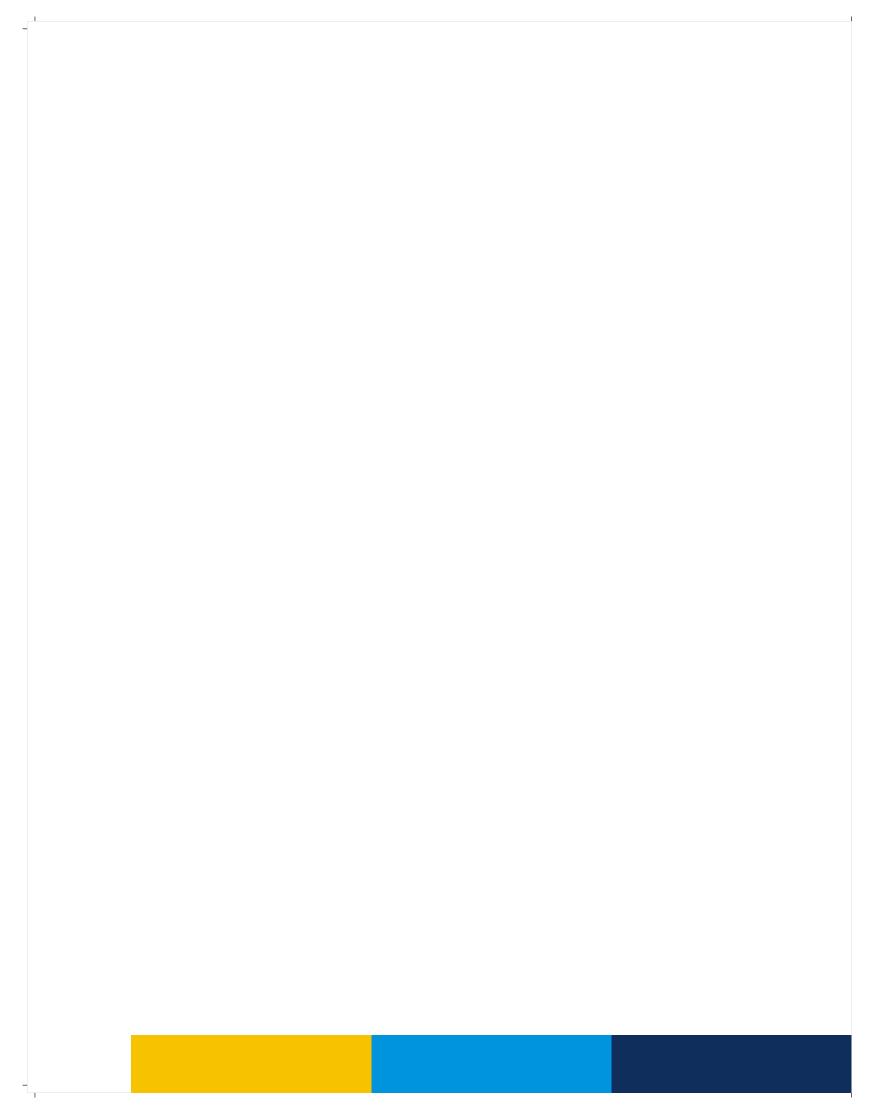
Audit in Telecom Industry
- Revenue, Fixed Assets
and Related Operating Costs



Audit in Telecom Industry
- Revenue, Fixed Assets
and Related Operating Costs



Auditing and Assurance Standards Board

The Institute of Chartered Accountants of India

(Set up under an Act of Parliament)

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Foreword

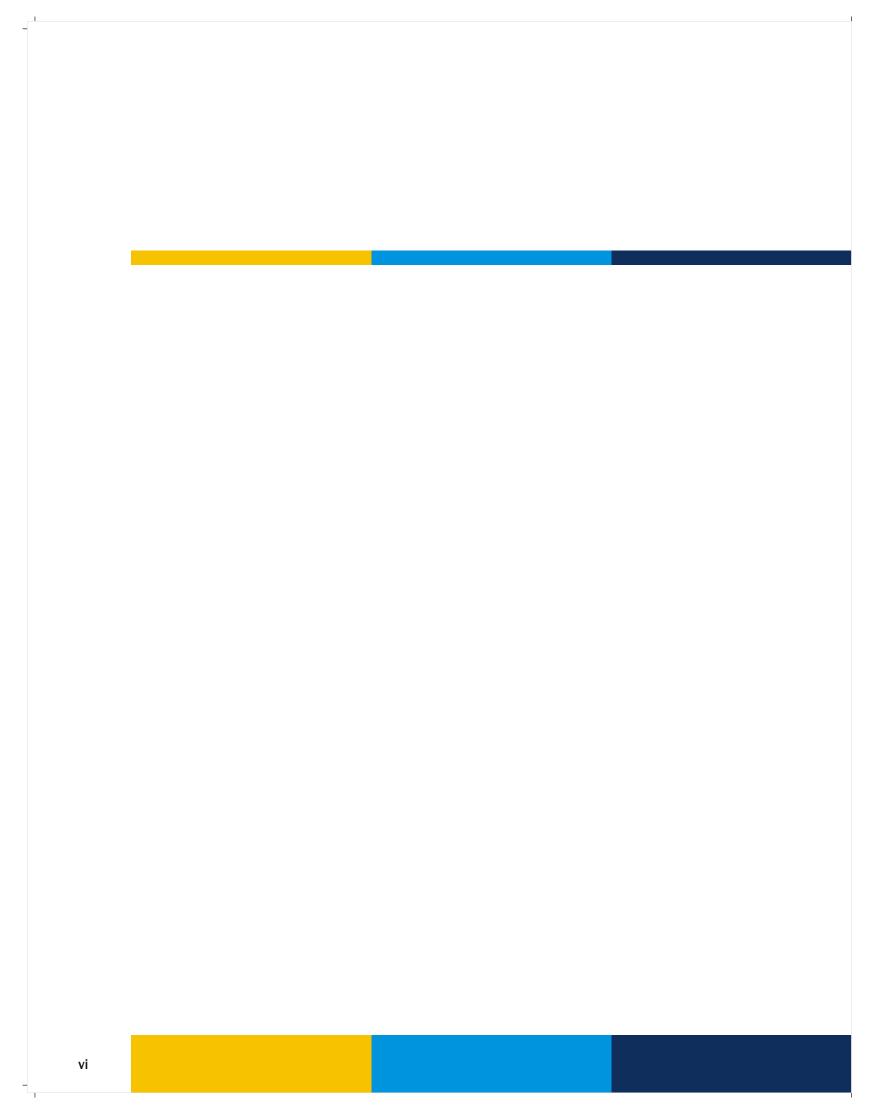
Telecommunication today forms a quintessential component of the basic infrastructure of modern economies. Telecommunication plays an important role in developing the modern economic order by eliminating distance and the associated time constraint. The Indian telecom industry has a growth rate of 45%, which is the highest in the world. India with a strong population of over 1.1 billion, has become one of the most dynamic and promising telecom markets of the world.

Telecom Sector being highly technology driven, involves technical complexities peculiar to the telecom industry mainly in the area of revenue recognition, amortisation of assets etc., for which adequate guidance is required to be given. I am happy to note that the Auditing and Assurance Standards Board of the Institute has brought out this Technical Guide on Audit in Telecom Industry. Such industry specific guidance will go a long way in helping the members understand the basic concepts and peculiarities of the industry concerned for performing the attest function effectively.

I wish to place my appreciation to CA. Harinderjit Singh, Chairman, Auditing and Assurance Standards Board, members of the Auditing and Assurance Standards Board for bringing out this Technical Guide. I am sure that this Technical Guide would be useful to the members and other interested readers.

New Delhi January 23, 2009 **VED KUMAR JAIN**

President, ICAI



Preface

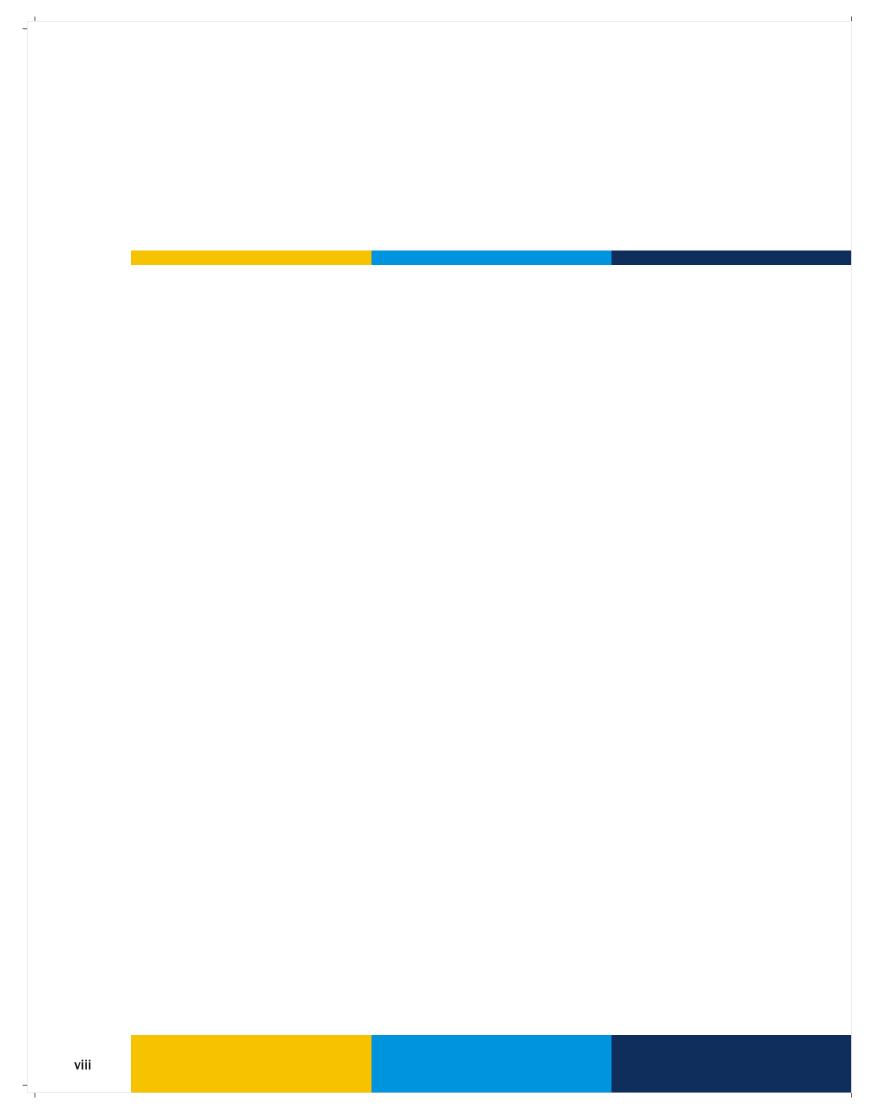
The Indian telecommunications industry is one of the fastest growing in the world and India is projected to become the second largest telecom market globally by 2010.

In view of the complexity associated with telecom industry, it is imperative for a professional accountant to understand the basic features of the industry to deal appropriately with critical financial reporting issues relating to revenue recognition and capitalisation of different kinds of fixed assets. Keeping this in mind, the Auditing and Assurance Standards Board has brought out this Technical Guide on Audit in Telecom Industry. This Technical Guide contains extensive guidance on all significant aspects such as the regulatory framework in which the telecom companies operate, audit approach and procedures for risk assessment, revenues and receivables, fixed assets etc. The Guide contains an extensive glossary of terms for enhanced understanding of the readers. The Appendix to the Technical Guide contains guidelines for obtaining licenses for various telecom services, Adjusted Gross Revenue Computation Sheet and Format of Auditor's Report.

I am extremely grateful to CA. Usha Rajeev, CA. Nishant Singhal and CA. Rajnish Baweja for taking out time out of their professional and personal commitments and preparing the basic draft of this Technical Guide.

I am certain that the readers, especially members of the Institute, connected to the telecom sector would find this Technical Guide immensely useful.

New Delhi January 27, 2009 CA. HARINDERJIT SINGH
Chairman
Auditing and Assurance Standards Board



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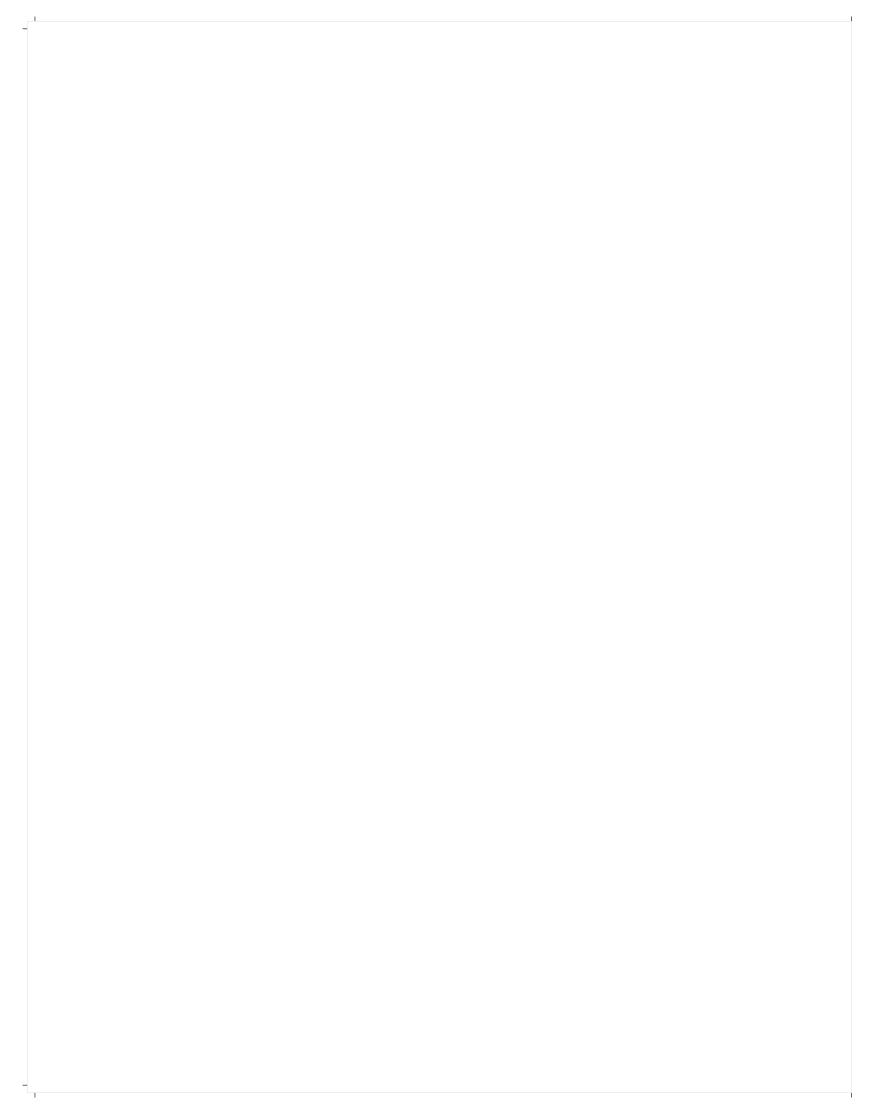
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FRAMEWORK OF TELECOM INDUSTRY





TELECOM INDUSTRY IN INDIA TELECOM INDUSTRY IN INDIA

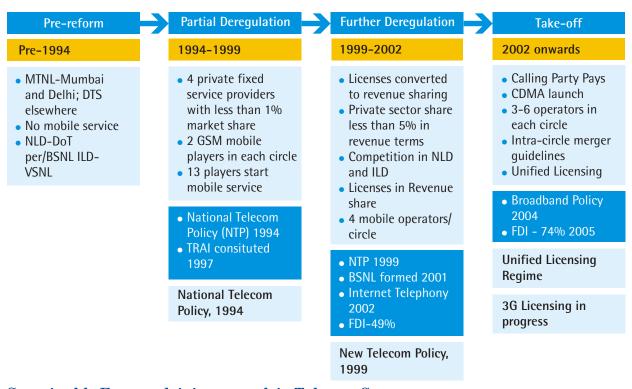
TELECOM INDUSTRY IN INDIA

Evolution of Telecom Industry

- The telecommunications industry has seen a rapid growth since the last decade due to a 1.1 series of events lead by the regulations surrounding the industry. The enactment of the Indian Telegraphy Act, 1885, and the Indian Wireless Telegraphy Act, 1933 which provided the legal framework for regulation of the telecommunications industry (both of which were administered by the Department of Telecom (DoT), Ministry of Communications were the first major events in the Indian scenario. The Department of Telecommunications (DoT) and the Department of Posts (DoP) earlier combined under the Postal & Telegraph (P&T) Board were separated in 1985 by setting up separate boards. Subsequently in 1986, Mahanagar Telephone Nigam Ltd. (MTNL) was set up for telephone services in Delhi and Mumbai representing about 22 percent of the telephones in the country at that time, and the Overseas Communications Services (OCS) was converted into a corporation as Videsh Sanchar Nigam Limited (VSNL). The Telecom Commission was established as an executive body under the Ministry of Communications and Information Technology to make policy decisions and to accelerate the development of all aspects of the sector, except those of allocation of radio frequency spectrum among defence, aviation, radio and television, police, government owned companies and private operators, which was the responsibility of the Wireless Planning Commission under the Ministry of Communications and Information Technology.
- 1.2 July, 1991 saw the Government adopt a new Economic Policy with a view to:
 - improve India's competitiveness in the global market,
 - a undertake a growth led export drive,
 - attract foreign investment,
 - strengthen Indian industry to compete globally,
 - shift away form the policy of import substitution, and
 - automatically approve 51% equity to foreign companies in telecom equipment manufacturing.

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1.3 Thereafter a New Telecom Policy was announced in May 1994 which brought a series of reforms to the telecommunications industry which had a thrust on independent regulation, competition and investment facilitation. The Indian telecom story, if put on a time scale, will look like as detailed below:

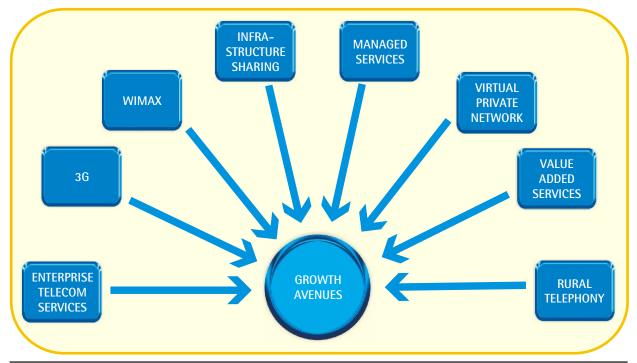


Sustainable Factors driving growth in Telecom Sector

- 1.4 The Indian telecommunications industry is growing at the fastest pace in the world and India is expected to become the second largest telecom market globally by 2010. Forthcoming services such as 3G and WiMax will further augment the growth rate. The world's leading telecom handsets manufacturers such as Nokia, Samsung, Motorola and LG have their presence in India, along with leading global service companies and infrastructure majors, such as Vodafone, AT&T, Ericsson, Alcatel, Singapore Telecom and Siemens.
- 1.5 On June 18, 2008, India reached the target of having 300 million telephone subscribers, becoming the second largest telecommunications network in the world



after China. India is adding around 8.5 million to 10 million new mobile subscribers to the network each month, emerging as one of the fastest growing telecom markets in the world. According to the report titled 'Mobile BRIC*: Extreme Growth Ahead'. India is expected to be the second largest mobile market in the BRIC nations, with 560 million mobile users, by 2012 (after China with 800 million users). The market saw a growth rate of 33 per cent over previous year and recorded a compounded annual growth rate (CAGR) of 22 per cent for the period beginning from 2002-03 to 2006-07. This growth has resulted in the revenues of the segment growing two-fold, in the past three years. It is projected that the industry will generate revenues worth US\$ 43 billion in 2009-10. India's overall tele-density stood at 26.89 per cent in June 2008, and the government has plans to raise the tele-density to 40-45 per cent by 2010, thereby offering greater growth opportunities for service providers to exploit the large untapped potential. The Indian telecom sector offers unprecedented opportunities for foreign companies in various areas, such as 3G, virtual private network, international long distance calls, value added services, etc.



^{*} BRIC - Brazil, Russia, India and China

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- 1.6 Following factors have led to rapid growth of telecom sector in the Indian industry:
 - a. Favourable macro-economic fundamentals and demographics:
 - Strong economic growth and rising incomes
 - By 2020, working age population to rise to 65%
 - Low tele-density relative to Asian peers
 - b. Progressive Policy and Regulation:
 - Tindependent Regulation
 - Consistency policy framework
 - Favourable investment climate
 - c. Rising affordability:
 - ☎ Declining ARPU's
 - Lowering cost of handsets
 - Growing popularity of pre-paid format

Key Operators in the Indian Market

- 1.7 Key operators which provides various telecom services in the Indian market are:
 - Bharat Sanchar Nigam Limited (BSNL) Incumbent service provider and world's 7th largest telecommunications company providing comprehensive range of services in India. Its services include Wireline, CDMA mobile, GSM Mobile, Internet, Broadband, Carrier services, MPLS-VPN, VSAT, VoIP services, IN services, etc.
 - Bharti Airtel Limited Integrated operator with presence in all the segments. It leads the Mobile segment in the country.
 - ▼ Vodafone Second largest private telecom player in the GSM segment after Bharti
 Airtel.
 - Tidea Cellular Large private sector telecom player in the GSM segment.
 - Mahanagar Telephone Nigam Limited (MTNL) State owned operator covering the cities of Mumbai and Delhi. Provides both Mobile and Fixed line services.
 - Reliance Communications Limited Largest operator in India in the CDMA segment.
 - TATA Teleservices Limited Integrated operator (with VSNL) with presence in all segments. Provides CDMA in 20 Circles



1.8 The company wise % market share in India as on October 31, 2008 was as detailed below:

Group Company	Total Subscribers	Market Share
Airtel (GSM)	80,199,747	25.04%
Reliance (CDMA + GSM)	57,427,888	17.93%
Vodafone Essar (GSM)	56,703,506	17.70%
BSNL (GSM)	39,836,494	12.44%
IDEA (GSM)	31,582,937	9.86%
Tata (CDMA)	30,162,845	9.42%
Aircel (GSM)	14,659,298	4.58%
MTNL (GSM)	3,743,879	1.17%
Spice (GSM)	3,637,129	1.14%
BPL (GSM)	1,807,902	0.56%
HFCL (CDMA)	374,334	0.12%
Shyam (CDMA)	194,434	0.06%
Total (All India)	320,330,393	100.00%

CDMA figures include WLL services. Source: India-Cellular.com



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Institutional Framework

- 2.1 The telecommunications industry in India is subject to extensive government regulation. A number of Government authorities have regulatory responsibilities for various aspects of the industry. The principal regulatory authorities are Department of Telecommunication (DoT) of the Ministry of Communications and Information Technology and the Telecommunication Regulatory Authority of India (TRAI).
- 2.2 The responsibilities of DoT include as under:
 - formulating and enforcing industry policies, regulations and technical standards;
 - granting telecommunications service licenses;
 - supervising the operations and quality of service (quality of service comes under the TRAI charter) of telecommunications service providers;
 - allocating and administering telecommunications resources such as Spectrum and numbers; and
 - maintaining fair and orderly market competition among service providers.
- 2.3 The Telecommunications Regulatory Authority of India was established in 1997, TRAI acts as an independent autonomous body to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace which will enable India to play a leading role in emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.
- 2.4 The functions of the TRAI include the following:
 - recommend the need and timing for introduction of new service provider;
 - recommend the terms and conditions of licence to a service provider;
 - ensure technical compatibility and effective inter-connection between different service providers;



- regulate arrangement amongst service providers of sharing their revenue derived from providing telecommunication services;
- fix the terms and conditions of inter-connectivity between the service providers
- ensure compliance of terms and conditions of licence;
- recommend revocation of licence for non-compliance of terms and conditions of licence;
- 2 lay down and ensure the time period for providing local and long distance circuits of telecommunication between different service providers;
- facilitate competition and promote efficiency in the operation of telecommunication services so as to facilitate growth in such services;
- protect the interest of the consumers of telecommunication service;
- monitoring the quality of service and conducting periodical survey of services provided by the service providers;
- inspect the equipment used in the network and recommend the type of equipment to be used by the service providers;
- maintain register of interconnect agreements and of all such other matters as may be provided in the regulations;
- keep register maintained under clause (l) open for inspection to any member of public on payment of such fee and compliance of such other requirements as may be provided in the regulations;
- settle disputes between service providers;
- render advice to the Central Government in matters relating to development of telecommunication technology and any other matter significant to the telecommunication industry in general;
- levy fees and other charges at such rates and in respect of such services as may be determined by regulations;
- ensure effective compliance of universal service obligations;
- recommend technological improvements in the services provided by the service providers;
- efficient management of available spectrum.
- 2.5 Under the TRAI Amendment Ordinance, 2000, "The Telecom Disputes Settlement and Appellate Tribunal" (TDSAT) was formed to regulate the telecommunication

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services, adjudicate disputes, dispose off appeals, protect the interests of service providers and consumers to promote and ensure orderly growth of the telecom sector along with TRAI.

- 2.6 TDSAT has been empowered with the following powers:
 - a. to adjudicate any dispute
 - i. between a licensor and a licensee
 - ii. between two or more service providers
 - iii. between a service provider and a group of consumers
 - b. hear and dispose off appeals against any direction, decision or order of TRAI under this Act.

Decisions of TDSAT are appealable to the Supreme Court of India.

- 2.7 The Central Government or a State Government or a local authority or any person may take an application to the TDSAT for adjudication of any dispute referred above.
- 2.8 The Central Government or a State Government or a Local Authority or any person aggrieved by any direction, decision or order made by TRAI may prefer an appeal to the TDSAT.
- 2.9 Refer to Appendix I for detailed Guidelines issued for International Long Distance Service Licenses, National Long Distance Service Licenses, Cellular Mobile Telephone Service Licenses, Internet Service Licenses and Unified Access Service Licenses.

Licensing Requirements

- 2.10 Telecom industry is regulated by the Ministry of Communications and Information Technology, Government of India through the Telecom Regulatory Authority of India (TRAI). TRAI regulates the telecom business through licensing requirements. A telecom company can provide only those services and in such telecom circles, for which license has been granted to it. Any telecom operator intending to enter into telecom business has to fulfill the following licensing requirements:
 - Foreign equity in the paid up capital of the licensee company should not, at any time during the entire licence period, exceed such percentage of total equity as has



been mentioned in the licence agreement or as decided by the Government of India from time to time.

- Licensee shall have a minimum paid up equity capital of such amount as has been mentioned in the licence agreement or as decided by the Government of India from time to time.
- The Licensee Company and its promoters shall have to maintain a combined net worth as prescribed in the licence agreement or as decided by the Government of India from time to time.
- Licence shall be valid only for the period, services and for telecom circles mentioned in the agreement.

Fees

2.11 As per the financial terms and conditions of the Licence agreement, a telecom operator has to pay the following fees:

Entry Fees: This is a one time fee which an operator is required to pay before signing the agreement as specified by Department of Telecommunications. The amount of fee may be as prescribed from time to time.

License Fees (Revenue Share): In addition to the Entry fee, a licensee is also required to pay licence fee on quarterly basis in the form of revenue share at the prescribed rate on the Adjusted Gross Revenue (AGR), viz.:

- For first three quarters of the financial year within 15 days of completion of the relevant quarter on actual revenue on accrual basis.
- For last quarter by 25th of March of each financial year, on estimated basis but not less than the payment made in the 3rd quarter.
- 2.12 Each quarterly instalment of the Licence Fee is payable based on the AGR, duly certified, along with an affidavit by a representative of the Licensee, authorised by a resolution passed by the Board of Directors of the Licensee Company.
- 2.13 The Licence Fee varies based on the type of service and classification of telecom circles as may be prescribed from time to time. AGR includes installation charges, late fees,

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sale proceeds of handsets, revenue on account of interest and dividend, value added services, supplementary services, access or interconnection charges, roaming charges, revenue form permissible sharing of infrastructure and any other miscellaneous revenue, without any set off for related item of expense, etc. For arriving at the AGR, following expenses only are allowed as deduction:

- Charges actually paid to other operators including PSTN (Public Switched Telecom Network) related call charges, Access Charges actually paid to other eligible / entitled telecommunication service providers (not applicable from April 1, 2008), and roaming revenue actually passed on to the other eligible/entitled telecommunication service providers, and
- Service Tax on provision of service and sales tax actually paid to the Government if component of sales tax and service tax has been included in the Gross Revenue.
- As per the recent TDSAT judgement, the pass through charges can be allowed on accrual basis. However the matter is now pending with the Supreme Court of India.
- 2.14 The telecom companies are also required to submit the following documents to Controller of Communication Accounts (CCA):
 - a. On quarterly basis:
 - Audited statement of Revenue and License Fees
 - Auditor's Report
 - Affidavit duly signed by authorised signatory as per the Board's resolution
 - Operator-wise details of actual Interconnection Usage Charge (IUC) payment
 - b. On annual basis:
 - Audited annual accounts
 - Reconciliation of Gross Revenue (GR), AGR and audited accounts, within seven working days of signing the audited annual accounts.

Radio Spectrum Requirement

2.15 The spectrum is allotted for various purposes: analog TV broadcasts get a certain slot (from 54 to 88 MHz, 174 to 216 MHz and 470 to 806 MHz), FM radio gets a certain slot (88 to 108 MHz), AM radio gets a certain slot (535 to 1700 kHz). Telecommunication



systems also require a certain amount of electromagnetic bandwidth to operate; accordingly cellular communications (mobile phones) get certain slots.

As the world becomes increasingly wireless (with cordless phones, cell phones, wireless internet, GPS devices, etc), allocation of the available spectrum to each technology becomes increasingly contentious. Each user community (usually Mobile Service Providers) wants more bandwidth in order to be able to sell and service more units. For any given slot of bandwidth, there is a limited amount of data that can be shared in that bandwidth, so vendors want more bandwidth so that they can handle more devices in a given area.

Radio Spectrum Charges

- 2.16 In addition to Entry Fee and Licence Fee, the Licensee is also required to pay fees and royalty for the use of radio frequencies on the basis of specified percentage of AGR as per the details prescribed by the Wireless Planning and Co-ordination Wing (WPC) of DoT. The spectrum charges for Global System for Mobile Communications (GSM) is collected as a percentage of AGR while foar Code Division Multiple Access (CDMA) spectrum, a percentage of AGR as well as fixed charges for point to point links (microwave access) and backbone links of all Unified Access Service Licence (UASL) licensees using CDMA spectrum.
- 2.17 The Spectrum Charges are required to be paid in advance on quarterly basis within 15 days of the beginning of relevant quarter on the basis of estimated AGR. Spectrum charges are levied on the AGR of the full circle despite allocation of additional spectrum that may have been made for a city/part of licensed area. The Government of India is considering of levying fixed charges for allocation of spectrum.

Calculation of Interest/Penalty on Delayed Payment

2.18 Penal interest to be levied for delayed payments is on the same terms and conditions as in the main DoT license agreement. However, for the time being, the work of computation of interest/penalty/short payment, etc., will continue to be done by the DoT and any demands on this account will be raised only by the DoT.

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Financial Bank Guarantee and Performance Bank Guarantee

2.19 Further, licensee has to submit Performance Bank Guarantee (PBG) and Financial Bank Guarantee of prescribed amount as has been mentioned in the licence agreement. Auditors need to examine the licence agreement to ensure that there is no default, w.r.t., financial and other conditions specified in the agreement as any default may lead to suspension / cancellation of license and the very existence of the company may be in jeopardy.

Subscriber Verification

2.20 TRAI has issued detailed guidelines, w.r.t., verification of subscribers at the time of acquisition, such as, obtaining and verification of Proof of Identification / Proof of Residence from the subscribers. The compliance with these guidelines is mandatory for every operator. As such, the auditors should review that the company has proper controls for verification of identity and address of the subscriber, at the time of acquisition of customer, so that, compliance with the TRAI guidelines is ensured.

Routing of Call

2.21 Telecom Company has to route the call through the trunk allotted by the other telecom company for transmission of calls to other telecom company's network. There are dedicated trunks for carrying Local, NLD, ILD calls. A telecom company can not route local calls either through NLD or ILD trunk and *vice versa*. Any violation of these conditions may attract penalty.

Metering and Billing Audit

- 2.22 In order to bring standardisation and transparency in the metering and billing procedures being followed by various operators, TRAI developed a regulation "Quality of Service (Code of Practice for Metering and Billing Accuracy) Regulation, 2006", which has benchmarks for metering and billing system. The salient features of the Code are as follows:
 - Before a customer is enrolled as a subscriber of any telecommunication service, he shall be provided in advance with detailed information relating to the tariff for using that service. Further, the service provider shall inform the customer in writing, within a week of activation of service, the complete details of his tariff plan.



- Where a value-added service (e.g., download of content, such as a film clip or ring tone) or entry to an interactive service (such as a game) can be selected through a choice of the service user (e.g., by dialling a specific number) then the charge for the service must be provided to the customer before he commits to use the service.
- The services provided to the customer and all subsequent changes therein shall be those agreed with him in writing prior to providing the service or changing its provisions.
- All the charges must be consistent with published tariff applicable to the user.
- Payments made by a post-paid customer shall be credited to his account immediately for cash payment and within reasonable time in case of cheque payment. For pre-paid customers, top-up credit shall be applied to a customer's account within 15 minutes of its application.
- Where the service provider unilaterally intends to restrict or cease service to the customer, a notice shall be provided to the customer in advance of such action so that the customer has reasonable time to take preventive action to avoid restriction or cessation of service.
- The service provider shall have a documented process for identifying, investigating and dealing with billing complaints and creating appropriate records thereof.
- Reliability performance of the total metering and billing system should be within the tolerances specified by TRAI.
- The telecom company shall submit the compliance of code of practices adopted to TRAI on yearly basis.
- The TRAI has notified a panel of agencies capable for auditing the metering and billing system to certify the adequacy of Metering and Billing System of Telecom Company.
- The telecom companies shall arrange audit of their Metering and Billing System in compliance with this regulation on an annual basis through any one of the auditors notified by TRAI and an audit certificate thereof shall be furnished to TRAI not later than 30th June of every year.

Quality of Service (QoS) Parameters

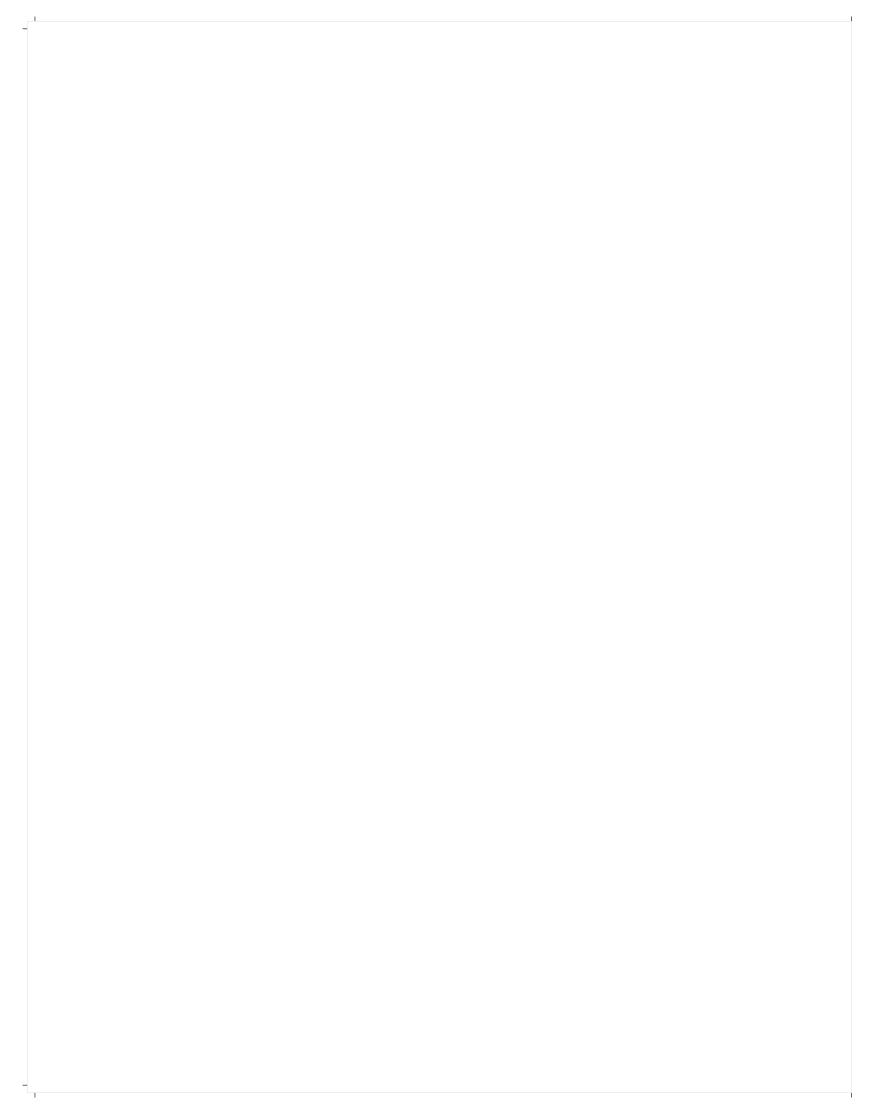
2.23 Telecom Regulatory Authority of India (TRAI) has prescribed quality of service parameters for various Basic Wireline and Wireless and Cellular Mobile Telephone

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Services (CMTS), e.g. provision of telephone, fault repair, grade of service, call completion rate, response time to customer for assistance network performance, billing complaints and customer perception of services, etc. The auditors need to acquaint themselves with these parameters, analyse the relevant data and report the adverse features observed to the management.



AUDIT APPROACH AND PROCEDURES





Understanding Telecom Business

- 3.1 Prior to accepting an engagement, the auditor needs to obtain a preliminary knowledge of the industry, nature of company's ownership, management and operations, and need to consider whether a level of knowledge of the business adequate to perform the audit can be obtained. Following acceptance of the engagement, more detailed information needs to be obtained.
- 3.2 The Standards on Auditing as issued by the Institute of Chartered Accountants of India holds its relevance for all telecom audits. It establishes standards on:
 - makes what is knowledge of the business,
 - its importance to auditor and its team,
 - its relevance to all phases of audit, and
 - manner of obtaining and using it.
- 3.3 Standard on Auditing (SA) 300, "Planning an Audit of Financial Statements" states that:
 - "6. The auditor shall establish an overall audit strategy that sets the scope, timing and direction of the audit, and that guides the development of the audit plan.
 - 7. In establishing the overall audit strategy, the auditor shall:
 - a. Identify the characteristics of the engagement that define its scope;
 - b. Ascertain the reporting objectives of the engagement to plan the timing of the audit and the nature of the communications required;
 - c. Consider the factors that, in the auditor's professional judgment, are significant in directing the engagement team's efforts;
 - d. Consider the results of preliminary engagement activities and, where applicable, whether knowledge gained on other engagements performed by the engagement partner for the entity is relevant; and

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- e. Ascertain the nature, timing and extent of resources necessary to perform the engagement.
- 8. The auditor shall develop an audit plan that shall include a description of:
- a. The nature, timing and extent of planned risk assessment procedures, as determined under SA 315 "Identifying and Assessing the Risks of Material Misstatement Through Understanding the Entity and Its Environment".
- b. The nature, timing and extent of planned further audit procedures at the assertion level, as determined under SA 330 "The Auditor's Responses to Assessed Risks".
- c. Other planned audit procedures that are required to be carried out so that the engagement complies with SAs."
- 3.4 Standard on Auditing (SA) 315, "Identifying and Assessing the Risks of Material Misstatement Through Understanding the Entity and Its Environments" states that:
 - "3. The objective of the auditor is to identify and assess the risks of material misstatement, whether due to fraud or error, at the financial statement and assertion levels, through understanding the entity and its environment, including the entity's internal control, thereby providing a basis for designing and implementing responses to the assessed risks of material misstatement. This will help the auditor to reduce the risk of material misstatement to an acceptably low level".

Understanding the entity is an iterative process, continuing throughout the entire duration of the audit.

- 3.5 Paragraph 11 of SA 315 provides as follows:
 - "11. The auditor shall obtain an understanding of the following:
 - a. Relevant industry, regulatory, and other external factors including the applicable financial reporting framework.
 - b. The nature of the entity, including:
 - i. its operations;
 - ii. its ownership and governance structures;
 - iii. the types of investments that the entity is making and plans to make; and



- iv. the way that the entity is structured and how it is financed; to enable the auditor to understand the classes of transactions, account balances, and disclosures to be expected in the financial statements.
- c. The entity's selection and application of accounting policies, including the reasons for changes thereto. The auditor shall evaluate whether the entity's accounting policies are appropriate for its business and consistent with the applicable financial reporting framework and accounting policies used in the relevant industry.
- d. The entity's objectives and strategies, and those related business risks that may result in risks of material misstatement.
- e. The measurement and review of the entity's financial performance.

Each year, the auditor's understanding of the entity should be updated and details of significant changes should also be documented.

- 3.6 Obtaining the required knowledge of the business is a continuous and cumulative process. To the extent practicable, the auditor needs to obtain the required knowledge at the start of the engagement. Major portion of the information is gathered at the planning stage. As the audit progresses, the information already obtained should be updated. It is ordinarily refined and added to in later stages of the audit as the auditor and the members of his audit team learn more about the business.
- 3.7 An auditor can obtain knowledge of the industry and the entity from a number of sources. e.g.:
 - previous experience with the industry and entity,
 - discussions with senior personnel, internal audit personnel, other auditors, legal and other advisors who have provided services to the entity or within the industry,
 - publications related to the industry,
 - legislation and regulations significantly affecting entity,
 - visit to the entity's premises,
 - documents provided by the entity (for e.g. minutes of meeting, promotional literature, prior years' financial and annual reports, internal management reports, etc.)

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- 3.8 Knowledge of the client's business is also important to identify areas of special audit emphasis, to evaluate reasonableness of accounting estimates and management representations and to make judgments' regarding appropriateness of accounting policies and disclosures. The auditor makes judgments' about many matters throughout the course of audit where knowledge of business is important, for e.g., considering business risks, developing the overall audit plan and audit programme, determining a materiality level, assessing appropriateness of audit evidence and judging its relevance to related financial statement assertions, identifying related parties and related party transactions, evaluating accounting estimates and management representations, etc.
- 3.9 To make effective use of knowledge about the business, the auditor should consider how it affects the financial statements taken as a whole and whether the assertions in the financial statements are consistent with the auditor's knowledge of the business.
- 3.10 The auditor may obtain understanding of the client's business under the four broad categories as below:
 - Market overview
 - Strategy
 - Value Creating Activities
 - Financial Performance

Market Overview

- 3.11 It refers to the competitive environment in which the entity operates, understanding of the regulatory framework, and the macro-economic factors which may impact the entity. There is substantial competition in the Indian telecommunications industry and is expected to continue with the increase in number of operators, expansion of area of coverage and services offered. The competition ranges in a number of different areas:
 - services and features offered to customers
 - pricing tariff plans
 - customer service
 - quality of technical support systems



a network coverage and capacity

- 3.12 High competitive intensity results in higher churn rates, higher customer acquisition costs and an increased pressure on margins. The focus in the competitive market is shifting from customer acquisition to customer retention through various measures like reduction in tariffs, network coverages, effective back-end support services, etc. Tariffs have consistently moved downwards to match the competition. Since pricing is an important factor, all pricing initiatives undertaken by the competition are analysed and reciprocated.
- 3.13 Telecom industry is subject to significant and extensive regulation by the Government. The DoT currently regulates all matters relating to licensing, ownership and operation of telecommunication networks, including granting, assignment, maintenance, transfer, renewal of licenses; ownership interests in licensed operators and frequency spectrum allocations.
- 3.14 The Government has created autonomous bodies such as the TRAI to monitor the industry and lay down guidelines for the operators to offer services. In addition to the TRAI, the Government also constituted the Telecom Dispute Settlement Appellate Tribunal (TDSAT) as an autonomous body to regulate and adjudicate matters in the industry, including issues related to tariffs and interconnection.
- 3.15 Telecommunication licenses reserve broad discretion in favour of the Government to influence the conduct of businesses by private operators by giving it the right to modify, at any time, the terms and conditions of licenses and take over entire services, equipment and networks or terminate or suspend licenses, if necessary or expedient, in public interest or in the interest of national security or in the event of a national emergency, war or similar situation. The licenses are for fixed periods and renewable for additional terms at the discretion of the Government.

