# VIAVI

Data Center Case Study & Test Guide

Data centers have become the epicenters of the digital world, and thus continue to grow in speed, complexity, and importance. Third-party, multi-tenant data center operators (DCO) in particular, have an obligation to their customers to provide continuous access to their data via network connections. That obligation requires testing and reporting to manage SLAs, and to simply instill confidence in customers and prospective customers.

In that multi-tenant data center, (co-location model), there are thousands of potential points of attachment for test instruments. The following is a short list of the some of the key test use cases for data center operators.
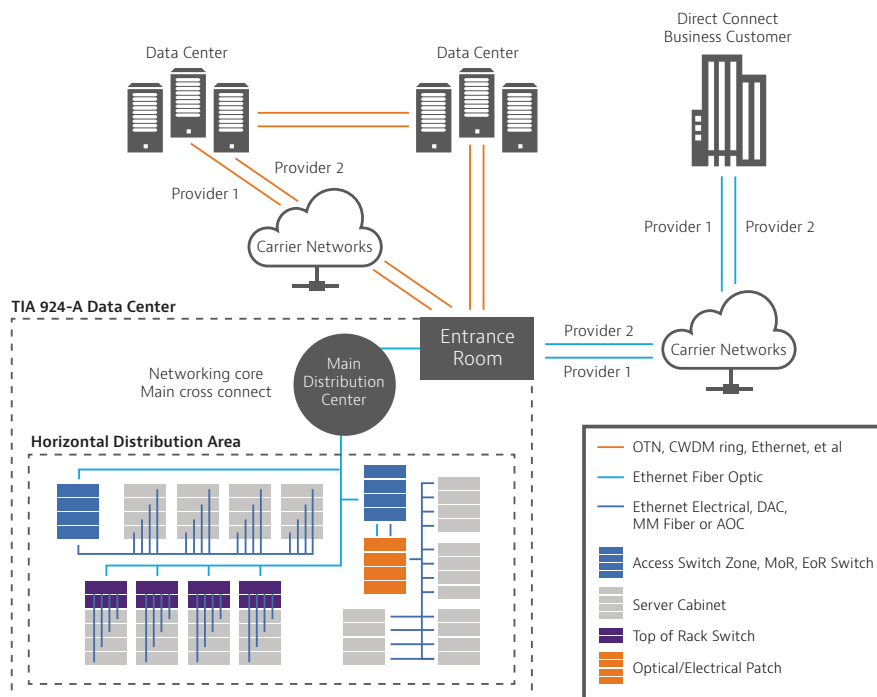
Use Case 1. Data Center to Data Center Interconnect

Problem: Due to the importance of the data stored in data centers, most DCOs back up the data to yet another data center to ensure quick disaster recovery (DR), and to safeguard their customers' business continuance (BC). DCOs want that back-up or retrieval to happen as quickly as possible, so data centers are linked by huge connections in various protocols. To maintain the integrity of those connections, and to verify SLAs, a DCO tech needs to be able to perform tests on Ethernet line rates up to 100G, as well as OTN, CWDM, or DWDM circuits.

Solution: Viavi's T-BERD/MTS-5800-100G is the most versatile test platform in the industry, able to perform tests on OTN, CWDM/DWDM, and Ethernet up to 100G with dual ports. Critical tests include industry-based

- RFC-2544

- Y.1564

- RFC-6349 TCP Throughput

In addition, with such big and critical circuits connecting data centers, testing the underlying fiber integrity on those circuits is also prudent. With the same hand-held tester, techs can also do fiber testing with a 4100 Series OTDR, making the T-BERD/MTS-5800-100G an essential tool for today's modern data center.

Use Case 2. Customer to Data Center Connection

Problem: A customer requires a private Ethernet circuit from their premises all the way to their space (rack or cage) in the data center. When customer application problems arise, the customer will call the DCO first, and the DCO must be able to test the transmission quality on the customer's circuit into the meet-me room as well as to the extended demarc as part of a standard SLA verification protocol.

