

Report Training-2

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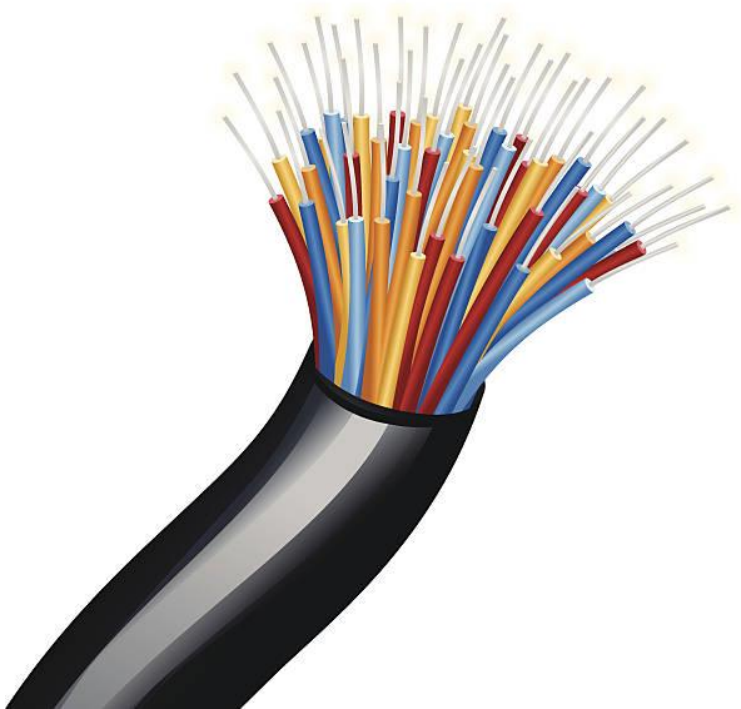
Communications and electronics engineering - Level 4

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Training organization name and location: المصرية للإتصالات - طلخا

Training content:

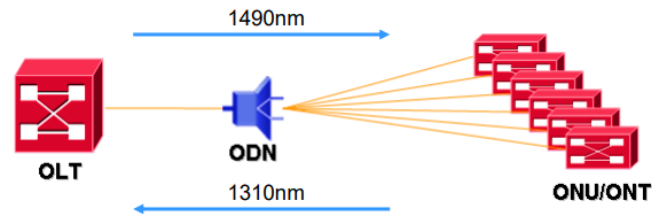
- Gigabit Ethernet passive optical network (GPON) Network Architecture
- GPON Working Principle
- GPON Key Technologies
- Network layers.
- Fiber-optic cable, installation method, internal connections and types.
- Pulse-code modulation (PCM).
- Dense wavelength-division multiplexing (DWDM).
- Synchronous Digital Hierarchy (SDH).
- Plesiochronous digital hierarchy (PDH).
- Difference between PDH and SDH.
- Methods of data transmission.



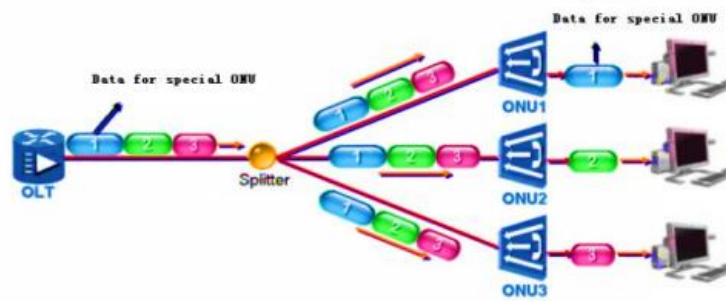
• Gigabit Ethernet passive optical network (GPON) Network Architecture

-Data Multiplexing

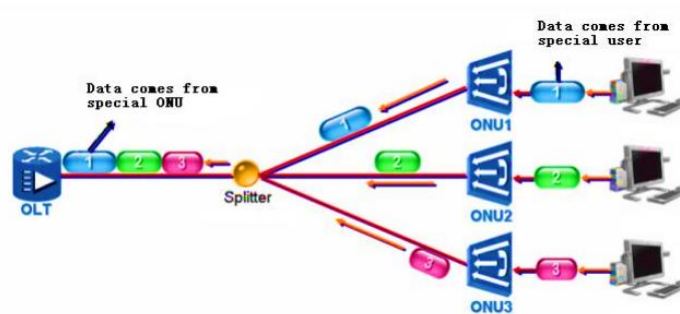
GPON adopts Wavelength Division Multiplexing (WDM) technology, facilitating bi-direction communication over a single fiber.