Strategy

3.16 It includes understanding of goals and objectives, organisational design and governance framework of the entity. In telecom industry, strategy is a major

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determinant which does have an impact on the risks at present and on the future periods. Depending on the strategy, the near future of the entity can be more or less challenging and uncertain. It is important that organisational design and governance are appropriately aligned to the goals and objectives of the organisation.

3.17 The telecom operators are directed and controlled by the Company's management in the best interest of stakeholders and others ensuring greater transparency and timely financial reporting. The Board of Directors is responsible for its governance. Besides being a statutory requirement, the Company looks upon Corporate Governance as a distinctive brand and benchmark in profile of corporate excellence. It understands that governance is a necessary discipline and proper governance would lead to effectiveness and transparency in its functioning.

Value Creating Activities

- 3.18 The activities that underpin financial performance, e.g. how the Company services its customers, its distribution network, its supply chain network etc. The network (supply chain) and successful innovation are currently critical to the performance of telecom operators. The retention of key employees may be a critical factor for certain operators. However, majority operators are concerned with the cost level of their operations with the employee related expenditure as a major factor.
- 3.19 The industry is highly dynamic and subject to rapid and significant changes in technology. Although the operators strive to keep its technology in accordance with the latest international technological standards, the technologies currently employed may become obsolete or subject to competition from evolution of new technologies in the future. The cost of implementing new technologies, upgrading the networks or expanding capacity is significant and could adversely affect results of operations. In addition, ability to respond to technological changes may depend upon ability to obtain additional financing and licenses which again is dependent on several other factors.

Financial Performance

3.20 Financial measures & risk information are used to manage financial performance of



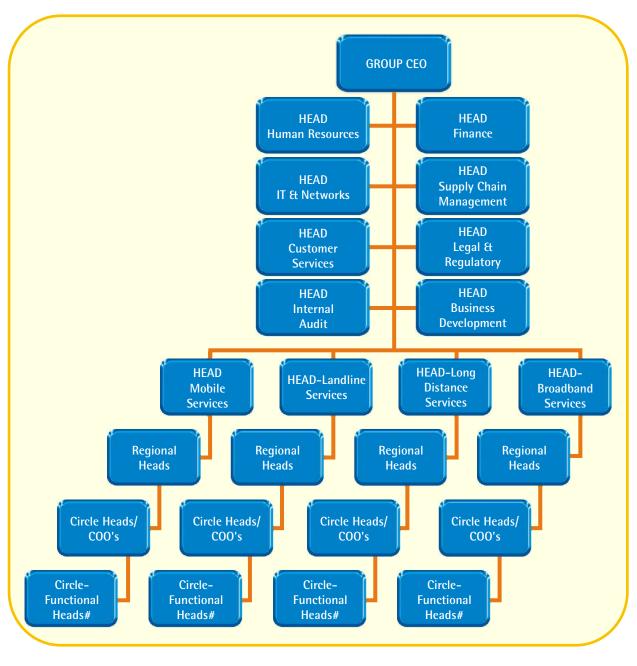
and entity. The telecom business is highly capital intensive and has long gestation period. It requires additional financing to complete roll-out plans for new networks and expand and upgrade its existing networks. The actual amount and timing of future capital requirements may differ from its estimates as a result of:

- unforeseen delays
- cost overruns
- unanticipated expenditure
- regulatory changes
- engineering design changes
- technological changes
- additional market developments
- new opportunities in the industry
- 3.21 The above structure and the information gathered will help form the audit attention to keep risks that may be evident at the initial stage, which the auditor needs to be aware of. It is likely that some of these may be pure business risks, with no impact on the financial statements, while others may need to be understood and addressed during the course of audit.

A Typical Organisation Structure of a Telecom Company

3.22 Successful Telecom Environment Management requires key processes and best practices that help organisations to maintain control in a constantly changing industry. Organisations looking for best in class telecom environment management must focus on achieving the most efficient and effective practices for their telecom and IT environment if growth and success are in their future plans. The organisation structure adopted may vary from one telecom company to the other based on type and scale of operations. However an illustrative overview of Corporate Structure of an entity offering variety of telecom services is presented below. The Organisation structure of the entity under audit needs to be clearly understood, as the flow of information, authority, delegation of responsibilities and segregation of duties are all dependent on this.

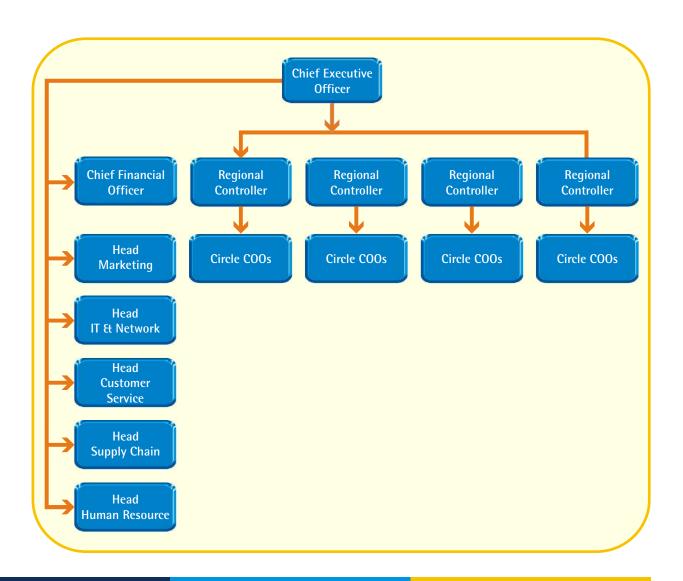
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Functional Heads would include Heads of various functions within a Circle i.e., Finance, Supply & Chain Management, IT & Networks, Human Resources, Legal & Regulatory, Customer Services, etc.



The organisation structure of a telecom company operating only in Mobile Services segment is illustrated below:



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Need for Information Technology (IT) Experts in the Audit

- 3.23 Telecom organisations are highly dependent on technology for their entire business life cycle. There are number of complex applications, operating systems, databases, reporting and reconciliation tools used in a typical telecom organisation. A few of them are listed below:
 - Enterprise Resource Planning (ERP) Applications, e.g. Oracle e-business suite, SAP
 - Postpaid Rating and Billing Applications. e.g. BSCS, Arbor
 - Prepaid Rating and Billing Applications. e.g. Intelligent Network (IN)
 - Electronic recharge applications and solutions. e.g. UTIBA, VOMS
 - Switches and its components. e.g. MSC, HLR, VLR, AuC
 - Interconnect billing system. e.g. INTEC
 - Mediations for conversion of Switch data into readable format from the billing applications
 - **☎** SMSC
 - Customer Relationship Management applications (CRM)
 - Reporting tools and applications
 - Reconciliation tools and applications
 - Data Warehouses for collecting and maintaining huge volume of data generated on a daily basis
- 3.24 The organisations are heavily dependent on the above applications for carrying out their day to day operations i.e. service delivery, accounting, reconciliations, management reporting, error resolution, customer acquisitions, provisioning, etc. The smooth and error free working of these applications is vital for telecom companies. These applications are also responsible for providing the base data for preparing the books of accounts for the organisation. For instance, the Postpaid Billing System would provide details of the postpaid revenue, subscriber receivables, subscriber security deposits, etc. Hence from the perspective of audit of financial statements, it is imperative to ensure that these complex systems and related reporting tools generate, capture and provide complete, accurate, valid and timely information for financial reporting.
- 3.25 As a part of the audit of financial statements, it is important to ensure that the



financially significant applications and related databases generate, capture and provide complete, accurate, valid and timely information for financial reporting. In view of the technology-intensive nature of the telecom industry, it is preferable to engage those specialists who have the expert knowledge of working of these complex systems, risks attached to each of these systems and the requisite skills to audit these systems to address the relevant audit risk.

- 3.26 Generally, the specialists would be called upon to perform the following scope of work in the financial audit of a Telecom organisation:
 - 1. Information Technology General Controls (ITGC):
 - Tdentifying key risks related to IT.
 - and Gathering and documenting information about the client's systems and IT general controls and related risks, including entity-level controls over IT.
 - Determining financial significant applications and scoping the work over IT general controls
 - Evaluating and validating IT general controls.
 - 2. Evaluating and validating automated application Controls.
 - 3. Testing the integrity of system generated data and reports used in key manual controls or in the generation of manual journal entries.
 - 4. Revenue Assurance Controls review.
 - 5. Data Analysis use of CAATs.
- 3.27 In planning an audit that includes the involvement of specialists, the following need to be agreed upon:
 - The testing plan and resource allocation for IT general controls, automated controls, automated accounting procedures, report testing, revenue assurance etc.
 - Trelated issues and risks that should be given particular attention.
 - The How control weaknesses identified should be documented and reported.



INTERNAL CONTROL RISK ASSESSMENT AND INTERNAL CONTROL RISK ASSESSMENT AND INTERNAL CONTROL INTERNAL CONTROL

Audit Risk

- 4.1 Audit risk contains two key elements:
 - The risk that the financial statements contain a material misstatement (inherent and control risk); and
 - The risk that the auditor will not detect such a misstatement (detection or engagement risk).
- 4.2 To reduce audit risk to an acceptably low level, the auditor has to:
 - Assess the risks of material misstatement; and
 - Limit detection risk. This may be achieved by performing procedures that respond to the assessed risks at the financial statement, class of transactions, account balance and assertion levels.
- 4.3 Auditors are required to assess the risks of material misstatement at two levels. The first is at the overall financial statement level, which refers to risks of material misstatement that relate pervasively to the financial statements as a whole and potentially affect many assertions. The second relates to risks identifiable with specific assertions at the class of transactions, account balance, or disclosure level. This means that for each account balance, class of transactions and disclosure, an assessment of risk (such as high, moderate, or low) should be made for each individual assertion being addressed.

Components of Audit Risk

- 4.4 The major components of audit risk are described below:
 - 1. Inherent Risk refers to susceptibility of an assertion to a misstatement that could be material, individually or when aggregated with other misstatements, assuming that there are no related controls. Inherent risk is addressed at both the financial statement level and at the assertion level. These are the business and other risks that arise from the entity's objectives, nature of operations and



industry, the regulatory environment in which it operates and its size and complexity. The risks of material misstatement will vary based on the nature of the account balance or class of transaction. Risks of particular concern to the auditor might include:

- Complex calculations which could be misstated;
- High value inventory;
- Accounting estimates that are subject to significant measurement uncertainty;
- A lack of sufficient working capital to continue operations;
- A declining or volatile industry with many business failures; and
- Technological developments that might make a particular product obsolete.
- 2. Control Risk refers to the risk that the entity's internal control system will not prevent, or detect and correct on a timely basis, a misstatement that could be material, individually or when aggregated with other misstatements.

The entity should identify and assess its business and other risks (such as fraud) and respond by designing and implementing a system of internal control. Entity level controls such as board oversight, IT general controls, and HR policies are pervasive to all assertions whereas activity level controls generally relate to specific assertions. Some control risk will always exist because of the inherent limitations of any internal control system. The auditor is required to understand the entity's internal control and perform procedures to assess the risks of material misstatement at the assertion level.

3. Detection Risk refers to the risk that the auditor will not detect a misstatement that exists in an assertion that could be material, either individually or when aggregated with other misstatements. The acceptable level of detection risk for a given level of audit risk bears an inverse relationship to the risks of material misstatement at the assertion level. The auditor identifies assertions where there are risks of material misstatement and concentrates audit procedures on those areas. In designing and evaluating the results of performing procedures, the auditor should consider the possibility of:

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- Selecting an inappropriate audit procedure
- Misapplying an appropriate audit procedure
- Misinterpreting the results from an audit procedure
- 4.5 Risk-based audits require practitioners to understand the entity and its environment, including internal control. The purpose is to identify and assess the risks of material misstatement of the financial statements. Because risk assessment require considerable professional judgment, this phase will require the time of the audit partner and senior audit personnel in identifying and assessing the various types of risk and then developing the appropriate audit response.
- 4.6 The risk assessment phase of the audit involves the following steps:
 - Performing client acceptance or continuance procedures;
 - Planning the overall engagement;
 - Performing risk assessment procedures to understand the business and identify inherent and control risks;
 - Identifying relevant internal control procedures and assessing their design and implementation (those controls that would prevent material misstatements from occurring or detect and correct misstatements after they have occurred);
 - Assessing the risks of material misstatement in the financial statements;
 - Tidentifying the significant risks that require special audit consideration and those risks for which substantive procedures alone are not sufficient;
 - Communicating any material weaknesses in the design and implementation of internal control to management and those charged with governance; and
 - Making an informed assessment of the risks of material misstatement at the financial statement level and at the assertion level.

Parts of the risk assessment phase of the audit can often be carried out well before the year end.

4.7 The time involved in performing risk assessment procedures may be offset by reducing, or even eliminating, audit work in low risk areas. The knowledge and insight gained can also be used to provide the entity's management with practical comments and recommendations on how to minimise or reduce risk.



- 4.8 An effective risk assessment process requires that all members of the engagement team be involved and that they communicate effectively. The audit team¹ should meet or talk together on a regular basis to share their insights. This can be achieved through:
 - A team planning meeting to discuss the overall audit strategy and detailed audit plan, brainstorm how fraud could occur, and design audit procedures that may detect whether such fraud did in fact occur; and
 - A team debriefing meeting (towards or at the end of the fieldwork) to discuss the implications of audit findings, identify any indications of fraud and determine the need (if any) to perform any further audit procedures.

Risk Assessment

- 4.9 In a telecom industry, following is an illustrative list of key risks which persists and may require special audit response:
 - Throduction of innovative products (Bill Plans, Value Added Services, etc.) and services involving commissioning of new systems for provisioning.
 - The pendency on real time Networks and IT systems wherein breakdown in control environment, security breach or controls can impact provisioning of customer services further leading to increase in customer churn.
 - Functionality of the highly complex technical systems supporting the business (e.g. Post-paid & Prepaid customers billing systems, Interconnect billing system, etc.).
 - Accounting for complex transactions, borrowing instruments, derivative contracts, acquisition revenue and costs in line with GAAP, forward covers and hedges including swaps, equipment supply contracts, network outsourcing contracts, etc.
 - That Inaccuracy in forecasting returns from prospective infrastructure investments including optic fibres, wireless spectrum licenses, etc.
 - Managing of assets by outsourced vendors/agencies leading to risk of misappropriation/loss of large base of assets spread across wide geography.
 - Litigations by and against the companies with customers, customer forums, tax and regulatory authorities, etc.
 - Compliance with regulatory conditions specified by TRAI and its financial

¹ Even in cases of audit engagements performed exclusively by one person (the practitioner), the same general principles will apply.

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implications.

- Management override of controls leading to Fraud Risk, roaming fraud, bypass hacking and bypass fraud, SMS fraud, SIM card cloning, credit card and subscription fraud, etc.
- Inappropriate provisioning in the financial statements for revenue and receivables and obsolete capital inventories which constitutes major components of a telecom business.
- Complex tax computations, given the entity structures, business operations, industrial undertakings, tax holiday periods, etc.
- Complex and significant contract terms & conditions which might not be fully reflected in financial accounting and disclosures.
- Committed capex and lower than expected demand, declining ARPU's and fixed capital charges could result in impairing the financial health of operators.
- Business information security due to handling of customer data at various levels and by various outside (third party) agencies franchisees, channel partners, etc.
- Challenges with respect to customer service and timely resolution (including closure) of complaints, else-wise leading to huge customer dissatisfaction, customer churn and revenue loss.
- Non-timely identification and action for preventing revenue leakages from potential earnings post-paid, prepaid, interconnect and roaming billing systems.

Information Technology Controls

- 4.10 Information Technology General Controls (ITGC) contribute indirectly to ensuring that the underlying financial statement assertions of completeness, accuracy, cutoff, existence occurrence, rights & obligations and presentation and disclosure are met. Effective ITGC is the basis of ensuring continued effectiveness of the application controls and automated accounting procedures that depend on computer. ITGC are also important when manual controls depend on application-generated information. If reliance on automated application controls, automated accounting procedures, or manual controls that depend on application-generated information is planned, validation of relevant ITGCs is required.
- 4.11 Testing of ITGC's has to follow a phased approach i.e.:



- Identifying key risks related to IT.
- and documenting information about the client's systems and IT general controls and related risks, including entity-level controls over IT.
- Tidentifying significant applications that have impact on the financial statements and related disclosures and scoping the work over IT general controls.
- Evaluating and validating IT general controls.
- Observations in ITGC and its impact on the timing, nature and extent of audit procedures.

Each of these phases are discussed in detail in the paragraphs below:

Identifying Key Risks related to IT

- 4.12 Following a risk-based audit approach, it is important to identify the key risks related to IT as the starting point of the audit. Key risks are identified based on auditor's knowledge about the business and the related business cycles of the organisation under audit. For telecom companies the following may be categorised as key risks related to IT:
 - i. Complex systems that are automatically interfaced to each other and hence require batch processing (scheduled or otherwise) to transfer data completely and accurately.
 - ii. The organisations send or receive financially significant data across the network.
 - iii. Huge volume of data to be managed and backed up on a daily basis.
 - iv. Frequent changes to master data upon changes in bill plans, introduction of new bill plans, new promotional offers etc.
 - v. Introduction of new applications for effectiveness and efficiency of operations.
 - vi. A number of centrally managed applications as well as a number of decentralised and geographically dispersed applications.
 - vii. 24×7 working environment.
 - viii. Division of work responsibilities among the IT department of the telecom companies and third party vendors.
 - ix. Frequent Network upgradations, scalability enhancements.
 - x. A number of third party and in-house developed applications.

Documenting Information about the Client's Systems and IT General Controls

4.13 Having understood the key risks related to IT, the auditor should:

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- a Gather sufficient and reliable information about the overall functioning of the IT function, roles and responsibilities, third party agreements etc.
- Understand and evaluate controls put in place by management to address the IT risks.
- Understand and evaluate the broader entity level controls, for instance, the Chief Technology/ Information Officer being invited to attend the Board of Directors meetings and discuss the IT issues.
- Evaluate whether any of the key risks have not been addressed by management or has only been partially addressed i.e. indicative of a control design weakness.

All the above should be documented as part of the audit planning process.

Identifying Significant Applications that have Impact on the Financial Statements and Related Disclosures

- 4.14 It is important for the auditor to keep in mind the objective of performing the ITGC review. To reiterate:
 - "Information Technology General Controls (ITGC) contributes indirectly to ensuring that the underlying financial statement assertions of Completeness, Accuracy, Cut-off, Existence Occurrence, Rights & Obligations and Presentation and Disclosure are met.

Effective ITGC is the basis of ensuring continued effectiveness of the application controls and automated accounting procedures that depend on computer. ITGC are also important when manual controls depend on application-generated information." In other words ITGC review is being performed to obtain audit comfort over the financial statement assertions in the financial statements. Since the comfort is required on financial statement assertions, it is only the financially significant applications that need to be scoped in as part of ITGC.

- 4.15 In a Telecom organisation the following applications would typically be scoped in as part of ITGC:
 - Switch (MSC)
 - Mediation
 - Postpaid Billing Systems e.g. Arbor, BSCS



- Interconnect Billing Systems e.g. INTEC
- Prepaid Billing Systems e.g. IN and related provisioning applications
- Electronic Recharge systems e.g. UTIBA, VOMS
- Financial Accounting and Reporting applications e.g. Oracle financials, SAP
- 4.16 Audit teams should document a clear link between key ITGC and:
 - **EXECUTE:** Key automated application controls and interfaces,
 - Key automated accounting procedures, and
 - System generated data and reports used in key manual controls or in the generation of manual journal entries.

Based on the documentation of this link, other applications may be scoped in / scoped out for ITGC purposes.

Evaluating and validating IT General Controls

4.17 ITGC has to be conducted under the following four domains:

Control over Computer Operations

- Overall management of Computer Operations activities
- Batch scheduling and processing
- Real-time processing
- Backup and problem management
- Tisaster Recovery

Controls over Access to Programs and Data

- Management of security activities
- Security administration
- **Data security**
- Operating system security
- Network security
- Physical security

Controls over change management

- Management of maintenance activities
- Specification, Authorisation and Tracking of Change Requests
- **Construction**
- Testing and Quality Assurance

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- Program Implementation
- Documentation and Training
- Segregation of Duties

Controls over program development

- 2 Overall management of Program Development activities
- Project initiation, analysis and design
- Construction/Package Selection
- Testing and Quality Assurance
- Data conversion
- Program Implementation
- Documentation and Training
- Segregation of duties
- 4.18 Relevant ITGC typically include granting and removing user access rights, administering system security, enforcing password controls, segregating IT functional responsibilities, and monitoring direct access and security change activities. Weaknesses in relevant ITGC could compromise the effectiveness of management's segregation of duties, controls or other related control objectives by permitting inappropriate access rights.

Observations in ITGC and its impact on the Audit Approach

- 4.19 Because of the pervasive nature of the IT, control weaknesses in ITGC would have impact on the financial statement assertions. In light of the exceptions in ITGC, it may be difficult to place reliance on automated application controls. However each and every observation in ITGC review needs to be discussed in terms of it's potential impact on audit, the materiality of the exception, the compensating controls and mitigating factors, if any and the further audit procedures required in the area. The further audit procedures could include amongst the following:
 - Testing of the compensating controls, if in the judgment of the auditor, the compensating control would address the audit risk arising from the exception. Before testing the compensating control the auditor should determine, whether the compensating control can be relied upon for the purposes of the audit. This is done by understanding and evaluating the design of the control.



- Calculating the materiality of the observation. This has to be done by understanding the nature of the observation and identifying the period for which the observation was not remediated. If in the judgment of the auditor, the amount related to the observation is not material to impact the true and fair view of the financial statements, there may not be any further work required.
- Increase in substantive testing i.e. substantive analytics and/or test of details. For instance a client has many "superusers" in their IT department whose access rights enable them to create, process and delete transactions in all significant business processes without leaving an audit trail. Even if functional duties are properly designed and segregated amongst the operating and financial personnel involved in the client's transaction processes, the desired level of control may not be achieved if the risks of "superuser" access are not adequately mitigated by other IT and/or business process controls. In such a situation, it may be required to extract a dump of transactions created by "superuser" and determine if the transactions were approved and in normal course.
- Auditors also need to assess the impact of observations on reporting on Internal Controls under Clause 4 of Companies (Auditor's Report) Order, 2003, as amended by the Companies (Auditor's Report) (Amendment) Order, 2004, issued by the Central Government of India in terms of sub-section (4A) of Section 227 of 'The Companies Act, 1956' of India.
- 4.20 The impact of the ITGC observations on audit and further audit work should be clearly documented in the audit working papers.

Automated Application Controls

What are automated application controls?

- 4.21 Automated application controls, as the name suggests are the controls that reside within the application and are performed automatically by the application. Automated application controls can be of the following nature:
 - Tinherent application controls
 - **Configurable application controls.**
- 4.22 Inherent application controls are the controls that are inbuilt into the application code

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- and are part of the standard application installation. These controls cannot be configured to be turned off.
- 4.23 Configurable application controls on the other hand are control features that can be customised to suit the requirements of the business. Some applications are highly configurable but where the application provides greater security and control features, such features may not be optimally utilised.
- 4.24 In a telecom organisation, the auditors may want to test the automated application controls as substantial audit comfort can be obtained if the automated application controls are working fine or have been configured appropriately to meet the needs of the client and address the risks in the underlying business processes. Controls may need to be tested for the following applications:
 - Billing Applications Postpaid and Prepaid
 - Financial Accounting and Reporting Applications e.g. Oracle financials, SAP.
- 4.25 Automated application controls are influenced to a greater degree by the effectiveness of information technology general controls (ITGC) and may require manual follow up for resolution. They should ideally be tested in conjunction with their associated manual based controls to determine whether there is a proper balance of control (e.g. a transaction is rejected or flagged and there is a manual research and follow up process with a documented resolution).
- 4.26 Some examples of automated application control methods for satisfying the objectives of completeness, accuracy, validity and restricted access are as follows:

Completeness

- Sequential numbering of transactions so that every transaction can be uniquely identified in the system and the system will not accept duplicate numbers, or numbers outside the set range. Missing numbers are reported for investigation and followed up as needed.
- Control total balancing of number of transactions input into the system. The following are some examples of control total balancing techniques:
 - Hash totals



- Batch is entered into the system and total is calculated again and compared to first totals to ensure data is transferred from the source system to the destination system completely.
- Edit checks to identify potential duplicate transactions such as invoice payments.

Accuracy

- Edit checks which could include limit checks, reasonableness checks, existence checks, format checks.
- Matching of customers, vendors, part numbers, invoices, and purchase orders to existing data
- Control total balancing of data within transactions which are input into the system.

 The following are some examples of control total balancing techniques:
 - Hash totals
 - Batch is entered into the system and total is calculated again and compared to first totals to ensure data is transferred from the source system to the destination system completely.

Validity

- Transactions routed along a workflow approval process for processing by employees with appropriate authority.
- Matching customer data against an existing data file (historical data, standing data, data from another organisation/system, prior data matching).

Restricted Access

- Formal authorisation by application owner is required for access to specific accounting records. Management reviews access rights periodically to ensure only authorised individuals have access for carrying out their duties. Exceptions noted are investigated and resolved.
- Access controls include a proper segregation of duties (access only the information needed to perform the job function, i.e. responsibilities for approving, processing, handling assets should be divided among employees).
- Access controls such as user IDs and passwords are utilised and specific to each application. Passwords should be changed periodically and must not be replaced by

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previously used passwords. Multiple failures to log on invalidate the user ID and reported via an exception report. Management to investigate and resolve all items.

Testing of the Automated Application Controls

- 4.27 Testing the automated application controls require an expert knowledge of the application in terms of the inherent and configurable controls. Further the auditor needs to be aware of the various possible configurations and the impact of a particular combination on the business cycle.
- 4.28 It is more important to be aware of the configurations because each and every application installation is unique and is governed by the configuration. A configuration that is required by one installation may not be required at all in the other installation. Awareness of these configurations is vital for reaching appropriate conclusions about the working of the application controls.
- 4.29 The following approach needs to be adopted in testing of the automated application controls:
 - Tidentify the financially significant applications by identifying which business cycles are impacted by the application.
 - Identify the application's interfaces as they are often linked to other systems that in turn need controls to ensure that all inputs are received for processing and all outputs are distributed appropriately.
 - Testing of the automated application controls by performing a walkthrough should be done in the test environment. However the auditor need to first of all perform audit procedures to ensure that the test environment is the exact replica of the live environment and the results of the testing done in the test environment would not be different from the results, had the testing been done in the live environment. This can be done by ensuring that the configuration in the test environment and the live environment are matching and there are procedures to ensure that the test environment is replicated with the live environment (both the application and database) on a regular basis. In case the latest replication done by the organisation does not have all the relevant changes / information required for the purposes of audit, then the auditor should consider requesting for a fresh replication.



Interface Controls

4.30 Consideration should be given to automated application controls within an application as well as interface controls between applications and databases. In telecom companies, there can be interfaces between various applications eg., interface between the billing systems and General Ledger, interfaces between two billing systems etc. Interface controls are critical in helping to ensure the completeness and accuracy of data transfer, as well as the validity of the data received. Interface controls can be manual or automated as the data transfer may be manually initiated and the value / record count may be reconciled manually or through application batch totals. If reconciled through application batch totals, there needs to be a report stating the result as the system will not self-correct. The following are some of the automated application controls employed to ensure data transmission is transferred from the source system, and received by the destination system in a complete and accurate manner.

Edit checks

- 4.31 Edit checks used by destination systems to restrict receipt of interface data from only certain, predefined source systems. This is normally done by the use of system recognition codes (e.g. IP addresses and database pointers). This would also be considered a validity control as it ensures the validity of the data received.
 - Edit checks built into the destination system to disallow the acceptance of files that are not for the correct date. i.e., the system won't accept yesterday's file again if today's are not ready.
 - Edit checks built into data transmission. For example, the destination system can calculate control totals and record counts of data received from valid sources. The destination system compares the totals and counts back to the source system. The source system compares the control totals against its own calculated information. If the totals are the same, the source system will send a confirmation back to the destination system. If the totals are not the same, the destination system will not process the data. This will ensure that transmission was complete and accurate. For this area, also consider Resubmission Controls.
 - Edit checks using file headers/footers. File headers can summarise the information that is included in the files sent from source systems. The information for example

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can include, number of records, total amount fields, total debits, total credits, file sizes, etc. The destination system imports the file for record basis, individually computing edit check calculations. When the calculated information matches the header or footer, the information will go to the next stage of the validation process (See Data Validation Controls). If the data does not match refer to the Resubmission Controls.

Resubmission Controls

4.32 A very important follow-up control should exist to ensure that when the above controls detect failures in communications, the destination system will let the source system know to resubmit the original data transmission. In this scenario, the source system should ignore the original message, as this could lead to duplicate processing of transaction data.

Data Validation Controls

4.33 All data received by source systems should go through data validation controls or edit checks. These edit checks could include numeric fields that check for other characters, date fields that check whether the data is in the correct format, etc. Company numbering formats should also be checked against the business rules. There should be business rules that will apply on all data fields received by the source system. For example, a customer number must be between 1000001 and 1099999. These same controls should also be applied for resubmission activities.

Assessing the Reliability of System Generated Information, Including Information used in the Execution of Manual Controls, Manual IT Dependent Controls and Financial Reporting

4.34 Telecom organisations use and rely upon information produced by the information systems in form of various reports such as IN Balance report, Billing revenue, Postpaid MOUs, Prepaid MOUs, Prepaid Usage, VAS Usage, Acquisition report, churn report, recharge report, debtors ageing report, etc. This information is used for carrying out monitoring controls and entity level control activities such as business performance reviews.



- 4.35 Accuracy, completeness and reliability of this information would ensure the effectiveness of the control activities based on these reports / information. Information required for financial reporting purposes is also produced by these applications, for instance, based on the information contained in the IN Balance report, the corresponding liability for unearned revenue is recognised. Similarly, the debtors ageing report generated out of post paid billing systems would be used for making provision for bad and doubtful debts. This information would also be used by auditors to perform audit procedures.
- 4.36 It is essential for auditors to obtain an understanding of the sources of the information that management use and evaluate and how management obtains comfort that the information is reliable for their purposes. Thus, the auditor needs to obtain audit evidence about the accuracy and completeness of the underlying information by performing following procedures:
 - A. Understand the nature and source of the underlying information There would be some information that would be generated on a routine basis by the applications i.e. the reports would be predefined and would be available to the management at predefined intervals or as and when the management requires such information. There can be some reports/ information produced on ad-hoc basis as requested by the users. The queries for the reports may be written by the IT Team upon request by the management. The reports those are generated regularly and are a part of standard reports of the application are inherently more reliable as compared to the ad-hoc reports. However, the auditor should test the relevant ITGC like controls over access to program and data, program change management and program development before reaching to such a conclusion.
 - B. Depending on how management obtains comfort that the underlying information is complete and accurate, the auditor should perform all or combination of some of the following procedures to gather sufficient and appropriate audit evidence about the reliability of the underlying information:
 - I. Test the relevant application controls and information technology general controls that management relies on when using this approach, the auditor should perform all of the following:

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- i. Assess the reliability of the source data by testing key manual and automated controls. This will most often involve testing the effectiveness of key manual and automated controls designed to ensure the completeness, accuracy and validity of the source data.
- ii. Validate that the program or systems, in the routine, function as intended and draw information from appropriate, reliable data sources.
- iii. Test the effectiveness of key ITGC designed to support the ongoing integrity and reliability of both the system(s) and source data, and revalidate the automated program logic any time it is changed.

Some examples of the procedures stated above include:

- i. Performing substantive tests, such as tracing the output to source documents or by reconciling it to independent, reliable sources (eg., testing the accuracy of an aging report by comparing to circularisation results or by tracing back to sales invoices).
- ii. Replicating the output by running own independent queries or programs on the actual source data.
- iii. Evaluating the logic of the program/routine by perhaps:
 - a. Inspecting application system configurations
 - b. Inspecting vendor system documentation
 - c. Interviewing program developers (usually not enough by itself)
- iv. Running sample transactions (test decks) through the program or routine and comparing the output to expectations.
- II Obtain comfort on how management validates or corroborates the underlying information through independent objective sources:
 - i. Management may gain comfort that the information they are using is reliable from checks that they perform themselves using a reliable independent source.
 - ii. Another possible approach is to rely on procedures performed by management to validate or corroborate the underlying information. The auditor should first be satisfied that management is using a sufficiently rigorous process, and then obtain comfort on how they:



- a. Compare the underlying information to reliable sources external to the organisation.
- b. Compare the underlying information to internal information that is reliable and verifiable.
- c. Rely on corroboration by individuals with the requisite knowledge, experience and analytical skills who are not involved with the process and systems that generate the underlying information.

Examples:

- i. Management may be able to identify inaccuracy in roaming revenue report based on the information provided by the Data Clearing House (DCH) as well as by information received from roaming partners.
- ii. Management may be performing trend analysis of various KPIs e.g., churn, ARPU, SMS Revenue, Roaming revenue, Prepaid revenue, Postpaid revenue, activations etc. The figures are compared over a period and also against the budgets. Any unexpected fall, rise may be investigated to identify whether there is a possible reporting error. Some of the information may be corroborated with other sources as well, for instance, the fresh activations may be corroborated with the dealer incentive on fresh activations.

The auditor should plan and perform audit procedures, as needed, to validate the effectiveness of management's procedures for corroborating the underlying information.

III Perform own substantive testing of the underlying information:

i. In limited circumstances, the auditor may determine that it is appropriate to assess the reliability of underlying information used in a control by validating it through substantive testing. Such a determination should consider the results of procedures the auditor performed to obtain an understanding of internal controls to plan audit procedure. In obtaining this understanding, the auditor should consider

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an entity's use of information technology to initiate, record, process and report transactions or other financial data. If the auditor becomes aware of evidence that calls into question the expected reliability of the underlying information used in the manual controls and manual IT dependent controls, substantive testing alone may not be an effective approach.

- ii. The auditor may be able to gain a low to moderate level of assurance from a BPR or manual control by testing the effectiveness of control and substantive testing of the underlying information throughout the audit period. At a minimum, the auditor should substantively test the information as many times as the operation of the BPR or manual control. For example, if the auditor is testing a monthly control three times throughout the year, then he should substantively test the underlying information for the same three instances of the control.
- iii. Considerations for determining the nature of the substantive tests and increasing the frequency of the testing of the underlying information at the minimum include:
 - a. the source and expected reliability of the underlying information (e.g., is it sourced from systems independent of the financial reporting process; is it straightforward or complex; etc), and
 - b. the importance and level of desired comfort from the BPR or manual control (i.e. the more important and the higher the level of comfort desired, the more frequent the underlying information should be tested).

Revenue Assurance Controls Review

Need for a Revenue Assurance Function in Telecom Organisations

- 4.37 The telecommunications industry is undergoing a major revolution. New technologies, new products and services and entirely new business models are making existing risk management activities like usage tracking, billing tracking and fraud prevention measures, obsolete. Revenue assurance has always played an important role in telecom risk management and several other factors, as mentioned below, have brought it to the forefront:
 - Continued scrutiny and pressure by regulators mean that the telecom companies



- should be able to point specifically and definitively to prove the numbers they report to stockholders and the public.
- Increasing pressure to show performance and reduced operating budgets is making it critical for management to exploit all areas of potential revenue realisation. For most telcos surviving in today's competitive market requires them to discover any way possible to increase earnings. By determining how revenues are being missed, Revenue Assurance (RA) can generate an essential source of previously unrealised income.
- The struggle of existing revenue management systems to keep up with the continuing breakneck pace of technological and marketing innovation. Each month, hundreds of new technologies, products, price plans and marketing approaches force network and systems managers to continuously stretch and challenge their revenue management capabilities.

Revenue Assurance

- 4.38 Revenue Assurance is a combination of organisational structure, processes, technology and information responsible for understanding and monitoring the entire revenue process. Revenue assurance essentially cuts across all functional areas. Revenue Assurance in a telecom organisation is explained below:
 - To assure management that there is no leakage in particular area.
 - To determine the probability that leakage is occurring in a particular area.
 - To identify potential leakage situations as quickly as possible in order to effectively escalate them for leakage management to see and understand what is going on.
 - To identify those areas where leakage might occur in the future and take action to prevent that from happening.
 - To investigate a suspected leakage situation and determine the extent, risk and root causes associated with it.
 - To determine the appropriate treatment of a known leakage situation.
 - To remedy a known leakage situation when it is determined to be the best course of action.

Importance of Revenue Assurance Controls

4.39 As per the Standards on Auditing issued by the Institute of Chartered Accountants of

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India, the auditor should obtain an understanding of the accounting and internal control systems sufficient to plan the audit and develop an effective audit approach. The auditor should use professional judgment to assess audit risk and to design audit procedures to ensure that it is reduced to an acceptably low level. Auditors would be interested in Revenue Assurance controls from the following perspectives:

- Revenue Assurance Controls are one of the most important and distinguished facet of the overall internal control environment in a telecom organisation.
- An effective Revenue Assurance function address audit risks in the area of revenue. Revenue being one of the key risk area in audit of telecom companies, the auditors obviously are interested to review whether the revenue assurance controls are effective to be able to place reliance on them.
- Revenue process in telecom companies is complex and highly automated. It is effective, efficient and most appropriate for auditors to adopt a control based approach in audit of revenue area in a telecom organisation as against adopting a manual substantive audit approach. In adoption of a control based approach whereby management controls over the audit area are tested and relied upon, revenue assurance controls are the controls that the auditor should intend to rely upon and test.
- A breakdown in the revenue assurance controls would indicate the auditor, the areas where he needs to focus more to obtain audit comfort.
- The results of the revenue assurance work can be used by auditor for corroborating the numbers reported in financial statements.

Risks addressed by Revenue Assurance

4.40 Risks in Revenue and Receivable Cycle There are a number risks related to revenue leakage, revenue management and revenue maximisation in the revenue cycle that need to be addressed by telecom companies. A number of these risks are addressed by revenue assurance. Let us take a closer look at the possible risks that are addressed by Revenue Assurance (RA).

Mobile and Fixed Line Telcos

- CDRs may not be generated for all the chargeable calls resulting from incorrect suppression of CDRs at the Switch Level.
- There may be unauthorised activity at the switch resulting into revenue loss,



subscriber may be active only on switch but not on billing application resulting into calls not being rated at the Billing Package Level and getting rejected.

- Subscriber may not be charged for the services availed.
- Subscriber active on Billing but not active on switch will not be able to make calls leading to dispute, bad debts and related costs. The Client may lose the subscriber to competition.
- Revenue/Postpaid CDRs may be filtered at Mediation resulting into revenue loss / leakage.
- Since the call flows from Switch to Mediation to Billing in CDR Files, there is a possibility that the Files and the CDR within Files are not transferred from Switch to Mediation and from Mediation to Billing resulting into revenue loss.
- The calls made by the subscriber may be rated differently from the approved and communicated rates. This may result into revenue loss in case of under billing or subscriber dissatisfaction and related costs like subscriber care calls, waivers, losing subscriber to the competition, in cases of over billing.
- CDRs may be rejected due to various reasons at billing system and the same may not be re-rated.
- Incorrect billing may even lead to Regulatory issues.
- Calls may be rated for wrong jurisdiction e.g. a Local code may be defined as an STD Code and hence wrongly charged and vice versa. This may result into revenue loss or subscriber dispute. The IUC Payout and the recovery against the same from the Subscriber may be affected.
- Billing may not be done for all the Billable customers leading to loss of revenue to that extent. Further, in case, these customers are billed later on, there is possibility of delay in collection and increased cost of collection.
- Subscriber's online balance decrement for the calls that the subscriber makes might be different from the approved and communicated rates. This may result into revenue loss in case of under decrement or subscriber dissatisfaction and related costs like customer care calls, waivers, losing subscriber to the competition, in cases of over decrement.
- Roaming online decrement may be incorrect resulting into revenue leakage or subscriber dissatisfaction.
- There can be a risk that incorrect talk values are transferred to the subscriber on

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- recharges. This can be resulting from incorrect configurations in the system.
- The amount transferred to subscriber on electronic recharge / easy recharge may not be deducted from the dealer online account resulting into revenue loss.
- Subscriber may be able to utilise more or decremented more than the available balance in the account.
- Services of the customers like GPRS and SMS may not be barred at the defined threshold due to command failures and hence resulting into negative balance and consequent revenue loss to the organisation.
- Unauthorised adjustments may be given to the subscriber resulting in revenue leakage.
- Rentals for services such as GPRS, Roaming etc., may not be charged to the customer leading to revenue loss to the organisation, similarly there can be instances of duplicate charging resulting to customer dispute and related costs like customer care calls, waivers, losing subscriber to the competition, in cases of over decrement.
- Incoming and Outgoing calls of the customer may not be barred on time leading to chance that the customer would accordingly delay the recharging.
- Incorrect Rating of CDRs at Interconnect billing system resulting into settlement disputes with other operators.
- Incomplete processing of CDR Files at Interconnect billing system resulting into under billing to the operators as well as reconciliation issues / settlement issues of IUC with other operators.
- The Incorrect charging of Content Download CDRs may result into revenue leakage or subscriber dissatisfaction.
- The amount paid to the vendor for VAS download may not be correspondingly recovered from the subscriber.
- Over invoicing by the vendor may not be detected.

Carrier Services - NLD and ILD

- The distance band and TIER ID mapping for new and existing codes may be incorrect and hence may lead to incorrect billing.
- The rates configured in Interconnect billing system against each TIER ID and product ID may be incorrect leading to inaccurate rating and hence incorrect



revenue and access charges.

