicle across all routes plied at a speed of less than 20 km per hour. Taking into consideration the route that was taken for the drive test; most of the major areas of Tamil Nadu 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 Coimbatore, Tiruchy and Cuddalor was conducted along the following route:

Area Type	Type of Location	Coimbatore	Tiruchy	Cuddalor
Outdoor	Periphery of the city	GH, Lakhmi Mills, Hopes College, Singanallur, Ramanathapuram	Tollgate to Madurai Bypass	Ramesh theatre to Sipcot industrial estate
	Congested Area	Town hall, Raja Street, KG circle	Tvs toll gate, Palakarai, Raja Theatre, Sataram Bus stand	Krishnalaya theatre, new bus stand koothapakkam
	Across the City	Lakshmi mills, Gandhipuram, Town Hall	Sataram Bus stand, Srirangam, tiruvanakoil, toll gate 1	Cuddalore entrance, new bypass road, koothapakkam, krishnalaya theatre
Indoor	Office Complex	LIC Office	Arihant towers	Dhinathanthi
	Shopping Complex	Cheran Towers	Periasamy Tower	Hardware Shop

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

Drive Test - Coimbatore

	Bharti		BSNL		Vodafone		TATA		Aircel		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	90.20%	90.39%	84.93%	89.63%	99.15%	98.48%	99.19%	95.13%	87.18%	86.02%	99.93%	99.40%
Call set up Success Rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	93.83%	100.00%	100.00%
Call drop rate	0.00%	0.00%	0.00%	3.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.00%	99.31%	0.00%	99.30%	100.00%	100.00%	100.00%	100.00%	0.00%	100.00%	100.00%	100.00%

Drive Test - Tiruchy

	Bharti		BSNL		Vodafone		TATA		Aircel		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	92.68%	90.02%	85.21%	89.41%	98.48%	99.07%	99.75%	97.30%	89.98%	83.11%	99.84%	98.40%
Call set up Success Rate	100.00%	100.00%	100.00%	95.51%	100.00%	100.00%	100.00%	100.00%	100.00%	97.89%	100.00%	100.00%
Call drop rate	0.00%	1.28%	0.00%	2.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.42%
Hands off success rate	100.00%	99.26%	100.00%	99.18%	100.00%	100.00%	100.00%	99.81%	100.00%	100.00%	100.00%	99.55%

Drive Test - Cuddalor

	Bharti		BSNL		Vodafone		TATA		Aircel		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	89.23%	92.24%	89.95%	87.40%	99.25%	99.88%	100.00%	99.85%	95.29%	89.41%	98.62%	99.79%
Call set up Success Rate	100.00%	100.00%	100.00%	98.25%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Call drop rate	0.00%	0.00%	50.00%	5.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

☐ Not meeting the benchmark

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international

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

Aircel:

Coimbatore: There was interference and low signal strength recorded for Aircel in the outdoor areas near Ramanathapuram, Sukrawarpet, Gandhipuram, Lakshmi mills, Singanallur, Marakadai, Sukrawarpet, town hall and in the indoor area of Cheran towers and LIC office.

Tiruchy: There was interference and low signal strength recorded for Aircel in the outdoor areas near pallpanai, pallakarai, toll gate 1, Cauvery Bridge, Sataram bus stand, raja theatre and in the indoor areas of Periasamy tower, Arihant towers

Cuddalore: There was interference and low signal strength recorded for Aircel in the outdoor areas near Sipcot, Koothapakkam, Near Railway Station, Kambiampettai, Sidco estate, OT and in the indoor areas of Dhinathanthi office

Bharti:

Coimbatore: There was interference and low signal strength recorded for Bharti in the outdoor areas near Lakshmi mills, town hall road, RS Puram, Ramanathapuram, Marakadai, Raja Street and in the indoor area of Cheran towers and LIC office.

Tiruchy: There was interference and low signal strength recorded for Bharti in the outdoor areas near TVS Toll gate, Satram bus stand, Palakarai, Thillai nagar and in the indoor areas of Periasamy tower

Cuddalore: There was interference and low signal strength recorded for Bharti in the outdoor areas near OT, Koothapakkam bye pass, near bus stand, Sipcot estate and in the indoor areas of Dhinathanthi office, Jayaram timber

BSNL:

Coimbatore: There was interference and low signal strength recorded for BSNL in the outdoor areas near Lakshmi mills, Singanallur, Sarakadai, Ramanathapuram, sukrawarpet, Gandhipuram and in the indoor area of Cheran towers and LIC office.

Tiruchy: There was interference and low signal strength recorded for BSNL in the outdoor areas near TVS Tollgate, Cauvery Bridge, Pallpanai, Sataram bus stand, Raja Theater, pallakarai and in the indoor areas of periasamy and arihant tower

Cuddalore: There was interference and low signal strength recorded for BSNL in the outdoor areas near Sipcot road diversion, Sipcot estate, Koothapakkam, near railway station, Lawrence road and in the indoor areas of Dhinathanthi office, Sivamani traders

RCOM:

Coimbatore: There was interference and low signal strength recorded for RCOM in the outdoor areas near Bharathiyar road, Mill Road, variety hall road but there was no such place where inadequate coverage was recorded in the indoor areas covered during the drive test.

Tiruchy: There was interference and low signal strength recorded for RCOM in the outdoor areas near Main Guard gate, singarathopu, Cauvery Bridge, pallpannai but there was no such place where inadequate coverage was recorded in the indoor areas covered during the drive test.

Cuddalore: There was interference and low signal strength recorded for RCOM in the outdoor areas near Sipcot estate, Koothapakkam and in the indoor areas of Dhinathanthi office, Sivamani traders

TATA:

Coimbatore: There was interference and low signal strength recorded for TATA in the outdoor areas near Ramanathapuram, Sukrawarpet, Gandhipuram, marakadai and in the indoor areas of Cheran towers, LIC tower.

Tiruchy: There was interference and low signal strength recorded for TATA in the outdoor areas near Toll gate, Cauvery Bridge, Pallpanai, Satram bus stand, Raja Theater, Pallakarai and in the indoor areas of Periasamy towers, Arihant tower.

Cuddalore: There was interference and low signal strength recorded for TATA in the outdoor areas near Koothapakkam but there was no such place where inadequate coverage was recorded in the indoor areas covered during the drive test.

Vodafone:

Coimbatore: There was interference and low signal strength recorded for Vodafone in the outdoor areas near Ramanathapuram, Sukrawarpet, Gandhipuram, marakadai, town hall, Lakshmi Mills, Siganallur and in the indoor areas of Cheran towers, LIC tower.

Tiruchy: There was interference and low signal strength recorded for Vodafone in the outdoor areas near Toll gate, Cauvery Bridge, Pallpanai, Satram bus stand, Raja Theater, Pallakarai and in the indoor areas of Periasamy towers, Arihant tower.

Cuddalore: There was interference and low signal strength recorded for Vodafone in the outdoor areas near Koothapakkam, Sipcot, near railway station, OT, sidco estate, Lawrence road and in the indoor areas of Dhinathanthi office

Conclusions:

1. Bharti, BSNL & Aircel 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 cities of Coimbatore and Cuddalor.
3. All the operators except RCOM experienced inadequate coverage in Coimbatore in the outdoor areas near Ramanathapuram, Sukrawarpet, Gandhipuram, Lakshmi mills, singanallur, marakadai, sukrawarpet, town hall and in the indoor area of Cheran towers and LIC office.
4. RCOM records inadequate coverage in the areas near Bharathiyar road, Mill Road, Variety hall road but has no problems in the indoor areas.
5. All the operators in Tiruchy in the outdoor areas experienced inadequate coverage near Toll gate, Cauvery Bridge, Pallpanai, Satram bus stand, Raja Theater, pallakarai and in the indoor areas of Periasamy towers, Arihant tower (except RCOM).
6. Most of the operators in Cuddalor in the outdoor areas experienced inadequate coverage near Koothapakkam, Sipcot, near railway station, OT, Sidco estate, Lawrence road and in the indoor areas of Dhinathanthi office

Summary of Live Measurement Results – Cellular Mobile Services

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
CSSR	> 95%	98.07%	92.68%	99.33%	99.72%	97.19%	99.16%
SDCCH / Paging Channel Congestion	< 1%	0.81%	0.51%	0.15%	0.00%	0.04%	0.00%
TCH Congestion	< 2%	0.92%	2.03%	1.79%	0.49%	0.05%	0.50%
POI congestion	< 0.5%	0%	0%	0%	0%	0%	0%
Call drop rate	< 3%	1.12%	0.53%	1.28%	1.18%	0.30%	0.67%

☐ Not meeting the benchmark

During the three day live measurement, all the operators except BSNL were found to be meeting the TRAI benchmark for all the parameters that were to be measured during the three days. TATA led the way on CSSR with a call success rate of 99.72%. Also, CSSR for BSNL was found to be just 92.68% 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 Bharti at 0.81%. RCOM and TATA experienced no Paging Channel Congestion. BSNL did not meet the benchmark on traffic channel congestion with a congestion of 2.03%. 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 Vodafone with 1.28% calls getting dropped after establishment. It was followed by TATA with 1.18% and Bharti with 1.12% call drop rate. The lowest call drop rate was observed for Aircel with only 0.30% of total calls getting dropped after establishment.

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

S.No	Parameters	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
1	**Service provisioning uptime**								
1.1	Total connections registered		2258	2984	44	1306	1119	189	131
1.2	Percentage connections provided within 15 days	100%	96%	69%	100%	89%	97%**	67%**	100%
2	**Fault repair restoration time**								
2.1	Total number of faults registered/calls made		1981	10179	39	2218	31604	253	378
2.2	Percentage faults repaired by next working days	> 90%	7%	85%	92%	96%	87%**	98%	99%
2.3	Percentage faults repaired within three working days	99%	99%	92%	100%	100%	92%**	100%	100%
3	**Billing performance**								
3.1	Total bills generated/calls made		88782	DNA	Prepaid*		20424	1076	7144
3.2	Billing complaints per 100 bills issued	<2%	0.11%	DNA			1.10%	0.09%	0.15%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	100%			100%	100%	100%
3.4	Time taken for refund of deposits after closure	100%	100%	No closure requests	100%	No cases	100%	No cases	100%
4	**Customer care/helpline assessment**								
4.1	Percentage calls answered within 60 seconds	> 60%	94%	Centralized call centre in Bangalore	100%	100%	78%	84%	99%
4.2	Percentage calls answered within 90 seconds	>80%	96%		100%	100%	85%	90%	100%
5	**Bandwidth utilisation/Throughput**								
5.1	Total number of intra network links tested		63	BRAS-23,T1-24,T2-610, DSLAM-5456	400	2 (Trichy and Coimbatore)	16	NA	NA
5.2	Total number if intra network links crossing 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	1	NA	NA
	Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)								
5.3	Total number of upstream links		NA	97	28	NA	28	NA	2
5.4	Number of links > 90%		NA	1	0	NA	0	NA	0
5.5	Percentage bandwidth utilised on upstream links	<80%	NA	75%	74%	NA	64%	NA	79%
6	**Broadband download speed**	>80%	Complied	Complied	Complied	Complied	Complied	Complied	Complied
7	**Service availability/uptime**	>98%	99.87%	100.00%	100.00%	98.08%	98.58%	99.56%	98.96%
8	**Packet loss**	<1%	0%	0%	0%	<1%	0%	DNA**	0%
9	**Network Latency**								
9.1	POP/ISP Node to NIXI to IGSP	<120msec	71 ms	Complied	< 45ms	<20	<80	<40	5 ms
9.2	ISP node to NAP port	<350msec	72 ms	Complied	<250 ms	<150	<180	<250	184 ms

{*Note: -For Sify and Hathaway all the connections provided to retail broadband customers are prepaid, hence the service provider claims that there are no billing related complaints.}

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

Critical findings and Key take outs: 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. 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.

It should also be noted that during the Audit process and verification at You telecom it was discovered that the service provider has subscribers present only in Chennai circle. However, the operator submits the PMR submitted to TRAI for Tamil Nadu. The service provider clarified that their understanding was based on the fact that Chennai being a part of state of Tamil Nadu comes under Tamil Nadu circle. Hence, the findings provided herewith for the service provider are for Chennai circle.

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

Service provisioning/Activation time

- Bharti, BSNL, VSNL (TATA communications), Hathaway and Reliance do not meet the benchmark with scores of 96%, 69%, 97%, 89% and 67% respectively.
- For Live calling carried out Bharti, Sify and You telecom are doing exceptionally well with >= 95% of subscribers claiming that connection was provided within 15 days. Low scores on the same are observed for Reliance communications, BSNL and Hathaway at 50%, 77% and 78% respectively.
- As far as the book keeping methodology is concerned it was observed that Reliance is including the cases where it is technically not feasible to provide the connections to the subscriber within 15 days while reporting to TRAI. This is one of the reasons for service provider's low performance on the parameter. Ideally such cases should be excluded as per TRAI guidelines.
- Also, VSNL (TATA communications) considers all types of connections as Broadband which includes connections subscribed with download speed of less than 256Kpbs, which is not in line with the QoS regulation for Broadband.

Fault Repair/Restoration time

- Bharti, BSNL and VSNL (TATA communications) are falling below the benchmark for fault repair within next working day.
- For Bharti although the score was observed to be really low with only 7% faults repaired by next working day the service provider comfortably meets the benchmark for faults repaired by three working days.
- There is a scope for improvement as far as the scores are concerned for the parameter. TRAI can consider including Mean Time to Repair (MTTR) for faults as one of the parameters for measuring Quality of Services (QoS) in future for Broadband services as well.

- None of the service providers were found to be meeting the benchmark for Fault repair/Restoration for live calling results. Scores are as low as only 3% (for Reliance) subscribers claiming that their fault was repaired within next working day. Some part of variation can also be attributed to low sample size (10% of total faults reported in the month prior to visit of Audit)
- As far as book keeping methodology is concerned, TATA Communications (VSNL) was found to be considering even billing complaints as fault complaints while reporting to TRAI. This may be one of the reasons for service provider's ordinary performance for the parameter.
- All the service providers were found to be providing Rebate as per the norms stipulated by TRAI except TATA communications, where rebate was being provided for the number of days for which the connection was inactive and not as per TRAI guidelines for the same.

