25G Pluggable Transceivers for Enterprise Applications

Upgrading seamlessly from 10G to 25G

Enterprise campus traffic continues to grow, driven by increases in video conferencing and other demanding business applications that push beyond the speed limits of traditional 10-Gigabit infrastructure. Whether it’s IEEE802.1ax Wi-Fi access points that require 1G/2.5G/5G/10G backhaul interfaces or new 1G/2.5G/5G/10G direct copper or fiber Ethernet to the desktop or telepresence video systems (Figure 1), new enterprises are now being built for high speed that exceeds the bandwidth that’s available using existing 10-Gigabit connectivity.

Features

- IEEE standards-based 25G over MMF or SMF
- Options for operation up to 400m over MMF or up to 10km over SMF
- 25G and 10G dual-rate capability
- Backward compatibility with IEEE 10Gbe-SR/LR and 25Gbe-SR/LR
- SFP28 form factor
- Operates over duplex LC-connectorized MMF and SMF fiber infrastructure
- Enables incremental upgrade to 25G from 10G
When the popular Small Form-Factor Pluggable Plus (SFP+) 10-Gb transceiver was released, it enabled high-speed connectivity between the wiring closet switches and the distribution switches. This enabled Gigabit communication between the workstations, desktop computers, access points or video walls, and the local computer room, over duplex Multi-Mode Fiber (MMF) or Single-Mode Fiber (SMF) infrastructure. Instead of utilizing a second 10G link, network operators are now choosing 25G technology to increase bandwidth.

New Cisco® SFP-10/25G-CSR-S and SFP-10/25G-LR-S transceivers (Figure 2) are the bridge to what’s possible, enabling 25G transmission over that existing duplex MMF or SMF infrastructure for easy migration from 10G to 25G with more than two times the bandwidth.

The traditional enterprise campus network

The traditional enterprise campus (Figure 3) consists of wiring closet switches positioned in small rooms that are located near staff desktops or video telepresence systems, as well as distribution switches that are found in a building’s main computer room.
Ethernet switches. To reduce costs, most campus networks are based upon MMF, which specifies maximum distances of 300m over OM3 (400m over OM4). These distances are well established by building trades and among network designers, which has resulted in many wiring closets being located up to 300m (or 400m) from computer rooms and data centers. The new Cisco SFP-10/25G-CSR-S transceiver enables 25G over MMF-based existing and new installations. The new Cisco SFP-10/25G-LR-S transceiver enables 25G over SMF-based existing and new installations.

The network transformation to 25G building backbone

The enterprise campus is transforming from a backbone that was based largely upon 1/10G switches such as Cisco Catalyst® 2K, 3K, 4K and 6K Series Switches that interface to the WAN using 10G and 40G interfaces to new, high-performance 10/25/40/100G switches like Cisco Catalyst 9500, 9400, 9300 and 9200 Series Switches, which interface to the WAN using new 25G, 40G, and 100G interfaces. However, the same wiring closets and generally the same MMF or SMF backbone fiber infrastructure remains, as shown in Figure 4.

Figure 4. 25G network transformation

25G in campus backbone networks

The Cisco SFP-10/25G-LR transceiver is ideal for connecting distribution switches to core switches in campus backbone networks (see Figure 5) where the distances between buildings can reach up to 10 km.

Figure 5. 25G in campus backbone networks

Cisco Short Reach “CSR” technology fixes the IEEE 25G-SR problem

While IEEE 25G-SR provides the needed speed increase to 25G, it has a reach of only 70m over OM3 (100m over OM4) and falls short of the 300m (and 400m) distances already in place for 10G. Cisco’s advanced CSR technology provides 25-Gbps bandwidth at distances up to 300m over OM3 (400m over OM4) MMF*. While providing these extended reaches, the new SFP-10/25G-CSR-S transceiver is fully interoperable with traditional IEEE 802.3by (IEEE-25G-SR) transceivers but limited to distances of 70m over OM3 (or 100m over OM4) MMF.

