INDEX

1. ADVANCE IN TRANSMISSION NETWORK (MSPP, RPR)

1.1 LEARNING OBJECTIVE

After reading this unit you should be able to understand:

- Multi-Service Provisioning Platform
- Features Of MSPP
- Resilient Packet Ring (RPR)
- The Key Feature Of RPR Technology
- RPR Operation
- Comparing RPR To Other Solutions
- RPR Benefits

1.2 MULTI-SERVICE PROVISIONING PLATFORM

MSPP is deployed in the boundary of Access and Metro core backbone. TEC has prepared two different platforms for catering to the needs of the inter city and intra equipment. The first platform is the STM-16 with the GFP-F, GFP-T protocols and layer- 2 switching functionality which caters to the need of inter-city traffic. This platform also includes higher cross connect capability, and supports EoS as per IEEE standards. The second platform is using Multi service Provisioning Platform (MSPP), and caters to the need for the intra-city traffic requirements.

The main application of this system shall be for multi-service traffic switching and aggregation at MAC layer, traffic grooming and traffic consolidation of TDM traffic at SDH layer from access network towards core network. Another prominent application of MSPP shall be, multiple SDH ring inter connection at STM1 tributary interfaces as well as at STM4 & 16 aggregate interfaces. The equipment shall provide an integrated cross connect matrix to switch digital signals at SDH layer.

The MSPP equipment shall be capable of simultaneously interfacing the PDH streams and mapping / de-mapping into SDH payloads and vice-versa, thus enabling the co- existence of SDH & PDH on the same equipment. This is the major advantage for the present network as SDH and PDH existing in the present network can integrate easily which in turn enables quick bandwidth provisioning to the customer.

MSPP is implemented with two different back haul transmission rates, viz. STM-16 and STM-64. TEC has also been working on the STM-64 in BSNL Metro networks. Apart from the standard interfaces on the tributary side, the revised STM-16 provides POS (packet over SDH) capability on Ethernet interface at 10Mb, 100 Mb, and 1000Mb. The equipment is also envisaged to support DS-3 of SONET. The encapsulation of Ethernet on SDH capability shall be in accordance with ITU-T G.7041. The system should support Tandem Connection Monitoring (TCM) on N1 byte and N2 byte for HO path & LO path respectively.

ADMs supporting GFP and VCAT are known as Multi Service Provisioning Platform (MSPP). Service providers can now deliver packet based transport services using existing SDH infrastructure. GFP and VCAT is located at the endpoints of the network, therefore MSPP need only be deployed at the edge of the transport network. MSPP targets all application connecting ultra-high capacity backbones to end customers at their premises. The advent of GFP has created a spur of customer located equipment and MSPP cards that

function as aggregating Ethernet traffic onto SDH rings. The generic structure of a next generation MSPP is shown in fig1. This platform consists of the integration of metro WDM with Ethernet / RPR and SDH VC-4 switching fabrics. Integration means both direct inter working, in terms of WDM wavelengths, and full NMS / control plane integration for management and path provisioning.

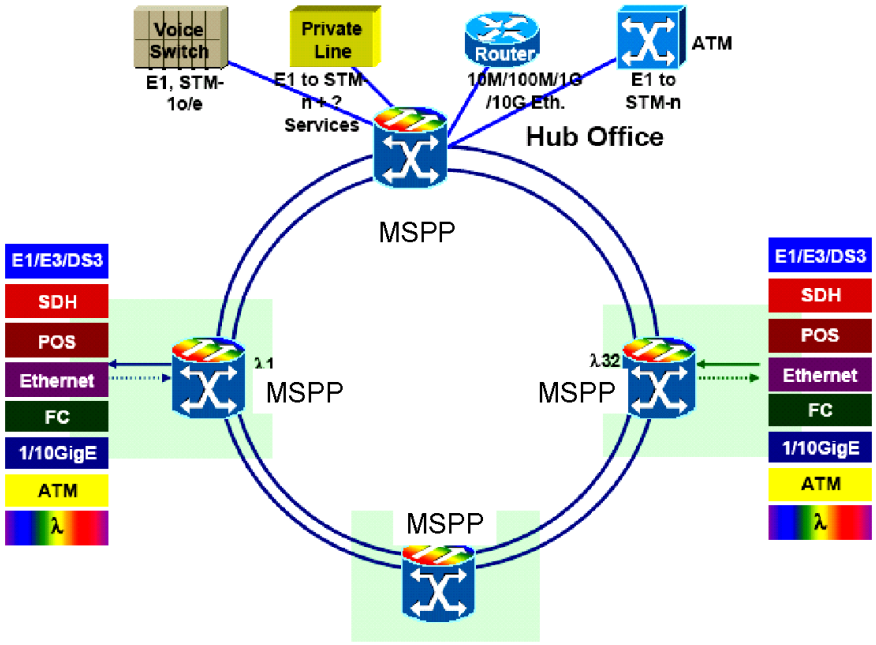

Figure 1: MSPP Applications

1.3 FEATURES OF MSPP

The major features of MSPP are as listed below:

1. Generic Framing Protocol-Frame(GFP-F)
2. Generic Framing Protocol-Transparent(GFP-T)
3. Link Capacity Adjustment Scheme(LCAS).
4. Virtual concatenation(V-CAT)
5. Layer 2switching.
6. Integrated higher cross connect capability
7. Ethernet on SDH(EoS)
8. DS-3 tributary interface of SONEThierarchy
9. Multi service traffic switching
10. Traffic aggregation at MAC layer
11. Traffic grooming
12. Traffic consolidation of TDM traffic at SDH layer from access towards core network.
13. Multiple SDH rings interconnection at STM-1tributary interfaces as well as at STM-4/16 aggregate interfaces.

14. Interfacing the PDH streams (2Mb, 34Mb, 140Mb) and mapping / De-mapping into SDH payloads and vice-versa.
15. PoS capability on Ethernet interface

1.4 RESILIENT PACKET RING (RPR)

Resilient packet ring (RPR) is the technology for optimized and efficient packet networking over a fiber ring topology. This technology incorporates the various features of SDH technology like performance monitoring, protection mechanism and flexible deployment capabilities. RPR networks have the capability to carry jitter- and latency-sensitive traffic such as voice and video, in addition to Ethernet and Internet protocol (IP) services. Due to this Service providers are able to deliver multiple services on RPR solutions, instead of having data, voice, and video delivered over separate parallel networks. In this unique way RPR combines the best features of legacy Synchronous digital hierarchy (SDH) and Ethernet into one layer and thus maximize the profitability of the network operators.

RPR networks are optimized to transport data traffic rather than circuit-based traffic. The unique feature of this technology is that it consumes bandwidth only between source and destination nodes and is more efficient than a time division multiplexing (TDM) technologies like SDH and also is able to deliver data efficiently with the resiliency and performance required by the latest applications in the networks.

1.5 THE KEY FEATURES OF RESILIENT PACKET RING TECHNOLOGY

Table 1. Key Features

Resilience	Proactive span protection automatically avoids failed spans within 50 ms.
Services	Support for latency / jitter sensitive traffic such as voice and video. Also supports committed information rate (CIR) services.
Efficiency	Spatial reuse: Unlike SDH, bandwidth is consumed only between the source and destination nodes. Packets are removed at their destination, leaving this bandwidth available to downstream nodes on the ring.
Scalable	Supports topologies of more than 100 nodes per ring. Carries the Automatic topology discovery mechanism.

1.6 RPR OPERATION

RPR technology uses a dual counter rotating fiber ring topology. Both rings (inner and outer) are used to transport working traffic between nodes. By utilizing both fibers, instead of keeping one spare fiber for protection, RPR utilizes the total available ring bandwidth. These fibers or ringlets (as they are also called) are also used to carry control messages for topology updates, protection, and bandwidth control. All the time control messages flow in the opposite direction of the traffic that they represent. For instance, inner-ring traffic-control information is carried on the outer ring to upstream nodes.

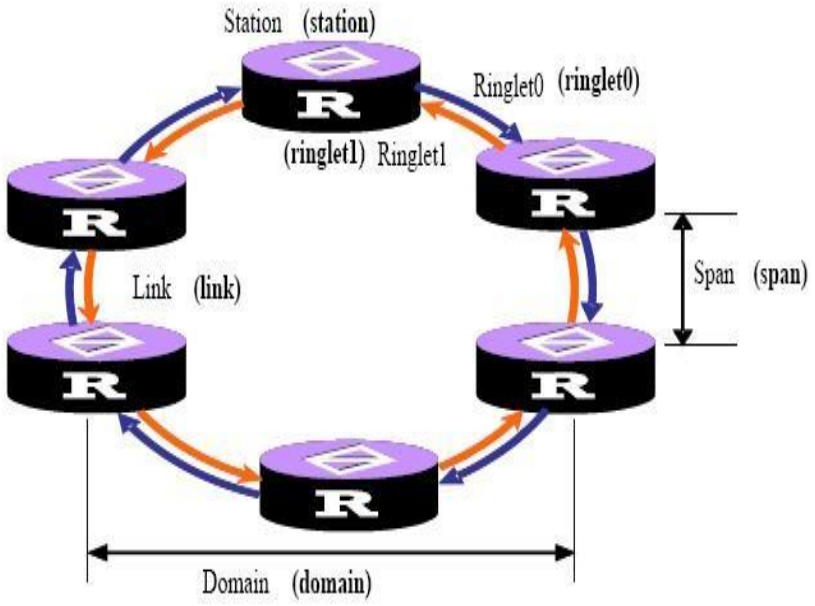

Figure 2: RPR Terminology

By using bandwidth-control messages, a RPR node can dynamically negotiate for bandwidth with the other nodes on the ring. RPR has the capability to differentiate between low and high-priority traffic and can transmit high-priority packets before those of low priority. In addition, RPR nodes also have a transit path, through which packets destined to downstream nodes on the ring flow. Since RPR nodes have a transit buffer that is capable of holding multiple packets, it can transmit higher-priority packets while temporarily holding other lower-priority packets in the transit buffer.

1.6.1 Resource Allocation and Control:

There is no master node on the ring; bandwidth management and congestion control are fully distributed over all nodes, which implement control algorithms collectively. This is potentially a nice feature, as it combines the nodes' abilities for topology discovery with ease of adding or removing nodes from the ring.

Each node processes three traffic streams: *exit* traffic destined for the node; *ingress* traffic entering the node locally and to be placed on the ring; and *transit* traffic destined for nodes further downstream. The basic issues are to ensure that ingress and transit traffic don't interfere with each other's QOS and to share the ring resources fairly and avoid congestion.

1.6.2 Receive Decision:

Every station has a 48-bit MAC address. The Node will only receive the packets which have a matching MAC destination address. The MAC can receive both uni-cast and multi-cast packets. Multicast packets are copied to the host and allowed to continue through the transit path while the uni-cast packets are stripped from the ring and do not consume bandwidth on downstream spans. The rings are also carrying control packets that may be meant for the neighbouring node; these packets do not need a destination or source address.

1.6.3 Transit Path

Nodes with a non-matching destination address are allowed to continue circulating around the ring. Unlike point-to-point protocols such as Ethernet, RPR packets undergo minimal processing per hop on a ring. RPR packets are only inspected for a matching address and header errors.

1.6.4 Transmit and Bandwidth Control

The RPR MAC can transmit both high and low-priority packets. The bandwidth algorithm controls is applied only for the bandwidth allotment of low-priority packets. High-priority packets are not subject to the bandwidth-control algorithm. The bandwidth-control algorithm ensures that nodes will not be disadvantaged due to its location on the ring or due to the changing traffic patterns. It only manages congestion, enabling nodes to maximize the use of any spare capacity.

1.6.5 Topology Discovery

RPR has a topology discovery mechanism that allows nodes on the ring to be inserted / removed without manual management intervention. After a node is inserted on the ring, it will circulate a topology discovery message to learn the MAC addresses of the other stations. Nodes also keep on sending these messages periodically (1 to 10 seconds). Each node that receives a topology message appends its MAC address and passes it to its neighbor. Eventually, the packet returns to its source with a topology map of the ring and the same is updated on the Node. The topology map will be used to determine which direction on the ring will provide the best path to the destination.

1.6.6 Protection:

RPR has the ability to protect the network from single span (node or fiber) failures. When a failure occurs, protection messages are quickly dispatched. RPR has two protection mechanisms:

1. Wrapping

Nodes that are adjacent to the failed span will move the packets away from the failure by wrapping traffic around to the other fiber (ringlet). This mechanism requires that only two nodes participate in the protection event, other nodes keep on sending the traffic as normal.

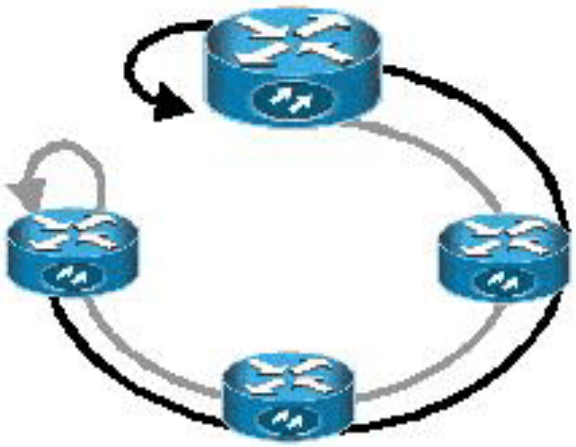

Figure 3: Wrapping

2. Steering

This protection mechanism notifies all nodes on the ring of the failed span. After receiving this notification, every node on the ring will adjust their topology maps to avoid this span. Regardless of the protection mechanism used, the ring will be protected within 50 ms.

1.7 COMPARING RPR TO OTHER SOLUTIONS

Table 2. Comparison

Legacy TDM	It can only provision circuits with a limit of 16 nodes on one SDH ring. While lot of equipment is required for providing IP services.
Meshed Ethernet	Protection response is limited to minutes and very limited number of nodes can be provided. The requirement of QoS is applied on hop to hop basis,
Ethernet Rings	Limited and proprietary protection schemes with limited number of nodes. Hardly any good NMS & packets processed at each hop with no guaranteed delivery for high-priority traffic.

1.8 RPR BENEFITS

1.8.1 Efficiency

It is efficient

1.8.2 Multicast

One RPR multicast packet can be transmitted around the ring and can be received by multiple nodes. Mesh topologies require multicast packets to be replicated over all possible path switching bandwidth.

1.8.3 Spatial Reuse

RPR uni-cast packets are stripped at their destination. Unlike SDH networks, where circuits consume bandwidth around the whole ring, RPR allows Bandwidth to be used on multiple idle spans.

1.8.4 Resiliency

- **Topology Discovery**– Nodes are automatically added and removed from the topology map.
- **Protection**– RPR protects failed spans within 50ms.

1.8.5 Performance

- **High-Priority Service**– High-priority packets are delivered with minimal jitter and latency.

1.8.6 Scalability

System throughputs range from 80 to 320 Gbps, typically scaling in 1-Mbit/s increments to 1 Gbit/s. Normally, RPR rings can support about 100 nodes.

1.9 WHY USE RPR?

The fundamental argument is that RPR is going to save a lot of money for the operators by following three main directions:

1. By maximizing the utilization of fiber and width.
2. By simplification of network architectures and a reduction in the amount of equipment needed.
3. By simpler OA&M functionality.

1.10 CONCLUSION

Today when service providers are trying to build scalable, feature-rich networks that can deliver profitable value-added services like multi-protocol label switching (MPLS) virtual private networks (VPNs); carrying voice, video, and data services, RPR can be one solution which can meet these requirements effectively and also at the same time will provide with carrier class reliability and scalability. So the RPR is seen by the operators as the required bridge technology which can fulfil networks' much needed requirement of transition from circuit to packet base services.

2. CONVERGED PACKET ACCESS NETWORK (CPAN)

2.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- What Is CPAN?
- CPAN Key Characteristics
- Features Of MPLS Not Supported By CPAN
- Differences Between MPLS And CPAN
- MPLS And CPAN Components
- Operation, Administration, And Management (OAM)
- CPAN Applicability And Deployment Options

2.2 INTRODUCTION

The goal of CPAN is to provide connection-oriented transport for packet and TDM services over optical networks leveraging the widely deployed MPLS technology. Key to this effort is the definition and implementation of OAM and resiliency features to ensure the capabilities needed for carrier-grade transport networks – scalable operations, high availability, performance monitoring and multi-domain support.

Objective of CPAN is:

- To enable MPLS to be deployed in a transport network and operated in a similar manner to existing transport technologies (SDH/SONET/OTN)
- To enable MPLS to support packet transport services with a similar degree of predictability, reliability, and OAM to that found in existing transport networks

Current transport networks (e.g. SONET/SDH) are typically operated from a network operation centre (NOC) using a centralized network management system (NMS) that communicates with the network elements (NEs) in the field via the telecommunications management network (TMN). The NMS provides well-known FCAPS management functions which are: fault, configuration, accounting, performance, and security management. Together with survivability functions such as protection and restoration, availability figures of >99,999% have been achieved thanks to the highly sophisticated OAM functions that are existing e.g. in SONET/SDH transport networks. This well proven network management paradigm has been taken as basis for the development of the new CPAN packet transport network technology.

Moreover, CPAN provides dynamic provisioning of CPAN transport paths via a control plane. The control plane is mainly used to provide restoration functions for improved network survivability in the presence of failures and it facilitates end-to-end path provisioning across network or operator domains.

The operator has the choice to enable the control plane or to operate the network in a traditional way without control plane by means of an NMS. It shall be noted that the control plane does not make the NMS obsolete – the NMS needs to configure the control plane and also needs to interact with the control plane for connection management purposes.

One of the major motivations for developing CPAN was the need for the circuits in Packet Transport Networks. Traditionally packet transport switches each packet independently. However with connection oriented transport a ‘connection’ is first setup between the end points and then all the traffic for that connection follows only that path through the network. This makes the Packet Transport Network very similar to the TDM networks and simplifies management and migration of the transport network.

The concept of Label Switched Paths or LSPs from MPLS technology is already tried and tested and successful in the internetworking world. It made sense to adapt it for use in Packet Transport Networks. However there was a need to simplify the working of MPLS to make it more suitable for use in the Packet Transport World

With this in mind, some features were removed from the traditional MPLS, since it was felt that these were not needed in Transport World and would simply the network.

2.3 WHAT IS CPAN?

CPAN is a profile of MPLS for transport networks. So CPAN is also known as MPLS-TP. CPAN (Multi-Protocol Label Switching – Transport Profile) is an effort by IEEE & ITU-T to have a technology that meets all the requirements of transport networks but is packet switched in nature.

It takes a subset of MPLS/GMPLS protocol suite and adds a few extensions to address transport network requirements. These enhancements extend the already rich MPLS/GMPLS protocol suite such that it will be able to serve both transport and services networks.

2.4 CPAN KEY CHARACTERISTICS

- It is strictly connection oriented
- No modifications to existing MPLS data plane
- IP or IP routing is not required for packet forwarding
- Interoperates/interworks with existing MPLS and pseudo-wire control and data planes
- It is client-agnostic (can carry L3, L2, L1 services)
- It is physical layer agnostic (can run over IEEE Ethernet PHYs, SONET/SDH [G.783] and OTN [G.709],[G.872] using GFP [G.7041], WDM, etc.)
- It provides strong operations, administration and maintenance (OAM) functions similar to those available in traditional optical transport networks (e.g., SONET/SDH, OTN); these OAM functions are an integral part of the MPLS-TP data plane and are independent from the control plane
- It provides several protection schemes at the data plane similar to those available in traditional optical transport networks.
- It allows network provisioning via a centralized NMS and/or a distributed control plane
- The GMPLS control plane is also applicable to the CPAN client or server layers and allows to use a common approach for management and control of multi-layer transport networks

2.5 FEATURES OF MPLS NOT SUPPORTED BY CPAN

The features from MPLS that are not supported by CPAN are:

- **MPLS Control Plane:** CPAN does not require LDP or any other control plane protocol to set up the circuits. Instead a user provisioned model is followed. The user can provision a circuit from a centralized Network Management System in a way similar to TDM networks.
- **Penultimate Hop Popping (PHP)** : PHP is used by MPLS Edge Routers to reduce the load of two label lookups. However this causes problems with QoS and was disabled in CPAN

- **LSP Merge**: Merging two LSPs (going to the same destination) reduces the number of labels being used in the network. However it makes it impossible to differentiate between traffic common from two different sources before the merging happened. To simplify things in transport networks, LSP merge was also disabled.
- **Equal Cost Multi Path**: In traditional IP/MPLS networks different packets between a source-destination pair can take different paths. This is especially true when multiple equal cost paths exist.

However this is in conflict with the concept of a circuit where all the traffic should follow the same path. Hence ECMP is disabled.

2.6 DIFFERENCES BETWEEN MPLS AND CPAN

When it comes to the major differences between MPLS and CPAN, here's what you need to know.

- Bidirectional Label Switched Paths (LSPs). MPLS is based on the traditional IP routing paradigm -- traffic from A to B can flow over different paths than traffic from B to A.But transport networks commonly use bidirectional circuits, and CPAN also mandates the support of bidirectional LSPs (a path through an MPLS network).In addition, CPAN must support point-to-multipoint paths.
- Management plane LSP setup. Paths across MPLS networks are set up with control-plane protocols (IP routing protocols or Resource Reservation Protocol (RSVP) for MPLS Traffic Engineering (MPLS-TE). CPAN could use the same path setup mechanisms as MPLS (control plane-based LSP setup) or the traditional transport network approach where the paths are configured from the central network management system (management plane LSP setup).
- Control plane is not mandatory. Going a step farther, CPAN nodes should be able to work with no control plane, with paths across the network computed solely by the network management system and downloaded into the network elements.
- Out-of-band management. MPLS nodes usually use in-band management or at least in-band exchange of control-plane messages. CPAN network elements have to support out-of-band management over a dedicated management network (similar to the way some transport networks are managed today).
- Total separation of management/control and data plane. Data forwarding within CPAN network element must continue even if its management or control plane fails. High-end routers provide similar functionality with non-stop forwarding, but this kind of functionality was never mandatory in traditional MPLS.
- No IP in the forwarding plane. MPLS nodes usually run IP on all interfaces because they have to support the in-band exchange of control-plane messages. CPAN network elements must be able to run without IP in the forwarding plane.
- Explicit support of ring topologies. Many transport networks use ring topologies to reduce complexity.

CPAN thus includes mandatory support for numerous ring-specific mechanisms.

2.7 MPLS AND CPAN COMPONENTS

As mentioned previously, MPLS refers to a suite of protocols, and CPAN refers to a set of compatible enhancements to the MPLS protocol suite. These protocols and new enhancements can be separated into the following categories:

- Network Architecture—Covers the definition of various functions and the interactions among them.
- Data Plane-Covers the protocols and mechanisms that are used to forward the data packets. This can further be divided into the following subcategories:
    - Framing, forwarding, encapsulation
    - OAM
    - Resiliency (protection and restoration)
- Control Plane—Covers the protocols and mechanisms used to set up the label-switched paths (LSPs) that are used to forward the data packets.
- Management Plane - Covers the protocols and mechanisms that are used to manage the network.

A list of protocols and mechanisms in each of these categories is provided in Figure below. The figure also highlights the set of enhancements that are being pursued by CPAN.

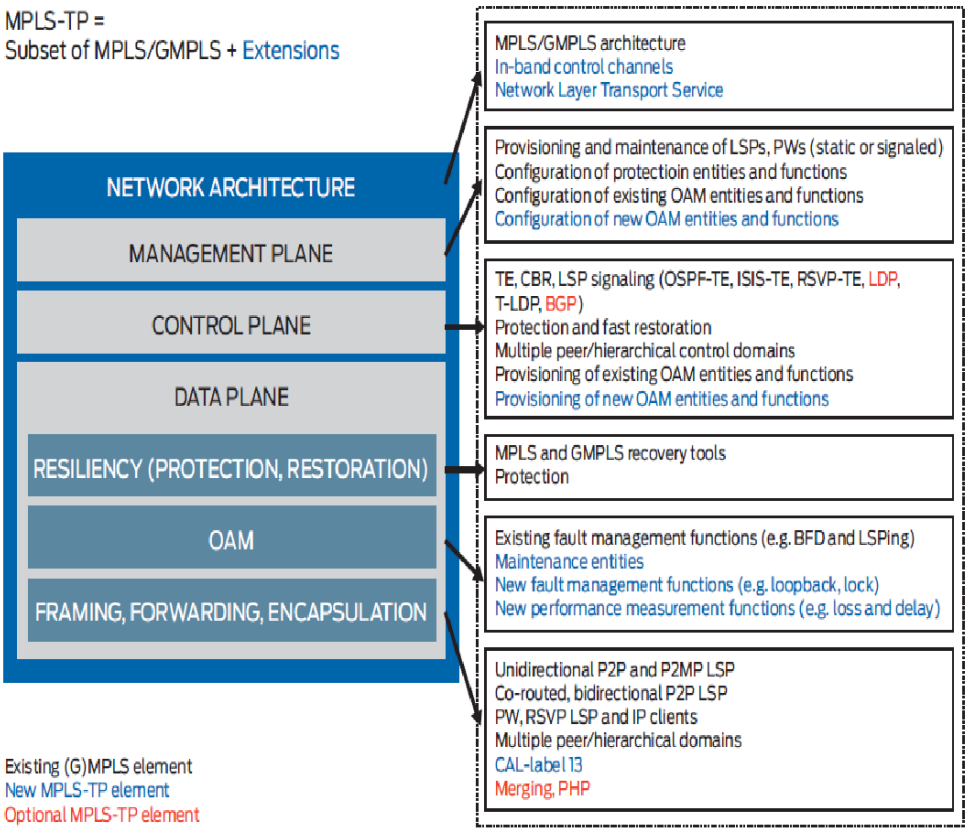

Figure 4: Components of MPLS and CPAN

2.8 OPERATION, ADMINISTRATION, AND MANAGEMENT (OAM)

- This is the key focus area of the CPAN and by far the most needed one by MPLS in general. Legacy transport networks use extensive and well established tools to monitor and manage transport networks, as providing and enforcing service-level agreements (SLAs) is a critical requirement for these networks. Note that the OAM enhancements that are being added to the MPLS protocol suite are required for

transport networks but will prove to be extremely valuable for other types of MPLS networks as well.

- The OAM functions being added as part of CPAN (see Table 1 below) are fault detection (e.g., connectivity check, connectivity/path verification), fault localization (e.g., loopback, lock), and performance monitoring (e.g., delay and loss measurement). Note that the existing MPLS tools such as Bidirectional Forwarding Detection (BFD), LSP ping, and LSP trace are being extended to support these new OAM functions. The following table describes the role of these new OAM functions and the tools that are being used to enable them.
- Since CPAN is designed to work in devices where IP routing is not supported, these OAM functions need to operate without any IP layer functionalities. In order to make that possible, the framing, forwarding, and encapsulation component of the MPLS protocol suite is being enhanced with Generic Associated Channel (G-ACh) and G-ACh Label (GAL) to carry the OAM packets without any reliance on IP. Also, the OAM packets need to traverse the same path as the data packets. To support this requirement, the network architecture component of the MPLS protocol suite is being enhanced to support the in-band control channels.

2.8.1 G-ACh and GAL

In order to ensure congruency between the OAM packets and the data path, the OAM packets use in-band control channels. The idea of tagging the packets with an additional header was first introduced in the context of MPLS pseudo-wires, via the ACH [RFC 4485]. The ACH indicates that the tagged packet must be processed by an appropriate OAM function. This idea was generalized to a generic ACh (G-ACh) as part of the CPAN effort and now applies to LSPs and segments as well. So, G-ACh is simply a header in the packet that provides the de-multiplexor function for OAM packets for appropriate handling.

Note that the existence of ACh was negotiated when the pseudo-wire was set up, which is not feasible if static provisioning is used. This problem has been solved by using one of the reserved labels for this purpose. RFC 5586 identifies the reserved value 13 as a G-ACh label (GAL), thus providing the necessary tagging. Use of GAL for tagging OAM packets also enables easy extraction of the OAM packets at either a midpoint or an endpoint of an LSP or a pseudo-wire.

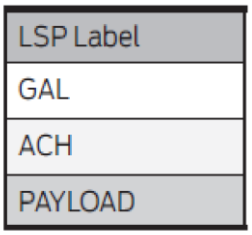

Figure 5: Packet headers for OAM packets in CPAN

2.8.2 Control Plane (Static or Dynamic)

The control plane mechanism is responsible for the setup of LSPs (dynamically or statically) across a MPLS network. The MPLS protocol suite supports a robust and mature dynamic control plane with protocols such as OSPF-TE, IS-IS-TE, RSVP-TE, LDP, and BGP. The current transport networks, however, have been using a static control plane, i.e., the circuits are statically provisioned by an intelligent network management system (NMS). Dynamic control plane is optional with CPAN.

Static provisioning in MPLS has been supported by many vendors, including Juniper, for quite some time. The static control plane may have applicability in scenarios where some equipment, especially equipment used at the edges of the network, does not support a dynamic control plane, or in which static configuration is preferred for security reasons. The NMS-driven control plane also allows operators to manage the packet-based network in the same way that they have historically been managing the circuit-switched network.

Even though the use of dynamic control plane is optional in CPAN, a dynamic control plane has its own advantages, in particular with regards to scaling. It also provides advanced protection functions (for example, schemes such as LSP tail-end protection).

Therefore, operators that are comfortable with the dynamic control plane can and are encouraged to use GMPLS and T-LDP to set up the LSPs and the pseudo wires respectively in the context of CPAN. The dynamic control plane, coupled with Juniper Networks® Junos® SDK, can deliver maximum flexibility and embedded logic for path computation, routing, and application or location-aware routing decisions.

Advantages of CPAN Technology:-

- Efficient bandwidth utilization, sharing bandwidth between services
- Includes the benefits of RPR.
- SDH packet switching based on statistical multiplexing.
- Path protection & recovery within 50 ms for any topology-Ring, Linear
- Support for TDM interfaces(E1,STM-1) & Multiservice traffic
- Both UNI & NNI interface upto max 100G capacity
- Access to last mile connectivity bandwidth upto 100G capacity.
- .bandwidth scalability -from 6G,40G to 100G
- OAM & Performance Monitoring-Proactive & Reactive
- Resiliency-1:1,1+1;Linear & Ring.
- GUI EMS provisioning.

2.8.3 Resiliency (Protection and Restoration)

MPLS has a rich set of protection and restoration mechanisms such as LSP fast reroute, pseudo-wire redundancy, and path protection. CPAN work enhances the resiliency mechanism of MPLS by adding support for OAM-triggered protection (i.e., allowing an operator to trigger the LSP to a secondary path) and optimizing protection in ring topologies.

Ring topologies are important, as circuit networks are typically built as interconnected rings, and it is expected that many initial deployments of CPAN will consist of replacing the circuit-switched nodes with CPAN packet switching nodes. Though MPLS fast reroute works in ring topologies, it does so in an inefficient way. Various optimizations and schemes (such as wrapping and steering) have been developed as part of CPAN work to provide efficient protection in ring topologies.

2.9 CPAN APPLICABILITY AND DEPLOYMENT OPTIONS

CPAN enhancements are primarily applicable to the access and aggregation networks, where the majority of the migration from circuit-switched networks to packet-based networks is currently occurring, and where higher scale and lower cost is required. Juniper believes that

the OAM enhancements to the MPLS protocol suite, however, will be extremely valuable to all MPLS networks, especially in the MPLS-based core networks.

These OAM enhancements will allow service providers to have better visibility into their existing MPLS-based core networks, which will allow further optimization. The new OAM capabilities will also help the wholesale business by improving the tools required to measure and enforce strict SLAs. Juniper, therefore, is prioritizing the implementation of these OAM enhancements, such as the enhancements to BFD and LSP ping. Figure 3 illustrates how IP/MPLS and CPAN can be deployed together and are very complementary in nature.

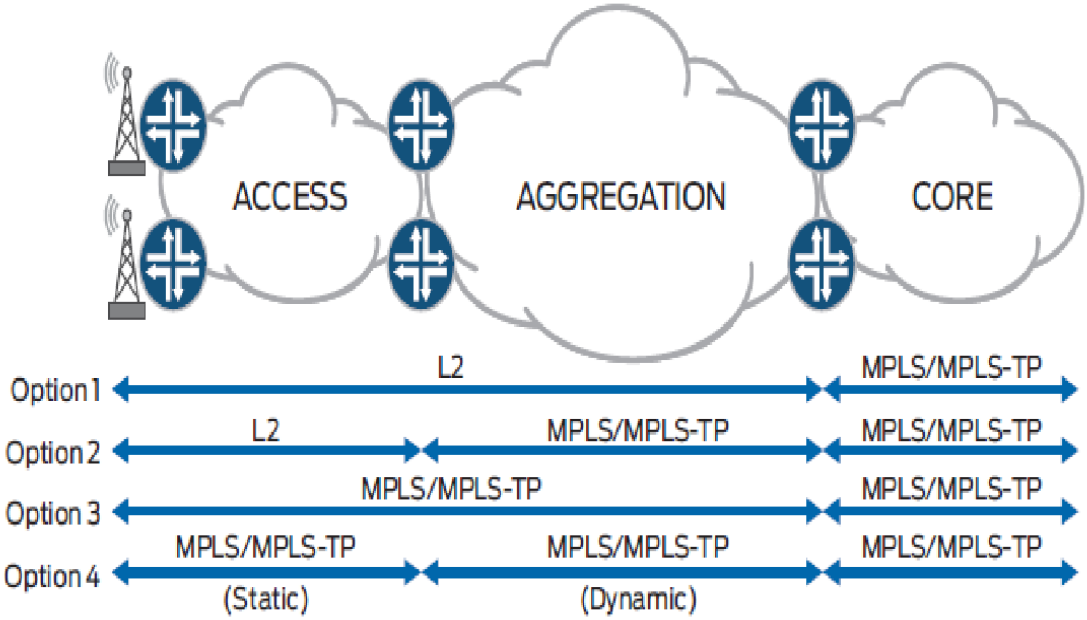

Figure 6: MPLS and CPAN Deployment Options

2.10 CPAN STANDARDS

- RFC 6423: Using the Generic Associated Channel Label for Pseudowire in the MPLS Transport Profile (CPAN)
- RFC 5654: Requirements of an MPLS Transport Profile
- RFC 5718: An In-Band Data Communication Network For the MPLS Transport Profile
- RFC 5860: Requirements for Operations, Administration, and Maintenance (OAM) in MPLS Transport Networks
- RFC 5951: Network Management Requirements for MPLS-based Transport Networks
- RFC 5960: MPLS Transport Profile Data Plane Architecture
- RFC 6370: MPLS Transport Profile (CPAN) Identifiers
- RFC 6426: MPLS On-Demand Connectivity Verification and Route Tracing
- RFC 6378: MPLS Transport Profile (CPAN) Linear Protection
- RFC 6427: MPLS Fault Management Operations, Administration, and Maintenance (OAM)

- RFC 6428; Proactive Connectivity Verification, Continuity Check, and Remote Defect Indication for the MPLS Transport Profile
- RFC 6435: MPLS Transport Profile Lock Instruct and Loopback Functions

2.11 CONCLUSION

CPAN is a set of enhancements to the already rich MPLS protocol suite. The current MPLS suite has successfully served packet-based networks for more than a decade. The CPAN enhancements will increase the scope of MPLS overall, allowing it to serve both the transport and the services networks. The biggest and most important enhancements that are being developed under the CPAN effort are OAM related (e.g., fault management and performance monitoring). These OAM enhancements will prove to be very valuable for the existing MPLS networks, as they will allow operators to improve the efficiency and effectiveness of their networks by enabling full end-to-end integration with the existing and the next-generation MPLS networks.

