【CN】Day3

Created	@May 12, 2022 9:42 PM
Class	
Type	
Materials	Cable, Fiber to the Home(FTTH), and Ethernet and WiFi
Reviewed	☐

【Ch1】Computer Networks and the Internet

1.2.1 Access Networks(2)

Cable Internet access makes use of the cable television company's existing cable television infrastructure. A residence obtains cable Internet access from the same company that provides its cable television.

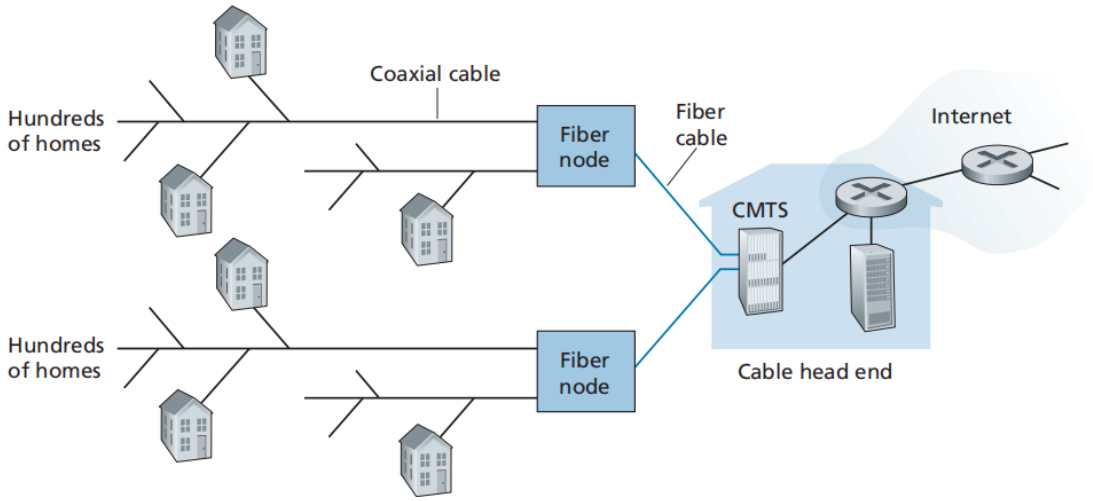

Figure 1.6 ♦ A hybrid fiber-coaxial access network

Cable internet access requires special modems, called cable modems. The cable modem is typically an external device and connects to the home PC through an Ethernet port.

At the cable head end, the cable modem turns the analog signal sent from the cable modems in many downstream homes back into digital format.

One important characteristic is that it is shared broadcast medium. In particular, every packet sent by the head end traverls downstream on every link to every home and every packet sent by a home traverls on the upstream channel to the head end.

For this reason, if several users are simultaneously downloading a video file on the downstream channel, the actual rate at which each user receives its video file will be significantly lower than the aggregate cable downstream rate.

Although DSL and cable networks currently represent the majority of residential broadband access in the US, an up-and-coming technology that provides even higher speed is fiber to the home(FTTH). The FTTH concept is simple-provide an ptical fiber path from the CO directly to the home. FTTH can potentially provide Internet access rates in the gigabits per second range.

There are several competing technologies for optical distribution from the CO to the homes. The simplest optical distribution network is called direct fiber, with one fiber leaving the CO for each home.

More commonly, each fiber leaving the central office is actually shared by many homes; it is not until the fiber gets relatively close to the homes that it is plit into individual customer-specific fibers.

There are two competing optical distribution network architectures that perform this splitting: active optical networks(AONs) and passive optical networks(PONs). AON is essentially switched Ethernet.

