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2010/03/08
Info 250
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Fiber to the Home

There is a growing need for faster internet in the world as higher-bandwidth applications such as HD videos and on-demand movie or game downloads become more ubiquitous. According to Akamai's "State of the Internet" report for Q3 2009, the United States is currently 18th in average internet connection speeds at 3.9 Mbps (compared to South Korea at 14.6 Mbps). As a result, several companies in the US are starting to offer higher speeds via fiber optics using Fiber to the Home (FTTH) connections.

While fiber optics as a transmission medium has been around for some time now, FTTH deployments are a relatively recent offering, with the first major deployment being Verizon's FiOS in 2005, followed by AT&T's U-Verse. FiOS currently has around 70% of the FTTH market, with U-Verse making up the bulk of the rest. One of the reasons FiOS and U-Verse aren't offered everywhere is that Verizon and AT&T don't own the local phone networks or fiber loops in all locations in the US. Since these companies are competitors, in most communities, there will only be one offering in the near future.

There are several types of last-mile fiber - fiber to the node (FTTN), curb (FTTC), building (FTTB), and home (FTTH). Generally, the closer the fiber goes to the home, the faster the overall bandwidth of the setup. FiOS is deployed using FTTH, whereas U-Verse is a combination of FTTN and FTTH. These fiber lines all terminate at an optical network terminal (ONT), which is a device that converts fiber's light signals to electrical signals for voice, data, or TV. In FTTH installations, the ONT replaces the DSL modem or cable modem in standard home setups.

There are two types of FTTX setups: active or passive optical networks. Since running an individual wire from the central office to each subscriber's home is prohibitively expensive, the carriers place devices in-between that forward the signals from hundreds of homes across just a few fiber strands. In an active network, an equivalent of a switch, router, or multiplexer will serve tens or hundreds of homes, and only relevant data is sent to each ONT. In a passive network, the signal is sent to all ONTs connected to a hub-like device (broadcast). This wastes signal capacity but the passive network does not require a power source, whereas the active network requires that it be powered at all times.

There are many advantages to the carrier when switching to fiber installations. The greatest advantage is bandwidth - fiber has a theoretical limit of about 2.5 Gb/s whereas copper is only 1.5 Mb/s. This means that the carrier can offer higher end-user speeds for HD videos and high-speed downloads. Additionally, there is greater signal quality since the light signals are immune to electromagnetic and radio frequency interference. Consequently, fiber lines can be run for about 200km instead of 2.5km for copper because of the greater signal quality.

As of the time of this writing, the disadvantages are mostly cost-based. It costs around $800 per home to create a new FTTH connection, a capital investment that won't be made back for many years to come. Optical networking devices are still on the expensive side compared to copper. Also, to create FTTX deployments, new wires need to be laid under existing infrastructure from the central office to each home. Finally, the internet backbone is not set up to deal with gigabit speeds to every home, so customers can only use a fraction of the theoretical capacity. On the bright side, this means that the

fiber is future-proof and as the backbone is upgraded, customers will be able to buy faster internet connections.

The main competitor to FTTX is cable networks. Currently, both fiber and cable deployments offer around 50 Mbps to the end user. Cable has the advantage that the infrastructure is already in place from TV deployments so capital costs are cheaper. However, theoretical cable speeds are much lower than fiber; in the long run, fiber optics will most likely be the dominant medium for internet and TV signals.

FTTH is an area that has only recently become popular, is satisfying a growing need, and consumers are willing to pay for it. As mentioned earlier, the speed limitations are in the internet backbone - as the internet as a whole gets faster, FTTH operators can introduce new speed and price tiers, starting at the currents speeds of 20-50 Mbps all the way until the theoretical limits of 2.5 Gbps. There are still many underserved markets at the moment where the VC can invest since only about 15% of the country has a FTTH connection. Given the demand and lasting impact of FTTH, the VC firm is recommended to invest in this area. At best, this will provide a multi-year or even multi-decade recurring return on investment; at worst, we will be providing a valuable public service to get faster internet connections to communities in the US.

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