CAPITEL

Building a Backhaul Mix: Key to optimizing costs and capacity

A combination of mm-wave links, with microwave links and fiber can help optimize the overall cost of backhaul and can be configured at a market level

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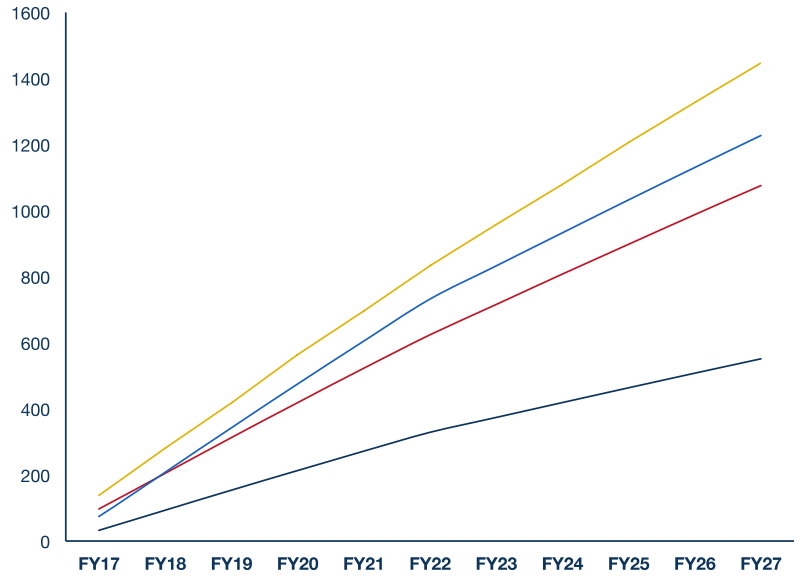
Building a Backhaul Cocktail

The two primary ingredients of a mobile broadband business case are spectrum and backhaul. Once operators have sufficient spectrum in the bands of their choice, the next critical decision to maintain the user experience is the backhaul design and capacity. In highly competitive markets such as India, the backhaul cost, defined by the mix of underlying technologies, also becomes a key consideration. The drivers for backhaul remain clear – increasing traffic density on 4G, bundling of FTTx with mobile services, likely deployment of small cells, cloud RAN and 5G.

Traffic density (Mbps per sq. km), in contrast to traffic levels (GB demand) is the parameter of interest. The traffic density reflects the adoption of data services by customers in a specific cluster, their data usage as well as level of simultaneous active users. Our modeling for some of the Tier 1 cities suggests increasing traffic density, as the data usage becomes more widespread across the city, and the absolute consumption of data continues to increase.

Figure 1: Traffic density estimation
Mbps per sq km, wireless traffic only



Source: Capitel analysis and engagement experience

Such a concentration of demand results in high traffic in hotspots and dense urban locations within cities, and loads wireless sites – 20% of the sites are estimated to carry more than 50% of the traffic. The next 30% of the sites will be carrying ~30% of the traffic. Operators are identifying these sites and migrating them on a high capacity backhaul to manage the surging traffic.

The traffic density will continue to increase. The spectrum band under consideration for 5G in India is the 3.3GHz to 3.6GHz band. A pilot deployment on these frequencies by an OEM suggests more than 20+ nodes per sq km, representing about 3-4 nodes per macro cell. Such a concentration of 5G (and small cell) nodes, especially with significant quantum of access spectrum and high spectral efficiency will put pressure on backhaul.

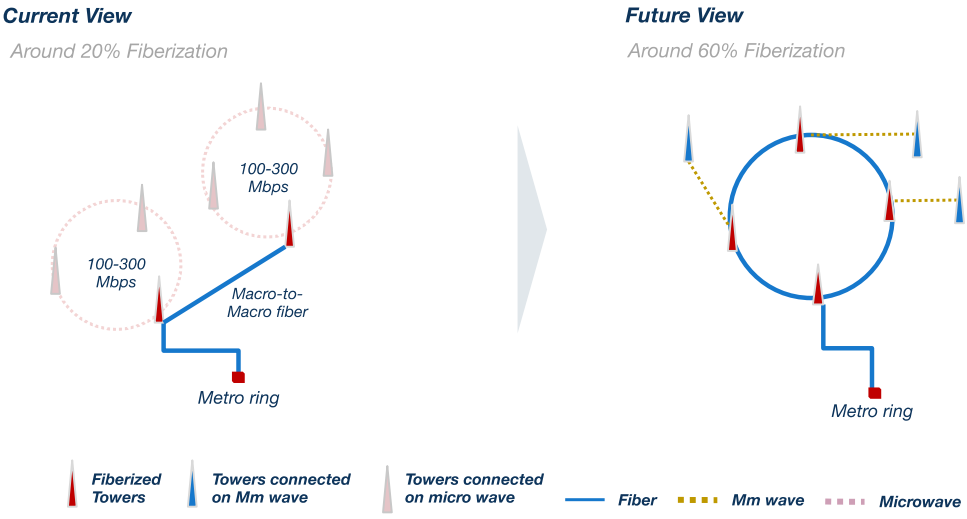
Finally, with increasing competition in mobility, operators in India are also considering deployment of various versions of the FTTx (x being home, node, tower). Such FTTx deployments will also need fiber backhaul.