3. NEXT GENERATION OPTICAL TRANSPORT NETWORK (NG OTN)

3.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- OTN Hierarchy.
- Multiplexing Structure of OTN
- Advantages of OTN
- OTN Interfaces and layer architecture of OTN

3.2 INTRODUCTION

With the growing demand for services and bandwidth, now telecom operators are trying to converge their networks in order to reduce Operational Expenses (OPEX), and also to eliminate additional Capital Expenditures (CAPEX) on multiple parallel networks. The amount of data traffic relative to voice traffic on optical networks and the total traffic volume keeps increasing. These factors are the drivers behind emerging, flexible technologies to supplement the mature, voice optimized, SONET/SDH transport infrastructure and help manage network complexity. The aim of the optical transport network (OTN) is to combine the benefits of SONET/SDH technology with the bandwidth expandability of DWDM. OTN (Optical Transport Network) provides a vehicle to enable convergence, and for providing a common and SONET/SDH-like operational model for network operations, administration, maintenance and provisioning (OAM&P) functionality, without altering the individual services· This newly developed OTN is specified in ITU-T G.709 Network Node Interface for the Optical Transport Network (OTN).

Since the 1980s, SONET/SDH is supporting a flexible and transparent mix of traffic protocols including IP, Fiber Channel, Ethernet and GFP by providing protection and performance monitoring. Whilst deployment of dense wavelength division multiplex (DWDM) networks during the following decade served to increase existing fiber bandwidth, it severely lacked the protection and management capabilities inherent in SONET/SDH technology.

The optical transport network (OTN) was created with the intention of combining the benefits of SONET/SDH technology with the bandwidth expansion capabilities offered by dense wavelength-division multiplexing (DWDM) technology.

3.3 WHAT IS OTN?

Networks employing OTN technology are designed and optimized to support current applications employing massive network capacity, and OTN is increasingly recognized as the transport standard of choice to meet the growing demand for network capacity. The ITU Telecommunication Standardization Sector (ITU-T) defines OTN in a set of standards, with the G.709 specification acting as the core technology definition. The ITU-T standards cover the encapsulation format, multiplexing, switching, management, supervision, and survivability of optical channels carrying client payloads. OTN also provides the ability to measure network performance across multiple service providers' domains and to provide seamless, end-to-end monitored services.

An Optical Transport Network (OTN) is composed of a set of Optical Network Elements connected by optical fiber links, able to provide functionality of transport, multiplexing, routing, management, supervision and survivability of optical channels carrying

client signals. A distinguishing characteristic of the OTN is its provision of transport for any digital signal independent of client-specific aspects, i.e. client independence.

ITU Standard G.709 is commonly called Optical Transport Network (OTN)– sometimes referred to as digital wrapper (DW), allows network operators to converge networks through seamless transport of the various types of legacy protocols while providing the flexibility required to support future client protocols

OTN provides transport for all digital payloads with superior performance and support for the next generation of dynamic services with operational efficiencies not expected from current optical wavelength division multiplexing (WDM) transport solutions and support for a wide range of narrowband and broadband services like

- SDH/SONET
- IP based services
- Ethernet services
- ATM services
- Frame Relay services
- Audio/Video services etc.

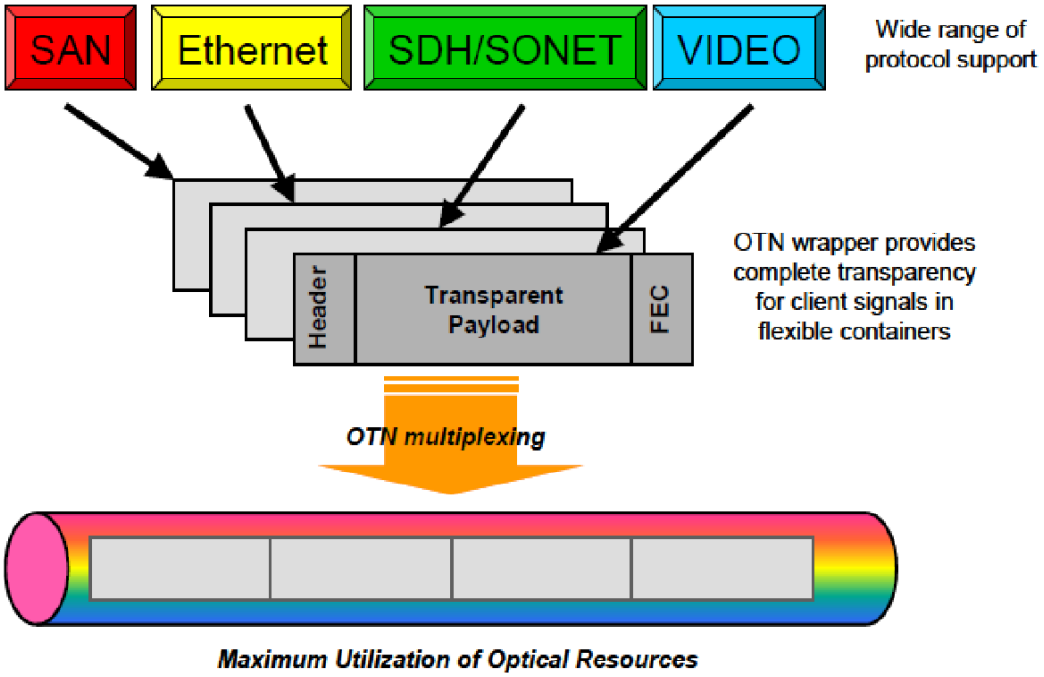

Figure 7: Converged transport over OTN

3.4 KEY ADVANTAGES OF OTN

Unlike SONET/SDH, OTN was designed to be an efficient transport layer for packet services such as Ethernet. At the same time, OTN is able to support the multiplexing of many different protocols including SONET/SDH, video, and storage protocols such as Fiber Channel.

OTN offers a number of advantages over legacy transport networks and the primary advantages of OTN include:

- **Reduction in transport costs:** By allowing multiple clients to be transported on a single wavelength, OTN provides an economical mechanism to fill optical network wavelengths.

- **Efficient use of optical spectrum:** OTN facilitates efficient use of DWDM capacity by ensuring fill rates are maintained across a network using OTN switches at fiber junctions.

- **Determinism:** OTN dedicates specific and configurable bandwidth to each service, group of services, or each network partition. This means that network capacity and managed performance (throughput, latency, jitter, and availability) are guaranteed for each client, and there is no contention between concurrent services or users.

- **Virtualize network operations:** The ability to partition an OTN-switched network into private network partitions, also referred to as Optical Virtual Private Networks (O-VPNs), provides a dedicated set of network resources to a client, independent of the rest of the network. Each network tenant sees only the resources associated with that tenant's private partition. Other resources associated with other tenants will not be visible. O-VPNs also ease network evolution because network upgrades can be tested or introduced in a protected network partition or 'sandbox,' without the risk of impacting day-to-day network operations in production partitions.

- **Flexibility:** OTN networks give operators the ability to employ the technologies needed now to support transport demands while enabling operators to adopt new technologies as business requirements dictate.

- **Secure by design:** OTN networks ensure a high level of privacy and security through hard partitioning of traffic onto dedicated circuits. This segregation of network traffic makes it difficult to intercept data transferred between nodes over OTN-channelized links. And because OTN-switched networks keep all applications and tenants separate, organizations can effectively stop hackers who access one part of the network from gaining access to other parts of the network.

- **Robust yet simple operations**: OTN network management data is carried on a separate channel completely isolated from user application data. This means OTN network settings are much more difficult to access and modify by gaining admittance through a client interface port.

- **Better Forward Error Correction**: OTN has increased the number of bytes reserved for Forward Error Correction (FEC), allowing a theoretical improvement of the Signal-to-Noise Ratio (SNR) by 6.2 dB. This improvement can be used to enhance the optical systems in the following areas:

    - Increase the reach of optical systems by increasing span length or increasing the number of spans.
    - Increase the number of channels in the optical systems, as the required power theoretical has been lowered 6.2 dB, thus also reducing the non-linear effects, which are dependent on the total power in the system.
    - The increased power budget can ease the introduction of transparent optical network elements, which can't be introduced without a penalty. These elements include Optical Add-Drop Multiplexers (OADMs), Optical Cross Connects (OXCs), splitters, etc., which are fundamental for the evolution from point-to-point optical networks to meshed ones.

- **Tandem Connection Monitoring (TCM):** TCM enables the user and its signal carriers to monitor the quality of the traffic that is transported between segments or connections in the network.

3.5 OTN Vs. SONET/SDH

Although OTN and SONET/SDH have similarities, there are also some significant design differences. Perhaps the biggest difference is that SONET/SDH was defined with fixed frame rates, while OTN was defined with fixed frame sizes.

Table 3. OTN Vs SDH

OTN	SONET/SDH
Asynchronous mapping of payloads	Synchronous mapping of payloads
Timing distribution not required	Requires tight timing distribution across networks
Designed to operate on multiple wavelengths (DWDM)	Designed to operate on multiple wavelengths
Scales to 100 Gb/s (and beyond)	Scales to a maximum of 40 Gb/s
Performs single-stage multiplexing	Performs multi-stage multiplexing
Uses a fixed frame size and increases frame rate to match the client rate.	Uses a fixed frame rate for a given line rate and increases frame size (or uses concatenation of multiple frames) as client size increases
FEC sized for error correction to correct 16 blocks per frame	Not applicable (no standardized FEC)

The G.709 standard defines client payload encapsulation, OAM overhead, FEC, and a multiplexing hierarchy. These functions deliver optical transport capabilities as robust and manageable as SONET/SDH, but with greater suitability for current traffic demands, and data center interconnection circuits in particular.

OTN is asynchronous and thus does not require the complex and costly timing distribution and verification of SONET/SDH. Instead, OTN includes per-service timing adjustments to carry both asynchronous (GbE, ESCON) and synchronous (OC-3/12/48, STM-1/4/16) services. OTN can additionally multiplex these services into a common wavelength.

Like SONET/SDH, OTN also offers comprehensive OAM, but with standardized FEC. OAM is used to efficiently manage network resources and services. FEC enables service providers to extend the distance between optical repeaters, reducing expenses and simplifying network operations.

3.6 OPTICAL TRANSPORT NETWORK (OTN) LAYERS

The optical transport hierarchy (OTH) is a new transport technology for optical transport networks developed by the ITU. It is based on the network architecture defined in various recommendations (e.g., G.872 on architecture; G.709 on frames and formats; and G.798 on functions and processes). OTH combines electrical and optical multiplexing under a common framework. The electrical domain is structured in a hierarchical order just like SONET/SDH, and the optical domain is based on DWDM multiplexing technology but with

standardized interfaces and methods to manage the network. ITU-T recommendation G.872, Architecture for the Optical Transport Network (OTN), defines two classes of OTN interfaces:

- OTN inter-domain interface (IrDI): This interface connects the networks of two operators, or the subnetworks of one or multiple vendors in the same operator domain. The IrDI interface is defined with 3R (reshape, regenerate and retime) processing at each end. Since the IrDI is the interface for interworking, it was the focus of the initial standard development.
- OTN intra-domain interface (IaDI): This interface connects networks within one operator and vendor domain. Since the IaDI is typically between equipment of the same vendor, it can potentially have proprietary features added such as a more powerful FEC

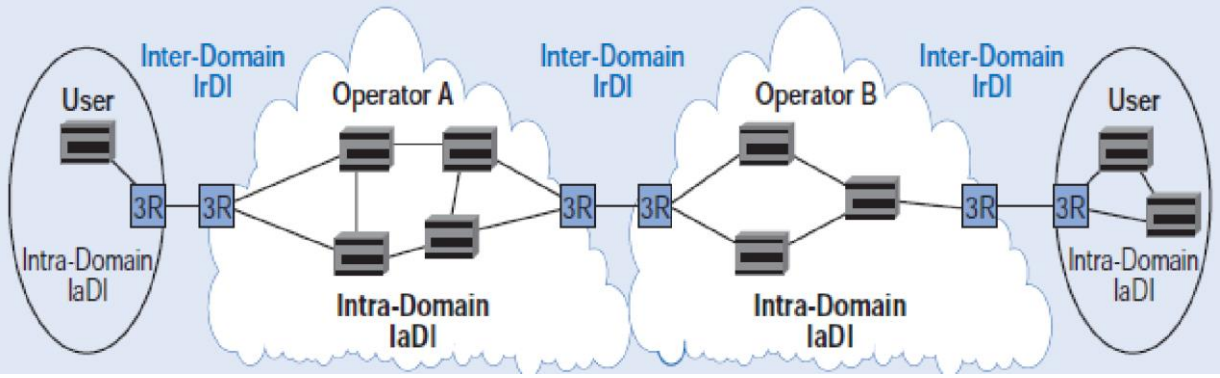

Figure 8: IrDI Vs IaDI

The transport of a client signal in the OTN (shown in Figure i.e. Basic OTN Transport Structure) starts with the client signal (SONET/SDH, ATM, GFP, Ethernet etc.) being adapted at the optical channel payload unit (OPU) layer by adjusting the client signal rate to the OPU rate. The OPU overhead itself contains information to support the adaptation process of the client signal. Once adapted, the OPU is mapped into the optical channel data unit (ODU) with the necessary ODU overhead to ensure end-to-end supervision and tandem connection monitoring. Finally, the ODU is mapped into an OTU, which provides framing, as well as section monitoring and FEC.

Additional OH may be added to the OCh to enable the management of multiple colours in the OTN. The OMS and the OTS are then constructed. The result is an OCh comprising an OH section, a client signal, and a FEC segment.

The OCh OH, which offers the OTN management functionality, contains four substructures: the OPU, ODU, OTU, and frame alignment signal (FAS).

Each OPUk (k=0,1,2,2e,3,4,flex) is transported using an optical channel (OCh) assigned to a specific wavelength of the ITU grid. Several channels can be mapped into the OMS layer and then transported via the OTS layer. The OCh, OMS and OTS layers each have their own overhead for management purposes at the optical level. The overhead of these optical layers is transported outside of the ITU grid in an out-of-band common optical supervisory channel (OSC). In addition, the OSC provides maintenance signals and management data at the different OTN layers.

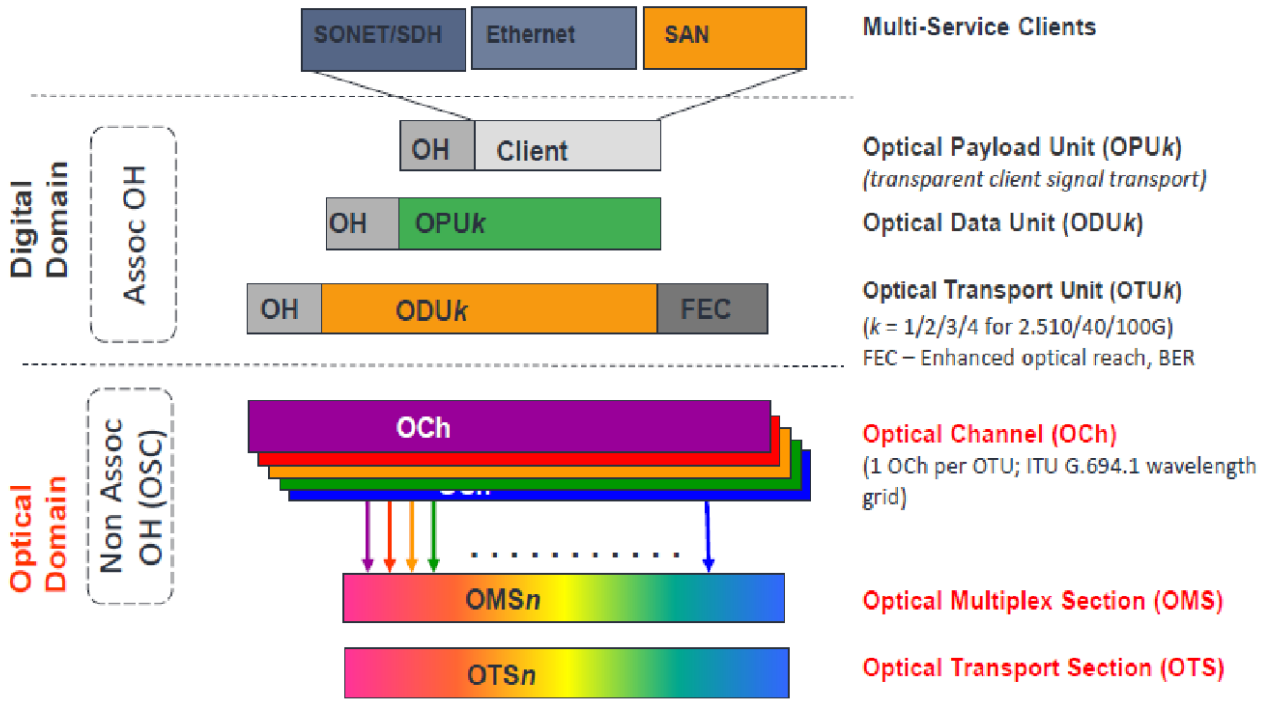

Figure 9: Basic OTN Transport Structure

3.6.1 OTN Layer Termination Points

The ITU G.872 recommendation also defines the optical network architecture based on the optical channel (OCh) carried over a specific wavelength. Different from that of legacy DWDM systems, the structure of this signal is standardized. The OTN architecture is composed of three layers, shown in Figure - OTN Layer Termination Points, and constructed using the OCh with additional overheads.

Optical Channel (OCh) – represents an end-to-end optical network connection with the encapsulated client signal in the G.709 frame structure.

Optical Multiplex Section (OMS) – refers to sections between optical multiplexers and demultiplexers.

Optical Transmission Section (OTS) – refers to sections between any network elements in the OTN, including amplifiers.

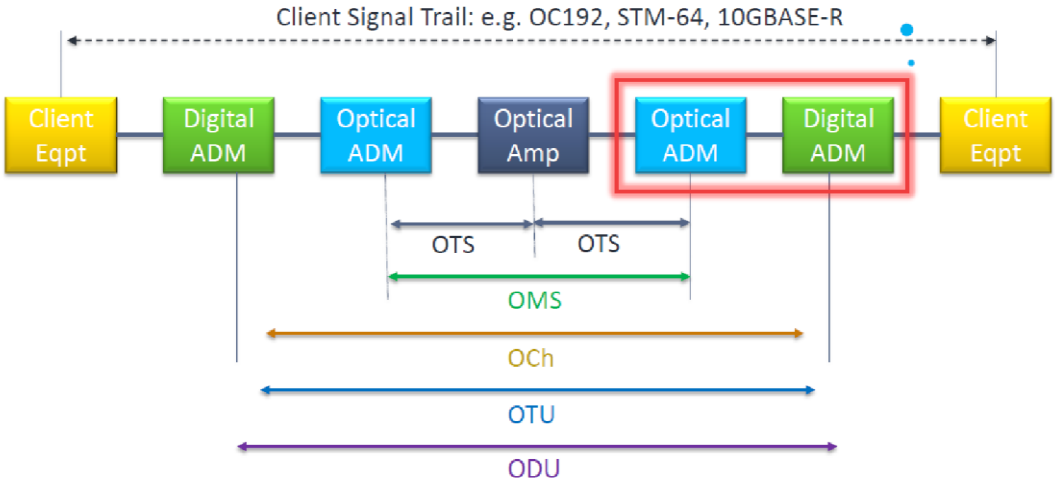

Figure 10: OTN Layer Termination Points

The termination of the OTS, OMS and OCh layers is performed at the optical level of the OTN. The OCh payload consists of an electrical substructure, where the optical channel transport unit (OTU) is the highest multiplexing level. This layer is the digital layer — also known as the "digital wrapper" - which offers specific overhead to manage the OTN's digital functions. The OTU also introduces a new dimension to optical networking by adding forward error correction (FEC) to the network elements, allowing operators to limit the number of required regenerators used in the network and in turn reduce cost.

3.7 STANDARD OTN LINE RATES

G.709 defines standard interfaces and rates. OTN rates are equal to or higher than the bit rates of the client traffic. Typical client signals and corresponding to G.709 rates are listed in Table-2.

Table 4. OTN Line Rates

Client Signal Type	**Client Signal**	**OTN Line Signal (G.709)**	**OTUk Line Rate (kbit/s)**	**OPUk Payload Rate (kbit/s)**	**OTUk frame period (µs)**	**OTUk frequency accuracy (ppm)**
SONET/SDH	STS-48/STM-16	OTU1	2,666,057	2,488,320	48.971	± 20
SONET/SDH	STS-192/STM-64	OTU2	10,709,225	10,037,629	12.191	± 20
Ethernet/Fibre Channel	10GBASE-R/10GFC	OTU2e	11,095,727	10,356,012	11.766	±100
SONET/SDH /Ethernet	STS-768/STM-256/ Transcoded 40GBASE-R	OTU3	43,018,413	40,150,519	3.034	±20
Ethernet	Up to 4 10GBASE-R	OTU3e2	44,583,355	41,611,131	2.928	±20
Ethernet	100GBASE-R	OTU4	111,809,973	100,376,298	1.167	±20
ODUflex signals are transported over ODU2, ODU3, ODU4						±100

Note: ODU0 signals are to be transported over ODU1, ODU2, ODU3, ODU4 or ODUCn signals, ODU2e signals are to be transported over ODU3, ODU4 and ODUCn signals and ODUflex signals are transported over ODU2, ODU3, ODU4 and ODUCn signals

Unlike SDH/SONET, the line rate is increased by maintaining the G.709 frame structure (4 rows x 4080 columns) and decreasing the frame period (in SDH/SONET the frame structure is increased and the frame period of 125 µs is maintained).

3.8 OTN FRAME STRUCTURE

There are three overhead areas in an OTN frame: the Optical Payload Unit (OPU) overhead, the Optical Data Unit (ODU) overhead, and the Optical Transport Unit (OTU) overhead. These overhead bytes provide path and section performance monitoring, alarm indication, communication, and protection switching capabilities. One additional feature is the inclusion of a Forward Error Correction (FEC) function for each frame. The FEC improves the Optical Signal-to-Noise Ratio (OSNR) by 4 to 6 dB, resulting in longer spans and fewer regeneration requirements.

Figure illustrates the three parts that constitute the G.709 OTN frame; namely the overhead, the payload, and the FEC.

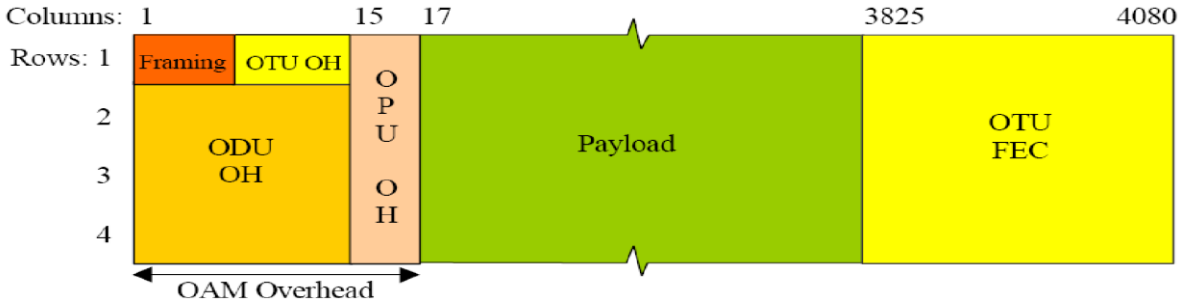

Figure 11: OTN Frame

Although OTN and SONET/SDH have similarities but the biggest difference in respect of frame structure is that SONET/SDH was defined with fixed frame rates, while OTN was defined with fixed frame sizes. Perhaps the biggest difference is that SONET/SDH was defined with fixed frame rates, while OTN was defined with fixed frame sizes.

3.8.1 Optical Transport Network Equipment

There are several different types of optical transport network equipment being deployed based on the OTN standards. The most common types include:

- Regenerators,
- OTN terminal equipment
- Optical Add/Drop Multiplexer (OADMs),
- Optical cross connect (OXCs).

OTN terminal equipment is used for point-to-point connections through WDM networks, mapping the client signals into OPUs, sometimes multiplexing multiple signals in the electrical types of regenerators primarily process the OTN signals in optical domain.

3.9 CONCLUSION

OTN-based backbones and metro cores offer significant advantages over traditional WDM transponder-based networks, including increased efficiency, reliability, and wavelength–based private services. The IP-over-OTN infrastructure also offers better management and monitoring, reduced hops, increased protection of services, and reduced costs for equipment acquisition. In addition to scaling the network to 100G and beyond, OTN plays a key role in making the network an open and programmable platform, enabling transport to become as important as computing and storage in intelligent data center networking.

4. BHARAT AIRFIBER

4.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Concept of AirFiber
- Wireless Bridging
- Network Architecture of Bharat AirFiber
- Advantages of Bharat AirFiber

4.2 Introduction

BSNL had started to expand its fibre connectivity in villages with BharatNet and the AirFibre is a continuation of the effort that aims to connect 2.5 lakh Gram Panchayats. Back in January 2020, the state-led telecom operator, Bharat Sanchar Nigam Limited (BSNL) launched the BSNL Bharat AirFibre service in India. The Bharat AirFibre service mainly caters to the rural regions in the country and aims to connect villages via the means of radio-waves. Unlike the Bharat Fibre service which is the standard offering from BSNL based on wired-FTTH, this is wireless technology.

BSNL Bharat AirFiber is a last mile telecom connectivity solution based on Radio Network using unlicensed Spectrum band. BSNL Bharat Fiber offers high-speed wireless broadband connectivity by deploying Point to Point / Point to Multi point Radio network in collaboration with franchisee partners with a Robust Backhaul connectivity from the nearest BSNL Nodes. Partners shall design, build and operate the system to provide high speed Broadband/Voice services through RF Technology at its own cost.

4.3 CONCEPT OF AIRFIBER

AirFiber ushers in a new era in price-disruptive wireless technology, delivering amazing wireless gigabit+ performance, low latency and long range, making it ideal for carrier backhaul, building-to-building enterprise use or public safety applications. AirFiber core networks backbones can be instantly and cost-effectively deployed anywhere, bringing the Internet deep into the unserved areas of the world. Utilizing the worldwide license-free bands , AirFiber can be freely purchased and deployed nearly anywhere.

In its most basic form a wireless bridge is created by linking 2 access points together. One access point adopts the role of being an 'access point' and the other the role of being a 'client' or 'station‘ Wireless bridges are generally required to provide links over long distances. Typically for a wireless bridge to work at full throughput you will require perfect line of sight.

Wireless Bridges are usually used to extend network coverage to locations physical cabling cannot reach. Wireless Bridges eliminates the requirements for expensive wiring (like Fibre & splicing cost)

4.3.1 Point to Point Bridging

In Wi-Fi networking, a point-to-point wireless bridge lets users wirelessly connect two locations together through line of sight (LOS). This bridge enables users to share an Internet connection between two locations and to share files and other types of data across the network.

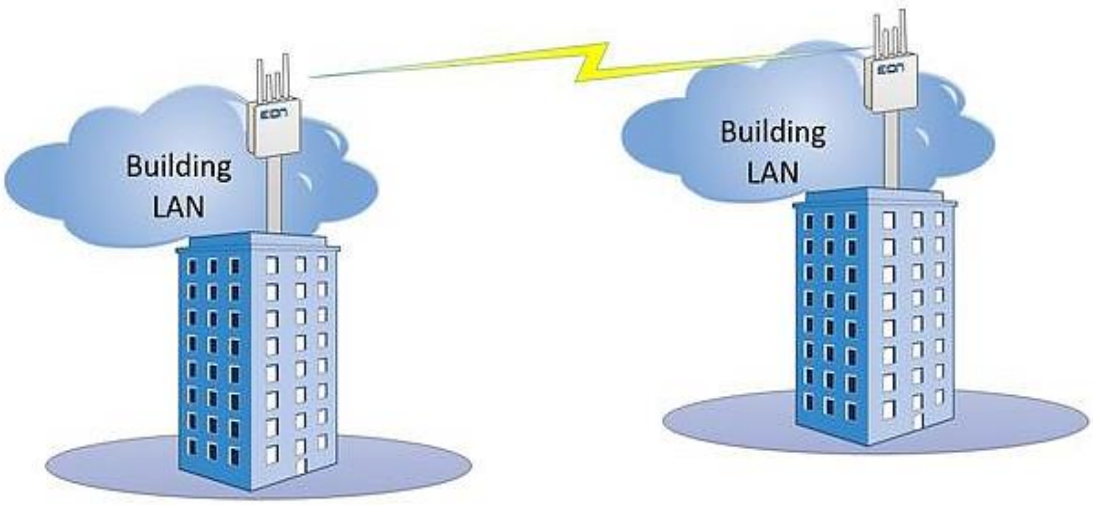

Figure 12: POINT TO POINT BRIDGING

4.3.2 Point to Multi-point Bridging

In Wi-Fi networking, a P2MP wireless network lets users wirelessly connect multiple locations to central Base Station through line of sight (LOS). This multiple bridges enables users to share an Internet connection between two locations and to share files and other types of data across the network.

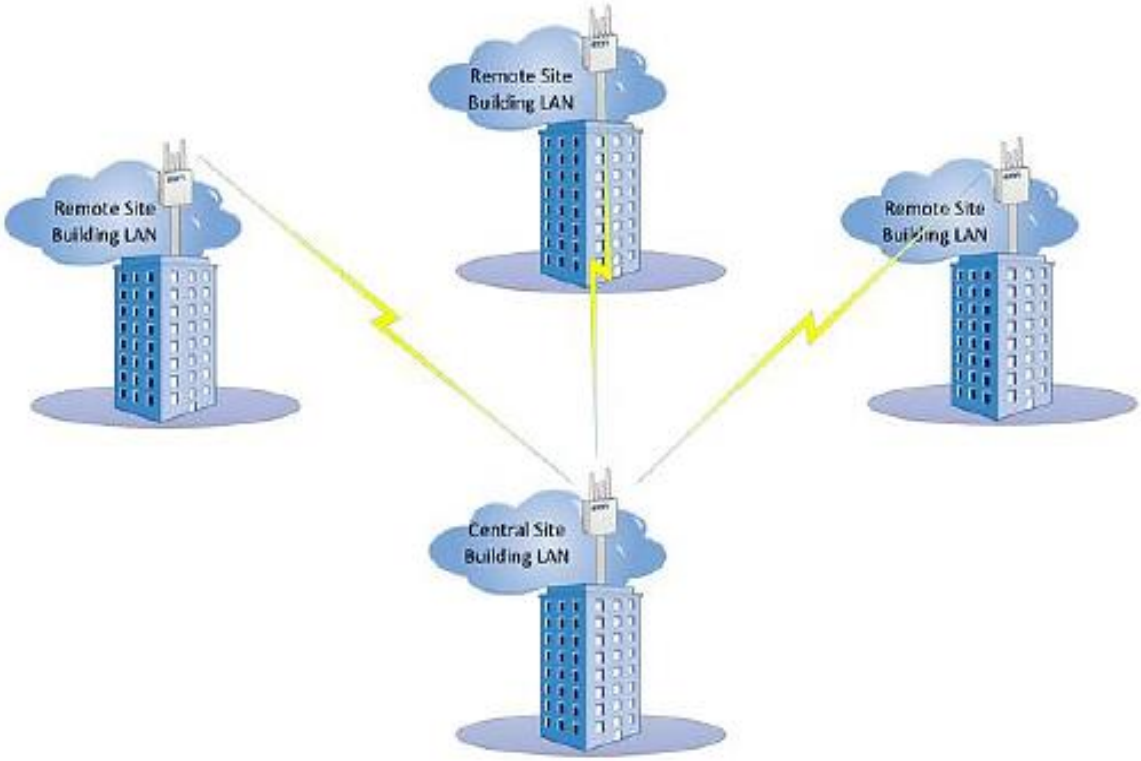

Figure 13: POINT TO MULTI-POINT BRIDGING

4.3.3 Radio Frequency (RF) or MW Bridges

Two types of spectrum, licensed and unlicensed are used for bridges:.

1. **Licensed spectrum** is allocated by the DoT for specific services (broadcasting, land mobile, cellular, satellite, etc.). This tightly controlled spectrum has strict regulations, and does incur fees.

2. **Unlicensed spectrum** may be used without direct DoT allocation as long as there's compliance with all related rules and regulations.

These bridges operate in a wide range of frequencies. The most common are:

- 3GHz: Requires licensing and usually used by WISPs (Wireless ISPs) to provide low throughput connection to end users
- 2.4GHz: License Exempt and used for short links providing speeds of <300Mbps
- 5GHz: licensed exempt and used for links of >300Mbps
- 60GHz: License Exempt and usable for links of up to 1Gbps
- 70GHz: Light Licensed and usable for links of up to 1Gbps. Slightly greater range than 60GHz
- 80GHz: Light Licensed and capable of 1Gbps over much longer distances than 60/70GHz
- Free Space Optics (FSO) Bridges are incredibly low latency and provide links of up to 1Gbps over distances of up to around 3.5km (1Gbps) or 5km 100Mbps). They are the license free and require absolutely perfect line of sight to operate.

