**15EC390L INDUSTRIAL TRAINING**

**REPORT OF**

****

**SEMESTER VI**

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**To**

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**Abstract**

BSNL has been the pioneering institution in the telecommunication industry. It has been a major pillar in the formation and nurturing of Indian telecommunications. From the day of about 16 Rs for one call to one paisa per second to the VOLTE calling, BSNL has witnessed everything and thus because of such a prosperous history I selected BSNL for internship.

This project report pertains to 4 Weeks of industrial training under the course name of Industrial Training that I had underwent at BSNL, Bareilly as part of curriculum of degree in Bachelor of technology in Electronics and Communication engineering as required by SRM Institute of Engineering and Technology, Chennai. I ponder upon my decision and always get a thought that I have made a very good decision by doing my internship at BSNL. Because of its huge network in the mobile and broadband network.

I learnt a lot of things over there as my workplace was near to their actual telephone exchange and could thus see how they actually work and how the voice and data are accessed. I also was able to see their data center through which they access very high number of calls at a time. They over their made me familiar with all the technical terms which helped me in my curriculum also. The schedule also included lecture on cooling techniques which are very important to keep all the machines working properly for constant of 8-10 years.

I learned about different modulation techniques and specifically the ones which are used in communication. Also, the channel coding and source coding schemes, powering schemes to the data lines and to the transformer required to keep the landline working even when the power is not available.

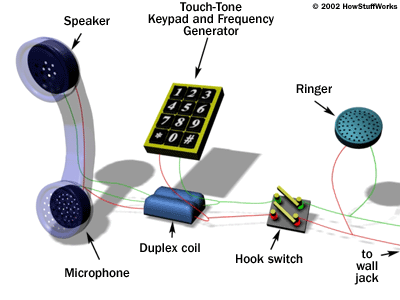
**About the company**

BSNL (Bharat Sanchar Nigam Limited) is the prestigious Indian [state-owned](https://en.wikipedia.org/wiki/State-owned)[telecommunications](https://en.wikipedia.org/wiki/Telecommunications) company headquartered in [New Delhi](https://en.wikipedia.org/wiki/New_Delhi).It is one of the most prestigious companies when compared to all the telecom companies in the country. It covers a large share of market in the field of telecommunications.It was incorporated on 15 September 2000 and assumed the business of providing telecom services and network management from the erstwhile Central Government Departments of Telecom Services (DTS) and Telecom Operations (DTO) as of 1 October 2000 on a going-concern basis. It is the largest provider of [fixed telephony](https://en.wikipedia.org/wiki/Telephony) and [broadband](https://en.wikipedia.org/wiki/Broadband_Internet_access) services with more than 60% market share, and is the [fifth largest](https://en.wikipedia.org/wiki/Mobile_network_operators_of_India)[mobile telephony](https://en.wikipedia.org/wiki/Mobile_telephony) provider in India. BSNL is India's oldest communication service provider and had a customer base of 93.29 million as of June 2015. It has footprints throughout India, except for [Mumbai](https://en.wikipedia.org/wiki/Mumbai) and [New Delhi](https://en.wikipedia.org/wiki/New_Delhi), where telecommunications are managed by [Mahanagar Telephone Nigam](https://en.wikipedia.org/wiki/Mahanagar_Telephone_Nigam)limited (MTNL).

