

Adequate telecom infrastructure is essential for meeting the current and emerging demand for telecom services. {K2Splitter} Adequate telecom infrastructure is essential for meeting the current and emerging demand for telecom services. There is a strong correlation between telecom infrastructure and telecom services, as can be seen from the growth in the number of towers and mobile subscribers over the past five years. While as of March 2006, 85,000 telecom towers served 98.8 million mobile subscribers, as of March 2011, there were 370,000 towers serving 811.6 million users.

The National Telecom Policy (NTP), 1999 as well as the draft NTP 2011 recognise the need for developing large-scale and good quality telecom infrastructure as a key to rapid economic and social development of the country.

Over time, both public and private telecom operators, with the support of government policies and regulations, have created a substantial telecom network with about 400,000 tower sites, 640,000 base transceiver stations, and over 1,000,000 route km of optic fibre cable (OFC) network across the country.

Despite this, the infrastructure capacity is currently unable to meet the demand, especially in the metros and other urban cities which are overstretched. The telecom infrastructure in rural and remote areas is still far from satisfactory.

### Current status

A telecom service provider's network can be broadly classified into backbone/core, aggregation/backhaul, and access.

A backbone primarily consists of carrier-grade core and edge routers with optic fibre links. All integrated service providers have created their internet protocol (IP) backbone networks. Several small internet service providers that do not own backbone networks have obtained leased lines or VPNs to connect their access networks to other service providers' backbones.

The telecom backhaul network in India is a hybrid of microwave, leased lines, and optic fibre cables. The large operators have deployed their aggregation/backhaul network to meet their own requirements. Stand-alone service providers offering broadband services have to connect their equipment to a large service provider's aggregation network or directly to the backbone network, where the small service provider would have to build its own aggregation network at a substantial cost.

At present, aggregation/backhaul network primarily exists in the urban areas. In the rural areas, no aggregation exists and backhaul is primarily owned by Bharat Sanchar Nigam Limited (BSNL). The non-availability of aggregation access networks, especially in the rural areas, and the backhaul from blocks to district headquarters (DHQs) at competitive rates to the service providers is one of the major impediments in the growth of broadband.

Today, a large part of the wireless backhaul network is primarily built using microwave that cannot be scaled up to carry the amount of high speed multimedia traffic expected to be witnessed in the network as the broadband vision is realised over the next few years. BSNL leads in this space with 50,430 route km of microwave network covering 602 districts, 7,330 cities/towns and 560,000 villages.

There is a clear need to build a high speed optical network based on standardised transport technologies such as next-generation synchronous digital hierarchy, dense wavelength division multiplexing and carrier Ethernet that reaches up to the last mile cell towers.

Of the total OFC network, BSNL has over 600,000 route km, Reliance Communications (RCOM) 190,000 route km, and Bharti Airtel 126,000 route km. Also, companies like RailTel, PowerGrid and GailTel have a significant OFC network.

Optic fibre has been mostly used by service providers for long-haul traffic. Currently, optic fibre connectivity is largely available up to DHQs and up to block headquarters in rural areas.

However, fibre coverage is concentrated in the urban areas. In the rural areas, optic fibre connectivity is primarily provided by BSNL. It is estimated that about 30 per cent of the villages with a population of more than 1,000 have been covered by BSNL's fibre network, including 28,000 gram panchayats.

An analysis of the existing backhaul infrastructure deployed by various service providers, including the incumbent operator, suggests that although all cities and towns have at least one service provider with fibre infrastructure, the majority of villages lack core and middle mile infrastructure. Industry inputs suggest that BSNL provides connectivity to 28,000 villages through its existing exchanges, while the fibre coverage of other service providers such as Bharti Airtel, RCOM and Tata Communications remains limited to the metros and urban areas.

Infrastructure providers such as RailTel, Powergrid and Gailtel have also deployed their own fibre networks, but this exists along with the railway and main utility lines, and is not optimised to cover a large number of remote rural areas. Moreover, this network is mostly required for the company's captive use and is not being leased out for enterprise usage.

The access network can be classified into wireline and wireless. The wireline access network largely comprises copper loops. There are about 40 million copper loops in India, which are primarily owned by BSNL and Mahanagar Telephone Nigam Limited (MTNL).

BSNL has a capacity of 46 million basic telephony lines. However, of these, only 10 million lines are capable of supporting broadband at a speed of less than 1 Mbps. Only 2-3 million lines are capable of servicing more than 2 Mbps speeds. MTNL too has a widespread wireline access network across the Delhi and Mumbai circles.

Among private operators, Bharti Airtel has around 3 million lines. Its entire wireline network is capable of supporting 7-8 Mbps. The operator is in the process of converting its voice-only wireline connections into DSL lines. It has recently launched a service called Falcon 2 for offering broadband services at speeds of 2-8 Mbps. RCOM and Tata Teleservices Limited also have small-scale wireline access networks. The key reason for the lack of adequate wireline access network, which is best suited for higher speeds and superior service quality, is the high cost of right-of-way (RoW).

As far as wireless access is concerned, there has been a widespread adoption of 2G technologies such as GSM/CDMA, but that is primarily for voice. The 3G networks (on UMTS/HSPA/CDMA 2000/ EVDO) deployed recently by some operators are capable of providing throughput of 2 Mbps for stationary customers. However, this would be inadequate for the large-scale deployment of broadband at higher speeds. Also, it will be difficult to provide

credible cell-wide broadband coverage using 3G technologies alone. When the customer moves from one cell site to another, it would be difficult to ensure that the connection is sustained at the negotiated broadband speed.