GPON Downstream Dataflow



GPON Upstream Dataflow



- TDMA mode

GPON Working Principle

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GPON Technology Standards

ITU-T G.984.1

- GPON general characteristics
- Protection switchover requirements

ITU-T G.984.2

- Physical Media Dependent(PMD) layer specification
- Optical interfaces specification for 2.488Gbit/s downstream/1.244 Gbit/s upstream
- Physical layer overhead definition

ITU-T G-984.1/2/3/4

ITU-T G.984.3

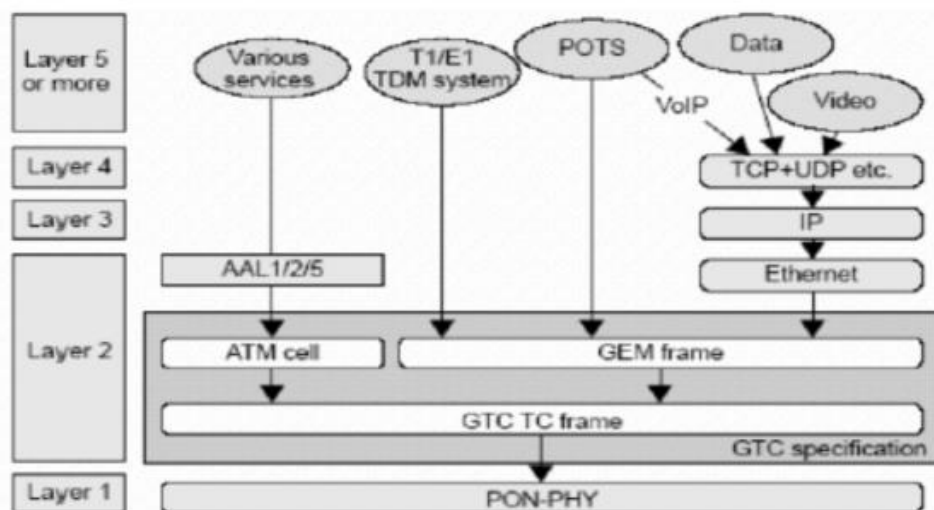
- Transmission Convergence layer specification
- GTC multiplex structure and protocol
- GTC frame structure definition
- Specification of the ONU registration method and various clarifications
- DBA specification
- Alarms and performance

ITU-T G.984.4

- ONT management and control interface(OMCI) specification
- OMCI equipment management architecture
- OMCI principle introduction

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The Multiple Service Features for GPON System



● GPON Key Technologies

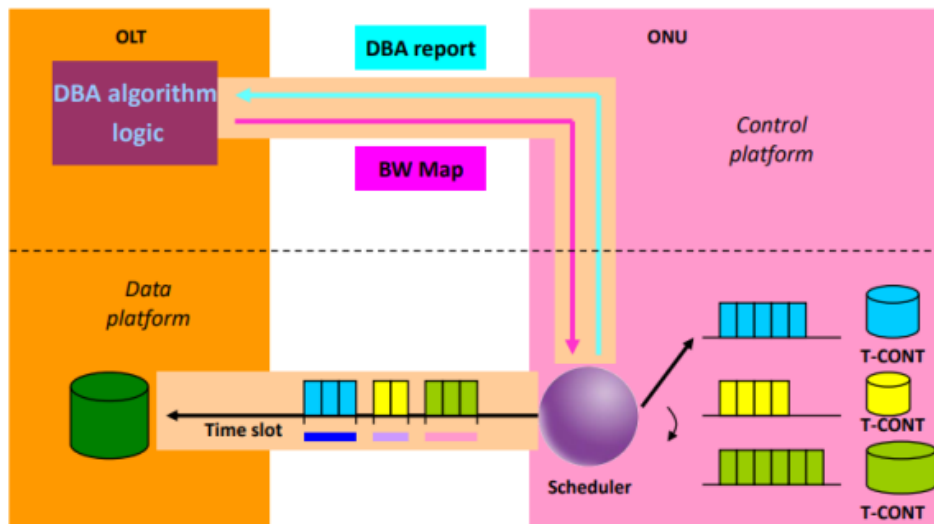
- What is DBA?