**Services by BSNL**  
BSNL is very popular for its plentiful number of services spanning across the country, including:

* **Mobile services (GSM, CDMA, HSPA+, EDGE technology).**BSNL provides GSM cellular mobile services under the brand name Cellone. It provides fixedline services and landline using CDMA technology and its own extensive optical fiber network. BSNL provides [Internet access](https://en.wikipedia.org/wiki/Internet_access) services through dial-up connections as prepaid, *NetOne* as Postpaid and [*DataOne*](https://en.wikipedia.org/wiki/BSNL_Broadband) as BSNL Broadband.. On 20 March 2009, BSNL launched blackberry services across India. BSNL paid Rs. 101.87 billion for [3G](https://en.wikipedia.org/wiki/3G) spectrum in 2010. As of 2011, BSNL offered coverage in over 800 cities across India. BSNL launched in 2012 a 3G wireless pocket-sized router called Winknet Mf50. BSNL 3G provides HSPA+ service with a top speed of 21.1 Mbit/s downlink and 5.76 Mbit/s uplink.
* **Landline services.** BSNL is the leader in landline service as it owns more than 80% of the total market of India with the capability to provide services around the globe support for ISD calling.
* **Broadband services**.Through its large enough landline services, it provides dial up connection to the customers.
* **Leased line.** BSNL provides leased line connection of maximum of about 24 Mb/s to the commercial places this is a very reliable and secure network.
* **Optical fiber network (for high speed communication link).**Bharat Sanchar Nigam Limited, a Public-Sector Enterprise, also provides fiber plans for the home, which are generally known as BSNL FTTH broadband service. This is the fastest broadband service provided by BSNL, offering speeds up to 100Mbit/s to home-based Internet users.
* **Value-added services** such as Free Phone Service (FPH), India Telephone Card (Prepaid card), Account Card Calling (ACC), Virtual Private Network (VPN), Tele-voting, Premium Rate Service (PRM) and Universal Access Number (UAN).
* **BSNLIPTV** which enables customers to watch television through the Internet and Voice and Video Over Internet Protocol (VVoIP). In 2007, BSNL announced plans to provide 5 million broadband connections and secured 80% of the INR 25 billion rural telephony project of the Government of India.
* **Telegraph.**After providing it for 160 years, BSNL discontinued its telegraph service on 15 July 2013. It began delivering telegrams to the public in February 1855; this service was upgraded to a web-based messaging system in 2010 and had been offered through 182 telegraph offices across India.

**Training schedule:**

* **Landlinecommunication:**

A fixed phone line (a line that is not a [mobile phone](https://en.wikipedia.org/wiki/Cellular_network) line) can be [hard-wired](https://en.wikipedia.org/wiki/Wire) or [cordless](https://en.wikipedia.org/wiki/Cordless_telephone) and typically refers to the operation of wireless devices or systems in fixed locations such as homes. Fixed wireless devices usually derive their electrical power from the utility mains electricity, unlike mobile wireless or portable wireless, which tend to be [battery-powered](https://en.wikipedia.org/wiki/Battery-power). Although mobile and portable systems can be used in fixed locations, efficiency and bandwidth are compromised compared with fixed systems. Mobile or portable, battery-powered wireless systems can be used as emergency backups for fixed systems in case of a power blackout or natural disaster.

It is implemented as a circuit in a wired switched system (usually the [public switched telephone network](https://en.wikipedia.org/wiki/Public_switched_telephone_network)). The implications of a land line in this context are security and [survivability](https://en.wikipedia.org/wiki/Survivability). For example, a military headquarters might be linked to front-line units "by landline" to ensure that communication remains possible even if the conventional telephone network is damaged or destroyed. Another example of this is in airports. All air traffic control towers have dedicated lines connected to the police, fire department, hospitals, army, etc. Deployed as a precaution in case of emergency, these can be used at any time.

The concentrator digitizes your voice at a sample rate of 8,000 samples per second and 8-bit resolution. It then combines your voice with dozens of others and sends them all down a single wire to the phone company office. Either way, your line connects into a line card at the switch so you can hear the dial tone when you pick up your phone.

* **Mobile communication:**First-generation technology of the early 1980s—1G—was based on analog transmissions.  1G technology only provided voice. For the first time, cellular technology had cut the cord from the telephone, giving users the flexibility of being mobile while still staying connected.

**2G**

Then industry switched to digital spread spectrum about 10 years later, ushering in the age of 2G cellular networks based on Global System for Mobile Communication (GSM) standard.  2G came along with improved transmission quality, system capacity, and coverage for the telecoms and for the subscribers, encryption, voice, voicemail, SMS and basic data called General Packet Radio Service (GPRS).  2G cellular systems include GSM, digital AMPS (D-AMPS), code-division multiple access (CDMA), and personal digital communication (PDC).