### Growth in telecom towers

The exponential wireless subscriber growth witnessed in the country over the latter half of the last decade, coupled with falling tariffs and low ARPUs, prompted operators to share infrastructure to maintain margins and reduce costs. Passive infrastructure sharing, an industry norm today, created new business opportunities and paved the way for the emergence of the tower industry.

Between 2006 and 2011, the industry almost quadrupled in size with the number of towers growing from 85,000 to over 370,000 as of March 2011 and 400,000 as of January 2012. Between March 2006 and March 2011, it witnessed a compound annual growth rate of 44.44 per cent. On a year-on-year basis, the industry registered the highest growth in 2007-08 at over 63 per cent, albeit on a small basis. This high growth rate can be attributed to tower build-outs by the industry to meet the network expansion demands of existing operators and in anticipation of the strong demand for towers by new operators entering the mobile segment.

Tower industry growth was comparatively low at 16 per cent in 2010-11. This was primarily due to the shift in the industry's focus from increasing the number of towers to increasing tenancies on the existing towers. Tower companies have scaled down their rollout plans in order to avert an oversupply situation and are not very eager to deploy greenfield towers. Consequently, the upcoming towers are likely to be built primarily due to the demands resulting from new technologies (3G and BWA), but the pace will be slower. The number of towers is expected to go up by an additional 60,000 by September 2014 and the industry is expected to grow by 20-25 per cent during the next five years.

The industry is also moving towards the enhanced use of high capacity multi-tenant towers. In order to reduce costs, it is looking at streamlining tower design and making them lightweight and tubular. Companies are also aiming to downsize older uneconomical towers that cater to only one or two tenants. Increasing tenancies is also beneficial for telecom operators. With each additional operator, the overall power requirement increases by just 20 per cent, thus resulting in large economies of scale.

### Rural infrastructure rollout

As per the 2011 census, 61.35 per cent of the population resides in 638,000 villages and the remaining lives in more than 5,100 towns and over 380 urban agglomerations. As of September 2011, only 36 per cent of the rural population has been covered by wireless telecom services. Thus, rural areas present a huge opportunity for operators in terms of growth.

Most of the pan-Indian operators have achieved sizeable mobile coverage across the country. However, not all have a significant presence in remote regions. BSNL, Bharti Airtel and RCOM are the top three players in terms of rural coverage, in that order. While for BSNL it is mandatory to provide telecom coverage in the remotest regions of the country, for Bharti and RCOM it is a part of their strategy to tap this segment at the earliest. Bharti Airtel has expanded its coverage to all rural areas with a population of up to 5,000, and is now targeting areas with lower population densities.

However, the rural endeavours of operators in the past one year have taken a back seat. The high cost incurred for purchasing 3G and BWA spectrum has weighed heavily on their account books. Moreover, the focus has now shifted to capitalising on the opportunity presented by these next-generation technologies, and operators are busy rolling out network and services on the 3G platform.

The business case for telecom in rural areas has never been very lucrative as the infrastructure cost in these areas is much higher given the low customer density, difficult geographic terrain and the lack of supporting infrastructure like power supply.

Operators like Bharti Airtel and RCOM have even approached the government with a view to prematurely terminating their involvement with the rural telephony scheme under the Universal Service Obligation (USO) Fund. Bharti wanted to exit around 180 of the 1,174 sites assigned to it. As of August 2011, the company has commissioned 950 of the 1,174 sites assigned. RCOM has fewer than 500 active base stations against its commitment of 8,000 when it had won the bid in 2007. None of the operators has been allowed to terminate its projects.

Although private telecom players have slowed down their rural expansion plans, the government's focus on catering to this segment remains strong. Many initiatives have been taken under the USO Fund scheme that have led to significant development in rural infrastructure.

As part of the government initiatives to improve coverage, over 11,000 towers are planned to be installed in the tribal areas and sparsely populated areas. With an aim to boost rural internet and broadband services, the government plans to provide the village panchayats with broadband access by 2012 and public telephone facilities by 2011. Also, 250,000 villages will be provided broadband connectivity by 2012.

A Rs 20 billion National Optical Fibre Network (NOFN) plan for countrywide broadband connectivity has been approved by the Department of Telecommunications (DoT). This NOFN will extend the existing optic fibre network from the district level to the village level, providing services like e-education, e-health and e-banking throughout the country, and also checking the migration of the rural population to urban areas. The project, which envisages building 250,000 km of optic fibre cable network, will ensure that fibre connectivity is available in every village that has a population of more than 500. The first phase, covering all cities, urban areas and gram panchayats, will be completed by 2012. Phase II will see the extension of the network to all habitations with a population of more than 500 and will be completed by 2013.

The project involves setting up a special purpose vehicle (SPV) comprising state-owned operators like BSNL and MTNL and other public sector undertakings such as RailTel, GailTel and Powergrid that already own optic fibre cable networks. The details of the SPV are yet to be finalised as DoT is keen on a model that ensures a level playing field for stakeholders and private players who bring in best industry practices.

The proposed NOFN will facilitate effective and faster implementation of various mission mode e-governance projects, amounting to about Rs 500 billion, initiated by the Department of Information Technology. It will also enable the delivery of a whole range of electronic services by the private sector to rural citizens.

Other initiatives on the government's part include establishing wide area networks in 29 states and six union territories across the country at a total cost of Rs 33.34 billion.

### The way forward

The next round of growth would be achieved as a result of the commercial implementation of 3G and wireless broadband based on next-generation networks. Next-generation technology will result in increased tenancies on the existing tower base.

The growing demand for data services is expected to augment the number of base stations per tower. The increased focus on rural penetration will also play a pivotal role in increasing the tower base. The focus in rural areas will be on erecting new towers in the short run followed by enhanced tenancies in the long run.

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