- DBA, Dynamic Bandwidth Assignment

- Why DBA?

- It enhances the uplink bandwidth utilization of PON ports.
- More users can be added on a PON port.
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- Users can enjoy higher-bandwidth services, especially those requiring comparatively greater change in terms of the bandwidth.

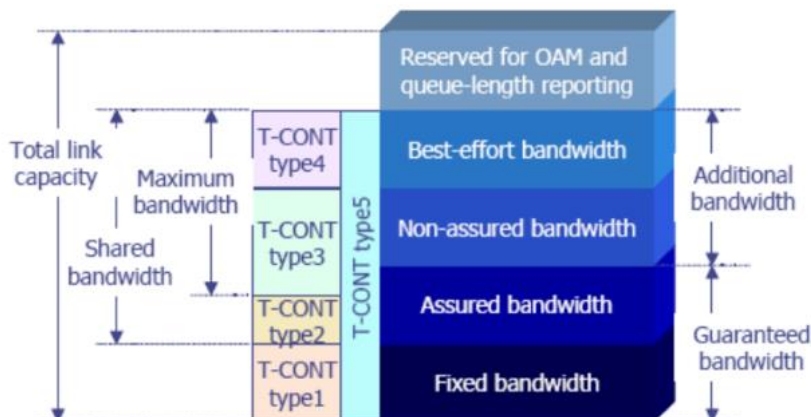
How does DBA function?



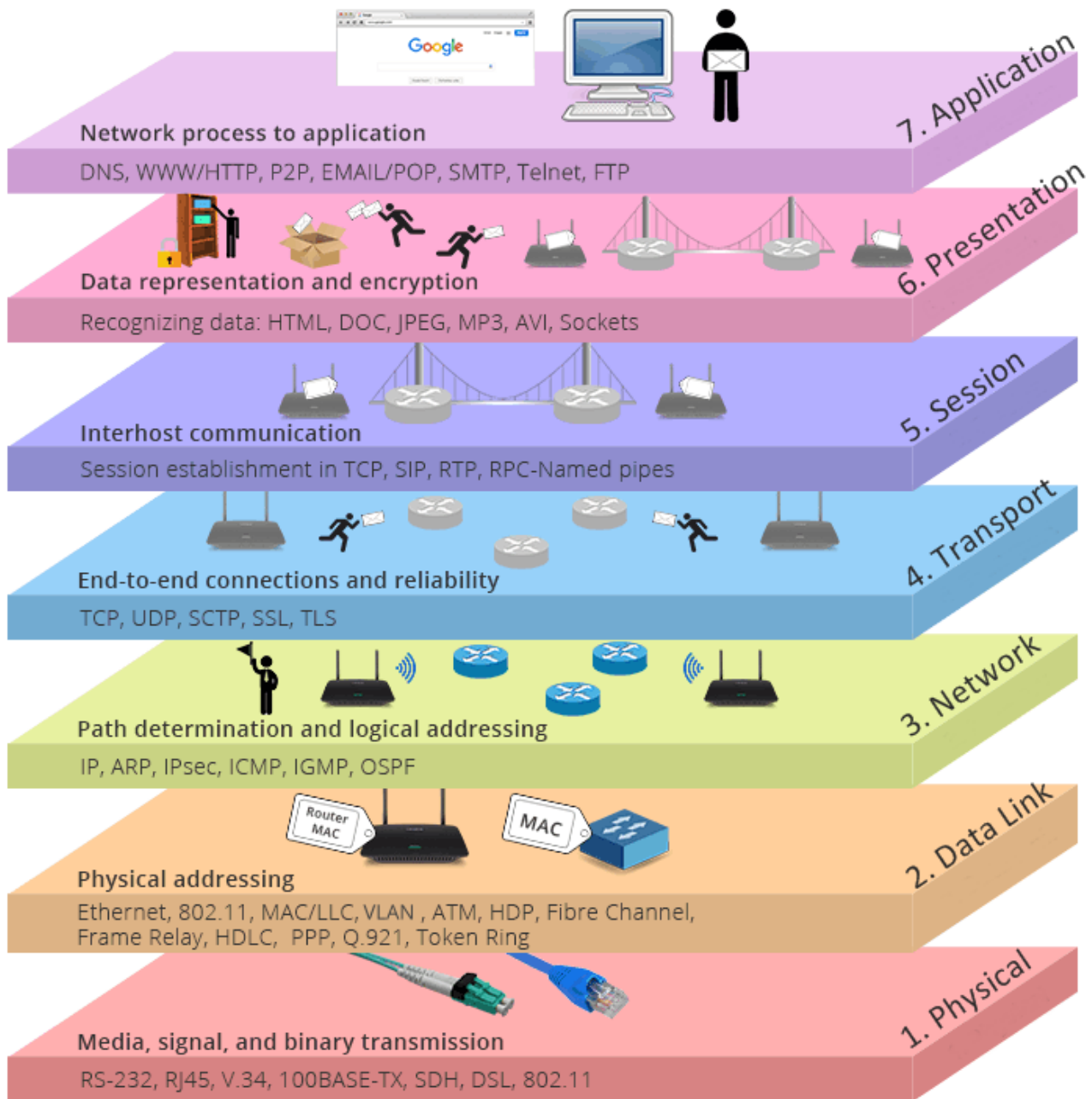
- T-CONT will report the status of its buffers so as to ask for upstream bandwidth assignment.
- OLT will give corresponding bandwidth assignment to each T-CONT based on their buffer status.
- ONU will be responsible to give bandwidth to each queue of each T-CONT.

