Q-SYS Networked Systems **Technical Notes**
Q-LAN General Switch Requirements

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).

- For any switch interface passing Q-LAN audio traffic, it is good design practice to not exceed 80% of the link bandwidth. Use the Check Design feature in Q-SYS Designer Software to verify that the estimated Tx and Rx data usage do not exceed 80% of the available network bandwidth to or from the Core Processor as well as in any uplinks between switches.

These networking features and settings may affect performance with Q-SYS:

- Jumbo frames or jumbo packets can cause latency and jitter problems, so do not enable them on any switch ports that carry Q-SYS traffic. This is set by individual port on some switches and is set globally on others.

- Traffic that is prioritized and queued "equal to" or "greater than" PTPv2 (EF) and/or Q-LAN audio (AF41) may cause problems if it travels through the same switch interface as the Q-SYS traffic, such as on an uplink.

- Interfaces carrying Q-SYS traffic must be 1 Gb/s or higher because of the strict network requirements regarding latency and jitter.

- Error counts in network interfaces must be at or near zero.

- Q-SYS does not support passing real-time traffic (PTPv2, Q-LAN audio or video) through firewalls, MPLS, or WiFi.

- Running Fibre Channel over Ethernet (FCoE) and Q-SYS traffic on the same switch interfaces and/or backplane queuing resources may cause problems.

- Q-SYS does not allow use of Passive Optical Network (PON/ GPON) as well as Fabric Extender Technology (FEX).

- 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.

- Forwarding Decision Time that exceeds 10 µs could cause late packet arrival and ultimately degrade media performance.

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

	QoS Presets		
	Q-LAN	Audinate	Manual
PTPv2	46	56	user selected
Q-SYS Audio	34	46	user selected
Q-SYS Video	26	26	user selected