The new Cisco SFP-10/25G-CSR-S transceiver enables 25G over MMF for existing and new installations.

*Note: 25G distance depends upon the fiber quality
Interoperability with 10G

To future-proof the network, the new Cisco SFP-10/25G-CSR-S and SFP-10/25G-LR-S transceivers have a dual-rate capability that allows interoperability with 10G-SR MMF* or SMF transceivers. This allows the network to be incrementally upgraded at either the end of the fiber and fully upgraded to 25G when the time is right.

Figure 7. SFP-10/25G-CSR and SFP-10/25G-LR transceivers enable incremental 25G network upgrades

Interoperability with 40G and 100G

In some circumstances the distribution switch may only have QSFP interfaces.

For MMF applications, the new SFP-10/25G-CSR-S can interoperate with Cisco QSFP-40G-SR4 * or QSFP-40G-SR4-S transceivers at 4x10G or with Cisco QSFP-100G-SR4-S transceivers at 4x25G using third-party MMF breakout cables that are plugged into the transceivers. For 100G interoperability, 25G requires the usage of RS-FEC (Forward Error Correction), which has been standardized for 100G operation.

For SMF applications, the Cisco SFP-10/25G-LR-S can interoperate with Cisco QSFP-4x10G-LR4-S transceivers at 4x10G or with Cisco QSFP-100G-PSM4-S transceivers at 4x25G using third-party SMF breakout cables that are plugged into the transceivers. For 100G interoperability, 25G requires the use of RS-FEC, which has been standardized for 100G operation.

*Note: May require a 4dB attenuator for full IEEE interoperability

Figure 8. Cisco SFP-10/25G-CSR-S and SFP-10/25G-LR-S transport support breakout mode
Platform support
Cisco 25-Gigabit transceivers are supported on Cisco switches. For more details, refer to the [Transceiver Module Group (TMG) Compatibility Matrix](#).

For more information read the [Cisco 25GBASE SFP28 Modules Data Sheet](#).

### Cisco family of 25G transceivers for enterprise applications

Table 1 summarizes the full line of Cisco transceivers and cables for enterprise applications.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>10G and 25G</td>
<td>10G and 25G</td>
<td>25G</td>
<td>25G</td>
<td>25G</td>
</tr>
<tr>
<td>Reach</td>
<td>300/400m*</td>
<td>10km</td>
<td>70/100m</td>
<td>1,1.5,2,2.5,3,4,5m</td>
<td>1,2,3,4,5,7,10m</td>
</tr>
<tr>
<td>Fiber</td>
<td>MMF</td>
<td>SMF</td>
<td>MMF</td>
<td>CU</td>
<td>-</td>
</tr>
<tr>
<td>Wavelength</td>
<td>850nm</td>
<td>1310nm</td>
<td>850nm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Power</td>
<td>1.2W</td>
<td>1.3W</td>
<td>1.2W</td>
<td>1W</td>
<td>1W (per end)</td>
</tr>
<tr>
<td>Optical Connector</td>
<td>Duplex-LC</td>
<td>Duplex-LC</td>
<td>Duplex-LC</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pull Tab Color</td>
<td>Peach</td>
<td>Blue</td>
<td>Beige</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>FEC</td>
<td>None, FC-FEC, RS-FEC</td>
<td>RS-FEC</td>
<td>RS-FEC</td>
<td>None, FC-FEC, RS-FEC</td>
<td>FC-FEC</td>
</tr>
<tr>
<td>DOM</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Coding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form Factor</td>
<td>SFP28</td>
<td>SFP28</td>
<td>SFP28</td>
<td>SFP28</td>
<td>SFP28</td>
</tr>
<tr>
<td>Operating Temp</td>
<td>0–70°C</td>
<td>0–70°C</td>
<td>0–70°C</td>
<td>0–70°C</td>
<td>0–70°C</td>
</tr>
</tbody>
</table>

*note: depends upon fiber quality