Solution: Viavi's T-BERD/MTS-5800 hand-held network testers lets technicians quickly run several, standards-based tests on the circuit, regardless of the bandwidth, from a quick connectivity check to KPI verification - without being telecom experts. Tests include:

- FC-2544

- Y.1564

- RFC-6349 TCP Throughput

DCOs can quickly determine if the customer circuit is the problem or not, and then take the appropriate next step.

## Use Case 3. Testing & Troubleshooting Physical Cabling Infrastructure

Problem: A fiber cross-connect cable must be run from a service provider's POP 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 connections (typically both copper and fiber) have very strict loss budgets and are often the source of performance degradation. While the structured cabling is initially installed and certified to industry standards during network construction, several factors can change after installation (usually during moves, adds, and changes [MACs]) that cause network problems and downtime. Some of these causes include electromagnetic interference (EMI) from copper cabling, reversed polarity in duplex & multi-fiber connectors and excessive loss caused by contaminated fiber end-faces, physical stress (micro- or macro-bends) not transmitting light properly. These issues must be identified and eliminated as a problem's root-cause.
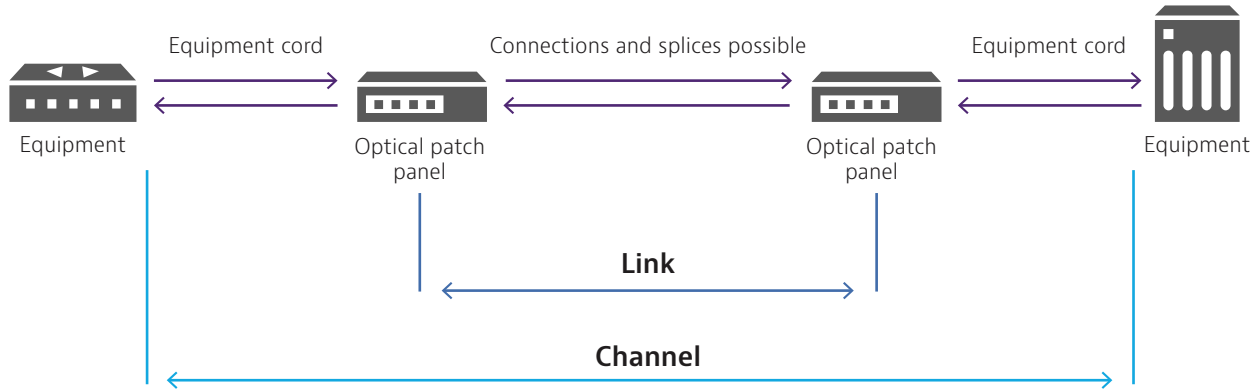
Solution: Those cross-connect cables should be certified against industry standards. Because contamination is the #1 cause of troubleshooting and optical network downtime, fiber optic cabling must be checked for insertion/return loss, and for dirty cable end faces and connections. Similarly, proper installation techniques will insure that network performance is not degraded. With a few essential tools, like Viavi's FiberChek probe microscope and PowerChek OPM, technicians can ensure best practices during MACs and eliminate most of these problems. Similarly, Viavi's T-BERD/MTS-2000 provides an all-in-one solution to troubleshoot network issues by pinpointing the exact location of any event causing excessive loss. For copper testing, the Certifier10G gives technicians the ability to test for length, loss, and polarity, while the Certifier40G can test BOTH copper or fiber optic cables quickly and accurately. This insures that cables were terminated and installed properly and are capable of supporting the stringent demands of today's datacenters.