4.4 BHARAT AIRFIBER ARCHITECTURE

4.4.1 Bharat Air Fiber(P2P)

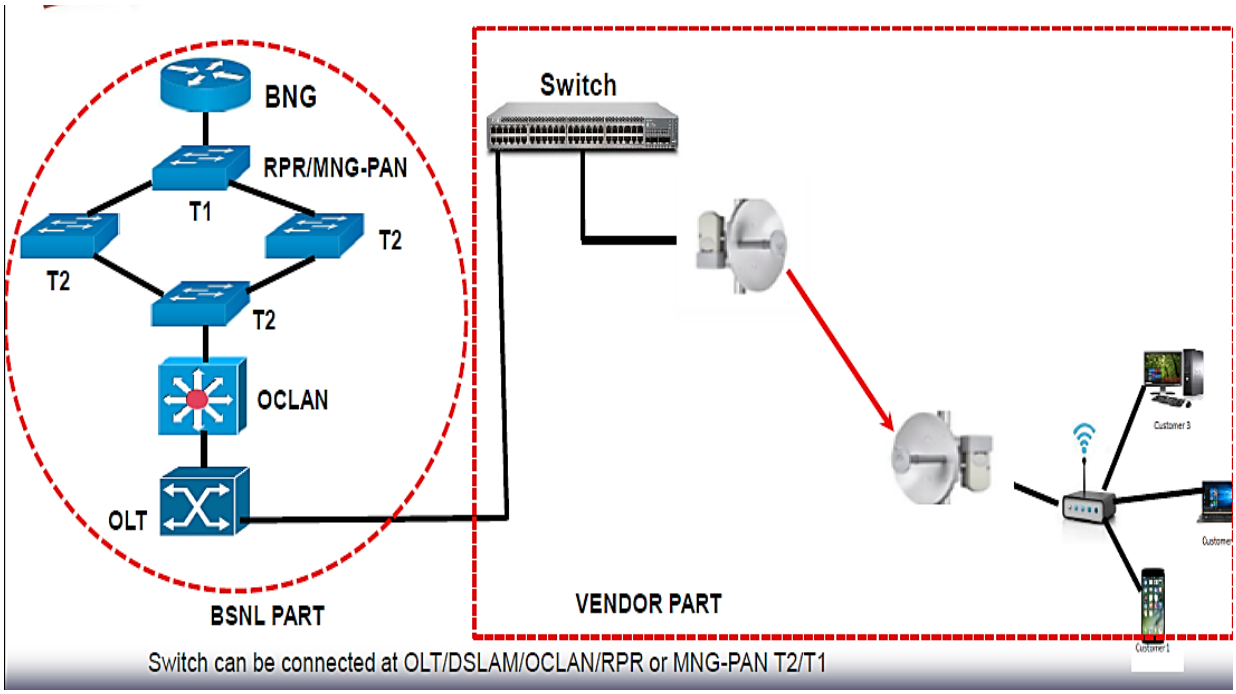

Figure 14: Bharat Air Fiber(P2P)

4.4.2 Bharat AirFiber(P2MP)

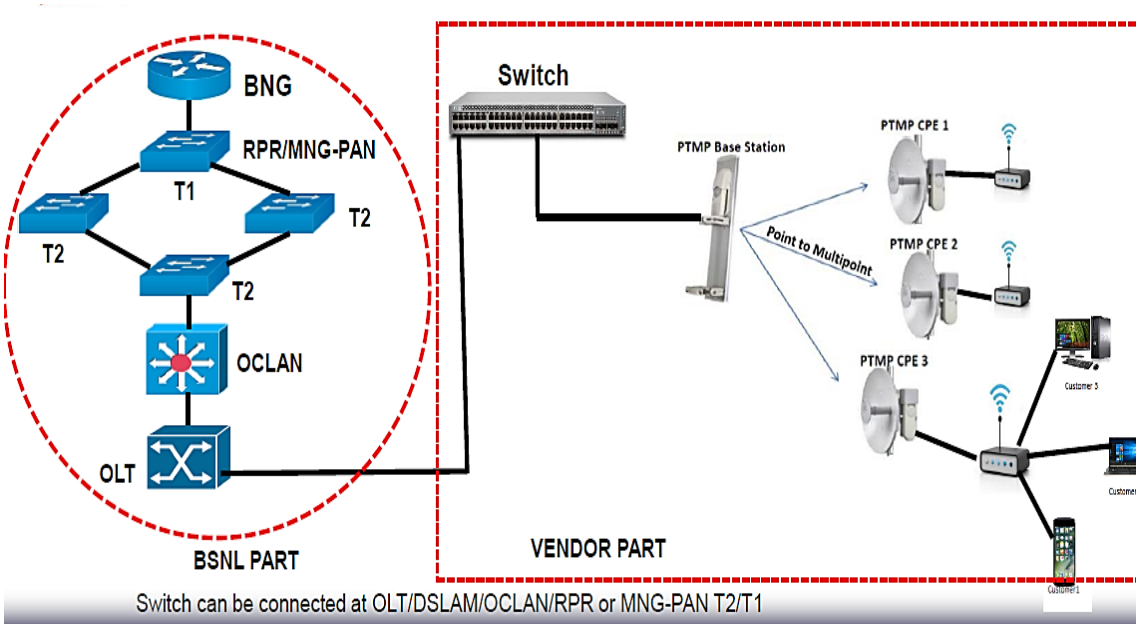

Figure 15: BHARAT AIRFIBER(P2MP)

4.5 ADVANTAGES OF BHARAT AIRFIBER

- Eliminates the requirements for expensive wiring (like Fibre & splicing cost)
- Quick & Easy implementation with very less set up time.
- Low maintenance cost
- Last mile connectivity can be provided in Non-Feasible areas.
- Central Radio Equipments can be deployed in BSNL Exchanges as towers are available in most of the places.

4.6 FACTORS AFFECTING THROUGHPUT IN REAL ENVIRONMENT

- Physical obstruction (Non Clear LOS)
- Distance Between devices
- Poorly deployed Devices / Antennas
- Wireless Network Interference
- Low interference(scannable RSSI(Received Signal Strength Indicator) less than -90dbm) will decrease the performance 10~30% ;
- Medium interference(scannable RSSI less than -75dbm) will decrease the performance 20~40%;
- High interference(scannable RSSI less than -60dbm) will decrease the performance 30~60%;

4.7 MAJOR OEMS

Figure 16: MAJOR OEMS

4.8 ROLES & RESPONSIBILITIES

Table 5. Roles and responsibilities

Sr. No.	Activity	Responsibility
1.	Provisioning & Physical connectivity	RBSP/Node in Charge/SSA
2.	Feasibility of intermediate equipment utilized	Node in Charge/SSA
3.	Allotment of IP and VLAN	NOC
4.	Configuration of allotted IP and VLAN in Broadband Access Network	NOC
5.	Billing of Customers	ITPC/ Node in Charge/SSA
6.	Security/LEA/LI	RBSP/ Node in Charge/SSA
7.	Maintenance & trouble shooting of radio elements and media	RBSP/ Node in Charge/SSA/NOC
8.	SLA related issues/ Data Generation Statistics	Node in Charge/SSA

9.	Trouble shooting & configuration of Multiply N/Es (BNG/RPR/PTN/OCLAN/OLTs & SERVERS)	NOC
10.	Call center support	ITPC

4.9 Checklist for Router/ Modem Security

- Bandwidth and adversely creating speed issues, network congestion, Consuming Network Element Resources etc.
- As these devices are not secured by default ,necessary security measures has to be taken to harden these devices which will help us in reducing the attack surface and providing better QOS to the customer. Maintain Up to date FIRMWARE of the device with latest patches and fixes.
- Change the default login username and password: A strong password that uses a combination of letters, numbers and special characters with 10 characters or more is recommended. Change passwords every 30 to 90 days.
- Enable router firewall to keep intruders from establishing a connection with the router and its configuration through the wide area network (WAN) interface.
- Disable unwanted services like FTP, Telnet, UPnP, NTP, DDNS etc on the WAN Side to reduce the router's exposure.
- Configure WPA2-AES for data confidentiality and WEP is not recommended
- Turn Off SSID (Service Set Identifier) Network Identifier Broadcasting. Change the default SSID as unique name.
- Do not use default or easily guessable names.
- Disable WPS Feature, If not in use.
- Use MAC Address Filtering and allow only trusted Devices.
- Monitor the upload/download traffic daily and take immediate action in case any suspicious traffic is observed.
- Logging: Enable router logging and periodically review the logs for important information regarding authentication, intrusions, probes, attacks, etc.

4.9.1 SECURITY POINTS

- If Vulnerable CPEs are accessible on the internet, they are luring attackers to convert the devices as botnet to launch several attacks majorly DDOS attack which is consuming the network bandwidth and adversely creating speed issues, network congestion, and Consuming Network Element Resources etc.
- Most of the modems are not secured by default ,necessary security measures has to be taken to harden these devices which will help us in reducing the attack surface and providing better QOS to the customer.
- All connections being provided should be provided only after proper hardening of the device. These Vulnerable ONTs are accessible on the internet luring attackers to convert the devices as botnet to launch several attacks majorly DDoS(Distributed denial of service) attack which is consuming the network
- BBNOC Bangalore has developed a portal to address the security concerns pertaining to BSNL FTTH Element(ONTs).

4.10 D-LINK SYSTEM FEATURES

- Variable Bandwidth Selection
- Adapt to different environments, improve the stability of bandwidth
- Auto ACK Time-out Adjustment
- Improve long-distance transmission performance
- Intelligent Rate Control
- Adapt to different environments, improve the stability of bandwidth
- TDMA+ Polling

By checking the status of each client, such as whether it's active, what kind traffic carried on and etc. It then allocates time slots to the client by a decision algorithm. Thus maximize the transmission airtime efficiency and avoid wastes. Avoid conflicts, and improve outdoor point-multipoint performance.

Figure 17: TDMA+ Polling

The voice and video session are scheduled with the highest priority in the time slot allocation, so that the lowest latency can be achieved

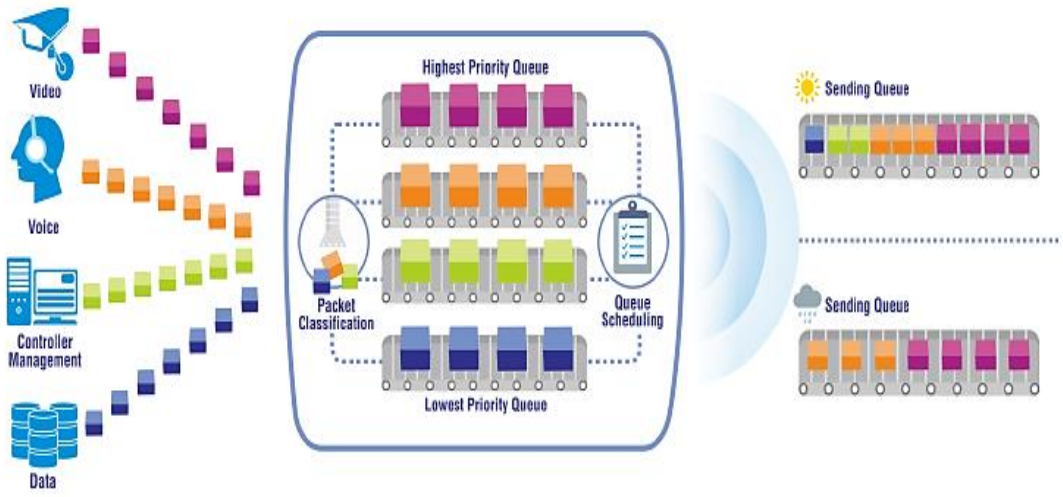

Figure 18: TDMA+ Polling

Smart Auto Channel selection

- The AP automatically scans the entire working channels during startup and selects the channel with minimum noise & interference.

- The AP will periodically perform the channel scan, and switch to a less noisy channel based on the user preference setting from the GUI.
- User can also specify the channel hopping list that is allowed in the working area. This can eliminate collisions with channels that are already occupied by other important users.

Figure 19: Smart Auto Channel selection

Self Healing Mechanism

- Self healing Mechanism works in an extremely noisy environment.
- This feature can degrade the external interference from the devices operating in or near the same frequency.
- This can also neutralize the noise floor, which is the background noise always presented in the unlicensed frequency band.
- By effectively preventing or reducing the unwanted signals, devices with this protocol can achieve better and stable throughput in the congested area.

Figure 20: Self Healing Mechanism

- Centrally Management-Hardware Controller or cloud

- Central configuration and management make operation efficient.
- Online or offline map function makes the device location easy
- Integrated tools for device issues debugging
- Abundant capacities models Fast & easy

Figure 21: Centrally Management-Hardware Controller or cloud

4.11 CONCLUSION

The Bharat AirFibre services are introduced by BSNL as part of digital India initiates by the Government of India and it aims of providing Wireless Connectivity in the range of 20 KMs from the BSNL Locations and thus customers at remote places also will be benefited as BSNL comes with cheapest services with support of Telecom Infrastructure Partners (TIPs).These Bharat Airfiber services opens new way of fastest Wireless internet connectivity as well Voice services in reasonable cost. BSNL provides Bharat Air Fibre connectivity upto 100 Mbps speed.

5. CHANNEL PARTNER

5.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Criteria for Empanelment of Channel Partners.
- Channel Partners Responsibilities
- Sales & Provisioning
- After Sale
- SLA parameters to be observed by Channel Partner for Customers.

5.2 INTRODUCTION

The Channel Partners Role involves building or extending and maintaining BSNL Network and its customers and to explore the possibility of expanding the BSNL Customer base through extension of last mile connectivity in provisioning of BSNL Services by the prospective partners and to expand the Telecom footprint.

The dedicated partner does get involved in maintaining the BSNL network and its customer along with having the possibility for expanding the extension of BSNL customer base, and this is an option to spread the network in all corners of India through the help of customers who are willing to upload the tasks.

BSNL is providing unique opportunity to Builders, Resident Welfare Associations (RWAs), Telecom Infrastructure Providers, Franchisees, System Integrators, DIDs, Franchisees of BSNL, any registered company or society, Local Cable TV Operators, Telecom Service Providers, BSNL Retailers, Direct Selling Agents Start-ups or local entrepreneurs for providing BSNL Telecom Services in the existing and upcoming residential/commercial complexes and all other parts of rural and urban areas on revenue sharing basis.

Where the Channel Partners Role involves building or extending and maintaining BSNL Network and its customers and to explore the possibility of expanding the BSNL Customer base through extension of last mile connectivity in provisioning of BSNL Services by the prospective partners and to expand the Telecom footprint for BSNL across India.

Attractive Revenue Sharing Model with commission up to 50% of Revenue generated along with a well known branding of BSNL whose services are available in nook and corner of the Country along with host of many other benefits.

BSNL has decided to deal with Platinum & Gold customers directly. BSNL executives have been appropriately trained in enterprise sales.

For capturing silver customers, BSNL has started appointing Channel partners in all circles. These channel partners are given an exclusion list mentioning Platinum & Gold customers so that they don't waste their efforts on these customers. The job of channel partners is primarily for direct marketing & sales of BSNL data services to silver customers. They get commission as per approved structure on various services. Purpose of such channel partner is to offer Total Telecom Solution to the silver clients as per need comprising of MPLS, lease lines, Web Hosting, VPN, Broadband, basic, Mobile, IN, bill collection etc.

Accounts are mapped to channel partners by geography and by their specializations. 100 to 300 accounts are given to each channel partner. Channel partners are controlled at the circle level through channel managers. Technical expertise in basic products/bundles is essential.

5.3 THE EMPANELMENT OF CHANNEL PARTNERS TO BSNL

Enterprise Business Unit, BSNL, invites Letter of intent and Consent from the existing partners of BSNL, for the empanelment of Channel partners to BSNL to acquire business from Platinum, Gold and Silver customers in CFA/CM/EB verticals.

The channel partner policy enclosing the eligibility criteria for product range of operation and commission structure details are enclosed herewith.

5.3.1 Scope Of Policy

For engaging an enterprise customer, several visits and regular pursuance is needed. BSNL tends to lose business at times needing more persuasion of leads constantly; this gap needs to be filled. Channel Partners are proposed in all the three categories of business i.e. Platinum, Gold and Silver covering products and services from all the three verticals.

5.3.2 Eligibility Criteria

In order to jump start the system and the business acquisitions are taken over immediately by the partners, no special eligibility and selection criteria has been prescribed. The stream of partners in respective business verticals attached with BSNL to be offered for the empanelment as Channel Partners.

5.3.3 Selection Criteria

The interested partner of any stream EB/CM/CFA who wants to be an empanelled Channel Partner for the scheme would need to show his intention/consent and to agree to general business rules to get enrolled as a Channel Partner in the relevant segment before being empanelled as a Channel Partner. The empanelment of such interested Channel Partners would be reviewed & renewed after a year based on the business brought by them which however, may not be renewed for non-performers.

For CM/CFA Products:

Franchisees, RD, DSA of CFA and CM Verticals to operate within their prescribed jurisdiction as per respective S&M Policy.

CM Vertical Products:

a. Mobile Connections with Voice and/or Data

b. Bulk Mobile CUG Connections (Prepaid/ Postpaid)

c. 3G Data Services/VPNo3G

d. OBD

CFA Vertical Products:

a. LL and BB Connections

b. VPNoBB Services

c. PRI Connections

d. Toll Free Services/IN services

e. Free PABX Services

f. Wi-Fi

g. OBD

For Core Network Products:

SIs, MNS Partners, PABX Franchisees and IDC Partners, etc. of EB.

EB Vertical Products:

1. MPLS-VPN services
2. Internet Leased Lines
3. P2P Leased Lines
4. Video Conferencing Services (v-Sangosti)
5. Managed Network Services
6. Fibre /Band width Leasing
7. Internet Data Centre Services

No jurisdictional restriction of booking business for National Level SIs. Circle Level SIs would book business for the respective Circle of their empanelment, however can book business operable in other Circles when a part of business lies in his home Circle. The leads/ business of Pan-India Platinum Customers attached to a particular Platinum Unit shall be dealt through such designated units only. Exceptions if any may be considered with the consent of the CGM of other Circle(s). The business brought by MNS/PABX/IDC Partners in their respective scope of business shall not be part of this policy.

The different partners engaged in selling and delivery of services of BSNL in all the three segments as detailed above would need to submit their intent and consent before their empanelment as Channel Partner in this policy.

Following Would Be Excluded

- Landline and Broadband Leads of less than 20 connections from a single enterprise Customer should not be entertained from Channel Partners.
- Sale of SIMs less than 100 shall not be entertained in isolation.
- However, if the sale of lesser number of SIMs, Landline or Broadband constitutes part of a bigger business deal, it may be included.
- The business done with TSP/ISPs will not be part of this scheme

5.4 CHANNEL PARTNET RESPOSIBILITIES

- The channel partner will handle the customer request through phone/web/e-mail/fax etc. and must ensure that customer gets uniform and good experience across different contact points.
- NOC Services to customers: Its job is to interact with customer through phone/web/ email etc. to satisfy them regarding SLA.
- There will be continuous interaction for new product design and development and also giving technical solutions and commercial quotes. In any case BSNL will be the final deciding authority.
- On BSNL web site, the product information will be given. The customer information for pre-sale activities will also be collected on web site. The channel partner is supposed to white label their web site handling these activities for BSNL. The entire query registered at web site has to be attended by the channel partner, by cold calling as well as follow up at sites for generating business.

BSNL will carry out ATL (Above the Line) as well as BTL (Below the Line) Marketing of these products. All efforts have to be made by the channel partner to capture the leads generated into business.

1. The door to door activity for capturing is to be done by the channel partner without any cost to BSNL and give feedback to the nodal officer for future improvisation every six months or as the case may be.

2. The channel partner will nominate single point of contact for interaction with BSNL SSA Nodal Officer.

3. It will be sole responsibility of the CP to settle all third party claims. Under no circumstances, BSNL will have any liability for any such claims.

5.5 LEAD LOCKING AND CP MANAGEMENT

1. Channel Partners to intimate the Leads to the concerned Channel Manager in the initial stage itself to avoid any payment claim after completing the lead. Also this will avoid duplication of business lead from different Channel Partners.

2. Although, bringing the lead, follow-up with the customer and final winning of business shall be the sole responsibility of the Channel Partner but never the less the financial quote and deal shall only be finalized by BSNL so BSNL's sales team would remain associated with the Channel Partner at appropriate juncture.

3. It will be the responsibility of the Channel Partners to get order from customer at the rates finalized by BSNL Circle and timely realization of payment is to be ensured before payment to the channel partner is released.

5.6 PAYMENT TO CHANNEL PARTNER

All the business for the Telecom Services acquired from above category of customers should be brought in the name of BSNL. Commission on above rate shall be payable to the Channel Partner on the actual realized amount (excluding all taxes) on Monthly/Quarterly/Half yearly/Annual basis etc. as per agreement made with the customer. S&D Module in ERP will be modified accordingly to incorporate above payable commission to Channel Partners (similar to retail commission payment, created for CM/ CFA franchisees).

CGMs would be authorized to call meetings of the EB customers and Channel Partners for which they will be empowered to spend Rs. 1 Lakh for Gold and 5 Lakh for Platinum 1units. The maximum annual Ceiling for business promotion by CGMs may be fixed as 0.25% of the previous year's EB Revenue of the Circle.

This policy would be applicable for a period of one year and supersedes all earlier directions on the subject.

5.7 SALES & PROVISIONING

1. Get completed all commercial formalities as per BSNL requirements.
2. Get the undertakings also filled up for minimum 24 months committed period.
3. Coordinate with BSNL for last mile connectivity.
4. Coordinate with customer to keep the site ready.
5. Providing a pair of leased Line Modems in Non- MLLN case or converter in case of MLLN.

6. Providing Routers to suit the requirements of bandwidth.
7. Providing RF equipments.
8. Provisioning of firewall and IP Sec tunnel.
9. Providing NOC/SOC services to the customer.
10. The channel partner shall do configuration and maintenance of the Customer's End Equipments.
11. Providing all reports to customer as per SLA.

5.8 AFTER - SALE

1. The channel partner is the front end to the customer.
2. 24x7 Proactive monitoring of the customer circuits up to router has to be done from the channel partner NOC/SOC. The monitoring rights will be given by BSNL NOC Bangalore.
3. BSNL responsibility is up to correctness of cable pair at customer premises. Rest all i.e. proper working of leased line modems, converters, routers and RF equipments etc. lies with the channel partner.
4. In case of Faults in the equipments supplied by the channel partner, it has to be repaired/replaced as per the scheduled specified in SLA. The channel partner will stock spares for ensuring good support to customers.
5. Proper and continuous interactions with the customer are to be done by the channel partner.
6. In case of faults, the circuits need to be analyzed and if fault lies in BSNL portion a complaint has to be booked with BSNL fault unit. A SMS has to be sent to Nodal Officer as well as concerned Line Man. In case the fault is not restored in the time specified, the complaint has to be escalated to proper authorities as per chart below.

Table 6.

Fault Duration	**Name of Officer in case of Line Fault**	**Name of Officer in case of BSNL Equipment Fault**
When fault occurs	LM/JTO/SDE (External)/ Nodal Officer	LM/JTO/SDE (External)/ SDE Node In-charge/Nodal Officer
More than 4 hours	DE/DGM (External)	DE/DGM (External) as well as Node In-charge
More than 8 hours	GM of SSA	GM of SSA
More than 16 hours	CGM/GM (EB) CO	CGM/GM (EB) CO

7. After restoration of fault the customer is to be intimated and checked for proper restoration of services.
8. 5.9 The channel partner will provide all the information to the customer on monthly basis through web site.

5.9 SLA PARAMETERS TO BE OBSERVED BY THE CHANNEL PARTNER FOR CUSTOMER

1. Change request for rules – 30 minutes for priority rules / 4 hours.
2. 24 x 7 Real – time monitoring via SOC – 99.5% (Platinum) & 99% (Gold) (as per requirement) of SOC availability guaranteed.
3. 24 x 7 Real – time event correlation and interpretation.
4. 24 x 7 Incident handling.
5. Availability and performance monitoring.
6. Notify to customer in 15 minutes.
7. Real – time reports on customer portal.
8. 4 hour Response and 24 hour Resolution time.
9. Event log storage duration – I month; up to bill payment by the customer.
10. Notification of security update and bug-fixes.
11. The NOC should be able to monitor the links satisfactorily irrespective of the make, version or type of the CPE.

5.10 CONCLUSION

- The channel partner will ensure that their NOC/SOC etc. are working and services to BSNL customers are not affected. In case of any fault in their NOC/SOC operations, it should be brought to the notice of BSNL Nodal officer in SSA.
- The Channel partner will commit enough sales engineers who will work closely with BSNL's team, and ensure that all leads are attended within 4 hours on phone and following working day in case of potential customers.
- The channel partner will provide Day-to-Day support as per SLA agreement between customer and BSNL. The channel partner will provide monthly report to BSNL nodal officer in SSA about the sales, installations, problems raised by customers and their resolution etc.
- The channel partner will closely work with BSNL at SSA level in order to provide forecast of sales on monthly basis. The channel partner will manage the inventory list and upgrade of software/patches.
- In case any additional things are required by the customer, which need to be serviced by BSNL, it should be brought to the notice of BSNL Nodal Officer in SSA / SSA Head / CGM / Enterprise Business unit in corporate office, so that modus operand rates could be decided for the same.
- The channel partner will help BSNL in building marketing and sales collaterals. The channel partner will provide best practices for managing service delivery. A monthly feedback of the usage, numbers of customers, revenue generated through MNS services are to be furnished to SSA / Circle as well as EB unit of corporate office.

6. PARTNER MANAGEMENT, SYSTEM INTEGRATOR (NATIONAL, CIRCLE & SSA LEVEL)

6.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Steps for Empanelment of Vendors & System Integrators.
- Finalization of Rates
- Allocation of works.
- Single window approach.
- Financial Powers for Execution of Projects.
- Model Eligibility criterion for Network Integrators.

6.2 INTRODUCTION

In enterprise core business, recognizing the surety of timely end to end delivery of the service has always been a challenge. Based on the need of customer & field units according to the challenges being faced in the business, guidelines have been modified from time to time. However, owing to the increased competition and in order to ensure ease of business in the current market scenario, still a need was being felt to bring some more changes in these guidelines to enhance the enterprise business by empowering field units.

A number of important customer's viz. Corporate Houses, Nationalized/Private Banks, Financial Institutions, State Governments, Educational Institutions and various Micro Small and Medium Enterprises need dedicated connectivity for its business needs. Also at most of the occasions they look toward connectivity provider for establishment of Private Wide Area Network and complete networking solution for them on turnkey basis including supply, installation, integration and maintenance of networking equipment. Some of the organizations are also inviting bids through open tender for providing leased connectivity and for setting up of WAN for them. In order to acquire and maintain the business, Telecom Circles have to participate and compete in the tenders alone and with other service providers.

One of the major activities for providing total Network Solutions is procurement of networking equipment & its integration in the network. Since such projects are time bound, it may not be possible to follow normal procurement procedure for procurement of equipment and service required to establish the networks on account of the various reasons such as:

- Projects being time bound and are to be completed within the timeframe specified by the customer.
- Enormous delay will be encountered for finalization of the tender and we may end up selecting the lowest bidder who may not be a reputed vendor or the equipment he offers may not be meeting the requirement of the customers.
- The procurement process for such equipment needs to be looked into on a different perspective. Here the customer is going to pay the cost of the equipment. BSNL is adding margin over it.
- The components involved in the network design are decided according to the requirement of the customer and the equipment are available with limited vendors.

Taking the above aspects into account, procedure for meeting such requirements has been approved by BSNL management which is indicated below:

6.3 STANDING COMMITT EE/EMPANELMENT OF VENDORS

Each circle may constitute a Standing Committee for procurement of equipment/empanelment of equipment suppliers /Network Integrators required for execution of turnkey projects. The committee will be consisting of SAG officers from CM/CFA/CN-Ent Verticals and BA Heads (wherever required). The broad constitution of the committee may be:

- GM/Sr. GM/PGM (NW-CFA/CM/CN)
- Business Area Head (Optional, case to case basis)
- GM/Sr.GM/PGM (EB)
- GM/Sr.GM/PGM from Finance, available at HQ (other than IFA) (In cases where GM level officers of finance are not available, DGM/Jt.GM/Adl.GM can be taken)

The Standing Committee constituted will finalize the list of equipment normally required for such projects along with details of reputed OEM/Vendors. The committee may invite offers from OEM/Vendors/Network Integrators from open market for major equipment taking into account pre-qualifying factors such as Vendors' Annual Turnover, supply performance during last three years, Ability to supply equipment within short period, Commitment to maintain the equipment etc.

Based on the pre-qualification parameters, the Standing Committee shall empanel vendors/OEMs/Authorized Channel Partners of OEMs for each make & model for various networking products like Computers, Computer related software & peripherals, servers, Modems, Routers, Remote Access Servers, LAN Switches, ISDN backup devices, EPABX, MUX etc.

The panel of vendors and System Integrators finalized by the committee shall be approved by CGM of the Circle.

6.4 FINALIZATION OF RATES/PRICES

For participation in any bid for execution of the project, the standing committee shall invite sealed quotations from these empanelled vendors/Integrators for various types of equipment for finalization of the rates. The quotation shall specify validity of the prices, delivery period, penalty, AMC etc. The rates for such equipment shall be finalized after observing all the formalities. Depending upon the requirements, order could be placed on the empanelled vendors at the finalized rates. However, before placement of Purchase Order, the reasonableness with reference to prevailing market price must be ensured.

For participation in Projects through open tender in order to be competitive, standing committee to explore the best rates with empanelled vendors.

It may not be possible to fix the prices of all the items as depending upon the requirement of the customers, there may be slight variations in the specifications. This standing committee could invent the best prices of such items with these selected vendors and place orders on any of the empanelled vendor at such price.

In a situation when the customer desires to expand the existing network, the procurement of add on equipment becomes proprietary in nature. Keeping in view the requirement of the customer and the fact that ultimately the customer will be paying for the cost of equipment, this Standing Committee may finalize the prices of proprietary equipment as above.

6.5 TIE-UP WITH NETWORK INTEGRATORS/SYSTEM INTEGRATORS

A number of network/system integrators (SIs) may be keen to join hands with BSNL for participating against a specific tender or for networking requirements of the enterprise customers and for the projects BSNL needs to execute for various customers. Such Network Integrators/solution providers (SIs) can be empanelled by the Standing committee based on various factors such as Past experience in Networking, Financial strength, their level of presence in the country, their tie-up with various Networking equipment suppliers etc.

When any turnkey project is to be executed, bids can be obtained from these pre-qualified bidders and work awarded to any of them after following normal selection procedure. The AMC can also be awarded to them for maintenance of end equipment at customer premises. The agreement/MOU with Network Integrators can be made with/without supply of equipment.

6.6 ALLOCATION OF WORK OF NETWORK INTEGRATION & SUPPLY

It is appreciated that, on-Boarding of customer, on nomination basis is most difficult and an important step in Enterprise Business Chain. Though BSNL is having its own Sales Teams and mechanism but the help of SIs is very crucial as they are domain knowledge experts. BSNL should encourage SIs to bring on board more and more customers on behalf of BSNL. SI who makes all efforts in On-boarding the customer should be extended all out support and shouldn't be subjected to undue competition.

But it is also a fact that most of the business on nomination comes out of customer's faith in the fair and transparent policies of BSNL at large. It becomes more important when the end customer is Government or its subsidiary and awards work to BSNL on nomination basis, BSNL itself being a Govt. Company. So, with a larger business interest in view, the policy of "Bring It Get It" on back to back basis can only be adopted in rare cases where the client gives clear choice for a particular SI, with its rates and the solution. Otherwise, the prevalent practice of exploring best rates from empanelled vendors/SIs by the Circle Standing Committee should continue.

However, the efforts of SI can't be undermined in bringing the customer on board may it be a Government or Private and involves continuous visits presentations and perusals at different levels and to appreciate the same and in order to give an edge to such SIs (Incumbent SI), who nurtured the business, must be given a choice if he is eligible and can meet the competition by way of providing "First Right of Refusal" at the L1 rates, determined by existing sealed bid method from the eligible sources.

In case the incumbent SI is non L1 and chooses not to accept L1 rates, the L1 SI/Vendor has to work on his quoted rates. In case L1 SI/Vendor refuses to work, then he shall be debarred for one year to participate in tender from date of refusal, along with other penal actions under empanelment. The genuineness of rates however would continue to be vouched by the Circle Standing Committee. A model eligibility criteria for selection of network integrator is enclosed for reference.

6.7 SINGLE WINDOW APPROACH

For execution of such projects, the circle should nominate one SSA/Officer who shall be the interface with the customer for all activities such as issue of demand note, collection of payments, customer support, coordination with customers etc.

Option may be given by the Telecom Circles to prospective/existing customers that they can source their equipment from market or through approved vendors of BSNL. In case they opt for BSNL option, the cost of equipment (CAPEX/OPEX /Mix thereof) will be paid by them to BSNL and in turn, BSNL shall make similar terms of payment with SI.

In turnkey projects, BSNL will undertake entire execution responsibility of the project. The project cost indicated to the customer shall be inclusive of equipment cost, project management cost, investment cost overheads and profit margin. Typical profit margin of 15% may be included over and above all the costs but it may vary from project to project depending upon the nature of the project, competition, timeframe for realization of investments made in the project.

Factoring in of the License Fee: In this regard, CA Cell circulars/instructions as issued from time to time may be referred please. The license fee is over and above 15% BSNL margin, accordingly, financial viability may be duly ascertained. Also, Circulars from Finance Enterprise vide no. BSNL/Ent. Fin/9-1/2020/, dated 18.03.2020 and BSNL/Ent. Fin/9- 1/2016/, dated 08.03.2018 & this office Circular No BSNLCO- EBII/19/1/2020-EB-II dated 19.08.2020 may please be referred for taking care of additional 8% (or as applicable) of "License fee" in all EB projects.

6.8 FINANCIAL POWERS FOR EXECUTION OF TURNKEY PROJECTS

The Heads of Telecom Circles may execute such projects for which procurement is up to ₹10 crore per annum. For projects beyond ₹10 Crore per annum, the proposal may be referred to BSNL HQ for approval.The above financial powers delegated to Heads of Telecom Circles should be exercised in consultation with IFA and not to be delegated below.

6.9 MODEL ELIGIBILITY CRITERION FOR NETWORK INTEGRATORS

BSNL requires services of System/Network Integrators, who will be responsible to supply network equipment, configuration and integration with existing network, operation, maintenance and support related to customers.

The Network Integrators shall be categorized as National System Integrator/Circle System Integrator/Circle-Silver System Integrators and basic structure and scope would be as below:

6.9.1 System Integrator(SI) Structure:

In case the particular business needs the delivery in more than three Circles and the Circle, despite of all efforts could not empanel any National SI; the condition can be waived on satisfaction of CGM on case to case basis.

Table 7.