Billing performance

- All the service providers 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 its retail broadband customers are prepaid and hence there are no billing complaints for Sify.
- It should also be noted that the definition of billing complaints/Disputes can be considered as lenient as service providers namely Bharti and Reliance include only those complaints where an internal ticket is opened and refund is made to the customer. Hence there is a need felt to have some clarity on the definition of billing complaints.
- For BSNL details about total bills generated is not available at the respective POP's and circle offices as bills are generated centrally in Bangalore. Out of the total POP's for which data was obtained 22 cases of billing complaints was recorded during the period, all of them were resolved in the stipulated time period of 4 weeks.

Customer Care/Helpline Assessment

- All the service providers meet the benchmark (Both for live calling as well as One month data verification results) for percentage calls answered within 60 by the operator (Voice to Voice).
- For Live calling results for calls answered within 90 seconds, You telecom falls short of the TRAI specified benchmark as only 78% of total calls made were answered by the operator in 90 seconds.
- For BSNL call centre details were not available at the exchanges as the service provider has a centralized call centre in Bangalore.

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, VSNL) are reporting Average bandwidth utilised during the complete period to TRAI instead of Bandwidth utilised during Time Consistent Busy Hour (TCBH) as they claim that their peak hours generally range from 11.00AM in the morning to 4.00 PM in the evening owing to high corporate usage during the period. Also, it was observed that there are multiple links and busy hour may vary for each link.

- All the service providers were found to be reporting combined bandwidth utilisation for corporate and household customers as there is no mechanism available to provide it separately for different users.
- For Intra network link, data for Sify, BSNL and VSNL (TATA communications) was obtained on all India basis. For VSNL (TATA communications) out of 8 POP locations in India, the link running from core router in Chennai to Delhi was found to be above 90%.
- Similarly for BSNL uplink Traffic from Chennai Broadband Remote Access Server (BRAS) was found to be more than 90% during the month for which the data was obtained.
- Tamil Nadu being a category A circle, it was observed that all the links (tested during three day live measurement) in the Access segment for most of the service providers were found be below 80%.
- Infact for large service providers having Metro E network, bandwidth utilisation during peak hours was found to less than 50% during peak hours for some if the links randomly tested during three days live measurement.
- Also, service providers distributing services through cable operators (Sify and Hathaway) claim that it is not possible to measure the Bandwidth available from Cable operator to their base stations as wireless technology is being used for the same. Hence, it is believed that last mile experience may suffer as operators have relatively less control over the operations of cable operator.
- For Bandwidth utilisation on upstream links (From ISP Node to IGSP/NIXI), all the service providers meet the TRAI specified benchmark cumulatively for all the gateways present in India. Hathaway and Reliance do not have gateway connectivity from any city in Tamil Nadu circle.

Download speed

- All the service providers in the circle have made available the tool for measuring download speed on the respective websites. Also, during live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.
- However, no historic data was available for verification of records for month of Audit as well as quarter ending October to December 2007 with all the service providers 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, BSNL and VSNL(TATA communications) were the two operators found to be not meeting the TRAI benchmark (For sample calls made to subscribers across different locations in Tamil Nadu).

Service Availability/Uptime:

- All the service providers are meeting the benchmark on service availability/uptime.
- However, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator.
  - o For e.g. TATA communications (VSNL) and Bharti consider 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.

- o 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.
- o 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 although all the service providers are measuring packet loss and latency by conducting random ping tests for their internal performance measurement, but there are no records being maintained or book keeping methodology was non existent for all the operators except BSNL and You telecom. However it should be noted that the network related data for BSNL for verification was obtained from their central node in Bangalore.
- ▪ Also, while conducting ping tests it was observed that service providers (except BSNL) were found to be unaware of the standard prescribed by TRAI i.e. one ping test constitute of 1000 pings of 64 byte packet each to be carried out daily during Time consistent Busy Hour(TCBH).
- ▪ Due to non availability of the records of old ping tests, verification process could not conducted for 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 meaurements revealed that all the service providers are meeting the benchmark prescribed by TRAI.
- ▪ 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.

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Service Availability Uptime	>98%	99.81%	100.00%	100.00%	99.9%	98.97%	DNA**	100.00%
No of **Intra network links** found to be above 90%		0	0	0	0	0	No Core Distribution Router(CDR) in any city in Tamil Nadu	No separate Core Distribution Router in Chennai
Total Bandwidth utilization at all upstream links	< 80%	Gateway in Chennai	71%	74%	No links to IGSP from ROTN	64%	Gateway in Chennai	63%
Data Download Speed	> 80%	Complied	Complied	Complied	Complied	Complied		Complied
Packet Loss (Percentage)	< 1%	0.00%	0.00%	0%	<1%	0.00%	0.00%**	0.00%
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	<80 ms	Complied	<15 ms	98.3	<80	<40	5
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	<120 ms	Complied	240 ms	<320 ms	<230	<250	250

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

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 %.

Also, all the operators were found to be meeting the TRAI benchmark on packet loss and network latency parameters for three day live measurement for live ping tests carried out.

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

6.1 Graphical/Tabular Representations for Basic (Wireline) services

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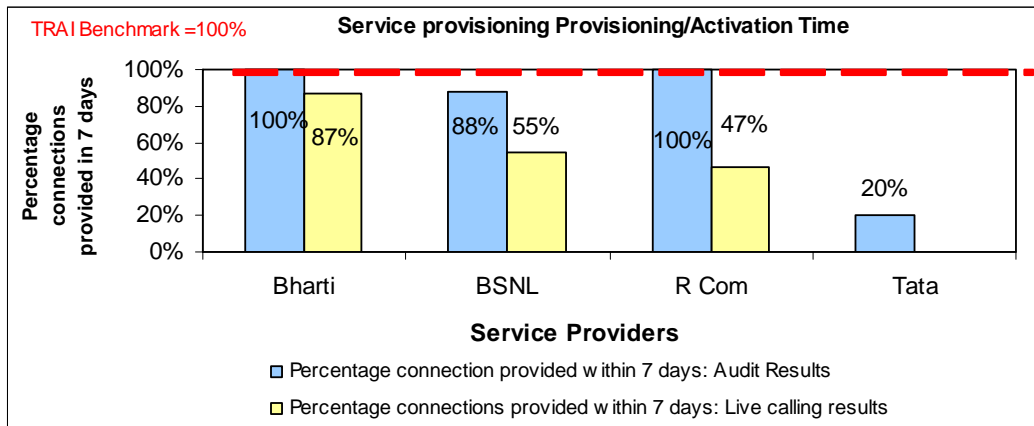

Bharti and Reliance communications score 100% on percentage connections provided within seven days. BSNL score for sample exchanges visited during the month of Audit is observed to 88% which is deemed to good as service provider provides connection in rural as well as urban areas. TATA teleservices claimed to have recently launched in Tamil Nadu circle as only 5 new connections were registered in the month of Audit out of which 2 (40%) were provided within 7 days. For live calling results 87% of Bharti subscribers called claimed that their connection was activated in stipulated period of time followed by BSNL at 55%. Reliance communication score on live calling was observed to be low at 47%. For TATA live calling was done for only 5 customers out of which in zero cases connection was provided in 7 days.

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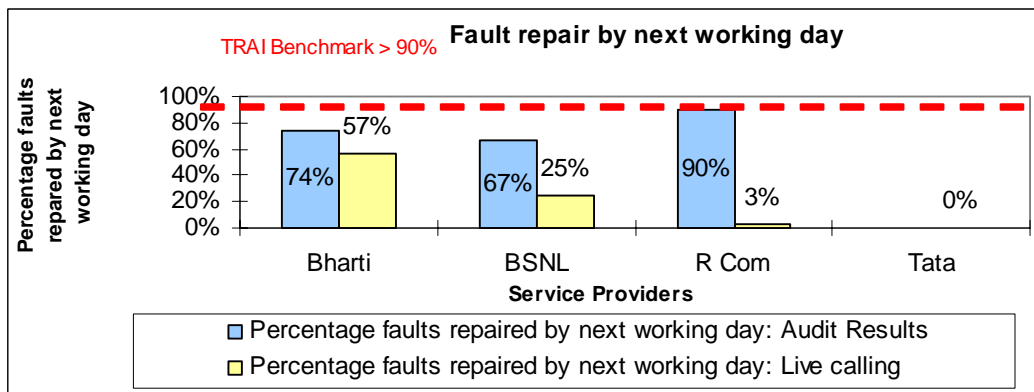

None of the service provider meets the benchmark for percentage faults repaired by next working day for the month of Audit. **For TATA teleservices there was no fault reported in the month of**

visit of Audit. For Live calling Bharti leads with 57% of the subscribers called claimed that fault was repaired by next working day followed by BSNL at 25%. Reliance score on live calling for this parameter remained really low with only 3% of the subscribers who were called claimed that fault was repaired by next working day. **For TATA live calls was possible only for 5 customers who had reported fault in the month prior to visit of Audit out of which none of them claimed that fault was repaired by next working day.**
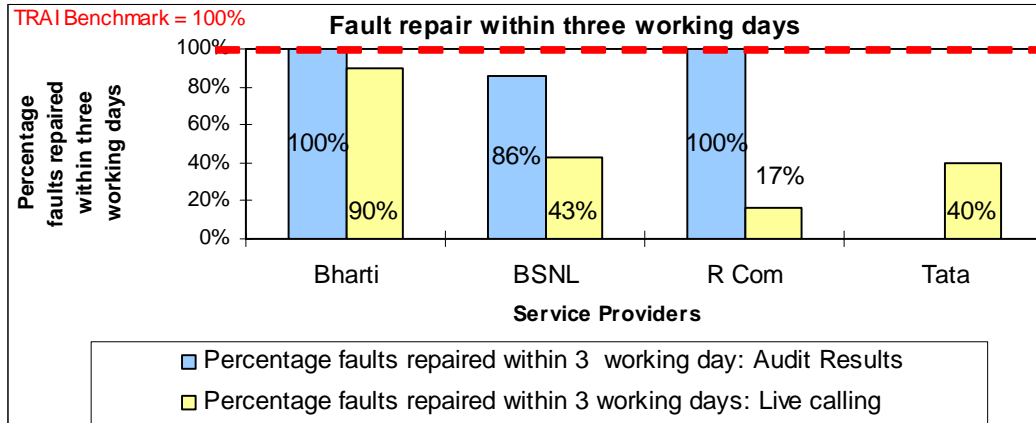

For fault repair by three working days only BSNL falls short of the TRAI specified benchmark for the month in which Audit was carried out. For TATA teleservices there was no fault reported in the month of Audit. For live calls made Bharti leads with 90% of its subscribers claiming that fault was repaired by next working day followed by BSNL at 43%. **For TATA 5 customers were called out of which 2 claimed that fault was repaired within three working days.**

<u>Call completion rate (Comparison between one month audit results and three day live measurement)</u>
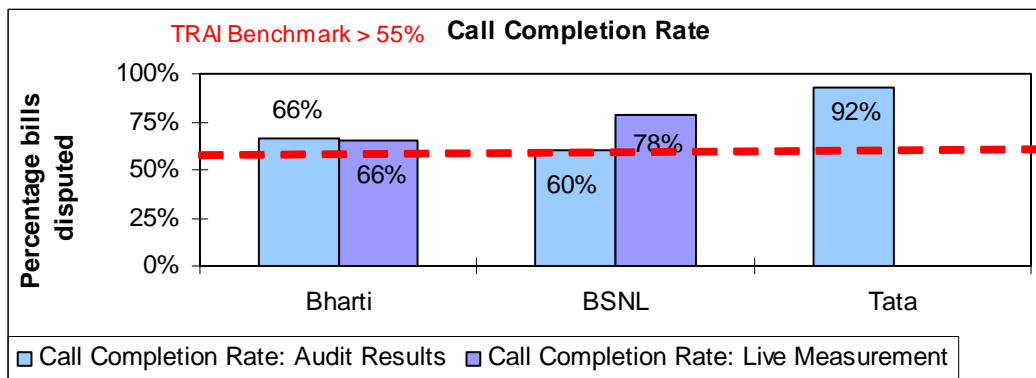
All the service providers comfortably meet the TRAI specified benchmark both for Live measurements and the month in which Audit was carried out. **For TATA teleservices live measurements for CCR was not possible as the Coimbatore exchange visited by the Auditor did not have the facility to measure CCR**. The same is being monitored by NMSC is Chennai. As mentioned in the executive summary Reliance does not have the technical feasibility to measure CCR and does not even report the same to TRAI.

Percentage bills disputed
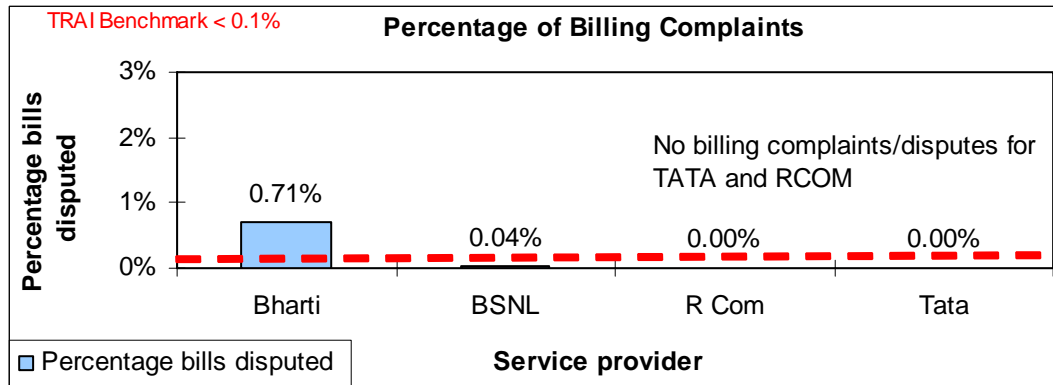
For percentage of billing disputes out of the total bills generated for the audit month, Bharti was found to be exceeding the TRAI benchmark of 0.1%. For TATA and RCOM there were no billing complaints reported during the month of Audit.

