NEXT GENERATION TECHNOLOGIES

Wireline NG Technologies

WIRELINE NG TECHNOLOGIES

- Fiber to the Premises (FTTP)
  - Includes mostly Passive Optical Networks (PON) fiber based services to homes, apartment buildings, business and education campuses, LTE towers, etc

  - Broadband PON(BPON) has been specified in ITU-T's G.984 standard
    - 1310 nanometer for upstream data at 155 Mbps (1.2 Gbps with GPON)
    - 1490 nanometer for downstream data at 622 Mbps (2.4 Gbps with GPON)
    - 1550 nanometer for RF based video with 870 MHz bandwidth
    - Enhanced security and reliability

WIRELINE NG TECHNOLOGIES

- Fiber to the Premises (FTTP)
  - IEEE 10G Ethernet PON (IEEEP 802.3av)
    - Backward compatible with Ethernet PON (EPON or GEPON IEEE 802.3ah)
    - Use separate wavelengths for 10Gbps and 1.0Gbps downstream
    - Use single wavelength for both 10 Gbps and 1.0 Gbps upstream with TDMA separation
  - GPON and GEPON based FTTP deployed in US, Europe and Asia
  - NGPON including 10G-EPON and WDM-EPON will be available in 3 to 5 years
  - More than 15 million FTTP/H subscribers in Japan
  - More than 3 million subscribers in Europe and US

WIRELINE NG TECHNOLOGIES

- Long-Haul Managed Ethernet (over optical gears)
  - Two factors for its establishment
    - Requirement to reduce complexity
      - Uses lightweight provisioning and packet routing capability at optical transport layer
    - Advancement of Key photonics technologies
      - Supports Higher-speed modulation, FEC and Wideband filtering
      - Availability of standardized photonics IC modules
  - Capability of 100 Gbps or more
  - Expected to eliminate large number of intermediate network elements and interfaces
  - Reduce overall power requirements
  - Improve provisioning, operations and management of end-to-end service quality

WIRELINE NG TECHNOLOGIES

- Advantages/Features:
  - Support convergence in terms of interfaces
  - Support features and functions to maintain seamless services
  - Routers and switches will be application-aware
  - Physical layer elements will be aware of IP layer functions and features
  - Application layer services will be HMI aware
    - For Example, TVs will support bidirectional voice and video calls
    - TVs will also support instant messaging and email service
    - Wireline phones will support web service and low bit rate television services along with usual POTS

Wireless NG Technologies

Wireless NG Technologies

- Will use mostly new generation hand-held or wearable devices supporting:
  - Real time voice/data/video
  - Gaming
  - High-bandwidth access to location-based services
  - Health/Pollution/Traffic monitoring services

Wireless NG Technologies

- Broadband Bluetooth
  - IEEE 802.15.1 standard
  - Will utilize multi-band OFDM over unlicensed 2.4 Ghz frequency band
  - Support secure, High speed (up to 480 Mbps) and low power communication for PAN and BAN applications
  - Services:
    - HD phone conversations
    - High speed file transfer
    - Sophisticated Gaming
    - High security transactions
  - Challenges:
    - Automated Device Pairing
    - Privacy and security
    - Topology management
    - Prevent Hijacking of service

Wireless NG Technologies

- ZigBee
  - IEEE 802.15.4 standard
  - Low-power, low complexity wireless communication standard
  - Operates over unlicensed 2.4 GHz band
  - Supports data rate up to 250 Kbps
  - Applications:
    - Smart Gadgets/Toys
    - Home automation
    - Sensors
    - Personal Home/Hospital care
  - Challenges:
    - Reducing ambiguities and complexities without compromising on:
      - Performance over newly available frequency bands
      - Flexibility in security key usage

Wireless NG Technologies

- Long Term Evolution(LTE)
  - Telecom wireless technology
  - Provides simplified radio access and core packet network
  - Also provides greater spectrum efficiency and reduced latency in over-the-air interfaces.
  - Uses MIMO system
  - Downlink data rate of 100 Mbps using O-FDMA
  - Uplink data rare of 50 Mbps using SC-FDMA
  - Uses 20 MHz bandwidth
  - Advantages:
    - Reduce IP network complexity significantly
    - Reduce network cost
    - Reduce End-to-end latency
    - Improves throughput

VoIP (Voice over IP)

- VoIP allows you to make telephone calls using a computer network, over a data network like the Internet. VoIP converts the voice signal from your telephone into a digital signal that travels over the internet then converts it back at the other end so you can speak to anyone with a regular phone number. When placing a VoIP call using a phone with an adapter, you'll hear a dial tone and dial just as you always have. VoIP may also allow you to make a call directly from a computer using a conventional telephone or a microphone.

- Also referred to as IP Telephony
- Voice conversations are turned into digitized data and packetized for transmission across a network.

VoIP


Personal
Computer
Telephone
Cable
Modem
Phone
Adapter
Internet
Personal
Computer
Telephone

VoIP

VoIP

- IP address to Phone Number
  - VoIP look for IP address
    - Translate Phone numbers to IP addresses
  - The **central call processor** is a piece of hardware running a specialized database/mapping program called a **soft switch**.
  - Soft switches know:
    - Where the endpoint is on the network
    - What phone number is associated with that endpoint
    - The current IP address assigned to that endpoint
  - If soft switch does not have the information, the request is handled by another soft switch.

VoIP Protocols

- Used to connect different pieces of hardware.
- H.323
  - Most widely used protocol
  - provides specifications for real-time, interactive videoconferencing, data sharing and audio applications (VoIP)
- SIP
  - More streamlined protocol
  - Developed specifically for VoIP
- Lack of a standard protocol is a problem. Not always compatible.

VoIP vs. PSTN

- PSTN = Public Switched Telephone Network
- VoIP uses Packet Switching which is more efficient than a dedicated line
- Also compression can be used
- Can transmit data (video)

VoIP advantages

- Cost
  - Free VoIP to VoIP
  - Low cost VoIP to Public Switch Telephone Network (PSTN)
  - Less bandwidth requirements
  - Low cost / no cost software and hardware
- Mobility
  - Any internet connection
  - Growing number of wireless broadband locations

VoIP drawbacks

- Quality
  - High quality PSTN
  - Variable VoIP dependent on connection
- Dependent on wall power
- Lost or delayed packets cause drop-out in voice
- Emergency Calls
  - Hard to find geographic location
- Security
  - Most VoIP services do not support encryption