## Use Case 4. Active Optical Cable/Direct Attach Copper Test

Problem: An active optical cable (AOC), which is a fiberized cable based on multimode fibers terminated by pluggable optic cages such as QSFP or SFP, needs to be run within a rack, a row, or between adjacent rows inside the data center. Direct Attach Copper (DAC) is a similar but it's with copper cables. The AOC can, for instance, be used to connect a Top of Rack (TOR) switch to a Leaf/Spine. Such cables are typically used for short reach high-speed connections at 40GE or 100GE or 25GE. These AOC/DAC cables may be the cause of errors due to manufacturing defects such as reversed polarities or potentially crushed or squeezed optical fibers. Errors can be identified BEFORE cables are laid avoiding extra effort to replace the cable. Alternatively, it is possible to troubleshoot a cable which has already been laid when a link will not come up. At a cost of $1,000 apiece, a DCO wants to avoid mistakenly throwing away good AOC cables.
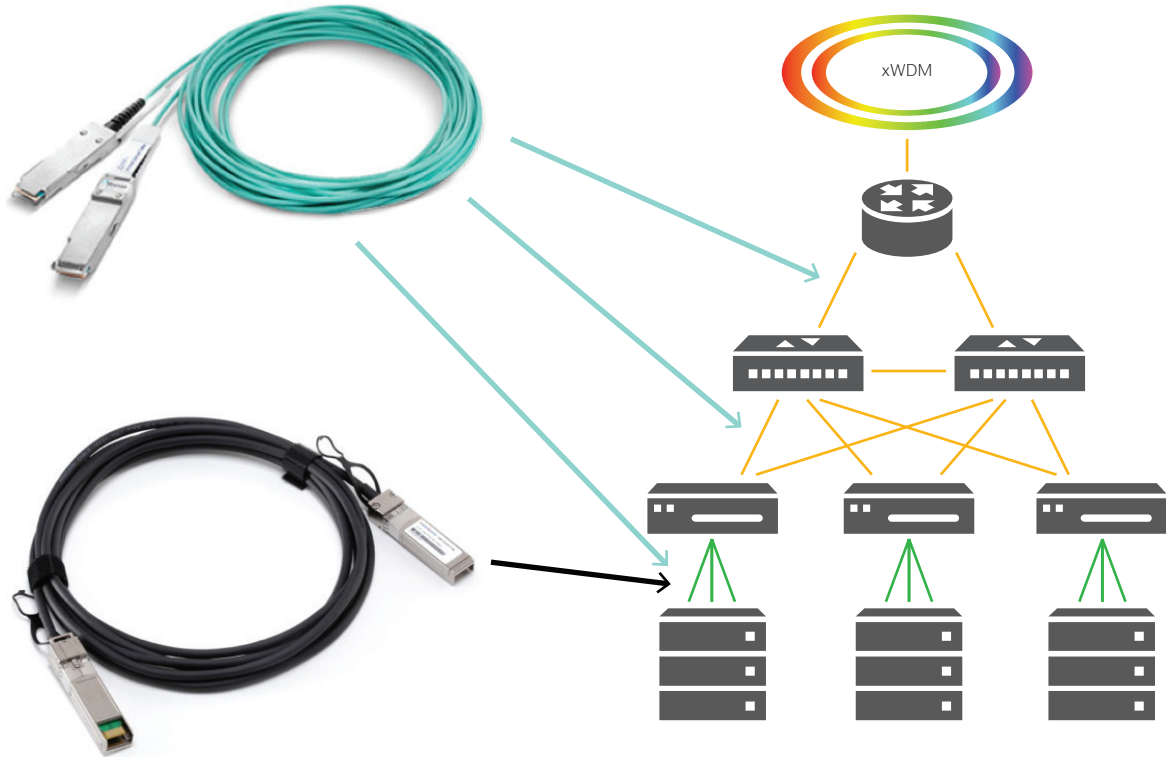
Solution: Such AOC/DAC cables should be tested against transmission defects with a Bit Error Rate test. Viavi's T-BERD 5800-100G with the cable test script and report capabilities provides dual QSFP+/QSFP28 ports for quick and efficient testing of AOC/DAC cables.

Use Case 5. Optics Self-Test

Problem: The pluggable, optical transceiver modules (QSFP & CFPx) on the ends of those cross-connect cables must also be checked to ensure they are working optimally.
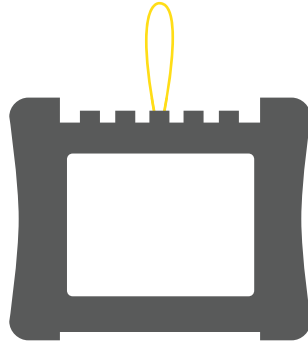
Solution: The TBERD/MTS 5800-100G Optics Self-Test is a workflow tool to verify and troubleshoot performance issues related to high-speed optics. It is especially well suited to data center environments and helps isolate pluggable optics issues. This easy-to-use test integrates items such as a bit error theory algorithm, clock offset verification, and per-lambda power monitoring. Coupled with RS-FEC, it offers pre-FEC and post-FEC testing.