Resolution of billing complaints (Comparison between one month audit results and live calling results)
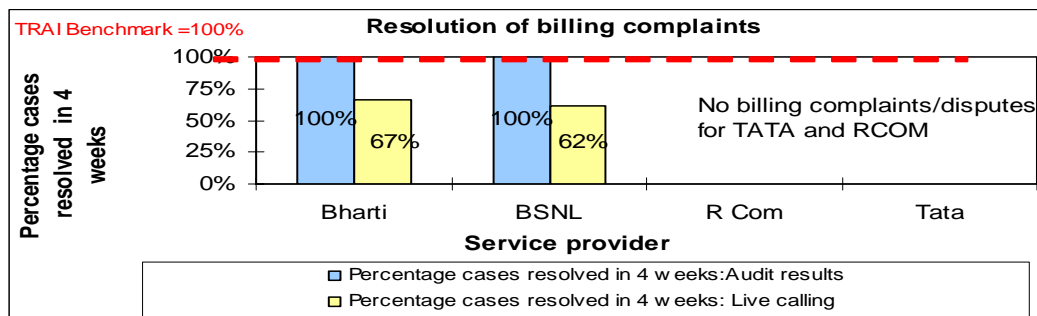
As per audit data findings, all the billing related complaints were resolved by Bharti and BSNL within stipulated period of time. For Live calling score 67% and 62% of subscribers called claimed that complaint was resolved within 4 weeks. There were no billing complaints reported for TATA and Reliance communications in the month prior to visit of Audit and hence no live calling was carried out.

Shift requests attended (Comparison between one month audit results and live calling results)
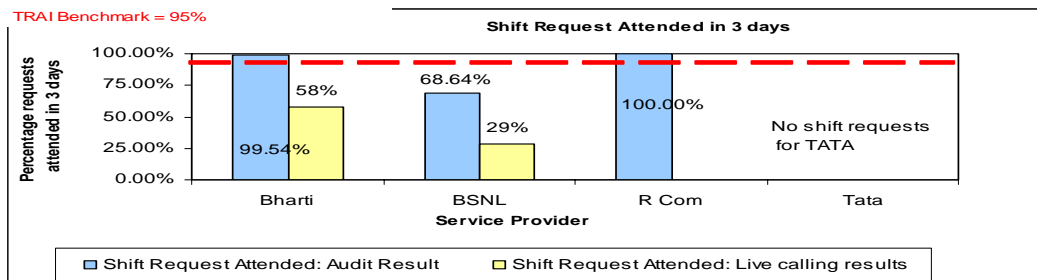
As far as shift request for Bharti and BSNL is concerned, 99.5% and 68.6% requests for them respectively were attended in stipulated period of time. However their scores on live calling were observed to be low. For Reliance there were negligible requests for shifts in the month of Audit

(Only 4). For live calling carried out for Reliance none out of two customers called claimed that the request was attended in three days.

Closure requests attended within 24 hours

TRAI Benchmark = 95%

Closure Request Attended in 24 hours
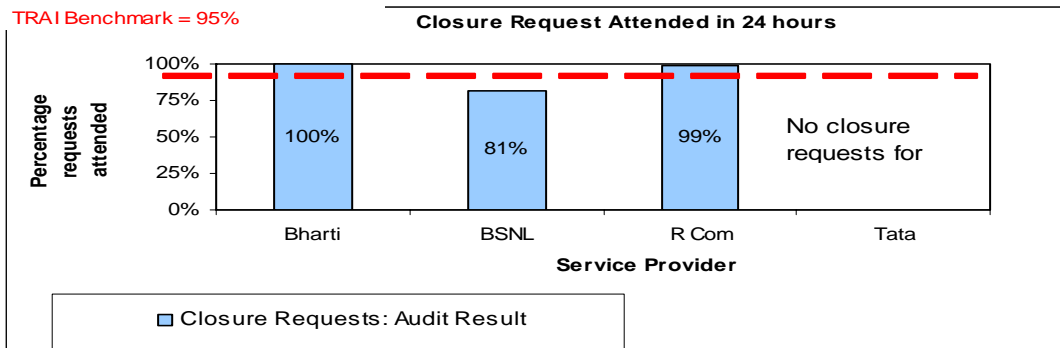
100% and 99% closure requests were found to be attended for Bharti and R Com, as per audit data. For BSNL, 81% cases of closure requests for sample exchanges were attended within 24 hours.

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

TRAI Benchmark = 95%

Supplementary Request Executed within 24 hours
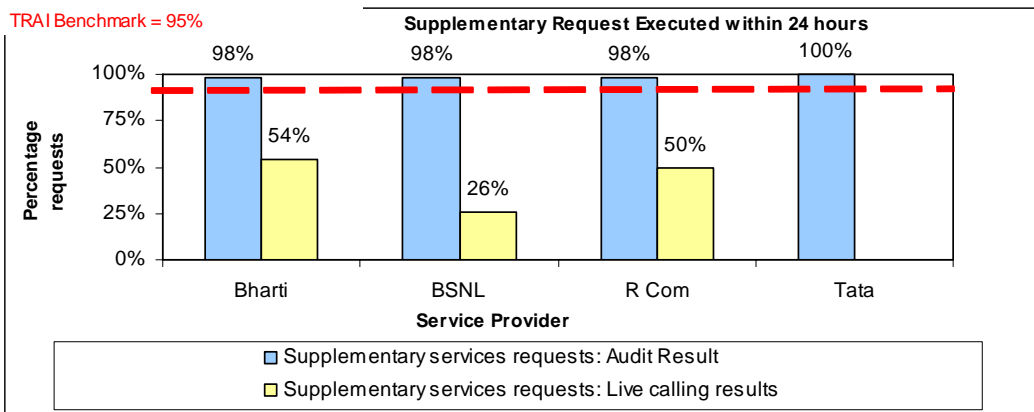
All the service providers meet the TRAI specified benchmark for supplementary requests attended within 24 hours for the month of Audit. For TATA there were only 3 cases of supplementary services requests during the month of Audit and all of them were fulfilled in stipulated time period. For live calling only 2 calls were possible for Reliance as in most of the cases where supplementary services were requested subscriber had withdrawn the services.

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

TRAI Benchmark = 80%

Call answered electronically within 20 seconds
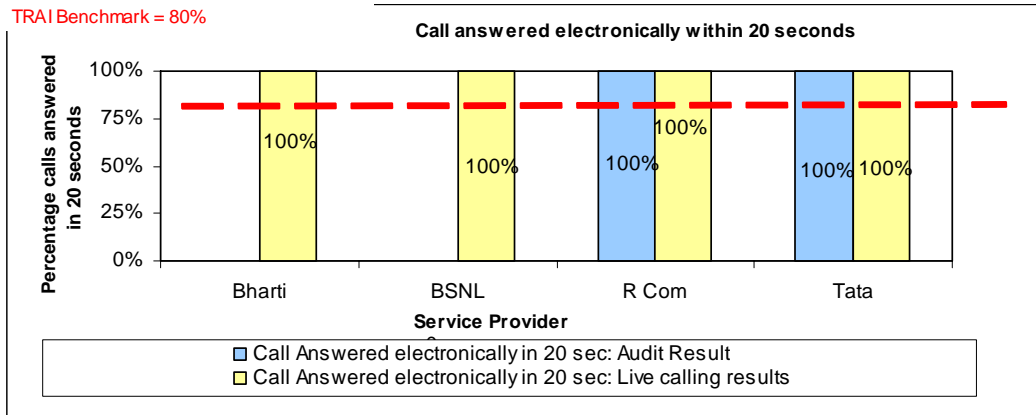
All the service providers meet the TRAI specified Benchmark for calls answered by IVR in 20 seconds for Live calling results. For Bharti there is no system to record the calls received by IVR and the service provider does not even report the same to TRAI. Details of call centre were not available at the exchanges in Tamil Nadu for BSNL as the service provider has a centralized call centre in Bangalore.

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

TRAI Benchmark = 80%

Call Answered by Operator within 60 seconds
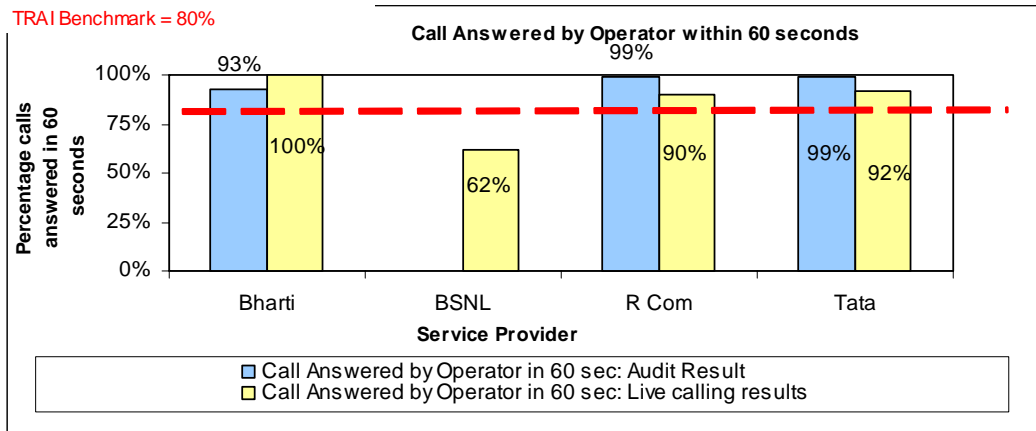
As per live calling results, the score on the parameter call answered by operator within 60 seconds for all the operators except BSNL was 100%. For BSNL, data on call centre details is not being maintained by exchanges in Tamil Nadu as there is a centralized call centre hence one month data could not be obtained.

Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)
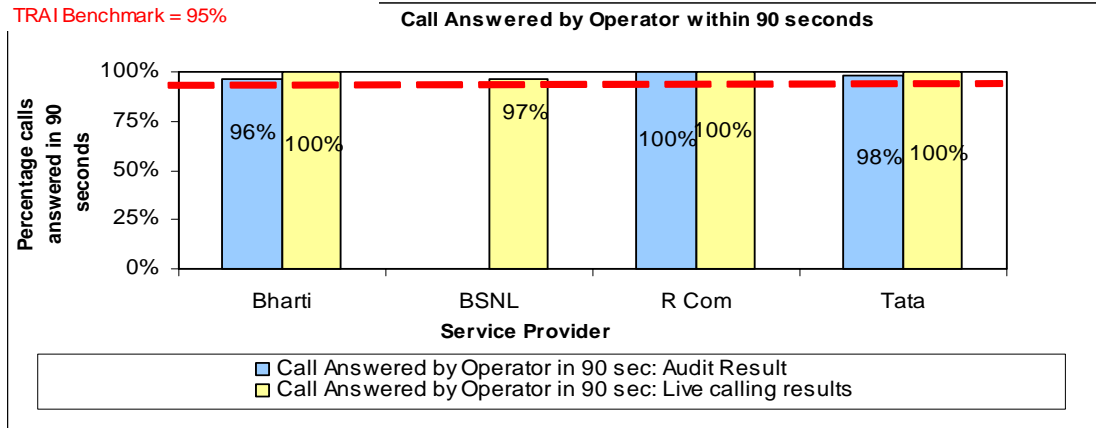
As per live calling results, the score on the parameter call answered by operator within 60 seconds for all the operators except BSNL was 100%.

Time taken to refund of deposits after closure
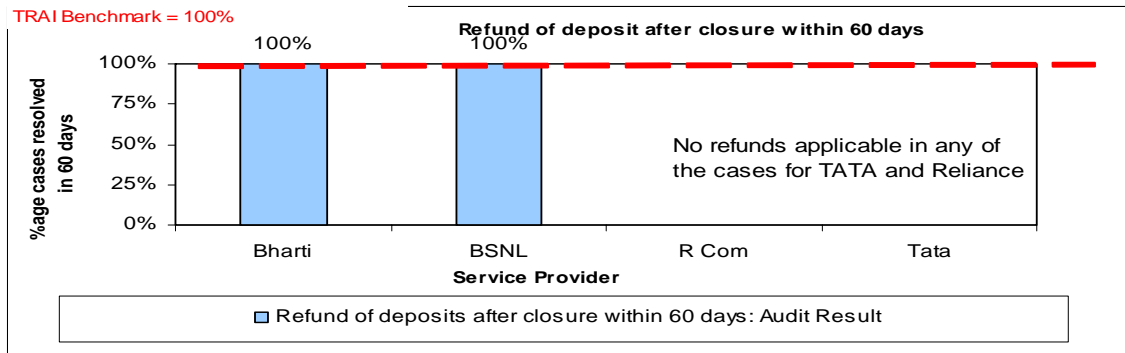
All the cases of refunds of deposits after closure were resolved by Bharti and BSNL in 60 days.

6.2 Graphical/Tabular Representations for Cellular Mobile Services

Accumulated Downtime
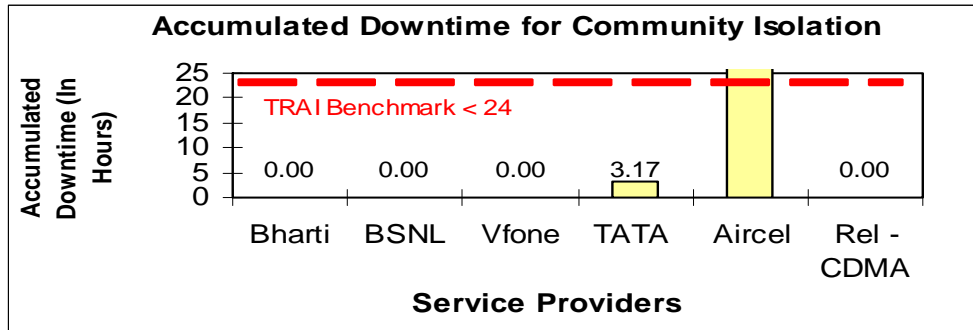
Only TATA & Aircel experienced a downtime in the Tamil Nadu circle in the month of audit. All other operators did not experience any downtime in the network.