Category of SI	**Basic Criteria**		**Scope of Service**
National	Average Turnover(for IT/Networking business) for last two years	₹ 20 Cr.	All the business of
	Bank Guarantee**(BG)**	₹15 Lakh	

	Minimum Experience of WAN Implementation on turnkey basis.	20***Projects****	the Circle.
	Minimum Support Centre	**	
Circle	Average Turnover(for IT/Networking business)for last two years	₹ 3 Cr.	All business, of the Circle provided, execution limited to three Circles#.
	Bank Guarantee**(BG)**	₹3 Lakh	
	Minimum Experience Of WAN Implementation on turnkey basis.	5***Projects****	
	Minimum Support Centre	**	
Circle-Silver*	Average Annual Income as per ITR or Turn over as per balance sheet as applicable, for last two years	₹20 Lakh	All business, of the Circle provided, execution limited to home Circle or part of Circle
	Bank Guarantee**(BG)**	₹ 50,000	
	Minimum Experience of WAN Implementation on turnkey basis.	2***Projects****	
	Minimum Support Centre	**	

*Experience in EB Core Business including Computer Networking, ILL/ MPLS-VPN/ MNS etc. having number of Projects equal to the respective Criterion of the System Integrator as mentioned above, with work per FY equivalent to minimum BG.

** For Support Centers, applicant needs to give undertaking as per its category that SI shall work on PAN India (National SIs) or PAN Circle basis (Circle and Circle-Silver SIs) as applicable.

*** The eligibility criterion for Circle-Silver category can be relaxed by CGMs in consultation with the standing committee for the applicants such as qualified Engineers, experienced telecom/IT professionals etc. The monetary limit for any project would be ₹ 50 Lakh in this category.

Once a SI is empanelled in National Category in any of the Circle, it can get empanelled in any other Circle with a consent letter (Appendix-A). Consent would authorize its home Circle to revoke its BG on the advice of the additional consented Circle. Also, a Circle SI can become SI of any other Circle(s) of its choice on submitting a consent letter as above with an additional BG of ₹1 Lakh per Circle.

NTR Circle would be treated as a Circle with its geographical territory as NCT, Delhi for the purpose of SI empanelment and delivery of service.

Detailed Eligibility and Operational Criteria of SI:

Table 8.

SN	National & Circle SIs	Circle-Silver SIs
a	SI shall be an IT/Networking sector company.	SI may be an Individual or Proprietorship /partnership Concern.
b	SI or its parent company should be a public limited or private limited company registered in India.	SI may be an Individual/ Proprietor/ partnership Concern/LLP/Company and registered as per commercial laws to undertake the activities mentioned in scope of empanelment.
	TheSIshouldhaveavalidCST/StateVAT/TIN/GSTregistrationcertificateasapplicable.(Copies of relevant tax/registration certificates to be submitted before any work order to SI).	
c	Each applicant for its empanelment as SI will need to submit refundable Security Deposit (SD)of ₹1Lakh and ₹50,000 for National and Circle Level empanelment respectively ,in the form of a Bank Guarantee from any scheduled bank valid for One year.	Each applicant for its empanelment as SI in Circle-Silver category will submit refundable Security Deposit (SD) of ₹ 10,000 in the form of Bank Guarantee from any scheduled bank valid for One year or a cash receipt of BSNL fort this purpose.
d	A Bank Guarantee (BG) valid for five and half years shall be submitted by applicants once selected for the empanelment of ₹ 15 Lakhs and3 Lakhs for National and Circle level Sis respectively for abiding by the general rules of empanelment agreement. The refundable SD of ₹1.0 Lakh and ₹50,000 respectively submitted at the time of application for empanelment would stand released thereafter.	A Bank Guarantee(BG), valid for five and half years shall be submitted by applicants once selected for the empanelment of ₹ 50,000 for abiding by the general rules of empanelment agreement. The refundable SD of ₹ 10,000 submitted at the time of application for empanelment would stand released thereafter.
e	SI shall also submit additional PBG of at least5% of the P.O. value, whenever a work is awarded to Network/ SI valid for the duration of the project. However, in tender cases SI shall submit EMD/PBG as per customer requirement on back to back basis.	SI shall also submit additional PBG of at least5% of the P.O. value, whenever a work is awarded to SI valid for the duration of the project. However, in tender cases SI shall submit EMD/PBG as per customer requirement on back to back basis.

f	SI shall be a direct owner of technology or have a direct teaming agreement with each of technology companies directly or with their authorized channels that form the core building block for WAN or related project implementation. The core building blocks may be classified as servers, computers, computer peripherals, routers, LAN Switches/hubs, firewall, leased line modems, ISDN backup devices, connectors. and basic computer related software etc.	SI shall have tie up and technical arrangement directly with the technology company or thorough its authorized dealer whose equipment has been used in delivery of the WAN/LAN so as to ensure long term support to the core building block for WAN/LAN or related project implementation. The core building blocks may be classified as servers, computers, computer peripherals, routers, LAN Switches/hubs, firewall, leased line modems, ISDN backup devices, connectors and basic computer related software etc.
g	The SI should provide letters of support from OEM or its authorized channels of OEM stating that their solution will be supported on the platform proposed by SI for minimum two years and as per customer requirement.	The SI should provide letters of support from OEM or through its dealer/associate stating that the solution/equipment will be supported at all standard platforms for minimum two years and as per customer requirement.
h	SI shall provide a 24X7 help center either web- based or IVR based. SI shall ensure consultation, assistance and advice within four hours or as defined in SLA entered with the customer. In other cases, complaints may be attended within eight hours.	SI shall maintain 24X7 help number. SI shall ensure consultation, assistance and advice within four hours or as defined in SLA entered with the customer. In other cases, complaint may be attended within eight hours.
i	The technical team of SIs will assist BSNL in coming out with the cost effective solution for the customers and will be required to give a joint presentation with BSNL to customers. The software upgradation for the first year shall be provided by the SI free of cost. However, SI will continue to provide up gradation on chargeable basis for subsequent years.	
j	SI shall support SLA requirements of BSNL customers and ensure its compliance. In case SLA commitments are not met, SI shall be responsible for payment of penalties, if any, imposed by the customer.	
k	Validity of the empanelment agreement shall be Five years, initially and renewal for two years, based on performance.	
l	ISP should not be allowed to become SI, and If any SI after registration becomes ISP then the SI agreement should be cancelled. Accordingly, previously empanelled SIs also to be reviewed.	

The SI Policy would be non-exclusive, walk-in & Open for all eligible categories and would remain hosted on Circles websites under "Business Opportunity Section".

The policy would be operated in sync with the EoIs of Circles, having attendant conditions mentioned herein above.

6.10 PROCUREMENT GUIDELINES

CPNE Guidelines (Initially issued on 04.09.2003, latter majorly modified on 15.10.2015 and lastly on dated 17.07.2017) are meant for establishment of Customer's Private Network as mentioned vide its preamble- "… connectivity provider for establishment of Private Wide Area Network and complete networking solution for them on turnkey basis including supply, installation, integration and maintenance of networking equipment". However, it has been found that Circle/field units try to work out solutions under the ambit of a single policy or guidelines issued from BSNL CO. specially CPNE guidelines. This happens as Circle EB unit has to deal with all sort of situations for which solutions are being provide through different sections of BSNL CO. as mentioned above.

In view of above, Circles are advised and clarified for the following:-

In normal process the prescribed procedure as per procurement manual needs to be adopted for products and services. The procedure brought out in these CPNE guidelines for SI empanelment (SI policy) is made following general financial and commercial principle to minimize the delays in delivery of turnkey services to Enterprise Customers striking out balance between the business interests of BSNL and the basic principles of procurement of products and services. Moreover these CPNE Guidelines have been envisaged to ensure fast delivery of turnkey business to BSNL's Enterprise customers where customer pays for it's own network establishment and seeing the urgency of the situation with very limited time while keeping full regard to basic principles of procurement of products and services and needs to be dealt within the framework of guidelines for enterprise customer's private network establishment only- Customer-wise and project based i.e. on case to case bases and not for procurement of the material for general planning purpose for multi projects.

Accordingly, Circles are requested that CPNE guidelines may be exercised for Establishment of Customer's Private network only in conjunction with applicable BSNL procurement manual and CVC Guidelines like e-tendering etc. bringing transparency and more automation in the system.

CPNE guidelines are not applicable for "Last Mile Connectivity" which requires laying of OFC, RF modems etc. For the complex field requirements exploration and analyses for all available policies/ guidelines / MoU/ agreements etc. like from New Business, VAS, MM Cell and others may be done to best suit in the situation at hand and accordingly, the bigger project/s may be undertaken applying different applicable policies guidelines etc. and best suited solution may be carved out well within the framework of statutory and CVC guidelines in the best interest of BSNL and the esteemed customers. Like, for MNS subject matter, Circles are requested that the concerned nodal unit needs to be consulted for further update/necessary instructions/permission/action.

For tender cases for customer's private network establishment, SI should submit EMD/PBG for the SI part.

For License fee of 8% (As applicable presently), refer- CA Cell circulars/instructions as issued from time to time. The licence fee is over and above 15% BSNL margin, accordingly, financial viability may be duly ascertained (Also, Circulars from Finance Enterprise vide no. BSNL/Ent. Fin/9-1/2020/, dated 18.03.2020 and BSNL/Ent. Fin/9-

1/2016/, dated 08.03.2018 & this office Circular No BSNLCO-EBII/19/1/2020-EB-II dated 19.08.2020 may please be referred for taking care of additional 8% (or as applicable) of "License fee" in all EB projects).

For Escrow account opening, fixed revenue share option is not available with empanelled SIs under CPNE guidelines, moreover, finance vertical needs to be consulted in the matter as per available instructions.

6.11 CONCLUSION

Service to the Customer is always a challenge. Recognizing this, the end to end delivery and that too timely, in this era of competition Management is very much keen to deliver and the content of this is one of the step towards achieving the Goal.

7. HSSP (HOTSPOT SERVICE PROVIDER), MNS PARTNER, CSP PARTNER FOR CLOUD SERVICES

7.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Enterprise Wi Fi model, Managed Network Services and Cloud Service provider.
- Responsibilities of various Entities
- Various terms and conditions
- Benefits and Challenges.

7.2 INTRODUCTION (HSSP)

BSNL is providing Telecommunications services to Enterprise customers such as Government customers, PSUs, MNCs, Educational Institutions & other customers. There is large scope of business opportunity to provide Wi-Fi hotspot services for these customers. BSNL has deployed Wi-Fi core system with main at Bangalore and DR at Pune.

BSNL Corporate Office has instructed all the telecom circles vide letter no. 64-491/2020- NWP-BB dated 25.04.20 from GM (NWP-BB), BSNL CO to engage public Wi-Fi providers for providing Wi-Fi services under Bulk user plan to Enterprise customers on revenue share basis. Under this policy the PWPs shall be required to do the following:

- Supply, install, commission, operate & maintain Wi-Fi hotspot location equipment as detailed in the enclosed policy document.
- BSNL shall extend bandwidth as per tariff plans purchased by the end customer. The public Wi-Fi partner shall be responsible for extending the bandwidth connectivity from this single point to the remaining access points at that hotspot location including electrical wiring starting from UPS, optical, data, LAN cabling etc. For non-feasible locations, PWP can establish fiber or radio backhaul links to BSNL nearest point of presence.
- Access points shall be integrated with OEM's WLC and create CAP/WAP tunnel as per standard CAP/WAP protocol.
- The PWP shall plan the hotspot locations by site survey, plan logistics etc. and get the acceptance testing completed. The location/address details along with Lat/long of the HS/AP shall be furnished to BSNL and the Wi-Fi service provider shall not relocate the HS/AP without the concurrence from BSNL to comply with the security requirement of Govt./DoT/Regulator/LEAs.
- The Wi-Fi partner shall be fully responsible for the operation and maintenance of HS/APs/WLCs/EMSs being deployed under this partnership and shall have back to back agreement with OEM of AP/WLC.
- PublicWi-Fi Partners shall proactively market Wi-Fi Services educating the Customer on the usage/benefits of the service & BSNL tariff plans etc. In consultation with BSNL shall lock the marketing lead with the concerned partner only.
- The PWP shall carry out formalities for customer acquisition, assisting customers in filling up CAF (customer acquisition form), and subscription of BSNL services by residents in a proactive manner. The Wi-Fi partner shall carry out required co-ordination with BSNL commercial/booking offices for completion of commercial formalities.

7.1 ENTERPRISE WI-FI POP OPEN POLICY

7.2.1 Enterprise Wi-Fi Model

- Public Wi-Fi providers/partners (PWPs) shall be permitted on first come first served basis as per the requirement of SSAs/Circles.
- The PWP can deploy the APs both indoor and outdoor using the available models (including RAPs with mesh APs).
- The public Wi-Fi provider (PWP) shall supply, install, commission, operate and maintain the PoEs/APs/UPS in customer premises.
- BSNL reserves the right to broadcast its own SSID other than captive traffic in future with addition additional bandwidth provision.
- The required bandwidth for provisioning of bulk user plans shall be bundled with the various plans. Beyond this bandwidth, incremental BW charges shall be applicable for which BSNL will raise a separate invoice to the bulk customer. No revenue share shall be payable to the public Wi-Fi partners for the cumulative total bandwidth charges beyond bundled BW.
- Internet shall be unlimited.
- Captive portal for customer authentication shall be customized as per client requirement. SSID will be configured as for the client partner choice.

7.2.2 Responsibilities Of Public Wi-Fi Partners

- The public Wi-Fi partners engaged through the open policy shall supply, install, commission, operate and maintain Wi-Fi Hotspot location equipment such as Access Points (which may be indoor or outdoor), UPS, POE, racks and associated installation materials at hotspot locations.
- BSNL shall extend bandwidth as per traffic plans purchased by the customer. The public Wi-Fi partner shall be responsible for extending the bandwidth connectivity from the single point to the remaining access points at that hotspot location including electrical wiring starting from UPS, optical, data, LAN cabling etc. For non-feasible locations, PWP can establish fibre or radio backhaul links to BSNL nearest point of presence.
- Access Points (APs) shall be integrated with OEM's WLC and create CAP/WAP tunnel as per standard CAP/WAP protocol. Integration of deployed Access Point/POE/UPSs with the WLCs/EMS/CMS shall be responsibility of the Public Wi-Fi partner and BSNL shall not bear any expense on account of it.
- The PWP shall plan the hotspot location by site survey, plan logistic etc. and get the acceptance testing etc completed. The location/address details along with Lat/ long of the HS/AP shall be furnished to BSNL and Wi-Fi service provider shall not relocate the HS/ AP without the concurrence from BSNL to comply with the security requirement of Govt/DoT/Regulator/LEAs.
- The Wi-Fi partner will be fully responsible for the operation and maintenance of HS/APs/PoEs/WLCs/EMSs being deployed under this partnership and shall have back to back arrangement with OEM of AP/WLC.
- Detailed scope of work regarding installation of Wi-Fi hotspot, integration details of WLCs/DHCP with BSNL existing WAG/DHCP and integration of EMSs/CMSs shall be discussed and finalized with the Wi-Fi NoC team at the time of validation/testing.

- **Promotion and Marketing of services** - Public Wi-Fi Partners shall proactively market Wi-Fi services by educating the customer on the usage/benefits of the service and BSNL tariff plans etc. in consultation with BSNL. BSNL shall lock the marketing lead with the concerned partner only.
- The public Wi-Fi Partner shall carry-out formalities for Customer acquisition, assisting customers in filling up of CAF (customer acquisition form), and subscription of BSNL services by residents in a proactive manner. The Wi-Fi partner shall carryout required co-ordination with BSNL commercial/booking offices for completion of commercial formalities.

7.2.3 Responsibilities Of BSNL

- BSNL shall provide space and power at central location for installation of WLC/EMS free of cost. No co-location charges shall be taken from the OEM/authorized partner of the OEM.
- The B/W or backhaul shall be bundled by BSNL as per the bulk user plan. To start with a minimum of 10 Mbps will be given and can be scaled up 100 Mbps depending upon the usage/sessions/users/throughput which will be detailed by NoC. Initially plans ranging from 10- 60 Mbps are proposed for Wi-Fi Hotspots with maximum of 10 Access Points. For larger Wi-Fi plans ranging from 11- 20 Access Point, backhaul of 100 Mbps may be bundled with the plans for better customer experience.
- BSNL shall be responsible for integration of WLC/EMS with BSNL Core.
- Provisioning and billing shall be BSNL's responsibility.
- BSNL shall provide necessary support to the PWP/OEM/authorized OEM for integration with the BSNL core network, marketing strategies and use of prepaid wallet system etc.

7.3 ELIGIBILITY REQUIREMENTS F PUBLIC Wi-Fi PARTNERS (PWPS)

- Any registered/partnership/proprietorship firm/society including existing telecom infra provider, having minimum turnover of Rs. 5 lakhs per year during the last three consecutive years shall be eligible.
- The register/partnership/proprietorship firm/society shall have worked with Telecom Service Provider(s)/ISP for minimum one year.
- Existing FTTH franchisee/ franchisee with good record of providing FTTH connection/BSNL services shall be eligible to become public Wi-Fi partners.
- One time registration charges of Rs. 10,000/- (non-refundable) and applicable taxes shall be taken at the time of registration.

7.4 REVENUE SHARE OF THE WI-FI SERVICE PARTNERS (PWPS)

- For feasible areas where BSNL bandwidth is available within 250 meters of the customer premises, Public Wi-Fi partner (PWP) shall be responsible for extending the bandwidth connectivity from the single point to the remaining access points.
- Revenue share to the PWP shall be at 25% of the net revenue for 1-4 APs plans.
- Revenue share to the PWP shall be at 28% of the net revenue for 5-10 APs plans.

- Share of revenue to the PWP shall be @30% of the net revenue for plans beyond 4 APs and 11-20 APs plan is provided.
- For non-feasible areas where the Public Wi-Fi Partner (PWP) is required to extend bandwidth through radio antenna or through optical fibre arrangement from nearest PoP of BSNL, additional 8% of the revenue share (net realized revenue) on and above revenue share shall payable to the PWP.
- Upon successful implementation of 3 projects under such arrangements, the Public Wi-Fi Partner (PWP) shall be considered for providing large solutions in BSNL's bid proposal to other Government entities. This shall encourage PWP for generating more business leads to BSNL.

7.5 PAYMENT TERMS

- BSNL shall not pay any amount, out of security deposit collected by BSNL from Wi-Fi bulk customer, if any.
- The plan configuration and billing for bulk customer is already available in CDR system. Accordingly, the revenue share and tagging of the Public Wi-Fi Partner's shall be done in the Clarity and CRM systems.
- The revenue share report shall be published in CDR using FMS system. FMS system shall provide revenue report by taking annual payments, cancellation and refunds into account. The revenue report is generated after realization of revenue for any given bulk customer.
- After generation of revenue report on FMS, since the revenue share and tagging of the Public Wi-Fi Partner is available in Clarity and CRM systems, payment of bills to PWPs shall be made centrally at Circle level, based on the online report of revenue share. One central location in the circle shall be responsible for the payment of all PWPs in the circle and payment shall be made within one month from realization of revenue from bulk user customer.
- The public Wi-Fi provider shall receive up to 90% revenue share after deduction of 5% TDS margin and SLA after payment of bill by the customer. The public Wi-Fi partner shall submit invoice for 100% amount including GST. The withheld amount shall be settled after confirmation of satisfactory SLA by customers.
- In the enterprise Wi-Fi, customers shall be shared in advance for the annual charges. The PWP partner can be paid revenue share on quarterly basis for 25% of the annual charges for first three quarters. In fourth quarter the charges shall be paid after settlement of SLA/related penalties agreed with customer.
- Rebates and compensation given by courts/TRAI/ any regulatory bodies to the customers, due to service deficiency, if any, shall be deducted from the due payment to the channel partner.
- Any discrepancy found in the payment settlement shall be mutually discussed and resolved. Balance of payments arising due to any reason shall be adjusted in future. In case of bill cancellation (due to wrong billing etc.) later, any excess payment made to Public Wi-Fi Partner (PWP) shall be adjusted accordingly on quarterly basis.
- For the Wi-Fi bulk user plans, the SLAs agreed with customers shall be applied back to back on the PWP. However, the Public Wi-Fi Partner shall not be e levied penalty for fault on part of BSNL.

- Since present prepaid wallet system is not suitable for high amount bills, the online payment method of revenue share shall be separately developed. Prepaid wallet of payment to Public Wi-Fi Partner (PWP) shall be implemented after further technical feasibility and successful testing of the same by ITPC.

7.6 DURATION OF CONTRACT PERIOD

- Duration of contract shall be 3 years from the date of award of work. After one year, the contract can be extended for two years on satisfactory service to customer.
- Renewal or extension of the agreement after three years period will be based on the performance of the Public Wi-Fi Provider (PWP).
- There shall be a lock in period of minimum three years for the PWP in order to ensure maintenance unless BSNL terminates the contract, the bidder is bound to provide services for three years. The exit during lock in period shall carry penalty in terms of surrender of all the equipment to the BSNL at no cost.

7.7 TERMINATION

- The agreement shall be terminated by giving a one month notice to the Wi-Fi partner in case of:
- Failure to perform any obligation(s) under the contract.
- Equipment does not perform satisfactory in the field in accordance with the satisfactions.
- Failure to meet the SLAs parameters continuously for 3 months.
- The agreement may also be terminated by mutual, written consent of the both parties by giving 6 months notice.

7.8 RESPONSIBILITIES OF OEM/AUTHORIZED PARTNER OF OEM FOR ACCESS EQUIPMENT AT CENTRAL LOCATIONS

- Wi-Fi Access Systems like WLCs, EMS/CMS shall be supplied, installed and commissioned by respective OEMs/authorized partner(s). All the OEMs/authorized representative(s) of OEMs of WLCs, EMSs for shall be allowed to deploy new Access Systems or augment existing Wi-Fi Access Infrastructure of BSNL at 5 RPOP locations namely Bangalore, Pune, Chennai, Kolkata and Noida.
- All the OEM shall be offered to install and integrate Wi-Fi access systems (like WLC, EMS) with BSNL's Wi-Fi core system and testing test one deployed Wi-Fi access system within six months at the location decided by BSNL.
- A suitable agreement shall be signed by PM NOC Bangalore.
- WLC shall be installed at RPOP locations of BSNL in 1 + 1 configuration.
- The co-location of equipment by OEMs or authorized partner shall be permitted by BSNL. BSNL shall provide space, electricity, bandwidth for connecting the WLC free of cost.
- WLC shall be Wi-Fi alliance certified for passport TM (release 2 and above). It should have proven and security hardened operating system and shall provide network services like QoS, 802.1Q, Telnet, Radius, WPA, 802.11x, etc. It should comply to security standard such as 802.1i, WPA, WPA2, etc. Security guidelines of

DoT/Government of India/LEA/Regularity authority issued from time to time shall be adhered to.

- BSNL shall facilitate the integration of deployed Wireless Access System (WLC, EMS/CMS) with BSNL existing core system.
- The wireless LAN (WLC) supplied by the Wi-Fi shall be capable of managing Multiple Access Points from central location. WLC shall be able to provide the status for each Access Point being managed and shall be able to remotely handle configuration, reboot, update or firmware, backup of a group (one or more) of Access Points according to a schedule.
- EMS/CMS supplied by Wi-Fi Access System Providers should have the capability to integrate with NMS in future. The cost shall be borne by the OEM/authorized partner of OEM.
- Further, helpdesk for management, trouble ticketing. etc. of the deployed access and hotspot equipment shall be set up by the OEM/ authorized partner of OEM. The supplier shall provide a portal for booking faults and share the user id and password to all the node Incharges/NOC/Management for booking/closure of dockets and taking out necessary reports.

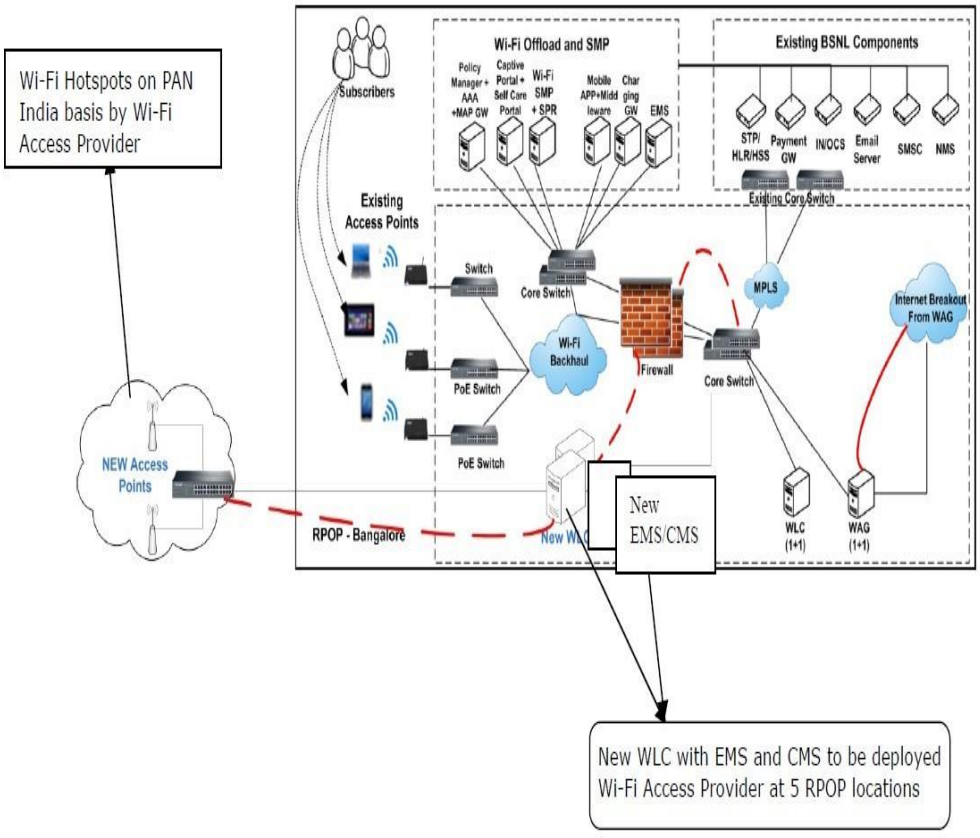

Figure 22: Typical Wi-Fi Architecture Diagram

7.9 INTRODUCTION (MNS)

Managed services means taking responsibility for customers' complete IT and Telecom needs including MPLS, ILL, P2P Lease Line &VPNoBB. Depending upon the type

of services the extent of management, there could be different flavor of services. The services offered to customer will be end to end services that include all the following criteria:

1. Providing complete networking solutions as BSNL MNS Services on OPEX Cost basis to customer.
2. Signing the Service level agreement with the customer along with BSNL.
3. Remote configuration and troubleshooting.
4. Proactive monitoring.
5. CPE Title will be with the channel partner.
6. Providing last mile on RF on OPEX basis for technically non feasible cases.

BSNL **Managed Network Services** is a fully managed Secured Data services, providing a truly one-stop and a complete experience that significantly reduces risks and complexities involved in implementing and maintaining a robust IP network. It brings together all of a business' communications needs in an integrated offering.

With the promise of an integrated platform with **one-stop convenience and fully managed experience**, BSNL Managed Network Services is an All-in-One comprehensive bundle of hardware, connectivity packages and managed services. It is a solution that simply, affordably and reliably supports your business.

The "One-Stop" promise delivered by BSNL Managed Network Services is beyond technical integration of the best-in-breed network and hardware setup. It offers truly executable technical and business propositions for your business today:

- No CAPEX
- No risk of technical obsolescence
- Scalable according to changing business needs
- One helpdesk number to call for troubleshooting and fault resolution.
- Integrated customer report (Web Based) giving you a complete view of your network

7.10 COMPREHENSIVE SERVICE PACKAGE:

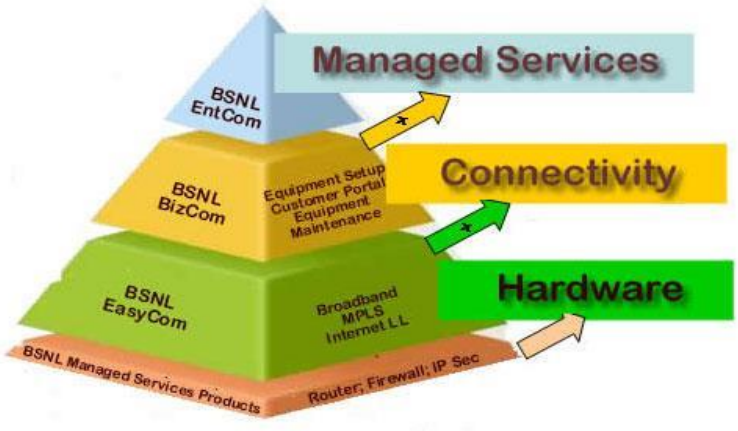

Figure 23: COMPREHENSIVE SERVICE PACKAGE

To ensure one stop solution for all connectivity needs, better manageability and accountability, BSNL offers Managed Network Services which includes Enterprise Broadband, Internet and MPLS VPN connectivity as completely managed offering. With an integrated service option, you would enjoy benefit of an SLA backed network services with

convenience of being supported by single helpdesk number for your network connectivity, hardware related issues. Other benefits include:

- End-to-end Turnkey Implementation (including CPE)
- Proactive management through state of the art NOC
- Periodic reporting facilitating trend analysis
- Capability to provide VPN connectivity from any part of the country.
- Managed Firewall as well as IP Sec

These services are designed for a wide range of environment, from enterprise-scale organizations to small branch offices. The CPEs chosen is universal and delivers the performance, availability, and reliability to scale mission-critical needs. Built on a foundation of comprehensive routing and switching management capabilities the Routers installed help maximize the power of your organization's network with unified network services, integrated security, and application intelligence. These Routers are ideal platform for delivering Secure & managed IP connectivity to an organization.

7.11 MNS PARTNER

BSNL is providing unique opportunity to Builders, Resident Welfare Associations (RWAs), Telecom Infrastructure Providers, Franchisees, System Integrators, DIDs, Franchisees of BSNL, any registered company or society, Local Cable TV Operators, Telecom Service Providers, BSNL Retailers, Direct Selling Agents Start-ups or local entrepreneurs for providing BSNL Telecom Services in the existing and upcoming residential/commercial complexes and all other parts of rural and urban areas on revenue sharing basis.

Where the Channel Partners Role involves building or extending and maintaining BSNL Network and its customers and to explore the possibility of expanding the BSNL Customer base through extension of last mile connectivity in provisioning of BSNL Services by the prospective partners and to expand the Telecom footprint for BSNL across India.

Attractive Revenue Sharing Model with commission up to 50% of Revenue generated along with a well known branding of BSNL whose services are available in nook and corner of the Country along with host of many other benefits.

7.11.1 Geography

- Service presence throughout India.
- Can opt for city or State level Franchisee Provider.

7.11.2 Services

- Multiple Product Range
- Product Packaging and pricing
- Product Bundling

7.11.3 Commission

- Attractive Commission Percentage
- Activity Based Commission
- Product Based Commission

7.11.4 Payments

- Real-time Revenue Share
- Wallet Based Payments
- App Based Payments

7.11.5 Web App

- Dedicated IT tools
- State of the art IT Infra
- Franchisee Management System
- Sanchar Aadhar

7.11.6 Mobile App

- Teevra App
- EPAY App
- Sanchar Aadhar App

7.11.7 Franchisee Manager

- Dedicated Franchisee Manager
- Circle & SSA Level Support Teams
- Marketing and Sales Support

7.11.8 Support Systems

- 24x7 support
- Web Based Helpdesk
- Email & Mobile Alert

Managed services are the practice of transferring day-to-day related management responsibility as a strategic method for improved, effective and efficient in built operations. Service providers have offered their business customers managed services for broadband connections VPNs, security services, and IP communications for years. Managed network services are typically offered by a **managed services provider** (MSP) on a subscription basis, with some fee that reflects the network services, bandwidth, number of users, equipment, and service level agreement (SLA) performance levels covered by the customer contract.

The MSP staff monitors the health and availability of the subscriber's network equipment and services to ensure they operate smoothly and securely. A managed services provider also offers a single point of contact for network trouble reports and a fulltime help desk for user support.

7.12 SERVICE OFFERINGS

The MSP should focus on understanding your unique service needs and meeting them with a business orientation that goes beyond offering all customers a "cookie cutter" solution. The provider should offer network connectivity in a variety of access speeds from DSL to DS3, allowing you to select the right speed for each user or remote location. The broadband access service should offer a high-speed "always on" connection in a nationwide connectivity

solution that is easy to deploy, manage, and support. The MSP should also offer business class hosted voice services in a range of equipment and feature packages with low start-up costs and affordable monthly fees. To ensure superior quality on voice calls, the MSP should maintain high QoS levels for voice traffic and guaranteed levels of service uptime.

7.13 NETWORK, VOICE & SECURITY OPERATION CAPABILITIES

The service provider should support and proactively monitor its data, voice, and security services on a 24/7/365 basis from multiple redundant Network Operations Centers (NOCs) and Security Operations Centers (SOCs). A dedicated support infrastructure ensures that the network services perform to their maximum potential, and that customers receive timely and responsive technical support. The provider should also give customers complete visibility into network status and performance via a Web-based customer information portal, so great service is extended to self-service capabilities.

7.14 THE IMPORTANCE OF SERVICE LEVEL AGREEMENTS

Service Level Agreements (SLAs) are a valuable tool for assessing how well a managed services provider maintains high levels of network performance and availability. These measurements guarantee overall network uptime, as well as response and resolution times for network problems. For greater confidence in the provider's performance, look for an MSP that backs it's SLAs with customer credits when targets are missed.

7.15 MANAGED NETWORK SERVICE SOLUTION

In a managed network services solution, we outsource the day-to-day operation and management of your network to a managed services provider. Outsourced network management offers a viable option for most communications services, including:

- **Network connections**: Broadband Internet access—including T1, bonded T1, business Ethernet, DS3, DSL, cable, and wireless broadband
- **Remote access**: Virtual private networks (VPNs) based on Secure Sockets Layer (SSL) and Multiprotocol Label Switching (MPLS) that use the Internet to provide remote sites and users with secure access to an internal business network.
- **Voice**: Carrying voice and data traffic on the same circuits.
- **Network security**: Comprehensive management of security elements to mitigate network intrusions, attacks, viruses, spam, and other threats

A managed services provider can consolidate, integrate, and manage all of these network services - giving organizations cost-effective ways to connect their business locations to each other, the Internet, and business partners.

7.16 CONCLUSION

By outsourcing to an MSP, they would be achieving increased operational efficiencies while lowering network costs by using managed data, voice and security services.

