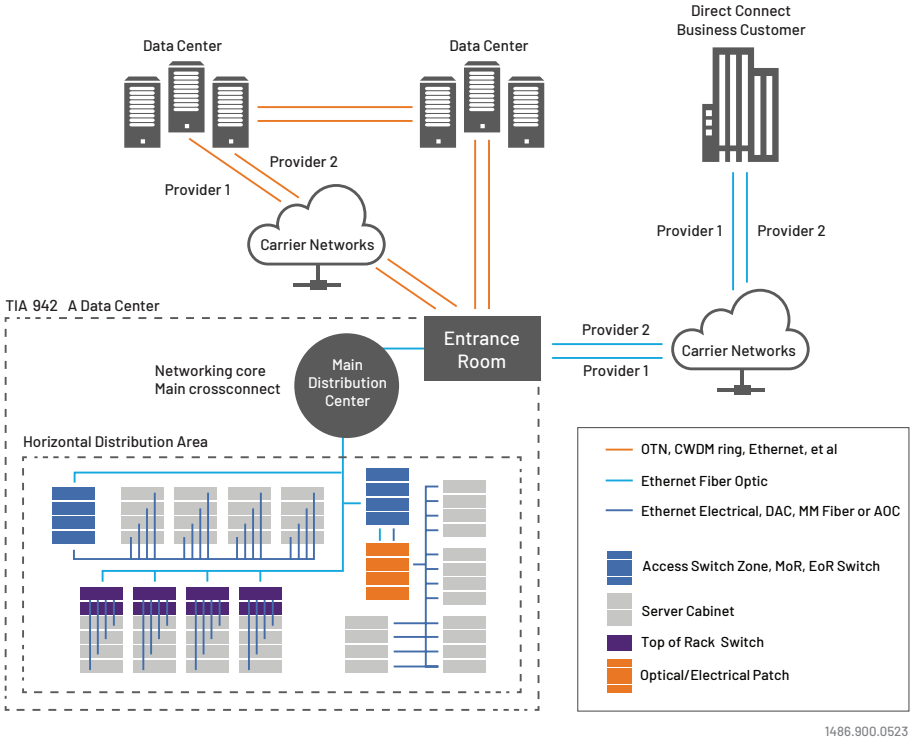
VIAVI Data Center Use Case Test Guide

Introduction: The Modern Data Center Landscape

Modern data centers are no longer just centralized compute hubs—they are the backbone of AI workloads, edge computing, and sustainability-driven digital infrastructure. Whether operated by a cloud service provider (CSP) or a multi-tenant/colocation data center (MTDC), data centers must meet increasingly stringent SLAs and performance metrics. Testing is essential to ensure reliability, security, and efficiency across these evolving environments.

Today's data centers contain thousands of links, cables, optics, and interfaces, or simply put, countless potential failure points. With limited staff and rising complexity, where should testing begin? Below is a concise guide to key test scenarios for data center teams, organized into two categories: external and internal validation needs. Let's start with external use cases.



Typical Data Center Internal and External Connectivity

(External) Use Case 1. Data Center to Data Center Interconnect (DCI) – Leased Connections

Problem:

Data Center to Data Center Network Interconnection

To ensure the integrity of customer data, most data center operators (DCOs) replicate data across sites using high-capacity DCI links to ensure rapid disaster recovery (DR). To uphold SLAs and ensure link integrity, technicians must validate Ethernet circuits up to 800G, along with optical transport network (OTN), coarse wavelength division multiplexing (CWDM), or dense wavelength division multiplexing (DWDM) paths. DCOs also need to test enterprise-facing links—often Ethernet—to isolate performance issues.

Solution:

The VIAVI OneAdvisor 1000 and 800 are versatile, portable platforms supporting Ethernet, OTN, and DWDM up to 800G. They enable dual-ended or remote testing via VIAVI Fusion, which orchestrates tests using rack-mounted agents like MAP-2100. These tools are optimized for 800GE and ZR/ZR+ optics, which require specialized validation.