Use Case 6. Intra Data Center Bit Error Rate Testing

Situation: A tenant wants to know about the transmission performance within the data center, from POP to the rack, or from the rack to another service provider on another floor, etc. The transmission quality is likely very high, however the DCO has no way to provide the customer with a measurement, and verify the SLA.
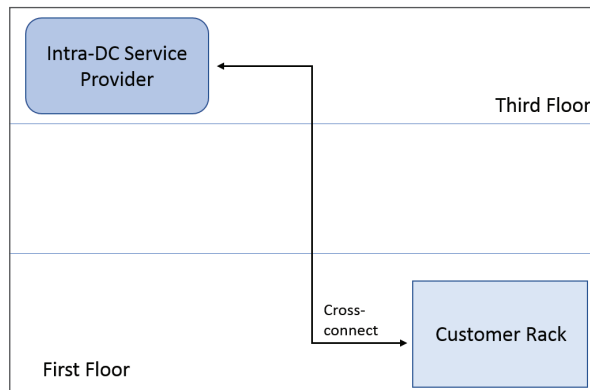
Solution: Viavi's T-BERD/MTS-5800 provides precise measurements of network KPIs (latency/packet delay, frame loss, jitter/inter-packet delay variation, and burstability) down to the nano second, which are required for such short network links. In addition, for every test conducted the 5800 generates an easy to read report that can be printed out, e-mailed to the customer, or stored in the cloud via StrataSync.

Use Case 7. Fiber Monitoring

Problem: The optical connections between data centers are mission-critical, so DCOs want to constantly monitor those fiber links and be quickly alerted to any fiber degradation, intrusion, especially a cut. Without the proper technology and alarm system, it can take days to identify and pinpoint the location of the cut, negatively impacting customer SLAs.

DCI Fiber Monitoring Diagram
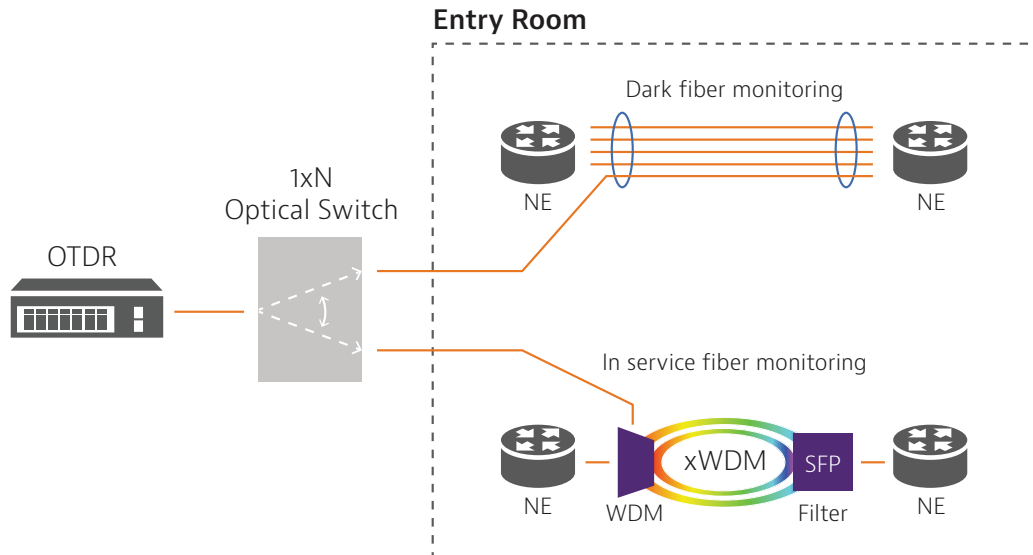
Solution: Viavi's SmartOTU is a rack-mounted OTDR that continuously monitors critical fibers in small optical networks. It can be run right out of the box with no training or IT configuration. When a fiber event occurs, it alerts users within minutes (email, SMS or SNMP) to help lower mean time to repair (MTTR), improve network security, and boost SLA performance.