Call Set-up Success Rate (CSSR)
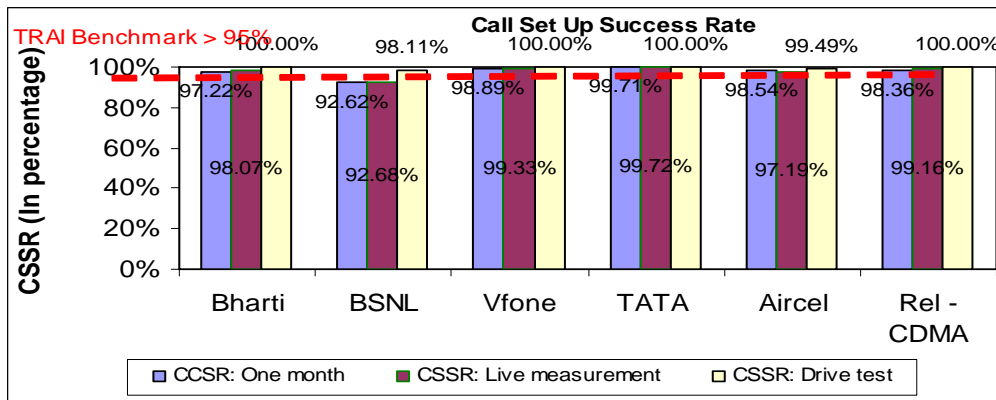
All the operators except BSNL are meeting the benchmark for the audit month, live measurement as well as the drive test.

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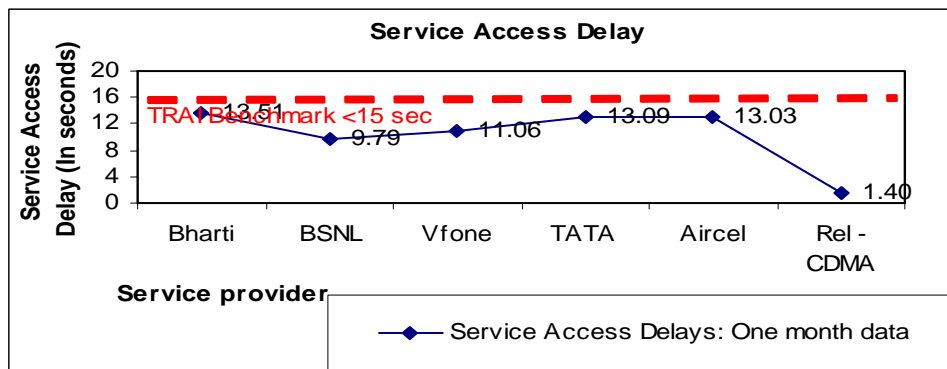
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit.

SDCCH / Paging Channel Congestion
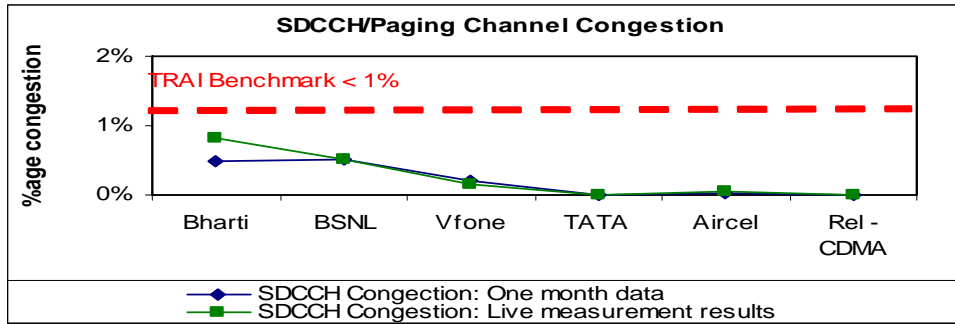
All the operators meet the benchmark both for the month of audit as well as the three day live measurement.

TCH Congestion
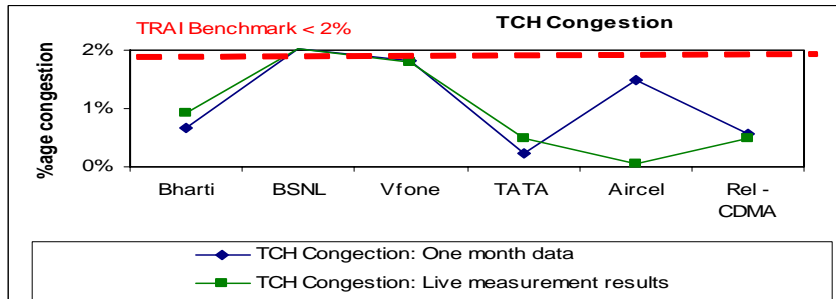
All the operators expect BSNL with a congestion of 2.03% for both the live measurement and audit period meet the TRAI specified benchmark. The minimum TCH congestion observed is for RCOM.

Call Drop Rate
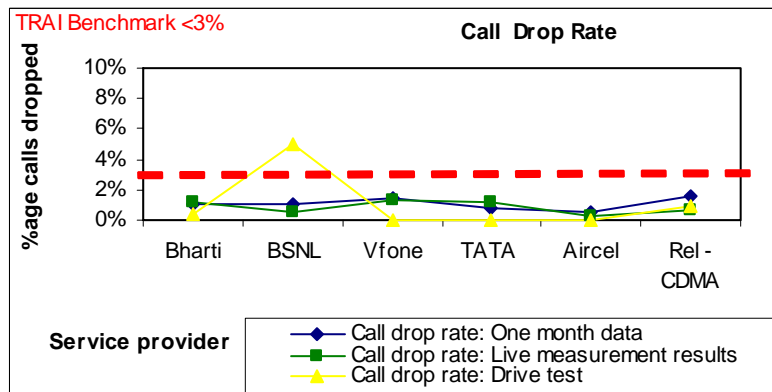
All the operators except BSNL during the drive test meet the TRAI benchmark. The operator with the least call drop rate taking into consideration the figures for live measurement and the month of audit is Aircel.

Voice quality
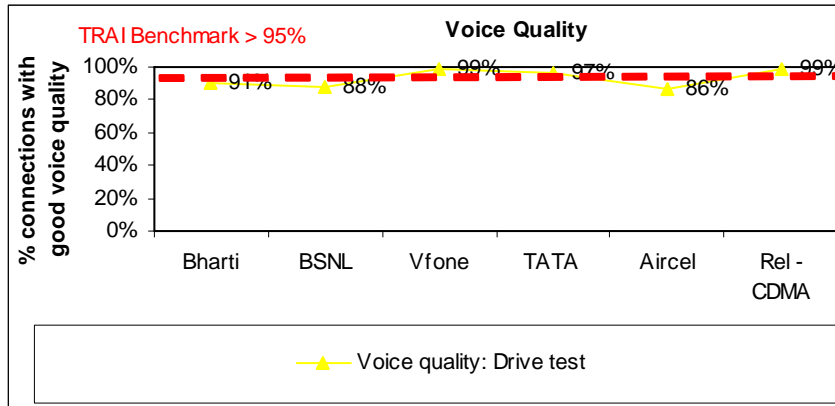
Bharti, BSNL & Aircel do not meet the TRAI benchmark as found out during the drive test. Aircel has the lowest number of connections with good voice quality at only 86% while the same is highest for RCOM at 99%.

Billing Disputes
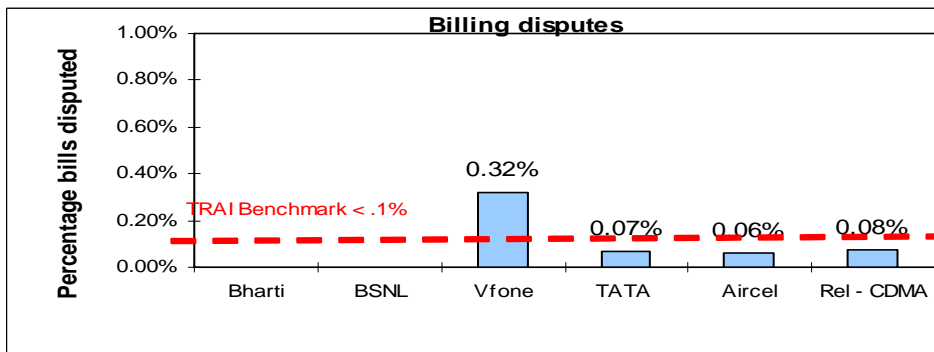
Vodafone does not meet the TRAI benchmark. **Interestingly, none of the Bharti subscribers have registered a billing complaint** in the period for which the PMR verification was done. The data for **BSNL was not provided by the service provider for the month of audit as they told the auditors that the same is being maintained centrally.**
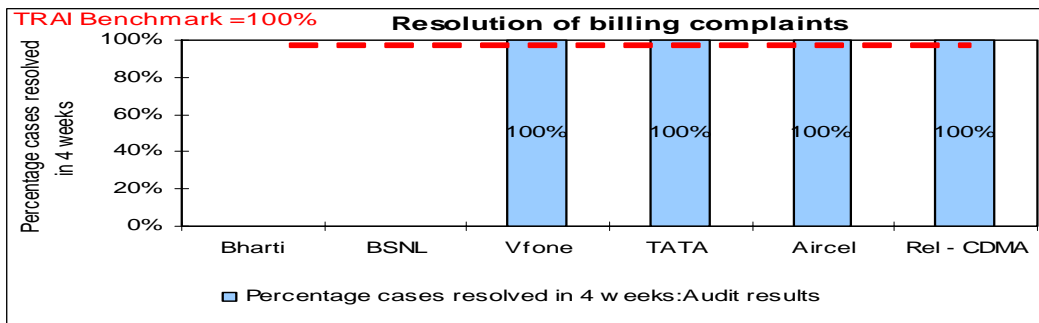
All the operators meet the TRAI benchmark of resolving 100% of the cases related to resolution of billing complaints for the month in which data was collected. However, the operators consider only

those as billing complaints where they have issued an internal ticket which essentially means that a refund is due to the customer.
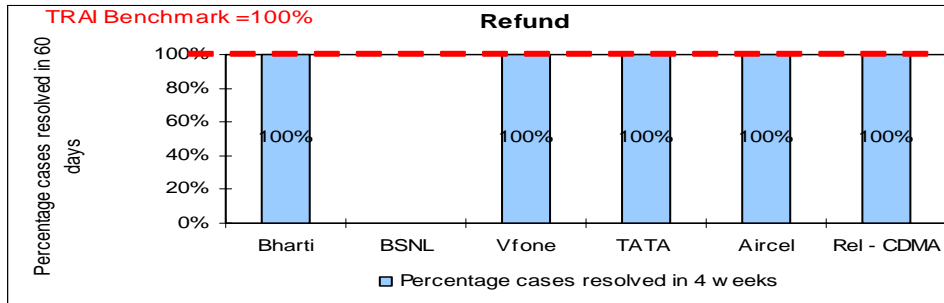
All the operators were found to giving the refunds to their subscribers within the stipulated time period. No data for refund of billing complaints was provided by BSNL as it is managed centrally

Live calling for billing Complaints

Resolution of billing complaints	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls made	17	29	100	100	67	94
Number of cases resolved in 4 weeks	11	15	58	100	23	15
Percentage cases resolved in four weeks	65%	52%	58%	100%	34%	16%

Except for TATA none of the operators were able to meet the TRAI benchmark for the live calling aspect. Only 16% of RCOM subscribers say that their complaints were resolved within 4 weeks.

Customer Care / Helpline:
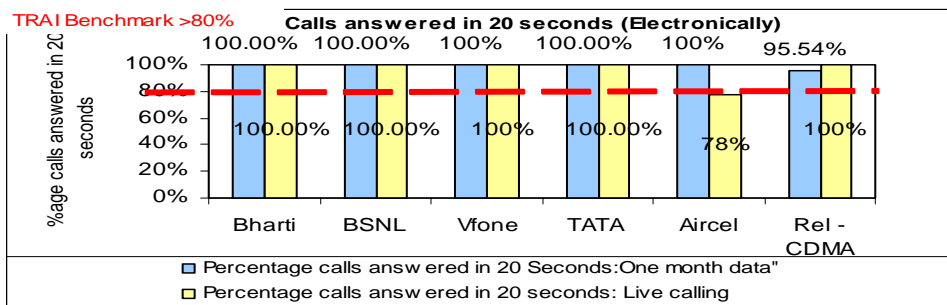
All the operators meet the TRAI benchmark for IVR (Electronic) answering of customers' calls for the one month data. However, the IMRB auditors found out that during live calling only 78% of the calls were answered by the IVR within 20 seconds.
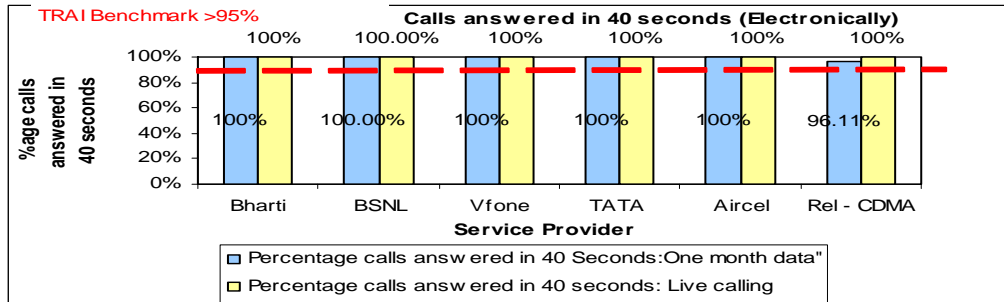
All the service providers meet the TRAI specified benchmark.
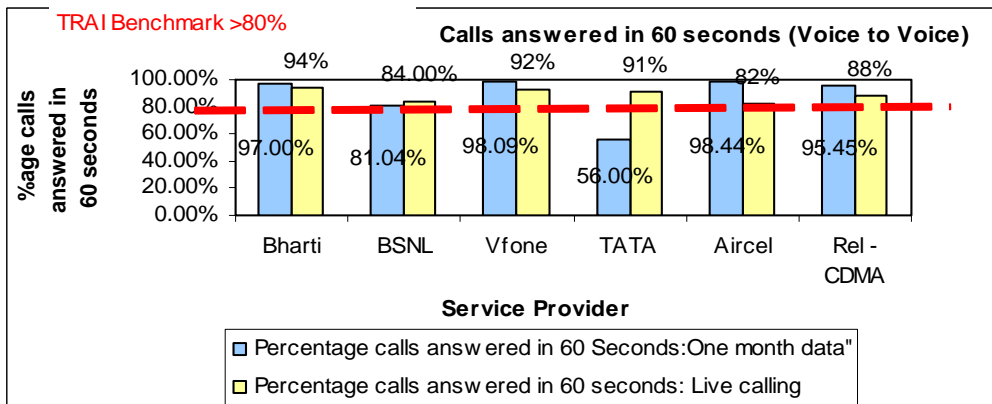
However, except for TATA all other operators meet the TRAI benchmark for the one month data for voice to voice calls answered within 60 seconds. For live calling all operators meet the TRAI specified benchmark
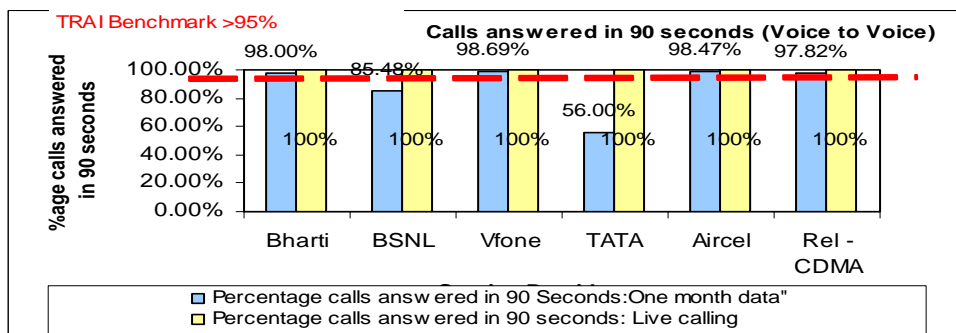
Except for TATA and BSNL all other operators meet the TRAI benchmark for the one month data for voice to voice calls answered within 90 seconds. For live calling all operators meet the TRAI specified benchmark