The telecoms began to realize the potential in SMS after having been accidentally discovered it. This was discovered to make the full use of the available bandwidth, the bandwidth which was left out after allotting the voice a particular bandwidth.

Even though it got a lot better with the release of 2.5G network that brought along with-it EDGE(Enhanced Data rates for GSM Evolution), still at only about 256Kbps, using phones having more or less same capabilities as their predecessors wasn’t much of an improvement.

**3G**

3G, short for 3rd Generation, is a term used to represent the 3rd generation of mobile telecommunications technology.The 3G technology adds multimedia facilities to 2G phones by allowing video, audio, and graphics applications to be transmitted over the network.

A 3G cell-phone system depends on code division multiple access (CDMA) and spread spectrum radio technology, which allows many users to share both time and frequencies. If eight units of bandwidth are available, for instance, each user can transmit all of the time over all of the frequencies, but will be limited to using only one of the eight available orthogonal codes (non-overlapping communication channels for each active link) to avoid interference with anyone using the other seven units of bandwidth. I know, that’s a bit hard to digest, but here’s the breakdown of the network standards based on feature support added.

**1G**: Only voice.

**2G**: Voice + SMS + basic data (GPRS).

**2.5G**: Voice + SMS + a little faster data (EDGE).

**3G**: Voice + SMS + fast data (3G).

**3.5G**: All the above with faster data speeds at 7.5Mbps.

**3.75G**:  All the above with even more faster data speeds at 21Mbps.

**4G**

Will be based on an all-IP packet switched network. Have peak data rates of up to approximately 100 Mbit/s for high mobility such as mobile access and up to approximately 1 Gbit/s for low mobility such as nomadic/local wireless access. It also supports IPv6, As IPv4 addresses are (nearly) [exhausted](https://en.wikipedia.org/wiki/IPv4_address_exhaustion).[IPv6](https://en.wikipedia.org/wiki/IPv6) is essential to support the large number of wireless-enabled devices that communicate using IP. By increasing the number of [IP addresses](https://en.wikipedia.org/wiki/IP_address) available, IPv6 removes the need for [network address translation](https://en.wikipedia.org/wiki/Network_address_translation) (NAT), a method of sharing a limited number of addresses among a larger group of devices, which has [a number of problems and limitations](https://en.wikipedia.org/wiki/Network_address_translation#Issues_and_limitations). When using IPv6, some kind of NAT is still required for communication with legacy IPv4 devices that are not also IPv6-connected.

* **Optical fiber communication:**

Fiber-optic communication is a method of transmitting information from one place to another by sending pulses of [light](https://en.wikipedia.org/wiki/Light) through an [optical fiber](https://en.wikipedia.org/wiki/Optical_fiber). The light forms an [electromagnetic](https://en.wikipedia.org/wiki/Electromagnetic_radiation)[carrier wave](https://en.wikipedia.org/wiki/Carrier_wave) that is [modulated](https://en.wikipedia.org/wiki/Modulation) to carry information.

Fiber is [preferred over electrical cabling](https://en.wikipedia.org/wiki/Fiber-optic_communication#Comparison_with_electrical_transmission) when high [bandwidth](https://en.wikipedia.org/wiki/Bandwidth_(computing)), long distance, or immunity to [electromagnetic interference](https://en.wikipedia.org/wiki/Electromagnetic_interference) are required.

Optical fiber is used by many telecommunications companies to transmit telephone signals, Internet communication, and cable television signals. Researchers at [Bell Labs](https://en.wikipedia.org/wiki/Bell_Labs) have reached internet speeds of over 100 [petabit](https://en.wikipedia.org/wiki/Petabit) per second using fiber-optic communication.

It can withstand such a huge speed because of the high frequency it operates on offering such a large bandwidth and thus a million of channel are generated sustaining such high speeds.