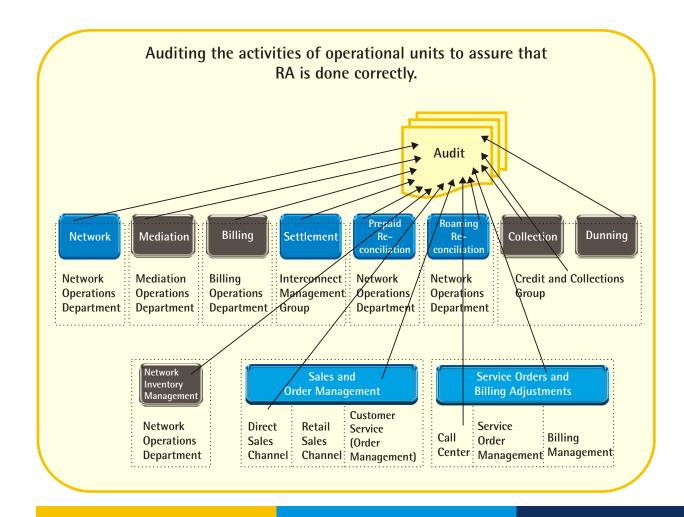
- Billable Trunk Groups may not be configured at all the instances i,e. Switch, Mediation and Interconnect billing system and hence leading to either incorrect CDR Filtration or rejection of CDRs due to TG Not Found cases. All this would lead to revenue loss to the organisation.
- Since the call flows from Switch to Mediation to Billing in CDR Files there is a possibility that the files and the CDR within files are not transferred from Switch to Mediation and from Mediation to Billing resulting into revenue loss.
- CDRs may be rejected due to various reasons at Interconnect billing system and the same may not be re-rated.
- Any traffic going towards International Carriers would be originated from Domestic Operators or International Carriers (Incoming Hubbing). ILD traffic originated from NLD operators may not match with Outgoing traffic given to ILD operators leading to revenue loss to the organisation.
- Any traffic that flows in from International Carriers would either be terminated on Domestic operators or International Carriers (Incoming Hubbing). Similarly, any traffic flowing out to International Carriers would be originated from Domestic Operators or International Carriers (Incoming Hubbing). If the same does not reconcile then there would be revenue loss to the organisation.
- All the calls originated at the switch may not be billed to the operator and hence leading to under invoicing and revenue loss to the organisation.
- 4.41 List of risks detailed above, is an indicative list of risks that are faced by telecom companies and addressed by revenue assurance. Auditor should understand these and any other risks that are addressed by revenue assurance and the possible impact of these risks on the audit of financial statements.

Controls performed by Revenue Assurance Function

- 4.42 Revenue Assurance is an important control function for the telecom companies. The RA function cuts across departmental and technology barriers and encompasses the following major operational areas in its pervasive domain:
 - Network operations
 - Mediation

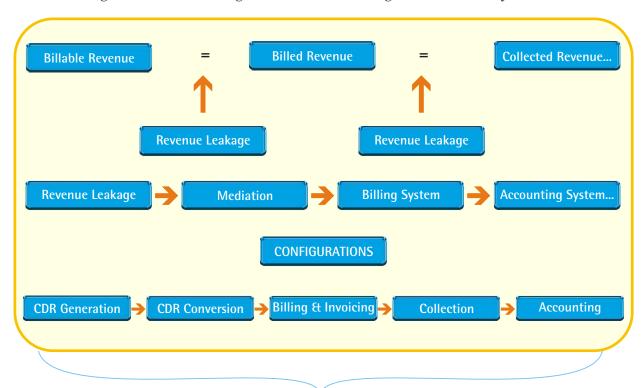
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- Postpaid billing
- Prepaid billing
- Interconnect
- Roaming reconciliation
- Collections and settlement
- Dunning
- raud
- Cross system synchronisation
- End-to-end revenue management chain





4.43 The main objective of the RA function would be to ensure that the Billable revenue equals the Billed revenue and Collected revenue. There would be leakage (Potential and Actual) in every area. RA needs to identify and plug these leakages and continuously monitor the revenue stream to detect any further sources of revenue leakage as well as ensuring that there is no leakage in areas already corrected.



REVENUE ASSURANCE

Performing Review of the Revenue Assurance Controls

4.44 That the auditors of telecom organisation need to be aware of revenue assurance controls and should test these controls as part of the audit engagement can hardly be over emphasised. The revenue assurance controls are performed manually by the RA team. RA may make use of macro based spreadsheets, access or ACL based applications to expedite their routine operational work especially since the volume of data that is being managed and reconciled by RA cannot be handled without the use of automated tools.

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- 4.45 In performing a review of the revenue assurance controls, the auditor should first of all understand and evaluate the overall revenue process in the organisation. This would include but not limited to understanding the flow of CDR movement, the network elements, various billing applications, the organisational structure, structure of the RA department, relevance attached to RA in the overall control environment in the organisation, RAs role in new product testing, RAs role in revenue accounting, controls being performed by RA, use of automated tools to perform RA controls, monitoring mechanism put in place by management to review the activities of RA, Resolution mechanism i.e. how RA reports to and how management responds to the issues raised by RA etc.
- 4.46 The collection of audit information will include:
 - Therviews with the people performing and managing RA activities.
 - The Interviews with people responsible for overseeing the RA activities.
 - Review of RA documentation and procedures manuals.
 - Review of RA reporting schedules, results and resolution log.
- 4.47 This information would be the starting point for planning the approach to be taken in performing the RA controls review. The greater the relevance attached to RA by the management, the higher would be the level of audit comfort, the auditors would like to obtain from testing of the RA Controls. The RA control testing would cover all the revenue streams of the business. The auditor should develop a detailed audit plan indicating the Control objective, RA activities and Validation procedure to test the RA Controls. The results of the validation procedure should be documented and observations if any should be discussed with the management to obtain their comments as well as to identify any mitigating controls that the auditor would need to test to obtain comfort over the area.

Audit Plan - Revenue Assurances (RA) Controls

4.48 The auditor should develop a detailed audit plan indicating the Control objective, RA activities and Validation procedure to test the RA Controls. The results of the validation procedure should be documented and observations if any should be discussed with the management to obtain their comments as well as to identify any mitigating controls that the auditor would need to test to obtain comfort over the area.



4.49 An illustrative Audit plan indicating the control objective, activities performed by RA and validation procedure is given below:

Post Paid

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Control Objective	Activities Performed by RA	Validation Procedures
CDRs are generated at switch for all the successful calls made.	 RA performs monitoring of B tables to check for CDR suppression parameter RA also makes test calls and further traces CDR generation for all possible scenarios to ensure CDRs are being generated in switch for all call types. 	 Inquire from RA, the make of switch in the circle and accordingly inquire about the parameters checked in B table audit. Examine the working papers for proof of reconciliation performed. Additionally also ensure that any variances observed by RA have been properly escalated and close looped. Check for properly documented call scenarios & their mapping to actual CDRs in TT files.
Basic parameter settings for all subscribers is correct on switch	RA should perform Switch vs. Billing- VAS reconciliation for the following features. All mismatches found are further send to Provisioning team for rectifications. 1. STD, 2. ISD, 3. National Roaming, 4. Regional Roaming, 5. International Roaming, 6. CLIP(Caller Line Identification Presentation), 7. CLIR (Caller Line Identification Restriction), 8. PRBT, 9. Fax, 10. Data, 11. Safe Custody, 12. Voice Mail (Additional reco to be done with customers configured on VMS server also), 13. Call Conference/ MPTY(Multiparty), 14. SMS (Separate reconciliation for SMS	 Inquire about the reconciliation activity and understand the following: Frequency of the activity What parameters / VAS services are included How is the reconciliation performed (Access queries, ACL Tool or any other customized program for reconciliation etc.) Who makes the changes in the reconciliation logic in case of reconciliation of new parameters/ VAS services introduced. Escalation Matrix and TAT and service level agreements with other departments for closure of mismatches. Tolerable limits of mismatches How RA keeps track of open cases and repeat observations. What steps are taken to analyse and

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Control Objective	Activities Performed by RA	Validation Procedures
	MO(Originating) & MT(Terminating), 15. Group SMS, 16. CUG (Closed user groups) 17. MMS (Separate reconciliation with MMS server also) 18. GPRS 19. WAP Also check for any additional VAS features specific to operator or circle for which such reconciliations are being performed	rectify the root cause of the problem to ensure minimum mismatches in future. 2. Examine the following: In case the RA teams are using access or ACL, verify the logic used to perform these Reconciliations. Evidence that mismatches have been appropriately escalated and followed up till all observations are closed. Process Note/ approvals for all Direct activations/ provisioning done at the Switch.

Prepaid

Prepaid Customers Profile on Switch is correct RA may verify through reconciliation that all prepaid customers have appropriate parameters defined in switch,

- i. Identification as prepaid / postpaid
 Ericsson: S Type- 9 & 10" and "OICK10,50"
 Nokia: Determined by "Category"
 parameter and IN flag.
 Siemens: INMOC & INMTC Flag.
 Additionally prepaid and postpaid
 numbers may also be segregated on the
 basis of Separate IMSI series.
- ii. Checking of Camel profile
 Ericsson: Camel profile decrementing of Prepaid customer while roaming.

 Nokia: Determines the ability of a customer to Roam.
- iii. Unbarring of Incoming and outgoing Voice & SMS facilities for "0" balance & Grace customers (determined by organisation policy, that what features should be available to customers in such

- 1. Examine working papers of the above activities and their subsequent escalation and rectification.
- 2. Check if RA is covering all the required scenarios and inquire if any additional exception reports are being generated.
- 3. Inquire of any other compensating controls put in place by RA to gain comfort, if any of the above reconciliations are skipped.
- 4. Also examine sample logics of generating these exception reports.



Control Objective	Activities Performed by RA	Validation Procedures
	state). iv. Other VAS features: Status of other VAS features should be in accordance with the Status of customer or any balance threshold limits as set by circle. E.g. an unregistered customer or a grace customer has limited or no features available. Similarly circles having offline charging may define threshold limits in the system. They bar specific features of customers whenever the threshold limits are crossed. v. Parameters and status of pre on post customers.	

Interconnect

Control Objective	Activities Performed by RA	Validation Procedures
All files are received from switch and processed in Interconnect billing system	 Separate reports are generated from switch, mediation & Interconnect billing system giving details of each TT file & number of CDRs in each file that have been processed. File wise CDR count is only available in Ericsson switch report. RA performs the following reconciliation i. Mediation & Interconnect billing system To ensure all files pushed from meditation have been rated at Interconnect billing system. Additionally count of CDRs pushed by mediation to those rated in Interconnect billing system is also matched. A trend analysis of Filtered CDRs at mediation is done to check for any unexpected spikes in the filtered CDR count, which may indicate inconsistencies in the filtration rules definition. 	 Confirm with RA about the reconciliation & subsequent resolution process of these CDR files. Check if all such streams for all MSCs are considered for reconciliation. Examine RA work files for evidences of following reconciliations: Gaps in file sequence numbers Duplicate File sequence numbers Reconciliation of mediation reports with billing reports for each file wise count of CDRs pushed by mediation to those rated in billing. Also ensure that all observations are immediately escalated to concerned teams and RA also keeps track of resolved and unresolved cases to ensure 100% rectification before each month.

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Control Objective	Activities Performed by RA	Validation Procedures
	3. There are scenarios where more than 1 file generating stream (charging Unit) is present in MSC, i.e., 1 MSC may also have parallely 2 or more TT files each with its own sequence numbers.	

Roaming

Control Objective	Activities Performed by RA	Validation Procedures
Rates for new operators are correctly configured in the billing systems (pre & post)	RA may perform the following activities in case of agreement with a new operator: Validate the IR24/IR32 documents and match the CDRs for all successful call scenarios. Check Test TAP files for format and rating as per information in AA14 document.	 Inquire about the new operators who have entered into a roaming agreement in the audit period. Examine working papers for validation of IR documents and test TAP files. Examine close looping of issues.

Results of Revenue Assurance Controls Review and Impact on Audit

- 4.50 In case the auditor finds control weaknesses during RA controls testing, after considering the compensatory controls, the observations should be discussed with the management. Based on the management comments, the observations need to be close looped by documenting the impact on nature, timing and extent of audit procedures, if any, along with documentation of alternate audit procedures that may have to be conducted.
- 4.51 Each and every observation in the RA controls review needs to be discussed in terms of it's potential impact on audit, the materiality of the exception, the compensating controls and mitigating factors, if any and the further audit procedures required in the area. The further audit procedures could include amongst the following:
 - Testing of the compensating controls, if in the judgment of the auditor, the compensating control would address the audit risk arising from the exception. Before testing the compensating controls, the auditor should determine, whether the compensating controls can be relied upon for the purposes of audit. This is done by understanding and evaluating the design of the control.



- Calculating the materiality of the observation. This has to be done by understanding the nature of the observation and identifying the period for which the observation was not remediated. If in the judgment of the auditor, the amount related to the observation is not material to impact the true and fair view of the financial statements, there may not be any further work required. For instance, if it is identified that rating on a particular bill plan was not happening correctly then the materiality of the observation needs to be calculated. For these purposes the nature of the observation i.e., by what amount the rating was inaccurate, was it for all the type of calls (Local, STD, ISD) or for any particular type of call, what is the subscriber base on the bill plan, for what time period did the exception continued etc., would help to determine the materiality of the observation.
- [™] Increase in substantive testing.
- Auditors also need to assess the impact of observations on reporting on Internal Controls under Clause 4 of Companies (Auditor's Report) Order, 2003, as amended by the Companies (Auditor's Report) (Amendment) Order, 2004, issued by the Central Government of India in terms of sub-section (4A) of Section 227 of 'The Companies Act, 1956' of India.
- 4.52 The impact of the RA observations on audit and further audit work should be clearly documented in the Audit working papers.

Data Analysis

4.53 Data Analysis, is another area where information technology expertise can be leveraged while carrying out audit procedures in a telecom organisation. The basic approach is to identify the conditions that should not be present in the entity's data files, if the controls were working properly. By analysing the entity's data, we can identify where controls may not have been working properly or that they have been overridden. Data analysis can be done by designing certain queries which when run on entity's databases will throw up exceptions which can then be further looked into to determine, if there is break down in controls. Many telecom companies have either implemented or are in the process of implementing such data analysis tools. Following are some of the examples of Data Analysis based tests which can be conducted using CAATs:

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- Tests to determine if transactions were authorised based on the user responsible for entering transaction.
- Matching of purchase order, invoice and receiving advice.
- Purchase orders present, where required.
- Duplicate transactions.
- Payments for goods or services to vendors not in the entity's vendor master file.
- The Invalid dates, or dates outside specified range.
- Lack of required approvals.
- Tidentification of transactions passed by a particular ID such as "superuser".



AUDIT OF REVENUE AND RECEIVABLES AUDIT OF REVENUE AND RECEIVABLES AUDIT OF REVENUE AND RECEIVABLES

Background

- 5.1 Few years ago, the telecom sector was relatively easy to define and explain. It comprised of two different types of operators:
 - Fixed line (or wireline) operators That provided traditional phone lines to the home/corporate customers over a copper wire. The major players were State held/government funded corporations.
 - Mobile (or wireless) operators Providing relatively costly mobile phone service to individual subscribers.

The sector has been ever-changing since then, not just in the technology but in the nature of the business. Privatisation has opened the market to newer entrants (the alternative network operators or altness), thus increasing competition.

- 5.2 The operators are now focused on the business potential from smaller or niche part of the market. New products and services are being launched every day, for example, IPTV, Mchek, 3G services, bundled offers etc. Healthy competition and strict regulatory regime has forced the operators to:
 - **Keep** a close check on the pricing structures,
 - Constantly innovate/ offer customised products & schemes for both market acquisition as well as customer retention,
 - Provide best possible customer service, and
 - Elaborately spend on promotion of products.

The rate of development of telecom companies together with increasing complexity of the products and services offered, create an inherent risk over capturing and measurement of revenue.

Revenue & Receivable - An inherently risky audit area

5.3 Revenue & Receivables in the telecom industry are inherently risky audit areas due to

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the following reasons:

- a. Complexity of the systems necessary to capture a billable event (phone call, video download, SMS etc)
- b. Complexity of pricing or tariffing arrangements (depending on destination, time of day; is the service within your monthly allowance/bundle or outside?)
- c. The ever-changing complexity of the offerings available from service providers
- d. Customer portability, within and across countries
- e. Low value and high volume transactions and receivables base.
- 5.4 Our audit procedures should be focused on getting comfort on the following financial statement assertions:

Revenue	Receivables	
Completeness	Completeness	
Accuracy	Accuracy	
Cut off	Valuation	
Valuation	Rights & Obligations	
Existence / Occurrence	Presentation and Disclosure	
Presentation and Disclosure		

Auditing Revenue & Receivables of Telecom Industry

- 5.5 The discussion is broadly categorised as follows:
 - Products & Services offered today in the sector, categorised broadly into:
 - Mobile Services
 - Fixed Line Services
 - Network Overview structure of a telecom network, to the extent it is relevant to the revenue cycle, again categorised broadly into:
 - Mobile Services
 - Fixed Line Services
 - Revenue Cycle explaining its key stages and related risks
 - Auditing Considerations Specific financial audit risks and typical audit procedures for each revenue & receivables related account balance in the financial statements specific to telecom industry.



Products & Services

- 5.6 The products and services in the telecom sector can broadly be split into,
 - a. Mobile (or wireless) Services.
 - b. Fixed line (or wireline) Services

Mobile (or wireless) Services

5.7 Definition - A communication network that links two or more mobile devices (handset) by a radio based technology within the area of coverage. The main advantage of mobile or wireless communication is the mobility of the user, since both the terminal (handset) used and access to the telecom network are basically independent of a fixed location.

Types of Operators

Following are the different type of operators other than traditional mobile network operators:

- a. Joint Operators: Operators that provide both fixed line and mobile services. For example BSNL, MTNL, Bharti Airtel, Reliance etc. Conventionally, many of these operators have managed the fixed line and mobile operations as if they were two separate businesses. This trend is starting to change as these operators consider taking the 'quad play' (phone, broadband, IPTV and mobile) proposition to the market. Many companies are indicating they will merge management teams and offer seamless services.
- b. *Mobile Virtual Network Operators (MVNOs):* A Mobile Virtual Network Operator is a company that does not own a licensed frequency spectrum, but resells wireless services under their own brand name, using the network of another mobile operator. It is effectively the equivalent of a reseller in the fixed line sector. For example, Virgin Mobile, etc. MVNOs tend to service the prepay mobile market as they do not own the sophisticated infrastructure to develop and offer more advanced 2.5G and 3G services. The billing relationship between the MVNO and its customer is often managed by the mobile operator whose network the MVNO is utilising to deliver service.

Types of Products and Services

a. Voice - In addition to the basic telephony service, offers often include free add-ons

Audit in Telecom Industry - Revenue, Fixed Assets and Related Operating Costs

such as call waiting, call identifier and messaging service. Some mobile operators are starting to offer VoIP through partnerships with companies such as Skype.

- b. Video Calls
- c. SMS
- d. MMS
- e. Content download
- f. Internet Access
- g. Television

Fixed Line (or wireline) Services

5.8 Definition - A fixed communication network physically links two or more static devices (telephones, facsimile machines, computers, television) by electric cable (copper) or optical fibre. Originally the fixed telephone network was an analogue network, which generally only carried voice traffic. Gradually the technology has moved towards digital networks. Operators have invested significant amounts in the construction of integrated digital networks capable of carrying data traffic as well as voice.

Types of Operators

- a. *Incumbents:* Traditionally every country had one fixed line operator which was government owned the PTT. Deregulation has resulted in the break-up of these monopolies and the sector has experienced increased levels of competition and innovation. The traditional government-owned operators are referred to as incumbents.
- b. Alternate Network Operators (Altnets): The newer entrants are called alternative network operators or "altnets". Examples of these operators in India are Bharti Airtel, Reliance etc.
- c. Resellers: Incumbents and altnets have constructed and own their network infrastructure. There are also service providers who do not own network infrastructure. These companies purchase capacity from either the incumbents or altnets and resell it to their customers. Such service providers are generally referred to as resellers. Resellers tend to develop territory to territory and are not global or regional brands. Currently, there are no such resellers in India.



Types of Products and Services

a. Home

- Voice Service Also known as Plain Old Telephone Services ("POTS") available on fixed or mobile phones. Offers often include free add-ons such as call waiting, call identifier and messaging service.
- VOIP Similar to voice service except that voice conversations are routed over the Internet or through any other IP-based network. The calls can be routed to a laptop or IP compatible phone. The costs of longer distance and international calls are much lower than a traditional voice service.
- This may take the form of:
 - Dial-up the customer uses a modem to connect a computer to a telephone line and dials into an Internet service provider's ("ISP") node, for example, MSN or Yahoo, to establish a modem-to-modem link, which is then routed to the Internet.
 - Digital Subscriber Line (DSL) technology that provides digital data transmission over the wires of a local telephone network.
- TV Increasingly, telecom operators are moving into the entertainment business by offering subscription or pay per view TV access. For fixed line operators, this is generally through IPTV. For mobile operators it is through DVB-H.

b. Business

- Leased Lines These are physical symmetric telecom lines connecting two locations (A and B) together, each side of the line being permanently connected to the other. They are suited for high-volume traffic, and can be used for telephone, data or internet services. The leased lines are often referred to as "point to point" circuits. They are increasingly being replaced by VPN.
- Virtual Private Network (VPN) This is a private communications network that connects multiple sites securely. It is often used within a company, or by several companies or organisations, to communicate confidentially over a publicly accessible network. Now that encryption technologies have developed, it is no longer necessary to have dedicated fixed point-to-point circuits. Many corporates are opting for the VPN.

Audit in Telecom Industry - Revenue, Fixed Assets and Related Operating Costs

- Facsimile (FAX) This is a relatively more economic offering as the telecom company does not need to build dedicated lines from A to B. It can use the existing network to offer the service to its customer, hence making it more cost effective. Though not the latest technology, faxing stills plays an important role in business in transmitting paper documents between companies.
- Hosting and Managed Solutions Hosting is a managed service that runs internet servers, allowing organisations and individuals to access internet content, using either the telecom operator's servers or their own servers located in the telecom operator's data centre. There are various levels of service and various kinds of solutions offered.

Types of Customer - Both Mobile and Fixed Line Services

- 5.9 There are three main types of customers serviced by both fixed line and mobile operators. These are:
 - Residential or retail customers the main services used by retail or residential customers include voice, Internet access, texting and content downloads.
 - Corporate customers the needs of a corporate customer are very different to those of a private customer. They can range from small and medium size enterprises (SMEs) to large corporations employing thousands of people.
 - Other telecom operators no telecom operator in the world has an end-to-end network that connects every person or corporation. Yet we all expect to be able to make a call or send an email to anybody in the world. In order to be able to connect us, telecom operators interconnect with each others networks to carry phone calls and data. Accessing other operators networks is called interconnection for fixed line operators and roaming for mobile operators.

Billing methods

- 5.10 Following are the billing / charging methods currently prevailing in the telecom industry:
 - Connection / Installation One-off fee charged when the customer signs up for service with a new telecom service provider.



- from customer to customer depending upon the bill plan opted.
- Per event charges Billed for each time the customer sends a text message (SMS) or picture message (MMS) or downloads content. These are usually billed in arrears on each invoice.
- Bundled offer The customer receives a monthly allowance of minutes, texts, downloads etc., for a fixed monthly charge.
- ** Line rental Fixed amount billed periodically as set out in customer's contract. These are usually billed in advance on each invoice.

Table - Billing: An illustration of a bill raised to a customer

Account Summary				
Previous Balance (Rs.)	Payments (Rs.)	This Month's Charges	Amount Payable by Due Date (Rs.)	Amount Payable after Due Date (Rs.)
5,710.98	5,711.00	4,525.86	4,525.86	4,675.86
This Month's Charges				
One Time Charges	5			0.00
Monthly Charges				295.00
Usage Charges				
Call Charges				1,395.41
Value Added Serv	rices			126.60
Roaming				2,289.88
Credits				0.00
Discounts				0.00
Adjustments				0.00
Late Fee				0.00
Total Charges				4,106.89
Service Tax				410.76
Education Cess				8.21
This Months Cha	rges			4525.86

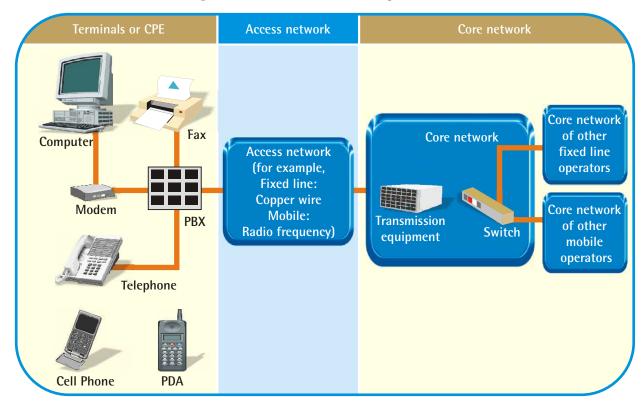
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Network Overview

5.11 A telecom network is a very complex computer system. Indeed, the pace of ongoing technological change means that this complexity is increasing by the day. Here we will simply outline the major components, particularly where they are relevant to the revenue cycle.

Generic Network Structure

5.12 Mobile and fixed line network structures are distinct from each other. However, there are certain components which are common in both. A generic network structure consists of three components, as shown in the diagram:



5.13 Terminals or Customer Premises Equipment (CPE): Customers access the network using a terminal. This is often a handset, but it could be a fax machine, computer, PDA



device, Cable TV set-top box etc. Terminals are sometimes referred to as Customer Premises Equipment "CPE".

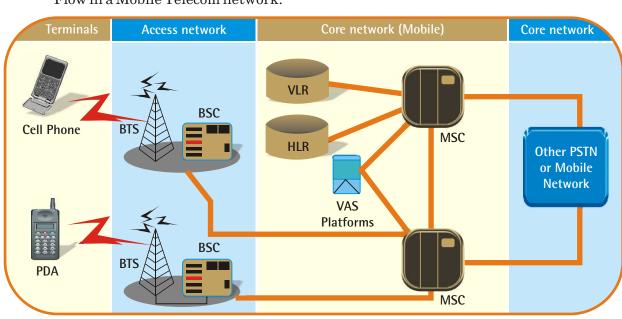
- 5.14 Access Network: The access network is the direct point of connection between the phone (terminal) and the network. If using landline then the access network is likely to be the phone line (copper wire or fibre optic cable) that runs from home or office. If using mobile then the access network will be wireless, transmitting call by means of radio frequencies.
- 5.15 Core Network: Once there is access to the network, the phone call (or text message, email) will generally flow through the core network to its destination. The core networks of fixed line and mobile operators are similar and generally include the following components:
 - Switching equipment The switch captures important billing information for voice calls and also determines the route of calls.
 - Transmission equipment This enhances the capacity of the infrastructure.
 - Infrastructure such as cable and duct This is core infrastructure that carries the traffic across the network.

Mobile Telecom Network

5.16 The basic components of a Mobile Telecom Network are illustrated in the diagram below:



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Flow in a Mobile Telecom network:

- 5.17 Each of the components of the flow in mobile telecom network has been explained as follows:
 - 1. **Terminals:** Mobile networks are accessed using a mobile phone or similar handheld device. Terminals are increasingly used for receiving and sending data. The types of terminals would include mobile handsets, data cards etc. Any mobile handset would have the following major components:
 - a. Subscriber Identity Module (SIM) Smart card which carries all the subscriber specific information. Its major functions include identification of the current user of the mobile network / handset, storing personal information of the user, permanent storage of subscriber's IMSI and Authentication key (Ki), semi permanent storage of system information e.g. current Location Area Identity (LAI), telephone directory, short messages etc.
 - b. *Mobile Equipment (ME)* ME provides the radio and processing needed to access the GSM network, plus a Man Machine Interface (MMI) to enable the user to access services. Specific functions include serving as a radio transceiver, power control, call handling, man-machine interface, display,



keypad, speech transducers, interfaces to external equipment e.g., laptops, palmtops etc.

- 2. **Radio Access Network (RAN):** The mobile access network, which is virtual or wireless, is referred to as the Radio Access Network (RAN). The RAN is a collection of cell sites that overlap. As we walk along and talk on a mobile phone, the phone call is handed over between the cells to ensure the continuity of the call.
- 3. Base Transceiver Stations (BTS): BTS provides GSM radio coverage within a cell. It comprises of radio transmitting and receiving equipment (including antennas) and associated signal processing. Its specific functions include radio transceiving and signal processing. A mobile phone accesses the core mobile network by means of radio signals transmitted by Base Transceiver Stations (BTS), sometimes referred to as mobile masts. In 3G networks, the BTS equivalent is called a Node B. A BTS contains the equipment for transmitting and receiving radio signals (transceivers), antennas, and equipment for encrypting and decrypting communications with the Base Station Controller (BSC).
- 4. Base Station Controller (BSC): BSC connects the BTS to the Mobile Switching Centres (MSC). It is a small switch with enhanced processing capability. It acts as a local concentrator of traffic and provides local switching to effect handover between a number of BTSs. Its responsibilities include coordination and control of a number of BTSs, traffic concentration and low level switching operations. The BSC not only provides a physical link between the MSC and BTS or Node B, but also manages the call and control radio frequency power level in the BTS or Node B. A number of BSCs can be served by a single MSC.
- 5. **Mobile Switching Centres (MSC):** MSC is an ISDN switch with significantly enhanced processing capability. An MSC will parent a number of BSCs and is responsible for call handling of the mobile subscribers within its domain. This

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includes generating call charging records for billing. Specific responsibilities of the MSC include generation of call records and inter BSC & inter MSC handover of calls. The MSC captures important billing information for voice calls and also determines the route of calls. The functions of the MSC are the same as those of the switch in the local exchange of the fixed line network.

The call details / data recorded in MSC is called Call Data Record. The CDRs include:

- A number
- B-number
- Start time
- End time
- Kb (Data) used
- To Others

Further, the types of CDRs include:

- Mobile Originating Call MOC (Billable)
- Mobile Terminating Call MTC (Non Billable in Home Circle)
- SMSMO Billable
- SMSMT- Non Billable other than when in form of Content
- Call Forwarding Billable
- Emergency Calls Police, Fire Brigade etc
- Transit Calls
- Roaming Calls
- 6. **HLR and VLR:** The MSC validates the identity of the subscriber before connecting the call by drawing information from two key databases: the Home Location Register (HLR) and Visitor Location Register (VLR).

HLR is an intelligent database and service control function responsible for management of each subscriber's records and control of certain services. It is a central database that contains the details of every SIM card issued by the mobile operator that is authorised (provisioned) to use the network. It carries subscription details for a



subscriber and location information enabling the routing of calls. Responsibilities of the HLR include management of service profiles, mapping of subscriber identities (MISDN, IMSI), execution of supplementary service logic e.g., barred incoming and passing subscription records to VLR.

When a person makes a call, the HLR validates whether the customer can access the network or not. When a person receives a call, the HLR will also work out where the person is geographically located and tells the network which cell to send the call to, so that the person receives it.

The VLR is a similar mechanism that handles calls when customer is in another country / region. VLR is an intelligent database and service control function. It stores (on a temporary basis) the information needed to handle calls set up or received by sets registered with it. This includes their International Mobile Subscriber Identities (IMSI), current Location Area Identities (LAIs) and supplementary service entitlements.

- 7. **Intelligent Network (IN):** An Intelligent Network is a telephone network architecture in which the service logic handling a call is located separately from the switching facilities. In an Intelligent Network (IN), the logic for controlling telecom services migrates from traditional switching points to computer-based, service-independent platforms. This provides network operators an open platform provisioned with generic service components that can interoperate with elements from different vendors. This platform can be used to develop new and different services. IN platforms can capture non-voice usage services such as content downloads, ringtones etc. IN generally works in the following way:
 - a. Once a call is originated, the switch determines whether it is a normal call or a call for an IN service.
 - b. This is done based on a profile information obtained from the HLR.
 - c. A normal call is completed as usual by connecting to the called party.
 - d. If it is an IN call, the switch then queries the IN control point asking for further instructions.
 - e. The IN completes its processing, e.g., checks the validity of the pre-paid card

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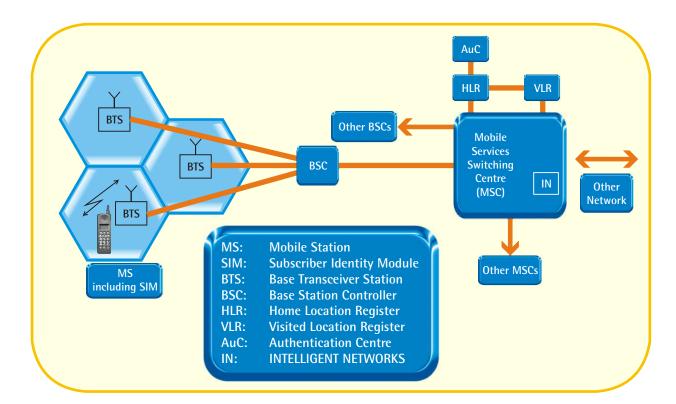
and then instructs the switch to complete the call.

Access techniques in a Mobile Network

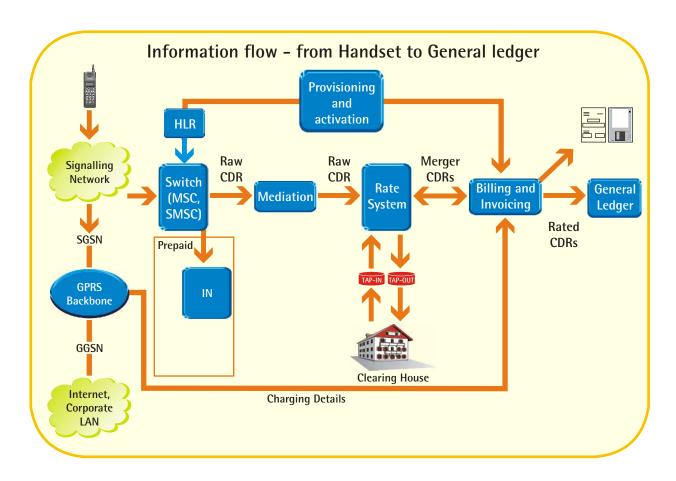
- 5.18 Different access techniques in a mobile network are:
 - a. *Global System for Mobile communications (GSM):* Under this access technique, the set of standards are set by European Telecommunication Standard Institute specifying the infrastructure for cellular services. This technique is getting used in more than 200 countries.
 - b. Code Division Multiple Access (CDMA): Radio signals associated with a call are spread across a single broad frequency spectrum. Each call in the spectrum is differentiated from other calls in that spectrum by assigning a unique code to each call's signal.

Route of a Call Route - from Handset to MSC

5.19 The route of each call has been illustrated in the diagram below:



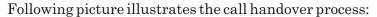


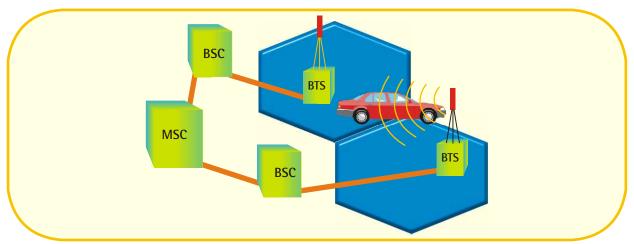


Switching of an on-going call to a different channel or cell

- 5.20 A call is continued, without any interruption, even if the customer moves from one BTS's range to another. The Continuity of the call is managed by a call handover process. There are four phases of a call hand-over:
 - a. Base Station Controller (BSC) decides a hand-over is needed, as the customer is going out of the range of the BSC.
 - b. A Second mobile connection is established, with another BSC in the range which the customer is moving into.
 - c. The MSC connects to new mobile connection.
 - d. The initial mobile connection is closed.

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Roaming on mobile networks

5.21 When a mobile network sends traffic to a fixed line network, this is also called interconnect. Roaming is a variant of interconnect where mobile telephone customers are granted access to other networks either locally (national roaming) or abroad (international roaming), without physical connection of the two networks. Provided the two operators have a roaming agreement, customers are allowed to access the other network while abroad. The operator in the host country will charge your service provider when you access its network, either to make or receive calls. Your operator then charges you roaming fees, even to receive calls. Therefore, mobile operators will have both roaming revenues as well as roaming costs, in addition to those from interconnect.

Fixed Line Networks

- 5.22 Each of the components of the Fixed line network has been explained as follows:
 - 1. Terminals or Customer Premises Equipment (CPE): In fixed line networks, CPE generally includes landline telephones, modems, Cable TV set-top boxes and private branch exchanges (PBX). At home, customer generally accesses the fixed line service provider through a land line phone (connected through the phone jack). Fixed line service provider's network may also be accessed via a PC and modem for internet service. In office, probably access to fixed line service provider's network is generally



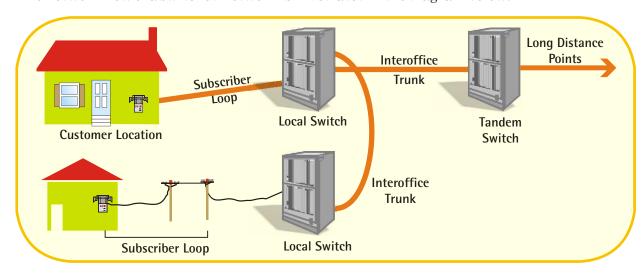
made via land line phone, fax and through PC.

- 2. Local Loop: The access part of a fixed line network is fixed, providing a physical link between the terminal and the rest of the network. At home generally the access to the network is made through a copper wire running from customer premises to the local exchange (switching centre). This copper wire is often referred to as the "local loop" or "last mile". In office, access to the network is generally made through a dedicated leased line or Virtual Private Network (VPN). The access will typically be over a fibre optic cable.
- 3. *Core Network:* The Core network includes:
 - Switching equipment / IN Platforms
 - Transmission equipment
 - Tinfrastructure such as cable and duct.

Types of Network

- 1. Switched Network
- 2. Dedicated Circuits
- 5.23 Switched networks consist of customer premises equipment, the subscriber loop, local and tandem switches and trunks between switches.

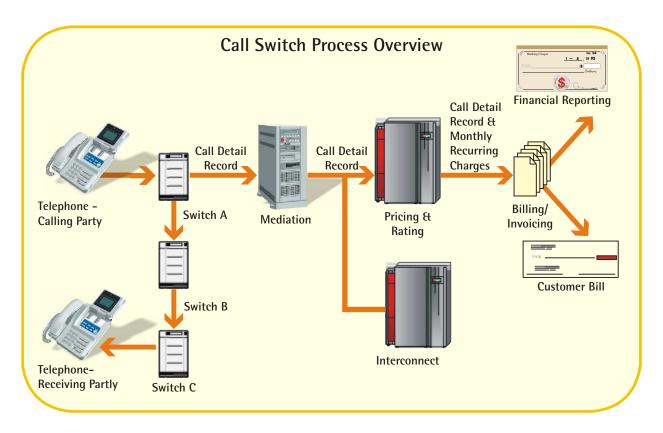
The network flow of a switched network is illustrated in the diagram below:



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An end user may reach any other end user anywhere on the network by dialling a telephone number.

- a. Public switched network Allows any end user to reach any other end user. This is "open" in the sense that access is not restricted to only members of a particular user group.
- b. Private switched networks Allows end users to reach only other end users that are members of a "closed" group. Typical call routing relies on dialling fewer digits than are needed in the public network.

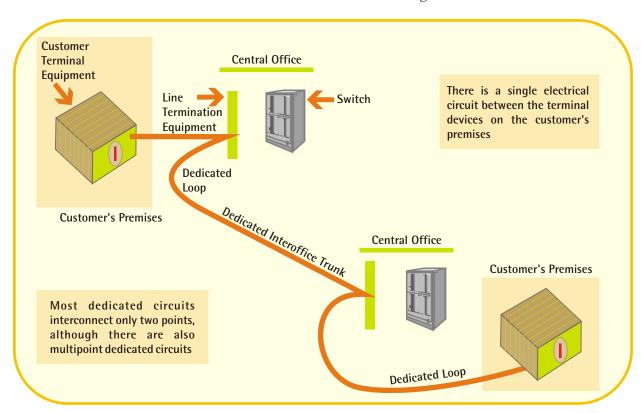


Dedicated circuits

5.24 The end user may only reach the destination at the other end of the same circuit. No switching takes place.



The network flow of a dedicated circuit is illustrated in the diagram below:



Revenue Cycle

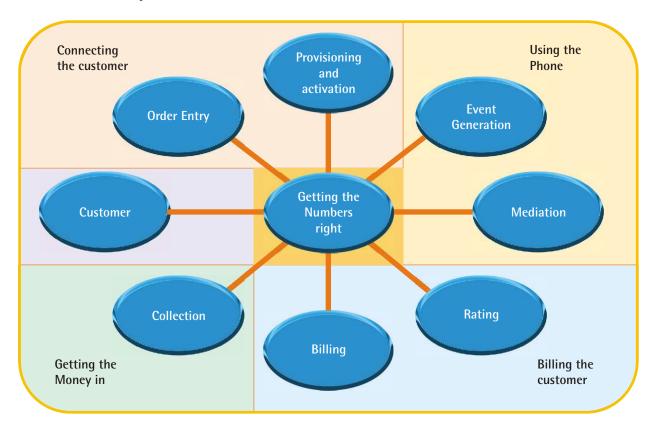
5.25 In order to provide high-quality services and bill its customers, a telecom company needs to have a number of sequentially interlinked processes in place. These processes are known as the Revenue Cycle.

These processes start and end with the customer. They all need to run correctly in order to retain happy customers, and derive revenue from them.

The components of the revenue cycle apply to both small and large telecom operators. The main differences relate to the number and complexity of the services provided. This will have an impact on the processing capacity of the systems, and the complexity of the internal control mechanisms required to monitor the effectiveness and efficiency of the processes.

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5.26 Revenue Cycle has been illustrated as below:



- 5.27 As it becomes clear from the above diagram that the Revenue Cycle has 5 main stages:
 - a. Connecting the customer
 - b. Using the phone
 - c. Billing the customer
 - d. Getting the money
 - e. Getting the numbers right

Connecting the Customer

 $Stage\ 1: Reaching\ the\ Customer\ and\ offering\ products$

5.28 For the products to be sold, each company needs to perform certain sales & marketing



activities, to make the product attractive and reachable to the customers. Following are the example of few sales and marketing assurance questions:

- How are new products developed? Who can develop them?
- What ensures all new products & services can be utilised by our customers?
- Mow do you know the billing systems have been updated with the correct products or pricing?
- Mow do we know what commissions we need to pay our dealers?

Each of the decisions above may have direct/indirect implications on the audit.

Stage 2: Connecting the Customer - Order entry

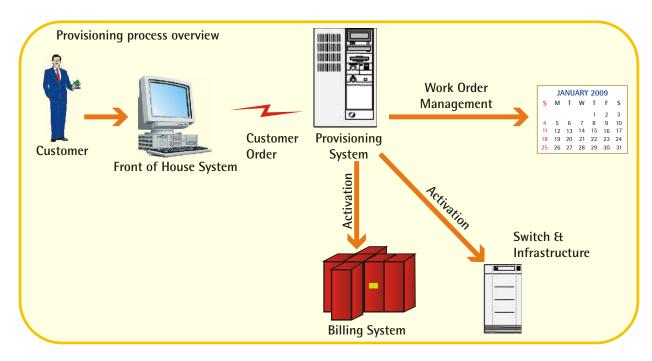
- 5.29 For this process to be successful, the companies need to ensure that they have recorded the required details completely and accurately. These include:
 - a. Name and address
 - b. Pricing plan
 - c. Billing details
 - d. Equipment to be included
 - e. Location
 - f. Starting time of the services based on time (if any) required to install and activate equipment, verify identification proofs, creditworthiness and assigning credit limits (if any).