Inter Operator Call Assessment

Inter operator call Assessment (From/To)	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Bharti		100%	100%	100%	100%	100%
BSNL	100%		77%	100%	100%	100%
Vodafone	100%	99%		92%	100%	97%
TATA	100%	100%	100%		100%	100%
Aircel	99%	96%	94%	96%		100%
RCOM	86%	100%	88%	100%	98%	

In the inter-operator call assessment, calls were made from the test sims of service provider whose audit was being conducted to all the other service providers. The calls from Bharti to all other service providers were established 100% of the times. Similarly BSNL's connectivity with all the operators was found to be good except Vodafone where only 77% of calls got connected. However, Vodafone has maximum difficulty in connecting to a TATA number with only 92% of its calls getting connected. TATA had no problems in connecting to any of the operators with all 100 of its calls getting established. Also, Aircel's connectivity to Vodafone was not good with only 94 out of 100 calls getting connected. RCOM had the most problem in connecting to a Bharti number with only 86 out of 100 calls getting connected.

6.3 Graphical/Tabular Representations for Broadband services

<u>Service provisioning/Activation time (Comparison between one month audit results and live calling results)</u>
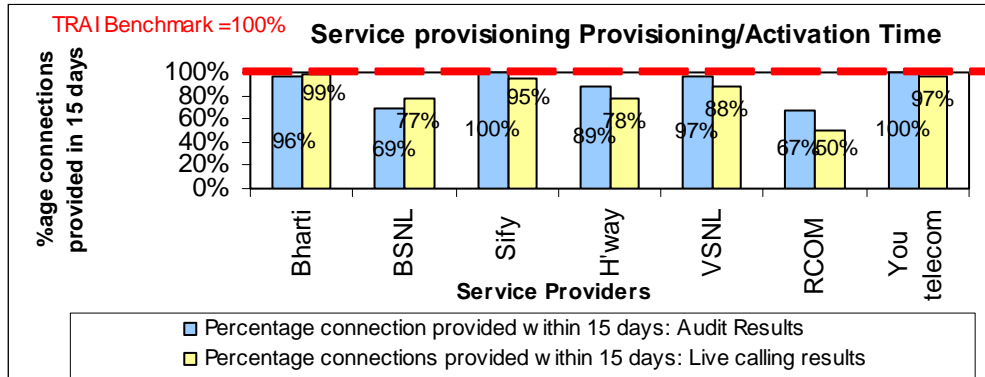
Hathaway, VSNL (TATA communications), BSNL and RCOM fall short of TRAI specified benchmark of 100 percent connections to be provided within 15 days. Although, Reliance scores below the benchmark of 100% connections to be provided within 15 days one month data collection, verification of records reveals 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 RCOM (50%) followed by BSNL and Hathaway at 77% and 78% respectively.

<u>Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results</u>
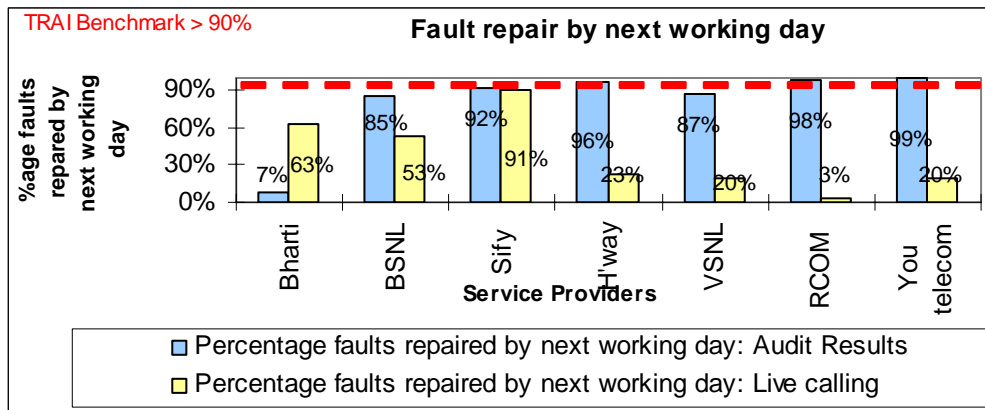
Bharti scores really low with only 7% of the faults reported by customers being repaired in one day during the month of Audit. Sify, Hathaway, VSNL (TATA communications) and You telecom meet the benchmark for the month of Audit. Highest scores on live calling are observed for Sify at 91% followed by Bharti and BSNL at 63% and 53% respectively. Also Reliance, You telecom and VSNL perform poorly on live calling results.

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

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

Fault repair within three working days

TRAI Benchmark = 99%

%age faults repaired within three working days

| | Bharti | BSNL | Sify | H'way | VSNL | RCOM | You telecom |
Audit: 99%, 92%, 100%, 100%, 92%, 100%, 100%
Live calling: 90%, 80%, 100%, 70%, 47%, 23%, 77%

Service Providers

☐ Percentage faults repaired within 3 working day: Audit Results
☐ Percentage faults repaired within 3 working days: Live calling
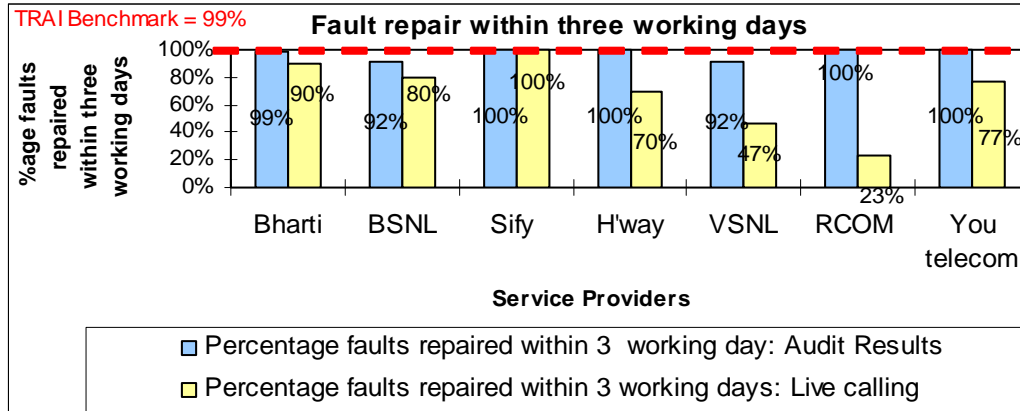
VSNL(TATA communications) and BSNL fall short of TRAI specified benchmark of 99% faults to be repaired within three working days for one month audit results. For live calling results Reliance and You telecom again perform poorly on the parameter

Percentage bills disputed

Billing disputes

%age bills disputed

TRAI Benchmark < 2%

| Bharti | VSNL | RCOM | You telecom |
| 0.11% | 1.10% | 0.09% | 0.15% |

☐ Percentage bills disputed   Service provider
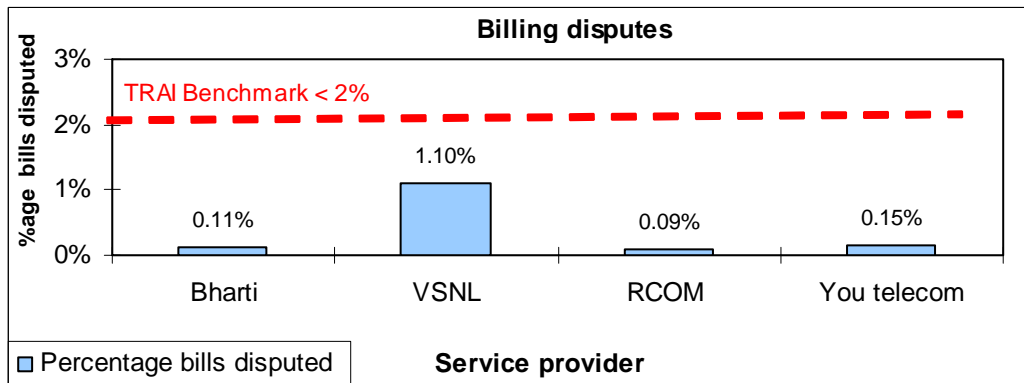
All the operators meet the benchmark on percentage bills disputed in Tamil Nadu circle. Sify and Hathaway claim that all its retail customers are prepaid customers and hence there are no billing complaints. Also for BSNL the details of total bills generated was not available at the respective POP's/Exchanges as its Broadband bills are generated centrally from Bangalore.

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

Resolution of billing complaints

TRAI Benchmark =100%

%age cases resolved in 4 weeks

| | Bharti | BSNL | Sify | H'way | VSNL | RCOM | You telecom |
Audit: 100%, 100%, , , 100%, 100%, 100%
Live calling: 50%, 93%, , , 27%, , 68%

All Prepaid customers for Sify and H'way

Service provider

☐ Percentage cases resolved in 4 weeks:Audit results
☐ Percentage cases resolved in 4 weeks: Live calling
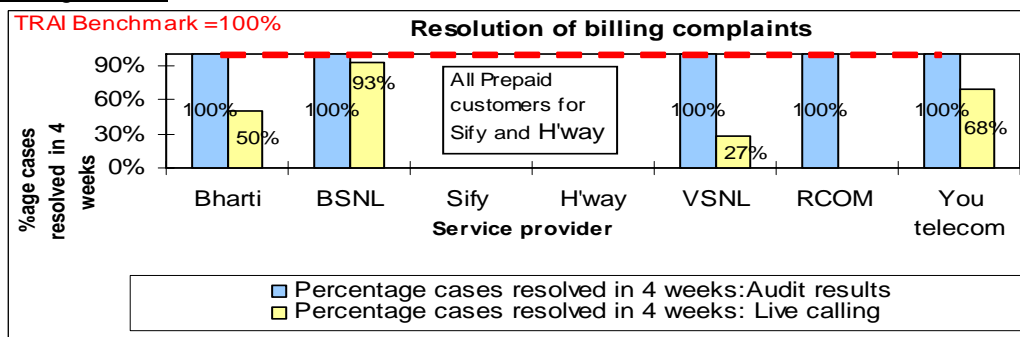
All the operators meet the TRAI specified benchmark for Percentage billing complaints resolved within four weeks during the month of Audit. VSNL (TATA communications) scores low on live calling results at 27%. For Reliance there was no live calling carried out as there were very few cases of billing 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)
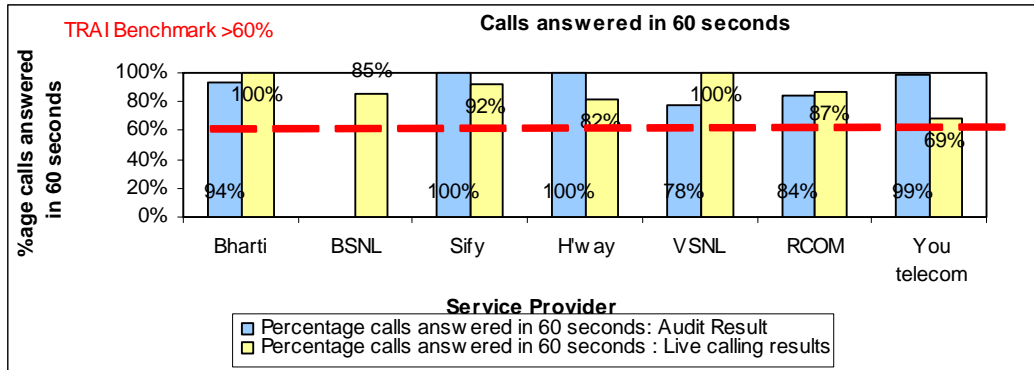
All the service providers meet the benchmark as more that 80% of the calls made to customer care were answered by the operator in 60 seconds both for live calling and the month in which Audit was carried out.

For BSNL there were no details of call centre available at the circle level as there is a centralized call centre in Bangalore for the service provider. Also, as Reliance and VSNL have a centralized call centre, the results shown are combined for all the circles in which they are operating.

Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)
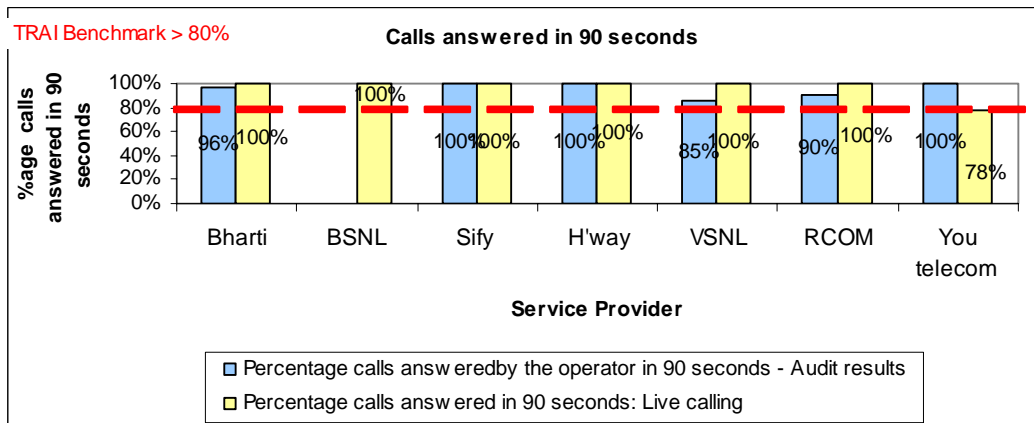
You telecom again does not meet the benchmark for live calling carried out during the month of Audit for calls answered within 90 seconds.

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

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
One month data Verification Results								
Total number of intra network links		63	BRAS-23,T1-24, T2-610, DSLAM-5456	400*	2	16*	No CDR Router in Tamil Nadu circle	No separate POP/Router. Direct connectivity to Gateway
No of Intra network found to be above 90%	<80%	0	Uplink Traffic in Chennai BRAS is > 90%	4*	0	1		
Live Measurement Results								
No of Intra network Links tested		63	20	37*	2 (Trichy and Coimbatore)	10*	No CDR Router in Tamil Nadu circle	No separate POP/Router. Direct connectivity to Gateway
No of Intra network found to be above 90%	<80%	0	0	0	0	0		

Reported on All India Basis

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

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

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

<u>Bandwidth utilization at Upstream links (Comparison between one month audit results and live measurement results)</u>
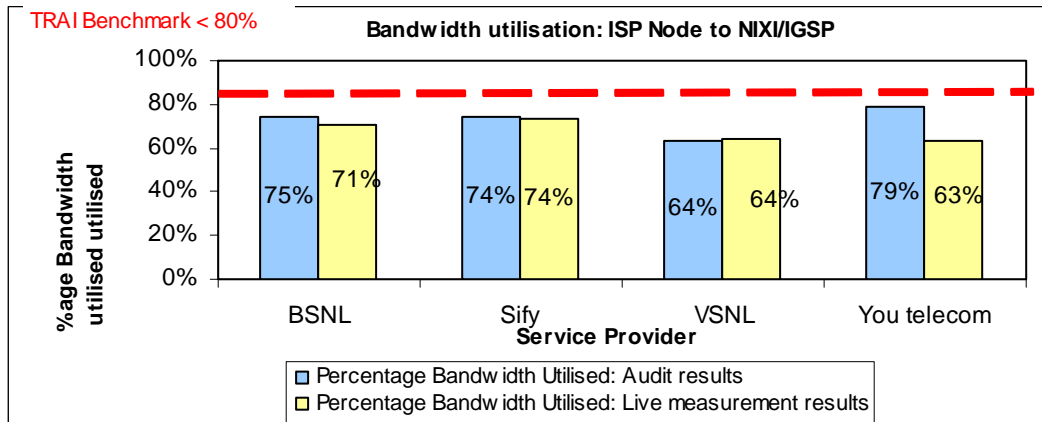
Sify, VSNL and BSNL meet the TRAI specified benchmark cumulatively for all the gateways present in India as %age utilisation remains well below 80%.

<u>Broadband connection speed available to sample subscribers – Live calling results</u>

Download Speed	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You Telecom
Percentage speed observed cumulatively for sample calls made	>80%	83%	73%	92%	83%	75%	93%	94%

All the service providers are meeting the benchmark for one month data collection and live measurements conducted at POPs/ISP Node. **Since verification of records was not possible because of unavailability of historic data with the operators**, IMRB auditors also conducted live calling to check speed available at the last mile. Live calling results reveal that most of the service providers (except BSNL and VSNL) are meeting the benchmark on download speed available to the customer. However, all the service providers have made available the tool for measuring download speed on their websites.

Service availability/Uptime (Comparison between one month audit results and live measurement results)
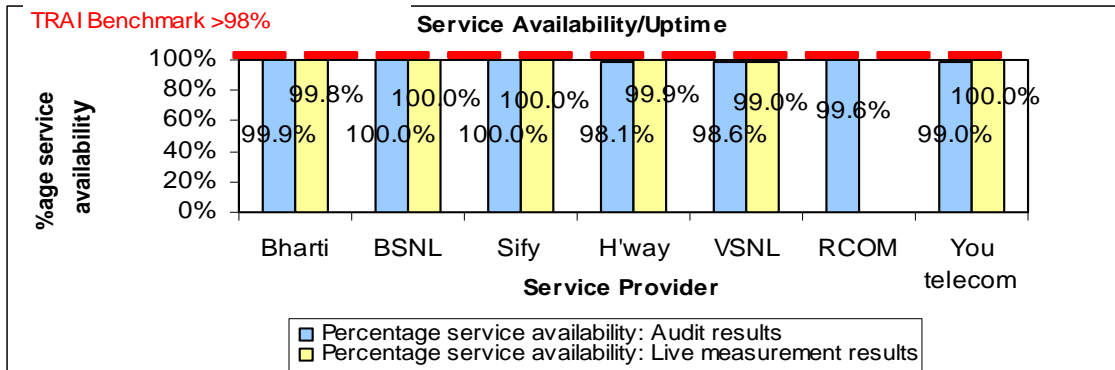
All the service providers meet the benchmark with uptime of more than 98%. Also, live measurement details could not be obtained for **RCOM has different methodology (based on faults reported by the customer and not network or site downtime) for calculating the above parameter and hence three day live measurement was not possible for the service provider.**

Network Latency and Packet loss - One month data collection

Network Latency and Packet Loss	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Packet Loss (Percentage)	<1%	0.00%	0.00%	0.00%	<1%	0.00%	NA	0.00%
Network Latency								
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	71 ms	Complied	< 45ms*	99.8	<80	<40	5 ms
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	72 ms	Complied	<250* ms	<320	<180	<250	184 ms

Reported on All India Basis

Three day live measurement

Network Latency and Packet Loss	Benchmark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Packet Loss (Percentage)		0.00%	0.00%*	0%	<1%	0.00%*	0.00%	0.00%
Network Latency								
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	71 ms	Complied*	<15 ms*	98.3	<80*	<40	5
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	72 ms	Complied*	240 ms*	<320 ms	<230*	<250	250

Reported on All India Basis

All the service providers audited during the period performed well on results of live measurement for packet loss and network latency. Reliance is using smoke ping tool to measure the latency at various links. However the some ping tool is configured to send 5 ping packets of 56 bytes each every 300 seconds.

Also, packet loss is calculated by Reliance basis the faults reported by the customers and not by carrying out ping tests as specified by TRAI. However ping results for various links tested during live measurement revealed that there was 0% packet loss.

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
1	Provision of telephone after registration of demand									
1.1	Percentage connections completed within 7 days	100%	96%	98%	100%	80%	93%	93%	100%	100%
2	Fault incidence/clearance statistics									
2.1	Fault incidence	<5	6.18	4.02	2.9	5.61	<3	<3	No faults	No faults
2.2	Faults repaired within 24 hours	>90%	98%	100%	96%	79%	100%	100%	0%	0%
2.3	Mean time to repair	<8 hrs	10.63	DNA	5.6	6	4.8	4.8	NA	NA
3	Call Completion Rate (CCR)	>55%	66%	64%	75%	60%	0%	0%	90%	DNA
4	Metering and billing credibility									
4.1	Billing complaints per 100 bills issued	<0.1%	0.87%	0.45%	0.01%	0.01%	<0.1	<0.1	0.00%	0.00%
4.2	%age of billing complaints resolved within 4 weeks	100%	14%	100%	90%	94%	100%	100%	NA	NA
5	Customer care/helpline promptness									
5.1	Shift requests (Total number received)									
	Percentage shift requests attended within 3 days	95%	95%	98%	100%	61%	100%	100%	NA	NA
5.2	Closure request attended (Total number received)									
	Closure within 24 hours	95%	99%	99%	100%	91%	99%	99%	100%	100%
5.3	Supplementary (additional) service requests attended (Total number received)									
	Additional facility provided within 24 hours	95%	99%	99%	100%	91%	99%	99%	98%	98%
6	Response time to customer									
6.1	% age call answered through IVR in 20 seconds	80%	No mechanism to record details		99%	NA	98%	98%	100%	Raw data not available since call centre is centralized
	% age call answered through IVR in 40 seconds	100%			99%	NA	99%	99%	100%	
6.2	% age calls answered by operator in 60 seconds	80%	98%	98%	100%	NA	97%	97%	55%	
	% age calls answered by operator in 90 seconds	95%	99%	99%	100%	NA	99%	99%	59%	
7	%age cases where refund received within 60 days	100%	92%	94%	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
▭	Not meeting benchmark

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		Aircel		Reliance	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
A	Network Performance													
1	Accumulated Downtime	< 24 hrs.	0	0	0	0	22.28 hr	22.28 hr	0.29 hr	55.66 hr	9.43 hr	9.42 hr	0	0
2	Call set up success rate	> 95%	99.40%	99.94%	95.51%	95.51%	99.15%	99.15%	99.76%	99.69%	98.65%	98.66%	99.36%	99.36%
3	Service Access delay	9 to 20 seconds	4.35	4.35	Oct-9.74, Nov9.79, Dec9.78	Oct-9.74, Nov9.79, Dec9.78	min7.26, max12.42	min.7.26, max12.42	5.24	13.46	11.14	11.14	4.11	4.11
4	Blocked call rate													
	SDCCH Congestion	< 1 %	0.88%	0.90%	0.89%	0.89%	0.27%	0.27%	0%	0%	0.04%	0.04%	0%	0%
	TCH Congestion	< 2 %	1.51%	0.30%	1.84%	1.84%	1.80%	1.80%	0.23%	0.19%	1.11%	1.11%	0%	0%
5	Call drop rate	< 3 %	2.10%	1.08%	1.09%	1.09%	1.50%	1.50%	0.99%	0.99%	0.64%	0.64%	0.75	0.75
6	%age connections with good voice quality	> 95%	97.69%	97.69%	96.44%	96.44%	99.30%	99.30%	98.14%	98.14%	95.85%	95.85%	98.76%	98.76%
7	Service coverage		Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	< 0.5%	Complied		Complied		Complied		Complied		Complied		Complied	
B	Customer Care													
	Calls answered electronically													
	Within 20 seconds	> 80%	100%	100%	100%	100%	100%	100%	100%	100%	80%	80%	97.32%	97.32%
	Within 40 seconds	> 95%	100%	100%	100%	100%	100%	100%	100%	100%	95%	95%	97.32%	97.32%
	Calls answered by the operator													
	Within 60 seconds	> 80%	90.00%	86.00%	84%	84%	94.41%	94.41%	55.40%	55.40%	80%	80%	68.06%	68.06%
	Within 90 seconds	> 95%	92.00%	96.00%	95%	95%	100.00%	99.98%	59.20%	59.20%	95%	95%	73.48%	73.48%
C	Billing complaints													
	Billing complaints/100 bills	< 0.1	0.02	0.00	< 0.1	< 0.1	0.05	0.05	0.05	0.05	0.02	0.02	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%	Not Reported	Not Applicable	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
Service provisioning									
Percentage connections provided within 15 days	100%	95%	98%	74%	74%	100%	100%	100%	100%
Fault repair restoration time									
Percentage faults repaired by next working days	> 90%	97%	99%	93%	93%	91%	91%	99%	99%
Percentage faults repaired within three working days	99%	98%	99%	100%	100%	99%	99%	100%	100%
Billing performance									
Billing complaints per 100 bills issued	<2%	NA	0.08%	0.05%	0.05%	Prepaid		Prepaid	
%age of billing complaints resolved in 4 weeks	100%	NA	100%	98.33%	98.33%				
%age cases in which refund of deposits after closure was made in 60 days	100%	NA	94.00%	100%	100%				
Customer care/helpline assessment (Voice to Voice)									
Percentage calls answered within 60 seconds	> 60%	94%	94%	86%	Centralized call centre in Bangalore	88%	88%	80-90%	80-90%
Percentage calls answered within 90 seconds	> 80%	97%	97%	96%		98%	98%	NR	NR
Bandwidth utilization/Throughput									
Intra network links (POP to ISP Node)								NR	NR
Total number of intra network links > 90%		1	1	NR	0			NR	NR
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)								NR	NR
Percentage bandwidth utilized on upstream links	< 80%	Gateway present in Chennai		NR	78%	85%	85%	NR	NR
Broadband download speed		**No raw data available for verification**							
Service availability/uptime	> 98%	100.00%	100.00%	99.85%	99.85%	100%	100%	99.68%	99.68%
Packet loss	<2%	No raw data available for old ping test results		NR	Complied*	No raw data available old ping test results			
Network Latency									
POP/ISP Node to NIXI	< 120 msec			NR	Complied*				
ISP node to NAP port (Terresrtrial)	< 350 msec			NR	Complied*				

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

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

7.4 Broadband services…..Ctd

Parameter	Benchmark	VSNL		RCOM		You Telecom	
		PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning time							
Percentage connections provided within 15 days	100%	100%^^	100%^^	68%^^	68%^^	100%	100%
Fault repair restoration time							
Percentage faults repaired by next working days	> 90%	83%^^	83%^^	93%^^	93%^^	100%	99%
Percentage faults repaired within three working days	99%	94%^^	94%^^	100%^^	100%^^	100%	100%
Billing performance							
Billing complaints per 100 bills issued	<2%	1.17%	1.17%	0.41%	0.41%	0.20%	0.22%
%age of billing complaints resolved in 4 weeks	100%	99.29%	99.29%	100%	100%	100%	100%
%age cases in which refund of deposits after closure was made in 60 days	100%	100%	100%	100%	100%	78%	85%
Customer care/helpline assessment (Voice to Voice)							
Percentage calls answered within 60 seconds	> 60%	86%	86%	73%	73%	98%	99%
Percentage calls answered within 90 seconds	> 80%	90%	90%	87%	87%	99%	99%
Bandwidth utilisation/Throughput							
Intra network links (POP to ISP Node)							
Total number of intra network links > 90%		0	0	0	0	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)							
Percentage bandwidth utilised on upstream links	< 80%	73%	73%	69%	69%	79%	79%
Broadband download speed		>80%	No historic data available for verification				
Service availability/uptime	> 98%	99.64%	99.64%	99%	99%	99%	99%
Packet loss	<2%	No raw data available for verification		0.54%	0.54%^^	<1%^^	0%^^
Network Latency							
POP/ISP Node to NIXI	< 120 msec			33.5	Old latency graphs verified	<40 ms	<40 ms
ISP node to NAP port (Terresrtrial)	< 350 msec			275.4		<300 ms	<300 ms

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

7.4 Conclusions

7.4.1 Basic Wireline Services

1. The figures for BSNL vary because the audit was conducted only in sample exchanges (5% spread across 10% of SDCA's) and the PMR figure is reported by the operator on the overall circle level.
2. For RCOM parameters related to customer care are reported on an all India level
3. During verification process carried out at exchanges it was observed that customer care data is not maintained at the exchanges as service provider has a centralized call centre.
4. Also while verifying the raw data figures for Bharti, there was variation observed for most of the figures reported to TRAI. The service provider claimed that the since the report for Tamil Nadu is generated in Bangalore there may be some error for which an internal audit will be initiated.
5. Also it was observed that the cases related to refund of deposits are being taken care by some of the bigger exchanges in Tamil Nadu circle.