GPON Bandwidth Types

- The priority is: fixed > assured > non-assured > best effort.

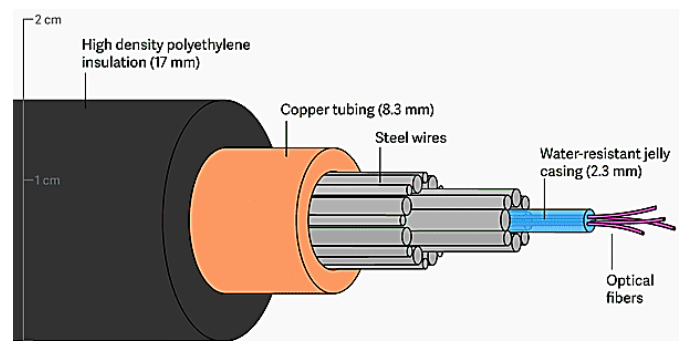


- Network layers.



- Fiber-optic cable, installation method, internal connections and types.

A fiber optic cable is a network cable that contains strands of glass fibers inside an insulated casing. They're designed for long-distance, high-performance data networking, and telecommunications. Compared to wired cables, fiber optic cables provide higher bandwidth and transmit data over longer distances. Fiber optic cables support much of the world's internet, cable television, and telephone systems.

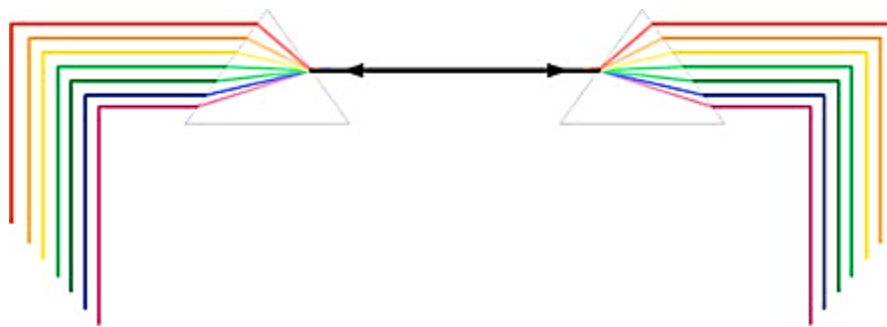


- **Pulse-code modulation (PCM)**

is a method used to digitally represent sampled analog signals. It is the standard form of digital audio in computers, compact discs, digital telephony and other digital audio applications. In a PCM stream, the amplitude of the analog signal is sampled regularly at uniform intervals, and each sample is quantized to the nearest value within a range of digital steps.