7.17 INTRODUCTION (CSP PARTNER FOR CLOUD SERVICES)

A **Cloud Service Provider**, or CSP, is a company that offers components of cloud computing -- typically, infrastructure as a service (IaaS), software as a service (SaaS) or platform as a service (PaaS).

Cloud service providers use their own data centers and compute resources to host cloud computing-based infrastructure and platform services for customer organizations.

Cloud services typically are priced using various pay-as-you-go subscription models. Customers are charged only for resources they consume, such as the amount of time a service is used or the storage capacity or virtual machines (VM) used. For SaaS products, cloud service providers may both host and deliver their own managed services to users or they can act as a third-party, hosting the application of an independent software vendor.

The most well-known cloud service platforms are Amazon Web Services (AWS), Google Cloud Platform (GCP) and Microsoft Azure.

Using a cloud provider has **benefits** and **challenges**. Companies considering using these services should think about how these factors would affect their priorities and risk profile, for both the present and long term. Individual CSPs have their own strengths and weaknesses, which are worth considering.

7.17.1 Benefits

- **Cost and flexibility:** The pay-as-you-go model of cloud services enables organizations to only pay for the resources they consume. Using a cloud service provider also eliminates the need for IT-related capital equipment purchases. Organizations should review the details of cloud pricing to accurately break down cloud costs.
- **Scalability:** Customer organizations can easily scale up or down the IT resources they use based on business demands.
- **Mobility:** Resources and services purchased from a cloud service provider can be accessed from any physical location that has a working network connection.
- **Disaster recovery:** Cloud services typically offer quick and reliable disaster recovery.

7.17.2 Challenges

- **Hidden costs:** Cloud usage may incur expenses not factored into the initial return on investment (ROI) analysis. For example, unplanned data needs can force a customer to exceed contracted amounts, leading to extra charges. Companies also must factor in additional staffing needs for monitoring and managing cloud use. Terminating use of on-premises systems also has costs, such as writing off assets and data cleanup.
- **Cloud migration:** Moving data to and from the cloud can take time. Companies might not have access to their critical data for weeks, or even months, while large amounts of data are first transferred to the cloud.
- **Cloud security:** When trusting a provider with critical data, organizations risk security breaches, compromised credentials and other substantial security risks. Also, providers may not always be transparent about security issues and practices. Companies with specific security needs may rely on open source cloud security tools, in addition to the provider's tools.
- **Performance and outages:** Outages, downtime and technical issues on the provider's end can render necessary data and resources inaccessible during critical business events.
- **Complicated contract terms:** Organizations contracting cloud service providers must actively negotiate contracts and service-level agreements (SLAs). Failure to do so can result in the provider charging high prices for the return of data, high prices for early service termination and other penalties.

- **Vendor lock-in:** High data transfer costs or use of proprietary technologies that are incompatible with competitor services can make it difficult for customers to switch CSPs. To avoid vendor lock-in, companies should have a cloud exit strategy before signing any contracts.

7.18 TYPES OF CLOUD SERVICE PROVIDERS

Customers will purchase an increasing variety of services from cloud service providers today. As mentioned above, the most common categories of cloud-based services include **IaaS**, **SaaS** and **PaaS**.

1. **IaaS providers**: In the IaaS model, the cloud service provider delivers infrastructure components that would otherwise exist in an on-premises data center. These components could consist of servers, storage and networking, as well as the virtualization layer, which the IaaS provider hosts in its own data center. CSPs may also complement their IaaS products with services such as monitoring, automation, security, load balancing and storage resiliency.
2. **SaaS providers**: SaaS vendors offer a variety of business technologies, such as productivity suites, customer relationship management (CRM) software, human resources management (HRM) software and data management software, all of which the SaaS vendor hosts and provides over the internet. Many traditional software vendors now sell cloud-based versions of their on-premises software products. Some SaaS vendors will contract a third-party cloud provider, while some vendors -- usually, larger companies -- will host their own cloud services.
3. **PaaS providers**: The third type of cloud service provider, PaaS vendors, offers cloud infrastructure and services that users can access to perform various functions. PaaS products are commonly used in software development. In comparison to an IaaS provider, PaaS providers will add more of the application stack, such as operating systems (OSes) and middleware, to the underlying infrastructure.

Cloud providers are also categorized by whether they deliver public cloud, private cloud or hybrid cloud services.

7.19 BSNL CLOUD SERVICES

BSNL Internet Data Center (IDC) is the most comprehensive cloud computing service provider in India. BSNL IDC offers cloud services in India that no other cloud service provider can. Our differentiators like being a highly secure data center, India's first Up-time Institute certified Tier III data centers, low latency network offering less than 50ms convergence, true utility usage models, globally proven integrated service management tool and a highly efficient data center cluster clearly help us overshadow other cloud service providers in India. With a portfolio of more than 17 different cloud computing services in India, we are India's most comprehensive cloud computing service provider.

7.20 COMPUTE SERVICE

Our versatile suite of cloud services in India, are capable of meeting the needs of the most demanding enterprises. We build superior solutions that take the complexity out of 'the cloud'. Our developer and enterprise IT-friendly cloud services are secure, easy-to use, fast, and designed to run complex, high-performance applications.

Critical to any company's cloud implementation, architecture and automation are integral components to the differentiation of BSNL IDC's Cloud Computing Service in India. Next

Generation Managed Cloud Platform supports both public and private cloud services with a common user interface and API, while the Cloud Control cloud management system provides self-service provisioning, configuration, and management of cloud servers, storage, and networking.

- **Customizable Cloud Servers:**Configure your servers with just the right amount of CPU, RAM, and storage for your application.
- **Flexibility:** Customize on the fly with up to 8 CPUs and 64GB RAM per Cloud Server; Data Centre located in India.
- **On-Demand Provisioning:** Use our web portal to start up a Cloud Server in few minutes, or spin up a full environment with our REST based API.
- **Cloud Networking Made Easy:** Configure ACL-based firewalls, load balancing, and set up your Cloud Servers on different VLANs all in our Cloud. It is that easy to have all of your Cloud-based needs in one place. Traffic between our MCPs is accelerated using WAN optimization.

Public Cloud: It supports on-demand provisioning of compute, storage and even networking. BSNL API is easy to use and allows scaling by automating customer operations.

Private Cloud: BSNL private cloud services in India deliver strategic versatility, corporate efficiency, and digital security. Even if customers business does not have the in-house expertise to develop and manage a private cloud, a BSNL IDC fully-managed private cloud provides increased agility while reducing both cost and execution risk.

7.21 PUBLIC COMPUTE SERVICE

BSNL Public Cloud in India, which is called as Public Compute-as-a-Service (Public CaaS for short) enables automated provisioning of virtual servers running Windows or Linux operating systems (OS) in less than 5 minutes. BSNL public cloud service includes customizable virtual servers, secure cloud networking and up to 2.5 TB of block-based storage per server. Use BSNL web-based user interface or REST-based API for easy automation and integration. It support both hourly and monthly pricing plans.

Clients can further utilize our Usage based option (pay-per-use model) for the different Compute offerings. With this sign-up clients would be able to use the following resources on truly pay per use model, paying only for the actual Resources Hours consumed.

- Virtual CPU/Hour
- Virtual RAM/Hour
- Storage (in GB)/Hour
- Network Segments/Hour
- Outbound Data Transfer/Bandwidth (per GB)/Hour
- Inbound Data Transfer/Bandwidth (per GB)/Hour

7.22 BSNL CLOUD SERVERS

- Hourly pricing and on-demand provisioning of virtual machines running Windows or Linux OS
- Flexibility to increase or decrease CPU, RAM and Storage on each Cloud Server on the fly

- 99.99% availability guarantee
- Hardware-based networking, including VLAN segmentation, customizable firewalls, load balancing, NAT and multicast
- Pay-as-you-go or prepaid pricing plans
- Role-based permissions for multiple users on a single account

7.23 SUPPORT

As a BSNL IDC Cloud Services client, you have access to:

- Free 24×7 Phone Support: 24 hours a day, 7 days a week.
- Cloud Support Centre Website : Quickly access FAQs, Videos, How-to documents, online access to experts, and more.
- Global Service Centres: Placed around the world, our Global Service Centres provide second-level support to all our global clients.

7.24 CONCLUSION

The Enterprise Business has become important organ of BSNL services. Here we have discussed the details of HSSP, MNS partner and CSP partner.

8. TENDER PARTICIPATION, EOI/RFP FUNDAMENTALS AND PROCESSES

8.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Various methods of procurement.
- Various Bidding system
- Government e-Market place
- Advantages to Buyers and Sellers.

8.2 INTRODUCTION

BSNL's aim is to procure the material of the specified quality, at the most competitive rates, in a fair, just and transparent manner. Procurement is an important activity in BSNL as about 50% of its budget is used for procurement of materials. Consequent upon Corporatization of Department of Telecom Services & Department of Telecom Operations into a Corporate Entity i.e. BSNL, a need has been felt to modify the existing procurement Procedure being followed by BSNL Corporate Office as well as by Telecom Circles so as to cut down the procurement time in the present liberalized telecom market. This is all the more necessary as BSNL is facing increasing competition in all types of services and has to respond quickly for procurement of materials as well as its utilization so as not only to keep its market share in the emerging telecom scenario but also to expand and acquire new market segments.

The procurement of materials in BSNL is usually done by inviting tenders and also through M/s ITI Ltd. against their reservation quota (as per guidelines issued by Department of Telecommunications from time-to-time).

The procurement is done at two levels viz.,

- BSNL Corporate Office
- Telecom Circle H/Q

The procurement of materials in BSNL Corporate Office is done for high value critical equipments such as large size switching equipment, transmission equipment, PIJF U/G Cables, WLL equipment & terminals and new technology equipment's etc. A list of items being procured at the BSNL Corporate Office

Items not covered in the corporate office stand decentralized for procurement by Telecom Circles. In addition, CGM Telecom Stores, Calcutta has been entrusted with the procurement of following items for some designated Circles:

- Batteries & power plants.
- Line & Wire materials.

This manual contains the detailed procedures, guidelines to be followed by BSNL Corporate Office as well as by Telecom Circles to ensure smoother and faster decision making. While the Manual aims at providing broad procedures for procurement of goods/services, the decision regarding the competent authority should be taken on the basis of the Schedule of Delegation of Administrative and Financial Powers issued by Corporate Office. For purchase without quotations and purchase of goods by a purchase committee, the delegation of powers should be referred.

8.3 METHOD OF PROCUREMENT

With the formation of BSNL as a corporate entity in a Liberalized Telecom Market where BSNL has to compete with a large number of competitors, it is imperative for BSNL to serve in the competitive environment. For such a scenario, it is essential not only to see the cost of materials being procured but also the time required for its procurement as well as successful implementation so as to make its presence felt among various competitors.

Thus, not only the cost and time factor is required to be taken into consideration but at the same time the cost of opportunity lost due to long gestation period of procurement and implementation is also to be taken into consideration i.e., the business opportunity is also one of the most important factors for implementation of any such venture/project. Hence, under such circumstances, it is essential to take an overall view for cost of material, time for procurement, method of procurement as well as business opportunity for any such venture/ project. In such a situation, the Management Committee / BSNL Board may decide the methodology to be adopted for such procurement taking into consideration cost, time as well as business opportunities as situation warrants. In addition to open tendering, the following methodologies can be adopted:

8.3.1 Negotiation Route

In a situation where the requirement is of an immediate nature and it is necessary to ensure continued supplies or addition of new features from the existing vendors, the BSNL management committee may decide to place repeat orders upto 100% of the quantities contained in the running contract and at a rate negotiated with the existing vendors considering the prevailing market conditions. Depending upon the total value of additional procurement, the negotiation committee can be constituted with the approval of competent authority of BSNL. This route will however be resorted to in exceptional circumstances.

8.3.2 Limited Tender Route

- There are certain specific provisions for calling the limited tender appearing in Para 31 to 36 under Rule 128 in the General Financial Rules (GFRs). The limited tender option has to be exercised in specific circumstances as already provided.
- In some cases the equipment is sophisticated and requires thorough technical screening, testing and prototype approval by the Telecom Engineering Center/Quality Assurance to ensure that these equipment's are of sufficient quality level to be used in public Telecom Network. In such cases an open tender may result in the participation of unknown bidders in open tenders, whose capability in making such equipment is yet to be established. They may submit unrealistic bids which may cause major difficulties in the tender evaluation process. In such cases, it would be necessary to screen out such bidders so that BSNL could interact only with bidders who have intrinsic capability as well as proven track record of supplying such sophisticated equipment. Where such equipment's are required, it would be worthwhile restricting Bids by issue of limited tenders only to those parties who have proven expertise in manufacture and supply of such equipment and who have prototype approval and production clearance. In such tenders it is essential that the reasons for limiting the tenders to proven suppliers needs to be brought out in the NIT itself so that such an action would stand justified. The issue of such limited tender should have the concurrence of Financial Advisor and personal approval by the head of the unit.

8.3.3 Expression Of Interest Route

In situations where BSNL proposes to induct new technology/ equipment/new service and the specifications of the new technology/ equipment/ new service are not firmed up, BSNL may invite Expression of Interest (EOI) from the available vendors of that technology/equipment/new service. Based on the offers received from the bidders who choose to participate in the EOI, the bidders satisfying the terms of EOI will be short-listed. Before short listing the participants for handing over the tender documents, BSNL may freely interact with them; obtain clarifications and feedback on the delivery of similar equipment/services elsewhere. The short listed bidders will be given the tender document containing detailed technical, commercial and financial conditions. After evaluation by a designated committee, the contract shall be awarded with the approval of competent authority to the successful bidder(s) as per the terms and conditions stipulated in the EOI and the technical, commercial and financial bids.

8.3.4 Managed Services & Managed Capacity Route

Managed Service is the practice of transferring day-to-day related management responsibility as a strategic method for improved, effective and efficient operations. Typical managed services may be network build (i.e. managed capacity), including planning and design, field operations, Network Operation Center (NOC) operations, application and service development, billing, etc. Many private operators have chosen to outsource laying out the network to third party companies. Using other Service provider's telecom towers is the latest trend which falls under managed services. In future, BSNL may also opt for managed service and/ or managed capacity model for which guidelines would be issued subsequently. However, this route shall be applied only on cases specifically approved by BSNL Board/ Management Committee.

8.3.5 Rate Contract Route

Certain routine items/ services of mass consumption are required in the organization, but their precise quantity may not be known. In such cases, the rate contract (RC) route of procurement may be adopted valid for a specific period not exceeding a year. BSNL should have own rate contracts and should not depend on other agencies for this purpose.

8.3.6 E- Procurement

Procurement through e-procurement and e-tendering should be encouraged. E-Tendering is the carrying out of the tendering process through the Internet, using e-tendering software applications. This promotes competition for the tender, and provides a process that is efficient for both the buyer and suppliers and a selection process that is transparent to bidders. The process results in a host of tangible and intangible benefits to both parties. The ERP project is being implemented and this would provide a platform for e-procurement in BSNL. The modalities and procedures for e-procurement are being framed and shall be issued separately. Meanwhile a set of instructions in this regard has been brought out in this Manual. It has been decided to process the Procurement cases of amount of Rs 2 lakhs and above through e-tendering method.

8.3.7 RFP (Request For Proposal)

The information contained in this Request for Proposal document (the "RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of the Utility or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided. The RFP is not an agreement and is neither an offer nor

invitation by the Utility to the prospective Bidders or any other person. The purpose of RFP is to provide interested parties with information that may be useful to them in making their financial offers (Bids) pursuant to the RFP. The RFP includes statements, which reflect various assumptions and assessments arrived at by the Utility in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require.

The RFP may not be appropriate for all persons, and it is not possible for the Utility, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses the RFP. The assumptions, assessments, statements and information contained in the Bidding Documents, may not be complete, accurate, adequate or correct. Each Bidder have to , therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in the RFP and obtain independent advice from appropriate sources. Information provided in the RFP to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Utility accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

The Utility, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in the RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of the RFP or arising in any way for participation in this Bid Stage.

The Utility also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in the RFP. The Utility may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this RFP. The issue of the RFP does not imply that the Utility is bound to select a Bidder or to appoint the Selected Bidder or Supplier, as the case may be, for the Project and the Utility reserves the right to reject all or any of the Bidders or Bids without assigning any reason whatsoever. The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Bid including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the Utility or any other costs incurred in connection with or relating to its Bid. All such costs and expenses will remain with the Bidder and the Utility shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Bid, regardless of the conduct or outcome of the Bidding Process.

8.4 BIDDING SYSTEM

Bidding systems are designed to achieve an appropriate balance between the countervailing needs for Right Quality, Right Source and the Right Price under different complexities/ criticality of Technical requirements and value of procurements. In certain critical and complex requirements, the technical and financial capability of Source of supply becomes an important determinant for value for money. Depending on the complexity and

criticality Technical of requirement, Criticality of capability of Source and value of procurement, following types of bidding systems may be used.

8.4.1 Single Stage Bidding System

In single stage bidding, all bids are invited together in a single envelope or in multiple envelopes system. This bidding system is suitable where technical requirements are simple or moderate; capability of source of supply is not too crucial and the value of procurement is not too high;

8.4.2 Single Stage Bid/Envelope System (1s1e)

Where it is feasible to work out the schedule of quantities and to formulate detailed specifications for Works and capability of contractor isn't critical and value of procurement is low or moderate, the single envelope system may be adopted, where eligibility, technical/ commercial and financial details are submitted together in the same envelope. This is the simplest and the quickest bidding system. The lowest responsive priced bid that meets the eligibility criteria, technical and commercial requirements laid down in the bid documents is declared as successful and awarded the contract.

8.4.3 Single Stage Two Envelope System (1s2e)

- In technically complex requirements but where capability of source of supply is still not crucial and value of procurement is not low, a two envelope system may be followed:
- If required, Technical specification and techno-commercial conditions may be modified, after the pre-bid conference in the two envelopes. The pre-bid conference is to be organized before the bid submission date. It may be necessary to issue the pre-bid conference minutes to all participants/ upload to the web-portals and some revised RFQ/ RFP documents where necessary;
- The tenderers should be asked to bifurcate their quotations in two envelopes. The first envelope, called the techno-commercial bid, contains the eligibility, technical quality and performance aspects, commercial terms and conditions and documents sought in the tender, except the price and relevant financial details. In the second envelope, called the financial bid, the price quotations along with other financial details are submitted.
- Both the envelope are to be submitted together in a sealed outer envelope, as it would not be desirable to invite financial bids after opening of techno-commercial bids;
- The techno-commercial bids are to be opened in the first instance on the bid opening date and time, and scrutinized and evaluated by the tender committee (TC) with reference to parameters prescribed in the tender documents and responsive, eligible and technically compliant bidders are decided;
- Thereafter, in the second instance, the financial bids of only the techno-commercially compliant offers (as decided in the first instance above) are to be opened on a pre-announced date and time for further scrutiny, evaluation, ranking and placement of contract. The financial bids of technically non-compliant bidders should be returned unopened to the respective bidders by registered acknowledgement due/ reliable courier or any other mode with proof of delivery. In e-Procurement, financial bids of technically non-compliant offers would not get opened.

8.4.4 Single Stage Multiple Envelope System (1s3e)

As discussed below, where the procurement is moderately complex and the time, effort and money required from the bidder to participate in a tender is not very high, instead of a separate stage of Pre-Qualification bidding (as described below), a clear-cut, fail-pass

qualification criteria can be asked to be submitted as the first (additional) envelope in a three envelope single stage bidding, so that a bidder's risk of having his bid rejected on grounds of qualifications is remote if due diligence is exercised him. Strictly speaking, this is not a pre-qualification but a Post-qualification of bidders (as in case of Single Envelope and Two Envelope Bidding). In the first instance on the bid opening date only the post-qualification envelope (also containing the EMD and other eligibility documents) is opened and evaluated to qualify the responsive bidders who pass the post-qualification. Rest of procedure is same as two envelope system for only qualified bidders. Rest two envelopes of unqualified bidders are returned unopened to the respective bidders by registered acknowledgement due/ reliable courier or any other mode with proof of delivery;

8.4.5 Two Stage Bidding With Expression Of Interest

- There are instances where the Works to be procured are of complex nature and the procuring organization may not possess the full knowledge of either the various technical solutions available or the likely Contractors for such Works. To meet the desired objectives of a transparent procurement that ensures value for money simultaneously ensuring up gradation of technology & capacity building- it would be prudent to invite a two-stage Expression of Interest (EoI) Bids and proceed to explore the market and to finalized specifications based on technical discussions/ presentations with the experienced Contractors in a transparent manner. Expression of Interest (EoI) bids may be invited in following situations:

  a) It is not feasible for the procuring entity to formulate detailed specifications or identify specific characteristics for the subject matter of procurement, without receiving inputs regarding its technical aspects from bidders;

  b) The character of the subject matter of procurement is subject to rapid technological advances or market fluctuations or both;

  c) The procuring entity seeks to enter into a contract for the purpose of research, experiment, study or development; or

  d) The bidder is expected to carry out a detailed survey or investigation and undertake a comprehensive assessment of risks, costs and obligations associated with the particular procurement.

- The procedure for two stage bidding shall include the following, namely:

  a) In the first stage of the bidding process, the procuring entity shall invite EoI bids containing the broad objectives, technical and financial eligibility criteria, terms and conditions of the proposed procurement etc without a bid price. On receipt of the Expressions of Interest, technical discussions/ presentations may be held with the short-listed Contractors, which are prima facie considered technically and financially capable of executing the proposed work, giving equal opportunity to all such bidders to participate in the discussions. During these technical discussions, the procurement agency may also add those other stakeholders in the discussions who could add value to the decision making on the various technical aspects and evaluation criteria. Based on the discussions/ presentations held, one or more acceptable technical solutions could be decided upon laying down detailed technical specifications for each acceptable technical solution, quality benchmarks, warranty requirements, delivery milestones etc., in a manner that is consistent with the objectives of the transparent procurement. At the same time care should be taken to make the specifications generic in nature so as to provide equitable opportunities to the prospective bidders. Proper record of discussions/ presentations and the process of decision making should be kept;

b) In revising the relevant terms and conditions of the procurement, if found necessary as a result of discussions with the shortlisted bidders, the procuring entity shall not modify the fundamental nature of the procurement itself;

c) In the second stage of the bidding process, the procuring entity shall invite bids from all those bidders whose bids at the first stage were not rejected, to present final bid with bid prices in response to a revised set of terms and conditions of the procurement; and

d) Any bidder, invited to bid, but not in a position to execute the work due to modification in the specifications or terms and conditions, may withdraw from the bidding proceedings without forfeiting any bid security that he may have been required to provide or being penalized in any way, by declaring his intention to withdraw from the procurement proceedings with adequate justification;

e) If the procuring entity is of the view that after EOI stage, there is likelihood of further participation by many more bidders and to avoid getting trapped into a legacy technology, the second stage bidding may not be restricted only to the shortlisted bidders of EOI stage and it may be so declared in the EOI document ab-initio. Thereafter in the second stage, normal OTE/ GTE bidding may be done. Such variant of EOI is called 'Non-committal' EOI.

- Invitation of EoI Tenders: In EoI tenders, an advertisement inviting expression of interest should be published. The invitation to the EoI document should contain the following information:

a. A copy of the advertisement;

b. Objectives and scope of the requirement: This may include a brief description of objectives and broad scope of the requirement;

c. Instructions to the bidders: This may include instructions regarding the nature of work, last date of submission, place of submission and any other related instructions;

d. Formats for submission: This section should specify the format in which the bidders are expected to submit their EoI;

e. The EoI document should be made available to the interested bidder as a hard copy as well as on its website in a downloadable form.

iv) **Eligibility criteria:** The invitation to EoI should clearly lay down the eligibility criteria, which should be applied for short listing. Supporting documents required need to be clearly mentioned. An example of EoI eligibility criteria is shown in Table 1. However, appropriate eligibility criteria have to be designed, keeping in mind the specific objectives of the EoI. Criteria used should be measurable and based on documents that are verifiable. Definitions and explanatory notes shall be provided for each criteria that are simple and unambiguous. It may also be advisable to cross-check and verify these documents, when in doubt. The following table shows an example of EoI eligibility criteria.

Table 9.

Criteria	**Sub-criteria**	**Weightage***	**Break-up of Weightages**

Past experience of the firm with similar requirements		A*	
Technical capabilities		D*	
Financial strength of the bidder		B*	
	Turnover figures of the		B1*
	last three years		
	Net profit figures of the		B2*
	last three years		
Quality accreditations, licensing		C*	
requirements			

*Weightages (out of 100) should be pre-decided and declared in EoI documents by the CA based on assessment of the required profiles of the potential bidders. The marking/grading scheme for allotting marks (out of 100) for various parameters should also be laid down.

v) **Evaluation of EoI:** The bidders should be evaluated for short listing, inter-alia, based on their past experience of performance in a similar context, financial strength and technical capabilities, among others. Each bidder should be assigned scores based on the sum of marks obtained for each parameter multiplied by the weightages assigned to that parameter. All bidders who secure the minimum required marks [normally 60 (sixty) per cent] should be shortlisted. The minimum qualifying marks should be specified in the EoI document. Alternatively, instead of weighted evaluation, the EoI document may specify a 'fail-pass criteria' with the minimum qualifying requirement for each of the criteria, such as minimum years of experience, minimum number of Works executed and minimum financial turnover. Under such circumstances, all bidders who meet the minimum requirement, as specified, should be shortlisted. The short list should normally comprise at least four firms.

8.5 GOVERNMENT E-MARKET PLACE (GeM)

Based on recommendations of Group of Secretaries made to Hon'ble Prime Minister, the Government decided that GeM SPV will create a one stop Government e-Market Place (GeM) to facilitate on line procurement of common use Goods and Services required by various Govt. Departments/organizations/PSUs. GeM aims to enhance transparency, efficiency, and speed in public procurement. It provides the tools of e-bidding, reverse e-auction and demand aggregation to facilitate the Government users achieve the best value for their money.

The purchases through GeM by Government users have been authorized and made mandatory by Ministry of Finance by adding a new Rule No. 149 in the General Financial Rules2017.

Special purpose Vehicle to be called Government e-market place(GeM SPV) as the National Public procurement portal as section 8 Company registered under the Companies

Act 2013 for providing procurement of goods and services required by Central & State Government organizations. GeM SPV shall provide an end-to-end online Market place for Central and State Government Ministries/Departments. Central & State Public Undertakings (CPSUs & SPSUs). Autonomous Institutions and Local bodies, for procurement of common use goods & services in transparent and efficient manner.

8.5.1 ADVANTAGES OF BUYERS

1. Offers rich listing or products for individual categories of Goods/services
2. Makes available in search, compare, select and buy facility
3. Enables buying of Goods and Services online as and when required
4. Provides transparency and ease of busying
5. Ensures continuous vendor rating system
6. Up-to-date user-friendly dashboard for buying, monitoring supplies and payments
7. Provision of easy return policy
8. Search with option to provide multiple consignee locations and quantity after authentication.
9. Order process redesigned for ease of use
10. Provision to generate multiple bills for one single order
11. Multiple CRAC to be generated on the basis of the invoice and generated for one order.
12. Bunching for products is available for Bidding

8.5.2 ADVANTAGES OF SELLERS

1. Direct access to all Government departments
2. One-stop shop for marketing with minimal efforts
3. One stop-shop for bids/reverse auction on products/services
4. New product suggestion facility available to sellers
5. Dynamic pricing: Price can be changed based on market conditions
6. Seller friendly dashboard for selling, and monitoring of supplies and payments
7. Consistent and uniform purchase procedures across the GeM portal
8. Multiple consignee locations are enabled with or without variation
9. Multiple invoices for one order
10. Ensures continuous vendor assessment system

8.6 PROCUREMENT THROUGH GOVERNMENT E-MARKET PLACE (GeM)

BSNL Board has approved the implementation of GFR 2017 in place of GFR 2005 in BSNL for procurement of Goods & Services through GeM Portal Rule 149 of GFRs 2017 :-

Up to Rs.50,000/- through any of the available suppliers on the Gem, meeting the requisite quality, specification and delivery period.

- Above Rs.50,000/- and up to Rs.30 lakhs through the GeM seller having lowest [price amongst the available sellers of at least three different manufacturers on GeM meeting the requisite quality, specification and delivery period. The tools for online bidding and online reserve auction available on GeM can be used by the buyer if decided by the competent authority.
- Above Rs.30 lakhs through the supplier having lowest price meeting the requisite quality, specification and delivery period after mandatorily obtaining bids using on line bidding of reverse auction tool provided on Gem.
- The invitation for the on line e-bidding/reverse auction will be available to all the existing sellers or other sellers registered on the portal and who have offered their goods/service under the particular product/service category as per terms and conditions of Gem.
- The above mentioned monetary ceiling is applicable only for purchases made through Gem. For purchases, if any outside Gem, relevant GFR Rules shall apply.
- The Govt. buyers may ascertain the reasonableness of prices before placement of order using the business analytics(BA) tools available on Gem including the last purchase price of Gem, Department's own last purchase price etc.,
- A demand for goods shall not be divided into small quantities to make piecemeal purchases to avoid procurement through L1 buying/biddings reverse auction on Gem or the necessity of obtaining the sanction of higher authorities required with reference to the estimated value of the total demand.
- All such powers shall be exercised by the CGMs/GMs/TDMs (Circles Heads/SSA Heads) strictly in accordance with the approved budget, business plan/policies and guidelines of the Central Govt./Admn. Ministry issued in this regard. Further these powers are to be exercised with the concurrence of concerned IFA after observing rules, orders and instructions issued from time to time.

8.7 CONCLUSION

Almost half of the BSNL's budget is for procurement of various items/services etc, we have discussed the methods of procurement and the steps needs to be followed while procuring the material/services. This will not only to cut down the procurement time but also to get it at Fair costing, in the present liberalized telecom market. This is all the more necessary as BSNL is facing increasing competition in all types of services and has to respond quickly for procurement of materials as well as its utilization so as not only to keep its market share in the emerging telecom scenario but also to expand and acquire new market segments.

9. NOFN, NFS PROJECTS, BHARAT FIBER, BHARAT AIRFIBER SERVICES AND NKN PROJECT

9.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- NOFN Project
- Network For Spectrum (NFS) Project
- Bharat Fibre
- Bharat Air Fibre Services
- NKN Projects

9.2 NATIONAL OPTICAL FIBER NETWORK (NOFN)

To bridge the rural coverage gap both for broadband penetration and voice, Government of India has approved the setting up of National Optical Fiber Network (NOFN) on 25/10/211 to provide connectivity to 2,50,000 Gram Panchayats of the country, which would ensure broadband connectivity with adequate bandwidth. This is to be achieved utilizing the existing optical fiber and extending it to the Gram Panchayats.

At present OFC (Optical Fibre Cable) connectivity is available in all State Capitals, Districts, HQs and upto the Block Level. There is a plan to connect all the 2,50,000 Gram panchayats in the country. This will be done by utilizing existing fibres of PSUs (BSNL, Railtel and Power Grid) and laying incremental fibre to connect to Gram Panchayats wherever necessary. Dark fibre network thus created will be lit by appropriate technology thus creating sufficient bandwidth at the Gram Panchayats. This will be called the National Optical Fibre Network (NOFN). Thus connectivity gap between Gram Panchayats and Blocks will be filled.

Non-discriminatory access to the NOFN will be provided to all the Service Providers. These service providers like Telecom Service Providers(TSPs), ISPs, Cable TV operators and Content providers can launch various services in rural areas. Various categories of applications like e-health, e-education and e-governance etc. can be provided by these operators. The project will be funded by the Universal Service Obligation Fund (USOF).

It was envisaged as an information superhighway through the creation of a robust middle-mile infrastructure for reaching Broadband connectivity to Gram Panchayats. The Ministry of Communications has launched the National Broadband mission that will facilitate universal and equitable access to broadband services across the country, especially in rural and remote areas.

- To facilitate the delivery of e-governance, e-health,e-education, e-banking Internet and other services to ruler India.
- To connect all the 2, 50, 000 Gram Panchayats in the country and provide 100 Mbps connectivity to all Gram Panchayat.
- To achieve this, the existing and unused fibres (dark fibre) of public sector undertakings (PSUs) (BSNL, Railtel, Power Grid) were utilized and incremental fibre was led to connect to Gram Panchayats wherever necessary.
- Non discriminatory access to the NOFN was provided to all the service providers Like Telecom Service Providers (TSPs),Cable TV operators and content providers to launch various services in rural areas.

- The entire project is being funded by the Universal Service Obligation Fund (USOF) which was set up for improving telecom services in rural and remote areas of the country.

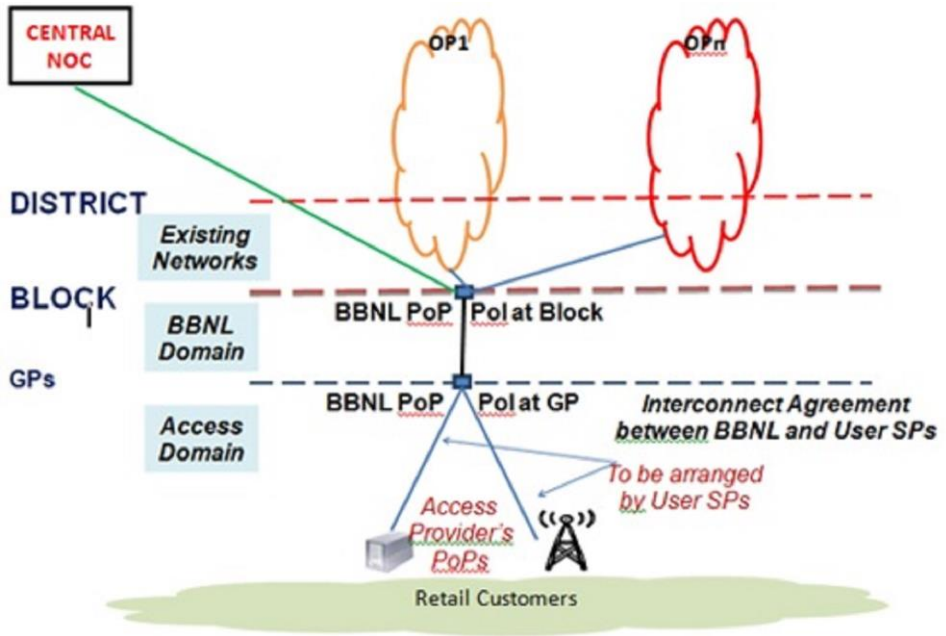

Figure 24: NOFN Concept Diagram

9.2.1 IMPLEMENTATION

The project is a Centre-State collaborative project, with the states contributing free Rights of way for establishing the optical fibre network. The three-phase implementation of the Bharat Net project is as follows:

- First Phase provides one lakh Gram Panchayats with broadband connectivity by living underground optic fibre cable(OFC) lines by December 2017.
- Second Phase provide connectivity to all the Gram Panchayats in the country using an optimal mix of underground fibre, fibre over power lines, radio and satellite media. It is to be completed by March 2019.
- Third Phase from 2019 to 2023, a state-of-the-art future proof network, including fibre between districts and blocks, with ring topology to provide redundancy would be created.

