

# Applications of Access Networks in India

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## 1 Introduction

India has a population of over 1 billion, the second largest in the world, with a territory area of 3.3 million square kilometres and 28 states; it is the largest country in South Asia. Since independence in 1947, India has made great progress on its national economy and infrastructure. By December 2001, India had 40 million telephone subscribers, of whom 33.62 million are fixed subscribers, 5.48 million mobile subscribers and 2 million Internet subscribers. Its mobile and Internet subscribers are developing at a 100% annual increase.

India has an enormous potential market for telecommunications equipment. The present telephone density is 4%, and it will be 7% by 2005 and 15% by 2010.

Over recent years, the Indian telecom department has worked closely with foreign equipment manufacturers to introduce advanced telecom equipment and network construction experience. This has greatly improved and enhanced the overall technology and operational management level of telecom networks. Indian telecom operators announced they would cooperate with the ZTE Corporation of China to introduce the largest DWDM transmission backbone equipment in India, which will substantially enhance the bandwidth of Indian telecom backbone networks. And ZTE Corporation has also signed contracts with BSNL (Bharat Sanchar Nigam Limited) to build India's national CDMA WLL network. Under the agreements, ZTE will pro-

vide BSNL with CDMA WLL products and solutions to construct its national CDMA WLL network covering nine major provinces of India. The network is scheduled to start operation in June 2003. By then, over 500 000 lines of network users can enjoy voice and data services brought about by ZTE's CDMA 2000 1x WLL technology.

In respect of local fixed network construction, two Indian state-run operators, MTNL (Mahanagar Telephone Nigam Ltd.) and BSNL, are working closely with ZTE on SDH-based optical fibre access networks (OFAN) to expand the service scope of fixed phone lines and provide more integrated services. This article concentrates on the introduction of applications of OFAN in India.

## 2 Indian Telecom Industry's Understanding of OFAN

The Indian telecom department has always put a strong emphasis on OFAN. As early as 1996, they started to research applications of access networks in India in compliance with relevant ITU-T standards and released Indian national standards of OFAN. Work began on the massive network construction in 1999. The research and development of local OFAN equipment have been heavily invested in by Indian local manufacturers.

The standard for the Indian access network is primarily established by Indian Telecom Engineering Centre (TEC), who introduced TEC General Requirements (GR) No. G/ANE-03/01 in March 1997. The standard has specified the network architecture, application

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mode and service type and serves as guidelines for the development of Indian OFAN.

The Indian telecom department has several objectives in introducing OFANs into telecom networks:

Firstly, they believe the introduction of OFANs is useful for expanding the scope of fixed telecom services and promoting the progress of fibre to the curb (FTTC) and fibre to the building (FTTB). The majority of the Indian population resides in rural areas; therefore the issue of communications cannot be settled by massively deployed exchanges. By contrast, OFAN takes advantages of long transmission capabilities and a large service radius to provide high quality services for a small capacity of cell subscribers in rural areas. For urban subscribers, with the continuing decrease of optical fibre price, the cost of optical networks is lower than that of copper networks in terms of cost per capacity unit. Additionally, the quality of service (QoS), reliability and scalability of optical networks are much better than copper networks. The Indian telecom department has therefore come to a common understanding on the promotion of optical network construction.

Secondly, the Indian telecom department wishes to make full use of network resources and provide integrated telecom services in addition to plain ordinary telephone service (POTS). The Indian traditional telecom network is basically designed to meet the demand of voice services. However, the emergence of new services and various data services, especially the demand for high-speed Internet access, has raised more requirements on networks, therefore an access network is the right option.

Thirdly, the infrastructure of India, especially the power system, is quite unstable. This has to be factored in together with the large variations in India's climate. The Indian Telecom department is therefore obliged to make full use of the strong environmental adaptability and ease-to-manage features of OFAN to widely deploy telecom equipment.

In view of the above reasons, the Indian telecom department plans to construct OFANs on a large scale in the near future. It is estimated that within 2 years, there will be more

than 2 million lines.

### 3 Structure and Key Services of the Indian OFAN Network

In TEC GR, OFAN is primarily composed of two parts. The first part, central office terminal (COT), is generally connected to the local exchange via V5 or other ports and performs service convergence. All network management information is transmitted to the NMS via the COT. The second part, access terminal (AT), is located on the service node near the customer and is designed to provide service interfaces. The two parts are connected via an SDH transmission system of STM1/4. GR has explicitly specified the structure of OFAN.

A complete set of OFAN consists of one COT and four ATs. The network is constructed in this mode. This clear network structure is conducive to equipment bidding but lacks flexibility and wastes a great deal of network resources.

TEC GR has also specified two types of access network equipment. Type A provides V5.1/V5.2 interfaces and Type B provides the Z interface. The two types of equipment require the same service types and networking modes. The main services are as follows:

(1)POTS and Payphone services. TEC requires the Payphone service to transmit two signal voices (16 KC pulse signal and reversed-polarity signal) simultaneously on one port.

(2)The ISDN service is required to provide two ports (ISDN BRI and PRI) at different rates simultaneously.

(3)The 2.048 Mbit/s leased line service.

(4)The Voice Hotline service. It is to provide an E&M interface on the COT and interconnect various access networks and exchange systems via an E&M cross-connect multiplexer. It must also establish a semi-fixed connection of voice timeslots among subscribers of different equipment to provide voice services for two subscribers. The simple service descriptions are as follows: when subscriber A picks up the phone, the preset voice timeslot is sent to subscriber B directly without dialling or service switching. The phone of subscriber B rings. After the conversation is completed,

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