Operators and network planners understand that a strong backhaul combined with a ubiquitous small cell infrastructure is going to provide them with competitive advantage and provide better QoS.

Currently 80% of the operator back haul is on microwave, and the remaining 20% is on fiber. We believe that operators will have to find the right technology mix for their backhaul that supports the capacity needs, and is also cost-efficient. To defend and build their market position, operators, independent fibercos and towercos are coming together to develop a high capacity backhaul network.

Our engagement experience suggests four different access media for designing a capable and cost-efficient backhaul, including microwave, millimeter wave, dark fiber and lit fiber. We believe the initial transition, which is already taking place in metro markets, is the upgrade of microwave backhaul, and migration of select microwave rings to fiber links.

Figure 2: Backhaul technology mix
Illustrative, metro markets



The Right-of-way (RoW) charges for underground fiber can become a limiting factor in select markets, as well as select circles such as Maharashtra. However, in markets with expected deployment of FTTx, data densification on 2300MHz, 2500MHz, 5G deployments on 3.4GHz+, there is no real alternative to underground fiber. The planning needs to identify the locations that will need fiber from all of the above areas, and to migrate these PoPs to fiber, with the rest of the network backhaul using a mix of other technology options. The Smart City initiative is helping few operators and Towercos reduce these costs, but this option is not available to multiple operators and is applicable to only a restricted number of cities.

The next best solution to underground fiber is aerial fiber, although the regulatory framework and supporting infrastructure for laying structured aerial cabling on poles is limited to few cities. Aerial fiber is being increasingly used in B2C use cases by LCOs and for specific small cell backhaul in Tier 2 markets, although we do not expect this to be a sustainable long-term solution for high capacity and reliable backhaul.

Regulators are also providing access to the millimeter wave E and V band spectrum for backhaul. The available capacity of mm wave spectrum can be 1Gbps per link, subject to propagation issues. The E band spectrum is expected to be a clear substitute for fiber in tough patches and areas with high RoW charges. A millimeter wave radio hop is currently priced at

~$5,000 per hop, although this is expected to rapidly decline with scale. A combination of mm-wave links, with microwave links and fiber can help optimize the overall cost of backhaul and can be configured at a market level.

Such a mix becomes especially important when planning for small cell deployments. The cost of backhaul as a percent of total equipment cost is double for small-cell network (point-to-multipoint and point-to-point) when compared to that of the macro network (20%).

The final decision in planning and optimizing backhaul cost is the mix of dark and lit fiber. For sites that are carrying majority of the data traffic, dark fiber provides a clear business case – the availability of dark fiber is likely to improve due to the high EBITDA margins (60%+) for the dark fiber business for the suppliers, as well as expected consolidation and organization of fragmented metro fiber networks in India. Lit fiber, including E1s and STM 1s will be used only for cell sites with predictable and limited backhaul capacity.

The cost of backhaul (or leased bandwidth) within the overall cost per GB is likely to continue to grow as operators deploy additional access spectrum, re-farm 3G to LTE, and introduce small cells, C-RAN, 5G and FTTx into their network design. The expected availability of mm-wave spectrum and dark fiber will help address this capacity demand, with a sweet-spot of functionality vs. cost achieved through a mix of these new technology media and microwave.

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Capitel is a leading advisor on major transactions and investments with specialized focus on Telecoms, Media and Technology infrastructure, networks and services. This includes wireless towers, fiber networks, data centers, sub-sea cables, in addition to FTTx, cable broadband, 5G and digital services.

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