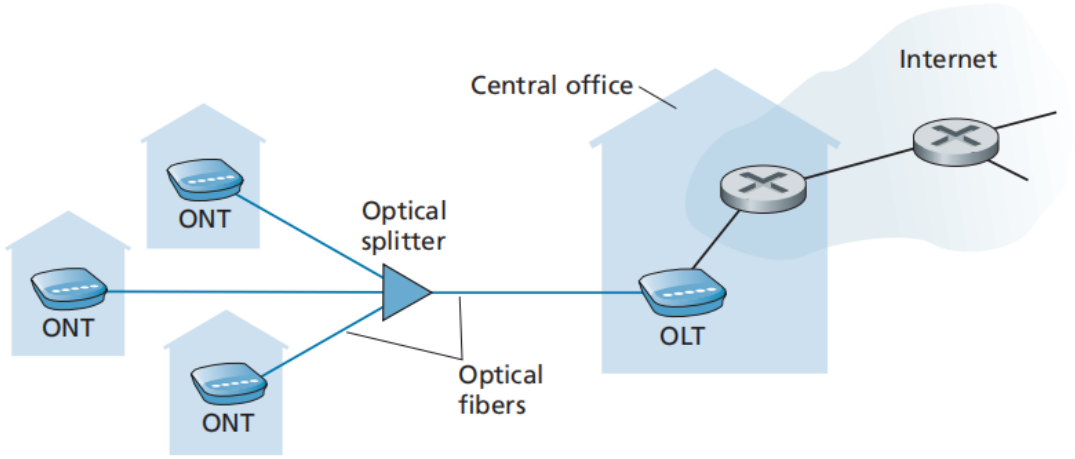

Figure 1.7 ♦ FTTH Internet access

The figure above shows FTTH using the PON distribution architecture.

Each home has an optical network terminator(ONT), which is connected by dedicated optical fiber to a neighborhood splitter.

The splitter combines a number of homes(typically less than 100) onto a single, shared optical fiber, which connects to an optical line terminator(OLT) in the telco's CO. The OLT, providing conversion between optical and electrical signals, connects to the Internet via a telco router.

At home, users connect a home router(typically a wireless router) to the ONT and access the Internet via this home router.

In the PON architecture, all packets sent from OLT to the splitter are replicated at the splitter.

Access in the Enterprise (and the Home): Ethernet and WiFi

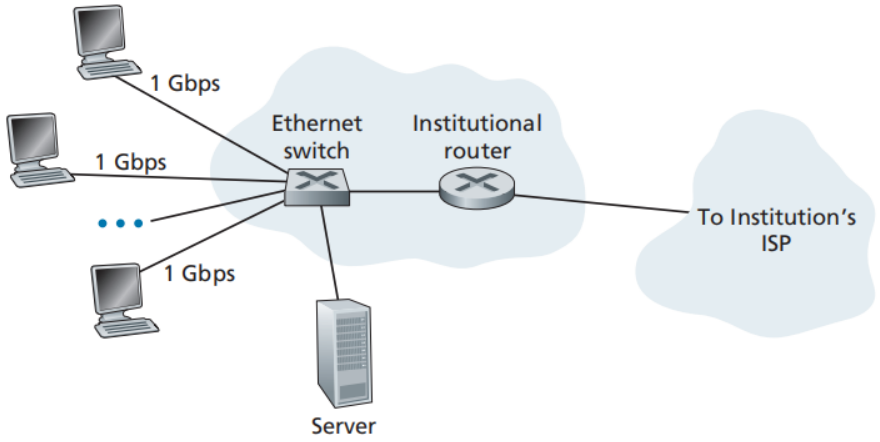

Figure 1.8 ♦ Ethernet Internet access

On corporate and university campuses, and increasingly in home settings, a local area network(LAN) is used to connect an end system to the edge router. Ethernet is by far the most prevalent access technology in corportae, university, and home networks.

Ethernet users use twisted-pair copper wire to connect to an Ethernet switch, which is then in turn connected into the larger Internet.

In a wireless LAN setting, wireless users transmit/receive packets to/from an access point that is connected into the enterprise's network, which in turn is connected to the wired Internet.

A wireless LAN user must typically be within a few tens of meters of the access point.