Title

General Information

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To the certification exam

Link Aggregation is a method of aggregating multiple network connections in parallel in order to increase throughput beyond what a single connection could sustain and to provide redundancy in case one of the links should fail. A Link Aggregation combines a number of physical ports together to make a single high-bandwidth data path, so as to implement the traffic load sharing among the member ports in the group and to enhance the connection reliability.

LACP

Link Aggregation Control Protocol (LACP) is a signaling protocol which provides a method to control the bundling of several physical ports together to form a single logical channel. LACP allows a network device to detect a faulty channel because this protocol sends special LACP packets to a peer. LACP has two standard drafts: old IEEE 802.3ad and new IEEE 802.1AX. LACP service messages are encapsulated directly into Ethernet frames, LACP does not use higher level protocols. The service messages are sent to the multicast MAC address 01-80-c2-00-00-02.
InfiNet Wireless devices have the full support of LACP according to the standard IEEE 802.3ad. Moreover, our devices support special proprietary an extension of LACP. LACP "Fast" mode increases efficiency and performance compared default mode. The "Fast" mode provides next advantages: faster reaction to changes of links, intellectual estimation quality of the links, more accurate statistical data.

Load Balancing

LAG consists of several physical interfaces. Devices need to determine to which of the interfaces send each received packet. All packets from the same data stream must be sent to one physical port to save an order of the stream. For example, TCP protocol can define a wrong order of the packets in the stream as a packet loss; a remote device may not be able to buffer packets for a long time and this will increase jitter and delay - lack of both of these distortions very important for VoIP protocol.

CAUTION

Load balancing in LAG cannot always be equable, and this will cause some issues.

Load Balancing Algorithm

1) A switch estimates a hash from some header fields of the packet, depending on the method of balancing.
Balancing methods:

- Source MAC or Destination MAC or both of them;
- Source IP or Destination IP or both of them;
- Source UDP/TCP port or Destination UDP/TCP port or both of them;
- Other criteria determined by the vendor. For example, MPLS overhead, VLAN ID etc.

NOTE

InfiNet Wireless device supports a hash function, which is a combination of source and destination MAC addresses, VLAN ID, source and destination IP addresses, UDP and TCP ports.

2) If a load balancing uses source and destination fields at the same time (these can be MAC, IP, and TCP/UDP port), then XOR is calculated from their hashes.

3) The hash or XOR result is calculated depending on the number of physical ports.

4) The hash result specifies the port to which the packet should be sent. It may be that several hashes correspond to one LAN port, and different ports correspond to different number of hashes. For example, for a maximum of 8 ports and 5 ports in LAG, the distribution of hashes between ports will be: 2:2:2:1:1.

5) The packet is sent to the corresponding hash port.

Radio Link Aggregation

InfiNet Wireless devices allow to aggregate several radio links to increase summary throughput. Moreover, you can build Full Duplex link through TDMA.

Redundancy

InfiNet Wireless devices support full 1 + 1 redundancy schemes. A hot reserve is provided by duplicating transmitting and receiving elements. It is possible to use a single frequency for the redundancy.