Key measurements include:

- Throughput
- Frame loss
- Latency
- Jitter
- Bit error rate (BER)
- Burstability

Key test workflows include:

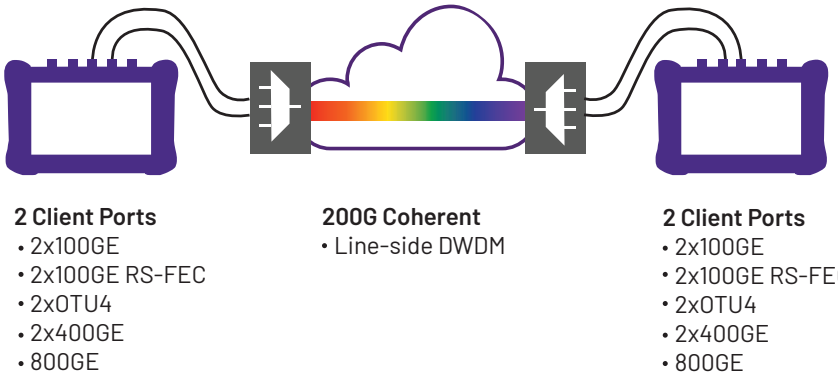
- Enhanced RFC-2544
- Y.1564 SAMComplete
- RFC-6349 TrueSpeed

In addition, with such large and critical circuits connecting data centers, testing the underlying fiber integrity on those circuits is also prudent. With the same handheld tester, techs can also perform fiber testing with a 4100 Series OTDR, making the OneAdvisor 800, OneAdvisor 1000, and MAP-2100 essential tools for today's modern data center.

(External) Use Case 2. 800G Data Center Interconnect (DCI)

Problem:

To meet growing demands, many DCOs are deploying 800G coherent wavelengths over DWDM systems—quadrupling or octupling throughput over existing fiber. While this boosts capacity, it also introduces risk if links aren't validated before live traffic to determine if they can reach the advertised line rate(s). There may be limitations on a particular wavelength that prevent it from achieving a 200/400/800 Gbps transmission rate; these limitations cannot be known without stress testing the wavelength before putting it into service. Optical signal-to-noise ratio (OSNR) limits and launch power mismatches for active Erbium-Doped Fiber Amplifier (EFDA) and Reconfigurable Optical Add-Drop Multiplexer (ROADM) can also degrade BER performance. Some operators skip testing due to lack of tools, risking service issues across both data and optical layers. The adoption of QSFP-DD800 and OSFP transceivers adds further complexity, requiring validation of new electrical and optical interfaces.



200/400/800G Coherent Data Center Interconnect Testing

Solution:

The VIAVI OneAdvisor 800 supports dual-port testing up to 800G, ideal for validating high-speed DCI links. Paired with Nano OSA or OSA-110, the OneAdvisor 800 can measure in-band OSNR and fine-tune launch levels for EDFA and ROADM systems.

Key measurements include:

- Throughput
- Frame Loss
- Latency
- Jitter
- BER
- Burstability
- Optical power level and in-band OSNR measurement/optimization
- DWDM wavelength stability – offset and drift

Key test workflows include:

- Enhanced RFC-2544
- Y.1564 SAMComplete
- RFC-6349 TrueSpeed

These tools ensure 800G links—especially those using QSFP-DD800 and OSFP optics—are fully stress-tested before activation, helping DCOs maintain performance and reliability across next-gen interconnects.

(External) Use Case 3. Dark Fiber DCI – Fiber Turn-Up

Problem:

To support high-throughput services, many DCOs are deploying their own dark fiber to reduce dependency on leased circuits. However, much of this fiber was originally installed for 10G and lacks certification for 100G–800G. These higher speeds are more sensitive to optical insertion loss (IL), return loss (ORL), and polarization mode and chromatic dispersion (PMD and CD). Even with coherent optics and DSPs using PMD and CD compensation mechanisms, there are limits to what can be tolerated. Without proper validation, turn-up can result in degraded performance or failed SLAs.