Stage 3: Connecting the Customer - Provisioning and activation

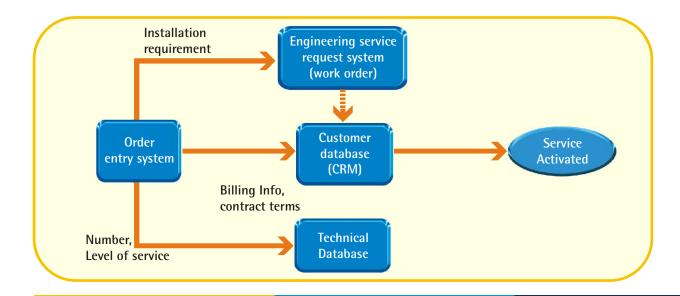
- 5.30 Provisioning is the process by which the customer is activated on the network for service. It is the process of successfully completing a customer's 'request for service'. Provisioning generally involves the following activities:

 - Providing the infrastructure to meet the service request
 - Integration of the service into the network
 - Update of the billing systems for the new service

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5.31 It is also the process by which customer details are input to the other business support systems- CRM, technical database billing etc.





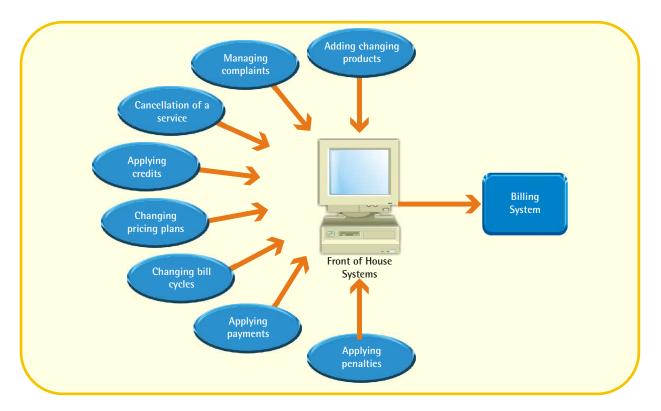
- 5.32 Following are the examples of assurance questions in relation to provisioning:
 - Mow do we ensure the customer has been provided with the correct products and pricing?
 - Mow do we know what products and services are available for the customer?
 - Mow do we know the customer is not a credit risk?
 - How do we know we are charging/quoting the customer the right amount?
 - How do we determine all the necessary information has been captured?
 - What ensures a customer is being billed for the services they are using?
 - Mow do we know we are not billing a customer for a service/product that we haven't delivered?
 - Mow do we know the service has been activated?
- 5.33 Activation of the service that is technically possible or ready for service ("RFS"), may be carried out automatically via the switch or the HLR. To provide more complex services, this will require engineer involvement, which will involve some additional complexity and time.
- 5.34 Pre-provisioned: In some cases, the telecom operator will reserve phone numbers and complete the necessary procedures to provision the SIM card on the various operating system platforms before a customer has requested the service. This allows telecom operators to activate new customers more quickly when they request service. If you move into a new house that already had telecom service, then generally the phone connection will have been provisioned before, hence connection is quicker
- 5.35 Provisioning mobile customers: As mobile phone customers are not physically connected to the network, the phone's SIM card is the mechanism by which the customer's service is activated onto the network. Every SIM number in the world has a unique number so only one customer can be connected to one network via a SIM. The SIM may already be pre-provisioned when the handset is shipped to the store. Once the phone is switched on, the customer is automatically connected to the network. This is often the case with handsets included in a prepay packs.

Otherwise the assistant in the store needs to call the operator's customer services

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department with the SIM number so that the handset can be provisioned to the network.

5.36 FoH Activities: There may be certain other interventions / activities by the Customer care team (in other words Front of house (FoH) activities), which may affect the provisioning process / other components of the revenue cycle. Some of the FoH activities which may affect the Revenue cycle are illustrated below:



- 5.37 Some of the assurance questions in relation to FoH activities / customer care are:
 - Were the changes appropriately approved?
 - Was the person authorised to make the change?
 - Are changes to services and credits approved?
 - How do we know all changes will get processed and end up on the customers bill?

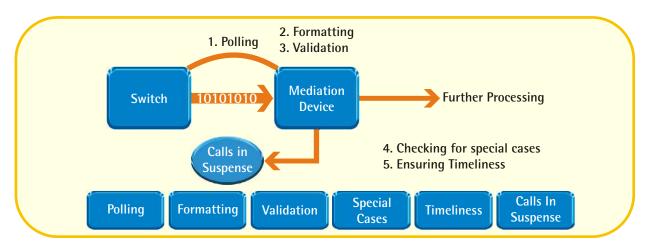


Using the Phone

Stage 4 and 5: Using the Phone - Event generation processes & Mediation

5.38 For voice, systems used to record event information are based around the Switch, basically a large computer that not only routes and manages the calls, but also records all events generated by that switch. The Call Detail Record (CDR) captured by the switch represents the start of an accounting record for financial reporting purposes.

The key aspects of this process are shown in the diagram and explained below:



- a. *Polling* All CDRs recorded in all the switches must be transferred to the information processing and billing systems in a complete and timely way, on a fixed schedule this is known as polling. The mediation device polls the switches on a regular basis to send over the CDRs for processing via strict polling schedules.
- b. *Formatting* Since every switch manufacturer uses its own technology, the mediation device translates the files retrieved from the switches into a uniform format. This is called the formatting process.
- c. Validation of the CDRs- Validation means that all fields of a CDR are checked, whether these contain values that are to be expected. If the mediation device is unable to repair an incomplete CDR, it will drop these in so-called suspense buckets or error buckets for further manual or automatic processing before transferring back into the regular process again. The mediation process is furthermore essential to monitor the accurate content of the CDRs at the

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- beginning of the process, since, the further incorrect CDRs progress through the rating and billing process, the more difficult and costly it will be to restore or delete the CDRs, particularly if the volumes are high.
- d. *Checking for special cases* The mediation device also checks whether there are duplicate files and connects CDRs that are related such as very long calls or calls over different time periods for which more than one CDR was generated.
- e. Ensuring timeliness Customers will not accept that their events are only being charged months after the actual date of the event. This is particularly the case with international roaming charges for calls being made while being abroad. There are mostly arrangements in place whereby CDRs have to be provided to the home country telecom company within a specific time frame. CDR files are therefore verified on the sequential numbering and date of the content.
- f. Calls in suspense (error buckets) Whenever the mediation is unable to format or validate a CDR, it will "drop" these CDRs in an 'error bucket' for further analysis and restoration. This mostly requires manual interface and judgement on whether the CDR should be restored or deleted.
- 5.39 Following can be examples of assurance questions in relation to Switch & Mediation. Main focus is on the completeness & accuracy of the call capture and transferring this information to down stream systems:
 - What ensures all calls are captured?
 - How do we know the correct information has been populated in the call record?
 - Thow do we ensure all call records are collected & distributed to downstream systems for billing?
 - How do we ensure the calls are sent to the correct downstream system?
 - Mow is the reference data within the switch maintained?
 - How are reference table changes made?
 - Who is authorised to make changes in reference tables (if any)?

Billing the Customer

Stage 6: Rating

5.40 After the mediation device has ascertained that only uniform and complete CDRs are being



used, the CDRs are transferred to the rating engine. The rating system computes the cost of the event based on the information contained in the CDR in combination with the rating table and the line number databases that maintain the number ranges of the telecom company. The cost is then inserted in the appropriate field in the CDR.

- 5.41 This system uses rating tables to represent the standard price plans from the telecom company. The rating tables may be very complex, depending on the number of tariffs and conditions the telecom company has set up. Rates may depend on the time of the day (peak, off-peak), the network used (on-net, off-net), origination (roaming), the destination (zone, local, interlocal, regional, national, international/country), type of event (regular, 0800, 0900, content), set-up costs, etc. These rate tables do not contain any information about specific arrangements with the customers. The rating engine therefore only rates the CDRs based on standard tariffs, without taking into account any flat rate, free minutes or other discounts plans agreed with customers. This will be done later in the billing system based on the (individual) pricing plans for each customer.
- 5.42 Following can be examples of assurance questions in relation to rating:

 - Who has access to make changes to rating and pricing tables?
 - Mow do we know we have applied the correct call rate?
 - Mow do we ensure all calls are rated and priced?
 - ≅ How do we ensure the correct customer pricing is included?

 - Mow do we know filtered records should not be billed?

Stage 7: Billing

- 5.43 Telecom companies normally have hundreds of thousands to millions of customers who need to receive their invoices on a periodical basis, mostly monthly, bi-monthly or quarterly. To be able to process these invoices on a timely basis, most telecom companies use billing groups/cycles to divide the customer base up into manageable sizes.
- 5.44 The first group will receive their bill at the start of the month, while the last group will

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receive the bill at the end of the month. At the end of the month the first billing group will therefore have 30 days of unbilled events that will only be billed at the start of the next month. The system that calculates and formats the bill is called the billing system. This system pulls the standard rated information from the storage system, the pricing plans and billing formats, per customer from the customer database and calculates the costs as per the pricing arrangement.

- 5.45 As with the rating engine, this system generally requires extensive and reliable computing capacity, based on the complexity of the pricing plans and the size of the client base. The billing system retrieves the data stored after the rating process, and then uses it to calculate and format the bill to be sent to the customer, in accordance with the pricing plan agreed upon.
- 5.46 Following can be examples of assurance questions in relation to billing:
 - The Have all calls been billed?

 - Are all physical invoices produced?
 - How do we monitor the billing process to ensure all tasks are undertaken?
 - Are all the charges on the bill valid?

 - The Have all the non-usage charges being applied including recurring and non-recurring charges?

Getting the Money

Stage 8: Getting the money in - Collection

5.47 With millions of customers, the telecom company may have a large number of total outstanding invoices with relatively small amounts per invoice. The outstanding balances can be quite substantial. Payments made by customers need to be credited against the outstanding balances. Given the nature of the balances, an automated system using direct debits is preferable for telecom companies. In practice, in some territories, the number of direct debit customers may be relatively limited, and manual activities may still be required to process other forms of payment, such as



cheques and telephone debit card payments.

- 5.48 In order to control the outstanding debtor balances, the telecom companies require a system that monitors the outstanding balances on a continuous basis and that supports the company to take appropriate actions when payments terms are exceeded. This system or process is generally called a dunning system. However, collection issues can also arise with customers acting in good faith, for example, where the customer does not agree with the invoice or is dissatisfied with service. In these instances, it is important that the telecom company has a good customer relations department that will take timely and appropriate action to resolve any complaints, thus managing and mitigating the risk of non- payment from these types of customers. Often in these cases the customer will be given a credit (goodwill or otherwise) that will be applied on the following month's bill.
- 5.49 During the collection process, the telecom company has to deal with a large number of customers with bills that are relatively small in value. The total balances can therefore be large and collection of overdue payments might be a very tedious process. Accordingly, each telecom company has to maintain a long & penetrating collections network, which can either be in-built or outsourced to a professional agency or based on an agency model where there could be commission based representatives collecting on Company's behalf.

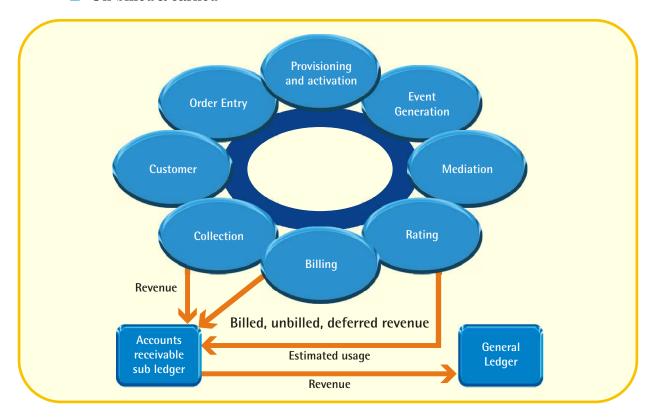
Getting the Numbers Right

 $Stage\ 9:\ Getting\ the\ numbers\ right\ Accounting\ for\ the\ Financial\ Impact\ /\ Financial\ Posting$

- 5.50 This is the final stage of the Revenue Cycle. It involves recording of revenue numbers in Financial books. For auditors other than system specialists, probably this stage is the starting point for the audit of revenue.
- 5.51 Accounting for the revenue normally takes place based on information from the billing and collections systems. Revenue postings are broken down by:
 - Product
 - Usage or network & connection
 - Billed & unearned

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- Billed & earned
- Un-billed & earned



- 5.52 Following can be examples of assurance questions in relation to financial posting:
 - How do we know the revenue postings are correctly classified?
 - How do we know all postings have been received?
 - Does the sub-ledger and account ledgers reconcile?
 - Do the postings appear reasonable? What analysis is performed?
 - Mow do we know the values are correct?
- 5.53 Aspects to consider for accounting of revenue are:
 - a. When revenue is recorded in the general ledger
 - b. Treatment of the different items (specially items of special nature)



- c. Dealing with unbilled revenue
- d. Analysing the data
- e. Automated and manual payments

Additional Aspects

- 5.54 Some of the additional aspects are:
 - a. Interconnect: when the telecom company has to deal with other networks that are physically connected.
 - b. Roaming: when customers travelling abroad use the services of agreed local operators
 - c. Pre-paid services: They are not billed and therefore have a somewhat different Revenue Cycle.

Interconnect

- 5.55 Operators interconnect with each other for completion of calls. Types of Interconnect include:
 - Local interconnect
 - National/International interconnect

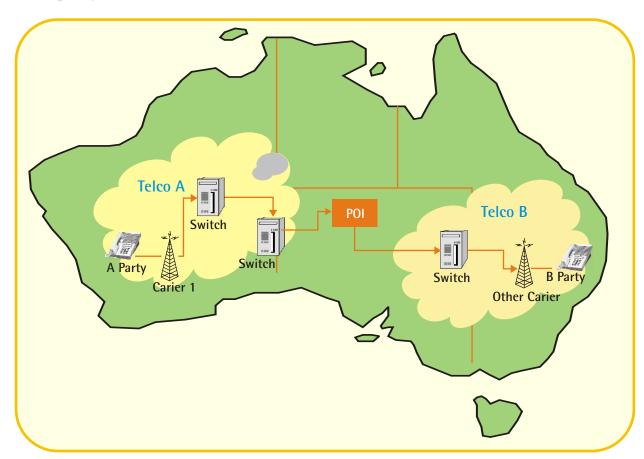
Interconnect Usage Charges (IUC) includes:

- Carrier charges
- Termination charges
- Access Deficit charge (ADC)
- 5.56 IUC rates are defined by the Telecom Regulatory Authority of India (TRAI) and are revised from time to time. Interconnect activities involve the following:
 - Traffic generated between two physically connected networks is handled by gateway switches, with similar characteristics to ordinary switches, at both ends of the networks. These switches record CDRs that will be used for the billing of originating and terminating traffic between the telecom companies.
 - The telecom company of the customer originating the call will charge their customer for delivering the call to the other network. These events flow through the regular Revenue Cycle sub-processes like any other event.

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- The other operator (where the call terminates) will charge home operator (where the call originates) for terminating the call, i.e. for allowing access to its network.
- The amount billed by the other telecom companies is verified by the home Telecom company by comparing it to the details on its own gateway switch recordings. It is usual for differences to be noted between the operators systems. These can arise for many different reasons and make the audit of both interconnect revenue and interconnect costs difficult and at times judgemental.

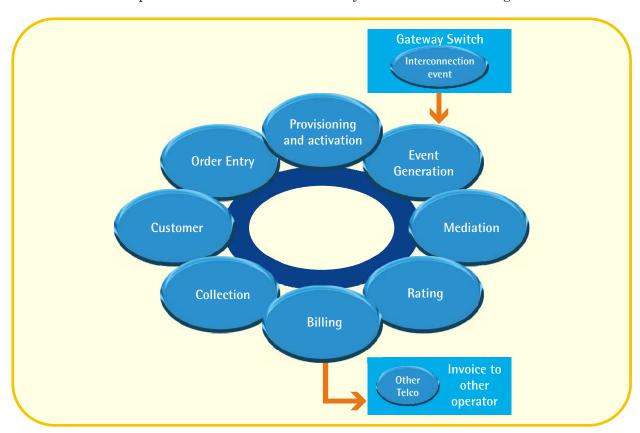
Example of an Interconnect





Example's Narration:

- Telco A customer makes a call to Telco B customer.
- This call is forwarded through several switches before being passed through to Telco B via a designated Point of Interconnect (POI).
- Telco B then terminates the call within it's network.
- This situation will generate revenue for Telco B and a cost for Telco A.
- 5.57 Relationship of Interconnect into Revenue Cycle is shown in the diagram below:



5.58 Interconnect - the risks

The main additional risks that relate to interconnect activities are:

The telecom systems may not have recorded the same information, for example, one or both of the operators dropping CDRs at the switch, the operators cutting off

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- at different dates, hence comparing information that will require specific reconciliation,
- The pricing arrangements may have a number of charging mechanisms that might be misinterpreted by either party. Particularly when large amounts of traffic are running over other networks, the financial impact of disputes can be significant.
- 5.59 Following are the examples of Interconnect assurance questions:
 - Are we receiving revenue for all the traffic carried?
 - Are the correct rates applied to the call traffic carried?
 - Are the records from other carriers valid?
 - To we reconcile all carrier statements?
 - Are we receiving all payments in a timely manner?
 - Is the amount paid to the other carriers correct?
 - ☎ Are all records processed end-to-end?
- 5.60 Auditors should be focused on ensuring that all costs have been recorded and that revenue is not inappropriately recorded. Hence, on the costs side, it is usual to focus on ensuring carrier disputes have been understood and whether the "worst case" cost scenario has been recorded.
- 5.61 At the same time, the auditor will be focussed on assessing if it is appropriate for an operator to record interconnect revenue on all or part of a balance that is being disputed. In assessing the appropriateness of recording these revenues, we need to consider the evidence in support that it is probable that the cash payment in respect of the revenue will be settled. This is further complicated by the fact that some operators do not settle their interconnect balances with cash. Instead they agree to balance the traffic on a periodic basis.
- 5.62 As you can imagine, it is very usual for operators to have differences in the data captured by their respective systems. Most operators, either individually or as an industry norm in their territory, have a rule of thumb to agree to settle invoices, provided the difference is below a certain threshold. This could be an absolute amount or a percentage of the balance. The auditor needs to ensure that such periodic

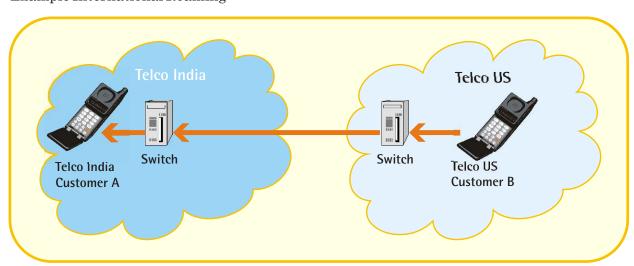


settlements are happening and necessary impact in the Profit & loss account has been taken. Conversely, in case the matter is under dispute then based on the information & explanations available, the auditor needs to use its own judgment and decide whether creation of a provision in the books is necessary.

Roaming

- 5.63 Roaming is a variant of interconnection whereby mobile telephone customers are granted access to other networks either locally (national roaming) or abroad (international roaming) without physical connection of the two networks. The customer is allowed to directly connect to the other network provided that the two telecom companies have agreed to do so. Roaming provides the ability to make and receive voice calls, send and receive data, or access other services when away from the home network.
- 5.64 Types of Roaming:
 - National Roaming from a mobile operator to another mobile operator in the same country.
 - The International Roaming onto other foreign mobile operators than your national subscription.

Example International Roaming



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Example's Narration:

A roaming customer is also able to receive calls (local and international).

A fee is applied by the local operator on the calls received by the roaming customer.

5.65 Terminology relating to roaming is explained below:

Mome Network : Our Client's Network

Foreign Network: Any network other than our client

Inroamer : Subscriber of foreign network coming into the client's

network and using it

2 Outroamers : Subscriber of the client going to a foreign network and

using it

Tap-in file : A file containing CDRs for your clients Outroamers

Tap-out file : A File containing CDRs for Inroamers into your clients

network

Clearing house : Central agency co-ordinating Roaming File exchange &

settlement between operators. It is an intermediary which helps the Mobile Operators in Roaming

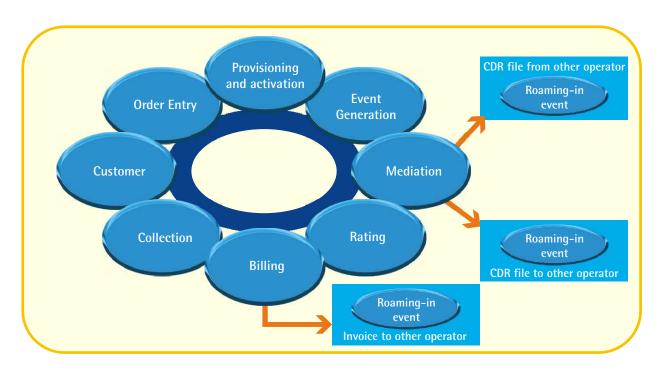
Settlement

5.66 Roaming Risks are depicted in the following table:

Risk Examples	Caused Examples
Difficulty of verifying revenue	Charges made through remote independent clearing house
Timeliness of customer billing	Call details submitted to home operator long after call took place
Disputes between operators	Different interpretations of roaming agreements
Regulator intervention	Customer complaints over high roaming charges

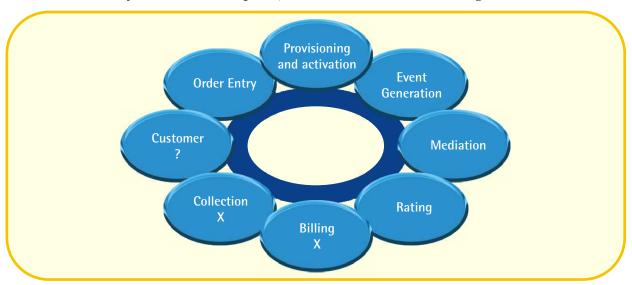
5.67 Relationship between Roaming and Revenue Cycle is shown by the following diagram





Pre-paid Mobile Services

5.68 The prepaid mobile service Revenue Cycle differs significantly from the post paid Revenue Cycle in several respects, as shown in this modified diagram:



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5.69 Is it not unusual that the controls and processes around tracking calling balances are weak and the customer can access the network for service after the prepaid credit has been depleted. This can result in free service being given and the inappropriate recognition of revenue (because there is no arrangement to bill prepay customers).

Auditing Considerations

5.70 Generally, the following heads under the financial statements get covered during audit of revenue & receivables:

Profit & Loss Account
Income
Prepaid Revenue
Post Paid Revenue
Roaming Revenue
Interconnect Usage Charge
Infrastructure Sharing
Activation Income
Processing Fee
Hardware Sales (VSAT, Sim Cards)
Leased Line Services
Expense
Interconnect Usage Charge
Roaming Expense
Infrastructure Sharing
VAS Revenue share
Dealer Commission
License fees expense

Specific financial audit risks and typical audit procedures for each revenue & receivables related account balance in the Financial Statements has been explained below:



Balance Sheet

Assets

Subscriber Receivables

- 5.71 The balance comprises of net receivables from subscribers, for billings done in the normal course of business. The gross receivable balance, i.e., balance outstanding out of actual billings to customers, is to be reduced by the Provision for Bad & Doubtful debts created by the management.
- 5.72 Following are the audit procedures of special relevance in Telecom industry engagements:
 - a. General Ledger (GL) vs. Billing system reconciliation All transactions with and balances of subscribers are recorded in the billing system. However, the financial statements are prepared based on the General Ledger. Therefore it is critical that reconciliations of balances & transactions are prepared and reviewed by the management on a regular basis. And the reconciling items are properly accounted for/adjusted in the books.

Audit procedures should include testing the reconciling items in the balance reconciliation and ensuring that there are no adjustable reconciling items which remain unadjusted as at the year end and which may materially affect the true & fair view of the financial statements. Generally, following are the valid reconciling items in GL vs. Billing system balance reconciliation:

i. Waiver Posted in the billing system but not recorded in general ledger: Normally waivers are recorded in GL based on billing to the customer. However, the effect of waiver takes place in the billing system, as soon as it is posted. Accordingly, the waivers posted after the last billing date for the respective bill cycle, till the period end form a reconciling item in the GL Vs Billing system reconciliation. In case the Company follows a policy for accruing such waivers, then there is a possibility that this reconciling item may even not appear in the reconciliation.

The amount for such reconciling item is determined based on Waiver Reports from the billing system.

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ii. Late payment charges (LPC) The Company may have a policy of recording Late payment fees as revenue in GL, only on actual receipt basis.

However, the Late payment fees once charged to a customer remains in the billing system. Accordingly, LPC billed but not recovered till period end may form a reconciling item.

The amount for such reconciling item is determined based on mapping of subscriber-wise collection details with the respective outstanding LPC amounts.

iii. Bad Debts written-off Bad Debts entry may be passed in GL in one month, but the corresponding impact in the billing system may come in the next month leading to a reconciling item in the GL vs. Billing system reconciliation.

The amount for such reconciliation item is determined based on approved subscriber-wise details for bad debts writen off, identified from system based report in accordance with the Company's policy.

iv. Grossing up of negative balances - Negative balances of subscribers are grossed up in GL for disclosure purposes. However, net amounts still continue to appear in the billing system. Accordingly, to the extent balances are grossed up form a reconciling item.

The amount for such reconciliation item is determined based on subscriberwise balance reports extracted from the billing system.

b. Provision for Bad & doubtful debts: Generally, the nature of receivable balances in a telecom industry is such that there are low value high volume receivable balances. Accordingly, reasonable assessment of the recoverability of such balances becomes critical.

Provision for Bad & doubtful debts is created in accordance with Company's policy in relation to the same. Following are the general guidelines for testing:

i. Generally, companies follow a policy of creating provision for debts older than certain age limit. The ageing buckets are obtained from the billing system reports. The auditor may test the accuracy of the ageing buckets. Auditor may



- also test the configuration of ageing reports obtained from the billing system.
- ii. Further, the auditor should insist obtaining original reports from the billing system and re-perform / get re-performed the provision calculation in his presence.
- iii. Subscriber-wise adjustment for security deposits (if any) should be ensured while calculating provision as the amount is adjustable at the time of final recovery from the customer.
- iv. Service tax reversal on the amount determined should also be ensured.

Other Receivables

- 5.73 The balance comprises of net receivables from customers other than subscribers. The balance includes receivables from other operators on account of roaming, Interconnect usage charges (IUC), infrastructure sharing etc., and from Channel partners.
- 5.74 Following are the audit procedures of special relevance in Telecom industry engagements:
 - a. Account balance reconciliation Companies generally follow a time cycle for reconciling the balances with IUC & roaming parties. Our audit procedures should include testing the reconciling items in the latest possible reconciliations by reference to the respective source documents and assessing the possible impact on financial statements. Further, regularity of settlements should be given weightage while using professional judgment for assessing the possible financial impact.
 - b. Provision for Bad & doubtful debt Other receivables balance mainly includes balances receivable from other operator for roaming, IUC, infrastructure sharing etc. Following are the items of special relevance in telecom industry:
 - i. The balances generally being material and number of operators being limited, the auditor may assess recoverability of all outstanding balances.
 - ii. Settlement schedule / Settlement pattern with each operator should be carefully analysed. Operators with which settlements are not done on a regular basis, should be reviewed closely for provisioning purposes.
 - iii. The auditor may insist for balance confirmations from the operators / data clearing house.
 - iv. The Company may follow provisioning based on ageing of balance. In that

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- case, the auditor may test the accuracy of the ageing buckets.
- v. The auditor should insist obtaining original reports from the system and reperform/get re-performed the provision calculation in his presence.
- vi. Generally, terms of agreement with the operator allows for adjustment of receivable balances against corresponding payable balance (if any). The auditor may refer to terms of agreement and ensure that necessary adjustments have been made while computing provision for bad & doubtful debts.
- vii. There may be an arrangement for 'only gross settlement with the operator', i.e, payable balances are not allowed to be adjusted against receivable balance. In such cases, both receivable and payable balances should be considered separately and assessment for provisioning should be done individually.
- viii. There may be an arrangement for settlements amongst operators for 'only adjustment against transactions', i.e. without any cash settlement. The auditor may analyse the transaction pattern with the operator and assess the reasonability of the provision created against the outstanding balance.
- ix. Service tax reversal on the amount determined should also be ensured.

Advance Revenue / Income received in Advance / Advance Billing and Prepaid Card Revenue

- 5.75 This balance comprises of revenue received in advance on account of:
 - a. Advance billings to post-paid customers For instance, Company may have a policy to bill the bill plan rentals one month in advance or there may be a bill plan where rental for specific period may have been taken upfront in advance.
 - b. The unutilised balance of prepaid customers.
 - c. The unutilised balance out of amounts recovered from dealers for e-recharges / other online services.
- 5.76 Following are the audit procedures of special relevance in Telecom industry engagements:
 - a. Revenue recognised out of advance revenue should include:
 - i. Time based pro-rata amount attributable to the current year out of the revenue collected during the year.
 - ii. Time based pro-rata amount attributable to the current year out of the revenue collected in the previous years.

It should be ensured that the amount recognised as revenue should not be greater than the amount actually collected/billed.

- b. Prepaid subscribers System vs. General Ledger (GL) reconciliation: All transactions with and balances of prepaid subscribers are recorded in the prepaid customer's system. However, the financial statements are prepared based on the General Ledger. Therefore it is critical that reconciliations of balances & transactions are prepared and reviewed by the management on a regular basis. And the reconciling items are properly accounted for / adjusted in the books.
- 5.77 The audit procedures should include testing the reconciling items in the balance reconciliation and ensuring that there are no adjustable reconciling items which remain unadjusted as at the year end and which may materially affect the true & fair view of the financial statements. Generally, following are the valid reconciling items in GL vs. Prepaid customer's system balance reconciliation:
 - i. Market Stock of recharge vouchers The Company may follow an accounting policy of recording prepaid liability as soon as a recharge voucher is sold in the market (primary sale). However, the balance in the system gets affected only when the recharge voucher is utilised by the customer (tertiary sale). Accordingly, there will be a reconciling item in the balance reconciliation relating to Recharge coupons sold but not yet utilised by the end customers and are still lying in the market.

 The amount for such reconciling item is determined based on reports obtained from
 - ii. Market stock start up kits Similar to recharge vouchers, there may be a reconciling item relating to recharge component in Start-up-kits for prepaid customers.

the prepaid system, showing the activation status of recharge vouchers issued.

- The amount for such reconciling item is determined based on reports obtained from the prepaid system, showing the utilisation status of recharge vouchers issued.
- iii. E-recharges by prepaid customers in circles other than the home circle: A Company may follow an inter-unit settlement cycle different from the period closure dates. Accordingly, a system GL reconciliation on a date other than the inter-unit settlement date, may lead to a reconciling item relating to transactions recorded in system post the inter-unit settlement date till the reconciliation date. Reason being the transactions post inter-unit settlement date would affect the

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system balance; however the transactions in the GL would be recorded in the next inter-unit settlement cycle. Such reconciling item may not arise in case the company follows a policy of provisionally recording such inter-unit entries and also in case the inter-unit settlement date is the same as reconciliation date.

The amount for such reconciling item is determined using system based Recharges report received from other circles, filtered based on the home circle's customers being the recipient of the recharge transaction.

Unbilled Revenue

5.78 As explained earlier, owing to large number of subscriber's telecom companies divide the post-paid customer base into different bill cycles having different billing dates. However, the general ledger is generally closed on a particular date which is different from the billing cycle dates. Accordingly, following the accrual concept, companies accrue the unbilled revenue for usage by customers between the last billing dates till the general ledger closure date.

The billing systems generally provide with unbilled reports as on a particular date. The audit procedures may also include the following:

- i. Comparing the balance with the proportional revenue computed based average revenues from bill runs in the recent past.
- ii. Comparing the balance with unbilled revenues booked in the previous GL closure, adjusted with extra-ordinary items / events and normal growth rate.

Liabilities

Provision for Bad & Doubtful debts

5.79 This balance comprises of provision created based on management's estimate of receivable balances considered to be doubtful for recovery/non-recoverable. The audit procedures in relation to Provision for bad & doubtful debts has already been discussed above along with subscriber & other receivables.

Security DepositSubscribers

5.80 Telecom companies generally accept Security deposit from post-paid subscribers,



which is refundable / adjustable at the time when the subscriber churns out of the network. Generally, a subscriber-wise detail of such security deposit is maintained in the billing system for post-paid subscribers. Entries in the General ledger are passed manually based on such reports and that too after specific time intervals.

- 5.81 General Ledger (GL) vs Billing system reconciliation All transactions with and balances of subscribers are recorded in the billing system. However, the financial statements are prepared based on the General Ledger. Therefore it is important that reconciliations of both balances as well as transactions are prepared and reviewed by the management on a regular basis. And the reconciling items are properly accounted for/adjusted in the books.
- 5.82 The audit procedures should include testing the reconciling items in the balance reconciliation and ensuring that there are no adjustable reconciling items which remain unadjusted as at the year end and which may materially affect the true & fair view of the financial statements. Ideally, there should not be any reconciling items in this GL vs Billing system balance reconciliation.

Service tax payable

5.83 Service tax is chargeable on each transaction involving delivery of a taxable service. Service tax is deposited to the concerned authority only on recovery from customers. At the time of billing to customer, the service tax is recorded under Service tax payable account. The amount continues to appear as a liability till the time the corresponding receivable balance is collected from the customer.

Movement in Service Tax payable account

- 5.84 The auditor may gain comfort over movement in Service tax payable balance. Following are the items of special relevance:
 - Credits in GL's service tax account are recorded based on system based reports for both prepaid & post-paid customers.
 - Debits are in the form of payments to authority. The amount of payment is again determined based on collections report from the billing system for post-paid subscribers. For Prepaid subscribers the payment amount is determined based on

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sales summary report. Generally, collections are also mapped with actual collections in bank.

Opening balance may be verified from previous year's financial statements.

Service Tax rationalisation

5.85 The closing balance of service tax payable may be correlated with the corresponding receivable balance. The closing receivable balance applied with the applicable service tax rates, should give out the closing service tax payable balance.

Unamortised Licence fees

- 5.86 Some Telecom companies had paid one-time telecom licence fees / entry fees. Generally such entry fee gets amortised over the period of licence. The charge for each year is computed and entries in GL are passed based on amortisation calculations. The auditor may refer the licence documents and other related correspondence to:
 - Verify the amount, licence period etc., and
 - Ascertain whether there are no terms & conditions which may affect such amortisation.

Profit & Loss Account

Prepaid Revenue

- 5.87 The balance comprises of revenue from prepaid customers on account of call usage, rentals, roaming rentals, value added services usage, balance forfeiture etc. A transaction by a prepaid customer gets recorded on an almost real time basis in the prepaid customer's billing system. Entries are periodically made in the GL based on specific reports received from the system.
- 5.88 Prepaid revenue recorded based on specific reports extracted from the system may be cross checked for reasonability by comparing the revenue balance with the derived revenue computed based on movement analysis of the Prepaid customer's advance revenue balance.

Overall prepaid revenue (containing all revenue components) derived using Prepaid customer's advance revenue balance is computed as follows:

Opening Prepaid customer's advance revenue balance:

XXXX



Add: Recharges made during the year: XXXX
Less: Closing Prepaid customer's advance revenue balance: XXXX
Derived prepaid revenue XXXX

Post Paid Revenue

5.89 The balance comprises of revenue from postpaid customers on account of call usage, rentals, roaming rentals, value added services usage, other charges etc, net of billing level adjustments & waivers. A transaction by a post-paid customer gets recorded on real time / batch processing basis in the post-paid billing system. Entries are periodically made in the GL based on specific reports received from the system (e.g., Billing summary report, adjustment report, etc.).

Roaming Revenue

- 5.90 Customers are allowed usage while roaming beyond their home territory. The network operator whose network is utilised while roaming, bills the home operator at agreed rates. Accordingly, roaming revenue for any operator would be revenue from usage of its network by subscribers of other operators. The other operator may be national/international. All rates are determined based on specific agreements & legal regulations.
- 5.91 Generally, settlements within operators for all roaming transactions, in the normal course of business, are done through a data clearing house specifically appointed for the purpose. Entries are recorded by all the operators based on report from the data clearing house. Further, balance reports are also circulated by the clearing house on a regular basis for confirmation / reconciliation.
- 5.92 Roaming revenue may be cross checked by reference to Tap-out reports sent by the data clearing house.

Interconnect Usage Revenue (IUC revenue)

5.93 Customer of one operator is allowed to make calls to customers of other operators. The billing is done only by the operator from whose network the call was generated. However, for a call to complete, the other operator's network also gets utilised. However, the other operator has no right to bill the call originating customer.

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Accordingly, the other operator bills the home operator an Interconnect usage charge for all calls originating from home operators network & terminating in its network.

- 5.94 The IUC revenue for a particular operator would include a charge on operator, at an agreed rate, for all calls originating in any other operator but terminating in its network. IUC revenue is recorded periodically based on reports from a system used particularly for tracking & billing IUC revenue & cost.
- 5.95 Following are the audit procedures of special relevance in Telecom industry engagements:
 - a. IUC revenue booked may be analysed by applying the standard rates on time duration summary reports extracted from the system.
 - b. As already discussed along with IUC debtors, the audit procedures should include testing the reconciling items in the latest possible account balance reconciliation / settlement, by reference to the respective source documents and assessing the possible impact on financial statements. Regularity of settlements should also be given due importance.

Infrastructure Sharing Revenue

- 5.96 In telecom industry, huge capital is required to create the network for providing telecom services. In order to minimise the requirement of huge funds for building up costly infrastructure, for reaching out to new consumers and to control costs in view of declining tariffs, the telecom operators are resorting to sharing of infrastructure. Sharing of infrastructure is a method wherein two or more telecom companies create a pool of passive infrastructure, i.e. Towers, Dark Fiber etc., and make use thereof on payment of agreed charges on the basis of quantum of usage.
- 5.97 The infrastructure sharing on fair, transparent and commercial terms ensures that consumers get choice of service, quality as well as affordability. On the other hand, the operators get an attractive commercial proposition and an opportunity to expand coverage & reach of their services.
- 5.98 Companies share infrastructure including towers, facilities, etc. with other operators.



The operator having the ownership / right over the property, bills infrastructure sharing cost (both capital & operating expenditure) to the operators availing the facility. Infrastructure sharing revenue / cost is calculated based on the agreed terms & conditions. Entries in the books are made based on such calculations.

5.99 The telecom operators generally have proper agreement for sharing of infrastructure facilities. Network usage details are properly generated and provided along with the bill to the infrastructure sharing partners.

As already discussed along with Infrastructure sharing debtors, the audit procedures should include testing the reconciling items in the latest possible account balance reconciliation / settlement, by reference to the respective source documents and assessing the possible impact on financial statements. Further, regularity of settlements should be given weightage while using professional judgment for assessing the possible financial impact.

Activation Revenue

- 5.100 At the time of activation of a new customer, companies may charge activation charge to the customers. The amount of activation revenue is calculated based on reports from both Prepaid & post-paid billing systems.
- 5.101 The auditor may perform substantive analytical procedures for activation revenue. Expected activation revenue can be calculated using activation count reports from the system and standard activation revenue under each plan. Difference between actual and expected revenue may be investigated. Exceptions found during the course of investigation may be disposed off by the auditor using his professional judgement.

Processing Fee

- 5.102 Companies may charge processing fees from prepaid customers on every recharge made. The amount of processing revenue is calculated based on reports from the prepaid billing system.
- 5.103 The auditor may perform substantive analytical procedures for processing fees

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revenue. Expected processing fees revenue can be calculated using recharge count reports from the system and standard processing fees rates under each type of recharges. Difference between actual and expected revenue may be investigated. Exceptions found during the course of investigation may be disposed off by the auditor using his professional judgement.

Hardware Sales (VSAT, Sim Cards)

5.104 Companies may earn revenue from sale of hardware equipments. Invoicing and recording for such a sale is made in the same way as a normal sales transaction in any other industry.

Interconnect Usage Charge (IUC Expense)

- 5.105 In the same way as IUC revenue, each operator has to bear an IUC cost. The IUC cost for a particular operator would include a charge on an operator, at an agreed rate, for all calls originating in its network but terminating in any other operator's network. Interconnect Usage Charges consist of following factors:
- 5.106 Access Deficit Charges (ADC charges): The National Telecom Policy 1999, requires telecom companies to have access to telephony even in the rural areas. Since BSNL was the only service provider in rural areas and its revenues were not enough to cover up the fixed costs, Access Deficit Charges (ADC) have been introduced by TRAI from May 1, 2003 for a limited period to give time to incumbent operators for rebalancing the tariff during a transition period. The ADC regime w.e.f. April 1, 2007 is as follows:
 - No ADC on outgoing ILD calls.
 - ADC on incoming ILD calls- as may be prescribed from time to time.
 - ADC on revenue share of AGR of all Access License, NLD, and ILD as may be prescribed from time to time.
 - Revenue from rural wire-line subscribers will not form the part of AGR for the purpose of ADC.
 - AGR will be the same as defined in the License except above. Similarly, the payment of ADC based on AGR has to be made on quarterly basis to BSNL by other operators. However the ADC amount of revenue from urban wire-line subscriber will be retained by the respective service providers.



Note: Effective from April, 2008, ADC charges are not applicable for local calls and effective from October 1, 2008, ADC charges are not applicable on incoming ILD calls also.

- 5.107 Carrier Charges (NLD / ILD charges): The carriage charge is the amount paid to the long distance carrier by the cellular and fixed telephone operator. The carriage cost depends on the distance of the call and IUC agreement between Telecom Companies. The rates may be as prescribed from time to time.
- 5.108 Call Termination Charges: Termination charges are the charges paid to Mobile Operators for NLD and ILD calls terminating on their network. Every Telecom company has to pay interconnection charges (IUC) on all local/NLD/ILD calls terminating on other telecom company's network as per the schedule of fee notified by TRAI. Similarly it will receive the IUC from other operators for all local/ NLD/ILD calls terminated on its network on the rates and basis prescribed from time to time.
- 5.109 IUC Charges are paid as per the mutually agreed terms between the telecom companies and based on reconciliation between CDR data of both the companies. Also, generally telecom companies mutually agree the range of variation below which the payments are made without reconciliations based on CDRs.
- 5.110 IUC cost is recorded periodically based on reports from a system used particularly for tracking & billing IUC revenue & cost.
- 5.111 Following are the audit procedures of special relevance in Telecom industry engagements:
 - a. IUC cost booked may be analysed by applying the standard rates on time duration summary reports extracted from the Interconnect billing system.
 - b. As already discussed along with IUC debtors, the audit procedures should include testing the reconciling items in the latest possible account balance reconciliation / settlement, by reference to the respective source documents and assessing the possible impact on financial statements. Regularity of settlements should also be

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- given due importance.
- c. The auditor may also verify whether there exists a proper system for verification and payment of IUC.

Roaming Expense

- 5.112 In the same way as roaming revenue, each operator has to bear roaming expenses. Roaming expense for any operator would be a charge for its subscriber's usage of any other operator's network, while roaming out its home territory. The other operator may be national / international. All rates are determined based on specific agreements & legal regulations.
- 5.113 Generally, settlements within operators for all roaming transactions, in the normal course of business, are done through a data clearing house specifically appointed for the purpose. Entries are recorded by all the operators based on report from the data clearing house. Further, balance reports are also circulated by the clearing house on a regular basis for confirmation / reconciliation.
- 5.114 Roaming expense can be cross checked by reference to Tap-in reports received from the data clearing house.