Use Case 1. Data Center to Data Center Interconnect

Viavi Package	Products in package	Product Link	Photo
TB5800-GE-100GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
	P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	
TB5800-100GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
	P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	
TB5800-1G-10GE	TBERD/MTS-5800v2	http://www.viavisolutions.com/en-us/products/t-berd-5800-handheld-network-tester	
	P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	

Use Case 2. Customer to Data Center Connection

Viavi Package	Products in package	Product Link	Photo
TB5800-1G-10GE-C5LSLAYER4-C510GLAYER4	T-BERD/MTS-5800v2	http://www.viavisolutions.com/en-us/products/t-berd-5800-handheld-network-tester	
	TrueSpeed VNF	http://www.viavisolutions.com/en-us/products/truespeed-vnf	
TB5800-1G-10GE-C5LSLAYER4-C510GLAYER4	T-BERD/MTS-5800v2	http://www.viavisolutions.com/en-us/products/t-berd-5800-handheld-network-tester	
	TrueSpeed VNF	http://www.viavisolutions.com/en-us/products/truespeed-vnf	
Existing T-BERD/MTS-5800 owners can add the L4 option	TrueSpeed VNF	http://www.viavisolutions.com/en-us/products/truespeed-vnf	

Use Case 3. Testing & Troubleshooting Physical Cabling Infrastructure

Viavi Package	Products in package	Product Link	Photo
FIT-FC-KIT3	FiberChek Probe w/ LC & SC Tips	http://www.viavisolutions.com/en-us/products/fiber-chek-probe-microscope	
FIT-SP-2	PowerChek OPM w/ LC & SC Adapters	http://www.viavisolutions.com/en-us/products/power-chek-op-1-optical-power-meter	
NGC-500-6A	Certifier10G	http://www.viavisolutions.com/en-us/products/certifier40g	
NGC-4500-CuQEF-NA	Certifier40G Copper & Fiber (MM EF, SM)	http://www.viavisolutions.com/en-us/products/certifier40g	
TB2-DIS-QUAD-SLM	T-BERD/MTS-2000 Quad w/ SLM & PMVFL	http://www.viavisolutions.com/en-us/products/t-berd-2000-handheld-modular-test-set	

Use Case 4. Active Optical Cable/Direct Attach Copper Test

Viavi Package	Products in package	Product Link	Photo
TBDC-100GE-AOCDAC	T-BERD 100GE Data Center Optical or Copper Cable Testing	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
TBDC-40GE-AOCDAC	T-BERD 40GE Data Center Optical or Copper Cable Testing	http://www.viavisolutions.com/en-us/products/t-berd-5800-handheld-network-tester	
MTSDC-100GE-AOCDAC	MTS 100GE Data Center Optical or Copper Cable Testing	http://www.viavisolutions.com/en-us/products/mts-5800-100g	
MTSDC-40GE-AOCDAC	MTS 40GE Data Center Optical or Copper Cable Testing	http://www.viavisolutions.com/en-us/products/mts-5800-hand-held-network-tester	

Use Case 5. Optics Self-Test

Viavi Package	Products in package	Product Link	Photo
TB5800-100GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
TB5800-40GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	

Use Case 6. Intra Data Center Bit Error Rate Testing

Viavi Package	Products in package	Product Link	Photo
TB5800-GE-100GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
	P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	
TB5800-100GE	T-BERD/MTS-5800-100G	http://www.viavisolutions.com/en-us/products/t-berd-5800-100g	
	P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	

Use Case 7. Fiber Monitoring

Viavi Package	Products in package	Product Link	Photo
OTU8000	Smart OTU equipped with OTDR @ 1625 nm 45 dB	http://www.viavisolutions.com/en-us/products/smartotu	

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