Solution:

VIAVI FiberComplete PRO™ enables one-button, bidirectional IL, ORL, and OTDR testing with on-board, real-time bidirectional OTDR event loss (TrueBIDIR) analysis—ideal for certifying dark fiber for high-speed DCI. For full fiber characterization, optical dispersion modules (ODM) measure CD, PMD, and attenuation profile (AP) in under two minutes. Combined with Nano OSA or OSA-110x, FiberComplete PRO can validate OSNR and wavelength performance.

Key tests include:

- Bidirectional IL, ORL and OTDR
- CD, PMD and AP (for distances over 50km)
- Optical power level and in-band OSNR measurement/optimization

These solutions ensure dark fiber is ready for turn-up and will support 100G–800G transport, minimizing activation delays and maximizing link performance.

(External) Use Case 4. DCI Fiber Monitoring

Problem:

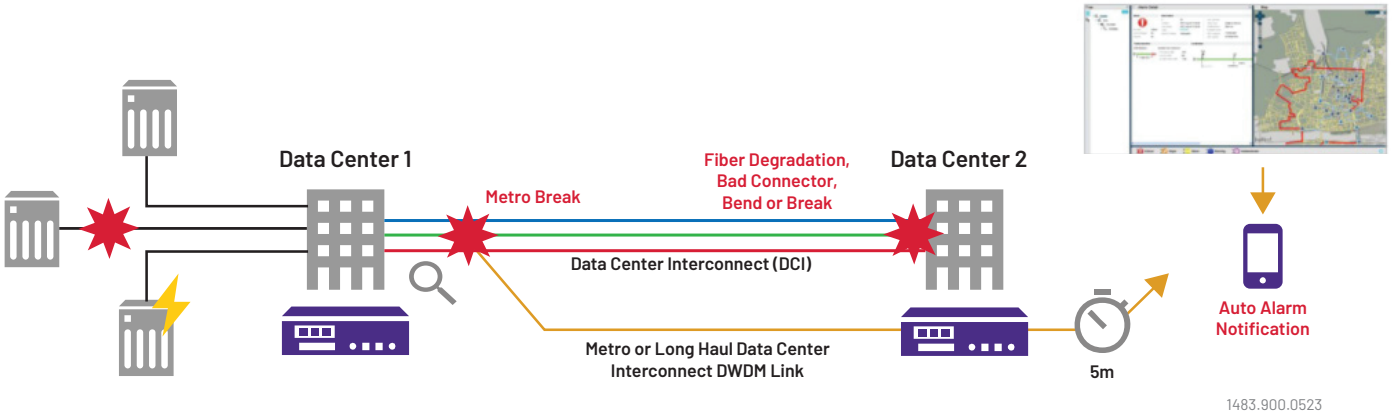
With AI, edge computing, and 100G–800G services driving mission-critical traffic, DCOs must continuously monitor fiber links between data centers to detect cuts, degradation, or intrusion. Without real-time alerts and diagnostics, outages can take hours to isolate, risking SLA violations. More critically, passive fiber taps bypass the data layer and expose full traffic streams—posing major security threats if undetected.

Solution:

The VIAVI standalone FTH-5000 rack-mounted OTDR with optical switch provides continuous, automated fiber monitoring across DCI links. It detects fiber faults, degradation, breaks and physical intrusions in real time, sending alerts via email, SMS, or SNMP within minutes. With zero-touch setup and no IT overhead, they reduce MTTR by over 30%, enhance network security, and ensure SLA compliance for high-capacity, multi-site data center environments.