[Optical fiber](https://en.wikipedia.org/wiki/Optical_fiber) is used by many telecommunications companies to transmit telephone signals, Internet communication and cable television signals. Due to much lower [attenuation](https://en.wikipedia.org/wiki/Attenuation) and [interference](https://en.wikipedia.org/wiki/Electromagnetic_interference), optical fiber has large advantages over existing copper wire in long-distance, high-demand applications and high-resolution contents. However, infrastructure development within cities was relatively difficult and time-consuming, and fiber-optic systems were complex and expensive to install and operate. Due to these difficulties, fiber-optic communication systems have primarily been installed in long-distance applications, where they can be used to their full transmission capacity, offsetting the increased cost. The prices of fiber-optic communications have dropped considerably since 2000.

The price for rolling out fiber to the home has currently become more cost-effective than that of rolling out a copper-based network. Prices have dropped to $850 per subscriber[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)] in the US and lower in countries like The Netherlands, where digging costs are low and housing density is high.

Since 1990, when [optical-amplification](https://en.wikipedia.org/wiki/Optical_amplifier) systems became commercially available, the telecommunications industry has laid a vast network of intercity and transoceanic fiber communication lines. By 2002, an intercontinental network of 250,000 km of [submarine communications cable](https://en.wikipedia.org/wiki/Submarine_communications_cable) with a capacity of 2.56 [Tb](https://en.wikipedia.org/wiki/Terabit)/s was completed, and although specific network capacities are privileged information, telecommunications investment reports indicate that network capacity has increased dramatically since 2004.

* **Leased line:**

A leased line is a private [bidirectional](https://en.wikipedia.org/wiki/Bidirectionalization) or [symmetric](https://en.wikipedia.org/wiki/Symmetric#Symmetry_in_telecommunications)[telecommunications circuit](https://en.wikipedia.org/wiki/Telecommunications_circuit) between two or more locations. Leased lines can be used for [telephone](https://en.wikipedia.org/wiki/Telephone), [Internet](https://en.wikipedia.org/wiki/Internet), or other [data](https://en.wikipedia.org/wiki/Data_communication)services. Some are [ringdown](https://en.wikipedia.org/wiki/Ringdown) services, and some connect to a [private branch exchange](https://en.wikipedia.org/wiki/Private_branch_exchange) or [router](https://en.wikipedia.org/wiki/Router_(computing)).

Typically, leased lines are used by businesses to connect geographically distant offices. Unlike dial-up connections, a leased line is always active. The fee for the connection is a fixed monthly rate. Because the connection does not carry anybody else's communications, the carrier can assure a given level of quality.

* **IPTV:**

Internet Protocol television (IPTV) is the delivery of [television](https://en.wikipedia.org/wiki/Television) content over [Internet Protocol](https://en.wikipedia.org/wiki/Internet_Protocol) (IP) networks. This is in contrast to delivery through traditional [terrestrial](https://en.wikipedia.org/wiki/Terrestrial_television), [satellite](https://en.wikipedia.org/wiki/Satellite_television), and [cable](https://en.wikipedia.org/wiki/Cable_television) television formats. Unlike [downloaded](https://en.wikipedia.org/wiki/Download) media, IPTV offers the ability to stream the source media continuously. As a result, a client media player can begin playing the content (such as a TV channel) almost immediately. This is known as [streaming media](https://en.wikipedia.org/wiki/Streaming_media).

Although IPTV uses the Internet protocol it is not limited to television streamed from the [Internet](https://en.wikipedia.org/wiki/Internet), ([Internet television](https://en.wikipedia.org/wiki/Internet_television)). IPTV is widely deployed in subscriber-based telecommunications networks with high-speed access channels into end-user premises via [set-top boxes](https://en.wikipedia.org/wiki/Set-top_box) or other [customer-premises equipment](https://en.wikipedia.org/wiki/Customer-premises_equipment). IPTV is also used for media delivery around corporate and private networks. IPTV in the telecommunications arena is notable for its ongoing standardization process (e.g., [European Telecommunications Standards Institute](https://en.wikipedia.org/wiki/ETSI)).