Infrastructure Sharing expense

- 5.115 In telecom industry, huge capital is required to create the network for providing telecom services. In order to minimise the requirement of huge funds for building up costly infrastructure, for reaching out to new consumers and control costs in view of declining tariffs, the telecom operators are resorting to sharing of infrastructure. Sharing of infrastructure is method wherein two or more telecom companies create a pool of passive infrastructure, i.e. Towers, Dark Fiber etc. and make use thereof on payment of agreed charges on the basis of quantum of usage.
- 5.116 The infrastructure sharing on fair, transparent and commercial terms ensures that consumers get choice of service, quality as well as affordability. On the other hand, the operators get an attractive commercial proposition and an opportunity to expand coverage & reach of their services.



- 5.117 Companies share infrastructure including towers, facilities, etc. with other operators. The operator having the ownership / right over the property, bills infrastructure sharing cost (both capital & operating expenditure) to the operators availing the facility. Infrastructure sharing cost / revenue is calculated based on the agreed terms & conditions. Entries in the books are made based on such calculations.
- 5.118 The telecom operators generally have proper agreement for sharing of infrastructure facilities. Network usage details are properly generated and generally provided along with the bill to the infrastructure sharing partners.
- 5.119 As already discussed along with Infrastructure sharing debtors, our audit procedures may include testing the reconciling items in the latest possible account balance reconciliation / settlement, by reference to the respective source documents and assessing the possible impact on financial statements. Further, regularity of settlements should be given weightage while using professional judgment for assessing the possible financial impact.

Value Added Service (VAS) Revenue share expense

5.120 Companies enter into an agreement with VAS providers, wherein the revenue for VAS usage is shared based on agreed proportions. Billing to customers is done by the operator providing service to the customer. The revenue earned by the operator may be passed on to the VAS provider based on fixed ratio / percentage / any other proportion. Calculations for VAS revenue share cost is done based on the terms of agreements and using reports from the billing systems. Entries in the books are made based on such calculations.

The auditor may perform substantive analytical procedures for VAS revenue share expense. Expected VAS revenue share expenses can be calculated using VAS usage count reports from the system and revenue share rates for each type of service from each type of vendor. Difference between actual and expected expense may be investigated. Exceptions found during the course of investigation may be disposed off by the auditor using his professional judgement.

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Dealer Commission

- 5.121 The Companies may enter into agreements with agents / channel partners for giving remuneration in the form of commission / percentage of collections / fixed amount per new connection etc. Generally, calculations for dealer commission is done based on the terms of agreements and using reports from the billing systems & reports from the customer service delivery team (if any).
- 5.122 The auditor may perform substantive analytical procedures for dealer commission expense. Expected dealer commission expense can be calculated by using system reports, customer service delivery reports and commission structure containing rates for each type of transaction with the dealer. Difference between actual and expected expense may be investigated. Exceptions found during the course of investigation may be disposed off by the auditor using his professional judgement.

License Fees Expense

- 5.123 All telecom companies have to pay licence fees for telecom operations. This may be paid in the form of:
 - i. Fixed amount paid upfront at the time of entry into the market and
 - ii. Variable amount calculated based on the revenue.
- 5.124 Generally, calculations for licence fees expense is done based on the applicable licence fees rates, revenue computation methods, licence period etc.
- 5.125 There are guidelines issued by the Telecom Regulatory Authority of India (TRAI) for calculation of Adjusted Gross Revenue (AGR), based on which licence fees payable is determined. Refer Appendix II for a specimen AGR calculation sheet.

Passive Links Charges (Point of Interconnection)

5.126 Every off net call (i.e. calls to other operators network) has to be routed though 'Point of Interconnection' (POI) as per TRAI guidelines. For obtaining POI, port and other charges are payable to other telecom company as agreed, mutually subject to overall ceiling laid down by TRAI. This has following structure:



Port Charges

- 5.127 All telecom companies can demand POIs from other operators on payment of charges as mutually agreed subject to ceiling laid down by TRAI except BSNL who generally does not pay to other operators but charges for the POIs provided, located at BSNL.
- 5.128 Entries for port charges in General ledger are passed based on port-wise calculations. The amounts are calculated based on the TRAI guidelines (prescribed from time to time), number of ports utilised and mutual agreements with parties. The Company's technical / network operations team may confirm the number of ports utilised. The same may also be confirmed by the other operator.

Active Link Charges

- 5.129 In addition to Port Charges, a telecom company has to pay Active Link Charges to BSNL. These are the links of Licensed Telecom Service Providers for which transmission equipment of service provider is installed in BSNL's exchange premises and their network is connected through it. The rental charges of infrastructure in this case have been streamlined and are given below:
 - i. Charges for sharing of building space: The Licensed Telecom Service Providers are given space (bay) for installation of their various equipments. The charges vary based on the category of the city. The rates may be as prescribed from time to time.
 - ii. *Electricity and miscellaneous charges*: These charges include the sharing of following services:
 - DC power at -48V up to 10 A/ transmissions bay,
 - AC power for lights, fans, testing instruments etc.,
 - Air-conditioning charges (sharing of existing air-conditioning system),
 - Generator Backup,
 - Earthing charges (Tapping from exchange earth bar is allowed),
 - Fire equipment (Sharing in case of requirement).

Charges for providing these facilities are varying as per the category of city. The rates may be as prescribed from time to time.

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- iii. Charges for tower sharing:
 - Charges per antenna may be as prescribed from time to time.
 - The charges are multiplied by no. of antennas in case multiple antennas are installed by Licensed Telecom Service Providers.
- iv. Charges for duct sharing:
 - Telecom operators have to take permission to lay their OFC cable, 50 mm pipe inside the BSNL exchange premises after paying a refundable security.
 - All the charges discussed above are applicable w.e.f. 1st April, 2006 with a provision of a prescribed annual increase every year i.e., 1st April, 2007 onwards and are payable in advance every year.
 - Entries for Active link charges in the General Ledger are passed based on link-wise calculations. The account balance reconciliation with BSNL may also be looked into for any differential, which may require any provisioning to be done.

However, in case of operators other than BSNL, the aforesaid charges are paid based on mutually agreed terms and conditions.

Passive Link Charges

- 5.130 Apart from Port Charges and Active Link Charges, telecom operators have to pay following charges to BSNL for providing passive link connectivity for 'PoIs' between BSNL and telecom operator:
 - Tinfrastructure Charges for passive links with HDSL modem,
 - The Infrastructure Charges for passive link with HDSL modem, with minimum infrastructure sharing charges up to 5 E1s.

The rates of the above may be as prescribed from time to time.

Entries for Passive link charges in the General Ledger are passed based on link-wise calculations. The account balance reconciliation with BSNL may also be looked into for any differential, which may require any provisioning to be done.



The auditor may also verify that the company has applied the ports/other infrastructure based on the proper planning and estimated requirement, so that, the excessive payment is not made for unwarranted infrastructure.

However, in case of operators other than BSNL, the aforesaid charges are paid based on mutually agreed terms and conditions.



Introduction

- 6.1 Telecom is a highly capital intensive industry. The industry has seen exponential growth in the last few years with a manifold growth in the subscriber base and expansion in geographical area coverage. Infrastructure of a telecom business holds the key for facilitating end services to its subscribers, whether be it in mobile services, fixed line services, long distance or broadband services.
- 6.2 Nowadays most of these infrastructure facilities are getting managed by network equipment vendors like Ericsson and Nokia, wherein contracts are entered between the telecom operator (Bharti Airtel Limited, Vodafone Essar, Idea Cellular Limited, etc.) and vendor for designing, planning, supply, installation, commissioning and upgradation of the array of increasingly complex and sophisticated communications and equipments. They also offer telecom IT solutions. The solutions and services portfolio comprises of the remote monitoring of servers, security operations and network operations, providing data centre services (including server hosting, server management and storage management), IT helpdesk services and end-to-end connectivity and fulfilling all telecom and communication requirements.
- 6.3 The competitive environment for these managed services help ensuring high service delivery and removing operational inefficiencies. The managed services could have the following advantages:
 - smooth management of technological complexity
 - opportunity to strengthen core competency
 - reduction in financial outlay
 - touching base with new processes and technology

Concepts of Fixed Assets in Telecom Sector

6.4 There are certain industry specific terminologies used in the Fixed Assets of a telecom business which are detailed below for wider understanding of the concepts:



Asset Retirement Obligation (ARO)

6.5 "An Asset Retirement Obligation is a legal obligation (i.e. a liability) for the cost of retiring (i.e. settling) a tangible long-lived asset that results from the acquisition, construction, or development and (or) the normal operation of that long lived asset". The companies need to recognise the ARO liability in the period in which the asset was acquired. The liability equals the market value, and if that is not available, the present value of cash flows will be required to extinguish the liability. An asset equal to the liability is added to the Balance Sheet, and depreciated over the life of the asset. In Indian scenario, most of the telecom operators are making provision for ARO under the category of 'Plant & Machinery' in their books of accounts.

Erlang

6.6 An Erlang is a unit of traffic density in a telecommunications system. One erlang is the equivalent of one call (including call attempts and holding time) in a specific channel for 3,600 seconds in an hour. The 3,600 seconds need not be, and generally are not, in a contiguous block. In digital communications, the voice signals are compressed. This makes it possible for one channel to carry numerous calls simultaneously by means of multiplexing.

For example, if a group of user made 30 calls in one hour, and each call had an average call duration of 5 minutes, then the number of erlangs this represents is worked out as follows:

Minutes of traffic in the hour = number of calls * duration

 $\begin{array}{lll} \mbox{Minutes of traffic in the hour} & = & 30*5 \\ \mbox{Minutes of traffic in the hour} & = & 150 \\ \mbox{Hours of traffic in the hour} & = & 2.5 \\ \end{array}$

Traffic figure = 2.5 Erlangs

6.7 Erlang traffic measurements are made in order to help telecommunications network designers understand traffic patterns within their voice networks. This is essential if they are to successfully design their network topology and establish the necessary trunk group sizes.

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6.8 In the Indian scenario, some of the telecom operators have entered into erlang based payment contracts with their strategic vendors/partners who provide infrastructure and managed services.

Provisional Capitalisation

- 6.9 The concept of provisional capitalisation is unique to telecom industry. To put a 'site on air' or to lay down telephony or broadband cables, there are various hardware equipments, software and services which are involved. All such items / services are required to be capitalised. Usually, the technical department prepares a detailed capital installation report / memorandum which provide details like site configuration, equipments installed (including the numbers of each component), software's utilised and nature of services (electrical, civil work, etc.) for capitalisation etc.
- 6.10 After capitalisation of such items and services in the system (in the normal course basis the process and accounting discussed above), a site-wise comparison is done between actual capitalisation with the capital installation report / memorandum. Based on this comparison, items pending to be capitalised are determined capitalised in the GL on a provisional basis. This concept of accounting for such identified items and services is known as provisional capitalisation.
- 6.11 The amount provisionally capitalised needs to be reviewed on a regular basis to ascertain whether the capitalisation has been actualised and uploaded in the Fixed Assets Register. In case all bills have been received, the amount can be reversed in GL. Whereas in case no bills have been received and none are expected against such provisional capitalisation, the amount may be considered for a reversal depreciation on provisional capitalisation items and needs to be computed as per the company's policy.

Indefeasible Rights of Use (IRU)

6.12 An indefeasible right of use is a contractual agreement between the operators of a communications cable, such as submarine communications cable or a fiber optic cable and a client. The IRU shall mean the exclusive, unrestricted, and indefeasible rights to use the relevant capacity (including equipment, fibers or capacity for any legal purpose. It refers to the bandwidth purchased after the submarine cable system has



sealed the Construction and Maintenance Agreement (C&MA) among owners or after the system came into service and where the un-owned capacity is available. IRU may also be purchased from the existing owner. The right of use is indefeasible, so, as the capacity purchased is also non returnable, maintenance cost incurred becomes payable and inrefusiable.

6.13 In plainer language, the purchase of an IRU gives the purchaser the right to use some capacity on a telecommunication cable system, including the rights to lease that capacity to someone else. However, with that right comes, an obligation to pay a proportion of the operating cost and a similar proportion of the costs of maintaining the cable including any costs incurred in repairing the cable after mishaps. Companies that buy a leased line between say, London and New York do not buy an IRU they lease capacity from a telecommunications company that themselves may lease a larger amount of capacity from another company (and so on), until at the end of the chain of contracts there is a company that has an IRU, or wholly owns a cable system.

Last Mile

- 6.14 The last mile is the final leg of delivering connectivity from a communications provider to a customer. Usually referred to by the telecommunications and cable television industries, it is typically seen as an expensive challenge because "fanning out" wires and cables is a considerable physical undertaking. In countries employing the metric (as opposed to the imperial) measurement system, the phrase "last kilometre" is sometimes used. Because the last mile of a network to the user is also the first mile from the user to the world, the word, "first mile" is sometimes used.
- 6.15 To solve the problem of providing enhanced services over the last mile, some companies have been mixing networks for decades. One example is Fixed Wireless Access, where a wireless network is used instead of wires to connect a stationary terminal to the wireline network. Various solutions are being developed which are seen as an alternative to the "last mile" of standard incumbent telecommunications providers: these include WiMAX and BPL (Broadband over Power Line) applications. Mentioned below are some of the existing last mile delivery systems:

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- Wired Systems (including dielectric guides)
 - Local Area Networks
 - Community Access Cable Television Systems
 - Optical Fibre
- Wireless Delivery Systems
 - Light Waves and Free Space Optics
 - Radio Waves
 - One-way (broadcast) Radio and Television Communications
 - Satellite Communications
 - Broadcast versus Point-to-Point

Gateways

- 6.16 In telecommunications, the term gateway has the following meaning:
 - in a communication network, a network node equipped for interfacing with another network that uses different protocols.
 - a gateway may contain devices such as protocol translators, impedance matching devices, rate convertors, fault isolators, or signal translators as necessary to provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between both networks.
 - a protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing the required protocol conversions.
 - Gateways also called protocol convertors can operate at any layer of the OSI model. The job of a gateway is much more complex than that of a router or switch. Typically, a gateway must convert one protocol stack into another.
- 6.17 Gateways work on all seven OSI layers. The main job of a gateway is to convert protocols among communications networks. A router by itself transfers, accepts and relays packets only across networks using similar protocols. A gateway on the other hand can accept a packet formatted for one protocol (e.g. AppleTalk) and convert it to a packet formatted for another protocol (e.g. TCP/IP) before forwarding it. A gateway can be implemented in hardware, software or both, but they are usually implemented by software installed within a router. A gateway must understand the protocols used



by each network linked into the router. Gateways are slower than bridges, switches and (non-gateway) routers.

Local Loop

- 6.18 In telephony, the local loop (also referred to as a subscriber line) is the physical link or circuit, that connects from the demarcation point of the customer premises to the edge of the carrier or telecommunications service provider network. At the edge of the carrier network in a traditional PSTN (Public Switched Telephone Network) scenario, the local loop terminates in a circuit switch housed in an ILEC (Incumbent Local Exchange Carrier) CO (Central Office). Traditionally, the local loop was wireline in nature from customer to central office, specifically in the form of an electrical circuit (i.e., loop) provisioned as a single twisted pair in support of voice communications. However, modern implementations may include a digital loop carrier system segment or fiber optic transmission system known as fiber-in-the-loop.
- 6.19 The local loop may terminate at a circuit switch owned by a CLEC (Competitive LEC) and housed in a POP, which typically is either an ILEC CO or a "carrier hotel". A local loop may be provisioned to support data communications applications, or combined voice and data such as digital subscriber line (DSL).
- 6.20 Local loop connections can be used to carry a range of services, including:
 - Analog voice and signalling used in traditional POTS
 - Integrated Services Digital Network (ISDN)
 - Variants of Digital Subscriber Line (DSL)
- 6.21 The term "local loop" is sometimes used for any "last mile" connection to the customer, regardless of technology or intended purpose. Hence the phrase "wireless local loop". Examples of "wireless local loop" are LMDS, WiMAX, GPRS, HSDPA, DECT.

Auditing Fixed Assets in Telecom Industry

- 6.22 Audit of Fixed Assets of a telecom company would revolve around the following broad categories:
 - Network Overview & Network Structure.

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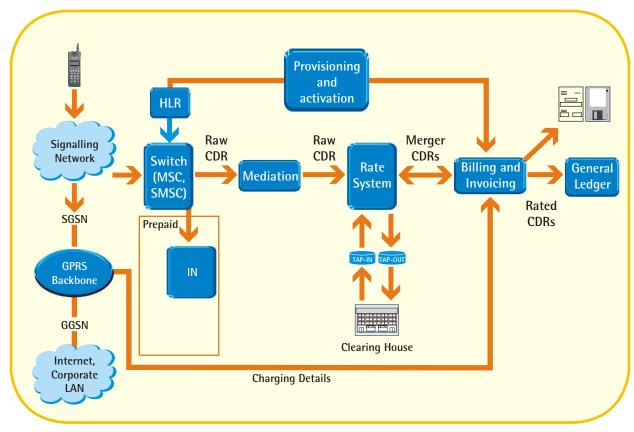
- Fixed Assets Cycle.
- Risks in Telecom Fixed Assets Cycle.
- Capitalisation of Fixed Assets.
- Audit considerations.
- Fixed Assets Register.
- **Key Reconciliations.**
- Change in Location of Fixed Assets.

Network Overview and Network Structure

6.23 The network of a telecom business is spread into

Mobile

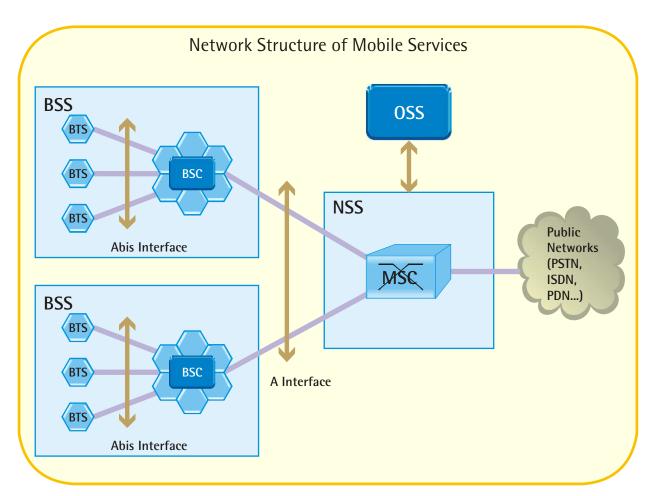
Overview of a Mobile Environment:





- 6.24 The mobile phone (also called a wireless phone or cellular phone) is a short-range, portable electronic device used for mobile voice or data communication over a network of specialised base stations known as cell sites. This sector which includes voice services, value added and data services such as SMS, mobile internet service, e-mail, conferencing, GPRS service, etc., majorly comprises of the following hardware equipments to facilitate end subscriber services BTS Towers, Radio Antennas, MSC, Green Shelters, DG Sets, etc. Mobile Network can be used without regard to location, using Radio frequencies. There are 2 Multiple Access technologies used in a mobile business which are as under
 - a. Global System for Mobile communications (GSM): Earlier known as Groupe Special Mobile, GSM is a set of standards set by European Telecommunication Standard Institute specifying the infrastructure for cellular services. The GSM Association estimates that 82% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. Today, globally GSM services are primarily being offered on following frequencies 900 MHz and 1,800 MHz in Europe and Asia and 850 MHz and 1,900 MHz bands in North America and Latin America. GSM technology uses the SIM (Subscriber Identity Module) and gives liberty to subscribers to switch to various handsets and transfer contacts and other important data as well. (Major service providers Bharat Sanchar Nigam Limited, Bharti Airtel Limited, Vodafone Essar, Idea Cellular Limited, AT&T, Singtel, Cable and Wireless, etc.).
 - b. Code Division Multiple Access (CDMA): Radio signals associated with a call are spread across a single broad frequency spectrum. Each call in the spectrum is differentiated from other calls in that spectrum by assigning a unique code to each call's signal. CDMA is handset locked and entire set is to be bought with the handset that can be prepaid or postpaid. (Major service providers Reliance Infocomm Limited, TATA Indicom, MTNL Garuda, etc.).
- 6.25 Detailed below are some of the key technical elements which form a mobile network / architecture:

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- A. Mobile Station (MS): Mobile Station comprises all user equipment and software needed for communication with a Wireless telephone network. In 2G system MS refers to Mobile Phone and in 3G system MS refers to User Equipment. The Mobile Station consists of four main components:
 - a. *Mobile Terminal:* offers common functions that are used by all the service, the Mobile Station offers. It is equivalent to the network termination of an ISDN access and is also the end point of the radio interface.
 - b. Terminal Equipment: is a peripheral device of the Mobile Station and offers services to the user. It does not contain any functions specific to GSM.
 - c. Terminal Adaptor: hides radio specific characteristics.
 - d. Subscriber Identity Module (SIM): is a personalisation of the Mobile Station



which carries all the subscriber specific information. Major functions of a SIM are: to identify the current user of an MS, store personal information e.g. abbreviated dialling codes (telephone directory), permanent storage of subscribers IMSI and Authentication Key (Ki) and semi permanent storage of system information e.g. current Location Area Identity, telephone directory, short messages, etc..

- B. The Network Switching System (NSS): The Network Switching System is a system of electronic components that connects telephone calls and is thus responsible for performing call processing and subscriber related functions. Thus it carries out switching functions and manages the communications between mobile phones and the Public Switched Telephone Network. It includes the following functional units:
 - a. Home Location Register (HLR): HLR is an intelligent database and service control function responsible for management of each subscriber's records and control of certain services. It has the current subscriber status and associated VLR. It carries subscription details for a subscriber and location information enabling the routing of calls. There are two kinds of data in HLR permanent and temporary. Responsibilities of HLR include: services that subscriber has requested or been given, management of service profiles, mapping of subscriber identities (MISDN, IMSI), execution of supplementary service logic, e.g. incoming barred and passing subscriber records to VLR. However HLR data is stored for as long as a subscriber remains with the mobile phone operator.
 - b. Mobile Services Switching Center (MSC): MSC is an ISDN switch with (significantly) enhanced processing capability. It is responsible for handling voice calls and SMS as well as other services (such as conference calls, FAX and circuit switched data). The MSC sets up and releases the end-to-end connection, handles mobility and hand-over requirements during the call and takes care of charging and real time pre-paid account monitoring. The network element performs the telephony switching functions of the GSM network and manages communication between GSM and other network. The MSC is also

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- responsible for toll ticketing, network interfacing, common channel signalling, location updation, call handling of mobile subscribers within its domain, echo canceller operation control, gateway to SMS between SMS centers and subscribers and generating call charging records (for billing). An MSC will parent a number of BSC's.
- c. Mobile Switching Centre Server (MSS): The Mobile Switching Centre Server or MSS Server is a soft switch variant of Mobile Switching Centre, which provides circuit-switched calling, mobility management, and GSM services to the mobile phones roaming within the area that it serves. MSC Server functionality enables split between control (signalling) and user plane (bearer in network element called as Media Gateway), which guarantees more optimal placement of network elements within the network.
- d. Gateway Mobile Services Switching Center (GMSC): A network element used to interconnect two GSM networks. The gateway is often implemented in an MSC. The MSC is then referred to as the GMSC.
- e. Visitor Location Register (VLR): VLR is an intelligent database and service control function. It stores (on a temporary basis) the information needed to handle calls set up or received by MS's registered with it. This includes their International Mobile Subscriber Identities (IMSI), current Location Area Identities (LAI's) and supplementary service entitlements. Responsibilities of the VLR include: MSRN, location where mobile station has registered, information for supplementary service parameters (if any), IMSI, TMSI, HLR or global title and Authentication Key.
- f. Authentication Center (AUC): The Authentication Centre or AUC is a function to authenticate each SIM card that attempts to connect to the GSM core network (typically when the phone is powered on). Once the authentication is successful, the HLR is allowed to manage the SIM and services described above. An encryption key is also generated that is subsequently used to encrypt all wireless communications (voice, SMS, etc.) between the mobile phone and the GSM core network. If the authentication fails, then no services are possible from that particular combination of SIM card and mobile phone operator attempted. There is an additional form of identification check performed on the serial number of the mobile phone described in the EIR section below, but this



- is not relevant to the AUC processing. Proper implementation of security in and around the AUC is a key part of an operator's strategy to avoid SIM cloning.
- g. Equipment Identity Register (EIR): A database which contains information about the identity of mobile equipment in order to prevent calls from stolen, unauthorized, or defective mobile stations. MSISDN and IMSI number configurations are stored.
- h. GSM Interworking Unit (GIWU): The network element which interfaces to various data networks. The GIWU consists of both hardware and software that provides an interface to various networks for data communications. Through the GIWU, users can alternate between speech and data during the same call. The GIWU hardware equipment is physically located at the MSC/VLR.
- C. The Base Station System (BSS): The term Base Station can be used in the context of land surveying, wireless computer networking and wireless communications. All radio-related functions are performed in the BSS, which consists of Base Station Controllers (BSC's) and the Base Transceiver Stations (BTS's). It connects the MS and the NSS. In a typical cellular wireless system, an area is divided geographically into a number of cell sites, each defined by a radio frequency (RF) radiation pattern from a respective BTS antenna. The base station antennae in the cells are in turn coupled to a base station controller (BSC), which is then coupled to a telecommunications switch (e.g., mobile switching center (MSC)) or gateway that provides connectivity with a transport network such as the PSTN or the Internet.
 - a. Base Station Controller (BSC): The network element which is a small switch (with enhanced processing capability) provides all the control functions and physical links between the MSC and BTS. The BSC provides functions such as handover, cell configuration data, control of radio frequency (RF) power levels in Base Transceiver Stations, traffic concentration and low level switching operations.

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b. Base Transceiver Station (BTS): The BTS is the radio equipment (transceivers and antennas) needed to service each cell in the network. It is thus a network element which handles the radio interface to the mobile station thereby encoding, encrypting, multiplexing, modulating and feeding the RF signals to the antenna. The network can be that of any of the wireless communication technologies like GSM, CDMA, WAN, WiFi, WiMAX, etc. The function of a BTS primarily includes frequency hopping, random access detection and uplink radio channel measurements.





A BTS has the following units:

- i. TRX Transceiver: Quite widely referred to as DRX (driver receiver). Basically does transmission and reception of signals. Also does sending and reception of signals to/from higher network entities (like base station controller in mobile telephony).
- *ii.* Power Amplifier: Amplifies the signal from DRX for transmission through antenna. May be integrated with DRX.
- *iii.* Combiner: Combines feeds from several DRXs so that they could be sent out through a single antenna. They are used for reduction of number of antenna used.
- iv. Duplexer: Used for separating sending and receiving signals to/from antenna. It does sending and receiving signals through the same antenna ports (cables to antenna).
- v. Antenna: Antenna is also considered as part of BTS.



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vi. Alarm Extension System: It collects working status alarms of various units in BTS and extends them to operations and maintenance (O&M) monitoring stations. The components of an alarm extension system have been illustrated below:



D. The Operation and Support System (OSS): The term Operation and Support System most frequently describes "network systems" dealing with the telecom network itself, supporting processes such as maintaining network inventory, provisioning services, configuring network components and managing faults. For traditional telecom service providers, OSS were mainframe based systems designed to support telephone company staff members to automate their daily jobs such as order processing, line assignment, line testing and billing, etc. The complementary term Business Support System is a newer term and typically refers to "business systems" dealing with customers, supporting processes such as taking orders, processing bills and collecting payments. The two systems together

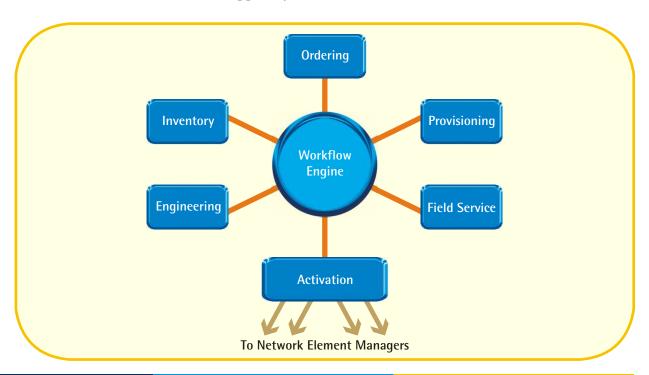


are often abbreviated BSS/OSS or simply B/OSS. B/OSS plays a critical role to support operations of a service provider and its increasing business services including voice, data, VOIP and multi-media.

Functions of an OSS solution may include the following components:

- Order processing, accounting, billing and cost management
- Network inventory, service provision, design and assign
- Network discovery and reconciliation, trouble and fault management
- Network elements, asset and equipment management, field service management.

Most of the Operation Support Systems are designed based on the Telecommunications Management Network (TMN) model. To better define OSS and BSS for future business and technology development, the Tele Management Forum is working on a newer model to replace the aging TMN. Refer diagram below for a business support system.



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Fixed Line

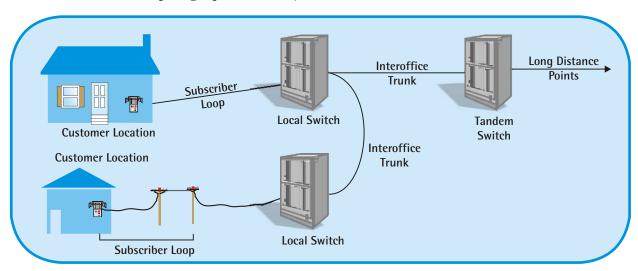
- 6.26 Land-line or fixed-line telecommunication is over 125 years old and, until the recent past, was defined as a telephone line that travelled through metal wire or optical fibre as part of a nationwide telephone network. This is distinguished from a mobile cellular line, where the medium used is the airwaves. The term landline is also used to describe a connection between two or more points that consists of a dedicated physical cable, as opposed to an always-available private link that is actually implemented as a circuit in a wider switched system (usually the public switched telephone network). Fixed-line telephony companies now also provide broadband data and voice as well as managed networking services to enterprise customers, as well as wholesale network capacity, all over fixed wirelines.
- 6.27 Fixed-line telecommunication will continue to be a huge industry, because the major players provide the backbone, i.e. fibre optic network, for the Internet, and fixed lines still provide the fastest data speeds by far. However, consumer business models are changing due to the evolution of voice and data transport technology. People are moving from fixed wireline phones to mobile phones and opting for lower-priced VoIP service in their homes thus causing local and long distance revenue growth to decline. On the flipside, fixed-telephony players are seeing an explosion in data service revenues, and are ultimately looking at providing the famous triple play-broadband Internet, voice, and video over an IP network-to consumers. Carriers are looking at increasing data sales faster than their declining circuit-switched voice revenues. (Major service providers Bharat Sanchar Nigam Limited, Bharti Airtel Limited, Vodafone Essar, TATA Indicom, etc.).

Network Structure of Fixed Line Services

- 6.28 This is a basic telephony which uses two types of network switched networks and dedicated private line circuits.
 - A. Switched network is a type of network that provides switched communication system and in which users are connected with each other through circuits, packets switching and control devices. Examples are public switch telephone network and private switched telephone network. The switched network consists of subscriber



premises equipment, subscriber loop, local and tandem switches and trunks between switches. An end user may reach any other end user anywhere on the network by dialling a telephone number. (Details of switching technologies are detailed in paragraphs to follow).



i. Public Switched Telephone Network: Network of the world's public circuitswitched telephone networks, in much the same way that the Internet is the network of the world's public IP-based packet-switched networks. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital, and now includes mobile as well as fixed telephones.

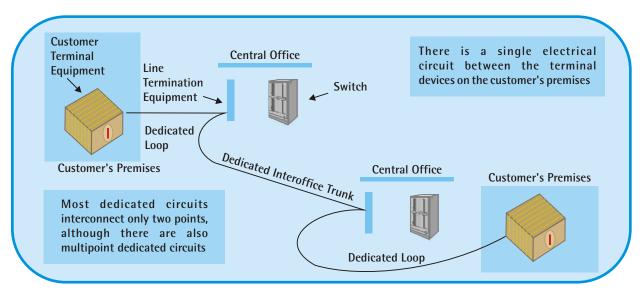


ii. Private Switched Telephone Network: Allow end users to reach only other end users that are members of a "closed" group; typical call routing relies on

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dialling fewer digits than are needed in the public network.

B. *Dedicated Circuits:* The end user may only reach the destination at the other end of the same circuit. No switching takes place.

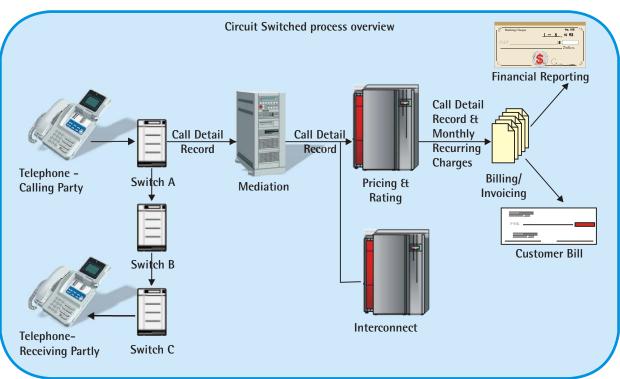


Switching Technologies

6.29 Circuit Switching: In telecommunications, a circuit switching network is one that establishes a fixed bandwidth circuit (or channel) between nodes and terminals before the users may communicate, as if the nodes were physically connected with an electrical circuit. It establishes connections between links, on demand and as available, in order to establish an end-to-end circuit between devices. The connections are temporary, continuous, and exclusive in nature. The connections are temporary as they are established and maintained only for the duration of the logical session, or call. They are continuous as they provide a specific amount of bandwidth, or capacity, continuously for the duration of the call. They are exclusive as the connection and the associated bandwidth are committed to only that call, i.e., are not shared with other transmissions. Circuit switches were developed for uncompressed, real-time voice communications, but will support any type of information transfer. Common examples of circuit switches include Private Branch Exchanges (PBXs) and Central Office



Exchanges (COs or COEs). All messages take the same path. Examples of Circuit Switch are Public Switched Telephone Network, Integrated Systems Digital Network, Circuit Switched Data and High Speed Circuit Switched Data.

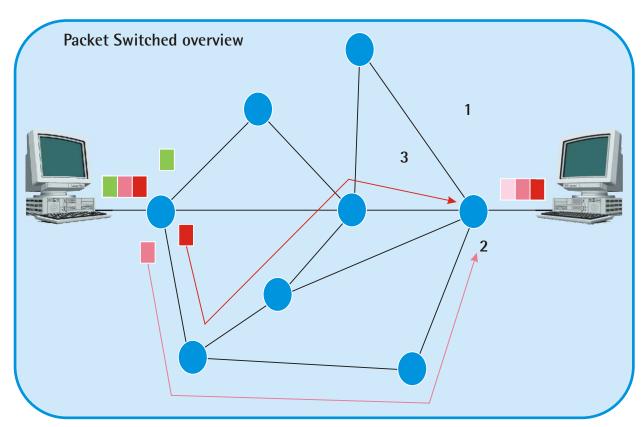


A. Packet Switching: Packet switching is a network communications method that splits data traffic (digital representations of text, sound, or video data) into chunks, called packets that are then routed over a shared network. There is no fixed route that a packet takes to get its destination. To accomplish this, the original message/data is segmented into several smaller packets. Each packet is then labelled with its destination and the number of the packet. This precludes the need for a dedicated path to help the packet find its way to its destination. Each packet is dispatched and may go via different routes. At the destination, the original message/data is reassembled in the correct order, based on the packet number.

Packet switching is used to optimise the use of the channel capacity available in digital

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telecommunication networks such as computer networks, to minimise the transmission latency (i.e. the time it takes for data to pass across the network), and to increase robustness of communication. The most well-known use of packet switching is the Internet and local area networks. The Internet uses the Internet protocol suite over a variety of data link layer protocols. For example, Ethernet and frame relay are very common. Newer mobile phone technologies (e.g., GPRS, I-mode) also use packet switching. Asynchronous Transfer Mode (ATM) also is a virtual circuit technology, which uses fixed-length cell relay connection oriented packet switching.



- 6.30 There are two basic types of Packet Switching:
 - A. Virtual Circuit Packet Switching Networks: An initial setup phase is used to set up



a route between the intermediate nodes for all the packets passed during the session between the two end nodes. In each intermediate node, an entry is registered in a table to indicate the route for the connection that has been set up. The packets passed through this route, have short headers, containing only a virtual circuit identifier (VCI). Each intermediate node passes the packets according to the information that was stored in its table, in the setup phase and according to the packets header content. In this way, packets arrive at the destination in the correct sequence.

- B. Datagram Packet Switching Networks: This approach uses a different, more dynamic scheme, to determine the route through the network links. Each packet is treated as an independent entity, and its header contains full information about the destination of the packet. The intermediate nodes examine the header of the packet, and decide the next hop of this packet. In the decision two factors are taken into account:
 - The shortest way to pass the packet to its destination protocols is used to determine the shortest path to the destination.
 - Finding a free node to pass the packet to in this way, bottlenecks are eliminated, since packets can reach the destination in alternate routes. Thus, in this method, the packets don't follow a pre-established route, and the intermediate nodes (the routers) don't have pre-defined knowledge of the routes that the packets should be passed through.

Long Distance

- 6.31 Long distance in telecommunications refers to telephone calls made outside a certain area, usually characterised by an area code outside of a local call area (known in the United States as a local access and transport area or LATA). Long-distance calls usually carry long-distance charges which, within certain nations, vary between phone companies and are the subject of much competition. International calls are calls made between different countries, and usually carry much higher charges. These calls are charged to the calling party unless the called party accepts a collect call.
- 6.32 While there have traditionally existed long-distance carriers who provided only long-

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distance services, today most if not all of the Baby Bells can offer service for all long-distance classes as well as local service, competing with the long-distance carriers. While the benefit of this arrangement is simplicity of billing and support for the customer, long-distance carriers can often offer lower rates or money-saving service plans.

- 6.33 In telephony, the long-distance operator is a telephone operator available to assist with making long distance telephone calls, answering billing questions, making collect calls and other functions, including emergency assistance. The major long distance service providers in India are Bharat Sanchar Nigam Limited, Mahanagar Telephone Nigam Limited, RailTel Corporation, Bharti Airtel Limited, Reliance Communications Limited, Videsh Sanchar Nigam Limited, etc.
- 6.34 Small customers with minimal Long Distance needs may access the network on a switched basis (i.e., long distance services provided over your local phone lines), while larger customers may find it more economical to access the network on a dedicated basis (i.e., users must install a dedicated line used for Long Distance calls).

Broadband

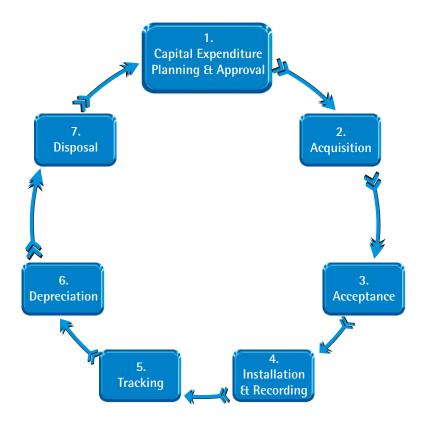
- 6.35 Broadband is a high speed, high capacity transmission medium that can carry signals from multiple independent network carriers. This is done on a single coaxial or fibre-optic cable by establishing different bandwidth channels. It is used to transmit data, voice and video over long distances simultaneously and comprises of MSU, Optic Fibre Cable, SDH Equipment (for connecting nationwide sites), POI Equipment, VSAT Equipment, etc. The major service providers within this segment are Bharat Sanchar Nigam Limited, Bharti Airtel Limited, Dishnet Wireless Limited, Gateway Systems (India) Pvt. Ltd., etc.
- 6.36 It is essential that the network overview and structure is clearly understood for the specific telecom entity, depending on the nature of services being provided to be able to audit the fixed assets.

Fixed Assets Cycle

6.37 The Fixed Asset cycle of a telecom company is almost the same as that of any other



business entity. This Fixed Asset cycle broadly comprises of the following stages Budgeting, Procurement, Acquisition, Recording, Accounting, Reporting and Disposal of an asset. Each stage of an asset's life has different accounting, reporting and management responsibilities. There may be certain inter-linkages between each of the stages and each stage logically flows into the next stage. Fixed asset life cycle in a telecom company has been illustrated as follows:



Capital Expenditure Planning and Approval (CAPEX)

6.38 CAPEX planning is a complex process often involving considerable levels of expenditure and exposure to risk. Capital Expenditure planning helps companies manage capital expenditures on an overall basis. It enables the management to monitor progress and gain visibility into the implications of delaying / accelerating capital spending.

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- 6.39 Since, capital expenditures involve huge cash outlay and blockage of funds for years; there is close scrutiny at all levels of management. All Capital projects are to be analysed for Return on Investment, risk evaluation measures like payback period, internal rate of return, net present value etc. Executive Committees may periodically review corporation-wide capital projects to ensure the expenditure is in the right direction.
- 6.40 Generally, capital budgets are compared with the actual expenditures on a monthly basis and significant differences analysed. Such practices help detecting misuse of funds, if any.
- 6.41 Discretionary capital spending, such as purchase of furniture or computer equipment, is generally decentralised and is controlled by restricting spending authority to appropriate levels of responsibility.
- 6.42 Thus, capital expenditure planning and capex approvals in telecom industry would basically include:
 - Strategic Network Planning.
 - Capacity Forecasting.
 - Capex approval by the Network Planning Department.
 - Determination of Costing.
 - Approval by functional heads and top management.

Acquisition

- 6.43 The acquisition stage of fixed assets would include:
 - **Yendor Selection:**
 - contracts covering circles / states
 - contracts for specific items BTS, antenna, cables, etc.
 - Placing of orders:
 - bulk purchase orders
 - purchase of specific items based on provision of services.
 - Receipt of Inventory:
 - in warehouses (stores)
 - at construction sites.



Acceptance

6.44 Acquired capital items are accepted by reference to the Purchase Orders raised to the vendor. Any defected / broken items are generally not accepted and are covered under the quality standard parameters as mentioned in the Purchase order / agreement. Receipt of goods may take place either in stores or at construction sites. At the time of receipt, a Material Receipt Note (MRN) is prepared which forms the basis for accounting further.

Installation and Recording

- 6.45 The installation of capital equipments requires expertise to provide end-to-end service from engineering and deployment to maintenance. The installation of capital inventory would include:
 - Issue of warehouse inventory to construction sites (purpose of issuance i.e. whether a fresh issuance or for expansion, repair or replacement needs to be documented).
 - Installation of capital inventory as per the configurations set by the Network (Technical) Department.
 - Preparation of Installation Certificates.
 - Capitalisation of capital inventory in GL and updating details in the Fixed Assets Register.
 - Provisional Capitalisation based on the standard Bill of Material.
 - **Calculation of Depreciation.**
 - Review of policies and procedures relating to movement of fixed assets between different locations.

Tracking

- 6.46 One of the very important stages of fixed assets cycle is the tracking. Tracking telecom assets is an important concern of every operator, regardless of size and its severity of location. Fixed assets are defined as any 'permanent' object that a business uses internally including but not limited to computers, tools, software or office equipment.
- 6.47 Many operators face a significant challenge to track location, quantity, condition, maintenance and depreciation status of their fixed assets, since inventory is

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voluminous and located / kept at various locations which could be highly prone to thefts, damages (either environmental or intentional), etc. A popular approach to tracking of fixed assets utilises serial numbered asset tags, often with bar codes for easy and accurate reading.