Key tests include:

- 24 x 7 monitoring for breaks and outages
- 24 x 7 monitoring for attenuation/loss and fiber degradation



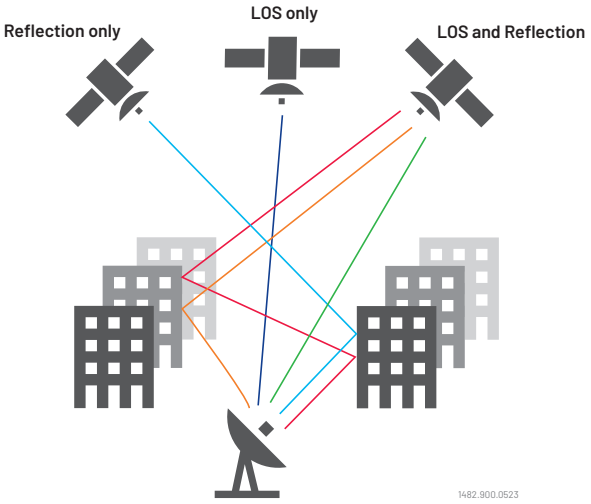
Auto Detect Vulnerabilities in a Data Center Network

(External) Use Case 5: GPS Antenna Placement for Timing Applications

Problem:

Modern data centers support latency-sensitive services like AI inference, financial trading, and distributed edge workloads. These applications rely on precise timing across packet-based networks. To ensure synchronization, protocols like NTP and PTP/1588 are deployed using global navigation satellite system (GNSS)-based timing sources. The challenge lies in placing rooftop antennas to maximize satellite visibility while minimizing interference and signal degradation.

Even with ideal placement, long cable runs through the facility are exposed to electromagnetic interference, which can attenuate signals and distort timing accuracy, leading to sync loss or jitter in critical applications.



GPS Antenna Placement for Data Center Applications

Solution:

The VIAVI OneAdvisor 800 and T-BERD/MTS-5800 testers include built-in GNSS receivers or can be paired with a timing expansion module (TEM). These tools allow technicians to scout rooftop and indoor locations for optimal satellite reception and signal quality. Once the best antenna site is selected, the same device verifies cable integrity, signal-to-noise ratio, and readiness for GNSS receiver and time server deployment. These tools also enable users to validate packet-based timing protocols such as PTP/1588v2, Synchronous Ethernet and NTP.

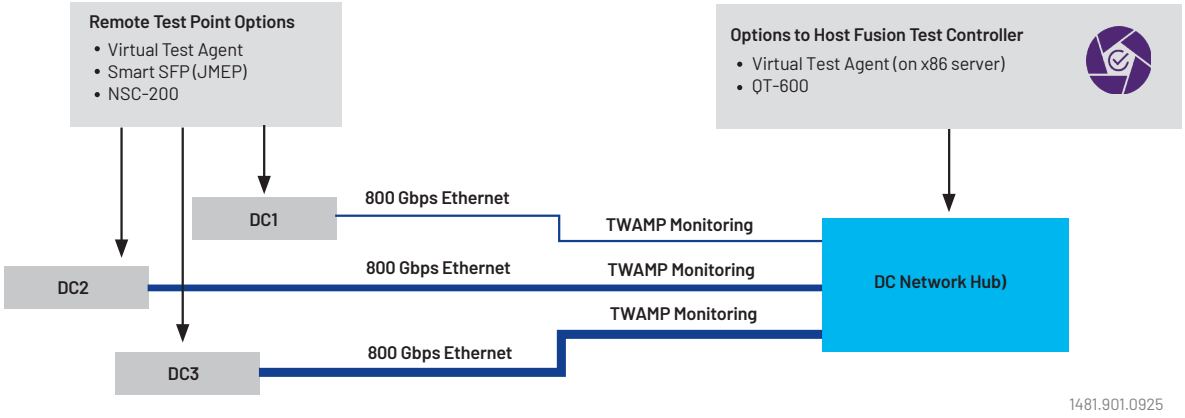
Key tests include:

- GPS, Galileo, GLONASS, BeiDou satellite constellation support
- Instantaneous Sky plot view
- Satellite signal strength measurements
- Satellite carrier-to-noise (C/No) measurements
- Comprehensive GPS signal quality report generation
- PTP/1588v2, synchronous ethernet, and NTP test

(External) Use Case 6. DCI Network Performance Monitoring

Problem:

While validating transmission quality at turn-up is essential, ongoing performance monitoring becomes critical once live traffic flows across the network. DCOs must ensure 24/7 visibility into link health, latency, and loss across high-speed DCI circuits. Latency between datacenters plays a critical role in AI performance—especially for distributed AI workloads, model training, and real-time inference.



Performance Monitoring a Data Center Network with Fusion

Solution:

VIAVI Fusion is a software-based test platform that can be hosted on generic servers (X86 servers) and can integrate multiple types of physical VIAVI devices and agents as test endpoints in almost any combination.

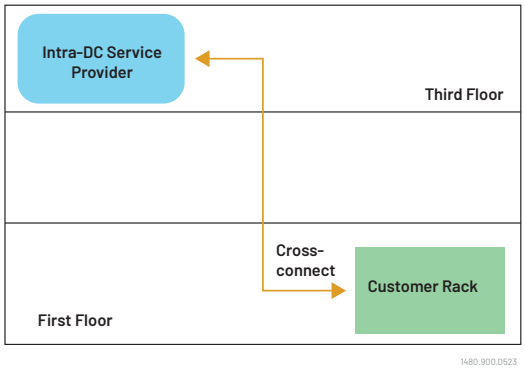
The Fusion controller can be deployed centrally for the proactive monitoring of DCI links, continuously generating test packets between different test points in the network via two-way active monitoring protocol, or TWAMP, alerting the DCO if latency spikes, for example. The permanent surveillance of round-trip-times (RTT) and frame loss ratio (FLR) provides valuable insights into the availability and latency in a multi-data center network.

Now let's take a look at some of the internal use cases.

(Internal) Use Case 7. Intra Data Center Testing

Problem:

A tenant may request proof of transmission quality within the data center—from the meet-me room (MMR) to their rack or cage, or between service providers on different floors. While performance is typically excellent, the DCO often lacks a way to measure and document it to validate SLAs or support latency-sensitive applications like AI inference or edge compute.



Intra Data Center BER Testing

Solution:

The VIAVI OneAdvisor 1000 and 800 deliver precise measurements of key network KPIs—throughput, frame loss, latency, jitter, and bit error rate testing, ideal for short intra-DC links. These tools generate clear, standards-based reports that can be printed, emailed, or uploaded to StrataSync for cloud-based access and audit trails. This enables DCOs to confidently validate SLAs and support ultra-low latency services within the facility.

Key tests include:

- Throughput
- Frame loss
- Latency
- Jitter
- BER

(Internal) Use Case 8. Ensuring Clean Fiber Connections

Problem:

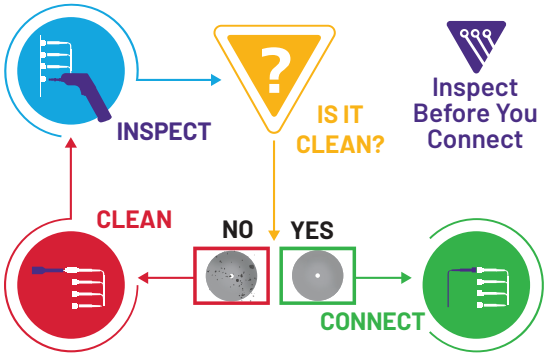
A fiber cross-connect cable must be run from the MMR inside the data center to the customer's extended demarc at their rack/cage, or between racks, which are patch-panel-to-patch panel connections. These fiber connections have very strict loss budgets and are often the source of performance degradation.

The presence of multi-fiber connectors like MPO and MMC with up to 24 fibers per connector reinforces the importance of end-face cleanliness since one contaminated connector affects multiple circuits.

