Experiences in Using Broadband Technologies: A Comparative Study

Headquartered in Bangalore, Atria Convergence Technologies Pvt. Ltd. (ACT) is a triple play service provider offering an interesting ensemble of information, communication and entertainment solutions.

Broadband Internet access for consumers has become a necessity for most of the urban population in India and is rapidly moving towards rural India. With increasing affordability of smarter phones and penetration of social networking applications, broadband access has become a necessity. It has become as necessary as water, electricity and food. The utmost urgency to share videos and live streaming of content has almost defined the internet speed requirements. Different Internet Service Providers are deploying services through multiple different technologies in an effort to meet the customer needs.

In the below section, I am attempting to do a comparative study between each of the technologies in some detail. I hope this will provide enough information to the consumers to make an informed decision on their preferred service provider depending on their respective needs.

1. **DSL Based Technologies:** DSL based technology over the years has evolved from DSL, HDSL, ADSL, VDSL and VDSL2. ADSL is the most prominently used technology by most of the telecom providers who have legacy phone installations with copper connectivity. ASDL can provide a peak speed of 8Mbps at distances less than 1km from the DSLAM and the peak speed drops to less than 2Mbps for distance more than 4km.

    ADSL2/2+ gives about 20-24Mbps at distances less than 500 meters from the DSLAM. At 4km distance, the peak speed of ADSL2+ is same as ADSL (about 2Mbps peak). VDSL2+ can provide up to 80 Mbps for < 300 meters, but drops to < 10Mbps for > 2kms distance. Also, VDSL2+ is susceptible to a lot of cross-talk interference if there are more than four connections within the same DSLAM. The peak speed drops down to < 20Mbps if there are more than four subscribers due to interference. Newer technology called Vectored VDSL, which presumably reduces cross-talk interference, is being worked upon. It is however estimated that this technology will take about 3-5 years to be deployed.

    The entry barrier for DSL based technologies is less for legacy telecom providers, since they already have an installed base of copper in the last mile. The severe limitations of throughput on copper over normal distances will limit the longer-term usefulness of these assets.
2. **Cable Based Technologies:** DOCSIS 2.0 was being deployed in India till recently. It had severe limitations on peak download speeds and hence is being replaced by DOCSIS 3.0 by most of the cable providers. The cable modem in the house has to be replaced for this purpose. DOCSIS 3.0 works on channel bonding technology. It can bond up to four channels in the downstream and hence is capable of providing up to 152 Mbps in the downlink, provided there is only one customer connected to the node. Typically in India, there are about 50-100 customers connected to every node, and hence the active subscribers share the bandwidth at any given time. The upload speed is much lesser than the download speed. DOCSIS 3.1 is being developed as a new standard and promises to provide even higher bandwidths. This is still in the development stage and may take 3-5 years to hit the market.
3. **LTE Based Broadband Service:** 4G-LTE Wireless broadband service is in the process of getting launched in most of the cities in India. It is being projected as an effective broadband alternative. However, each sector of LTE eNodeB can provide a maximum of 100Mbps download, which gets shared by the number of subscribers who are covered in the coverage area, typically a 1-2 km radius. Operators have a choice of deploying 3-6 sectors in a tower. Each operator has limited spectrum. Hence it is a challenge to deploy multiple sectors within a tower. Small Cells is a possible solution to this problem, with multiple

small towers/buildings, but the spectrum availability for every operator will be a big hindrance to aggressive small cell deployment.
4. **FTTH:** Lately, few Internet service providers are deploying "Fiber to the Home" technology.

There are multiple FTTH technologies.

- **GPON (Gigabit Passive Optical Network):**GPON is one of the commonly used mechanisms to deliver bandwidth. However, in GPON systems, there is dedicated terminal equipment required in each customer house. The fiber is passively split for multiple customers, which can go up to 1:128. About 2.5Gbps gets shared by the number of subscribers connected to it (either by 64 or 128 as per the capability). The uplink bandwidth is typically about 50 percent of the downlink bandwidth.
- Metro-Ethernet: ACT Fibernet uses Metro-Ethernet based FTTH to deliver bandwidth upto the home on Fiber. This provides dedicated fiber connectivity upto every individual home, and is capable of delivering up to 1Gbps for every subscriber. This is a symmetric mechanism of delivering bandwidth, where the upload speed will be equal to download speed. The bandwidth is not shared by multiple customers and hence the customer is guaranteed the subscribed bandwidth at any time of the day. This technology also has the advantage of not requiring a modem.

Summary:

DSL based technologies have a lot of challenge with interference control mechanisms and are limited with bandwidth capability. Even at peak rates, it will not be possible to provide 100Mbps to each subscriber using this technology. The upload speed is significantly lower than the download speed.

DOCSIS 3.0 technology is limited by the fact that the cable medium is shared and hence the user experience is defined by the number of concurrent customers at any given point in time. The upload speed in this case is also less than download speed. It will not be able to provide 100Mbps or above to any customer.

LTE will be a service that will be used as mobility convenience to customers. Hence there will be an increase in LTE uptake for mobility purposes. This will act as a complimentary service to the wired broadband industry, but will not replace it.

FTTH will be a significant technology of choice with its ability to deliver much higher bandwidth than any of the legacy technologies.