The participation of states became important in the second phase which involved laying of OFC over electricity poles. This was a new element of the BharatNet strategy as the mode of connectivity by aerial OFC has several advantages, including lower cost, speedier implementation, easy maintenance and utilization of existing power line infrastructure.

The Government of India entity, Bharat Broad Band Nigam Limited (BBNL), will centrally manage the project through a high capacity Network Management System being developed by C-DOT. A key feature of the project is that the GPON equipment used in the project has been indigenously designed and developed by C-DOT and manufactured domestically

BharatNet is a middle mile network from block to Gram Panchayats (GPs) which provides connectivity to Service Providers like TSPs, ISPs. MSOs, LCOs and Government agencies for extending their services from Block to GPs. It offers following services to the service providers/ government agencies:

- **Bandwidth:** It offers point to point (P2P) and point to multi-point (P2MP) bandwidth from block to GPs using GPON technology
- **Dark fiber: on incremental cable**: It offers dark fiber on the incremental cable laid by BBNL between Fiber Point of Interconnect (FPOI) and GPs

9.2.2 Technology

In NOFN the technology called GPON (Gigabit Passive Optical Network Technology) will be utilised.

- A passive optical network (PON) is a network architecture that brings fiber cabling and signals to the home using a point-to-multipoint scheme that enables a single optical fiber to serve multiple premises. Encryption maintains data security in this shared environment. The architecture uses passive (unpowered) optical splitters, reducing the cost of equipment compared to point-to-point architectures.
- The GPON (gigabit passive optical network) standard differs from other PON standards in that it achieves higher bandwidth and higher efficiency using larger, variable-length packets. GPON offers efficient packaging of user traffic, with frame segmentation allowing higher quality of service (QoS) for delay-sensitive voice and video communications traffic.

The main components of GPON technology are OLT, ONT/ONU, Splitters, OF cables etc.

9.3 NETWORK FOR SPECTRUM (NFS) PROJECT

Network for Spectrum (NFS) has been planned as an Exclusive Optical Fibre based 'Nationwide Communication Network' for Defence Services. This will be a Countrywide Secure, Multi service and Multi protocol Converged Next Generation Network based on Exclusive and Dedicated Tri-services Optical Transport Backbone. Rs. 5000 crore on release of 5 MHz spectrum in 2100 MHz band. Network for Spectrum (NFS) has been planned as an Exclusive Optical Fibre based 'Nationwide Communication Network' for Defence Services. The estimated cost of the project is Rs 13,334 crore. The project is being implemented by BSNL. The scheduled time for the implementation of the project is 36 months.

BSNL is the implementation agency for Indian Defence's NFS OFCproject. The Defence's NFS OFC project consists of laying of OFC aggregating to 57,100KM PAN India.

The project includes:

Design, Procurement, Supply, Trenching, Laying,Installation, Testing and Maintenance of OFC and accessories for construction of NLD back bone and access routes on turnkey basis.

Once complete, the state-of-the-art, Error-Free & Reliable OFC network for the Army, Navy and Air Force will provide World Class & viable Technology to Defence Forces which will boost services and security for the country.

NFS will be a "Next Generation Network" based on Highly Resilient and Virtualized IP/ MPLS backbone and Gigabit Optical Access Networks based on Fault Tolerant Carrier Ethernet transport technologies. The complete network will be controlled from Geo Redundant Central and Regional Network Operating Centres. This project involves several components. The most crucial component of the project is the laying of nearly 60,000 Km OFC spanning over the whole country. BSNL has already awarded the work of OFC laying in July 2014.

Network for Spectrum (NFS) is a defence project handled by BSNL. Earlier, for wireless communication, defence was using some special spectrum. For providing 3G and 4G services in India, Government instructed defence to spare those spectrums and in turn defence will get other networks for their internal communication. NFS is for that purpose.

- The NFS project aims at laying alternate communication network for defence services.
- NFS project will boost the communication capabilities of Defence Forces.
- In major way, it will lead to enhance National operational preparedness.
- It will also have forward linkages to other related industries such as telecom equipment manufacturing and other telecommunication related services.
- The project is being implemented by Bharat Sanchar Nigam Limited and will be completed in 2 years period.
- The Union Defence Ministry and Department of Telecommunications (DoT), the highest decision making body in Telecom Ministry had signed an agreement in 2009-10 to set up exclusive defence network for its communication services.
- Under it, DoT has agreed to vacate 25 megahertz of 3G spectrum and 25 megahertz of 2G spectrums in phases solely for defence communication purpose.

In order to enhance the operational communication of the Army, Govt. has envisaged a project called 'Network for Spectrum' (NFS).

- It is a Countrywide Secure, Multi-service and Multi-protocol Converged Next Generation Network based on Exclusive and Dedicated Tri-services Optical Transport Backbone.
- The impact of project will have on the Network Centric Warfare capabilities of the Indian Army in terms of enhanced voice, data and real time video services.
- The project is being implemented by BSNL.

Further, under Network for Spectrum project, optical fiber is being laid to provide a dedicated backbone communication and IT network connecting stations of Army, Navy and Air Force.

9.4 BHARAT FIBRE

9.4.1 Introduction

Bharat Fiber (FTTH) is a unique technology being deployed by BSNL for the first time in India. The fiber connectivity having unlimited bandwidth and state of the art technology provides fix access platform to deliver the high speed broadband from 256 Kbps to 100 Mbps, IPTV having different type of contents like HDTV and future coming 3D TV and range of voice telephony services. It provides a comprehensive solution for the IP leased line, internet, Closed User Group (CUG), MPLS-VPN, VoIP, video conferencing, video calls etc whatever the services available on the internet platform, bandwidth on demand can be delivered by this connectivity to the without changing the access fiber and home device. Customer will get a CPE called Home Optical Network Termination (HONT) consist of 4X100 Mpbs Ethernet ports and 2 normal telephone ports. Each 100 Mbps ports will provide broadband, IPTVs, IP Video call and leased line etc as required by the customers. Customer will get a power back unit having full load backup of four hours and a normal backup of three days. This power backup will be AC input and connecting to the HONT on 12V DC.

9.4.2 Connectivity via Bharat Fiber (FTTH)

BSNL will extend fiber from its nearest Central Office (CO) location directly or through franchisee and install HONT and battery backup at the customers identified locations. The services such as Voice, Broadband, IPTV etc. will be enabled as per the customer"s request plans for the same.

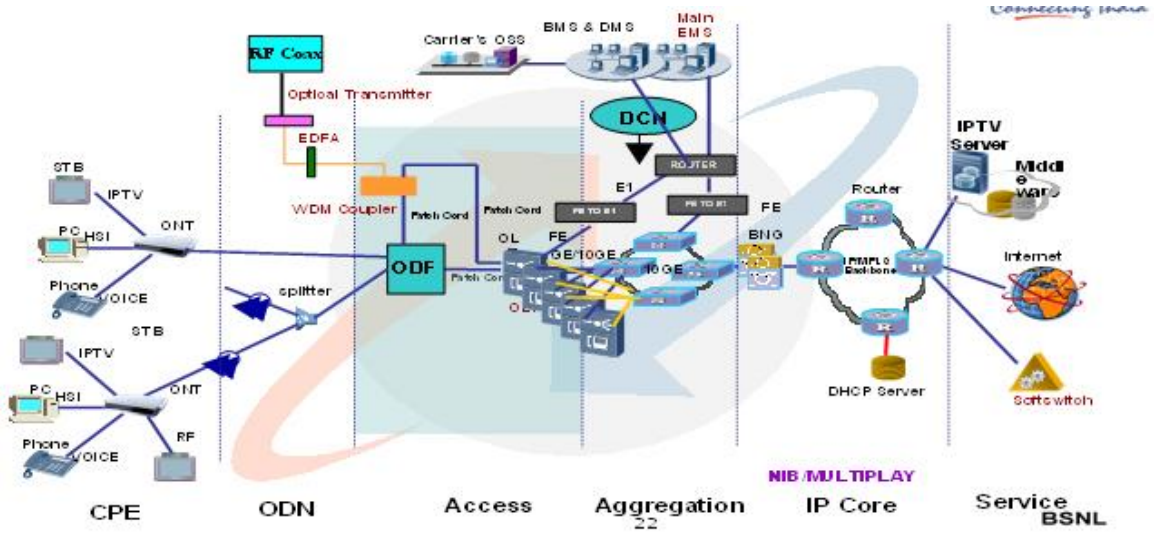

Figure 25: BSNL FTTH Architecture

The services over Bharat Fiber (FTTH):

- Basic internet Access Service controlled and uncontrolled from 256Kbps to 1000Mbps.
- TV over IP Service (MPEG2).
- Video on Demand (VoD)(MPEG4) play like VCR
- Audio on Demand Service
- Bandwidth on Demand (User and or service configurable)
- Remote Education
- Point to Point and Point to Multi Point Video Conferencing, virtual classroom
- Voice and Video Telephony over IP: Connection under control of centrally located soft switches
- Interactive Gaming
- VPN on broadband
- Dial up VPN Service
- Virtual Private LAN Service (VPLS)

9.5 BHARAT AIR FIBRE SERVICES

BSNL Bharat Air Fibre service is a wireless, or more precisely radio-based last mile telecom connectivity solution. It uses unlicensed spectrum (which are not been licensed to any entity) that has less interference to provide internet service. It also uses line-of-sight radio waves to deploy the service.

The Bharat Air Fibre services are being introduced by Bharat Sanchar Nigam Limited (BSNL) as a part of the Digital India initiative by the Government of India. It is being scaled pan-India. Aim: To provide BSNL fibre-to-the-home (FTTH) wireless connectivity up to a range of 20 km from the BSNL points of presence.

9.5.1 BENEFITS

- Customers at remote locations will be benefited as BSNL comes with the cheapest services with the support of Telecom Infrastructure Partners (TIPs).
- These services are wireless and there are very low chances of interruption in services locally.
- BSNL is tying up with local entrepreneurs/unemployed youth on revenue sharing basis thereby generating employment in rural areas.
- They will earn a regular monthly income of about one lakh per month thereby becoming self-reliant under the Aatmanirbhar Bharat initiative.
- This service could be game changer for rural areas as with a little integration of Internet of Things (IoT) and sensors, the moisture content of soil can be known on a real time basis, so that irrigation can be planned, resulting in saving of water and thereby increasing productivity.

9.6 NKN Project

In order to improve access to knowledge, a need has been long felt in the country to establish a National Knowledge Network (NKN) inter-connecting all knowledge and research institutions in the country through a high bandwidth network. Globally, research & development activities and innovations are increasingly becoming multidisciplinary and collaborative, and require substantial communication/computational power. For India to emerge as a significant R&D hub, it has to become a part of this wave of collaboration and co-creation. The idea of setting up of a National Knowledge Network was deliberated at the office of Principal Scientific Advisor to the Government of India and the National Knowledge Commission engagements were held with key stakeholders including experts, potential users, telecom service providers and educational and research institutions. These discussions have yielded a consensus on the optimal approach to be adopted for setting up such a network, to provide a unified high speed network backbone for all the sectors.

National Knowledge Network (NKN) project is aimed at establishing a strong and robust Indian network which will be capable of providing secure and reliable connectivity. Globally, frontier research and innovation are shifting towards a multidisciplinary and collaborative paradigm and require substantial communication and computational power. In India, NKN with its multi-gigabit capability aims to connect all universities, research institutions, libraries, laboratories, healthcare and agricultural institutions across the country to address such paradigm shift. The leading mission oriented agencies in the fields of nuclear, space and defence research are also part of NKN. By facilitating the flow of information and knowledge, the network addresses the critical issue of access and creates a new paradigm of collaboration to enrich the research efforts in the country. The network design is based on a proactive approach that takes into account the future requirements and new possibilities that this infrastructure may unfold, both in terms of usage and perceived benefits. This will bring about a knowledge revolution that will be instrumental in transforming society and promoting inclusive growth.

9.6.1 Vision

NKN is a state-of-the-art Pan-India network and is a revolutionary step towards creating a knowledge society without boundaries. It will provide unprecedented benefits to the knowledge community and mankind at large. Using NKN, all vibrant institutions with vision and passion will be able to transcend space and time limitations in accessing information and knowledge and derive the associated benefits for themselves and for the society. It will facilitate the development of India's information infrastructure, stimulate research, and create next generation applications and services.

9.6.2 Mission

NKN is designed to provide high availability, Quality of Service, security and reliability. The purpose of NKN goes to the very core of the country's quest for building quality institutions with requisite research facilities and to create a pool of highly trained professionals. The participating institutions at the edge would seamlessly connect to NKN at gigabit speed. NKN shall be a critical information infrastructure for India to evolve as a knowledge society. NKN is a significant step which will enable scientists, researchers and students from across the country to work together for advancing human development in critical and emerging areas.

9.6.3 Role of NKN:

- Establishing a high-speed backbone connectivity which will enable knowledge and information sharing amongst NKN connected institutes
- Enabling collaborative research, development and innovation amongst NKN connected institutes
- Facilitating advanced distance education in specialized fields like engineering, science, medicine etc.
- Facilitating an ultra-high speed e-governance backbone
- Facilitating connection between different sectoral networks in the field of research

NKN will also act as a test bed for research in the area of network, security and delivery models for various services. As NKN is a new initiative, it will leverage existing initiatives, to ensure faster roll out with modest investment.

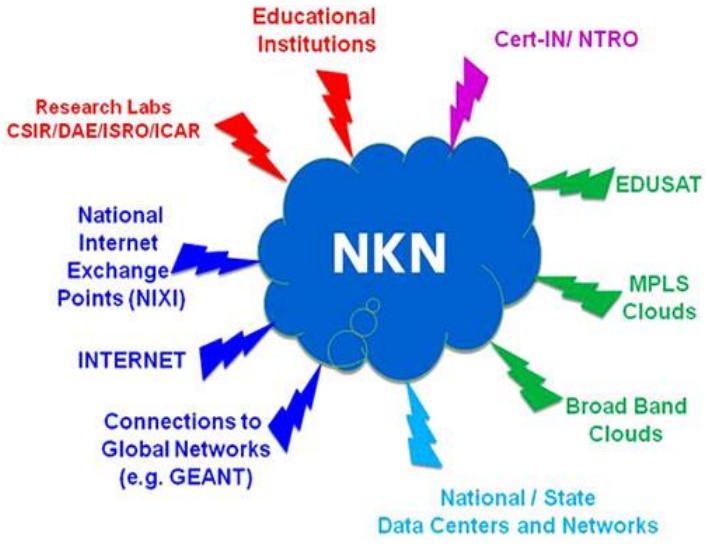

Figure 26: NKN

Based on the design objective, geographical spread and the expected usage, the following technical features are envisaged for NKN:

- NKN is a protocol independent network and is designed to carry multiprotocol traffic.
- NKN is capable of offering hierarchical Quality of Service (QoS) for real time traffic (voice and video) and guaranteed bandwidth for business critical applications. NKN governance backs it up by Service Level Agreements (SLAs) for the users.
- NKN design supports IPv6 transport, IPv6 networking and IPv6 MPLS VPN services in addition to the similar facilities based on traditional IPv4.
- NKN design, implementation, management, and control is such that service provisioning is internal to the NKN network and does not depend on telecom service providers from whom "raw" bandwidth or fiber is likely to be leased.
- NKN design supports Multicast enabled VPN for running Multicast applications, both in IPv4 and IPv6.
- NKN management is capable of handling provisioning for the central services such as Multimedia Conferencing, e-access, digital library, and central data centre to all users.
- NKN will provide access to secure data centres with Information Assurance.

9.6.4 NKN Services

NKN is steadily evolving as the National Education Research Network (NERN) of India. The project has already made significant progress by connecting over 1500+ institutes in the network. NKN is now being looked as the harbinger of change in our knowledge society but this also brings together the responsibility to continuously look forward to provide the much required impetus to R&D initiatives related to networking technology.

NKN network is designed with the aim of providing:

- Highest level of availability Robust & reliable connectivity
- Highest level of Scalability (specifically planned to match the unknown future demands which cannot be envisaged currently)
- Best Bandwidth Capacity: For NKN, various National Long Distance Carriers (NLDs) have provided 2.5Gbps / 10Gbps capacity links which can be self healed. Further, the NKN is in process of upgrading to 100Gbps or more connectivity.

NKN Services are categorized into three major categories:

- Cloud based Services
- Network Oriented Services
- Application Services

Some of the featured services are shown in below diagram:

Figure 27: Featured services

9.7 CONCLUSION

BharatNet will provide more employment opportunities, improved service delivery (online e-gram Panchayat services, e-governance, e-education, e-health, e-medicine, e-grievances, e-agriculture, e-citizen, etc.), and an impetus to the Make in India, Digital India and Startup India initiatives.

NKN is a powerful network which provides various kinds of fast services like High Speed Internet, Virtual Class, Digital Books & Journals, digital information, storage of data's in the form of data centres, etc.

10. TURNKEY SOLUTIONS (ONE STOP SOLUTION)

10.1 LEARNING OBJECTIVE:

After reading this unit, you should be able to understand:

- Guidelines for Establishment of customized Private Wide Area Network (WAN) on Turnkey basis.
- Works Allocation
- Financial Powers for execution of turnkey projects

10.2 INTRODUCTION

A number of important Governments, Educational Institutions and various Micro Small and Medium Enterprises need dedicated connectivity for its business needs. Also at most of the occasions they look toward connectivity provider for establishment of Private Wide Area Network and complete customer's viz. Corporate Houses, Nationalized/Private Banks, Financial Institutions, State networking solution for them on **turnkey** basis including supply, installation, integration and maintenance of networking equipment. Some of the organizations are also inviting bids through open tender for providing leased connectivity and for setting up of WAN for them. In order to acquire and maintain the business, Telecom Circles have to participate and compete in the tenders alone and with other service providers.

10.3 PROCUREMENT

One of the major activities for providing total Network Solutions is procurement of networking equipment & its integration in the network. Since such projects are time bound, it may not be possible to follow normal procurement procedure for procurement of equipment and service required to establish the networks on account of the various reasons such as:

1. Projects being time bound and are to be completed within the timeframe specified by the customer.
2. Enormous delay will be encountered for finalization of the tender and we may end up selecting the lowest bidder who may not be a reputed vendor or the equipment he offers may not be meeting the requirement of the customers.
3. The procurement process for such equipment needs to be looked into on a different perspective. Here the customer is going to pay the cost of the equipment. BSNL is adding margin over it.
4. The components involved in the network design are decided according to the requirement of the customer and the equipment are available with limited vendors.

Taking the above aspects into account, procedure for meeting such requirements has been approved by BSNL management which are indicated below:

10.4 STANDING COMMITTEE/EMPANELMENT OF VENDORS

Each circle may constitute a Standing Committee for procurement of equipment/empanelment of equipment suppliers /Network Integrators required for execution of turnkey projects. The committee will be consisting of SAG officers from CM/CFA/CN-Ent Verticals and SSA Heads (wherever required). The broad constitution of the committee may be:

1. GM/Sr.GM/PGM (NW-CFA/CM/CN)

2. Business Area Head (Optional, case to case basis)
3. GM/Sr.GM/PGM (EB)
4. GM/Sr.GM/PGM from Finance, available at HQ (other than IFA) (In cases where GM level officers of finance are not available, DGM/Jt.GM/Adl.GM can be taken)

The Standing Committee constituted will finalize the list of equipment normally required for such projects along with details of reputed OEM/Vendors. The committee may invite offers from OEM/Vendors/Network Integrators from open market for major equipment taking into account pre-qualifying factors such as Vendors' Annual Turnover, supply performance during last three years, Ability to supply equipment within short period, Commitment to maintain the equipment etc.

Based on the pre-qualification parameters, the Standing Committee shall empanel vendors/OEMs/Authorized Channel Partners of OEMs for each make & model for various networking products like Computers, Computer related software & peripherals, servers, Modems, Routers, Remote Access Servers, LAN Switches, ISDN backup devices, EPABX, MUX etc.

The panel of vendors and System Integrators finalized by the committee shall be approved by CGM of the Circle.

10.5 FINALIZATION OF RATES/PRICES

1. For participation in any bid for execution of the project, the standing committee shall invite sealed quotations from these empanelled vendors/Integrators for various types of equipment for finalization of the rates. The quotation shall specify validity of the prices, delivery period, penalty, AMC etc. The rates for such equipment shall be finalized after observing all the formalities. Depending upon the requirements, order could be placed on the empanelled vendors at the finalized rates. However, before placement of Purchase Order, the reasonableness with reference to prevailing market price must be ensured.
2. For participation in Projects through open tender, in order to be competitive, standing committee to explore the best rates with the empanelled vendors.
3. It may not be possible to fix the prices of all the items as depending upon the requirement of the customers, there may be slight variations in the specifications. This standing committee could invent the best prices of such items with these selected vendors and place orders on any of the empanelled vendor at such price.
4. In a situation when the customer desires to expand the existing network, the procurement of add on equipment becomes proprietary in nature. Keeping in view the requirement of the customer and the fact that ultimately the customer will be paying for the cost of equipment, this Standing Committee may finalize the prices of proprietary equipment as above.

10.6 TIE-UP WITH NETWORK INTEGRATORS/SYSTEM INTEGRATORS

A number of network/system integrators (SIs) may be keen to join hands with BSNL for participating against a specific tender or for networking requirements of the enterprise customers and for the projects BSNL needs to execute for various customers. Such Network Integrators/solution providers (SIs) can be empanelled by the Standing committee based on various factors such as Past experience in Networking, Financial strength, their level of

presence in the country, their tie-up with various Networking equipment suppliers etc. When any turnkey project is to be executed, bids can be obtained from these pre-qualified bidders and work awarded to any of them after following normal selection procedure. The AMC can also be awarded to them for maintenance of end equipment at customer premises. The agreement/MOU with Network Integrators can be made with/without supply of equipment.

10.7 ALLOCATION OF WORK OF NETWORK INTEGRATION AND SUPPLY

It is appreciated that, on-Boarding of customer, on nomination basis is most difficult and an important step in Enterprise Business Chain. Though BSNL is having its own Sales Teams and mechanism but the help of SIs is very crucial as they are domain knowledge experts. BSNL should encourage SIs to bring on board more and more customers on behalf of BSNL. SI who makes all efforts in On-boarding the customer should be extended all out support and shouldn't be subjected to undue competition.

But it is also a fact that most of the business on nomination comes out of customer's faith in the fair and transparent policies of BSNL at large. It becomes more important when the end customer is Government or its subsidiary and awards work to BSNL on nomination basis, BSNL itself being a Govt. Company. So, with a larger business interest in view, the policy of "Bring It Get It" on back to back basis can only be adopted in rare cases where the client gives clear choice for a particular SI, with its rates and the solution. Otherwise, the prevalent practice of exploring best rates from empanelled vendors/SIs by the Circle Standing Committee should continue.

However, the efforts of SI can't be undermined in bringing the customer on board may it be a Government or Private and involves continuous visits presentations and perusals at different levels and to appreciate the same and in order to give an edge to such SIs (Incumbent SI), who nurtured the business, must be given a choice if he is eligible and can meet the competition by way of providing "First Right of Refusal" at the L1 rates, determined by existing sealed bid method from the eligible sources.

1. In case the incumbent SI is non L1 and chooses not to accept L1 rates, the L1 SI/Vendor has to work on his quoted rates. In case L1 SI/Vendor refuses to work, then he shall be debarred for one year to participate in tender from date of refusal, along with other penal actions under empanelment.
2. The genuineness of rates however would continue to be vouched by the Circle Standing Committee.

A model eligibility criterion for selection of network integrator is enclosed for reference.

10.8 SINGLE WINDOW APPROACH

For execution of such projects, the circle should nominate one SSA/Officer who shall be the interface with the customer for all activities such as issue of demand note, collection of payments, customer support, coordination with customers etc.

10.9 SOURCE OF EQUIPMENTS

Option may be given by the Telecom Circles to prospective/existing customers that they can source their equipment from market or through approved vendors of BSNL. In case they opt for BSNL option, the cost of equipment (CAPEX/OPEX /Mix thereof) will be paid by them to BSNL and in turn, BSNL shall make similar terms of payment with SI.

10.10 EXECUTION OF RESPONSIBILITY

In turnkey projects, BSNL will undertake entire execution responsibility of the project. The project cost indicated to the customer shall be inclusive of equipment cost, project management cost, investment cost overheads and profit margin. Typical profit margin of 15% may be included over and above all the costs but it may vary from project to project depending upon the nature of the project, competition, timeframe for realization of investments made in the project

Factoring in of the License Fee: In this regard, CA Cell circulars/instructions as issued from time to time may be referred please. The license fee is over and above 15% BSNL margin, accordingly, financial viability may be duly ascertained. Also, Circulars from Finance Enterprise vide no. BSNL/Ent. Fin/9-1/2020/, dated 18.03.2020 and BSNL/Ent. Fin/9-1/2016/, dated 08.03.2018 & this office Circular No BSNLCO-EBII/19/1/2020-EB-II dated 19.08.2020 may please be referred for taking care of additional 8% (or as applicable) of "License fee" in all EB projects.

The Heads of Telecom Circles may execute such projects for which procurement is up to ₹10 crore per annum. For projects beyond ₹10 Crore per annum, the proposal may be referred to BSNL HQ for approval.

The above financial powers delegated to Heads of Telecom Circles should be exercised in consultation with IFA and not to be delegated below.

10.11 MODEL ELIGIBILITY CRITERION FOR NETWORK INTEGRATORS

BSNL requires services of System/Network Integrators, who will be responsible to supply network equipment, configuration and integration with existing network, operation, maintenance and support related to customers.

The Network Integrators shall be categorized as National System Integrator/Circle System Integrator/Circle-Silver System Integrators and basic structure and scope would be as below:

1. System Integrator (SI) Structure:

Table 10. SI Structure

Category of SI	**Basic Criteria**		**Scope of Service**
National	Average Turnover (for IT/Networking business) for last two years	₹ 20 Cr.	All the business of the Circle.
	Bank Guarantee **(BG)**	₹ 15 Lakh	
	Minimum Experience of WAN implementation on turnkey basis.	20 Projects*	
	Minimum Support Centre	**	
	Average Turnover (for IT/Networking business) for last two years	₹ 3 Cr.	All business, of the Circle

Circle	Bank Guarantee **(BG)**	₹ 3 Lakh	provided, execution limited to three Circles#.
	Minimum Experience of WAN implementation on turnkey basis.	5Projects*	
	Minimum Support Centre	**	
Circle-Silver*	Average Annual Income as per ITRor Turnover as per balance sheet as applicable, for last two years	₹ 20 Lakh	All business, of the Circle provided, execution limited to home Circle or part of Circle
	Bank Guarantee **(BG)**	₹ 50,000	
	Minimum Experience of WAN implementation on turnkey basis.	2 Projects*	
	Minimum Support Centre	**	

In case the particular business needs the delivery in more than three Circles and the Circle, despite of all efforts could not empanel any National SI; the condition can be waived on satisfaction of CGM on case to case basis.

Experience in EB Core Business including Computer Networking, ILL/ MPLS-VPN/ MNS etc. having number of Projects equal to the respective Criterion of the System Integrator as mentioned above, with work per FY equivalent to minimum BG.

For Support Centers, applicant needs to give undertaking as per its category that SI shall work on PAN India (National SIs) or PAN Circle basis (Circle and Circle-Silver SIs) as applicable.

The eligibility criterion for Circle-Silver category can be relaxed by CGMs in consultation with the standing committee for the applicants such as qualified Engineers, experienced telecom/IT professionals etc. The monetary limit for any project would be ₹ 50 Lakh in this category.

1. Once a SI is empanelled in National Category in any of the Circle, it can get empanelled in any other Circle with a consent letter . Consent would authorize its home Circle to revoke its BG on the advice of the additional consented Circle. Also, a Circle SI can become SI of any other Circle(s) of its choice on submitting a consent letter as above with an additional **BG of ₹1 Lakh** per Circle.
2. NTR Circle would be treated as a Circle with its geographical territory as NCT, Delhi for the purpose of SI empanelment and delivery of service.

1. **Detailed Eligibility and Operational Criteria of SI:**

Table 11. System Integrators

S N	**National & Circle Sis**	**Circle-Silver SIs**

1.	SI shall be an IT/Networking sector company.	SI may be an Individual or Proprietorship/partnership Concern.
2.	SI or its parent company should be a public limited or private limited company registered in India.	SI may be an Individual /Proprietor/ partnership Concern/LLP/Company and registered as per commercial laws to undertake the activities mentioned in scope of empanelment.
	The SI should have a valid CST/State VAT/TIN/GST registration certificate as applicable. (Copies of relevant tax/registration certificates to be submitted before any work order to SI).	
3.	Each applicant for its empanelment as SI will need to submit refundable Security Deposit (SD) of ₹1Lakh and ₹50,000 for National and Circle Level empanelment respectively, in the form of a Bank Guarantee from any scheduled bank valid for Oneyear	Each applicant for its empanelment as SI in Circle-Silver category will submit refundable Security Deposit (SD) of ₹ 10,000 in the form of Bank Guarantee from any scheduled bank valid for One year or a cash receipt of BSNL for this purpose.
4.	A Bank Guarantee (BG) valid for five and half years shall be submitted by applicants once selected for the empanelment of ₹ 15 Lakhs and 3 Lakhs for National and Circle level SIs respectively for abiding by the general rules of empanelment agreement. The refundable SD of ₹1.0 Lakh and ₹ 50,000 respectively submitted at the time of application for empanelment would stand released thereafter.	A Bank Guarantee (BG), valid for five and half years shall be submitted by applicants once selected for the empanelment of ₹ 50,000 for abiding by the general rules of empanelment agreement. The refundable SDof ₹ 10,000 submitted at the time of application for empanelment would stand released thereafter.
5.	SI shall also submit additional PBG of at least 5% of the P.O. value, whenever a work is awarded to Network/ SI valid for the duration of the project. However, in tender cases SI shall submit EMD/PBG as per customer requirement on back to back basis.	SI shall also submit additional PBG of at least 5% of the P.O. value, whenever a work is awarded to SI valid for the duration of the project. However, in tender cases SI shall submit EMD/PBG as per customer requirement on back to back basis.

6.	SI shall be a direct owner of technology or have a direct teaming agreement with each of technology companies directly or with their authorized channels that form the core building block for WAN or related project implementation. The core building blocks may be classified as servers, computers, computer peripherals, routers, LAN Switches/hubs, firewall, leased line modems, ISDN backup devices, connectors and basic computer related software etc.	SI shall have tie up and technical arrangement directly with the technology company or thorough its authorized dealer whose equipment has been used in delivery of the WAN/LAN so as to ensure long term support to the core building block for WAN/LAN or related project implementation. The core building blocks may be classified as servers, computers, computer peripherals, routers, LAN Switches/hubs, firewall, leased line modems, ISDN backup devices, connectors and basic computer related software etc.
7.	The SI should provide letters of support from OEM or its authorized channels of OEM stating that their solution will be supported on the platform proposed by SI for minimum two years and as per customer requirement.	The SI should provide letters of support from OEM or through its dealer/associate stating that the solution/equipment will be supported at all standard platforms for minimum two years and as per customer requirement.
8.	SI shall provide 24X7 help center either web-based or IVR based. SI shall ensure consultation, assistance and advice within four hours or as defined in SLA entered with customer. In other cases, complaint may be attended within eight hours.	SI shall maintain 24X7 help number. SI shall ensure consultation, assistance and advice within four hours or as defined in SLA entered with customer. In other cases, complaint may be attended within eight hours.
9.	The technical team of SIs will assist BSNL in coming out with the cost effective solution for the customers and will be required to give joint presentation with BSNL to customers.	
10.	The software up gradation for the first year shall be provided by the SI free of cost. However, SI will continue to provide up gradation on chargeable basis for subsequent years.	
11.	SI shall support SLA requirements of BSNL customers and ensure its compliance. In case SLA commitments are not met, SI shall be responsible for payment of penalties, if any, imposed by the customer.	
12.	Validity of the empanelment agreement shall be Five years, initially and renewal for two years, based on performance.	

13.	ISP should not be allowed to become SI, and If any SI after registration becomes ISP then the SI agreement should be cancelled. Accordingly, previously empanelled SIs also to be reviewed.

2. The SI Policy would be non-exclusive, walk-in & Open for all eligible categories and would remain hosted on Circles websites under "Business Opportunity Section".

3. The policy would be operated in sync with the EoIs of Circles, having attendant conditions mentioned therein above.

10.12 SELF DECLARATION/LETTER OF INTENT AND CONSENT FOR THE EMPANELMENT OF EXISTING SYSTEM INTEGRATORS IN OTHER CIRCLE/UNIT

TO

CGMT,

----------Circle,

SUBJECT: Request for Empanelment as Circle/National SI

As per the **"***Guidelines on Establishment of Customer's Private network on Turnkey basis through System / Network Integrator (SIs)***"** of BSNL for providing turnkey solutions to its enterprise customers the existing System Integrators (SI) may request for the empanelment in other Circles. In this regard, it is submitted,

(i) That, my firm/organisation/company, ---------- (herein after called applicant), is already empanelled as a System Integrator in – (Name of Home Circle)----------Circle as National/Circle Level System Integrator.

(ii) That, the applicant is interested to get empanelled as SI of your Circle Also.

(iii) That, the applicant is eligible under this policy to be empanelled as National/CircleSI.

(iv) That, the applicant on appointment as SI, would abide by the procedure as decided from time to time by BSNL and its officers in executing the network assignments as approved for the purpose.

(v) It is declared that the intended additional empanelment in your Circle would not affect the quality and speed of the works in my existing empanelledCircle.

(vi) It is well understood, that Enterprise Business leads are of utmost importance and has got commercial value for BSNL and would not be mis-utilised in any form which may be detrimental to the Business interests ofBSNL.

(vii) That the quotes given by me against the queries of BSNL would be firm and to be abided byme.

(viii) That, the acceptance of my offer against any goods or services would be at the sole discretion of BSNL and my Company would have no claim or right on any business.

(ix) That all the terms and conditions as applicable to me in my home Circle of empanelment would be enforceable in your Circle mutatis mutandis.