Contaminated fiber connections are the #1 cause of troubleshooting and optical network downtime. Therefore, the most critical element to safeguarding quality fiber connections is ensuring a proper end-face condition. When working with fibers only a few microns wide, any contaminant can be catastrophic.

Solution:

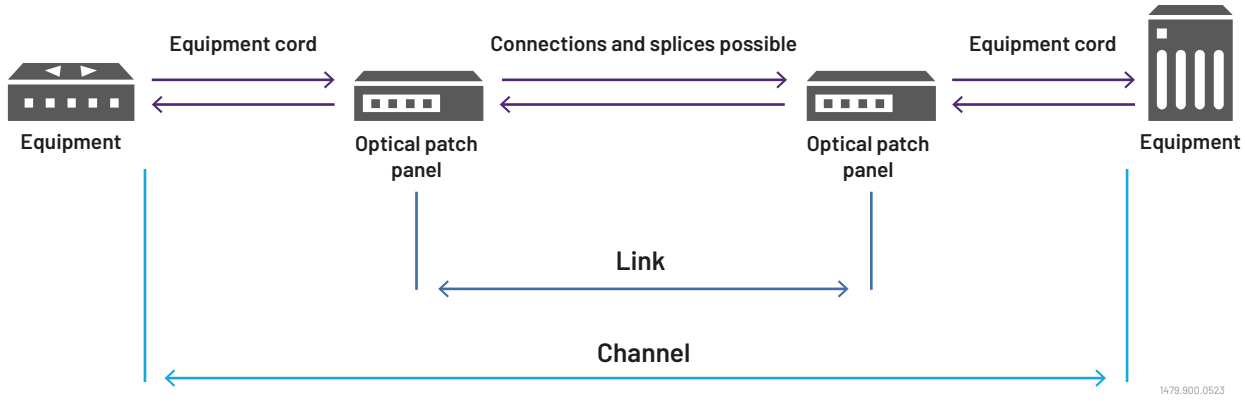
Proactively inspect, and clean when necessary, all fiber connectors prior to connecting them. The VIAVI INX™ family of fiber inspection tools makes it fast and easy to ensure proper end-face condition for every connector in the data center. The INX 700 series probe microscopes offer fully automated inspection for simplex, duplex, and multi-fiber connectors, delivering pass/fail results, high-resolution images, and standards-based certification reports. These compact, handheld devices are optimized for high-density environments and support integration with VIAVI Stratasync for cloud-based reporting and asset management. With INX tools, technicians can ensure clean, reliable fiber connections that meet the strict performance demands of modern data centers .



(Internal) Use Case 9. Testing and Troubleshooting Physical Cabling Infrastructure

Problem:

Although fiber and copper cabling is typically certified during initial installation, ongoing changes—like equipment upgrades, rack reconfigurations, or tenant expansions—can introduce cabling and connector faults. In high-speed environments supporting AI and edge processing workloads, even minor issues in polarity, loss, or connector alignment can lead to downtime or SLA violations. This is especially true for MPO-based links.



Typical Data Center Physical Cabling Infrastructure

Solution:

All cross-connects should be re-certified after any moves or changes. The VIAVI OLTS-85 and MPOLx optic loss test sets provide fast, standards-based Tier 1 certification for length, loss, and polarity—critical for both single-mode and multi-mode fibers. For deeper diagnostics, the T-BERD/MTS-4000 V2 with 4100 series OTDR and MPO switch modules pinpoints faults and validates link integrity.

