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Nokia Fixed Networks Fundamentals



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Question: 1

Which of the following statements correctly describes downstream and upstream transmission in a GPON network?

A. Downstream traffic uses time slots assigned individually by each ONT, while upstream traffic is broadcast to all ONTs.
B. Both downstream and upstream traffic are continuously broadcast without coordination by the OLT.
C. Downstream traffic is broadcast from the OLT toward the ONTs, while upstream transmissions use OLT-controlled time slots.
D. Downstream and upstream traffic require separate optical fibers between the OLT and each ONT.

Answer: C

Explanation:
GPON uses different transmission methods in the downstream and upstream directions. In the downstream direction, the OLT sends a continuous stream through the passive optical splitter. This stream reaches every connected ONT, but each ONT processes only the frames intended for it. Encryption can protect subscriber traffic from other ONTs on the same PON. In the upstream direction, several ONTs share the same optical fiber and cannot transmit simultaneously without coordination. The OLT therefore assigns transmission opportunities using Time Division Multiple Access. Dynamic Bandwidth Allocation can adjust these upstream grants according to traffic demand and service requirements. Separate fibers are not required for each subscriber because GPON commonly uses wavelength separation to carry downstream and upstream traffic over the same fiber infrastructure.
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Question: 2

Which component of a typical Optical Distribution Network requires no electrical power to perform its primary function?

A. Optical line termination
B. Passive optical splitter
C. Residential gateway
D. Optical network termination

Answer: B

Explanation:
A passive optical splitter divides an incoming optical signal into multiple output paths without requiring electrical power. It is a fundamental component of the Optical Distribution Network connecting an OLT to multiple ONTs or ONUs. The splitter does not regenerate, amplify, or actively switch the optical signal. Consequently, splitting introduces optical loss that must be considered when calculating the PON power budget. The OLT and ONT are active devices because they require power to transmit, receive, process, and convert signals. A residential gateway also requires power to provide functions such as routing, firewall enforcement, DHCP, Ethernet switching, and Wi-Fi connectivity. The use of passive splitters reduces the need for powered equipment in the outside plant, which can simplify field maintenance and lower operational costs.
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Question: 3

What is the primary purpose of vectoring in a DSL access network?

A. To combine two or more copper pairs into one logical connection
B. To cancel far-end crosstalk among coordinated copper lines
C. To divide optical power among multiple subscribers
D. To replace frequency-division duplexing with wavelength-division multiplexing

Answer: B

Explanation:
DSL vectoring is primarily used to reduce or cancel far-end crosstalk between copper pairs operating within the same cable bundle. Crosstalk can significantly reduce the attainable data rate, particularly with high-frequency technologies such as VDSL2. A vectoring system measures interference among coordinated lines and generates compensating signals that counteract the crosstalk. This can improve connection stability and allow lines to operate closer to their theoretical performance. Vectoring is different from bonding. Bonding combines the capacity of multiple physical copper pairs to increase the aggregate subscriber bitrate. Vectoring also does not divide optical signals because that is the function of a splitter in a passive optical network. Its effectiveness generally depends on coordinating the relevant DSL lines through compatible access equipment.
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Question: 4

In a GPON system using Dynamic Bandwidth Allocation, which device determines when an ONT may transmit upstream traffic?

A. Residential gateway
B. Ethernet aggregation switch
C. Optical line termination
D. Passive optical splitter

Answer: C

Explanation:
The OLT controls upstream access to the shared GPON medium. Multiple ONTs use the same upstream wavelength, so uncoordinated transmissions could overlap and cause collisions. Through Dynamic Bandwidth Allocation, the OLT evaluates bandwidth requirements and assigns upstream transmission grants to the ONTs. These grants specify when an ONT can transmit and how much upstream capacity it may use. Traffic containers, or T-CONTs, help represent different upstream traffic and service requirements. The passive splitter cannot schedule traffic because it has no processing capability. The residential gateway handles subscriber-side functions, while an aggregation switch forwards Ethernet traffic beyond the access network. Centralized upstream scheduling enables efficient bandwidth sharing and helps the operator support different service priorities and performance commitments across subscribers.
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Question: 5

A residential gateway ONT provides routed Internet access to devices in a subscriber's home. Which DHCP role does it normally perform on the home LAN?

A. It acts as a DHCP server and assigns private IP addresses to home devices.
B. It acts only as a DHCP relay and never maintains address information.
C. It acts as a DHCP client for every device connected to the LAN.
D. It disables local addressing and assigns public addresses directly from the OLT.

Answer: A

Explanation:
A Layer 3 residential gateway normally operates as a DHCP server on the subscriber's home LAN. It assigns private IP addresses and other configuration information, such as the default gateway and DNS server addresses, to connected devices. On its network-facing WAN interface, the gateway may operate as a DHCP client to obtain service parameters from the operator's network. These two DHCP roles must not be confused. The gateway also commonly performs routing, Network Address Translation, firewall enforcement, and local Ethernet or Wi-Fi connectivity. The OLT transports and controls subscriber access traffic but does not normally allocate private LAN addresses directly to individual home devices. This architecture separates

the operator-facing connection from the subscriber's private local network and allows multiple home devices to share the broadband service.
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