7.4.2 Cellular Mobile services

1. The figures for Bharti do not match for TCH congestion and call drop rate
2. Also, customer care figures (voice to voice) did not match for Bharti during the verification process.
3. The accumulated downtime and service access delay figures did not match for TATA
4. It was observed that all the service providers Audited in Tamil Nadu 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 which is not in line with QoS methodology.
3. VSNL was found to be including even billing complaints while reporting fault repair which has resulted in average performance by the service provider on this parameter. Also it was observed that the service provider considers all the connections less than 256kpbs as Broadband connections which is not in line with QoS methodology.
4. Most of the service providers were also found to be unaware of TRAI specified guideline for carrying out ping tests of 1000 packets of 64 bytes each.
5. Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was not available for verification for all the service providers except BSNL.
6. Also while verifying the raw data figures for Bharti, there was variation observed for most of the figures reported to TRAI. The service provider claimed that the since the report for Tamil Nadu is generated in Bangalore there may be some error for which an internal audit will be initiated.
7. Although all the service providers claimed that they conduct random ping tests and latency to check the packet loss but there is no book keeping which is maintained at their end. Records of old ping tests were found to be maintained only by BSNL and You telecom.

8. Annexure - I

8.1 Parameter wise performance reports for Basic Wireline services

<u>One month data verification results for Service provisioning</u>

Service provisioning/Activation time	Benchmark	Bharti	BSNL	R Com	Tata
Number of connections registered during the period		3002	288	426	5
Total number of connections provided within 7 days		2999	253	426	1
Percentage of connections provided within 7 days	100%	99.9%	87.8%	100.0%	20.0%
Total number of connections provided after 7 days		3	35	0	1
Percentage of connections provided after 7 days		0%	12%	0%	20%

<u>Live calling results for Service provisioning</u>

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration made		90	88	60	5
Number of cases in which connection was provided in 7 Days		78	48	28	0
Percentage cases in which connection was provided in 7 days	100%	87%	55%	47%	0%
Number of cases in which connection was provided after 7 days		12	20	47	1
Percentage cases in which connection was provided after 7 days		13%	23%	78%	20%
Percentage cases in which connection was provided after 7 days		13%	23%	78%	20%

<u>One month data verification results for Fault repair/Restoration time</u>

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com	Tata
Total number of faults registered during the period		5712	3247	522	0
Total number of faults repaired by next working day		4240	2168	468	0
Percentage of faults repaired by next working day	> 90%	74%	67%	90%	NA
Total number of fault repaired within 3 days		5697	2799	522	0
Percentage of fault repaired within 3 days		100%	86%	100%	NA

<u>Live calling results for Fault repair/Restoration time</u>

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	1301	30	5
Number of cases where faults were repaired by next working day		17	321	1	0
Percentage cases where faults were repaired by next working day	> 90%	57%	25%	3%	0%
Number of cases where faults were repaired within 3 days		27	557	5	2
Percentage cases where faults were repaired within 3 days		90%	43%	17%	40%

One month data verification results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		6299894	326802	DNA	3570514
Total number of successful local calls		4153496	196596	DNA	3297566
Call Completion Rate (CCR) in the local network	> 55%	66%	60%	DNA	92%

Live measurement results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		635256	797304	DNA	Live measurements not possible
Total number of successful local calls		416132	624775	DNA	
Call Completion Rate (CCR) in the local network	> 55%	66%	78%	DNA	

One month data verification results for Billing performance

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
Billing disputes					
Total bills generated during the period		88782	36019	13545	76
Total number of bills disputed		626	15	0	0
Percentage bills disputed	<0.1%	0.71%	0.04%	0.00%	0.00%
Resolution of billing complaints					
Total complaints resolved in 4 weeks from date of receipt		626	15	0	0
Percentage complaints resolved within 4 weeks of date of receipt		100%	100%	NA	NA

Live calling results for Billing performance

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	50	0	0
Number of cases resolved in 4 weeks		20	31	0	0
Percentage cases resolved in four weeks		67%	62%	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		434	338	4	0
Total number requests attended in 3 days	95%	432	232	4	0
Total number requests attended beyond 3 days		2	89	0	0
Shifts not attended		0	0	0	0
Percentage of requests attended in 3 days		99.54%	68.64%	100.00%	NA
Percentage of requests attended beyond 3 days		0%	26%	0%	NA
Percentage of shifts not attended		0%	0%	0%	NA

One month data verification Audit results for Customer Care – Closures

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of closure requests received		2325	887	628	0
Total closure attended within 24 hours	95%	2325	722	623	0
Total number of requests attended beyond 24 hours		0	7	5	0
Closure requests not attended		0	0	0	0
Percentage of closure attended within 24 hours		100%	81%	99%	NA
Percentage of closure attended beyond 24 hours		0%	1%	1%	NA
Percentage of closures not attended		0%	0%	0%	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		1269	241	516	3
Total number of requests attended within 24 hours	95%	1242	236	506	3
Total number of requests attended beyond 24 hours		27	1	10	0
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		98%	98%	98%	100%
Percentage of requests attended beyond 24 hours		2%	0%	2%	0%
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	252	2	0
Total number requests attended within 24 hours	95%	27	65	1	0
Total number requests attended beyond 24 hours		13	98	1	0
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		54%	26%	50%	NA
Percentage of requests attended beyond 24 hours		26%	39%	50%	NA
Percentage of supplementary requests not attended		0%	0%	0%	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	1850	100	100
Calls answered within 20 seconds					
Total Number of calls answered by IVR in 20 seconds	80%	100	1850	100	100
Percentage calls answered in 20 seconds		100%	100%	100%	100%
Calls answered within 40 seconds					
Total Number of calls answered by IVR in 40 seconds	95%	100	1850	100	100
Percentage calls answered in 40 seconds		100%	100%	100%	100%

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

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	2000	100	100
Calls answered within 60 seconds					
Total Number of calls answered by operator in 60 seconds	80%	100	1236	90	92
Percentage calls answered in 60 seconds		100%	62%	90%	92%
Calls answered within 90 seconds					
Total Number of calls answered by operator in 90 seconds	95%	100	1935	100	100
Percentage calls answered in 90 seconds		100%	97%	100%	100%

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

Refund of deposits after closure	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		184	982	0	0
Number of cases where refund was made in < 60 days	100% within 60 days	184	982	0	0
Percentage cases where refund was made in < 60 days		100%	100%	NA	NA

Level 1 Services

Level 1 services	Bharti	BSNL	RCOM	TATA
TOTAL Calls Made	235	225	250	220
Answered in 60 seconds	232	198	240	206
Percentage calls answered in 60 seconds	98%	88%	96%	93%

8.2 Parameter wise performance reports for Cellular Mobile services

Accumulated Downtime	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Downtime (In hours)	0.00	0.00	0.00	3.17 hr	107 hr	0.00
CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	DNP	DNP	22078678	616403.61	8152536	DNP
Total number of successful calls	DNP	DNP	21834323	614589.19	8033509	DNP
CSSR	97.22%	92.62%	98.89%	99.71%	98.54%	98.36%
CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	DNP	DNP	22071736	1695986	23296414	DNP
Total number of successful calls	DNP	DNP	21923809	1691321	22641797	DNP
CSSR	98.07%	92.68%	99.33%	99.72%	97.19%	99.16%
CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	236	264	202	276	978	432
Total number of successful calls	236	259	202	276	973	432
CSSR	100.00%	98.11%	100.00%	100.00%	99.49%	100.00%

DNP – the figure was obtained directly from the system.

Service Access Delay	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
One month data collection	13.51	9.79	11.06	13.09	13.03	1.40

Month of Audit						
Traffic Statistics	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of SDCCH Attempts	18221588	DNP	DNP	236941	16099.93	DNP
Total Number of SDCCH Congestions	87463.622	DNP	DNP	0.00	2.41	DNP
Percentage SDCCH Congestion	0.48%	0.51%	0.20%	0.00%	0.02%	0%
Total number of TCH Attempts	7993482	DNP	DNP	887094	81525.36	DNP
Total Number of TCH Congestions	52756.981	DNP	DNP	1952	1222.88	DNP
Percentage TCH Congestion	0.66%	2.03%	1.81%	0.22%	1.50%	0.57%
Live Measurement						
Traffic Statistics	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of SDCCH Attempts	DNP	DNP	DNP	770406	467862.37	DNP
Total Number of SDCCH Congestions	DNP	DNP	DNP	0.00	191.82	DNP
Percentage SDCCH Congestion	0.81%	0.51%	0.15%	0.00%	0.04%	0%
Total number of TCH Attempts	DNP	DNP	DNP	874282	23296414	DNP
Total Number of TCH Congestions	DNP	DNP	DNP	4284	11182.28	DNP
Percentage TCH Congestion	0.92%	2.03%	1.79%	0.49%	0.05%	0.50%

DNP – the figure was obtained directly from the system.

Month of Audit

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	DNP	DNP	DNP	26154320	6531162066	DNP
Total number of calls dropped	DNP	DNP	DNP	204003	30223889	DNP
Call drop rate	1.11%	1.08%	1.41%	0.78%	0.46%	1.52%

Live Measurement

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	DNP	DNP	21923809	2622846	607428149	DNP
Total number of calls dropped	DNP	DNP	281427	30949	1813947	DNP
Call drop rate	1.12%	0.53%	1.28%	1.18%	0.30%	0.67%

Drive Test

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	236	259	201	276	105	426
Total number of calls dropped	1	13	0	0	0	4
Call drop rate	0.42%	5.02%	0.00%	0.00%	0.00%	0.94%

DNP – the figure was obtained directly from the system.

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

Voice quality	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of sample calls	389542	63790	427239	58408	938979	26927
Total number of calls with good voice quality	353393	56129	422283	56410	888215	26658
%age calls with good voice quality	91%	88%	99%	97%	86%	99%

Audit Month Results

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by	DNP	294802	574881	DNP	9823264.00	882632
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	DNP	294802	574881	DNP	9823264.00	843242
Percentage calls answered in 20 seconds	100.00%	100.00%	100%	100.00%	100%	95.54%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	DNP	294802.00	574881	DNP	9823264.00	848298
Percentage calls answered in 40 seconds	100%	100.00%	100%	100%	100%	96.11%

DNP – the figure was obtained directly from the system.