(x) That, the policy is non exclusive in nature and the applicant can't claim any right to any business, customer, area or product etc.

(xi) That, the applicant is aware of the empanelment is mutual and can be cancelled by either side on a due notice as per policy ofBSNL.

(xii) The applicant authorizes existing Home Circle Head to have lien on the BG submitted by me for any non performance committed in your Circle. For this purpose CGM of home Circle would act as per the advice of yourCircle.

(xiii) The applicant is well aware that if at any stage/juncture it is established that the applicant as SI has misrepresented BSNL and acted in a manner detrimental to the business interests of BSNL, BSNL would be free to make good its losses from the applicant without prejudice to any other legal remedies it may have.

Dated:

At: (----------)

Copy: CGMT, ….. (Home Circle),……..

10.13 FAQ – FREQUENTLY ASKED QUERIES

Based on some of the previous clarifications issued for few of the Circles, following is hereby clarified:-

- For Enterprise Business segment, BSNL CO. is issuing different policies, MoU, agreements, guidelines etc. from different units including units of EB, CFA and CM. In case of New Business sections like EB, NB, VAS, Smart City, MM Cell, etc. and in certain cases Circle nodal units on authorization of BSNL CO. are issuing Guidelines / Policies etc. Few examples arelike:

  - EB-IICell
    - Customer Private Network Establishment(CPNE),
    - Channel Partner Policy(CPP),
    - Strategic Business Alliance(SA).
  - BP-Ent./ MPCircle
    - MNS Policy
  - New Business Cell
    - Application Service Providers (ASPs) for software provision, support etc. and Call Centre worketc.
  - Smart City
    - Empanelment for Smart City related works
  - VASCell
    - ASPs related to Bulk Push SMS and other similar services.

- Vehicle Tracking / Fleet Management (M2MServices)
- And various other policies…

○ IT-CFA

- IDC Services including Data Centresetc.

○ NWP-BB

- EOI for empanelment of SI for turnkey solutions(WiFi-EOI).

○ MMCell

- ProcurementGuidelines

CPNE Guidelines (Initially issued on 04.09.2003, latter majorly modified on 15.10.2015 and lastly on dated 17.07.2017) are meant for establishment of Customer's Private Network as mentioned vide its preamble- "… connectivity provider for establishment of Private Wide Area Network and complete networking solution for them on turnkey basis including supply, installation, integration and maintenance of networking equipment". However, it has been found that Circle/field units try to work out solutions under the ambit of a single policy or guidelines issued from BSNL CO. specially CPNE guidelines. This happens as Circle EB unit has to deal with all sort of situations for which solutions are being provide through different sections of BSNL CO. as mentioned above.

In normal process the prescribed procedure as per procurement manual needs to be adopted for products and services. The procedure brought out in this CPN guidelines for SI empanelment (SI policy) is made following general financial and commercialprincipletominimizethedelaysindeliveryofturnkeyservicesto Enterprise Customers striking out balance between the business interests of BSNL and the basic principles of procurement of products and services. Moreover these CPNE Guidelines have been envisaged to ensure fast delivery of turnkey business to BSNL's Enterprise customers where customer pays for it's own network establishment and seeing the urgency of the situation with very limited time while keeping full regard to basic principles of procurement of products and services and needs to be dealt within the framework of guidelines for enterprise customer's private network establishment only- Customer-wise and project based i.e. on case to case bases and not for procurement of the material for general planning purpose for multi projects. Accordingly, Circles are requested that CPNE guidelines may be exercised for Establishment of Customer's Private network only in conjunction with applicable BSNL procurement manual and CVC Guidelines like e-tendering etc. bringing transparency and more automation the system.

- CPNE guidelines are not applicable for "Last Mile Connectivity" which requires laying of OFC, RF modems etc.
- For the complex field requirements exploration and analyses for all available policies/ guidelines / MoU/ agreements etc. like from New Business, VAS, MM Cell and others may be done to best suit in the situation at hand and accordingly, the bigger project/s may be undertaken applying different applicable policies guidelines etc. and best suited solution may be carved out well within the frame work of statutory and CVC guidelines in the best interest of BSNL and the esteemed customers. Like, for MNS subject matter, Circles are requested that the concerned nodal unit needs to be consulted for further update/necessary instructions/permission/action.
- For, tender cases for customer's private network establishment, SI should submit

EMD/PBG for SI part.

- For License fee of 8% (As applicable presently), refer- CA Cell circulars/instructions as issued from time to time. The license fee is over and above 15% BSNL margin, accordingly, financial viability may be duly ascertained (Also, Circulars from Finance Enterprise vide no. BSNL/Ent. Fin/9-1/2020/, dated 18.03.2020 and BSNL/Ent. Fin/9-1/2016/, dated 08.03.2018 & this office Circular No BSNLCO-EBII/19/1/2020-EB-II dated 19.08.2020 may please be referred for taking care of additional 8% (or as applicable) of "License fee" in all EB projects).
- For Escrow account opening, fixed revenue share option is not available with empanelled SIs under CPNE guidelines, moreover, finance vertical needs to be consulted in the matter as per available instructions.

10.14 CONCLUSION:

From the module it is concluded that, In turnkey projects, we will undertake entire execution responsibility of the project. The project cost indicated to the customer shall be inclusive of equipment cost, project management cost, investment cost overheads and profit margin which may vary from project to project depending upon the nature of the project, competition, timeframe for realization of investments made in the project. The status of activities carried out in respect of execution of turnkey projects is to be sent to BSNL HQ every month.

11 APPLICATION SERVICE PROVIDER (ASP)

11.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Scope of work of ASP
- Roles and responsibilities of Application Service Provider and BSNL
- Process of Empanelling and signing of contract.
- Commercial terms and conditions.

11.2 INTRODUCTION:

Bharat Sanchar Nigam Ltd (BSNL), a wholly owned Public Sector Enterprise of the Government of India is a leading Telecom Service Provider in the country with PAN-India presence except in Delhi and Mumbai Metro Cities. It has dominant market share in landline telephony, Cellular Mobile, Internet and Broadband services, Leased line/MPLS-VPN connectivity, Internet Data Centres etc. with a large enterprise customer base all over the country. BSNL has also State-of-the-Art Tier- III Data Centers located at seven major locations across India at Ahmedabad, Faridabad, Ghaziabad, Ludhiana, Jaipur Mumbai and Chennai. From these Data Centres BSNL provides cloud based and hosted data centre services to its various clients.

For functional convenience, BSNL has divided its business in four broad verticals namely Consumer Mobility, Consumer Fixed Access, Enterprise Business and New Business. Due to M- Governance, E-Governance, Digital India, Smart Cities policies of Government the demand for a wide range of services based on ICT platform involving M2M and internet of things (IOT) etc. has increased manifold in recent times. The coming years are likely to see a big boom in the areas of E/M-Governance, IT/ITes Digitization and Smart City Solutions, besides the other applications of M2M and IOT. In the wake of Government thrust on initiatives focusing primarily on technology based services for improving governance and citizen services, BSNL envisages huge potential in the field of ICT, IT/ITes and E/M-Governance services. BSNL being a major service provider having largest coverage area in the country and having in-house data centre facilities at important locations can drive its business growth by making focused efforts and planned initiatives in these new emerging areas.

Accordingly, BSNL invites proposal from **Application Service Providers** (ASP) who has the capability of providing customized ICT based solutions for Government Departments, PSUs, Enterprise customers etc. and is willing to work with BSNL in the New Business areas. The ASP should have sound domain knowledge of the target customers so that it can conceptualize, develop, implement and support cutting edge solutions, utilizing the mobile, Internet and data centre services of BSNL. ASP should have experience of integration of the software application, Mobile App with SDP, OTA, SMSC etc.

The responsibility of exploring the opportunity, bringing/designing solution, hardware, software and managing the same will be that of BSNL partners i.e. ASP. A variety of business models viz. CAPEX based, OPEX based, CAPEX & OPEX based can be required to be implemented as per the decision of the customer. BSNL intends to target the emerging new areas like E/M- Governance, IT/ITes, M2M/IOT, Smart City and Digitization projects and will offer ICT based solutions to its customers on turnkey basis by utilizing its in-house strength of connectivity and IDC services.

11.3 CONDITIONS

11.3.1 Eligibility Qualifications

The bidder is required to meet the following criteria and submit documentary proof as under seriatim along with their offer:

1. The bidder should be a corporate entity duly incorporated in India under the relevant law and engaged in the business of providing ICT based solutions viz. E-GOV, M-GOV, M2M, IOT, digitization, IT/ITes and Smart City Solutions. (Copies of MOU, Article of Association, Certificate of incorporation to be submitted).
2. The bidder's profile along with its turnover in the last three years shall be submitted. The bidder must have a minimum average annual turnover of Rs.10 Crore (Rupees Ten Crore) during the three year period. (Attach documentary evidence). However, this turnover & experience conditions will be relaxed in case of start-up companies certified by DIPP, Min of Commerce, Government of India (Certificate of recognition issued by DIPP, MOC& I to be submitted)
3. The bidder should have a positive net worth in consecutive last three years. (Copy of the same certified by CA to be submitted)
4. The bidder should have a valid GST/TIN registration certificate. (Copies of relevant tax/registration certificates to be submitted)
5. Joint venture/consortium (with maximum 2 members/partners) for qualifying as Application service provider shall be acceptable. The technical & financial criteria's can be met separately. However, the member fulfilling the technical criteria's will be the lead member of the consortium.
6. The bidder or any of the promoters/directors/consortium & joint venture partner or member should not have been defaulted/blacklisted regarding bad performance/ delayed delivery / Bank NPA, CDR (Corporate Debt Restructuring), SDR ((Special Debt Restructuring), NCLT or for any other defaulting reason by any Central/State Government departments, Autonomous bodies, Bank and Financial Institutions, PSUs from participating in the projects either individually or as a member of a consortium as on the date of submission of EOI (Attached an Undertaking).
7. The bidder must comply with all regulatory and legal guidelines issued by GOI/DOT/TRAI regarding IT/ITes, M-Gov, E-Gov, IOT/M2M, Digitization & Smart City Solutions. (Attach an undertaking confirmation)
8. The bidder should have prior experience of supply, installation and commissioning of solutions with a minimum of 3 corporate customers including Govt. Dept. /organization, PSU & ULBs. (The Project completion certificates, along with a copy of Work Order/ Contract/ Agreement from the Client/ Owner to be submitted)
9. The bidder should also submit a declaration stating that in case BSNL jointly participates in the tender with the bidder then the bidder should be ready to submit the performance security/EMD etc. on back to back basis as per value/amount required by the tendering authority.
10. The bidder should submit a declaration that they are ready to undertake a pilot project at his own cost if so desired by BSNL or the customer.

11. The bidder should have experience of implementing any three ICT based M-Gov, E-Gov M2M/IOT Digitalization, IT/ITes and Smart City Solutions of more than 5 Crore value during the last three years. (Documentary proof to be submitted)

or

12. The bidder should have implemented at least one ICT based software system capable of collecting, processing and analyzing data's on daily basis and of value more than 5 Cr. The system must be collecting data from multiple locations in geographical areas. (Copy of purchase order and/or completion certificate for having implemented such system should be provided)

11.3.2 Scope Of Work

The scope of work in general but not limited to the following is given below:

1. The ASP should be capable of conceptualizing, developing and marketing on its own, innovative cutting edge ICT based solutions.
2. ASP's system should be capable of integrating with GSM network elements like SMSCs, OTA, SDP etc. for extending various solutions for masses helping BSNL to generate additional revenue from these services.
3. Integration of Application servers with the SMSC/ SDP/ OTA etc. over SMPP/ PARLEX/ XML/ CORBA or any other protocol specified by the customer shall be responsibility of the ASP
4. The real time MIS shall be made available for BSNL officials regarding statistics of the SMS traffic MO and MT for short codes based on key words so that appropriate billing can take place.
5. Providing a set of tools to enable all relevant parties to retrieve statistical information regarding all system activities such as number of transactions for each department, delivery reports, transactions effected by each mobile service provider network etc. The tools shall be capable of generating standard reports and shall be able to provide customized reports. The reporting system shall offer the web interface with a login. Summary reports should also be possible to be delivered/ retrieved from mobile phones by the designated officials.
6. The ASP's solutions in general should be able to enhance and scale the software application to meet the changing needs of the customer, the changing technologies and changing regulatory environment as well.
7. These features are indicative and not exhaustive. Any other details of the software/services to be offered may also be provided with the specific proposal to the concerned customer after the approval by BSNL.
8. After completely understanding the requirement of the customer, ASP will be responsible to prepare a techno-commercial proposal and submit the same to BSNL. BSNL will examine the same and offer them to the customer after adding costs of BSNL services along with its administrative costs.
9. The Smart City, E-Governance, M-Governance and M2M solutions generally involves devices also that need to be managed (Provision, de-provision, suspend, control, trouble shoot, test, map to a Connection ID etc.). Thus, the ASP will be responsible for providing the hardware as well as software apart from all such devices wherever required by the customer.

11.4 ROLE & RESPONSIBILITY OF THE APPLICATION SERVICE PROVIDER

Apart from the responsibilities assigned in the scope of work, the Application Service Provider will be also responsible for the following:

1. To analyze the market and find out the possibility of new business by providing ICT based solutions.
2. To explore the new ideas for digitalization of public utility services in Govt/semi-Government organizations.
3. To explore the possibility for optimum utilization of BSNL available infrastructure in providing digital solution to different Govt./semi-Govt./Corporate organization.
4. The Application Service Provider should be capable of performing all activities (except providing telecom connectivity & IDC services) required for end to end delivery of the services to the customers.
5. The ASP shall have to evaluate and select a right M2M device (Smart Communication Device) for the solution as per requirement of the customer.
6. The ASP shall have to do integration of hardware testing with the application in real environment before finalizing an M2M device (Smart Communication Device)
7. The ASP shall have to do all operation and management of the M2M device including warranty.
8. The ASP shall have to provide FMS Services if required by the customer.
9. A separate "Addendum" will be required to be signed with already empanelled ASPs inter-alia suitably incorporating the amended clauses.

11.5 ROLE AND RESPONSIBILITY OF BSNL

1. BSNL will do interaction with its customers individually or jointly with the Application Service Providers.
2. BSNL will provide Telecom connectivity as well as IDC services for ICT based solution as per requirement of the customer.
3. BSNL will provide short codes, long code & Access Point Names (APNs) where ever required for SMS, USSD, IVR etc.
4. BSNL will provide Subscriber Identity Module (SIM) for the M2M solution as per requirement of the customer.
5. BSNL will prepare special tariff plans for M2M/IOT customers as per requirement and feasibility.
6. BSNL will provide support for network related problems.

11.6 PROCESS FOR EMPANELLING APPLICATION SERVICE PROVIDERS

After scrutinizing the document submitted by ASPs, they will be called for a Technical presentation which will include future planning and road map for executing the services in BSNL.

11.6.1 Signing Of Agreement

This Agreement is non-exclusive and nothing in this Agreement will be construed to prevent either Party from entering into a similar Agreement with any other Party or to restrict such Party from directly engaging in related activities.

BSNL intends to sign a master service agreement with the ASP partner in which majority of terms & condition shall be available, however if required, an addendum agreement may be signed with the ASP depending upon the commercials of the project. The addendum agreement and other requirements of the project shall be finalized in discussion with the ASP. The master service agreement with the ASP shall be signed after empanelment.

11.6.2 Engagement With BSNL Customer:

Table 12. Type of Engagements

S No.	Type of Business Engagements	Approach
1	Customer floated Tender/RFP.	Scenario-1: BSNL, individually or jointly, participate in Tender/RFP floated by customer Scenario-2 ASP participated in this Tender/RFP floated by customer.
2	BSNL approaches Customer or vice- versa for Nomination Business.	Scenario-1: Customer ready to reimburse the cost quoted by BSNL, as jointly decided in consultation with selected ASP. Scenario-2: Customer wants competitive price/cost to be discovered for solution. Scenario-3: Customer asks BSNL to float an open ended EOI.
3	ASP approaches customer or vice versa for award of work to BSNL on nomination basis or through tender	Scenario-1: BSNL to quote price / cost to customer in consultation with this ASP. Scenario-2: In case of tender by existing BSNL client for scaling up or extension of the same service, then the same ASP should be selected as partner.

As shown in above table, there are different modes of engagement with enterprise customer. The field units will follow these modes of engagement while dealing with business opportunities with any Govt./Enterprise customer.

11.7 PROCEDURE FOR DIFFERENT ENGAGEMENTS

11.7.1 Customer FloatedRFP/Tender

Scenario-1: Selection of ASP will be at sole discretion of BSNL. Before bidding, BSNL may enter into negotiation with empanelled ASPs and select the one based on technical and financial competency to execute the project, revenue to BSNL etc. For this, detailed technical solution write-up may be obtained from the ASPs empanelled by NB cell Corporate office

and then after evaluating the technical competencies, as well as required compliances for the particular tender, one of them may be selected to be the backend partner of BSNL in the RFP/ Tender. In this case, the EMD if required will be paid byBSNL. The bid price will be decided in consultation with the ASP wherein the revenue share will be as per Para8.1.4.When the tender is won by BSNL, it will go along with the same partner for implementation with whom the bid is won. Once the ASP participates in a particular tender as BSNL backend partner and the tender/EOI is cancelled for any reason, the same ASP would be allowed to partner with BSNL in case the tender /EOI is recalled with or without modification.

Scenario-2: ASP participated in EOI/RFP floated by customer. If more than one ASP is participating in EOI/RFP, BSNL may partner with any one or more partners to be decided on case to case basis.

11.7.2 BSNL approaches Customer or vice-versa for Nomination Business:

In this case BSNL may select one of empanelled ASP or go for the EOI among centrally empanelled ASPs based on customer's requirement.

Scenario-1: Customer ready to reimburse: If customer is ready to reimburse the cost of the project as per their requirement then the BSNL may engage with any of ASP based on requirement of customer and other commercials and quote the cost of the project to customer after including BSNL's charges and other License Fee/Corporate tax etc.

Scenario-2: Customer agrees for Centrally engaging with BSNL empanelled vendors: BSNL may ask quotes from empanelled ASPs as per the requirement and selects one ASP. Quote of the selected ASP may be sent to customer after including BSNL's charges and other License Fee/Corporate tax etc.

Scenario-3: Customer asks BSNL to float an EOI: If customer wants a competitive price for their requirement and ask BSNL to float an open ended EOI, then BSNL draft & float an EOI in consultation with customer as per their requirement and ASP will be finalized by BSNL for Customer as per EOI Terms & Conditions. Centrally empanelled ASPs are also free to participate in EOI.

11.7.3 ASP approaches customer or vice-versa for award of work to BSNL on nomination basis or through tender:

On nomination basis: If ASP approaches customer with solution as per their requirement and customer agree & approve the solution of ASP the case (lead) will be locked for the particular ASP. Then BSNL may enter into the negotiation with the ASP and enter into the agreement as per agreed commercials. Circle CGMs are fully empowered to offer special tariff plans for the telecom component viz bandwidth, PRI Lines, IVR, SMS etc in such cases keeping in mind the site condition, technical feasibility, market competition etc.

Through Tender: If an existing client is going for tender for scaling up or extension of the same service including minor deviation / modification then the same ASP who has partnered with BSNL in the original work should be selected to bid with BSNL in this case also if their preference has been satisfactory in the earlier phase.

Through Swiss Challenge Method: If centrally empanelled ASP (CEASP) approaches the customer with an unique innovative idea / proposal / solution and the same is liked by the customer, BSNL may adopt "Swiss Challenge Method" to improve the solution and to discover the price of the offered innovative idea / proposal / solution, if agreed by the customer.

11.8 PROCEDURE FOR SELECTION OF ASP:

1. Sealed quotes wherever required as per provisions at Para 11.2.8 (excluding the scenario 11.2.8 (i) a & 11.2.8 (iii) b will be asked from Centrally Empanelled ASPs (CEASP) as per requirements from customers. The centrally empanelled ASPs will quoteonlyforhisservicesandproductexcludingthecostoftelecomconnectivity and IDC services. In all other cases, the commercial & technical terms & conditions will be negotiated with the selected ASP keeping in mind the requirement of the customer.
2. First right of refusal should remain with the CEASP whose Prototype (product/services) was selected by customer. It means, the quote of other EASP, if found to be L1, then such L1 rate may be offered first to the CEASP whose Prototype/proposal was selected by customer. If such CEASP does not accept the offered L1 rate, the work may be awarded to the CEASP who quoted the L1 rate. In case the L1 CEASP refuses to accept its own quoted rate, suitable punitive action viz. for forfeiture of BG and / or black listing of the ASP will be taken against it.
    1. The proposal should be submitted by ASP, signed by authorized signatory.
    2. If required, a Proof of Concept (POC) testing may be conducted at a zonal/circle/SSA level to check the technical feasibility or to conduct a Demo for customer. BSNL will provide the necessary connectivity and other hosting infrastructure for POC on no additional cost toBSNL
    3. BSNL may sign a separate agreement with Customer and ASP or may sign a combined tripartite agreement based on the proposal and discussions with Customers on case to case basis.
    4. In case BSNL signs separate agreement with Customer and ASP and there is a technology partner to the ASP as well, in such a case BSNL may sign a quadri-partite agreement (BSNL – ASP-Technology Partner - Customer) making the technology partner a party in the agreement.

11.9 COMMERCIAL TERMS & CONDITIONS

Salient points for Commercial model for New Business services are as follows:

1. **ICT based solution & services** are a novel approach in telecom domain and presently in its progressive stage in India. Like standard BSNL policies and services it is not feasible to fix standard revenue share with ASP. For such services, Fixed and variable revenue share for BSNL is introduced.
2. **Fixed revenue share for BSNL:** Fixed minimum revenue share for BSNL is for using its name and goodwill for grabbing opportunities
3. **Variable revenue share for BSNL (X):** Rest of the share will be divided between BSNL and ASP as per proportionate investment planning. In a scenario where the investment in Equipment is done by the vendor and telecom services, infrastructure, customer interfacing etc. is being handled by BSNL then the total cost of the project is calculated and revenue share is being taken in proportion. The revenue share will be finalized after negotiation with ASP on case to case basis and on the matrix of responsibilities defined to each as per requirements of customer. Value of X shall be calculated on basis of quantum of work & responsibilities handled by BSNL i.e. Telecom services (Connectivity, SIM etc.), infrastructure (like Data Centers, Towers etc.), customer interfacing, manpower for field service etc.

4. **Revenue share:** On the quoted price of ASP, BSNL will add at least 10% margin towards its administrative cost, besides a variable component X. The variable component on the hardware and software items will be decided separately by ED (AB) or Director (EB) (in case, ED (AB) post is vacant) when the offer is given by NB Cell, Corporate Office. In case the offer is being given by the Circle, the concerned CGM will take this decision.

5. The turnkey ICT solution often includes a significant portion of connectivity Requirements also. The revenue earned from the connectivity portion is not shared with the ASPs who are instrumental in bringing the lead and getting the business for BSNL. Hence in order to incentivize the ASPs for enhancing to prospect of including the connectivity component in all such turnkey ICT projects / works, the incentive as per BSNL "Channel Partner Policy" issued vide No BSNL/EB-II /CPP-2017 dtd 08.03.2017 will be payable for Telecom Component in those cases where BSNL will get the work on nomination basis through leads generated by the particular ASP.

11.9.1 Performance Bank Guarantee (PBG)

In case separate PBG is not required by the customer, the ASP shall submit a Bank guarantee of 5% of the cost of the project (i.e. amount quoted to enterprise customer) to BSNL at the time of signing of Agreement / Award of Work Order for execution of the project in both the cases whether the case is awarded to BSNL through tender or on Nomination basis. However, it is to be mentioned that the ASP will be solely responsible for all the activities done by the technology partner (if it exists). PBG shall be valid for the entire duration of agreement with ASP. BSNL shall reserve the right to encash the BG in case the ASP or its partner withdraw from the agreement citing commercial/ business case reasons or any other reason not mentioned in the agreement.

11.9.2 Costs Of Revenue Share Between BSNL & ASP

1. License fee, spectrum charges, any other levy payable to Licensing Authority pertaining to Telecom service, if any, on actual basis.
2. Any other cost which is mutually agreed.

11.9.3 Duration Of Agreement

3 years (36 months) initially and thereafter it will be renewed at the sole discretion of BSNL considering the performance of individual ASP. The revised eligibility criteria will not be applicable in case of those ASPs who have been empanelled initially before the modifications / amendments included in this EOI document.

11.9.4 Empanelment Fee:

The empanelled ASP has to pay non-refundable Rs. 1.0 Lakh as empanelment fee. However, the ASPs centrally empanelled by any Business Vertical here at Corporate Office are exempted from payment of empanelment fee.

11.9.5 Submission Of EMD

No BG is required to be deposited at the time of empanelment.

11.9.6 Other Terms And Conditions

(i) This EOI should not be treated as a commercial tender document and bidders are advised not to offer any price or include any financial aspect with their response.

(ii) This EOI does not constitute and will not be deemed to constitute any commitment

or confirmation on part of BSNL for any purchase/work order to the bidders.

(iii) These revised terms & conditions of the EOI, except the eligibility conditions will be applicable to all the ASPs who have been empanelled under the original EOI dated 9th Aug, 2016.

(iv) The extract of the terms & conditions of this revised EOI will be circulated among all the field units for their strict adherence while exploring New Business opportunities either through open tender route or through nomination basis.

(v) New Business opportunities will be handled by Circle EB groups at field level.

(vi) NB Cell, Corporate Office can also participate directly in tenders invited by Govt./ Enterprise Customers by depositing EMD where ever required.

(vii) Bidders shortlisted in the aforesaid EOI shall be required to sign an Agreement with BSNL on mutually accepted terms and conditions. The validity of such Agreement shall be 3 years which may be extended or curtailed at the sole discretion of BSNL on the performance of individual organization.

(viii) The bidder shall bear all cost associated with the preparation and submission of its response to this EOI including cost of demo/presentation for the purpose of clarification of the offer if so desired by BSNL. BSNL will in no case by responsible for these costs regardless of the conduct or outcome of the EOI process.

(ix) EOI document duly completed and signed by the authorize signatory should be submitted in a sealed cover super scribing "EOI for empanelment of Application Service Providers for providing new business solutions to BSNL customers specially in Government/semi-Government sectors"

(x) Due diligence should be exercised while providing information against the EOI. Unnecessary or irrelevant information will not give any advantage to the bidder. Only relevant and precise information should be provided. If any information provided by the bidder is found to be incorrect at any stage it would render his or her bid liable for rejection and the empanelment fee shall be forfeited.

(xi) At any time prior to the last date of receipt of the offers, BSNL may for any reason whether at its own initiative or in response to a clarification requested by prospective bidder modify the EOI document and all formats including Annexures by issuing clarification and/or amendment. In order to provide prospective bidders reasonable time to take the amendment into account in preparing their offers, BSNL may, at its sole discretion, extend the last date for receipt of offers and or make other changes in the requirement set out in the invitation for EOI.

(xii) While this EOI has been prepared in good faith neither BSNL nor its employees make any representation or warranty, express or implied or accept any responsibility or liability whatsoever in respect of any statement or omission herein or the accuracy, completeness or reliability of information and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this EOI even if any loss or damage is caused by any act or omission on their part. Bidders who are willing to work with BSNL on non-exclusive basis and strictly on back to back terms and conditions may kindly send their EOI in line with the aforesaid requirements .

11.10 CONCLUSION

In this chapter we have discussed the methods to engage the **Application Service Providers** (ASP) providing customized ICT based solutions for BSNL Customers. The responsibility of exploring the opportunity, bringing/designing solution, hardware, software and managing the same will be that of BSNL partners i.e. ASP. A variety of business models can be required to be implemented as per the decision of the customer. BSNL intends to target the emerging new areas like E/M- Governance, IT/ITes, M2M/IOT, Smart City and Digitization projects and will offer ICT based solutions to its customers on turnkey basis by utilizing its in-house strength of connectivity and IDC services.

12. FUTURE EB SERVICES SDWAN

12.1 LEARNING OBJECTIVE

After reading this unit you should be able to understand:

- Implementation of SDWAN
- SDWAN as a Service.
- Benefits of SDAN
- Features and Uses.

12.2 INTRODUCTION

SD-WAN initially helped branch users connect to corporate LANs. But there are several new SD-WAN trends that will expand the relevance of the technology.

As enterprises continue to move applications to the cloud, networking architectures such as SD-WAN have become increasingly important to accommodate cloud-based applications. With more software as a service (SaaS)-based applications in the cloud rather than residing in centralized data centers, data traffic patterns shift.

Enterprises see the ramifications of moving to the cloud loud and clear. Cloud-based apps and services can create a drag on app performance, boosting bandwidth costs and increasing data latency. Traditional wide area networks (WANs) aren't equipped to handle these new data flows. Accordingly, enterprises are considering new networking architectures such as software-defined wide area networks (SD-WANs) to address performance and management issues.

SD-WAN has already begun to change how customers manage branch offices to increase resiliency combined with low latency and jitter. The model for achieving this with today's SD-WAN tools is to place artificial intelligence (AI) at either side of a multi-connection WAN, then perform real-time analytics based on defined application-specific settings that indicate which data flows should have priority over others.

It's a simple way to get the most out of an existing WAN without an IT architecture overhaul. That said, now that SD-WAN is integrated in many enterprises in its most basic form, it's time to think bigger. Let's look at the key SD-WAN trends likely to emerge over the next few years from an enterprise IT perspective.

12.3 WHAT IS SDWAN

For 20 years, businesses have relied on edge routers that were manually configured by skilled IT workers combined with costly dedicated access circuits (MPLS) to provide site-to-site connectivity. The high cost for bandwidth and maintenance is unsustainable in today's world of business digital transformation.

Software Defined Wide Area Network (SD-WAN) is a solution that simplifies the management of the interconnection across multiple sites.

12.4 WHY SDWAN

Cloud will account for 92% of business network traffic by 2020, but legacy networks and MPLS are for ill-suited connecting business users to the cloud.

SD-WAN provides agile connectivity to support digital business transformation with superior reliability and performance for business cloud applications.

12.5 AN "SD-WAN-FIRST" APPROACH

Early implementations of SD-WAN were commonly deployed within the confines of existing WAN structures. These were often built around carrier Ethernet as the primary link and standard broadband/VPN as a secondary connection.

Now that SD-WAN has proven itself to be an effective asset at the WAN edge, IT architects are re-evaluating their existing WAN architecture to better exploit SD-WAN's performance and cost-savings benefits. The assumption is that SD-WAN will be deployed, so it's a default part of the equation for all WAN deployments moving forward.

For the most part, having an SD-WAN-first approach means you've factored in the benefits. Usually this means right-sizing connectivity to branch locations based on expected performance that can be achieved through SD-WAN features. Sizing not only includes the recommended throughput required for a remote site but also the WAN connectivity type selected. For example, WAN architects that are comfortable with the capabilities of SD-WAN may opt to deploy dual Internet broadband connections as opposed to a more expensive Multiprotocol Label Switching (MPLS). These design changes can result in massive operational expense (Opex) savings for businesses. It's important to note that while right-sizing a WAN is important for the bottom line, architecture needs to be able to scale up or down as needed, particularly for cloud-based architectures.

12.6 USER PERFORMANCE MANAGEMENT

User performance management initially gained traction on wireless LANs (WLANs). But today it enables performance gains based on an individual user's – or a group of users' – determination of "business critical" app functionality.

A WAN initially built on overall network performance has evolved into an SD-WAN that governed by application-based performance. Future SD-WAN deployments will likely provide greater granularity and treat data flows according to what an individual user determines are the most important data flows to get his or her work completed.

While user-performance management is a way to exploit advancements in AI, the complexity of managing user-based policies will increase. For some, managing the underlying infrastructure in addition to user performance policies may become overwhelming. That's why some businesses will choose to offload some management tasks to a third-party provider.

12.7 SD-WAN AS-A-SERVICE

The easiest and most time-efficient way for enterprises to implement today's SD-WAN technologies into existing WAN edge architecture has been to do it themselves. However, as IT decision-makers evaluate their long-term WAN strategy, it becomes apparent that it takes time and effort to create and manage application- and user-specific policies. Thus, some are concluding that to reduce the overall in-house manpower spent on WAN architecture, it's better to have a third-party provider manage the underlying SD-WAN infrastructure while leaving the policy creation and management to in-house staff.

SD-WAN as-a-service providers can manage everything from circuit up/down/degraded statuses to managing the routing protocols running between corporate and remote offices. What's left for in-house IT staff is to build policy based on what data flows are considered important to the business. The drawback, of course, is that the business becomes reliant on a third party for overall operation of the WAN from layers 1 to 4 of the Open Systems Interconnection (or OSI) model. It should be noted that managed SD-WAN as-

as-service is no different from a risk perspective than other managed service provider relationships.

12.8 SD-WAN AS PART OF A MULTI CLOUD STRATEGY

First-generation SD-WAN platforms are being integrated into hybrid cloud computing strategies as well. A hybrid cloud is when you connect a privately operated data center with a single public or private cloud provider. Policies are then shared between the two so that the appearance and operation are identical from an end-user – and an administrative -- perspective.

As cloud ambitions grow, most IT departments find benefits from a performance, reliability and security perspective when they deploy their services throughout multiple cloud service provider networks. Previously, multi-cloud strategies proved difficult because each cloud platform was managed using different tools and application programming interfaces, or APIs. Thus, creating identical network, security and application policies across multiple cloud infrastructures–in addition to a private data center–was too cumbersome to maintain. However, multi-cloud management platforms have emerged to help administrators create a centralized and universal network policy strategy that can be automated and pushed out to most of the popular public cloud platforms available today.

Now that multi-cloud strategies are a viable option, look for SD-WAN to begin creeping into the overall architecture by providing the same performance and latency benefits as they currently offer between corporate and remote offices. Only, this time, SD-WAN will be deployed between two or more public clouds managed by different service providers.

12.9 SD-WAN TO REMOTE USERS

Lastly, look for SD-WAN to break free from static remote-site and cloud deployments and instead deliver these services directly to end users no matter where they are located. By combining separate paths using broadband/Wi-Fi and carrier wireless technologies such as LTE and 4G/5G, SD-WAN can be brought directly to the desktop for remote or at-home users. We're already seeing carrier wireless being used as part of an

So it's only a matter of time before SD-WAN can be deployed anywhere. This will be possible, regardless of whether a user is at a branch office, at home or at a coffee shop thousands of miles away. Although this future SD-WAN trend is likely to be further down the road of the five future predictions presented in this article, this one has the potential for the largest impact. This is especially true since there continues to be a continued uptick in remote workforces.

