The past year has been a milestone in 4G service growth in India. Telecom operators rapidly rolled out high speed services to capitalise on the ongoing data boom and survive competition. This can be largely attributed to operators' robust backhaul networks, which have undergone significant upgradation and modification over the past few years.

In addition, operators have shown an increasing interest in backhaul network transformation towards an IP-based architecture. To this end, Bharti Airtel and Vodafone India have partnered with Juniper and Cisco respectively to transform their respective legacy backhaul networks and make them future ready. Besides supporting 3G/4G expansion, the shift to an IP-based backhaul network will help operators tap new business opportunities arising from the growth of internet of things (IoT), smart cities, video services, etc.

Currently, microwave is the dominant backhaul technology as the fibre footprint of operators continues to be low. Only 20 per cent of the cell towers in India are connected through fibre, as against 90 per cent in China and 95 per cent in the US. However, fibre deployment for backhauling traffic is now gradually gaining traction in the country. That said, backhaul upgradation remains more of an urban phenomenon and rural India, despite its huge untapped potential, is a difficult market to tap for data services owing to cost and adoption challenges. Operators are yet to come up with an appropriate backhaul technology for this market.

The Department of Telecommunications (DoT) is planning to finalise the first comprehensive policy on backhaul spectrum by end-2017. The policy is expected to bring clarity on aspects like spectrum bands to be used for backhauling, the allocation method of airwaves and their pricing. The backhaul spectrum is supported by higher frequency bands between 3 GHz and 70 GHz. Besides, the industry is requesting DoT to make spectrum in E-band available for backhaul purposes.

A look at the key trends in the Indian backhaul space…

Evolving microwave-fibre mix

Unlike global operators, Indian telecom operators largely use microwave for backhauling. Microwave served as an adequate backhauling medium in the 2G era. As Indian subscribers had not experienced high speed 3G/4G services at the time, there was no urgent need for deploying fibre, which anyway was an expensive option with its deployment fraught with challenges.

Later, with the emergence of 3G and now 4G there has been an unprecedented growth in data traffic on operator networks. In such a scenario, given the virtually unlimited capacity and extensive reach of fibre, a shift towards fibre-based backhaul is a logical step. Thus, in the past two to three years, the industry has witnessed an increase in fibre deployment activities. This prepared the operators for the 4G onslaught that they faced post Reliance Jio Infocomm Limited's entry in the market last year. As 4G roll-outs grew at a significant pace during the latter half of 2016, operators' early adoption of fibre-based backhaul helped them deliver quality high speed services. For instance, Vodafone has been on a 4G service launch spree over the past year and claims to have its SuperNet 4G network built on strong fibre backhaul across all its circles.

Despite fibre being the most efficient backhaul medium for high data transfer, its share in the country's backhaul mix is not likely to change dramatically in the near or medium term. Currently, fibre roll-out is facing several deployment challenges in India, which translate into huge cost considerations for the operators. The cumbersome process for securing right-of-way approvals and the exorbitant charges involved have dampened the business case for fibre deployment several times in the past. Another key impediment for fibre-based backhaul networks is that the existing network fibre topology is inadequate for providing network redundancy. This results in connectivity issues in case of link failures due to the lack of alternative routes for routing traffic in the ring architecture, which is deployed by most operators.

In contrast, microwave is more flexible as a site can be easily moved or redirected depending on the volume of network traffic. Further, it is not vulnerable to physical damage, and is thus more reliable. Meanwhile, in India's rural terrain, microwave clearly scores over fibre for meeting backhaul needs.

The capability of microwave link-based backhaul has also improved significantly in recent years owing to innovations in microwave technology, such as the use of multiple antennas and higher-order modulations. As per industry estimates, microwave backhaul links are capable of supporting up to 200 Mbps of data on an average. However, India has the potential to deploy microwave technology that can support up to ten times the capacity of the current microwave radios (subject to regulatory and spectrum clearances). In 2016, Airtel, under Project Leap,

increased its mobile backhaul capacity.

Exploring new spectrum bands

In the short to medium term, the lack of fibre at tower sites can easily be addressed by using spectrum in the E-band for backhaul purposes. For this, the government will have to make this spectrum available to operators. E-band can also prove to be a boon for rural users by bringing them under the broadband net.

Further, spectrum in V-band can be delicensed to be used for backhaul for supporting multi-gigabit throughputs. Also, the unused white space on TV spectrum can be used to backhaul data from village Wi-Fi clusters in order to provide broadband access.

Emerging growth drivers

The Smart Cities Mission and the Digital India initiative, and the emergence of IoT, will significantly increase backhaul network requirements at the user level, at the integration points and at centres where data would be used or processed for applications and transactions, etc. Public Wi-Fi will also increase demand for a robust backhaul network.

Further, as users realise the benefits of a high speed network, they are likely to demand ubiquitous 4G coverage. In this case, satellite-based backhaul systems are likely to play a bigger role as there are several pockets in India where let alone fibre, even microwave is difficult to reach. Operators such as Bharti Airtel, Vodafone India, Reliance Communications, Bharat Sanchar Nigam Limited and Aircel have already deployed satellite backhaul solutions to cater to users in the remote regions of the country. The need to connect everyone everywhere will create new opportunities for the satellite backhaul market in India.

Outlook

Going forward, as telecom operators continue to expand their 4G service reach in a bid to increase their share in the ever-growing 4G service market, it will be crucial to develop a strong and robust backhaul network to support these services. As per industry estimates, over 100,000 greenfield base transceiver stations (BTSs) are likely to be deployed in addition to the upgradation and modernisation of the existing BTS base. This would call for a proportionate expansion of backhaul networks.

Further, the introduction of 5G, though still a few years away, requires significant ramping up of the country's backhaul infrastructure. To this end, fibre penetration at mobile towers will have to be enhanced in a big way.

The migration to all-IP networks has already started happening, but it will take a couple of more years for incumbents to get rid of their legacy equipment and undergo an end-to-end backhaul network transformation.

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