General switch requirements for Q-LAN

Network switch models and series come to market and leave it with a frequency that makes it impractical for QSC to maintain a list of approved devices. This technical note details the general requirements and recommendations for operation with Q-SYS so the system designer or integrator can properly evaluate the suitability of any switch under consideration for use in a Q-SYS network.

Switch properties

These are the required and recommended network switch performance characteristics for satisfactory operation with Q-LAN traffic.

**Required for all real-time Q-SYS audio and video distribution**

- **1 Gbps bandwidth**—Must have non-blocking wire-speed Gigabit Ethernet; no dropped packets because of internal bandwidth constraints.

  **NOTE:** Control-only devices such as the TSC-80-G2 Touch Screen Controller can operate on a 100 Mbps link, but a Gigabit infrastructure is generally recommended.

**Recommended for designs with mixed media data types or ones that carry large amounts of data**

- **Quality of Service (QoS)**—Must support DiffServ (DSCP) packet classification. (Auto-QoS does not result in proper configuration for Q-LAN.)
- **Priority Traffic**—Must be able to recognize and prioritize at least two high-priority traffic classes by their DSCP values or other means, in addition to best-effort traffic.
- **Egress Queues**—Must have at least four egress queues per port.
- **Egress Buffering**—Each switch port carrying audio or video traffic must have at least 40 kB egress buffering memory.
- **Strict Priority Queuing**—Must support Strict Priority queuing (SP). Weighted round-robin (WRR), weighted fair queuing (WFQ), or other selection methods do not guarantee the latency performance required by real-time media systems such as Q-LAN. Note that Cisco Low-Latency Queuing (LLQ) only provides a single Strict Priority queue for multiple traffic classes, so bandwidth guarantees must be given to PTP traffic (8192 kb/s Committed Information Rate).

  **NOTE:** While it is not strictly required, QSC recommends always enabling QoS on a Q-LAN network to protect against unexpected data traffic from sources that might be added after the system is installed and commissioned.

**Recommended for designs featuring multicast data streams such as AES67 and/or video over IP distribution**

- **IGMP Snooping**—Must support IGMPv2 snooping and have access to an IGMPv2 querier, either on the network switch itself or hosted elsewhere on the network.

  **NOTE:** While it is not strictly required, a correctly configured IGMP Querier in tandem with IGMP Snooping will help ensure proper management of multicast data such as Q-SYS Device Discovery and PTPv2 clocking.
Notes on Q-SYS deployments

- Q-SYS uses IEEE-1588-2008 PTPv2 protocol, which is sensitive to latency, jitter, and packet loss. Q-SYS audio relies on PTPv2 for accurate timing.
- Q-SYS PTPv2 is assigned a per-hop behavior (PHB) of EF (46) and must be classified into the highest-priority queue with Strict Priority queuing. Q-LAN audio data has PHB AF41 (34) and must be classified into the queue with the second-highest priority with Strict Priority queuing. Q-SYS video data has AF31 (26) and must be classified into the queue with the third-highest priority (Strict Priority queuing is not required for video data).
- If your network scenario requires IGMP snooping/querying and/or PIM-Sparse Mode (for forwarding multicast across routers), they must be configured properly to maintain network performance.
- It is not strictly necessary to isolate Q-LAN, Dante, and AES67 from any other multicast traffic into their own respective VLANs, but it may reduce problems in complex network environments.
- Disable Spanning Tree Protocol (STP) on interfaces where Q-SYS devices connect. STP may cause PTPv2 clock and/or audio packet problems.
- To prevent timing problems, PTPv2 packet arrival jitter must not exceed ±30 μs and PTPv2 latency between end points must not exceed 280 μs.
- Be careful with single-mode optical fiber runs of less than 1000 ft (305 m) because the received light levels might be too high. Measure the light level and if necessary, use in-line attenuators to reduce the light signal to a usable level.
- Q-SYS Designer Software 5.3.x and later allows changing of the DSCP settings for PTPv2, Q-SYS audio, and Q-SYS video to allow custom QoS mapping. You must, however, maintain the priority hierarchy of PTPv2 highest; Q-SYS Audio second highest; and Q-SYS Video third highest.

Q-SYS DSCP Mappings (these can be edited in Q-SYS Designer Software under File > Design Properties)

<table>
<thead>
<tr>
<th>QoS Presets</th>
<th>PTPv2</th>
<th>Q-LAN</th>
<th>Q-SYS Audio</th>
<th>Q-SYS Video</th>
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<td>56</td>
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