IPTV services may be classified into three main groups:

* [Live television](https://en.wikipedia.org/wiki/Live_television) and live media, with or without related interactivity;
* [Time-shifted](https://en.wikipedia.org/wiki/Time_shifting) media: e.g. [catch-up TV](https://en.wikipedia.org/wiki/Catch-up_TV) (replays a TV show that was broadcast hours or days ago), start-over TV (replays the current TV show from its beginning);
* [Video on demand](https://en.wikipedia.org/wiki/Video_on_demand) (VOD): browse and view items in a stored media catalogue.
* **Broadband service:**

This is the dual subscriber line which supports both the telephone bandwidth and the internet bandwidth and thus supports both the link at the same time. There is a splitter used at the costumer end, which allows for multiplexing of both the signals and thus allows for simultaneous transmission. In the absence of splitter either the internet or the telephone line sustains and because of high preference to the telephone line. The internet line gets disconnected as soon as the costumer receives a call.

Also, there a need of a hub which act as a node that [broadcasts](http://whatis.techtarget.com/definition/broadcast) data to every computer or Ethernet-based device connected to it. A hub is less sophisticated than a [switch](http://searchtelecom.techtarget.com/definition/switch), the latter of which can isolate data transmissions to specific devices.

* **Data center:**



A data center is a [facility](https://en.wikipedia.org/wiki/Building) used to house [computer systems](https://en.wikipedia.org/wiki/Computer) and associated components, such as [telecommunications](https://en.wikipedia.org/wiki/Telecommunication) and [storage systems](https://en.wikipedia.org/wiki/Computer_data_storage). It generally includes redundant or backup [power supplies](https://en.wikipedia.org/wiki/Power_supply), redundant data communications connections, environmental controls (e.g. air conditioning, fire suppression) and various security devices. A large data center is an industrial-scale operation using as much electricity as a small town.

[IT operations](https://en.wikipedia.org/wiki/IT_operations) are a crucial aspect of most organizational operations around the world. One of the main concerns is [business continuity](https://en.wikipedia.org/wiki/Business_continuity); companies rely on their information systems to run their operations. If a system becomes unavailable, company operations may be impaired or stopped completely. It is necessary to provide a reliable infrastructure for IT operations, in order to minimize any chance of disruption. Information security is also a concern, and for this reason a data center has to offer a secure environment which minimizes the chances of a security breach. A data center must therefore keep high standards for assuring the integrity and functionality of its hosted computer environment. This is accomplished through redundancy of mechanical cooling and power systems (including emergency backup power generators) serving the data center along with fiber optic cables.

The boom of data centers came during the [dot-com bubble](https://en.wikipedia.org/wiki/Dot-com_bubble) of 1997–2000. [Companies](https://en.wikipedia.org/wiki/Company) needed fast [Internet](https://en.wikipedia.org/wiki/Internet) connectivity and non-stop operation to deploy systems and to establish a presence on the Internet. Installing such equipment was not viable for many smaller companies. Many companies started building very large facilities, called Internet data centers (IDCs), which provide [commercial clients](https://en.wikipedia.org/wiki/Customer) with a range of solutions for systems deployment and operation. New technologies and practices were designed to handle the scale and the operational requirements of such large-scale operations. These practices eventually migrated toward the private data centers, and were adopted largely because of their practical results. Data centers for cloud computing are called cloud data centers (CDCs). But nowadays, the division of these terms has almost disappeared and they are being integrated into a term "data center".

* **Cooling techniques:**

Because the electronics machines work constantly for a decade or so. There should be no case when the machine stops working because of internal heating of components. And thus, the machines should be kept in normal temperature of 20ºC and thus cooling is constantly required. One more important concern for the electronics is the dust free environment, because very small dust particle could also become the reason for errors in the functioning of the machine and should thus be kept in closed rooms free of dust. Thus, extreme care must be taken for the device to run without any errors.

**Reference**

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* <http://www.sapdatacenter.com/article/data_center_functionality/>
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**Summary**

From this internship gained a lot of knowledge in the field of communication and electronics. I got familiar with many terms related to the telecommunication department. This led me to understand how the telecom industry actually works and what are the problems which they face.I also got to know the various popular solution applied at the industry level to tackle such problem.

BSNL being the government firm I also understood what problems the government is tackling with and what are the reasons holding back BSNL from becoming a major telecom enterprise. Their I learnt how to manage various problems and to give priority to what service.

**Internship certificate**

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