The Rise of Modular Plug Terminated Links (MPTLs)

Developing new LAN cabling standards is an arduous process that takes many years. Most standards development work centres around higher performance cable and connectors to support new applications like 10, 25 and 40 gigabit Ethernet. New cable performance categories/classes take anywhere from 5-10 years to go from concept to ratification. But sometimes seemingly small things take hold and cause the industry to snap to attention and shift into high gear.

A Modular Plug Terminated Link (MPTL) is nothing more than an Ethernet cable that is terminated with a female socket (jack) on one side and a male plug on the other, whereas a standard Permanent Link is terminated with sockets on both sides of the cable. Simple, right? Wrong.

Installing is one thing, testing is another

The name Modular Plug Terminated Link is new, but the practice of installing LAN cabling with a socket on one side and a plug on the other goes back to the beginning of twisted pair cabling. An MPTL makes perfect sense to anyone who wants to connect a networked device by plugging the cable directly into the device. Installers of IP security cameras have been doing this since the advent of IP CCTV.

Today, virtually every building system including security, A/V, access control, lighting, climate control is either operating over Ethernet cabling or has the capacity to connect to the network. This means the cabling to support these services is now coming into the scope of communications designers who leave nothing to chance when it comes to cable performance. Designers who specify costly, high performance cabling raise an eyebrow at links installed with a plug at the device end. The reason is that there are currently no standards that define how to test a link with plug terminations at one or both sides.

LAN Cable Standardisation

Both the ISO/IEC 11801 series and ANSI/TIA 568 series of communications cabling standards define component specifications and installation practices for LAN cabling in commercial spaces. Component performance is specified by both IEC and TIA with a Category rating from 3 through 8.1 or 8.2. Today almost all of the global market is supplied with category 5e, 6 or 6A components. Higher and lower categories are available for specialty applications.

Once installed, cabling is tested with a LAN cable certifier to ensure the completed system meets the performance promised by the individual components. ISO/IEC rates system performance as Class D for cat. 5e components, Class E for cat. 6 components and Class EA for cat. 6A components. Similarly, ANSI/TIA has a Category scale for installed cabling that is the same as the component ratings, i.e., cat. 6A system performance is achieved with cat. 6A components.

Cabling standards evolved out of a need to bring order to chaotic phone and network wiring from the early days of Ethernet. At the time there were no industry-wide

installation guidelines and an enormous amount of time and money was wasted when companies tried to connect their equipment to cabling with no common installation practices.

Imagine if the electrical mains wiring in a building had no consistency for wire size (overheating/fires), number of outlets per breaker (constant breaker tripping), maximum cable length (voltage drop/devices don't operate), connector polarity (damaged devices). The ISO 11801 and TIA 568 standards defined common practices to ensure that any Ethernet device could connect to and operate on a cabling system that was designed in accordance with the standard.

Permanent Links

The installed cabling that services a network device is called a Permanent Link (PL). A PL is terminated at the network equipment room into a patch panel (socket), can be up to 90 meters long, and is terminated at the device end into a box or wall plate with another socket. Equipment/patch cords totalling 10 meters in length can then be used to connect the network switch and networked devices to the PL. The maximum allowed length of the Channel is 100 meters.

Permanent Link (square bracket represents a RJ-45 socket)

]--------90 m max--------[

A cabling channel with equipment connected at each end (angled bracket represents a RJ-45 plug)

|Network switch [<----5 m cord---->]----PL----[<----5 m cord---->] Networked device|

When testing PL's, a certifier uses special test cords with tuned RJ-45 plugs to measure the performance of the connections at each end of the PL. The measurements are compared to the standards to determine whether the installed PL passes or fails certification.

The diagram below represents testing a PL with a Cable Certifier. The angled bracket represents tuned RJ-45 plug that is part of the certifier's test cord. The portions of the diagram in green are measured during the test. The red portions of the diagram are not measured during the test.

|Certifier|Test cord -------->]--------PL--------[< Test cord|Certifier|

Cable certifiers measure very small signal changes at very high frequencies and use proprietary test cords and connectors to provide high accuracy and repeatability. A tuning process creates "Centred" connectors that will always measure the same when connected to a socket. Therefore, every brand of certifier with an approved test cord will show the same result when testing the same socket.

Testing Channels

Cable certifiers can also test Channels, shown below, that end with a Plug instead of a socket. However, the connection between the channel adapter and patch cord is not tested because the socket in the adapter is not Centred. A non-Centred socket cannot be used to test the performance of a plug.

|Certifier|Test cord -------->]--------PL-------->] CH adapter|Certifier|

Modular Plug Terminated Links

An MPTL is just like a PL, except one end is terminated with a socket, the other with a plug. MPTL support is only now being added to IEC and TIA cabling standards, even though cabling has been installed in this manner for many years.

]--------MPTL 90 m max>

When certifying an MPTL, one would expect that all they need to do is change the adapters on the certifier so one end has the test cord with a plug and the other end has the adapter with the socket. Unfortunately, it's not quite that simple. Measuring the performance of the plug at the end of the MPTL takes special care.

|Certifier|Test cord -------->]--------MPTL-------->] CH adapter|Certifier|

As mentioned above, a non-centred socket cannot not be used to measure the performance of a plug. So simply changing the adapter on the certifier doesn't necessarily mean the MPTL can be tested. Depending on the manufacturer of the certifier, the standard Channel adapter may not test the plug. Resulting in a bad plug or termination that does not meet required performance going unnoticed.

The only way a MPTL can be properly and accurately tested is with a channel adapter that uses the specific Centred socket required for certification of plugs. Some certifiers require the user to purchase an expensive patch cord test adapter or use a special test cord with the Centred socket to ensure proper accuracy.

|Certifier|Test cord -------->]--------MPTL-------->]-----PC test cord--->] CH adapter|Certifier|

TREND Networks has made testing MPTLs simple because their standard cat. 6A channel

adapter already uses the Centred socket allowing users to test MPTLs with no special components. The standard 6A PL and CH adapters are all that is required.

|LanTEK PL -------->]--------MPTL-------->] LanTEK CH|

MPTL Pitfalls Identified

Be aware of the following when installing and certifying Modular Plug Terminated Links:

- Not all field installed RJ-45 plugs are rated to meet IEC/TIA component specifications.
- Category 5e plugs are likely to pass certification with little extra effort.
- Category 6 plugs should be verified to meet component performance specifications. Careful installation is required to ensure they pass certification.
- Category 6A field terminated plugs are relatively new to market and the ones that provide the performance to pass certification are very expensive (more than $2-10 each).
- Do not exceed 90 meters/328 feet if testing to TIA standards. TIA standards require the test to fail if the MPTL exceeds 90m.
- IEC standards report cable length for information only, links exceeding 90 meters will not necessarily fail. However, links longer than 90 meters may fail tests for insertion loss or resistance which increase proportional to the length.
- Check with certifier manufacturers before certifying MPTL's. You may be testing improperly if your tester doesn't have the proper adapters or software.

Testing MPTLs is new and tester manufacturers have only recently began offering the capability. Because not all brands solve the problem in the same way there will be a bit of confusion surrounding the topic until it becomes more commonplace. And expect the testing solutions to change a bit with time as manufacturers find easier ways to adapt to this new testing requirement.

Ends - 1817 Words