- 6.48 However both types of capital inventory (a) lying at sites and stores which have not been capitalised, or (b) which are capitalised to a particular location / site, are tracked by operators manually and through details maintained in the software systems especially designed for the same. Whenever an asset is received in stores or at sites, the same is given a unique asset number with the date of receipt and location details. Similarly, physical asset is tagged for identification. In case of movement of inventory from stores to sites or at the point of capitalisation, the details of asset location are simultaneously changed.
- 6.49 Further, site locations and stores are guarded by the security agencies and records maintained by the store keeper (in case of warehouse) / security guard (in case of sites) for physical movement of personnel and equipments. Also in cases where inventory is moved for repairs or for replacements, the fixed asset records are simultaneously changed.
- 6.50 Further, as a practice and to keep a strict control over the fixed assets, the telecom operators often prepare a plan for physical verification of fixed assets. This plan is to be made depending upon the requirements, locations and other factors for physical verification in a phased manner wherein assets are to be physically verified either by internal team of personnel from a department other than the dealing department (in the presence of Head of Department) or by external agencies. During the course of physical verification, count of inventory is done both ways floor to tag and tag to floor. Thereafter, a complete report along-with the reconciliation of physical assets with Fixed Assets Register is submitted to management for corrective actions and adjustments in the books of account.
- 6.51 The common issues which are faced by telecom operators due to which there are differences in capital inventories and physical verification could be the following geographical spread (process is time consuming), frequent transfer of assets from one



site location to another without updation of records and reconciliation of physical inventory with the Fixed Assets Register.

6.52 An auditor of a company needs to ensure that the physical verification process is sufficient enough to covers all the category of assets located at all the site locations and within the warehouses. They may bring to the notice of the management any flaws in the physical verification process, which may further lead to loss of control over inventory or even monetary losses. Physical verification report should be reviewed by the statutory auditor. Any, differences highlighted in the report should be analysed & enquired into. Further, the impact of differences should be assessed for any adjustments to be made in the books of account.

Depreciation

- 6.53 As per an Accounting Standard (AS) 6 "Depreciation Accounting" issued by the Chartered Accountants of India, "Depreciation is a measure of the wearing out, consumption or other loss of value of a depreciable asset arising from use, effluxion of time or obsolescence through technology and market changes. Depreciation is allocated so as to charge a fair proportion of the depreciable amount in each accounting period during the expected useful life of the asset. Depreciation includes amortisation of assets whose useful life is pre-determined". Depreciation has a significant effect in determining and presenting the financial position and results of operations of an enterprise. Depreciation is charged in each accounting period by reference to the extent of the depreciable amount, irrespective of an increase in the market value of the assets.
- 6.54 In a telecom business, calculation of depreciation on various assets is quite cumbersome. As discussed above, since assets and their details are generally maintained in IT application software within the Fixed Assets Module, hence depreciation calculation is also done via the same software, wherein rate of depreciation charge is configured as per the accounting policy decided by the company management. When the relevant program in application software is run, depreciation on various fixed assets is automatically calculated and report generated which gives the desired results. Simultaneously, Fixed Asset Register also gets updated with the depreciation charge and provides the net book value as at the particular date. It is

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important for the auditor to test the IT system configuration whether the charge of depreciation is uploaded appropriately and calculated accurately.

Disposal

- 6.55 The last stage of fixed assets is the ultimate disposal of fixed assets. Telecom network inventory is slightly different from inventory in the "bricks-and-mortar". When one thinks about physical inventory, one generally considers that inventory itself has intrinsic value that can be realised by its sale.
- 6.56 The telecom company may enter into contracts wherein old/damaged fixed assets may be replaced by a strategic partners/ vendors providing warranty coverage / maintenance services. In such cases, adjustments in values may be made in the books of account and fixed assets register may be updated.
- 6.57 There could be other cases where assets may be destroyed or damaged and are not covered by such contracts. These assets may be required to be sold as a scrap. Actual loss on sale of such assets should be recorded basis the comparison of the net book value and sale price. Further such loss should be disclosed properly and fixed assets register should be updated.

Risks in Telecom Fixed Assets Cycle

6.58 The fixed assets of a telecom business are spread across geographical locations, which apart from obsolescence are prone to theft, sabotage, physical damages and operational damages. Some of the potential risks attached to fixed assets of a telecom business are enumerated hereunder:

Acquisition of Fixed Asset/Inventory

- Recorded fixed asset acquisitions do not represent fixed assets acquired by the entity due to which validation of such assets is not possible (validity).
- Not all the fixed assets acquired have been recorded in the books of account which may lead to incomplete records being maintained by an entity (completeness).
- Acquisitions may be incorrectly expensed thereby impacting the profit and loss account.



- Fixed assets recorded in wrong asset or expense accounts (classification). Misclassification of fixed assets to conceal unauthorised purchases.
- Fixed assets acquisitions are not recorded in the appropriate period.
- No formalized budgets are communicated to cost centre holders which could result in budget overruns.
- Asset acquisitions are not done in accordance with the Company's approval limits and Capex policy (authorisation).
- Asset acquisitions may not be suitable to fulfil the purpose for which they have been acquired due to technological changes and which eventually makes the inventory to be sold/scrapped at a loss.
- Taxation allowances may not be correctly applied. Thus all valid tax allowances may not be claimed.
- Acquisition documentation may be lost or otherwise not communicated to appropriate personnel.
- Acquired assets may not be adequately / incorrectly recorded / programmed w.r.t. sites, asset ID, location and location ID, description of asset, quantity of assets, amount of asset, useful life of the asset and rate of depreciation in the fixed assets register which may lead to probable issues like identification of assets, and incorrect accounting of gross block and depreciation thereof.

Depreciation of Fixed Assets

- Incorrect provisioning of rates of depreciation in the fixed assets module thereby calculating and providing wrong depreciation charge. Thus anticipated useful life may be incorrectly set, establishing an unreasonable period during which the cost of the asset is depreciated. For e.g. if as per the accounting policy of the company an asset amounting to less than Rs. 5,000 is required to be depreciated over a period of 12 months and is actually depreciated in the month of installation, then there is a wrong charge of depreciation which has an impact in the current period as well as future period financial statements.
- Incorrect method of depreciation programmed in the systems module which would lead to incorrect levy of depreciation on assets. For e.g. programming of written down value method instead of straight line depreciation method.
- Depreciation charges are invalid wherein access rights for change in the

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- depreciation period and other rights are open / provided to other personnel apart from the Fixed Assets Manager.
- No regular review / monitoring of reports generated by the IT system's for accuracy and completeness of the depreciation levied on the assets. Also exceptional items of depreciation are not tracked and reviewed which may even lead to recording of depreciation in the wrong period.
- Wrong classification of fixed asset which may lead to wrong computation of depreciation charge.

Disposal and Transfer of Fixed Assets

- Recorded fixed asset disposals do not represent actual disposals since there do not exist any clear criteria, in writing, for identification and disposal/transfer of damaged, obsolete or unneeded inventory. Also pre-numbering disposal documentation may be incomplete, unauthorised and unprocessed.
- Fixed assets disposal and scrapping of old and obsolete assets are not recorded. Equipment disassembled and used for spare parts is not independently checked from the fixed assets records.
- Assets transferred from one location to another location within the company may not be appropriately controlled, wherein inventory is transferred from one location to another without change in the location in the Fixed Assets Register / inventory records which may leads to misappropriation of assets and differences in Inventory during the course of physical verification.
- Fixed assets disposals are not recorded in the appropriate period, thereby leading to non-timely updation of records. This may happen since asset related transactions before and after the end of an accounting period are not scrutinised and/or reconciled to ensure complete and consistent recording in the appropriate accounting period.
- Transfer or sale of assets may not be in accordance with the regulatory requirements resulting in fines and penalties.
- Assets and related accounts may be charged or credited with incorrect amounts. Also accounting classifications may be incorrect.

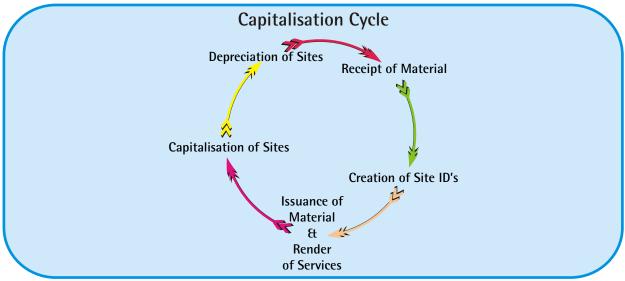
Capitalisation of Fixed Assets

6.59 Since being a capital intensive industry and high volumes of business with enormous



transactions, the fixed assets register and accounting of telecom cannot be developed and run in simple spreadsheets. Depending on the size of asset portfolio, the financial impact of these asset management challenges can be significant resulting in incorrect profits, taxes, and insurance covers. Further, asset accounting is complex and time consuming process. Thus, for the purpose of preparation and maintenance of fixed assets records, coupled with an objective of reduction in the complexity, increase productivity as well as accuracy in accounting of fixed assets, various software companies have launched automated applications such as ERP based Inventory and Fixed Assets Module which apart from data input and reports generation for information, process the transaction, allocates the asset to a defined class and cost centre, track financial or non-financial information (such as warranty information, physical location and service dates), calculates the depreciation and track historical transactions for each asset.

6.60 In a telecom industry, 'Plant and Machinery' forms the major category of fixed assets comprising almost 90% of the total gross block value and charge of depreciation. This trend is across all service segments of the industry mobile, fixed line, long distance and network services. Hence the main focus on the capitalisation front would be 'Plant and Machinery' which is provided in the paragraphs to follow. The sequencing for capitalisation of fixed assets is detailed hereunder which is generally followed by most of the telecom companies in India:



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Receipt of Material

- 6.61 Materials for telecom equipments are either received at the warehouse or at the construction sites. However in both the cases there is a three way matching of quantity which is done i.e. PO vs MRN vs invoice. For materials received at Stores material quantity and value as per invoice is matched with the PO raised. Material is thereafter unloaded and a gate entry number is generated for each invoice. Thereafter, material is physically verified as to the quantity. Excess and shortages, if any, are informed to the vendor.
- 6.62 For material received at Construction Sites delivery challan, invoice, installation certificate, etc. is sent by the vendor to supply chain department for preparation of MRN. After preparation of MRN, the details are uploaded in the system for invoice tracking and clearances thereof.

Creation of Site ID's

6.63 The site location for facilitation of services to subscribers and other end users are decided by the Technical department. To ensure site-wise tracking a unique system ID is created for each site to be installed, since issuance of material is thereafter done on basis of the site ID's created.

Issuance of Material (installation) and Render of Services

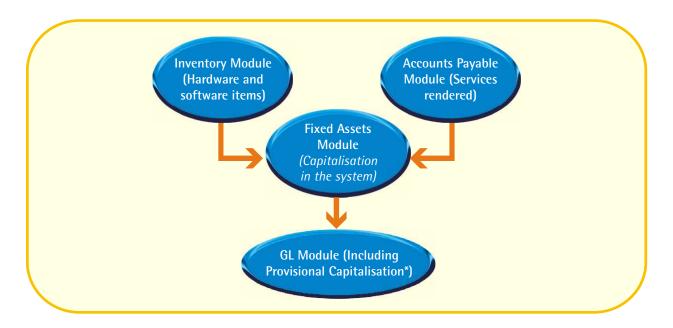
6.64 Materials are issued to sites for construction, basis the Technical requisition against which a Non Returnable Gate Pass cum material challan is prepared. Parallel to the issuance of such materials, the Inventory module is also updated for capital items and amounts transferred to the respective site ID's in the Fixed Assets module. In case of services rendered at sites, the accounting entries are not routed through Inventory module since there are no inventories involved in such transactions, but the same are routed through the Accounts Payable module with a specific mention of the site ID to which services rendered pertain to.

Capitalisation of Sites

All the new asset items whether from the Inventory module or from the Accounts Payable module are allocated a unique running asset number. This activity is done



manually in the system and is not automatically generated. Material issued to sites or services rendered will be capitalised in the gross block basis the 'date on air' as confirmed by the Technical department for each site. Thus, for the purpose of capitalisation, backend programs are run from the Inventory module and Accounts Payable module wherein capital inventory (in the form of Capital Work in Progress) is transferred to the Fixed Assets module. For the sites which are still in progress and are yet to be 'put on air', will remain parked as Capital Work in Progress.



Depreciation of Sites

6.66 Depreciation program is run within the Fixed Assets Module to automatically calculate depreciation on assets capitalised at site locations for the period and depreciation on assets previously capitalised. Post this program run, entry is passed in the General Ledger basis the depreciation report extracted. However, assets which are either provisionally capitalised or capitalised outside the system, depreciation is calculated manually (preferably in MS Excel sheet) and posted into the General Ledger.

^{*} explained above

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Advantages of Automated Fixed Asset Accounting System in Telecom

- Tt maintains perfect accounting for Fixed Assets.
- Gives complete control over physical assets spread across distributed locations.
- Takes care of statutory requirements like depreciation, insurance, etc.
- 2 Quickly and accurate by record, track, depreciate, and analyse locations assets with minimal efforts and gives the end users a tremendous flexibility, with multiple features and powerful reporting tools.
- Functionality allows the user to update and maintain records of the existing Fixed Assets with an option to create and maintain new assets.
- Keeps track of each asset in different locations, its costs, calculate depreciation, disposals, gain/loss on sale of asset.
- Handy in maintaining accurate accounting of Fixed Assets.
- Tighly scalable and efficient application, which enhances overall productivity of the organisation.

Audit Considerations

6.67 Fixed Assets in a telecom company would comprise of the following Balance Sheet and Profit & Loss items. Specific audit procedures for these account balances have been mentioned below:

Balance Sheet	Profit and Loss Statement
Gross Block: (majorly constituting the category of 'Plant and Machinery' inclusive of telecom specific - Erlang based capitalisation/de-capitalisation, accounting for Asset Retirement Obligation (ARO), Provisional Capitalisation), Indefeasible Rights of Use, etc. Accumulated Depreciation Capital Work in Progress (inclusive of capital inventory lying at construction sites, inventory lying in stores and capital advances)	Depreciation charge: (comprising of depreciation on fixed assets, effect of depreciation basis erlang computations, Asset Retirement Obligations and Provisional Capitalisation)



- 6.68 In order to reduce audit risk to an acceptably low level, the auditor should determine overall responses to assessed risks at the financial statement level, and should design and perform further audit procedures to respond to assessed risks at the assertion level. The overall responses and the nature, timing, and extent of the further audit procedures are matters for the professional judgement of the auditor.
- 6.69 Substantive analytical procedures are generally more applicable to large volumes of transactions that tend to be predictable over time. Hence in a telecom industry where volumes w.r.t. fixed asset balances are quite high, it is generally advisable to perform substantive analytical tests.
- 6.70 In designing substantive analytical procedures, the auditor needs to consider the following matters:
 - The suitability of using substantive analytical procedures given the assertions.
 - The reliability of the data, whether internal or external, from which the expectation of recorded amounts or ratios is developed.
 - Whether the expectation is sufficiently precise to identify a material misstatement at the desired level of assurance.
 - The amount of any difference in recorded amounts from expected values that is acceptable.
- 6.71 Paragraphs below are the suggestive steps for audit of additions to fixed assets. However documentation of work done is of a paramount importance and all audit steps and work done need to be documented as per the Standards on Auditing issued by the Institute of Chartered Accountants of India.

Capitalisation

6.72 For verification of capitalisation and performing substantive analytical procedures, the auditor may obtain a schedule of capitalisation of sites / locations. This is usually prepared "site-wise" which captures details like site locations, site ID's, date of capitalisation, amount capitalised, components capitalised at each site (for e.g. antenna's, BTS, racks, green shelters, tower, civil work, cables, ducts, etc.) along-with their configurations.

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- 6.73 To check the completeness of capitalisation, the auditor may obtain Technical Certificates which contains details of all the sites / locations and the total number of sites / locations capitalised during the period. The site-wise analysis may be mapped to ensure that all sites mentioned in the certificate have been covered and capitalised properly and vice versa. Exceptions to this may be enquired into and adjustments in the books may be considered.
- 6.74 To check the accuracy of capitalisation and for performing analytical procedures, the auditor may obtain Standard Bill of Material (which contains standard configuration for each kind of a site). The auditor, by using the standard bill of material, may ensure that components forming part of the sites (as per the Technical Certificate) have been properly capitalised. If the same have not been done, then provisional capitalisation schedule may be referred. Exceptions to this may be enquired into and adjustments in the books may be considered.
- 6.75 The amounts capitalised may be analysed on average cost basis. General guidelines for performing the analytical procedures are as follows:
 - Average cost of each type of material could be computed based on past three purchase orders.
 - Actual cost may be compared site-wise, component-wise (in terms of quantity, amount, length etc) with average cost calculated.
 - Difference may be investigated. Necessary disposal of differences could be done considering auditor's judgement and concept of materiality.
 - Documentation standards as well as controls should be ensured considering the quantum of data involved and amount of capitalisation.
- 6.76 There could be scenarios where no values are assigned to certain components installed at sites / locations. The auditor may check whether there has been any capital asset movement of the component from / to another site. In that case, following may be ensured
 - Necessary approvals have been taken from all the appropriate departments,
 - Documents confirming physical movement have been properly retained. The same may be reviewed by the auditor as a part of its substantive procedures,



Necessary updations in the Fixed Assets Register have been made w.r.t. site location, site ID, amount of component, etc.

Any exceptions to the above may be considered for assessing the possibility of under / over capitalisation.

6.77 The auditor should also perform Non-statistical sampling with an objective to get comfort on the capitalisation. The population should be the entire actual capitalisation (Fixed Asset additions) during the period. The sample size & selection method should be carefully selected considering factors like materiality levels, amount of capitalisation, value of each capitalisation line item, no. of items capitalised, audit methodology etc.

Depreciation

- 6.78 Companies calculate depreciation on each individual asset following the method and rates of depreciation adopted.
- 6.79 The auditor may decide about the verification steps based on his professional judgement, level of comfort desired, adjustments in the area in the past etc. General guidelines for verification are as follows:
 - Depreciation calculations could be recomputed for each asset applying the applicable depreciation rates, period of depreciation etc. The auditor may also decide verification on a sample basis.
 - Substantive analytical tests could also be performed to gain overall comfort over depreciation expense.
- 6.80 An analytical procedure could be checking reasonability of depreciation The actual expense can be compared with expected depreciation expense computed, based on the value, estimated life, remaining life and depreciation rate of the assets at a block level. Differences between actual depreciation and expected depreciation could be enquired and necessary adjustment in financials may be considered.
- 6.81 Expected depreciation can be computed considering the following:

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- The opening Gross Block may be reduced with assets fully depreciated in the previous years and assets getting fully depreciated in the current year.
- Assets getting fully depreciated during the period Remaining Net Block will be the amount of depreciation.
- Additions during the period Actual depreciation expense may be considered in place of expected depreciation as computed above. Otherwise the differential may become a valid reconciling item.

Fixed Assets Register

- 6.82 The Fixed Assets Register in a telecom company is generally maintained in its system's Fixed assets module. The Fixed assets data may become so voluminous that it cannot be captured in manual spread sheets. However, the fixed assets data can be retrieved from the system and can be used for verification and analysis. A Fixed Assets Register includes the following details:
 - Site ID
 - Site Location
 - Asset ID
 - Asset Description
 - Date of Capitalisation
 - Quantity Capitalised
 - Useful Life of the Asset
 - Rate of Depreciation
 - Gross Block
 - Depreciation charge
 - Accumulated Depreciation
 - Net Block
- 6.83 Generally, the asset register is configured in such a manner that all individual items capitalised on a site are capitalized as separate line item. However for keeping control over capitalisation on each site, all line items are tagged to the respective site IDs. Accordingly, data extracted from system could be used for analysis of capitalisation on each site.



6.84 From a CARO perspective, the auditor may ensure the following:

- Maintenance of proper records in the form of Fixed Assets Register showing full particulars, including the following apart from quantitative details and situation of fixed assets.
 - Identification of Asset
 - Proper classification under account head
 - Location of Asset
 - Quantity capitalised
 - Original Cost
 - Rates of Depreciation*
 - Depreciation written off to date
 - Particulars of sale, discard, demolition, etc.
- Whether these fixed assets have been physically verified by the management at reasonable intervals; whether any material discrepancies were noticed on such verification and if so, whether the same have been properly dealt with in the books of account.
- If substantial part of the fixed assets have been disposed off during the year, whether it has affected the going concern.
- The Whether physical verification of inventory has been conducted at reasonable intervals by the management.
- Whether proper records are maintained and whether any material discrepancies were noticed on physical verification and if so, whether the same have been properly dealt in the books of account.
- Is there an adequate internal control procedure commensurate with the size of the company and nature of its business, for the purchase of inventory and fixed assets.
- The Whether aggregate original cost and depreciation to date recorded in assets register tally with the figures shown in the books of account.
- Year since which records are being maintained.
- Are proper records maintained for assets located in residential premises of employees and directors.
- Are records maintained for items of assets fully depreciated but not sold.

rate of depreciation may be checked by the auditor in the fixed assets register, since there is a possibility that based on nature of assets, the rates could vary (to be mentioned in the accounting policy of the company) and hence defined useful life which would compute the depreciation on a particular asset. For e.g. assets valuing less than Rs 5,000, the same are either to be depreciated in the month of purchase or spread over a period of one year for depreciation. Hence in this case the depreciation needs to be defined accordingly in the system.

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Key Reconciliations

Capitalisation and Depreciation Reconciliation

- 6.85 As discussed above, Fixed Assets Register in a Telecom industry is voluminous in terms of number of line items for each site and number of sites. Accordingly, the register is maintained in its Enterprise Resource Planning (ERP) system.
- 6.86 Generally, transactions are entered into one module of the ERP which either automatically flow into or manually pushed into other modules. For instance all transactions are entered into the Fixed Assets Module and thereafter via a program run are transferred to General Ledger (GL) Module, Similarly transactions flow from inventory module to Fixed Assets module.
- 6.87 Further, all details of Fixed Assets are stored in the Fixed Assets Module and accounting is done in the General Ledger module. The financial statements are prepared based on General Ledger module. Accordingly, to form an opinion on the financial statements, the auditor should test the closing balance reconciliation between Fixed Assets module and the General ledger module.
- 6.88 This reconciliation is generally prepared manually (commonly known as Fixed Assets vs General Ledger Reconciliation) and forms part of the management's critical internal control activity before any financial reporting. The reconciliation should be prepared for both Gross Block and accumulated depreciation.
- 6.89 The auditor should test each of the reconciling items in the reconciliation, assess its validity and consider the possible impact on the financial statements. Following are the general guidelines in relation to testing the reconciling items:
 - There may be certain entries which are passed only in the General Ledger Module and are not routed through the Fixed Assets Module. Reasons could be disclosure entries, pending decisions on allocation to assets, posting delays in the Fixed Assets Module due to IT related issues, etc. For these specific entries, the Company may separately track details like location, quantity, value of asset, depreciation charge, etc. In such cases, the auditor may consider its opinion under CARO.
 - There could be other reconciling items which are passed only in the Fixed Assets



Module and not recorded in the General Ledger Module. Generally, there should not be any such reconciling items. However in case there are any, then validity of the same should be assessed, amount should be verified by reference to the source documents and possible impact on the financial statements as well as on the audit opinion may be considered.

- The FA vs GL reconciliations (both Gross Block and Depreciation) are prepared with certain reports extracted from the Fixed Assets Module. The auditor may review the FA GL reconciliation from the original reports generated from the system.
- The reconciling item in the FA vs GL Reconciliation for Depreciation should be the depreciation impact on reconciling items in FA vs GL reconciliation for Gross block.

Inventory (Capital Work in Progress) Reconciliation

- 6.90 Items which are not capitalised during the period closure form part of Capital Work in Progress and disclosed accordingly in the fixed assets category.
- 6.91 There is a separate module known as Inventory Module (apart from Fixed Assets Module) within the system which records the details and value of materials lying at warehouse and materials sent to the construction sites.
- 6.92 Generally, transactions are entered into one module of the ERP which either automatically flow into or manually pushed into other modules. For instance- all transactions are entered into the Fixed Assets Module and thereafter via a program run are transferred to General Ledger (GL) Module, similarly transactions flow from inventory module to Fixed Assets module.
- 6.93 Entry in this module is done at the time of receipt of material. This reconciliation is generally prepared manually (commonly known as Inventory vs General Ledger Reconciliation) and forms part of the management's critical internal control activity before any financial reporting.
- 6.94 The auditor should test each of the reconciling items in the reconciliation, assess its validity and consider the possible impact on the financial statements. Following are the general guidelines in relation to testing the reconciling items:
 - There are certain entries passed only in the General Ledger Module and are not

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routed through the Inventory Module. Reasons could be disclosure entries, pending decisions, posting delays in the Fixed Assets Module due to IT related issues, etc. For these specific entries, the Company may separately track details like location, quantity, value of asset, depreciation charge, etc. In such cases, the auditor may consider its opinion under CARO.

- There could be other reconciling items which are passed only in the Inventory Module and not recorded in the General Ledger Module. The validity of such reconciling items should be assessed, amount should be verified by reference to the source documents and possible impact on the financial statements as well as on the audit opinion may be considered.
- The Inventory vs GL reconciliation is prepared using certain reports extracted from the system. The auditor may review the Inventory GL reconciliation from the original reports generated from the system.

Change in Location of Fixed Assets

- 6.95 There could be certain possible situations like:
 - inventory moved from warehouse to a construction site, but again sent to another construction site without updation of initial movement in the company's records (Fixed Assets Register),
 - excess inventory at a construction site moved to another site without updation of initial movement of company's records,
 - inventory moved from warehouse for a referred site but in an emergency situation relocated to another site without updation of initial movement of company's records,
 - inventory moved to a heavy traffic site from its initial site during the peak hours (e.g. festivals, etc.) or due to some other requirement at other site.
- 6.96 In all the above cases it is important that fixed assets register is updated immediately subsequent to the occurrence of transaction, since in such movements there is a possibility of loss of control over the asset.
- 6.97 The auditor must ensure that such movements are properly approved and necessary updations are made in the fixed assets register. Further, Company's control over such movements and its tracking mechanism may be understood and tested. The results of such testing may be helpful in audit planning as well as in forming opinions.

APPENDICES

Appendices

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1.1 Guidelines for International Long Distance Services Licence

The government has issued guidelines (No.10-21/2005-BS-I/48 dated 14th December, 2005) for issue of licence for International Long Distance Service. These guidelines include, amongst other matters, the following:

- The applicant must be an Indian company, registered under the Companies Act, 1956.
- The applicant company can apply for only one licence for ILD service.
- The licence for ILD service shall be issued on non-exclusive basis, initially for a period of 20 years, with automatic extension of the licence by a period of 5 years subject to satisfactory performance in accordance with terms & conditions of the licence particularly in regard to Quality of Service (QoS) parameters.
- The applicant company shall submit, a detailed network Roll Out plan. The roll out obligations stipulate receipt and delivery of traffic from / to all the exchanges in the country which can be ensured through at least one gateway switch having appropriate interconnection with at least one National Long Distance Operators/ Access Service Providers and meeting the quality of service regulations and network to network interface requirement within three years from the effective date of licence.
- The applicant company shall pay one time non-refundable Entry Fee of Rs 2.5 crores before the signing of the licence. A processing fee of Rs. 50,000 is also payable by the applicant.
- In addition, unconditional Bank Guarantee (BG) of Rs. 2.50 crores shall be given which will be released on fulfilment of the roll out obligations. Non-fulfilment of roll out obligations will result in encashment of the bank guarantee by the licensor. This will be without prejudice to any other action, which the licensor may consider appropriate for the failure of licencee to fulfil the licence conditions.
- The applicant company itself shall have a networth as well as paid up capital of Rs 2.5 crores on the date of application and shall submit the certificate to that effect from Company Secretary / Company's statutory Auditor along with the application for licence. The minimum networth & paid up capital shall be maintained during currency of licence.
- In addition to entry fee described above, the annual licence fee including USO contribution, @ 6% of the Adjusted Gross Revenue (AGR) shall be payable. The

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quarterly instalments of licence fee for the first three quarters of a financial year shall be payable by the Licencee within 15 days of the completion of the relevant quarter of the year. This fee shall be paid by the Licensee on the basis of actual revenues (on accrual basis) for the quarter duly certified with an affidavit by a representative of the Licensee, authorised by a Board resolution coupled with General Power of Attorney. However, for the last quarter of financial year, the Licensee shall pay the licence fee by 25th March on the basis of expected revenues for the quarter, subject to a minimum payment equal to the actual revenue share paid for the previous quarter. For delayed payment beyond the said due dates, penalty as stipulated in licence for delayed payments will apply. The Licensee shall adjust and pay the difference between the payment made and actual amount duly payable (on accrual basis) for the last quarter of the Financial year within 15 days of the end of the said quarter. The Licensor shall have the right to inspect books of accounts of the Licensee, and, in addition have an independent audit conducted to ascertain the correctness of the licence fee paid.

- Full details of the settlement regime through accounting rate mechanisms shall be required to be filed by the ILD service licensee with the Licensor on regular basis. All bilateral settlements between the ILD service licensee and other foreign partner (carrier) shall be through normal banking channels in a transparent manner.
- The applicant company shall submit Financial Bank Guarantee (FBG) of Rs. 20 crores, one year after the date of signing the licence agreement or before the commencement of service, whichever is earlier, in the prescribed proforma given in the Licence Agreement. The FBG shall be valid for a period of one year and shall be renewed from time to time for such amount as may be directed by the Licensor. The amount of FBG shall be equivalent to the estimated sum payable for two quarters towards licence fee.
- ILD service provider can enter into an arrangement for leased lines with the Access Providers/NLD service provider. Further, ILD Service Providers can access the subscribers directly only for provision of international Leased Circuits/Close User Groups (CUGs). Leased circuit is defined as virtual private network (VPN) using circuit or packet switched (IP Protocol) technology apart from point to point non-switched physical connections/transmission bandwidth. Public network is not to

Appendix

be connected with leased circuits/CUGs.

- The licensees (who are International Long Distance, National Long Distance, Basic or Cellular Mobile Telephone service operators) can have only one Switch to perform the functions of ILD/ NLD/Cellular/ Basic services provided that the switch is located at the same station and separate accounts of all the operations are maintained by duly apportioning the costs between various service. Separate TAX and Gateway switch is not mandatory
- The charges for access or interconnection with other networks shall be based on mutual agreements between the service providers subject to the restrictions issued from time to time by TRAI under TRAI Act, 1997.

In case of not adhering to Licence conditions envisaged below, the licence(s) granted to the company shall be deemed as cancelled and the licensor shall have the right to encash the performance/financial bank guarantee(s) and the licensor shall not be liable for loss of any kind:

- i. There shall be a non-obstante clause in the licence which confers powers upon the licensor to cancel the licence under certain defined circumstances.
- ii. In order to ensure that at least one serious resident Indian promoter subscribes reasonable amount of the resident Indian shareholding, such resident Indian promoter shall hold at least 10 per cent equity of the licensee company.
- iii. The Company shall acknowledge compliance with the licence agreement as a part of Memorandum of Association of the Company. Any violation of the licence agreement shall automatically lead to the company being unable to carry on its business in this regard. The duty to comply with the licence agreement shall also be made a part of Articles of Association.
- iv. Chief Technical Officer (CTO)/Chief Finance Officer (CFO) shall be resident Indian citizens. The Licensor can also further notify key positions to be held by resident Indian citizens.
- v. The Company shall not transfer the following to any person/place outside India:
 - a. any accounting information relating to subscriber (except for roaming/billing) (Note: it does not restrict a statutory disclosure of financial nature);
 - b. user information (except pertaining to foreign subscribers using Indian

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- Operator's network while roaming); and
- c. details of their infrastructure/network diagram except to telecom equipment suppliers/manufacturers who undertake the installation, commissioning etc., of the infrastructure of the licensee Company on signing of non-disclosure agreement.
- vi. The Company when entering into roaming agreements with service providers outside India must provide, on demand, the list of such users (telephone numbers, in case of foreign subscribers using Indian Operator's network while roaming).
- vii. The Company must provide traceable identity of their subscribers. However, in case of providing service to roaming subscriber of foreign Companies, the Indian Company shall endeavour to obtain traceable identity of roaming subscribers from the foreign company as a part of its roaming agreement.
- viii. No traffic (mobile and landline) from subscribers within India to subscribers within India shall be hauled to any place outside India. For this purpose, location of satellites serving India for domestic traffic shall not be treated as outside India.
- ix. No Remote Access (RA) shall be provided to any equipment manufacturer or any other agency out side the country for any maintenance/repairs by the licensee. However, RA may be allowed for catastrophic software failure (such as failure to boot up etc.) which would lead to major part of the network becoming nonfunctional for a prolonged period, subject to meeting the following conditions:
 - a. An identified Government agency (Intelligence Bureau) will be notified, when RA is to be provided.
 - b. Remote Access password is to be enabled for a definite period only and only for access from pre-approved locations of the Original Equipment Manufacturer (OEM) Vendors and only for the equipments specifically under repair/maintenance.
 - c. The control of Remote Access i.e. activation, transfer of data, termination etc. shall be within the country and not at a Remote location, abroad.
 - d. The Government agency will be given all support to record the transactions for on-line monitoring.
 - e. Any equipment or software that forms part of the overall monitoring shall not

be permitted to have remote access under any circumstances.

- f. The terms catastrophic software failure, major part of the network, and prolonged period used under this clause shall be as defined by LICENSOR from time to time.
- x. It shall be open to the Licensor to restrict the Licensee Company from operating in any sensitive area from the National Security angle.
- xi. In order to maintain the privacy of voice and data, monitoring shall only be upon authorisation by the Union Home Secretary or Home Secretaries of the States/Union Territories.
- xii. For monitoring traffic, the licensee company shall provide blind access of their network and other facilities as well as to books of accounts to the security agencies.

The Licensor may, without prejudice to any other remedy available to it for the breach of any conditions of ILD service licence, by a written notice of 60 days issued to the licensee at its registered office, terminate the licence under any of the following circumstances:

If the licensee:

- a. fails to commission or deliver the service within the time period(s) specified in the licence.
- b. fails to perform any obligation(s) under the licence including remittance of timely payments of fee and other dues due to the Licensor;
- c. fails to rectify, within the time prescribed, any defect as may be pointed out to the licensee by the Licensor.
- d. goes in liquidation or ordered to be wound up.
- e. is recommended by TRAI for termination of licence for non compliance of the terms and conditions of the licence.
- f. fails to comply with FDI norms.

The fee /royalty for the use of spectrum and possession of wireless telegraphy equipment shall be separately payable as per the details and prescription of Wireless Planning & Coordination Wing. The fee/royalty for the use of spectrum /possession of

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wireless telegraphy equipment depends upon various factors such as frequency, link length, area of operation etc.

1.2 Guidelines for National Long Distance Services Licence:

Similar guidelines are issued for NLD licence vide guidelines No.10-21/2005-BS-I/ 47 dated 14th December 2005. Some of the guidelines are:

- The applicant must be an Indian company, registered under the Companies Act, 1956.
- The applicant company can apply only for one licence for National Long Distance Service.
- The licence for NLDO shall be issued on non-exclusive basis, for a period of 20 years, extendable by 10 years at one time, for inter-circle Long Distance operations within the territorial jurisdiction of India.
- The applicant company shall pay one time non-refundable Entry Fee of Rs 2.5 crores before the signing of the Licence. The applicant company shall pay a processing fee along with the application of Rs. 15,000.
- The applicant company shall also submit business plan along with its funding arrangement for financing the project.
- The applicant company shall have a minimum networth as well as paid up equity capital of Rs. 2.5 Crores on the date of the application and shall submit the certificate to that effect from Company Secretary/Company's statutory Auditors along with the application for licence. The minimum networth and paid up capital shall be maintained during currency of licence.
- In addition to entry fee described above, the annual licence fee including USO contribution, @ 6% of the Adjusted Gross Revenue (AGR) shall be payable. Licence fee shall be payable in four quarterly instalments during each financial year. The quarterly instalments of licence fee for the first three quarters of a financial year shall be payable by the Licensee within 15 days of the completion of the relevant quarter of the year. This fee shall be paid by the Licensee on the basis of actual revenues (on accrual basis) for the quarter duly certified with an affidavit by a representative of the Licensee, authorised by a Board resolution coupled with General Power of Attorney. However, for the last quarter of financial year, the Licensee shall pay the licence fee by 25th March on the basis of expected revenues

for the quarter, subject to a minimum payment equal to the actual revenue share paid for the previous quarter. For delayed payment beyond the said due dates, penalty as stipulated in licence for delayed payments will apply. The Licensee shall adjust and pay the difference between the payment made and actual amount duly payable (on accrual basis) for the last quarter of the Financial year within 15 days of the end of the said quarter. The Licensor shall have the right to inspect books of accounts of the Licensee, and, in addition have an independent audit conducted to ascertain the correctness of the licence fee paid.

- The applicant company shall submit Financial Bank Guarantee (FBG) of Rs. 20 crores, one year after the date of signing the licence agreement or before the commencement of service whichever is earlier in the prescribed Proforma given in the Licence Agreement. Initially, FBG shall be valid for a period of one year and shall be renewed from time to time for such amount as may be directed by the Central Government.
- NLD service Licensee shall be required to make own suitable arrangements/ agreements for leased lines with the Access Providers for last mile. Further, NLD Service Providers can access the subscribers directly only for provision of Leased Circuits/Close User Groups (CUGs). Leased circuit is defined as virtual private network (VPN) using circuit or packet switched (IP Protocol) technology apart from point to point non-switched physical connections/transmission bandwidth. Public network is not to be connected with leased circuits/CUGs. It is clarified that NLD service Licensee can provide bandwidth to other telecom service licensee also.
- The licensees (who are International Long Distance, National Long Distance, Basic or Cellular Mobile Telephone service operators) can have only one Switch to perform the functions of ILD/ NLD/Cellular/ Basic services provided that the switch is located at the same station and separate accounts of all the operations are maintained by duly apportioning the costs between various service. Separate TAX and Gateway switch is not mandatory. NLD service providers are permitted to deploy circuit switched or managed Packet Switched network to engineer their NLD networks.
- The charges for access or interconnection with other networks shall be based on mutual agreements between the service providers subject to the restrictions issued from time to time by TRAI under TRAI Act, 1997.

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In case of not adhering to Licence conditions envisaged below, the licence(s) granted to the company shall be deemed as cancelled and the licensor shall have the right to encash the performance/financial bank guarantee(s) and the licensor shall not be liable for loss of any kind:

- i. There shall be a non-obstante clause in the licence which confers powers upon the licensor to cancel the licence under certain defined circumstances.
- ii. In order to ensure that at least one serious resident Indian promoter subscribes reasonable amount of the resident Indian shareholding, such resident Indian promoter shall hold at least 10 per cent equity of the licensee company.
- iii. The Company shall acknowledge compliance with the licence agreement as a part of Memorandum of Association of the Company. Any violation of the licence agreement shall automatically lead to the company being unable to carry on its business in this regard. The duty to comply with the licence agreement shall also be made a part of Articles of Association.
- iv. Chief Technical Officer (CTO)/Chief Finance Officer (CFO) shall be resident Indian citizens. The Licensor can also further notify key positions to be held by resident Indian citizens.
- v. The Company shall not transfer the following to any person/place outside India:
 - a. any accounting information relating to subscriber (except for roaming/billing) (Note: it does not restrict a statutorily required disclosure of financial nature);
 - b. user information (except pertaining to foreign subscribers using Indian Operator's network while roaming); and
 - c. details of their infrastructure/network diagram except to telecom equipment suppliers/manufacturers who undertake the installation, commissioning etc. of the infrastructure of the licensee Company on signing of non-disclosure agreement.
- vi. The Company when entering into roaming agreements with service providers outside India must provide, on demand, the list of such users (telephone numbers, in case of foreign subscribers using Indian Operator's network while roaming).
- vii. The Company must provide traceable identity of their subscribers. However, in

- case of providing service to roaming subscriber of Foreign Companies, the Indian Company shall endeavour to obtain traceable identity of roaming subscribers from the foreign company as a part of its roaming agreement.
- viii. No traffic (mobile and landline) from subscribers within India to subscribers within India shall be hauled to any place outside India. For this purpose, the location of satellites serving for domestic traffic shall not be treated as outside India.
- ix. No Remote Access (RA) shall be provided to any equipment manufacturer or any other agency outside the country for any maintenance/repairs by the licensee. However, RA may be allowed for catastrophic software failure (such as failure to boot up etc.) which would lead to major part of the network becoming nonfunctional for a prolonged period, subject to meeting the following conditions:
 - a. An identified Government agency (Intelligence Bureau) will be notified, when RA is to be provided.
 - b. Remote Access password is to be enabled for a definite period only and only for access from pre-approved locations of the Original Equipment Manufacturer (OEM) Vendors and only for the equipments specifically under repair/maintenance.
 - c. The control of Remote Access i.e. activation, transfer of data, termination etc. shall be within the country and not at a remote location, abroad.
 - d. The Government agency will be given all support to record the transactions for on-line monitoring.
 - e. Any equipment or software that forms part of the overall monitoring shall not be permitted to have remote access under any circumstances.
 - f. The terms catastrophic software failure, major part of the network, and prolonged period used under this clause shall be as defined by LICENSOR from time to time.
- x. It shall be open to the Department of Telecommunications to restrict the Licensee Company from operating in any sensitive area from the National Security angle.
- xi. In order to maintain the privacy of voice and data, monitoring shall only be upon authorisation by the Union Home Secretary or Home Secretaries of the States/ Union Territories.

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xii. For monitoring traffic, the licensee company shall provide blind access of their network and other facilities as well as to books of accounts to the security agencies.

The Licensor may, without prejudice to any other remedy available to it for the breach of any conditions of NLD service licence, by a written notice of 60 days issued to the licensee at its registered office, terminate the licence under any of the following circumstances:

If the licensee:

- a. fails to commission or deliver the service within the time period(s) specified in the licence.
- b. fails to perform any obligation(s) under the licence including remittance of timely payments of fee and other dues due to the Licensor.
- c. fails to rectify, within the time prescribed, any defect as may be pointed out to the licensee by the Licensor.
- d. goes in liquidation or ordered to be wound up.
- e. is recommended by TRAI for termination of licence for non-compliance of the terms and conditions of the licence.
- f. fails to comply with FDI norms.

The fee /royalty for the use of spectrum and possession of wireless telegraphy equipment shall be separately payable as per the details and prescription of Wireless Planning & Coordination Wing. The fee/royalty for the user spectrum /possession of wireless telegraphy equipment depends upon various factors such as frequency, hop and link length, area of operation etc.

1.3 Guidelines for Cellular Mobile Telephone Service Licence

Following are the broad guidelines for issue of Licence for provision of CMTS in India:

- The bidder must be an Indian company, registered under the Indian Companies Act, 1956.
- The total foreign equity should not exceed 74% of the total paid-up equity of the company. The management control of the company shall lie in the Indian hands for

the complete duration of license.