- **Dense wavelength division multiplexing (DWDM)**

is a fiber-optic transmission technique. It involves the process of multiplexing many different wavelength signals onto a single fiber. Each fiber has a set of parallel optical channels and each one uses slightly different light wavelengths. The fibers employ light wavelengths to transmit data parallel-by-bit or serial-by-character. DWDM is a very crucial component of optical networks that will allow the transmission of data: voice, video-IP, ATM, and SONET/SDH respectively, over the optical layer. Figure shows this technique at its most basic representation.



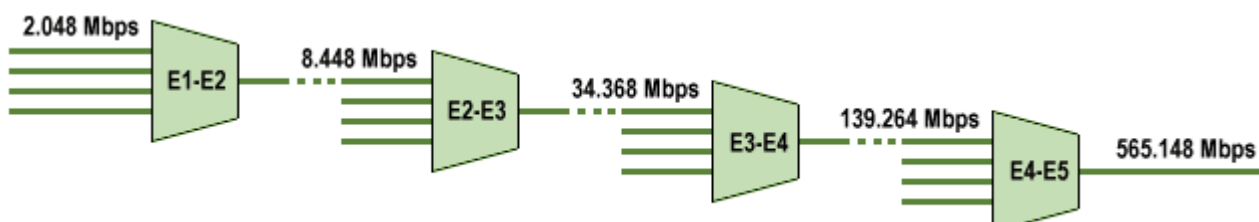
- **The synchronous digital hierarchy (SDH)**

is a new standard for multiplexing together many low rate digital traffic channels into higher rate channels in order that these low rate channels may be more efficiently transported around a telecommunications network.

- **Plesiochronous digital hierarchy (PDH).**

The plesiochronous digital hierarchy (PDH) is a telecommunications network transmission technology designed for the transport of large data volumes across large scale digital networks.

The PDH design allows the streaming of data without having isochronous (clocks running at identical times, perfectly synchronized) to synchronize the signal exchanges. PDH clocks are running very close, but not exactly in time with one another so that when multiplexing, signal arrival times may differ as the transmission rates are directly linked to the clock rate.



● Difference between PDH and SDH.

- Plesiochronous Digital Hierarchy (PDH) :
PDH stands for Plesiochronous Digital Hierarchy. It is a telecommunications network transmission technology designed for the transport of large data volumes across large scale digital networks. In PDH, multiplexing of 2 Mbit/s signals into higher order multiplexed signals. The laying cable between switch sites is very expensive. It increases traffic capacity of a cable by increasing bit rate.
- Synchronous Digital Hierarchy (SDH) :
SDH stands for Synchronous Digital Hierarchy and it refers to as a multiplex technology used in the telecommunication. Synchronous Optical Network is internationally used. It is said to be a variation of SONET and is taken equal to SDH. Its characteristics are founded on high order multiplexing. These are the technologies that provide quite fast and low priced network interconnection than PDH which stands for Plesiochronous Digital Hierarchy.

Difference between PDH and SDH :

S.No.PDH	SDH
1. Reference clock is not synchronized throughout the network.	Reference clock is synchronized throughout the network.
2. There is no synchronization between payload and frame.	There is synchronization between payload and frame.
3. Its system has different frame structures at different hierarchy levels.	Its system has consistent frame structures throughout the hierarchy.
4. In this, Physical cross-connections are provided on the same level.	In this, Digital cross-connections are provided at different signal levels.
5. In this, rates are derived from basic rate of 1.544 Mbps. The maximum capacity is about 566 Mbps.	In this, rates are derived from basic rate of 155.52 Mbps. The maximum up to 40 Gbps rates can be derived from basic rate mentioned.
6. The implementation cost of PDH is lower.	The implementation cost of SDH is higher.
7. The multiplying method used in PDH is complex.	The multiplying method used in SDH is simple.
8. It is incompatible with other signals such as ATM, FDDI, DQDB etc.	It is compatible with other signals such as ATM, FDDI, DQDB etc.
9. There is no universal standard for PDH.	The universal standard exists for SDH.