Key tests include:

- Fiber connector end face inspection
- Optic loss, fiber length, polarity
- OTDR (detection and location of attenuation due to bends, splice loss and reflectance, fiber breaks)

(Internal) Use Case 10. Active Optical Cable (AOC), Active Electrical Cable (AEC) and Direct Attach Copper (DAC) Testing

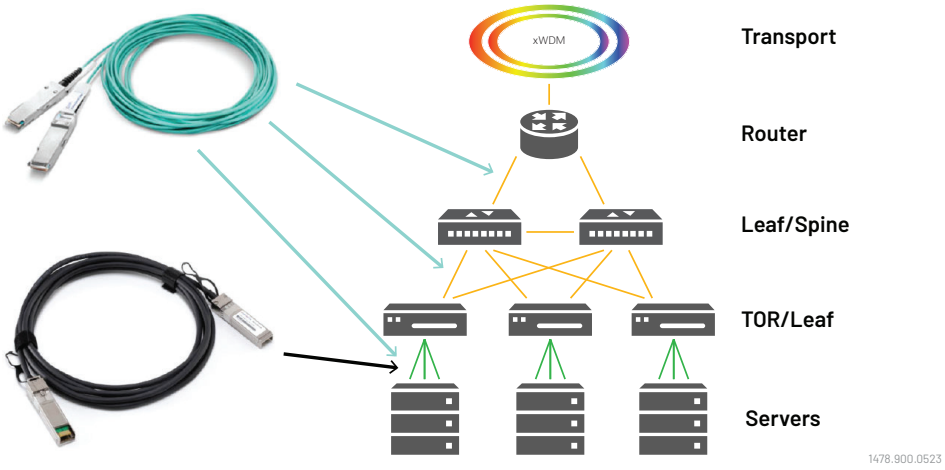
Problem:

Active optical cables (AOC) and Active Electrical Cables (AEC) are widely used in data centers, but they are difficult to test for errors because the optics are fused to each end. Direct attach copper (DAC) are copper cables but pose the same testing challenge. When a link will not come up, many DCOs will replace an AOC hoping that it was the root of the problem without confirmation. With a material cost and associated time and labor costs, a DCO wants to avoid mistakenly throwing away good AOC cables.

As speeds increase up to 400G or even 800G, the need for reliable cable validation becomes critical. Such AOC/DAC cables and breakout cables should be tested against transmission defects with a bit error rate (BER) test.

Key Tests :

- Bit Error Rate (BERT) Pre-FEC and Post-FEC
- Optical power level (on optical modules)
- Module Temperature



AOC/DAC Cable Applications

Solution:

The VIAVI OneAdvisor 800 and 1000 platforms support comprehensive AOC, AEC, and DAC testing using built-in dual ports for SFP28, QSFP+, QSFP28, QSFP-DD, and OSFP interfaces. With dedicated cable test scripts, technicians can perform BER testing, link training verification, and signal integrity checks across breakout and trunk cables. Results are automatically compiled into pass/fail reports that can be stored locally or uploaded to StrataSync for audit and asset tracking. This ensures that AOC, AEC, and DAC assemblies meet performance requirements before deployment in latency-sensitive, high-speed environments .

(Internal) Use Case 11. Optics Self-Test

Problem:

Modern data centers rely heavily on high-speed pluggable optics—QSFP-DD, OSFP, and SFPx —to support advanced, high-throughput workloads, and 100G to 800G links. These transceivers are critical to maintaining performance and uptime, yet they are often deployed without validation. Faulty optics can introduce errors, clock instability, or power mismatches, leading to degraded service or failed SLAs. Without a simple way to test them, operators risk costly downtime and troubleshooting delays.

Optics Self-Test

Solution:

The VIAVI Optics Self-Test workflow—available on OneAdvisor 800 and 1000—automates validation of pluggable optics across multiple Ethernet rates. It verifies signal integrity, clock offset, and per-lambda power levels, and supports both pre-FEC and post-FEC diagnostics for PAM-4 and NRZ modulation. The test is fast, intuitive, and ideal for data center environments, helping technicians isolate faulty optics before deployment. Results are compiled into pass/fail reports and can be uploaded to StrataSync for centralized tracking and compliance .

Key Tests:

- Bit Error Rate (BERT) Pre-FEC and Post-FEC
- Optical Power Level
- Optics Temperature

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