- The bidder company can apply for any number of service areas subject to fulfilment of all the conditions of entry.
- The license for CMTS will be issued on non-exclusive basis, for a period of 20 years, further extendable by 10 years at one time at the discretion of licensing Authority on mutually agreed terms and conditions, for providing service within the territorial jurisdiction of licensed service area.
- The bidder and promoters of bidder company should have a combined net-worth of amount indicated in Annex-II. The net-worth of only those promoters shall be counted who have at least 10% equity stake or more in the total equity of the company. Here networth shall mean as the sum total, in Indian Rupees, of paid up equity capital and free reserves. While counting Net-worth the foreign currency shall be converted into Indian Rupees at the prevalent rate indicated by the Reserve Bank of India as on the date of invitation of the bids.
- The successful bidder will be required to pay one time Entry Fee based on the final bid before signing the Licence Agreement.
- In addition to the Entry fee described above, the Licensee shall also pay License fee annually @ 10/8/6% of "Adjusted Gross Revenue" for the Category A/B/C telecom circles respectively as Revenue Share generated from the service in accordance with the procedure prescribed in the License Agreement document.
- Further, royalty for the use of spectrum for point to point links and access links (other than Cellular Service Spectrum) shall be separately payable as per the details and prescription of Wireless Planning & Coordination Wing. The fee/royalty for the use of spectrum /possession of wireless telegraphy equipment depends upon various factors such as frequency, hop and link length, area of operation etc. Authorisation of frequencies for setting up Microwave links by Cellular Operators and issue of licenses shall be separately dealt with WPC Wing as per existing rules.
- The bidder company shall submit Financial Bank Guarantee (FBG) of amount equal to Rs. 50, 25 and 15 Crores for category 'A' 'B' & 'C' service areas before the date of signing the licence agreement in the prescribed Proforma given in the Licence Agreement. Initially, FBG shall be valid for a period of one year and shall be renewed from time to time for such amount as may be directed by the Licensor.

- The bidder shall also submit Performance Bank Guarantees (PBG) of amount equal to Rs. 20, 10 and 2 Crores for category 'A' 'B' & 'C' service areas as prescribed in the license agreement before signing the license.
- Direct Interconnectivity among all service providers in a service area has been permitted for terminating traffic of each other subject to any regulations issued from time to time by Telecom Regulatory Authority of India (TRAI) under TRAI Act, 1997 as amended from time to time. Interconnection among Operators shall be as per mutual agreement between them.
- The frequencies shall be assigned by WPC from the designated bands prescribed in National Frequency Allocation Plan 2000. (NFAP-2000). A cumulative maximum of upto 4.4 MHz + 4.4 MHz will be permitted. Based on usage, justification and availability, additional spectrum upto 1.8 MHz + 1.8 MHz making a total of 6.2 MHz +6.2 MHz, may be considered for assignment, on case by case basis, on payment of additional license fee.
- The charges for access or interconnection with other networks shall be based on mutual agreements between the service providers subject to any regulations issued from time to time by TRAI under TRAI Act, 1997, as amended from time to time.
- EICENSOR shall have the right to take over the SERVICE, equipment and networks of the LICENSEE or revoke/terminate/suspend the LICENCE either in part or in whole of the Service area in the interest of national security or in case of emergency or war or low intensity conflict or any other eventuality in public interest as declared by the Government of India. Provided any specific orders or direction from the Government issued under such conditions shall be applicable to the LICENSEE and shall be strictly complied with. Further, the LICENSOR reserves the right to keep any area out of the operation zone of the service if implications of security so require.
- ☑ LICENSEE will ensure that the Telecommunication installation carried out by it should not become a safety hazard and is not in contravention of any statute, rule or regulation and public policy.
- The LICENSEE shall take measures that prevent the objectionable, obscene, unauthorised or any other content, messages or communications infringing copyright, intellectual property etc., in any form, from being carried on his

network, consistent with the established laws of the country. Once specific instances of such infringement are reported to the LICENSEE by the authorised agencies, the Licensee shall ensure that the carriage of such material on his network is prevented immediately. The LICENSEE is obliged to provide, without any delay, tracing facility to trace nuisance, obnoxious or malicious calls, messages or communications transported through his equipment and network. Any damages arising out of default on the part of LICENSEE in this regard shall be payable by the licensee.

In case any confidential information is divulged to the LICENSEE for proper implementation of the Agreement, it shall be binding on the Licensee and its employees and servants to maintain its secrecy and confidentiality.

Eligibility Criteria, General Conditions and the Bidding Process:

i. The minimum net-worth of the bidder company and its promoters (networth of only such promoters having not less than 10% share in the equity capital of the bidder company shall be added) and paid up equity capital of the bidder company should be at least as below:

Paid up Equity capital of the Bidding Company.	Service Areas (one or more in each category) for which bid can be submitted.
3 Crores	C
5 Crores	B and C
10 Crores	A, B and C

Note: A bidder company, which meets the minimum requirement of paid up equity for a service area of one category, may bid for any number of service areas of that or lower category.

Net-worth	Total Minimum Net-worth required
Rs. 30 Crores for each Category C Service Area Rs. 50 Crores for each Category B Service Area Rs. 100 Crores for each Category A Service Area	100 X+50 Y+30 Z where X,Y & Z is respectively the Number of A, B & C Service Areas bided for

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- ii. A promoter company cannot have stakes in more than one Bidder Company for the same service area.
- iii. The existing licensees cannot bid for the same service area.
- iv. The bidder must comply with the technical specifications, commercial, financial and operating conditions as laid down by the licensor.
- v. There shall be no restriction on number of licenses that can be awarded to a bidder company.
- vi. Minimum roll-out obligation: In Telecom Circles, at least 10% of the District Headquarters (DHQs) will be covered in the first year and 50% of the District Headquarters will be covered within three years of effective date of License. The licensees shall also be permitted to cover any other town in a District in lieu of the District Headquarters. Coverage of a DHQ/town would mean that at least 90% of the area bounded by the Municipal limits should get the required street as well as in-building coverage. In Metros, 90% of the service area shall be covered within one year of the effective date. The District Headquarters shall be taken as on the effective date of license.
- vii. The bidder company and/or its promoters should have experience in telecom sector.

Pre-Qualification Round: The bidders shall be pre-qualified if they meet the prescribed eligibility criteria such as, Financial strength, minimum roll out obligation, technical plan, business plan and other conditions as specified in the Tender Document Earnest money Bank Guarantee (EMBG) shall be returned to the bidders who fail in the pre-qualification round. No weightage shall be attached to the pre-qualification criteria.

Financial Bidding:

i. The bidding process shall be structured as "Informed Ascending Bidding Process." The pre-qualification bid as well as the first Financial Bid with EMBG will be submitted by the bidders in separate sealed covers. The pre-qualification Bid and Financial Bids of pre-qualified bidders as also Financial Bids in every subsequent round of financial bidding shall be opened in the presence of bidders' representatives, who should carry a letter of authority from the bidder company

authorising them to attend the bid opening and shall be made public.

- ii. The highest pre-qualified offer in the first financial bid shall be treated as 'Reserve Price' for subsequent round of bidding. If there are four or more pre-qualified bidders, excepting the lowest bidder, others will qualify for the second round of financial bidding. In case, there are less than four pre-qualified bidders, all will qualify for second round of financial bidding.
- iii. The successful bidders in the first round of financial bidding shall submit a Second Financial Bid for the second round of financial bidding, the bid amount to be quoted in this round will have to be equal to more than the 'Reserve Price'. The bidder who do not bid equal to or more than the 'Reserve Price' shall be disqualified for the further round of bidding. Bidders will, however not be permitted to reduce the bid amount from their financial bid in the first round; in the event of such happenings, his EMBG shall be encashed and earnest money shall be forfeited.
- iv. All the bidders who have quoted more than the 'Reserve Price' in the second round of financial bidding will be short-listed. If there are three or more such short-listed bidders, excepting the lowest bidder others will qualify for the third round of financial bidding. In case, there are only two short-listed bidders, both will qualify.

In case, there is only one short-listed bidder, there will be no third round of bidding.

- v. The bidders, who qualify for bidding for the third round, shall be required to submit the third and conclusive financial bid. The highest bidder of the third round financial bidding will be declared successful for grant of license.
 - The successful bidder shall deposit at least 20% of the bid amount by the close of the office hours on the next working day without waiting for a formal demand from the licensor in this regard. The balance 80% of the bid amount must be paid within 10 days of the final bid opening.
- vi. In case the successful highest bidder does not pay the due amount of 20% as

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above within the given time, his EMBG shall be encashed and the amount of EMBG shall be forfeited and the said bidder will be dis-qualified from the bidding process for license of the concerned service area. In case the said bidder pays 20% of the bid amount as above within the given time but subsequently backs out and does not pay the balance amount of the quoted entry fee as well as sign the license agreement by the prescribed date after fulfilling other requirements of furnishing FBG & PBG, then his EMBG shall be encashed and the amount realised shall be forfeited, the 20% of the bid amount paid as above shall also be forfeited and the said bidder shall be dis-qualified from the bidding process for license of the concerned service area without any further notice. The successful bidders of the previous round without dropping any bidder shall be asked to bid once again for a further round of financial bidding and the highest bidder of this round will then be declared successful for grant of licence. This process shall continue till the license is awarded.

vii. In case there is a tie in the conclusive round of bidding, the bidder who quoted higher amount in the previous round shall be declared successful for award of license.

In the service areas, where more than one licences are to be awarded, the first highest bidder, next highest bidder and so on in the third and conclusive round shall be declared successful to sign the license provided that the difference in entry fee quoted between the highest and other such bidders is less than 25%. The higher of the bidders shall operate the service in 900 MHz band against the vacant slot(s) and lower of successful bidder in 1800 MHz as fourth operator. In case the difference in entry fee quoted by the successful bidders is lower than 25% than the highest bidder, there shall be another round of financial bidding from amongst successful bidders of previous round.

Example 1: West Bengal Circle there are two licenses on offer.

The highest successful bidder will be granted first license for 900 MHz Band. The next highest bidder, if he has quoted entry fee within the range of 25%

difference from the first highest bidder, will be granted second license for 1800 MHz Band; however, if the difference is more than 25%, a further round of bidding will take place for which all the bidders who participated in the third round, except the one who is already successful for first license, will participate.

Example 2: Andaman & Nicobar Circle there are three licenses on offer.

The highest successful bidder will be granted first license for 900 MHz Band. Such of the next two highest bidders, who have quoted entry fee within the range of 25% difference from the first highest bidder, will be granted second license for 900 MHz Band and third license for 1800 MHz band, in that order; however, if the difference is more than 25% a further round of bidding will take place for which all the bidders who participated in the third round, except for those who are already successful for the first one or two licenses, will participate.

In every successive round of bidding, the bidders can only exceed or retain the bid amount of previous bid, lowering their bid or backing out unless ineligible will attract forfeiture of EMBG.

The Earnest Money Bank Guarantees as below shall be submitted by the bidders separately against each license bided for:

Category of Service Area Amount of EMBG

A 20 Crores

B 10 Crores

C 2 Crores

1.4 Guidelines for Internet Service Licence

There are two licences under Internet, namely, ISP licence with telephony and ISP licence without telephony. Under ISP licence with telephony, the service provider can provide voice services in addition to the normal internet services.

Internet telephony is service to process and carry voice signals offered through public

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internet by use of personal computer or IP based customer premise equipments connecting the following:

- 1. PC to PC within or outside India.
- 2. PC in India to telephone outside India.
- 3. IP based terminal connected to similar nodes within or outside India.

Internet Telephony is a different service in its scope, nature and kind from real time voice service as offered by other licensed operators like BSO CMSO, NLDO, ILDO and PMRTS.

The following are outside and do not fall under Internet Telephony service:-

- i. Voice communication from anywhere to anywhere by means of dialling a telephone number (PSTN/ISDN/PLMN) as defined in National Numbering Plan;
- ii. Originating the voice communication service from a Telephone in India;
- iii. Terminating the voice communication to Telephone within India;
- iv. Establishing connection to any Public Switched Network in India;
- v. Dial up lines with outward dialling facility from nodes.
- vi. Interconnectivity between ISPs who are permitted to offer Internet Telephony Services and the ISPs who are not permitted to offer Internet Telephony Services.

The other licence conditions are similar for both the licenses and are briefly summarised as follows:

- A Company registered in India under the Companies Act, 1956 is eligible to provide Internet service.
- Foreign equity, if any, shall be as per the Government policy and guidelines from time to time. At present, the foreign equity is permitted to the extent of 74%.
- There is no requirement of the applicant company having any prior experience in information technology or telecommunication services.
- Separate licences shall be granted to any applicant company for each service area. For this purpose, the country has been divided into separate service areas in three categories as mentioned below:
 - i. Category "A" This covers the territorial jurisdiction of the Union of India

- except specified areas that may be notified to be excluded from time to time.
- ii. Category "B" Any of the 20 Territorial Telecom Circles, four Metro Telephone Districts of Delhi, Mumbai, Calcutta or Chennai and four major telephone districts of Ahmedabad, Bangalore, Hyderabad or Pune are Category 'B' Service areas. The four Metro Telephone Districts (Delhi, Mumbai, Calcutta & Chennai) are not part of any Telecom Circle, whereas the four major Telephone Districts (Ahmedabad, Bangalore, Hyderabad & Pune) are part of respective Telecom Circle.
- iii. Category "C" Any Secondary Switching Area (SSA) of DOT with geographical boundaries as on 1.4.98, will form a separate category "C" Service Area.
- The ISP will be required to set up his nodes i.e., Routes/servers within the geographical limits of the service area. An applicant company may be granted any number of licences. Also, there shall be no limit on number of licences that can be granted in a particular service area. The leased line subscribers shall be from within the service area. However, the ISP can offer dial up service from any part of the country.
- Existing E-Mail and VSAT Service Licensees may also obtain separate ISP Licence for any number of the above mentioned service areas subject to fulfilment of eligibility criteria.
- The processing fees are Rs. 5,000/- (Rupees FIVE Thousand only).
- Direct interconnectivity between two separately licensed ISPs shall be permitted. Authorised Public/Government organisations will be allowed to provide INTERNET Gateway access including international leased circuits directly without going through VSNL Gateways. Private ISPs are allowed to provide such International Gateways after obtaining Security clearance for which the Interface of Private ISPs shall only be with the Telecom Authority.
- The licensee may obtain the transmission link on lease from DOT, Licensed Basic Service Operators, Railways, State Electricity Boards, National Power Grid Corporation or any other operator specially authorised to lease such lines to the ISPs. The licensee may also establish its own transmission links within its service area for carrying traffic originated and terminated by his subscribers, provided

- that such capacities are not available from any other authorised agencies and subject to permission of Telecom Authority.
- An ISP may provide Internet Service to any VSAT subscriber (who could be served by a shared hub commercial service provider or captive private VSAT network), if the VSAT is located within the service area of the ISP. For this purpose, a direct interconnection of VSAT or VSAT-hub through leased line obtained from an authorised provider to the ISP's node/server shall be permitted only for the flow of Internet traffic. The existing licence for Closed Users Group Domestic 64 KBPS Data Network via INSAT Satellite Systems does not grant long distance carrier rights to the licensee. The ISP shall provide to the Telecom Authority a monthly statement of VSAT subscribers served with their locations and details of leased line interconnection with the VSAT hub. The VSAT hub, however, need not be located in the service area of the ISP.
- Resources required for interconnecting the licensee's network to the network of upstream internet access providers (DOT/VSNL etc.) or any other service provider licensed by the Authority including time frame for provision of the same, will be mutually agreed between the parties concerned. The resources may refer to include but not limited to physical junctions, PCM derived channels, private wires, leased lines, data circuits other network elements. The licensee shall apply for and obtain the network resources from the concerned parties. The tariff of such network is outside the scope of this licence agreement. Licensor will have no obligation for such resources from other parties.
- The validity of licence is initially for a period of fifteen years unless otherwise terminated. If requested by the licensee, extension may be granted by the TELECOM AUTHORITY on suitable terms and conditions for a period of five years or more at a time.
- Access to internet through authorised Cable Operator shall be permitted without additional licensing subject to applicable Cable Laws (The Cable Television Networks (Regulation) Act, 1995) as modified from time to time.
- Last mile' linkages shall be freely permitted within local area either by fibre optic or radio communication for ISPs. In case of radio links, clearance from WPC wing of the DoT shall be required to be obtained by the ISPs to avoid frequency interference.

- It will be the responsibility of the licensee to obtain IP address, domain name etc. from the competent authority. In case the IP addresses are taken from the Department of Telecommunications, the same are non-portable and have to be returned to DoT at the termination of connectivity contract.
- The Telecom Authority has decided to waive the Licence Fee for a period up to 31.10.2003. For those ISPs also who obtain licences prior to 01.11.2003, a nominal licence fee of One Rupee per annum will become payable from 01.11.2003. For access and other charges including MODEM charges payable to the DOT/MTNL/VSNL/other service provider at the prescribed rates, bills will be raised directly by the DOT/MTNL/VSNL/other service provider and shall be a matter between the Licensee and such service provider(s).
- A performance bank guarantee of Rs. 2.00 crores for category 'A' Service Area, Rs. 20.00 lakhs for each category 'B' Service Area and Rs. 3.00 lakhs for each category 'C' Service Area valid for two years from any Scheduled Bank.
- ISPs will be free to fix their own tariff. The tariff shall be left open to be decided by market forces. However, the TRAI (Telecom Regulatory Authority of India) may review and fix a tariff at any time during the validity of the licence which shall be binding on the Licensee.

1.5 Guidelines for Unified Access Services Licence

- The applicant must be an Indian company, registered under the Indian Companies Act, 1956.
- The applicant company can apply for Licence in more than one service area subject to fulfilment of all the conditions of entry.
- The applicant company shall pay a processing fee of Rs. 15,000/-.
- The total composite foreign holding should not exceed 74 per cent.
- The licence for Unified Access Services shall be issued on non-exclusive basis, for a period of 20 years, extendable by 10 years at one time within the territorial jurisdiction of a licensed Service Area.
- No single company/ legal person, either directly or through its associates, shall have substantial equity holding in more than one LICENSEE Company in the same service area for the Access Services namely; Basic, Cellular and Unified Access Service. 'Substantial equity' herein will mean 'an equity of 10% or more'. A

- promoter company/ Legal person cannot have stakes in more than one LICENSEE Company for the same service area.
- The applicant company shall have a minimum paid up equity capital of Rs. 10 crores, Rs. 5 crores and Rs. 3 crores for Category A, B and C service areas respectively.
- The applicant and promoters of applicant company should have a combined networth of amount as detailed in the Table below:

Net-worth	Total Minimum Net-worth required
Rs.30 Crores for each Category C Service Area Rs.50 Crores for each Category B Service Area Rs.100 Crores for each Category A Service Area	100 X+50 Y+30 Z where X,Y & Z is respectively the Number of A, B & C Service Areas for which either LOI/ Licence have been issued or applied for in the name of applicant.

- The networth of only those promoters shall be counted who have at least 10% equity stake or more in the total equity of the company. Here networth shall mean as the sum total, in Indian Rupees, of paid up equity capital and free reserves. While counting ne-worth the foreign currency shall be converted into Indian Rupees at the prevalent rate indicated by the Reserve Bank of India as on the date of Application received. The minimum networth & paid-up capital shall be maintained during currency of the Licence.
- The applicant will be required to pay one time non-refundable Entry Fee based on the Letter of Indent (LOI) before signing the Licence Agreement, as mentioned in the Licence agreement for different states.
- The Licensee shall pay Licence fee annually @ 10/8/6% of Adjusted Gross Revenue (AGR) for category A/B/C service areas respectively excluding spectrum charges.
- Licence Fee shall be payable in four quarterly instalments during each financial year (FY). Quarterly instalment of licence fee for the first three quarters of a financial year shall be paid within 15 days of the completion of the relevant quarter. This Fee shall be paid by the LICENSEE on the basis of actual revenue (on accrual basis) for the quarter, duly certified with an affidavit by a representative of the LICENSEE, authorised by the Board Resolution coupled with General Power of Attorney. However, for the last quarter of the financial year, the LICENSEE

shall pay the Licence Fee by 25th March on the basis of expected revenue for the quarter, subject to a minimum payment equal to the actual revenue share paid of the previous quarter.

Any delay in payment of Licence Fee, or any other dues payable under the LICENCE beyond the stipulated period will attract interest at a rate which will be 2% above the Prime Lending Rate (PLR) of State Bank of India existing as on the beginning of the financial year (1st April) in respect of the licence fees pertaining to the said financial year. The interest shall be compounded monthly and a part of the month shall be reckoned as a full month for the purpose of calculation of interest.

In case, the total amount paid on the self-assessment of the LICENSEE as quarterly LICENCE Fee for the 4 (four) quarters of the financial year, falls short by more than 10% of the payable LICENCE Fee, it shall attract a penalty of 50% of the entire amount of short payment. This amount of short payment along with the penalty shall be payable within 15 days of the date of signing the audit report on the annual accounts, failing which interest shall be further charged as per terms of Condition in above paragraph 16. However, if such short payment is made good within 60 days from the last day of the financial year, no penalty shall be imposed.

- The Fee/royalty payable towards [Wireless Planning and Coordination Wing (WPC)] WPC Charges shall be payable at such time(s) and in such manner as the WPC Wing of the DoT may prescribe from time to time.
- The LICENSEE shall pay spectrum charges in addition to the Licence Fees on revenue share basis as notified separately from time to time by the WPC Wing. However, while calculating 'AGR' for limited purpose of levying spectrum charges based on revenue share, revenue from wireline subscribers shall not be taken into account.

Further royalty for the use of spectrum for point to point links and other access links shall be separately payable as per the details and prescription of Wireless Planning & Coordination Wing. The fee/royalty for the use of spectrum/possession of wireless telegraphy equipment depends upon various factors such as frequency,

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hop and link length, area of operation and other related aspects etc. Authorization of frequencies for setting up Microwave links by Licensed Operators and issue of Licenses shall be separately dealt with WPC Wing as per existing rules.

The Fees, charges and royalties for the use of spectrum and also for possession of Wireless Telegraphy equipment shall be separately securitised by furnishing FBG of an amount equivalent to the estimated sum payable annually in the proforma annexed, to WPC, valid for a period of one year, renewable from time to time till final clearance of all such dues.

- The applicant company shall submit Financial Bank Guarantee (FBG) of amount equal to Rs. 50, 25 and 5 Crores for category 'A' 'B' & 'C' service areas respectively before the date of signing the licence agreement in the prescribed Proforma given in the Licence Agreement. Initially, FBG shall be valid for a period of one year and shall be renewed from time to time for such amount as may be directed by the Licensor. The applicant shall also submit Performance Bank Guarantees (PBG) of amount equal to Rs. 20, 10 and 2 Crores for category 'A' 'B' & 'C' service areas respectively in the prescribed Proforma given in the Licence Agreement before signing the licence. PBG shall be valid for a period of three year and shall be renewed from time to time. FBG and PBG must be from any Scheduled Bank or Public Financial Institution duly authorised to issue such Bank Guarantee.
- Licensee shall ensure "Roll-out obligations" that
 - i. At least 10% of the District Headquarters (DHQs) will be covered in the first year and 50% of the District Headquarters will be covered within three years of effective date of Licence.
 - ii. The choice of District Headquarters/towns to be covered and further expansion beyond 50% District Headquarters/towns shall lie with the Licensee depending on their business decision.
 - iii. There is no requirement of mandatory coverage of rural areas.

On completion of one year from the effective date of Licence and meeting the coverage criteria stipulated for first year, the PBG shall be reduced to Rs.10/5/1

crores for category 'A'/'B'/'C' service areas on self-certification provided by the Licensee. Further on fulfilling the roll out obligations as stipulated in clause 34 of Licence agreement, the balance PBG shall be released on receipt of test certificate / test certificates issued by TEC in respect of coverage.

- The Licensee shall commission the Applicable Systems within one year from the effective date of the Licence. However, the Licensee may start providing service to customers at any time without the need of specific approval of the Licensor.
- Liquidated damages: In case the Licensee fails to bring the Service or any part thereof into commission (i.e., fails to deliver the service or to meet the required coverage criteria/ network roll out obligations) within the period prescribed for the commissioning, the Licensor shall be entitled to recover LD charges @ Rs. 5 Lakh (Rupees: Five Lakhs) per week for first 13 weeks; @ Rs 10 lakhs for the next 13 weeks and thereafter @ Rs. 20 lakhs for 26 weeks subject to a maximum of Rs. 7.00 crores. Part of the week is to be considered as a full week for the purpose of calculating the LD charges. For delay of more than 52 weeks the Licence may be terminated under the terms and conditions of the Licence agreement. The week shall mean 7 Calendar days (from midnight) Monday to Sunday; both days inclusive and any extra day shall be counted as full week for the purposes of recovery of liquidated damages.

The Licensor may also impose a financial penalty not exceeding Rs. 50 crores for violation of terms and conditions of licence agreement. This penalty is exclusive of Liquidated Damages as prescribed above.

For wireless operations in Subscriber access network, the frequencies shall be assigned by WPC wing of the Department of Telecom from the frequency bands earmarked in the applicable National Frequency Allocation Plan and in coordination with various users. Initially a cumulative maximum of upto 4.4 MHz + 4.4 MHz shall be allocated in the case of TDMA based systems @ 200 KHz per carrier or 30 KHz per carrier or a maximum of 2.5 MHz + 2.5 MHz shall be allocated in the case of CDMA based systems @ 1.25 MHz per carrier, on case by case basis

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subject to availability.

Additional spectrum beyond the above stipulation may also be considered for allocation after ensuring optimal and efficient utilisation of the already allocated spectrum taking into account all types of traffic and guidelines / criteria prescribed from time to time. However, spectrum not more than 5 + 5 MHz in respect of CDMA system or 6.2 + 6.2 MHz in respect of TDMA based system shall be allocated to any new Unified Access Services Licensee. The spectrum shall be allocated in 824-844 MHz paired with 869 - 889 MHz, 890 - 915 MHz paired with 935 - 960 MHz, 1710 1785 MHz paired with 1805 1880 MHz.

In the event, a dedicated carrier for micro-cellular architecture based system is assigned in 1880 - 1900 MHz band, the spectrum not more than 3.75 + 3.75 MHz in respect of CDMA system or 4.4 + 4.4 MHz in respect of TDMA system shall be assigned to any new Unified Access Services Licensee.

- The Licensee may enter into suitable arrangements with other service providers to negotiate Interconnection Agreements whereby the interconnected networks will provide the following:
 - a. To meet all reasonable demand for the transmission and reception of messages between the interconnected systems.
 - b. To establish and maintain such one or more Points of Interconnect as are reasonably required and are of sufficient capacity and in sufficient numbers to enable transmission and reception of the messages by means of the Applicable Systems,
 - c. To connect, and keep connected, to their Applicable Systems.

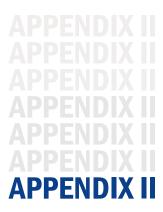
The terms and conditions of interconnection including standard interfaces, points of interconnection and technical aspects will be as mutually agreed between the service providers, subject to compliance of prevailing regulations, directions and determinations issued by TRAI from time to time.

The charges for accessing other networks for inter-network calls shall be based on

mutual agreements between the service providers conforming to the Orders/Regulations/Guidelines issued by the TRAI from time to time.

EICENSOR shall have the right to take over the SERVICE, equipment and networks of the LICENSEE or revoke/terminate/suspend the LICENCE either in part or in whole of the Service area in the interest of national security or in case of emergency or war or low intensity conflict or any other eventuality in public interest as declared by the Government of India. Any specific orders or direction from the Government issued under such conditions shall be immediately applicable to the LICENSEE without loss of time and shall be strictly complied with. Further, the LICENSOR reserves the right to keep any area out of the operation zone of the service if implications of security so require. Provided any taking over or suspension of licence, issuance of an order and exclusion of an area, as described above shall neither be a ground of extension of licence period or expansion of area in different corner or reduction of duly payable fee.





2.1 Specimen AGR Computation Sheet:

	PARTICULARS		to	Oct 1, xxxx to Dec 31, xxxx	Jan 1, xxxx to Mar 31, xxxx	Cumulative figures for the year ended Mar 31, xxxx
1. A	Revenue from services Revenue from wireline subscribers: i. Rentals ii. Call revenue within service area iii. National Long Distance Call revenue iv. International Long Distance Call revenue v. Pass thru revenue for usage of other networks (give Operator-wise details) vi. Service tax vii. Service changes viii. Charges on account of any other value added services, supplementary services, etc. ix. Any other income/ miscellaneous receipt					
В	Revenue from WLL subscribers: (Fixed) i. Rentals ii. Call revenue within service area iii. National Long Distance Call revenue iv. International Long Distance Call revenue v. Pass thru revenue for usage of other network (give Operator-wise details) vi. Service tax vii. Service charges viii. Charges on account of any other value added					

	PARTICULARS	Apr 1, xxxx to June 30, xxxx	July 1, xxxx to Sep 30, xxxx	to	Jan 1, xxxx to Mar 31, xxxx	Cumulative figures for the year ended Mar 31, xxxx
	service, supplementary services, ect. ix. Any other income/ miscellaneous receipt from WLL subscribers					
C.	Revenue from WLL subscribers: (Handheld) i. Rentals ii. Call revenue within service area iii. National Long Distance Call revenue iv. International Long Distance Call revenue v. Pass thru revenue for usage of other networks (give Operator-wise details) vi. Service tax vii. Service charges viii. Charges on account of any other value added services, supplementary Services etc. ix. Any other income / miscellaneous receipt from WLL subscribers					
D.	Revenue from Mobile Services: D1. Post paid options: i. Rentals ii. Activation Charges iii. Airtime Revenue iv. Pass through charges v. Service Tax					

PARTICULARS	Apr 1, xxxx to June 30, xxxx	to	Oct 1, xxxx to Dec 31, xxxx	to	Cumulative figures for the year ended Mar 31, xxxx
 vi. Roaming charges vii. Service charges viii. Charges on account of any other value added services, supplementary services, etc. ix. Any other income/ miscellaneous receipt from post paid options D2. Pre-paid options: i. Sale of pre-paid SIM cards including full value of all components charged therein ii. Any other income/miscellaneous receipt from pre-paid options D3. i. Revenue from Mobile Community phone service including full value of all components charged therein iii. Any other income/ miscellaneous receipt from Mobile Community phone service 					
 E. Revenue from Voice Mail/ any other value added service 1. Income from trading activity (all exclusive of sales tax) i. Sale of handsets ii. Sale of accessories, including simcards etc. 					

PARTICULARS	Apr 1, xxxx to June 30, xxxx	July 1, xxxx to Sep 30, xxxx	to	Jan 1, xxxx to Mar 31, xxxx	Cumulative figures for the year ended Mar 31, xxxx
iii. Any other income/ miscellaneous receipt from trading activity					
 2. Revenue from roaming Roaming facility revenue from own subscribers Roaming revenue from own subscriber visiting other networks including STD/ ISD/ pass thru charges for transmission of incoming call during roaming' Roaming Commission earned Roaming revenue on account of visiting subscribers from other networks Service Tax if not included above Any other income/ miscellaneous receipt from roaming 					
3. Income from investmentsi. Interest incomeii. Dividend incomeiii. Any other miscellaneous receipt from investments					
4. Non-refundable deposits from subscribers					

PARTICULARS	Apr 1, xxxx to June 30, xxxx	to	Oct 1, xxxx to Dec 31, xxxx	to	Cumulative figures for the year ended Mar 31, xxxx
5. Revenue from franchisee/ resellers including all commissions and discounts etc. excluding the revenues already included in IA&IB					
6. Revenue from sharing/ leasing of infrastructure					
 Revenue from sale/ lease of bandwidth, links, R&G cases, turnkey projects etc. 					
8. Revenue from other OPERATORs on account of pass through call charges					
Revenue from other OPERATORs on account of provisioning of inter connection					
10. Miscellaneous revenue					

PARTICULARS	Apr 1, xxxx to June 30, xxxx	July 1, xxxx to Sep 30, xxxx	to	Jan 1, xxxx to Mar 31, xxxx	Cumulative figures for the year ended Mar 31, xxxx
AA GROSS REVENUE OF THE LICENSEE COMPANY: (Add 1 to 10)					
 DEDUCT: Charges actually paid to other service provider(s) (operator-wise) Roaming revenues actually paid to other CMSPs and GMPCS service providers (operator-wise) Service Tax paid to the Government Sales Tax paid to the Government 					
BB TOTAL DEDUCTIBLE REVENUE (1+2+3+4)					
CC ADJUSTED GROSS REVENUE (AA-BB) REVENUE SHARE @ % OF ADJUSTED GROSS REVENUE					

Group CEO

2.2 Format of Auditor's Report on Statement of Revenue and Licence Fee as prescribed under relevant Regulations:

To
The Board of Directors
We have examined the attached Statement of Revenue and Licence Fee of(the name of the operators) for the quarter(s) ending We have also examined the reconciliation of the cumulative figures for the
quarter(s) ending appearing in the Statement of Revenue and Licence Fee of the company with the figures appearing in the profit and loss account of the company for the year ended which was audited by us. We understand that the aforesaid statement(s)
(and the reconciliation) is /are to be furnished to the Central Government for assessment of the Licence fee payable by the company to the Government, in terms of the Licence agreement
Nosigned between the company and the Department of Telecommunications.

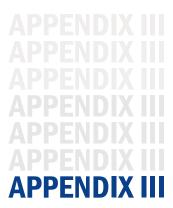
We report that:

- 1. We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.
- 2. In our view, the company has an adequate internal control system in relation to revenues which is commensurate with its size and the nature of its business. The system, in our opinion, provides reasonable assurance that there is no unrecorded revenue and that all revenue is recorded in the proper amount and in the proper period.
- 3. No amounts payable in respect of sales tax, service tax or PSTN/toll/roaming charges were outstanding at the last day of the quarter(s) for a period of more than two months from the date they became payable, except for the following:.......
- 4. In our opinion and to the best of our knowledge and belief and according to the explanations given to us, the Statement has been prepared in accordance with the norms/guidelines contained in the said Licence agreement in this behalf and gives a true and fair view of the revenue and Licence fee payable for the period computed on the basis of the aforesaid guidelines except for the following:'

(Signature)

^{*} Strike off wherever not applicable.





Glossary

1 G	Gigabit Ethernet.
2G	Second Generation (digital) mobile phones.
2.5G	2G phones with improved bit rates for data (HSCSD, EDGE, GPRS).
3G	Third Generation mobile phones.
10G	10G Ethernet (IEEE802.3ae).
2B1Q	Encoding 4 bits as 1 quat. A modulation scheme in which successive pairs of user information data bits are mapped into one of four symbols.
4B3T	Encoding 4 bits as 3 tribits.
AAL	ATM Adaptation Layer. The layer in ATM that adapts the higher layer information to a format suitable for placing in cells.
AAL1-5	ATM Adaptation Layer 1-5. The terminology used to identify the five alternatives for ATM adaptation.
ACR	Absolute Category Rating. Another name for MOS.
Access	All facilities and related services needed to support information transfer to or from an information source to some network's transport service.
Access Signalling	Signalling between a telephone/terminal and local exchange.
ACD	Automatic Call Distribution. A system designed to evenly distribute heavy incoming traffic among agents or answering positions.
ADC	American Digital Cellular. Another name for D-AMPS.

Address	A means of identifying a device on a network. Each technology has its own addressing system.
Admission Control	A network which does not accept new calls or packets unless it knows it has the capacity to handle them. Such a network will not experience congestion.
ADPCM	Adaptive Differential Pulse Code Modulation. An improvement on pure DPCM by each end predicting the next value, and only transmitting the difference between predicted and actual values. It allows good quality voice to be transmitted at 32kbit/s.
ADSL	Asymmetric Digital Subscriber Line. Modems attached to a twisted pair copper wiring - allows for fast traffic in one direction and slower return path.
AES	Advanced Encryption Standard. A single key encryption designed for E-Commerce.
A-Law	The European PCM method.
ACELP	Algebraic CELP. Instead of sending the code number identifying the curve, it transmits the algebraic coefficients of the curve. It requires less processing, but does require a floating-point processor. This is more suitable for PCs as they always have a floating-point processor today.
ADM	Add/Drop Multiplexor. A multiplexor that allows one channel to be removed (dropped) and another added in its place so traffic can join and leave a multiplexed link part way along it.
Air Interface	The specification of communications between a mobile and the base station.
AM	Amplitude Modulation. A method of carrying analogue data over an analogue circuit by varying the amplitude of a carrier.

Amplify	A device that increases the strength of the signal. Unfortunately it also amplifies noise, and introduces extra noise thus distorting the signal.
AMPS	Advanced Mobile Phone Service. American analogue system.
Analogue	The signal is encoded as a constantly varying line state making errors extremely difficult to detect.
ANSI	American National Standards Institute.
AO	Always On. A mobile service where data can be sent or received without setting up a call first.
AOA	Angle of Arrival. Using a directional receiver at a base station to locate the direction of a mobile.
AO/DI	Always On Dynamic ISDN. An ISDN D channel service which is always available.
Artefact	A pattern which appears in the output which was not present in the input, usually as the result of a losey compression algorithm (an algorithm which looses data rather than just compressing it without lose).
ASCII	American Standard Code for Information Interchange - the conventional method of storing characters on a computer or transmitting them over a network. There are 128 ASCII characters of which 95 are printable (upper and lower case letters, digits, punctuation) and the rest are control characters (including carriage return, line feed, tab, bell).
ASP	Advanced Speech Processing. Technique for converting voice into digital signals.
Assured Forwarding	An IP Differentiated Service giving 4 priority levels, each with 3 drop preferences, but no guarantees.

Asynchronous	There is no time relationship between two events.
ATM	Asynchronous Transfer Mode. A packet switched technology for broadband networks with voice, data or video transported as 53-byte cells.
ATMF	ATM Forum.
Attenuation	The decrease in signal strength with distance.
Authentication	Positively identifying the other party.
Availability	The percentage of time a system is available, usually in excess of 99.99%.
B2B	Business to Business E-Commerce.
B2C	Business to Consumer E-Commerce.
Bandwidth	The information carrying capacity of a channel. Analogue channels are measured by the frequency range (maximum minus minimum) and digital channels in bit/s.
Base Station	A radio/microwave transmitter receiver.
Basic Rate	An ISDN interface providing two B channels.
Baud	The number of changes of state per second on a medium.
B Channel	The 64k ISDN channel carrying 64k voice or data.
Best Effort	The network does its best, but makes no guarantees. Usually a cheap and simple approach.
B-ICI	Broadband - Inter Carrier Interface. Interface between public ATM networks.
Billing	Converting the CDR into prices.

AppendixII

B-ISDN	Broadband ISDN. An ISDN network that does not have a fixed channel size. Today is almost a synonym for ATM except B-ISDN refers to the service and ATM to the technology.
Bit	Binary Digit - has two mathematical values (0 and 1), two logical values (true and false), and two physical values (on/off/ high/low, present/absent etc.).
Blocking	A telephone exchange which cannot process calls from all subscribers simultaneous – anyone attempting to make calls when the exchange is blocked will get a busy sign. A router or switch which cannot process data on all ports at the maximum rate. When it becomes congested data will be delayed or discarded.
Bluetooth	A short range (10 metre) low speed data/voice network for home use.
BOM	Beginning Of Message. Used in cell relay and ATM to identify the beginning of segmented data in cells. (see also COM and EOM).
BPS	Bits Per Second. The rate at which bits are transmitted over a communications path is expressed as BPS, but the term bit/s is recommended for clarity.
Braggs Grating	An optical device that reflects a single wavelength in a DWDM system.
Broadband	A network on which a number of independent, simultaneous data network flows are multiplexed onto each cable.
Broadcast	A transmission from one device to all devices.
BSI	British Standards Institute.
Byte	A term used by computer engineers to refer to 8 bits.
Call Agent	Device controlling media gateways.
Carrier	A tone generated by a modem that carries analogue or digital data using modulation.

CBDS	Connectionless Broadband Data Service. The ETSI term for their cell relay standards.
CBR	Constant Bit Rate. Used to describe applications in ATM such as voice and video which are very sensitive to variable delay in transit.
СВХ	Computerised Branch Exchange. Name used by some manufacturers for their processor-controlled PABXs.
CCIS	Common Channel Interoffice Signalling. Signalling method used between computer controlled switching machines. Also known as CCS 7, CCITT#7, and SS-7.
ССІТТ	Consultative Committee for International Telegraph & Telephone. A committee which deals with standards development in telecommunications. This name has been replaced with ITU-T.
ccs	Centum Call Seconds. Traffic capacity measurement in increments of 100 seconds, 1/36th of an Erlang.
CDMA	Code Division Multiple Access. A means of multiple access where each pair of devices chooses specific codes to represent 0 and 1, which is different to the other codes in use. The signal is spread over a large range of frequencies shared by other transmissions.
CDMAOne	American second generation mobile network using narrowband CDMA.
CDMA2000	3rd generation version of CDMAOne.
CDR	Call Detail Record. The output from charging.
Cell	A fixed size packet. The area that can receive transmissions from a base station.

Cell Relay	A packet switched network using cells, standardised as ATM.
Cellular	A radio/microwave system where the transmission power is kept low to reduce the range of the transmission, allowing the same frequencies to be used in other non-adjacent cells.
CELP	Code Excited LPC. An improvement on pure LPC by measuring the difference between PCM and LPC, plotting the error as a curve, looking the curve up in a book of standard curves, and transmitting the curve number (code). It takes a lot of processing and introduces a significant delay but gives very good quality at 8kbit/s.
Centralised Routing	Routing performed by a routing centre, usually based upon the network loading as well as the physical configuration.
СЕРТ	European Conference of Post and Telecommunications Originally responsible for European standards.
CEPT 30	The European 2M E1 system named after the 30 voice channels.
C/FM	Cable/Facilities Management System. Software application developed by IBM which manages the twisted pair cabling of voice and data communications.
CGI	Common Gateway Interface. A standard interface between a web server and an application.
Character	A printable character or a control character normally is encoded in 8 bits so it often refers (informally) to a byte or octet.
СНАР	Challenge Handshake Authentication Protocol A means of sending dynamically encrypted passwords.
Charging	Collection of data for future billing.

CICS Customer Information Control System. An IBM telecommunications program supporting telecommunications applications. CIR Committed Information Rate. The almost guaranteed speed supported by a frame relay network for a PVC (Permanent Virtual Circuit). CIT Computer Integrated Telephony. An interface between DEC computers and PABX control computers for application integration of voice and data systems. Now more commonly known as CTI (Computer Telephony Integration). Class 5 A local switch and its controller. CLEC Competitive Local Exchange Carrier. CLI Caller Line Identification. A method of transmitting the caller number to the receiver. CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable – a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where analogue must be used.		
The almost guaranteed speed supported by a frame relay network for a PVC (Permanent Virtual Circuit). CIT Computer Integrated Telephony. An interface between DEC computers and PABX control computers for application integration of voice and data systems. Now more commonly known as CTI (Computer Telephony Integration). Class 5 A local switch and its controller. CLEC Competitive Local Exchange Carrier. CLI Caller Line Identification. A method of transmitting the caller number to the receiver. CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CICS	An IBM telecommunications program supporting telecommunications
An interface between DEC computers and PABX control computers for application integration of voice and data systems. Now more commonly known as CTI (Computer Telephony Integration). Class 5 A local switch and its controller. CLEC Competitive Local Exchange Carrier. CLI Caller Line Identification. A method of transmitting the caller number to the receiver. CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable – a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CIR	The almost guaranteed speed supported by a frame relay network for a PVC
CLI Caller Line Identification. A method of transmitting the caller number to the receiver. CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CIT	An interface between DEC computers and PABX control computers for application integration of voice and data systems. Now more commonly known as CTI
CLI Caller Line Identification. A method of transmitting the caller number to the receiver. CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	Class 5	A local switch and its controller.
CMIP Common Management Information Protocol. CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CLEC	Competitive Local Exchange Carrier.
CMOS Complementary Metal Oxide Semiconductor. A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CLI	
A fast cheap semiconductor memory. It is used in PCs to store the basic software necessary to start up the system. CO Central Office. Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CMIP	Common Management Information Protocol.
Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange, Public Exchange, End Office, Wire Centre, Class 5 Office. Co-ax Co-axially cable - a type of cable that can carry digital data at high bit rates or high bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CMOS	A fast cheap semiconductor memory. It is used in PCs to store the basic software
bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where	CO	Primarily used in the U.S.A. Refers to a local switching system that connects lines to lines and lines to trunks. Other terms that are synonymous include Local Exchange,
	Co-ax	bandwidth analogue signals over long distances (500MHz for 5 km) with little noise. Replaced by optical fire in telephony, but still used for television or where

Coder	A device which codes analogue into digital, and decodes the digital back into analogue.
Coding	Translating an analogue signal into a digital signal.
Co-location	Allowing other operators to put equipment inside an exchange.
Congestion	Overloading a network with traffic.
Congestion Control	A mechanism for avoiding or reducing congestion - discarding data is common on data networks, admission control on voice networks.
СОМ	Continuation Of Message. Used in cell relay and ATM to identify the continuation of segmented data in cells. (see also BOM and EOM).
Connectionless	A network where packets contain the destination address, and no connection is set up. The classical example is the postal service. LANs are connectionless, as is the Internet.
Connection Orientated	A network where a connection must be set up first. The classical example is the telephone network, X.25. Frame Relay, ATM and MPLS are connection orientated.
C00	Cell of Origin. Identifying which cell contains a mobile.
Corporate Number	A number identifying a company instead of its location.
CoS	Class of Service. Processing data according to its type – often used to distinguish voice and computer data traffic.
СР	Communications Processor. A statistical multiplexor with switching capability.