Live Calling

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by the operator	100	100.00	100.00	100.00	100.00	100.00
Total Number of calls answered in 20 seconds	100.00	100.00	100.00	100.00	78.00	100.00
Percentage calls answered in 20 seconds	100.00%	100.00%	100%	100.00%	78%	100%
Total Number of calls answered in 40 seconds	100	100.00	100.00	100.00	100.00	100.00
Percentage calls answered in 40 seconds	100%	100.00%	100%	100%	100%	10000%
Customer Care Assessment – Voice to Voice	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by the operator	DNP	108777	2237240.00	DNP	2176985.00	809372
Total Number of calls answered in 60 seconds	DNP	88152	2194502.00	DNP	2142931.00	772578
Percentage calls answered in 60 seconds	97.00%	81.04%	98.09%	56.00%	98.44%	95.45%
Total Number of calls answered in 90 seconds	DNP	92982	2207826.00	DNP	2143646.00	791768.00
Percentage calls answered in 90 seconds	98.00%	85.48%	98.69%	56.00%	98.47%	97.82%

Live Calling – Voice to Voice

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls made	100	100.00	100.00	100.00	100.00	100.00
Number calls answered within 60 seconds	94	84.00	92.00	91.00	82.00	88.00
Percentage calls answered in 60 seconds	94%	84.00%	92%	91%	82%	88%
Number calls answered within 90 seconds	100	100.00	100.00	100.00	100.00	100.00
Percentage calls answered in 90 seconds	100%	100.00%	100%	100%	100%	100%

Audit Results for Billing performance

Billing Performance	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Billing disputes						
Total bills generated during the period	265893	DNP	3161	102365	206641.00	131020.00
Total number of bills disputed	0	DNP	10	67	122.00	99.00
Percentage bills disputed	0.00%	DNP	0.32%	0.07%	0.06	0.08
Resolution of billing complaints						
Total complaints resolved in 4 weeks from date of receipt	0	DNP	10	67	122.00	99.00
Percentage complaints resolved within 4 weeks of date of receipt	NA	DNP	100%	100%	100%	100%
Refund						
Total number of cases requiring refund of deposits	108	DNP	148.00	67	DNP	99.00
Total number of cases where refund was made within 60 days	108	DNP	148.00	67	DNP	99.00
Percentage cases in which refund was receive within 60 days	100%	DNP	100%	100%	100%	100%

Live calling results for resolution of billing complaints

Resolution of billing complaints	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls made	17	29	100	100	67.00	94.00
Number of cases resolved in 4 weeks	11	15	58	100	23.00	15.00
Percentage cases resolved in four weeks	65%	52%	58%	100%	34%	16%

8.3 Parameter wise performance reports for Broadband services

One month data verification results for Service provisioning

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
No of connections registered during the period		2258	2984	44	1306	1119	189	131
Total number registered during 15 days		2178	2058	44	1156	1086	126	131
Percentage of connections provided within 15 days	100%	96.5%	69.0%	100.0%	89%	97.1%	66.7%	100.0%

Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	VSNL	RCOM	You telecom
Total Number of calls made		100	100	19	90	100	50	68
Number of cases in which connection was provided in 15 Days		99	77	18	70	88	25	66
Percentage cases in which connection was provided in 15 days	100%	99%	77%	95%	78%	88%	50%	97%
Number of cases in which connection was provided beyond 15 days		1	23	1	20	12	2	2
Percentage cases in which connection was provided after 15 days		1%	23%	5%	22%	12%	4%	3%

One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total number of faults registered during the period		1981	10179	39	2218	31604	253	378
Total number of faults repaired by next working day		147	8652	36	2138	27494	249	375
Percentage of faults repaired by next working day	>90%	7%	85%	92%	96%	87%	98%	99%
Total number of faults repaired within three working days		1963	9352	39	2216	2907568	252	378
Percentage of faults repaired within three working days	>99%	99%	92%	100%	100%	92%	100%	100%

Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		30	30	22	30	30	30	30
Number of cases in which faults were repaired by next working day		19	16	20	7	6	1	6
Percentage cases in which faults were repaired by next working day	>90%	63%	53%	91%	23%	20%	3%	20%
Number of cases in which faults were repaired within three working days		27	24	22	21	14	7	23
Percentage cases in which faults were repaired within three working days	>99%	90%	80%	100%	70%	47%	23%	77%

One month data verification results for billing performance

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Billing diputes								
Total bills generated during the period		88782	DNA	Prepaid	Prepaid	20424	1076	7144
Total number of bills disputed		96	22	Prepaid	Prepaid	225	1	11
Percentage bills disputed	<2%	0.11%	DNA	Prepaid	Prepaid	1.10%	0.09%	0.15%
Resolution of billing complaints								
Total complaints resolved in 4 weeks from date of receipt		96	22	Prepaid	Prepaid	225	1	11
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	Prepaid	Prepaid	100%	100%	100%
Refund of deposits after closure								
Total number of cases requiring refund of deposits		30	0	0	0	430	NA	16
Total number of cases where refund was made within 60 days		30	0	0	0	430	NA	16
Percentage cases in which refund was receive within 60 days	100%	100%	NA	100%	NA	100%	NA	100%

Live calling results for billing complaints

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		12	27	Prepaid	Prepaid	11	NA	19
Number of cases resolved in 4 weeks		6	25	Prepaid	Prepaid	3	NA	13
Percentage cases resolved in four weeks	100%	50%	93%	Prepaid	Prepaid	27%	NA	68%

One month data verification results for customer care

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls received by the operator		69787	DNA	64	5081	498869	295401	6600
Total Number of calls answered in 60 seconds		65271	DNA	64	5081	DNP	247896	6520
Percentage calls answered in 60 seconds	>60%	94%	DNA	100%	100%	78%	84%	99%
Calls answered within 90 seconds								
Total Number of calls answered in 90 seconds		67333	DNA	64	5081	DNP	265303	6567
Percentage calls answered in 90 seconds	>80%	96%	DNA	100%	100%	85%	90%	100%

Live calling results for call centre

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Number of calls made		100	100	100	100	50	100	100
Calls answered within 60 seconds								
Number calls answered within 60 seconds		100	85	92	82	50	87	69
Percentage calls answered in 60 seconds	>60%	100%	85%	92%	82%	100%	87%	69%
Calls answered within 90 seconds								
Number calls answered within 90 seconds		100	100	100	100	50	100	78
Percentage calls answered in 90 seconds	>80%	100%	100%	100%	100%	100%	100%	78%

One month data verification results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Operational Hours		29228040	53568	744	744	1677720	27413280	12663996
Total Downtime		37432.52	2	0	14.26	23815	335	132128
Total time when the service was available		29190607	53566	744	729.74	1653905	0	12531868
Service Availability Uptime in Percentage	>98%	99.9%	100.0%	100.0%	98.1%	98.6%	99.6%	99.0%

Three day live measurement results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Total Operational Hours		2828520	5184	72	72	342384	DNA	380088
Total Downtime		5414.52	0	0	0.04	3519	DNA	0
Total time when the service was available		2823105	5184	72	71.96	338865	DNA	380088
Service Availability Uptime in Percentage	>98%	99.81%	100.00%	100.00%	99.9%	98.97%	DNA	100.00%

One month data verification results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Intra-network links (POP to ISP Node)								
Total number of intra network links		63	BRAS-23,T1-24,T2-610, DSLAM-5456	400	2	16	NA	NA
No of Intra network found to be above 90%		0	Uplink Traffic in Chennai BRAS is > 90%	4	0	1	NA	NA
Upstream Links (ISP Node to IGSP/NIXI/NAP)								
Total number of upstream links		NA	97	28	NA	28	NA	2
No of Intra network found to be above 90%		NA	1	0	NA	0	NA	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		NA	17233	2830	NA	29462	NA	19
Total International Bandwidth utilised during peak hours		NA	12877	2097	NA	18720	NA	15
Percentage Bandwidth utilisation during peak hours (In mpbs)	<80%	NA	75%	74%	NA	64%	NA	79%

Live measurement results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM	You telecom
Intra-network links								
Total number of intra network links		63	BRAS-23,T1-24,T2-610, DSLAMS-5456	400	2	16	NA	NA
No of Intra network Links tested		63	20	37	2	10	NA	NA
No of Intra network found to be above 90%		0	0	0	0	0	NA	NA
International Bandwidth (ISP Node to IGSP/NIXI/NAP)								
Total number of upstream links tested by IMRB Auditors		NA	97	28	NA	10	NA	1
No of Intra network found to be above 90%		NA	10 t0 20	0	NA	0	NA	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		NA	18157	2830	NA	29462	NA	19
Total International Bandwidth utilised during peak hours		NA	12909	2082	NA	18720	NA	12
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	NA	71%	74%	NA	64%	NA	63%

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

9.1 For Basic wireline services

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

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

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

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

6. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100
Benchmark	(i) % age of calls answered (electronically): within 20 seconds = 80% of the calls over a period within 40 seconds = 95% of the calls over a period (ii) % age of calls answered by operator / voice to voice): within 60 seconds = 80% of the calls over a period within 90 seconds = 95% of the calls over a period
Audit Procedure	-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator. <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] X 100
Benchmark	Call Completion Rate (CCR) within local network: More than 55%
Audit Procedure	IMRB Auditors verified and collected data pertaining to Sample Traffic Data during Time Consistent Busy Hour (TCBH). These details were collected separately for -Three days in which live measurement was carried out - For the complete month in which audit was carried out

9.2 For Cellular Mobile services

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

2. Call Set-Up Success Rate (CSSR)	

Computational Methodology as per QoS definition	The ratio of calls established to total calls is known CSSR.
	Call Established means the following events have happened in call setup:-
	    ↳ call attempt is made
	    ↳ the TCH is allocated
	    ↳ the call is routed to the outward path of the concerned MSC
	Computational Methodology: Calls Established / Total Call Attempts * 100

Benchmark	> 95%

Audit Procedure	**IMRB** auditors collected and verified data pertaining to
	    ↳ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors
	    ↳ CSSR calculation was measured using OMC generated data only
	    ↳ Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week

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3. Service Access Delay	

Computational Methodology as per QoS definition	Service Access delay is a summation of following parts in the call flow:
	    ↳ Time to connect calls
	    ↳ Time to confirm instruction to connect
	    ↳ Time to release calls
	    ↳ Time to alert mobile set
	
	Computational Methodology:
	Time to connect calls = Time between "Origination" and "Service Connect" message from BTS to Mobile
	Time to confirm instruction to connect* = Time between "Origination" and "Base Station Acknowledgment"
	Note: Time measured here is a sub-part of first measurement
	Time to release call = Time between "Release on Reverse Link" and "Release on Forward Link"
	Time to alert a mobile = This is measured as a mean of two measurements (i+ii/2):
	    ● First paging attempt = Time between receiving a call request at PLMN and alerting the mobile
	    ● Final paging attempt = Time between receiving a call request at PLMN and hearing start of "Not reachable" announcement

Benchmark	Between 9 to 20 seconds depending on number of paging attempts (Average of 100 calls < = 15 sec.)

Audit Procedure	**IMRB Auditors collected and verified records pertaining to**:
	    ↳ Audit of the details of Layer 3 Message diagnostics generated from periodic Drive tests conducted at different parts of the network used to arrive at the benchmarks reported to TRAI was conducted
	    ↳ Validating that at least **100 sample** calls should have been by the service provider **made** during **Time consistent busy hour** (TCBH) for the quarter using standard drive test equipment. (Note: measurement using engineering handsets was not deemed acceptable)
	    ↳ The component 'first paging attempt' was checked whether it was measured by the operator using a protocol analyser.

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

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

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6. Percentage Connections with Good Voice Quality	

Computational Methodology as per QoS definition	Definition:
	  ↪ for GSM service providers the calls having a value of 0 – 4 are considered to be of good quality (on a seven point scale)
	  ↪ For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when it FER value lies between 0 – 4 %
	Computational Methodology:
	  ↪ **% Connections with good voice quality** = (No. of voice samples with good voice quality / Total number of samples) x 100

Benchmark	> 95%

Audit Procedure	**IMRB Auditors collected and verified records pertaining to**:
	Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI.
	Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited
	  ↪ Operator to conduct <u>at least one</u> drive test using standard drive test equipment every week during TCBH
	  ↪ Each drive test should evenly cover the following 5 types of locations:
	  ↪ **3 Outdoor** (Periphery of the city, Congested Area, Across the City), and **2 Indoor** (Office Complex and Shopping Complex)
	  ↪ 2 minute long calls to be initiated and held throughout the drive test
	  ↪ The speed of the vehicle should be kept at around 50km/hr. (around 30 km/hr in case of geographically small cities) – This was ensured during the drive tests conducted by IMRB Auditors
	  ↪ RxQual / FER samples generated during the drive test collected by the operator were verified
	  ↪ *Measurements using Engineering handsets were not acceptable*
	  ↪ All the operators were not maintaining this data at the switch level

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7. Service Coverage	
Computational Methodology as per QoS definition	**Definition:** ↳ The level of signal available in a particular part of a city is known as signal strength. **Computational Methodology:** ↳ Service Coverage for route type x = [(N1 x CSS1) + (N2 x CSS2) + …..+ (Nn x CSSn)] / (N1 + N2 +………..+Nn) ↳ Where:-N1 = Number of calls on type of route x made in drive test 1 ↳ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm) ↳ N2 = Number of calls on type of route x made in drive test 2 ↳ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm) ↳ Nn = Number of calls on type of route x made in drive test n ↳ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)
Benchmark	**Indoor >= -75 dBm** **In-vehicle >= -85 dBm** **Outdoor – in city >= -95 dBm**

Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to:**
	↳ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI.
	↳ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-
	    ↳ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH).
	    ↳ Each drive test should evenly cover the following 5 types of locations: –
	        ↳ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and
	        ↳ 2 Indoor (Office Complex and Shopping Complex)
	↳ *Measurements using Engineering handsets were not acceptable*

8. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	**To connect to IVR:** The time taken to connect a person (as soon as he presses call) to the IVR of the service provider **To connect to operator:** The time taken to connect a person (as soon as he presses 9) to the customer care executive **Computational Methodology:** Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100

Benchmark	(i) %age of calls answered (electronically):
	    ↳ within 20 seconds = 80%
	    ↳ within 40 seconds = 95%
	(ii) %age of calls answered by operator (voice to voice):
	    ↳ within 60 seconds = 80%
	    ↳ within 90 seconds = 95%

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

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

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

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

9.3 For Broadband services

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

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

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

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

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

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

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

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

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

Packet loss	
Computational Methodology as per QoS definition	Packet loss is the percentage of packets lost to total packets transmitted between two designated Customer Premises Equipments/Router ports. It is the measurement of packet lost from the broadband customer (User) configuration/User reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NAP port abroad The packet loss is measured by computing the percent packet loss of **1000 pings of 64 byte packet each**. Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI Minimum sample reference points for each service area shall be three in number or multiple reference points if required **Hence Packet loss is computed by the formula - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100**
Benchmark	<1 %

Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to**
	  - Records maintained for ping tests conducted during the period of July to September 2007
	  - Smoked ping test (wherever available) results for the period of July to September 2007
	  - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)
	  - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Network Latency	
Computational Methodology as per QoS definition	Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/Customer Premises Equipment (CPE). The round trip delay for the ping packets from ISP premises to the IGSP premises to the IGSP/NIXI gateway and to the nearest NAP port abroad are measured by computing delay for **1000 pings of 64 bytes each** (Pings are to be sent subsequent to acknowledgement received for the same for previous ping) Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI Minimum sample reference points for each service area shall be three in number or multiple reference points if required **Hence the formula for network latency would be Network latency for X days= Total round trip time for all the ping packets transmitted in X days /No of days during the period**
Benchmark	< 120 msec from user reference point at POP/ISP Node to International Gateway < 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial) < 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Sattelite)

Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to**
	  - Records maintained for ping tests conducted during the period of July to September 2007
	  - Smoked ping test (wherever available) results for the period of July to September 2007
	  - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)
	  - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

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