12.10 BENEFITS OF SD-WAN

Today's businesses require a more agile network designed to connect users with cloud-based services. A network that delivers better speeds, exceptional performance and lower operating costs while remaining secure.

12.10.1 Network Agility

Enjoy the flexibility to diversify bandwidth access using local internet providers and the ability to add new sites quickly and easily. Increase speed for any site whenever you need, by simply adding another connection and upgrading your site licenses as bandwidth demands change over time.

12.10.2 Increase Reliability

Our customers enjoy non-stop productivity because we protect users and applications against link outages. Link health is constantly monitored and we'll react in a split second to keep your sites connected, ensuring all your inbound and outbound services operate flawlessly.

12.10.3 Cloud Productivity

We condition your broadband connections to deliver predictable cloud performance across all your applications, as we prioritize real-time cloud services and manage your end-to-end connectivity to provide low-latency access to business cloud applications.

12.10.4 Reduce Opex

Delivered as a managed service, our solution drives network efficiency with centralized cloud management and branch automation. This provides IT economies of scale for small and mid-sized business customers, delivering lower total cost and decreased risk

12.11 FEATURES AND USE CASES

12.11.1Automatic Site Failover

D-WAN continuously monitor link health and seamlessly reacts to protect you against lost productivity caused by link outages. All inbound and outbound sessions will stay connected and all users will remain online with no dropped calls and no change in IP address.

Live voice calls happen in real-time, so they're highly vulnerable to getting disconnected whenever link outages occur. Our seamless failover solution manages your connections and quickly reacts to keep every call connected. It happens so fast you hardly even notice.

12.11.2BI-Directional QoS

Patented bi-directional QoS manages traffic priority for real-time voice and videoconferencing services delivered over broadband. Every broadband connection is calibrated to insulate your network experience against degradation caused by oversaturation.

Our network intelligently manages Quality of Service (QoS) for cloud services over any broadband connections. We protect both inbound and outbound call quality by ensuring voice calls always get priority over other traffic.

12.11.3Cloud Management

Our SD-WAN solutions include 24/7 support provided by certified IT professionals. Customers enjoy the confidence of a cloud managed network service, plus easy login access to view network and application performance in the Adaptive.

Enjoy the freedom to make important calls even while your co-workers are running multiple applications at the same time. We protect your call quality during peak periods of network congestion by dynamically reserving bandwidth whenever a call is initiated.

12.11.4Freedom Of Choice

We give you the freedom to use whichever voice and video conferencing solution that's right for your business.Our solution works with any cloud services any local broadband links. Whichever solution you choose, we'll protect call quality with no dropped calls on failover.

12.11.5Advanced Troubleshooting

When voice quality issues arise, it's critical to solve the problem quickly and restore services. Our solution is managed by IT pros with data capture and QoE tools that accelerate troubleshooting and eliminate the finger-pointing.

12.12 CONCLUSION

There is so much interest in the corporate WAN edge partly because traditional 9-to-5 jobs inside a corporate office are becoming a thing of the past; mobility is redefining how we work. While SD-WAN may have initially caught our eye to provide better service to branch offices, the technology has far more to offer. There is little doubt that SD-WAN technology will continue to evolve to provide users improved connectivity services that allow them to further break away from the corporate LAN.

13. FINANCIAL STUDY, EB REPORT AND ANALYSIS, EB MARKET FORECASTING

13.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- Business Development Cells
- Types of New Business
- Preparation of Techno-Commercial Proposals
- Delegation of Financial and Administrative Powers
- SWOT analysis for EB
- EB Portal

13.2 INTRODUCTION

Formation of Business development Cells in Telecom Circles: Growth in industrial and IT sectors in India during last few years has created new business opportunities in telecom sector. BSNL can leverage its wide- spread telecom network resources in India to tap these business opportunities and provide customized network solutions and services to its clients. It has been therefore decided to form a business development cell in every circle to undertake such new business activities in India. Broad guidelines for undertaking this business are described below.

13.3 BUSINESS DEVELOPMENT CELLS

Each circle will have a business development cell that will seek new telecom and IT business opportunities and undertake projects/ telecom related studies for the customers. The business development cell can be under GM(Marketing)/ GM(Development)/ GM(Installation) with a DGM (BD) and support staff to start with. As the business grows, the cell can be strengthened.

Business development cell will draw upon the expertise as and when needed from the manpower resources of the circle or from the other units of BSNL depending on the specific project requirements. Since the business opportunities in the present competitive environment present a big challenge a fresh outlook of the business modes of BSNL is required. Engaging consultants having required qualifications (may be an MBA) should be seriously considered.

Broad functions of the Business Development cell will be as under:

1. Address the communication needs of the large ,medium and small enterprises and government bodies ;and create business opportunities by proposing solutions for their communication needs.
2. Liaison with prospective business customers.
3. Prepare technical and commercial proposals ,participate in bid process wherever necessary, and if the work is awarded ,sign agreements and contract documents on behalf of BSNL.
4. Over see the project management, billing, payments and ensure that cost and -runs do not occur.
5. Appoint sub contractors/suppliers and process their work orders and payments.
6. Manage inter-circle/inter-agency/BSNL HQ coordination.

13.4 TYPES OF NEW BUSINESS

The new business can be in the form of consultancy services and turnkey projects as described below.

13.4.1 Project Consultancy

Broadly the work involved is

1. Planning and engineering,
2. Preparation of technical and commercial terms and specifications
3. Inviting offers and their evaluation,
4. Negotiations, award of contract,
5. Contract management,
6. Supervision, work measurement and certification of bills.

The consultancy is charged as a percentage of project cost. A typical figure can be 5%. But this figure is indicative and depends largely on the scope and nature of the project.

13.4.2 Turnkey Projects

In the turnkey projects, the entire execution responsibility of the project is with the contractor. The estimated project cost indicated to the customer includes the equipment cost, installation costs, project management cost, investment cost, overheads etc. A percentage of project cost is charged as profit margin. Typical profit margin of 15% is required over and above all the costs but it will vary from project to project depending on nature of project, competition, time for realization of investments made in the project and other factors.

13.4.3 Network Design Studies

Feasibility studies, market surveys, network design studies are charged on the basis of hourly/daily/monthly consultancy charges and also include travel and other miscellaneous overhead costs.

13.4.4 Operation & Maintenance Projects

BSNL being a telecom operator, there could be projects that involve operation and maintenance of equipment, network or software. There can be several possibilities.

1.Pure maintenance

2.Operations and maintenance

These projects may be with / without consumables, spares, testing instruments, installation jigs etc. Certain quality of service is to be guaranteed. Imprest stock of consumables and spares needs to be maintained to ensure the committed uptime.

Besides routine/preventive maintenance and operations, such projects usually require Up gradation of the maintained systems during the contract period. Such Upgradation are separately charged.

13.5 PREPARATION OF TECHNICAL AND COMMERCIAL PROPOSALS

1. The technical and commercial proposals submitted to the clients should be within the overall frame work ofBSNL's policy guidelines.

2. Utmost care will be taken to ensure BSNL's interests are safeguarded and infringement of third party rights is avoided at all times.
3. The technical proposals based on BSNL's network resources must comply with the network discipline and interface approvals.
4. All the customer premises equipment, technical services should be as per the specifications approved by the customer and should have back to back guarantees from the suppliers and service providers.
5. The basic cost of a project that accrues to BSNL can be categorized in to five heads:
    - Capital cost of equipment
    - Cost of execution of the work
    - BSNL's man power cost for supervision and management
    - Contingency expenditure
    - Overheads

To ensure that there are no cost over-runs, the project cost should be estimated taking into account all the cost factors, apparent and hidden. Risk, inflation, cost of inventory, cost of investment, taxes and all other such factors should be taken into account.

After arriving at the basic cost estimate of the project, a certain percentage of the project cost is to be added finally as profit margin. The profit margin will vary substantially from project to project depending on the competition, risk and other factors.

Circles will have to build check & cross check methods in their system to ensure that proposals are not under-quoted. The system should also ensure confidentiality of all the commercial proposals.

All the commercial proposals should have finance concurrence and approval of competent authority before their submission to the customer.

13.6 SUB CONTRACTING

The turnkey projects will involve supply, execution and O&M subcontracts. Therefore at the project proposal preparation stage itself, back up offers from the prospective subcontractors should be obtained. The needed agreements should be signed immediately on award of the contract. These agreements should clearly define the deliverables, terms, schedules, penalties, and guarantees so as to protect the BSNL's interests.

13.7 INTER-CIRCLE CO-ORDINATION

It is envisaged that there will be many projects that will be spread across the circle boundaries. CGMs must ensure that only one circle submits the bid. Inter-circle/inter-agency coordination for execution of the project will be the responsibility of the circle that bids for the project. Network resources of BSNL required for a project will be organized/ requested by the circle that executes the project.

13.8 PROJECT EXECUTION

Execution of each project will be under the charge of a designated Project Team Leader who will undertake this work in addition to the other duties as decided by the CGM. Project Team Leader will be responsible for

1. Management and execution of the projects.

2. Projecting man power, material, equipment and other resources required for the projects.
3. Coordinating with Business Development Cell, sub-contractors, customers, counter parts in other circles and other agencies involved in project.
4. Work measurement and certifying sub-contractors 'bills.
5. Maintaining expense account separately for each project and submitting periodic reports to BD cell.

13.9 DELEGATION OF FINANCIAL AND ADMINISTRATIVE POWERS

The Chief General Managers of the Telecom Circles and Districts will have full financial and administrative powers for undertaking new business ; purchase of equipment and forward of work to the sub-contractors. These powers will be exercised with the concurrence of IFA and can be delegated to lower formations to the extent felt necessary.

13.10 ENTERPRISES SALES

1. Generate high volume business by developing clients.
2. Long term approach
3. Win-win approach
4. Unlike marketing which is for masses, EB specifically targets select clients can happen from either party i.e. buyer or **seller.**

What an Enterprise Customer looks for:

Table 13. Customer Expectations

● Single Window Concept	● Telecom Expense management
● Unified communication solution	● Faster roll out
● Scalability	● 24x7 monitoring & servicing
● Simplicity of deal	● Long term commitment
● Business continuity (Disaster Management)	● Consultancy support for solution to new needs

13.11 CUSTOMER SEGMENTATION IN EB:

1. **Platinum customers**: These customers are large corporate entities (with indicative turnover greater than Rs. 500 cr p.a.), with significant telecom spend across several locations and sophisticated product needs.
2. **Gold customers**: These are medium-sized corporate entities (with indicative turnover of Rs. 50-500 cr p.a.).
3. **Silver customers**: All corporate customers that are not a part of the Platinum or Gold accounts are designated as Silver accounts (with indicative turnover greater than Rs. 10 cr p.a.)

13.12 PRODUCTS OF EB:

Mainly sold under EB services are

1. ISDN PRI
2. Pt-to-pt Leased Lines
3. Internet Leased Lines
4. MPLS VPN
5. VPNoBB
6. VSAT Services
7. CUG Mobile
8. IN Services
9. Bulk Landline & Broadband/DID
10. Bulk FTTH
11. IDC
12. All basic telecom services in bulk

13.12.1 ISDN PRI:

- ISDN PRI (Integrated Service Digital Network – Primary Interface Service) is a digital landline services
- ISDN Has emerged as a powerful tool worldwide for provisioning of different services like voice, data etc.
- ISDN is being viewed as the logical extension of the digitalization of telecommunication network.
- In which one ISDN PRI can provide 30 trunk junctions for incoming/outgoing calls simultaneously and can provide upto 300 Direct Inward/Outward Dialing (DID) numbers through ISDN PRI enabled EPABX. Hence every individual may have his individual number.
- You can have full control over the facility to be provided/withdrawal of each individual.

13.12.2 FTTH:

- Fiber to the Home **(FTTH)** is a unique technology being deployed by BSNL for the first time in India.
- Through this service BSNL offers ***'Hi-Speed'*** Internet connections on fiber along with landline.
- The fiber connectivity having unlimited bandwidth and state of the art technology provides fix access platform to deliver the high speed broadband from 256 Kbps to 100 Mbps.
- You can make your hospital a **Wi-Fi** enabled using this high speed Internet Line.

Also you can have landline connection along with FTTH line.

13.12.3VPNoFTTH

I. **Leased Line:**

- BSNL is a leading service provider in Leased Line, Managed Leased Lines
- All commercial, non-commercial org.
- Leased Line from 64Kbps onwards 2.5Gb and more
- On copper, OFC, Radio Modem, FTTH
- Useful interconnect multiple offices/sites, Video Conferencing, data transfer, online, CBS
- Tariff varies location to location & as per Bandwidth
- More than 2.5Lakh Leased Line working

II. **MPLS VPN:**

- MPLS is an acronym for "Multi Protocol Label Switching" & 'Virtual Private Network'
- Customer's Requirement
    - Secured Network
    - Scalable
    - Fast
    - Cost effective

Advantages of MPLS:

- Provide a diversified range of services (Layer 2, Layer 3 and Dial up VPNs) to meet the requirements of the entire spectrum of customers from Small and Medium to Large business enterprises and financial institutions.
- Make the service very simple for customers to use even if they lack experience in IP routing.
- Make the service very scalable and flexible to facilitate large-scale deployment.
- Provide a reliable and amenable service, offering SLA to customers
- Capable of meeting a wide range of customer requirements, including security, quality of Service (QOS) and any-to-any connectivity.
- Capable of offering fully managed services to customers.
- Allow BSNL to introduce additional services such as bandwidth on demand etc over the same network.

III. **Internet Leased Line:**

- To have dedicated Internet speed
- From 64Kbps to n*Gbps
- Static IP pool
- For corporate houses, IT firm etc
- Through Copper cable, OFC, Radio Modem, FTTH

- COS- (1:1), (1:2) & (1:4)
- (Due to GST requirement increases)

13.12.4 VSAT:

- VSAT is a Very Small Aperture Terminal , aligned towards a designated Satellite for up-linking and down-linking communication signals
- The network consists of a Hub located at Bangalore and VSATs located throughout the country.
- The VSAT communicates to the HUB through Express AM1 Satellite.
- All VSATs are connected in STAR topology and VSAT to VSAT communication is through the HUB at Bangalore.
- BSNL VSAT is a single platform for all your communication needs like:
- Leased Lines starting from 4Kbps onwards
- High speed Broadband Internet
- IP Multicasting, Video Conferencing
- Voice Telephone, Facsimile

13.12.5VPNoBB & VPNoFTTH

- VPNoBB: Provides Virtual private NW through BB Network (up to 4Mbps)
- VPNoFTTH: Provides Virtual private NW through FTTH Network (up to 24Mbps)
- Easily can connect multiple offices with very less requirement of HW
- Backbone is MPLS
- Central link would be MPLS

13.12.6 Internet Data Center (IDC):

- BSNL IDC is a state-of-the-art data center located at ten major locations across India who maintains most fault tolerant networks.
- Internet Data Center services comprises IT operations which is provided with the expertise well recognized worldwide.
- We have DCs at Seven locations across India : Mumbai, Ahmedabad, Faridabad, Ghaziabad , Hyderabad , Jaipur, Ludhiyana,
- Our Data Center Solutions enable our clients to empower their business by outsourcing their IT operations in a smart and secure way

SaaS: BSNL Managed SaaS (Software as Service) Business Mail Service has been launched with M/s Microsoft India Ltd.

Feature of BSNL Services:

- Services on Optical Fiber Cable & hence dedicated & uninterrupted.
- Can extend any service if OFC is there
- Can have dedicated Internet Leased Line
- Can have high speed Internet with FTTH

- Can interconnect other units via Leased Line
- Transparent billing
- 100% throughput
- Available Legacy Channel for grievances

13.13 SELLING SKILLS FOR EB

Key selling skills for Enterprise team:

- Need assessment
- Conceptual
- Technical
- Presentation Skills
- Business communication
- Interpersonal skills
- Meeting management
- Fluency in using IT tools: E-mail, PPT
- Project management
- Organizing Skills
- Business Intelligence
- Negotiation skills
- Proposal writing

Agencies:

A. System Integrator- To supply networking hardware to customer in Turn Key Project

- National Level (Trimax, DSM)
- State Level (At present 9)

B. Channel Partner-

- **TIP** (Telecom Infrastructure provider),
- **HSSP** (Hot Spot Service Provider)
- **CSP** (Cloud Service Provider)
- **DID Franchisees**
- **Free EPABX** Service provider
- **MNS Partner** (Managed Network Services)

13.14 TYPE OF CUSTOMERS:

1. Corporate & Govt Customer – with local or all India requirement
2. Colleges – For Internet Leased Lines, VPNoBB(NMEICT)
3. Big Residential Complex – Landline with Intercom & BB Services through Direct or DID Franchise
4. Customer segmented in Platinum, Gold, Silver and other category
   I. Turnover 500Cr & more : Platinum
   II. Turnover 100 to 500 Cr : Gold
   III. Turn over 50 to 100 Cr : Silver

13.15 SWOT ANALYSIS FOR EB

13.15.1Strength:

1. BSNL as a Brand
2. Experience
3. Huge Optical Network
4. Reach through Exchanges
5. Transparency
6. Availability
7. Copper Network
8. Gamut of Services

13.15.2Weakness:

1. Tariff
2. Service Delivery
3. Service Assurance
4. Customer Care Management
5. After Sales Service
6. Service Level Agreement
7. Non availability of Flexibility

13.15.3Opportunity:

1. Thrust in Quality Services
2. Requirement of data connectivity
3. ICT expansion
4. Huge Bandwidth requirement
5. Landline & BB in residential complex
6. IT companies
7. Core Banking
8. E-governance
9. Education
10. GST

13.15.4 Threat:

1. No. of Telecom Service provider
2. Delay in delivery
3. Competitive Tariff
4. Tenders by Govt organizations

5. New Player

13.16 Expectations:

1. **Customer Expectations :**
    1. Quick decision on tariff
    2. On table order finalization
    3. Service delivery within 7-15 days
    4. CRM team & Nodal officer
    5. Quick after sales services
    6. 24*7*365 support
2. **Expectations – From field**
    1. Top priority for installation of all type of Leased Lines
    2. Top & First priority for rectification of fault of Leased Lines
    3. Wherever possible to make Low Bandwidth Leased Line feasible on copper
    4. Early feasibility report
    5. Spread importance of Leased Line (revenue wise) among the filed staff
3. **Expectations from Transmission**
    1. Top priority for Installation of all type of Leased Lines
    2. First & Top priority for Installation of High BW and High revenue Leased Lines
    3. Dedicated team for installation and maintenance of all type of Leased Lines & MPLS VPN
    4. Fault booking mechanism
    5. Escalation Matrix

13.17 EB PORTAL WORKING

1. www.intranet.bsnl.co.in
2. Application
3. EB Portal Login
4. Customer Management- **Add Company**
5. Lead Management-**Create Opportunity**
6. Opportunities – **can change the Stage**
7. Reports Sale– **Sales Funnel**

13.18 ESSENTIALS FOR EB WORKING:

1. Positive approach
2. Self belief
3. Self confidence

4. Confidence about our Infrastructure
5. Confidence about BSNL Brand
6. Belief to take ownership and proprietorship of customer
7. Say Customer is Right and
8. Win-Win approach
9. Back end support from field unit and superior (GM/DGM/DE) in every decision

13.19 CONCLUSION

In this chapter we have discussed the necessary steps to be taken up at various levels such as to explore the New business, Techno-Commercial proposals, Power delegations, SWOT analysis.

14. NOFN

14.1 LEARNING OBJECTIVE

After reading this unit, you should be able to understand:

- About NOFN Project Of India.
- NOFN Applications For Government.
- NOFN ROADMAP
- NOFN Features.

14.2 INTRODUCTION

1. **NOFN** is a Countrywide National Optical Fibre Network project
2. **Objective:** Extend existing Optical Fiber Network to Panchayats by utilizing Universal Service Obligation Funds (USOF) and creating an institutional mechanism for management and operation of NOFN.
3. **Institutional Mechanism:** Bharat Broadband Network Limited (BBNL), a PSU has been registered under The Companies Act 1956 on Feb 25, 2012 for management and operation of NOFN
4. **Government Initiative**: - Government of India has approved on 25-10-2011 for the setting up of National Optical Fiber Network (NOFN) to provide connectivity to 2.5 lakh Gram Panchayats (Village Govt Office) of the country using optical fiber, which would ensure broadband connectivity with adequate bandwidth. This is to be achieved utilizing the existing optical fiber and extending it to the Gram Panchayat (Village Govt Office) i.e. by bridging the gap in the Aggregation Layer.
5. **Asset** :- NOFN is a National Asset
6. Now NOFN will be called as **BharatNET**
7. **BBNL**(Bharat Broadband Network Limited), is a Special Purpose Vehicle (SPV), set up by Govt of India incorporated as a Public Sector to implement and operate the NOFN project.
8. NOFN will provide Non-discriminatory access to all the Service Providers .This Telecom infrastructure which will bridge the gap (digital divide) in rural access. NOFN is being funded by the Universal Service Obligation Fund (USOF). Department of Telecom, Ministry of Communications & IT, Govt. of India provide secretariat service to project.
9. "The establishment of NOFN will open up new avenues for access service providers like mobile operators, cable TV operators etc. to launch next generation services and spur creation of local employment opportunities encompassing e-commerce and IT outsourcing, as well as e-banking, e-health and e-education".The project is being implemented by three central PSUs (CPSUs) namely BSNL, PGCIL and Railtel in the phase first.
10. The Government of India entity, Bharat Broad Band Nigam Limited (BBNL), will centrally manage the project through a high capacity Network Management System being developed by C-DOT. A key feature of the project is that the GPON equipment used in the project has been indigenously designed and developed by C-DOT and manufactured domestically.

11. The monitoring of the progress of the project will be done thorugh Primavera Software(Oracle's Primavera Professional Project Management Software).In the first phase NOFN shall be extended to cover 50,000 GPs, with the balance 2,00,000 GPs expected to be covered in a phased manner .
12. NOFN is part of the Digital India initiative of the Government of India. Digital India is an initiative of the Government of India to integrate the government departments and the people of India to ensure effective governance. It also aims at ensuring that the government services are made available to citizens electronically by reducing paperwork. The initiative also includes a plan to connect rural areas under high-speed internet networks.

The programme also aims at providing digital infrastructure as a utility to every citizen as well as high-speed internet as a core utility in all Gram Panchayats (Village Govt Office) through NOFN. On its completion, NOFN is expected to facilitate broadband connectivity to over 600 million rural citizens of the country.

14.3 WHY NOFN?

14.3.1 The Bandwidth Requirements Of Applications Used In Indian Scenario

Table 14 summaries various applications in Indian scenario and bandwidth required to support such applications. From this, It is observed that tentative bandwidth requirements to run various applications ranges from 64 Kbps to 8 Mbps.

Table 14. Bandwidth required

	Application	Minimum bandwidth Required
1.	Internet Surfing	Upto 256Kbps
2.	E-Mail	64 Kbps
3.	Voice Chatting	64 Kbps
4.	Voice & Video Chatting	256-512 Kbps
5.	Video Clips	256-512 Kbps
6.	Tele-education	256-512 Kbps
7.	Tele-Medicine	256 Kbps
8.	Video Streaming	2 Mbps
9.	Video Gamin	256-512-2Mbps
10.	High Definition Videos	4-8 Mbps

1. 256 Kbps - This speed is appropriate for viewing most websites, taking about 3 secs for the website to load.
2. 512 Kbps - This is the most common speed used in homes and small businesses. It takes 1.6 secs for a website to load and about 1.5 mins to download a 5min music

file at maximum speed. Suitable for video and music streaming.

3. 1Mbps - This speed is also commonly used amongst homes and small businesses. It is appropriate for website viewing, streaming and online gaming. It takes 0.8 secs to load a web page and about 40 secs to download a 5 min music file at maximum speed.
4. 2 Mbps - This and faster speeds are more suitable for people who play a lot of demanding online games. It is also suitable for people who share one Internet connection between many PC-s. It takes 0.4 seconds to load a website and about 20 seconds to download a 5 minute music file at maximum speed.
5. 24 Mbps - Ultra fast broadband offered these high speed services are particularly good for watching real-time DVD quality film.

14.3.2 The Bandwidth Available On Various Technologies

Table 15. Bandwidth available via different BB technologies

Connection Type	Megabytes per second	Connection Type	Megabytes per second
14.4 modem	0.014	ISDN	0.125
28.8 modem	0.028	Wireless local area network	0.127
V.92 Modem	0.055	Satellite	0.391
100 kbps	0.098	Broadband over power	0.488
Wireless Cellular	0.098	ADSL	0.625

14.4 THE SOLUTION – TECHNOLOGY USED - GPON

1. The GPON (Gigabit Passive Optical Network) standard differs from other PON standards in that it achieves higher bandwidth and higher efficiency using larger, variable-length packets.
2. A Passive Optical Network (PON) is a network architecture that brings fiber cabling and signals to the home using a point-to-multipoint scheme that enables a single optical fiber to serve multiple premises.
3. GPON (Gigabit Passive Optical Network) will be used for NOFN Project. GPON is an open standard technology. C-DOT has developed this technology and the approval has been obtained for the same from TEC (Telecommunication Engineering Center India)
4. Encryption maintains data security in this shared environment. The architecture uses passive (unpowered) optical splitters, reducing the cost of equipment compared to point-to-point architectures.
5. C-DOT has done the Transfer of Technology for GPON to manufacturers which include both CPSUs and private, to meet NOFN timely supply of equipment's.

Need a countrywide National Fibre Optic Network to use GPON Technology

14.5 NOFN -APPLICATIONS FOR GOVERNMENT

14.5.1 E-Monitoring And Empowering Of Various Govt Schemes Like

NREGS (National Rural Employment Guarantee Scheme) IAY (Indira Awas Yojana) NFSM (National Food Security Mission) RKVY (Rashtriya Krishi Vikas Yojna) BRGF (Backward Regions Grant Fund) RGGVY (Rajiv Gandhi Grameen Vidyutikaran Yojana) NRHM (National Rural Health Mission) SSA (Sarva Shiksha Abhiyan) MdM (Mid Day Meal) IWMP (Integrated Watershed Management Plan) PMGSY (Pradhan Mantri Gram Sadak Yojana) ICDS (Integrated Child Development Scheme) SGSY (Swaranjayanti Grameen SwarojgarYojna) Scheme for Universal Access and Quality at Secondary Stage NHM (National Horticulture Mission) Macro Management of Agriculture Scheme Central Rural Sanitation Program NLRMP (National Land Records Management Program) TSC (Total Sanitation Campaign) APDRP (Accelerated Power Development and Reform Program) RMSA (Rashtriya Madhyamik Shiksha Abhiyan) ARWSP (Accelerated Rural Water Supply Program)

14.5.2 To Meet Policy Aspiration For Broad Band

1. Teledensity of the country is 73%, while broadband density is only 1.4%.
2. Vision: BB on demand
3. Increase rural teledensity from 35 to 60 by 2017 and 100 by 2020.
4. Affordable and reliable broadband on demand by 2015.
5. Achieve 175 Million Connection by 2017
6. And 600 Million Connection by 2020 at minimum 2 mbps speed and higher speed upto 100 mbps on demand.
7. Recognize Telecom and BB connectivity as a basic necessity like education and health and work towards, " Right to Broadband"
8. Many Information and communication (ICT) application such as e-commerce, e-banking, e-governance, e- education and tele-medicine require high speed internet connectivity.

14.5.3 NOFN Applications In Panchayats

i **Panchayat Management:**

- Gram sabha meetings, village records,
- updating of citizen databases,
- Effective performance monitoring of Panchayats.

ii **Community Participation :**

- Intra-village, Intra-district sharing of practices and resources ,
- Communication with Block, and District

iii **Knowledge Dissemination :**

- Sharing of Agricultural practices, productivity techniques ,
- Small enterprises, Vocational learning

iv **Delivery of Citizen Services:**

- Delivery of services including Health, Education and Finance, etc ,
- Single point of Government to citizen interaction for Centrally sponsored/Central sector/ State sponsored schemes ,Grievance redressal**.**

v **Developmental planning :**

- Road, transportation and power connectivity ,
- Knowledge connectivity in the form of good educational & training institutions
- Provision of drinking water and up-gradation of existing health facilities ,
- Market connectivity to enable farmers to get the best prices for their produce.

14.6 NOFN STATISTICS

1. About 850 million population resides in 600,000 villages/ 250,000 Village Panchayats.
2. Village Panchayat is the lowest level of governance in rural India Average population of 500 to 5,000.
3. Panchayat are administered by 6,600 Blocks and 651 Districts.
4. OFC POP reaches all Districts, Blocks and some major Panchayts of about 60,000.
5. Government is implementing to connect 250,000 Village Panchayats on OFC within two years by laying 500,000 Route Km OFC over existing 1000,000 Km .

14.7 NOFN ROADMAP

1. Bridge the gap in Aggregation Layer by extending the existing networks
2. 2.5 lakh Gram Panchayats (Village Govt Office) to be connected on Optical Fiber
3. Approx 100 MB bandwidth at each Gram Panchayat
4. Non discriminatory Access to all SPs
5. Access Layer OFC to be provided through market dynamics
6. CUG connectivity to be provided at Gram Panchayats (Village Govt Office) for G2C services
7. Approx 5 lakh km new incremental OFC required
8. Approx 4 to 5 lakh km of dark fiber from existing OFCs of BSNL/Railtel/Powergrid required on long term lease basis
9. A High Level Committee (HLC) formed on 25-April-11 to guide the project

14.8 ROLE OF BBNL (BHARAT BROADBAND NETWORK LIMITED)

1. BBNL is a The Special Purpose Vehicle (SPV) to implement and operate the project
2. BBNL is a PSU set up under companies act by Govt of India under Rule 1956 has been registered on Feb 25, 2012 for management and Operation of NOFN.
3. Constitution of BBNL Director Planning ,Director Operation , Director Finance working under CMD BBNL
4. Vision of BBNL is **"To become the leading Telecom company to provide secure, reliable, affordable and high quality connectivity across India."**

5. NOFN Phase I -Government of India has approved on 25-10-2011 for the setting up of National Optical Fiber Network (NOFN) to provide connectivity to 2.5 lakh Gram Panchayats (Village Govt Office) of the country using optical fiber, which would ensure broadband connectivity with adequate bandwidth. This is to be achieved utilizing the existing optical fiber and extending it to the Gram Panchayats (Village Govt Office) .
6. NOFN Phase II - Bharat Broadband Network Ltd (BBNL) is in the process of building the National Optical Fiber Network (NOFN) that aims at providing broadband connectivity up to all 2,50,000 Gram Panchayats (Village Govt Office) across India.
7. As part of this initiative, BBNL outsources the work of laying fiberitially connecting approximately 50,000 Gram Panchayats (Village Govt Office), that in turn laying an estimated 120,000 kilometres of optical fiber cable and connecting it to pre-determined end points. Survey has been completed for more than ninety percent of the Gram Panchayats (Village Govt Office). MoU for Right of Way has also been signed with most of the states and union territories

14.9 OTHER INSTITUTES AND AGENCIES INVOLVED FOR NOFN PROJECT

1. DOT (Department of Telecommunications Govt of India) :- Secretariat service to the Project
2. USOF: The Funding Agency via Ministry of Finance under Planned schemes.
3. TAC(Technical Advisory Committee) under the chairmanship of Advisor to the Principal Advisor Scientific Advisor to PM, CDOT, BSNL, Railtel, Powergrid, USOF, NIC, TCIL.
4. BSNL, Railtel, Powergrid: Executing Arm they will lay the OFC and lease the existing resources to NOFN/BBNL to optimally usage of resources .
5. TCIL (Telecommunications Consultants India Ltd) :-Quality check and Project implementation scheme monitoring.
6. C-DOT(Centre for Development of Telematics):-Technology provider and NMS (Network Management Service) Development.
7. NIC (National Informatics Centre) :-GIS (geographic information system) Service provider and major user of the project

14.10 NOFN FEATURES

1. GIS mapping of all BSNL OFC routes completed and validated once
2. Detailed survey will be conducted by respective Circle through Nodal Unit created in each SSA of BSNL
3. L-14 diagrams prepared for each OLT
4. NMS by CDOT
5. Estimate to be prepared by the SSA on the basis of detailed survey and plan
6. Estimate will be sanctioned by BBNL
7. NOFN shall be built using indigenous hardware e.g GPON (Gigabit Passive Optical Network) will be used for NOFN Project)

8. NOFN shall have at least 1 Gbps capacity at the Panchayat level.
9. NOFN shall provide at least 100 mbps at the panchayat level in exchange of right of way by states, with backhaul up to district level.
10. NOFN shall be a 365x24 reliable, robust, scalable and available IP capable network to ensure continuous availability of services.
11. NOFN Shall Lease Dark Fiber / Lambda (Launch Alien Lambda) / Bandwidth On Long term Lease (IRU) from BSNL, RailTel, PowerGrid and others as and when necessary on the existing and available fiber.
12. NOFN shall have a national network operating center (NOC) using NMS with full visibility of the network, all activities observable in real time, and controllable from a central location at element level.

14.11 PROGRESS OF NOFN PROJECT

1. Govt of India has approved the project of NOFN
2. 2.5 Lac Panchayats with minimum 100 Mbps speed
3. Aimed at providing various E-Gov applications,
4. Support Telecom operators to roll out services in rural areas thereby enabling access of best technologies to the rural population.
5. Amount of Rs 25,000 crores have already been sanctioned by the Govt for this project which will be funded through USOF (Universal service obligation fund).

14.12 BSNL INFRASTRUCTURE PROVIDER FOR NOFN

1. Bandwidth Provider
2. User of NOFN are access operators (TSPs/ISPs/Cable TV Operators)
3. Enable them to launch various access services
4. B2B, No retailing ;Operator of operators (Carrier of Carriers)
5. Non-discriminatory access to all licensed operators
6. Seeks to trigger Ecosystem opening up new Rural markets
7. Detailed survey conducted by respective Circle through Nodal Unit created in each SSA of BSNL
8. BSNL has been asked by the government to meet 70% of the countrywide cable laying, trenching and ducting work to take high-speed internet to 2.5 lakh village blocks.
9. The total project involves laying 5 lakh route kms of optic fibre cables.

14.13 CONCLUSION

Government of India has approved on 25-10-2011 for the setting up of National Optical Fiber Network (NOFN) to provide connectivity to 2.5 lakh Gram Panchayats (Village Govt Office) of the country using optical fiber, which would ensure broadband connectivity with adequate bandwidth. This is to be achieved utilizing the existing optical fiber and extending it to the Gram Panchayats (Village Govt Office) i.e. by bridging the gap in the Aggregation Layer.