СРЕ	Customer Premises Equipment. A term used to describe any telecommunications equipment located on a subscriber's (customer's) premises.
CPS	Carrier Pre-Selection. Being able to select the carrier for a particular type of call without having to dial a special number to identify the carrier.
СРИ	Central Processing Unit. Main processor for computers.
CRC	Cyclic Redundancy Checking. Part of transmission message that checks the frame for correctness.
Cross charging	Money paid to another PTO for its part in transmitting voice or data.
Cross Connect	A device taking a channel from one ring and adding it to another. Physically it is two ADMs connected back to back.
CSMA	Carrier Sense Multiple Access. Listen to see if anyone else is transmitting.
CSMA/CA	Carrier Sense Multiple Access with Collision Avoidance CSMA, but uses a scheme for avoiding collisions. There are many different algorithms. Used on wireless networks where collision detection does not work.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection CSMA, but detects collisions, and retransmits. Used by Ethernet.
CSMA/CR	Carrier Sense Multiple Access with Collision Resolution CSMA, but detects collisions and allows the highest priority device to continue. Used on the ISDN D channel.
CSN	Circuit Switched Network - a network where an end-to-end circuit is created to carry the signal. Network resources are dedicated to the call.

CSPDN	Circuit Switched Public Data Network. A DATEX-L type network, providing switched digital data only service.
CSU	Channel Service Unit A function built into DCEs to support physical management to/from the network, also see DSU.
CT1	Cordless Telephone 1st Generation. A generic term.
СТ2	Cordless Telephone 2nd Generation. A system developed in the UK, but a heroic failure.
СТІ	Computer Telephony Integration. A generic term for the integration computers and PABX control computers for application integration of voice and data systems.
CUG	Closed User Group A service on a public network which restricts data to the members of the group.
CVSD	Continuous Variable Slope Delta. Form of Delta Modulation which minimises the tracking error of the samples relative to the original waveform.
D-AMPS	Digital AMPS. Second generation American mobile network.
Dark fibre	Fibre that has been installed, but is not being used. It may refer to fibre leased from a PTO using the customer's optical transmitting/receiving equipment rather than the PTOs equipment.
DASS	Digital Access Signalling System. A common channel signalling system for use between PABXs and network local exchanges developed by GPO/BT, but being replaced by Ω.931.

dB	Decibel One tenth of a Bell. A Bell is a ratio expressed as a logarithm to the base 10. Thus the ratio A/B is 10log(A/B) dB. For example the ratio 2/1 is 3dB. It is used extensively in electronics and optics to measure attenuation, amplification etc.
DCE	Data Communications Equipment) OR (Data Circuit-Terminating Equipment) A device that receives the output from a terminal and reformats it to be compatible with the data communications line.
D Channel	The ISDN channel carrying signalling and optional low speed user data.
DCS	Digital Cross-Connect System. An internal interface that acts as a central point for cross-connecting, rearranging, patching, and testing digital equipment and facilities.
DCS	Digital Communication System. Digital mobile network based on GSM, but at a frequency of 1.8GHz in Europe and 1.9GHz in America.
DDCMP	Digital Data Communications Message Protocol. Type of link protocol developed by Digital Equipment Corporation. Made obsolete with DECnet Phase V.
DDI	Direct Dial In. A feature that permits incoming calls to stations served by a private branch exchange or centrex to be dialled directly.
Decoding	Extracting an analogue signal from digital data.
DECT	Digitally Enhanced (Digital European) Cordless Telephone. Used domestically, and also in wireless PBXs.
DES	Digital Encryption Standard. The standard single key encryption algorithm (40, 56 and 128 bit keys are common, as is a triple encryption) that is easily implemented in hardware.
Demodulation	Extracting the data from the carrier, a task performed by a receiving modem.

DiffServ	Differentiated Service. A redefinition of the Type of Service field in an IP packet, used to improve the Quality of Service.
Digital	The signal is encoded using a finite number of line states allowing errors to be virtually eliminated provided the noise is below the threshold.
Diverse Routing	Using two different leased lines between two destinations so that if one is broken, the other will still be useable.
DHCP	Dynamic Host Configuration Facility. A TCP/IP protocol for assigning IP addresses from a central server.
Dibit	A symbol with 4 values representing two bits.
DIM	Drop/Insert Multiplexor. Another name for an ADM.
Direct Routing	Another name for Step by Step routing.
DLCI	Data Link Connection Identifier. The Virtual Circuit identifier used in Frame Relay networks.
DM	Delta Modulation. Form of digitising speech where each sample generates a single bit.
DMI	Digital Multiplexed Interface. Technique using T1 carrier facilities between a PABX and a host.
DPCM	Differential PCM - transmits the difference between two PCM values - usually generates 32kbit/s.
DPSK	Differential Phase Shift Keying. A method of transmitting digital data over an analogue circuit by changing the phase of a carrier - a practical implementation of PSK.

DPNSS	Digital Private Network Signalling System. Used for signalling between PABXs in a private network.
DQDB	Distributed Queue Dual Bus. A Metro Area Network access protocol defined by the IEEE as 802.6, and used with SMDS.
Drop	Terminating a mobile call because of problems.
Drop	Discard a packet.
Drop Preference	A means of indicating which packets should be dropped in the event of congestion.
DS	Directory Services.
DSL	Digital Subscriber Loop. A group of method of transmitting data a high rates (128k to 52M) over the local loop.
DSSS	Direct Sequence Spread Spectrum. A weak signal spread over a wide frequency range.
DSU	Data Service Unit. The term used to describe a digital DCE, also known as a line driver. (also see CSU)
DTE	Data Terminal Equipment. A device that is used with a computer system for data input and output.
DTMF	Dual Tone Multifrequency. Generic term for pushbutton or touch-tone dialling.
Duplex	Being able to transmit in both directions simultaneous. Sometimes referred to as Full Duplex.
DWDM	Dense WDM. Using 16 or more wavelengths (40, 80 and 120 are typical) at bit rates or 2.5G, 10G, or in the near future 40G each.

DXI	Data Exchange Interface. Used in ATM and frame relay standards to define how a terminal e.g. a router connects at the physical level to a DCE.
Dynamic Routing	In telephony, routing performed by a routing centre, where a call can be re-routed without terminating the call.
Е	Exa (one million million million)
E1, E2 - E5	Unofficial names for methods of transmitting digital data in the telephone network. Often used to refer to leased lines.
EAOIG	European AO/DI Interest Group.
EC	Echo Cancelling. Involves the addition of circuitry to cancel out any echo in the received signal of transmission.
ECC	Elliptic Curve Cryptography. A public key encryption algorithm.
Echo	A signal received by a transmitter from its own transmissions. Although not normally a problem in simplex and half duplex systems, it complicates full duplex systems as the received signal at one end will include echos from its own transmissions.
ECMA	European Computer Manufacturers Association. An association of European manufacturers to develop, and publish standards on for electronic apparatus.
EDFA	Erbium Doped Fibre Amplifier. A 10 metre length of Erbium doped fibre that amplifiers the signal by extracting energy from a constant beam from a pump laser.
EDGE	Enhanced Data Rates for Global (GSM) Evolution. Data rates higher than voice bandwidth over mobile phone networks, achieved by using special modulation methods.

EDI	Electronic Data Interchange. A standard approach to information interchange between open systems.
Encryption	Encoding the data in such a way that only the intended receiver(s) can read it.
EMS	Extended Message Service. An extension of SMS allowing for email type attachments.
EOM	End Of Message. Used in cell relay and ATM to identify the end of segmented data in cells. (also see BOM and COM)
EOTD	Enhanced Observed Time Difference. Locating a mobile by the difference in arrival time at multiple base stations.
EPABX	Electronic Private Automatic Branch Exchange. Private Automatic Branch Exchange in which switching is accomplished by the flow of electrons through solid state devices rather than by electromechanical means.
EPSS	Experimental Packet Switch Strea A UK experimental network implemented prior to X.25.
Erlang	A measure of traffic intensity - the fraction of time that a system is in use. A 1 hour call in a 1 hour period is 1 Erlang which is equal to 36 ccs.
Erlangs Formula	There are two. The first is an equation which given the number of simultaneous connections and the number of available circuits, gives the probability of the system being blocked and a busy signal returned. The second applies to systems where instead of returning a busy signal, calls are queued until there is spare capacity.
Error	The difference between the received signal and the transmitted signal which is not due to attenuation.
ES-IS	End System - Intermediate System. An OSI routing protocol between end systems and intermediate systems, e.g. routers.

ETACS	Extended TACS - UK analogue mobile telephony.
Ethernet	Ether Network. The most popular LAN developed by Xerox from 1972, later manufactured with the help of Digital and Intel. It runs at speeds of 10 and 100M, and 1 and 10Gbit/s.
ETS	Electronic Tandem Switching. Private network service that provides customers with a uniform numbering plan and call-routing features.
ETSI	European Telecommunications Standards Institute. Responsible for European standards.
Exchange	Refers to both the building and the equipment used to set up telephone calls.
Expedited Forwarding	An IP Differentiated Service guaranteeing a minimum packet rate.
Extranet	A company's semi-secure internet containing publicly available servers.
f	Femto (one thousandth millionth millionth).
FCAPS	Fault, Configuration, Accounting, Performance and Security Management.
FDDI	Fiber Distributed Data Interface. An ANSI / ISO LAN recommendation using token passing at 100 Mbps.
FDM	Frequency Division Multiplexing. Method of multiplexing more than one channel on a medium by assigning each channel its own frequency.
FDMA	Frequency Division Multiple Access. Similar to Frequency Division Multiplexing. The two devices agree on a frequency to use which is different to the other frequencies being used.
FDUX	Full Duplex. Transmission of data or voice in both directions simultaneously.

FECN	Foreword Explicit Congestion Notification. Used in frame relay networks to flow control a transmitting device from the destination device (see also BECN & DE).
FEP	Front End Processor. A front end computer primarily used with mainframes. An example is the IBM 3745.
FFOL	FDDI Follow On LAN. A generic term used to describe the box that interfaces a terminal (DTE) to a telephone line. The DCE can either be a modem or a line driver.
Firewall	A device which controls access into an intranet.
Fixed	A device that is static with respect to the network. Links can be wireline or wireless.
FM	Frequency Modulation. A method of carrying analogue data over an analogue circuit by varying the frequency of a carrier.
Forwarding	Another term for routing.
FSK	Frequency Shift Keying. A method of carrying digital data over an analogue circuit by using different frequencies.
F/R	Frame Relay. A packet switched network designed for data transfer between LANs (see X.25 and ATM).
FRAD	Frame Relay Assembler/Disassembler. Device which interfaces into a frame relay network.
Frame	Another name for a packet. Frequency Hopping Frequently changing frequency to avoid interference from other devices, and to improve security.
FTP	File Transfer Protocol. An Internet standard for the transfer of files

Full Duplex	Transmission in both directions simultaneously – correctly called just Duplex.
G	Giga (one thousand million).
G.711	The standard codec used on the PSTN.
G.729	The most common vocoder.
G.732	The European 2M E1 system.
G.733	The American 1.5 DS1 system.
Gate Keeper	Device between a PABX and a router designed to prevent the LAN becoming overloaded with voice traffic.
Gateway	A device interfacing two completely different systems.
Gateway Decomposition	Splitting conventional gateways into call agents and media gateways.
GEO	Geosynchronous Earth Orbit. A satellite orbit where the satellites appear to be stationary. The orbit is 23,400 miles or 36,000 km. The resulting long tome delays make it unsuitable for telephony.
Geographic Address	An address which identifies the location of a device and so allows calls or data to be routed to it.
GIB	Gateway Information Base. A database of the gateways to the PSTN available for the use by other domains.
GLC	Gateway Location Protocol. A protocol to find a gateway in the GIB.
GMPC	Global Mobile Personal Communications. Mobile communications using satellites.

GPRS	General Packet Radio System. A means of sending data over a radio packet network. It gives an always on shared capacity.
GPS	Global Positioning by Satellite.
GSM	Global System for Mobile communications. European standard for digital mobile cellular networks.
Guaranteed Delivery	A network that guarantees that the data will be delivered as sent with no errors.
Guiding	Adjusting the cost of a call to a customer's plan.
H.225	The ITU IP Signalling protocol based on Q.931.
H.320, 323, 324	ITU recommendations for video conferencing over ISDN, PSN and POTS.
Half Duplex	Transmission in both directions, but only in one direction at a time.
Handover	The processor of transferring a mobile from one base station to another, or one MSC to another.
H Channels	High bit rate ISDN channels intended for video traffic, but rarely implemented.
HCS	Hierarchical Cell Structure. A cell within a cell typically providing greater capacity within a limited area.
HDSL	High Rate Digital Subscriber Loop. Modem technology for transmitting T1/E1 data over a twisted pair cable with out the need for repeaters.
HDUX	Half Duplex. Transmission of data or voice in either direction but not simultaneously.
HEC	Header Error Control. Used to detect bit errors in an ATM cell header.

Hertz	One cycle per second – used in analogue systems.
HiperLAN	A developing ETSI standard for a wireless LAN.
HIPPI	High Performance Parallel Interface. A high speed metallic interface originally developed by the Los Alamos Laboratory, it specifies either a 800 Mbps or 1600 Mbps point to point parallel interface.
HomeRF	A low speed data network for the home.
HSCSD	High Speed Circuit Switch Data. High data rates over mobile networks by combining voice circuits.
HSSI	High Speed Serial Interface. An interface using a 50 pin SCSI 2 type cable, operating between 300 Kbps to 52 Mbps.
HTML	Hypertext Markup Language. The coding language used to create WWW pages.
НТТР	Hypertext Transmission Protocol. The protocol used to access world wide web (WWW) pages.
IC	Integrated Circuit. A "chip" or piece of silicon containing an electrical circuit and components, especially transistors.
ICMP	Internet Control Message Protocol. Used in the Internet to identify problems in the network.
IDF	Inter-Distribution Frame. Also known as an intermediate distribution frame, it is a wiring center used to connect floor distribution (horizontal) wiring with house cabling (vertical).
IDN	Integrated Digital Network. Networks comprised of digital data transmission and telephone traffic.

IEEE	Institute of Electronic and Electrical Engineers. An American organisation not to be confused with the British IEE.
IEEE802	The IEEE committee responsible for standardising LANs.
IEEE 802.1p	The IEEE standard defining how priority can be implemented on switched LANs.
IEEE802.3	The IEEE subcommittee responsible for Ethernet.
IEEE 802.11	The IEEE subcommittee responsible for wireless LANs.
IEEE 802.17	The IEEE subcommittee responsible for Resilient Packet rings.
IIS	Internet Integrated Service. A "real-time multimedia" service using RSVP.
ILEC	Incumbent Local Exchange Carrier.
IMT-2000	A hope for a single standard for the 3rd generation mobile network, but will be at least three incompatible systems. A service rather than a technology.
Imode	Japanese equivalent to WAP, but uses compact HTML.
Information	In telephony, the words being spoken.
Internet	With a capital I refers to the Internet.
internet	An internet is a network of networks linked by routers. It uses LAN, WAN and MAN networks.
Intranet	A companies secure internet.
IOTP	Internet Open Trading Protocol. An E-commerce protocol supporting SET.

IP	Internet Protocol. The layer 3 protocol used in the Internet and private networks, as part of the TCP/IP suite of protocols.
ISDN	Integrated Services Digital Network. An integrated digital network which provides integrated access of voice, data, and low quality video using circuit switched technology (64k capacity).
IDSL	ISDN Digital Subscriber Loop. Carries 128k data over the local loop – similar to two ISDN B channels but over a longer distance (10km rather than 5 km).
IN	Intelligent Network. A network which is designed to allow the centralised creation, development, testing, installation and monitoring of a new service.
International	A trunk between two countries or exchange at the end of the trunk.
Interconnection	A trunk between two PTOs or exchange at the end of the trunk.
Invoicing	Combining the billing information with other charges and discounts to create a customers invoice.
IP VPN	IP Virtual Private Network. Additional security provided by an ISP to give secure communications over the ISPs internet. It is a combination of authentication, encryption and often MPLS.
IS-95	Another name for CDMAOne.
IS-136	Another name for D-AMPS.
ISDT	Integrated Services Digital Terminal. Digital telephone set designed by GPT for use on its iSDX PABX.
ISO	International Standards Organisation. A non-treaty organisation that develops telecommunications standards based in Geneva, Switzerland.

ISP	Internet Service Provider.
ITAD	Internet Telephony Administration Domain. The equivalent of a PTO in Internet telephony.
ITU	International Telecommunications Union. A United Nations sponsored standards organisation.
ITU-TSS	International Telecommunications Union - Telecommunications Standardisation Sector The new name for the CCITT, generally referred to as ITU-T.
IVDT	Integrated Voice/Data Terminal. Computer terminal capable of handling both voice and data application.
Jitter	A variation in data rate or in packet or cell arrival times.
k	Kilo - 1000 (communications).
K	1024 (computing).
LAN	Local Area Network. Network owned and used by a single organisation providing full connectivity between devices.
LAP-B	Link Access Procedure - Balanced. The version of HDLC protocol used on X.25 networks.
LAP-D	Link Access Procedure D-Channel. The version of HDLC protocol used on the ISDN D channel.
LAP-F	Link Access Procedure - Frame. The version of HDLC protocol used by frame relay.
LAP-M	Link Access Procedure-Modem. An HDLC type protocol used between two V.42 compliant modems.

LASER	Light Amplification by Stimulated Emission of Radiation Light source used to transmit information over fibre optic system.
LATA	Local Exchange and Transport Area. Incumbent operator in the USA.
Latency	Time taken to cross a network.
LCGN	Logical Channel Group Number. Part of the 12 bit logical channel number, usually identifying a specific switching node on a packet network.
LCN	Logical Channel Number. The PVC/SVC circuit identifier in an X.25 network.
Leased Line	A permanent connection across the PSTN which is normally paid for by a rental regardless of use. It may be used for cost or security purposes.
LED	Light Emitting Diode. Light source used to transmit information over fibre optic system.
LEO	Low Earth Orbit. A low orbit where non-directional antenna can be used.
LIM	Line Interface Module. A non-blocking port package which resides in the Ericsson MD110.
LLC	Logical Link Control. The functions performed by Layer 2 of Local Area Networks.
LLU	Local Loop Unbundling. Allowing other operators to use the local loop.
LMDS	Local Multipoint Distribution Services - another name for WLL typically using high frequencies so the transmission distance is limited by the atmosphere (water and oxygen).

Local Exchange	A telephone exchange used to switch calls from subscribers.
Local Loop	Twisted pair copper telephone line from subscriber to the local exchange. Loops may differ in distance and diameter depending on the network.
Local Office	American term for a local exchange.
Location Register	A table at an MSC containing the location (cells) of mobiles known to it. Normally there is a Home Location Register of devices which are registered with that MSC, and a Visitor Location Register of mobiles active but not registered.
Location Services	Services which rely on knowing the location of a mobile.
Loop start	Picking up the handset closes a switch allowing a current to flow and so signals to the exchange that the user wants to make a call, or is answering an incoming call.
LPC	Linear Predictive Coding. Uses a mathematical model of the human mouth, and transmits how the sounds were generated rather than the sounds themselves. It results in robotic quality, but the bit rate can be as low as 1.8kbit/s.
m	Milli - one thousandth.
М	Mega - one million (communications)
М	1024 x 1024 = 1,048,576 (computing).
MAC	Medium Access Control. Usually refers to the protocols used in Local Area Networks
MAN	Metro Area Network. A network designed to offer interconnection service to a small geographic area such as a city. Currently offered for data networking.
Mark	The name of the symbol representing a binary one.

MD5	Message Digest 5. A standard for a one way encryption.
Media Gateway	A device converting from one coding system to another.
Mediation Device	A device in a TMN network which converts data from one form to another.
MEGACO	Media Gateway Control. Model of modern IP telephony using call agents and media gateways
MEM	Micro Electro-Mechanical. Used to refer to the mechanism inside an optical router where very small mirrors reflect the beams of light.
MEO	Middle Earth Orbit. An orbit between LEO and GEO.
MF	Multifrequency Signalling used between PABXs or exchanges using tones on same path as is used for voice.
MGCP	Media Gateway Control Protocol. Protocol between call agents and media gateways.
Micron	One millionth of a metre.
Microwaves	An unofficial term used for frequencies from 1 to 100 GHz or wave lengths of 3 cm down to .03 mm. Sub-millimetre wavelengths are only starting to be used.
MMF	Multimode Fibre. A large diameter (50 or 62.5 micron core) optical fibre which transmits multiple modes or beams of light. Although relatively cheap it suffers from multimode dispersion which limits its length to a few km. It is used in LANs for cheapness.
MNS	Managed Network Services. A VPN which offers significant additional services.

Mobile	A device which moves in relation to the network. This implies a wireless link.
Modem	Stands for "Modulator-Demodulator". Converts digital data into a form suitable for transmission over the analogue medium.
Modulation	A method of carrying analogue data over an analogue circuit by modifying a property of a carrier signal (amplitude, frequency and/or phase), a task performed by a transmitting modem.
MOS	Mean Opinion Score. A method of quantifying the quality of coding systems based on a value between 1 (unusable) and 5 (perfect). A perfect analogue line has the value 4, and 64k PCM 4.1. Any value over 3.5 is good enough for telephony.
MPEG	Motion Picture Expert Group. An organisation which has developed an algorithm for digitizing motion pictures.
MPLS	Multi Protocol Label Switching. A form of packet switching used on the Internet which while giving the appearance of conventional routing, uses packet switching to improve both performance and security.
MS	Mobile Station - the GSM subscriber unit
MSC	Mobile Switching Centre. The equivalent of an exchange in a mobile network, but it must also handle device location.
МТР	Message Transfer Part. The signalling network protocol in SS7.
Mu	Micro - one millionth.
Mu-Law	The American PCM encoding system.

Appendix

Multicast	A transfer from one device to many (but not necessarily all) devices.
Multiple Access	A form of multiplexing where there is no multiplexor - each device obeys rules so that its transmissions can be distinguished from other terminals' transmissions. The common methods include FDMA.
TDMA, CDMA, and CSMA. Multiplex	A transmission of many logical connections along one physical connection.
MUX	Multiplexor. Equipment for combining a number of individual channels into a common frequency band or into a common bit stream for transmission
MVS	Multiple Virtual Storage. An operating system developed by IBM for use on some of its mainframes.
n	Nano (one thousandth millionth).
NAU	Network Addressable Unit. A unique network address in an IBM SNA network.
NDIS	Network Driver Interface Specification. A device driver developed by Microsoft and 3Com, used by Windows, LAN Manager and Banyan Vines, isolates layer 3 from layer variations.
NE	Network Element. A component managed by a TMN system
NFS	Network File System. A protocol developed by Sun Microsystems to support file transfers transparently to the user, i.e. hides the difference between local and remote file location.
Nibble	Half a byte - 4 bits.
N-ISDN	Narrowband ISDN. An ISDN based on fixed bit rate channels (normally 64k or multiples thereof).

NMF	Network Management Forum.
NMS	Nordic Mobile System. First European analogue mobile network.
NNI	Network Node Interface. The electrical interface in SONET / SDH.
NNI	Network to Network Interface. The standard for switch to switch protocol in frame relay networks.
Noise	That which causes errors in the signal. Noise can be external (from other systems), or internal (from within the system - echos, amplification, quantitisation).
Non-blocking	A telephone exchange on which all subscribers can make calls simultaneous, or a router or switch which can process data at the maximum rate on all ports simultaneous. Such a device will not become congested.
NT	Network Termination Functions associated with physical and electromagnetic termination of the ISDN.
NTA	Norwegian Telecommunications Administration.
NTU	Network Terminating Unit. Device which can be used as DCE to interface with V.24, V.35. or X.21.
Number Portability	The ability to keep the same number when changing to another PTO.
OADM	Optical Add/Drop Multiplexor.
Octet	Communication engineer's term for 8 bits.
Office	American term for a public exchange.
Olympic service	A simplified form of Assured Forwarding with only 4 options instead of 12.

Open Wires	Term used for straight (non-twisted) wires that used to be strung along telegraph poles.
Optical Router	A router that routes beams of light. It takes a relatively long time (msecs) to change the route.
Optical Switch	A switch that switches beams of light at high speeds. The term is frequently misused for an optical router.
OS	Operator Service.
OS	Operational System.
OSS	Operational Support System.
OSI	Open Systems Interconnection. A standard set of protocols for exchanging information between independent systems developed by the International Standards Organisation (ISO).
OSPF	Open Shortest Path First. A routing protocol used by routers.
Р	Peta (one thousand million million).
р	Pico (one millionth millionth).
PABX	Private Automatic Branch Exchange. Private automatic switching system which services an organization and is usually located on the customer's premises.
Packet	A block of data with control information such as source and destination addresses, or circuit identifiers.
PAD	Packet Assembler/Disassembler. Device which interfaces into an X.25 network.

Pan European	A network that connects several European countries.
PAP	Password Authentication Protocol. A means of sending passwords (in clear text).
PAM	Pulse Amplitude Modulation. A method of carrying an analogue signal by sampling it at regular intervals and transmitting a pulse whose amplitude represents the value of the sample.
PANS	Pretty Amazing Network Services. A network offering more services than POTS.
PBX	Private Branch Exchange - American term for PABX.
PCI	Protocol Control Information. An OSI term to describe the header added to the data by an 'N' layer.
PCI	Peripheral Component Interconnect. An Intel developed local bus for personal computers.
PCM	Pulse Code Modulation. Method of converting a varying analogue signal into a digital signal by sampling at regular intervals and transmitting the value of the sample. It usually implies 64k bit/s voice.
PCN	Personal Communication Network (GSM 1800).
PDC	Personal Digital System. Japanese second generation mobile network.
PDH	Pleisiochronous Digital Hierarchy. The access network TDM system (E1 to E3 in Europe, and DS1 to DS3) in America. Devices have their own derived clocks and so bit rates are only approximately the same.

PDN	Public Data Network Public network designed exclusively for data transmission which is physically separate from the voice network, although it may share transmission facilities.
PDN	Private Data Network. A privately owned network that uses the same technologies as public data networks.
PDH	Plesiochronous Digital Hierarchy The traditional digital telephony network where clock speeds are approximate. Now used as an access network to SDH.
PDS	Premise Distribution System. System of organised wiring and related components developed by A.T.&T.
PDU	Protocol Data Unit. An OSI term for a data unit passed to an N-1 layer for processing.
Personal Number	A telephone number identifying a person rather than a telephone.
PHS	Personal Handy Phone System. Japanese mobile network.
PIN	Positive-Intrinsic-Negative. Basic receiver that detects light and outputs an electric current in fibre optic transmission.
PING	Packet Internet Groper. A program used by Internet hosts to test reachability of destinations.
PMD	Polarisation Mode Dispersion. A problem encountered when using older optical fibre at bit rates over 2.5G, due to different polarisation modes having different velocities.
Port	Interface on a device.

PPP Pretty Good Privacy. A public key encryption algorithm. Primary Rate An ISDN interface providing 30 B channels in Europe and 23 B channels in America. PSE Packet Switch Exchange. PSN Packet Switched Network. A network where the information is put into packets. Each packet has an identifier that allows packet switches to switch the packets along a pre-established route to the destination. Network resources are not dedicated to specific circuits, and it is more efficient than circuit switching for data. Typical examples include X.25, Frame Relay, ATM, and MPLS. Protocol Set of rules for communications. These are of two types. Procedural – the order in which things are done, and Syntactical – the formats and structures. PSK Phase Shift Keying. Sending digital data over an analogue circuit by changing the phase of the carrier – in practice DPSK is used. PSTN Public Switched Telephone Network. Portion of the total network that provides the capability for interconnecting homes or offices. PTT Post Telegraph & Telephone. Used to refer to a public monopoly (e.g. The General Post Office in the UK prior to 1980). PTO Public Telephony Operator. Pulse Dialling A rotary dial telephone opened and closed contacts thus causing short breaks 9 zero by 10 breaks).		
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	PTO	Pulse Dialling A rotary dial telephone opened and closed contacts thus causing short breaks in the current. Each digit was represented by a different number of

PVC	Permanent Virtual Circuit. A permanent connection between two end systems on a packet switched network (see also SVC).
Q Interface	A standard TMN interface – a Q3 or a Qx interface.
03	The interface between an OS and a device in a TMN network.
Ох	The interface between a mediation device and another device in a TMN network.
Q.931	The ISDN signalling protocol.
Q Adapter	A TMN device which interfaces to non-TMN devices.
QAM	Quadrature Amplitude Modulation. Sending digital data over an analogue circuit by changing both amplitude and phase of a carrier. The name comes from the first system that encoded 4 bits per baud. Today this would be called 4QAM as today we have 8QAM, 16QAM etc., the number representing the number of bits per baud. These usually have unacceptably high error rates so are combined with TCM.
QoS	Quality Of Service. A specification of the quality of service of a network connection. For data it may be sequential or guaranteed delivery, for voice and video it is normally latency and jitter.
Quality	In telephony the degree to which the person talking can be identified by the sound of their voice.
Quantisation noise	The error induced in a PCM system due to values being measured to a the nearest integer value.
Quat	A quadbit - a symbol which has 16 possible values representing 4 bits.
Queuing	Theory A branch of mathematics that gives the average delay based up the utilisation of a system (measured in Erlangs).

Raman Amplification	Amplifying the signal using the Raman effect where energy from one beam is transferred to another beam in the same fibre. It has the advantage over EDFAs that it does not require special fibre and it works over a much greater range of wavelengths.
RAS	Registration, Administration and Status. An H.323 protocol (part of H.225) between a terminal and a gate keeper.
Rating	Converting a CDR into a price by looking up costs in a table or using an algorithm.
RC	Routing Centre.
Real Time	An application where minimal time delay is critical.
Repeater	A device which receives distorted digital signals and transmits a regenerated signal, thus removing any noise.
RIP	Routing Information Protocol. A protocol used to exchange routing information amongst a set of computers.
Ringing	Current An alternating current designed to make an electro-mechanical bell on the telephone ring.
RJ-11	The 6 pin plug used for UK telephones.
RJ-45	The 8 pin plug used for LANs, and ISDN.
Roaming	Using a mobile on another operators network.
Route	The path followed or to be followed across a network.
Routing Centre	The location where routing decisions are made.
RPR	Resilient Packet Rings. A low cost alternative to SDH/SONET rings.

RSA	Rivest, Sharmir and Aldeman. A public key encryption algorithm.
RSVP	Resource Reservation Protocol. Used to reserve capacity within IP routers.
RTCP	Real Time Control Protocol. Used to control RTP.
RTP	Real Time Protocol. Used to carry voice and video.
SA	Signal Attenuation. A method of locating a mobile by signal strength.
SASL	Simple Authentication Security Layer. A protocol for authentication.
SCE	Service Creation Environment. The part of an intelligent network where new services are created and tested
SCP	Signalling Control Point. The controlling part of a SS7 network.
SCCP	Signalling Connection Control Part. The connection across a SS7 network.
SCPP	Smart Card Payment Protocol. A method of securing credit card information.
SCSI	Small Computer System Interface. A popular parallel interface between personal computers and disk drives. Standard on Macintosh computers, optional on others.
SDCU	Satellite Delay Compensation Unit. Device used over satellite link to increase throughput efficiency.

SDH	Synchronous Digital Hierarchy. The TDM system used in the core network at speeds of 155 and 622M, 2.5 and 10Gbit/s. All devices are controlled by a single clock so bit rates are exactly the same. The network is constructed in rings for increased availability, and allowance has been made for network management traffic. The numbering system is based on multiples of 155M.
SDSL	Symmetric Digital Subscriber Loop. A method of transmitting data over the local loop which provides for the same data rate in both directions.
SDP	Service Data Point. The part of an intelligent network where all the data for a service is held, plus CDRs.
SDP	Session Description Protocol. Used in conjunction with SIP, it gives information regarding the type of session and the equipment used.
Sequential Delivery	A network that guarantees that data will be delivered in the correct order however it does not necessarily mean that the data has not been corrupted.
Service code	A telephone number that indicates a type of service (typically call cost) as opposed to a geographical number. The best known is the American 1-800 which has been adopted in most countries (in the UK it is 0800).
SET	Secure Electronic Transaction. A method of securing credit card information so that the store does not have access to it.
Shift Keying	Sending digital data over an analogue connection using modulation.
Signal	An electrical voltage or current, or a light beam carrying data.
Signalling	The process of call set -up and call clear-down (plus other status messages) on a telephony network. The term is rarely used on data networks.

Signalling Protocol	Signalling using messages instead of tones, currents and voltages.
Signalling Network	A network optimised for signalling traffic.
SIM	Subscriber Interface Module. A GSM smart-card holding the subscribers information.
Simplex	Transmission in one direction only.
SIP	Session Initiation Protocol. An Internet user-user signalling protocol used to set up sessions.
Sizing	Calculating the capacity to be provided to give an acceptable service. It is the application of Erlang's formula.
Slot	The location of a voice sample in a TDM frame.
SMF	Single Mode Fibre. The core is only 8.3 microns which only allows one beam of light so it does not suffer from multimode dispersion, and the distance is typically limited by attenuation (at speeds up to 2.5G). Used in WANs, but is expensive.
SMS	Service Management System. The part of an intelligent network where services are installed, configured and monitored.
SMS	Short Message Service. 160 character GSM message.
SNMP	Simple Network Management Protocol.
States	The values of a digital system (normally 1 and 0).
SONET	Synchronous Optical Network. The American equivalent of SDH, the main difference being that SDH supports a 51Mbit/s channel, and the number refers to multiples of that vale.

SP	Signalling Point. The part of an exchange which handles the signalling.
Space	The name of the symbol representing a binary zero.
SPAG	Standards Promotion and Application Group. A European association of Information Technology organizations whose goal is to further the realisation of open systems.
SPC	Stored Program Controller. The specialised computer controlling a telephone exchange.
SS7	Signalling System 7. A standard model for modern digital signalling within the telephony network.
SSAC	Signalling System Alternating Current. Used for Inter-city distances via tones over talk circuits.
SSL	Secure Sockets Layer. The standard technique for IP authentication of client, and encryption of data.
SSP	Service Switching Point. An exchange which can communicate with a SCP.
STATDM	Statistical Time Division Multiplexer. Similar to TDM except that total bit rate is assigned dynamically rather than with time slots. The bits or characters only occupy bandwidth as needed.
State	The physical encoding of a symbol.
STD	Subscriber Trunk Dialling. The system allowing UK subscribers to make long distance calls (outside the area of the local trunk exchange).
Step by Step Routing	The early form of routing telephone calls where one exchange would route it on to the next until the destination was reached.

STM	Synchronous Transport Module. Used in SDH to identify a specific payload size, e.g. STM-1 = 155.52 Mbps
STS	Synchronous Transport Signal. Used in SONET to identify a specific payload size, e.g. STS-1 = 51.84 Mbps.
Subscriber	In a telephone network it normally refers to a telephone rather than a person.
SVC	Switched Virtual Circuit. A connection set up and cleared down between two end systems on a packet switched network.
Switch	The equipment within an exchange which switches data from an input to an output.
Symbol	The representation of a digital value on a physical medium.
Synchronous	There is a time relationship between two events.
System X	The first UK digital telephone system.
Т	Tera (one million million).
T1, T2, T3, T4	Standard methods of sending digital data over twisted pair in America.
TA	Terminal Adapter. Equipment to connect non ISDN compatible equipment (such as an analogue telephone or a computer) to an ISDN network.
TACS	Total Access Communication System. First UK analogue mobile network.
Tag Switching	A form of packet switching developed by Cisco and standardised as MPLS.
TAT	Transatlantic. Term used to refer to the cables. TAT8 was the first fibre.

TAXI	Transparent Asynchronous Transceiver/Receiver Interface A 100 or 140 Mbps interface using AMD's TAXI chip, used as an initial User Network Interface (UNI) for ATM. Its layer 1 physical line signalling is the same as FDDI (4B5B).
TCM	Trellis Code Modulation. A method of correcting errors on high speed modems. The name comes from the signal's appearance on an oscilloscope - it looks like a trellis gate.
ТСР	Transmission Control Protocol. Used in the Internet as a layer 4 protocol giving reliable delivery of data.
TDM	Time Division Multiplexing. A method of serving multiple channels over a common transmission path via discrete time intervals.
TDMA	Time Division Multiple Access. Similar to TDM, but there is no multiplexor.
TD-SCMA	Time Division - Synchronous CDMA. Chinese 3rd generation mobile network.
TE	Terminal Equipment. Equipment such as digital telephones, data terminal equipment, and integrated work stations that provide functions necessary to interface to an ISDN.
Telegraph	A network capable of sending text messages. Mechanical telegraph used flags or semaphores, optical telegraph uses lights, electrical telegraph uses wires, and wireless telegraph uses radio. It is complicated to send and receive messages so specialist operators are normally required.
Telephone	An analogue device containing little more than microphone, loudspeaker, amplifiers and a bell.
Teleprinter	A printer that prints data received from a connection or paper tape. Sometimes called a teletype.

Telex	Teleprinter Exchange – uses a feature similar to telephone exchanges to create a true telegraph network. It also implies that specialist staff are not required in the sense that simple keyboards are used for input, and the received messages are automatically printed or displayed. It works at a speed of 50, 110 or 2400 bit/s with 5 bits per character so is limited to upper case letters, digits and a few punctuation signs.
Terminal	The digital equivalent of a telephone – often has more features, and can do more than set up clear down calls. Used for ISDN and mobile networks. Most PBX use proprietary terminals.
TETRA	Terrestrial Trunked Radio. The European standard for digital radio/telephone.
Tetrapol	A proprietary alternative to TETRA.
TLS	Transport Layer Security. A method of encrypting internet data developed from SSL.
TMN	Telecommunications Management Network. A network management system used by the telephone industry to manage their internal networks consisting of 5 layers.
TOA	Time of Arrival. Method of determining the location of a mobile by the time at which a signal arrives.
Tone dialling	Each key produces two tones which are used by the telephone exchange to detect the button pressed. The system allows for 16 buttons. The tones are also sent across the network once a call has been made so the buttons can also be used for user-user signalling.
ToS	Type of Service. Processing data according to its type - often used to distinguish voice and computer data traffic.

Traffic	Telephony term referring to voice as opposed to signalling.
Traffic Intensity	The number of calls and the time they last measured in Erlangs or ccs.
Transcoder	A device which changes from one coding system to another (usually changing the bit rate).
Tribit	A symbol with 3 possible values, mathematically -1, 0 and +1.
Trunk	A connection between two exchanges that carries many calls. A trunk consists of two physical connections, each connection carrying traffic in one direction only.
Trunk Exchange	A central exchange used to switch calls from local exchanges.
ΠΥ	Teletype Equipment. Data transmission terminal used in time sharing, dial-up applications.
Twisted pair	A pair of wires twisted together to enhance transmission qualities, especially to reduce noise.
UART	Universal Asynchronous Receiver Transmitter A chip used in serial communications boards to interface terminals to modems.
UDP	User Datagram Protocol. Used on the Internet for applications not requiring the overheads of TCP. Used especially for real time application.
UMTS	Universal Mobile Telecommunications Service. This uses the term Universal in its narrower sense of Europe and Japan.
UNE	Unbundled Network Elements.
UNI	User Network Interface. A broad term that describes the necessary protocols to support communications between user equipment and a network interface.

Unicast	A transmission from one device to just one other device.
Unicode	A universal coding system for all the worlds major languages. It is compatible with ASCII, and is being widely used on the World Wide Web.
UP	User Part. The SS7 application protocols.
URL	Uniform Resource Locator. A combination of protocol, DNS name and file path used to identify resources on the World Wide Web.
User Signalling	Signalling between a telephone/terminal and local exchange.
User-user Signalling	End-to-end signalling across the network.
UTRAN	UMTS Terrestrial Radio Access Network.
UWC-136	Third generation version of IS-186.
VCI	Virtual Channel Identifier. Used in the ATM cell header to uniquely identify a virtual circuit over an ATM network.
VDSL	Very High Rate Digital Subscriber Loop. A method of transmitting very high data rates over very short local loops (approximately 50 Mbit/s for 300 metres).
VF	Voice Frequency. An analogue voice signal which modulates a higher frequency carrier wave.
Vocoder	A coder that is designed specifically for voice, and which will not work with other types of signal such as modem traffic.
VoDSL	Voice over DSL.

Voice Gateway	An interface between VoIP and the PSTN.
VoIP	Voice Over IP.
VPI	Virtual Path Identifier Used in the ATM cell header to uniquely identify a group of virtual circuits over an ATM network
VPN	Virtual Private Network. A service offered by a PTO to a company that appears to be a private network with the features that a private network has that are not present on a public network.
VTAM	Virtual Telecommunications Access Method. The primary access method used by IBM in SNA networks.
WAN	Wide Area Network. The public network provided by a country's public telephone operator.
WAP	Wireless Application Protocol. Equivalent to HTTP used on mobile networks
W-CDMA	Wideband CDMA.
WDM	Wave Division Multiplexing. Using typical 4 wavelengths (colours), each carrying 2.5G giving 10G in all.
Wireless	A link that does not have a physical connection. It is typically microwave, radio, infra red or visible light.
Wireline	A link that does have a physical connection, typically electric cable or optical fibre.
WLL	Wireless Local Loop. A directional radio system (using high frequency microwaves) as an alternative to a wired local loop.

WML	Wireless Markup Language. Equivalent to HTML optimised for text over the World Wide web.
Word	Basic unit processed by a computer - typically 32 bits, but the next generation of computers will use 64 bit words.
www	World Wide Web. A resource on the internet.
X.21	A circuit switched data network standardised in 1972 and used extensively in Scandinavia.
X.25	A packet switched data network designed for low speed reliable data transfers, standardised in 1976 (see frame relay and ATM).
XML	Extensible Markup Language. A meta language for data.

Notes