Straight-Talk Blog

Ensuring Cable Readiness for IoT Deployments

The First Step in Any IoT Project is Cable Readiness

Internet of Things (IoT) projects can be complex. The last thing you want to worry about is whether your cabling will be able to handle what you throw at it. No matter if you're working on an intelligent building, smart manufacturing plant, asset/fleet tracking system or a similar project, your first step to success is making sure your cable plant is ready. Let's look at how to tackle this goal that will ensure the success of your next IoT project.

Understand what's required from a network and cabling perspective

This may sound obvious, but the most important thing to understand from a cabling perspective is what you plan to connect from one end of the cabling to the next. Yet there are many things that must be considered. And this is especially true when working with IoT devices that can vary greatly in terms of what they require from the network. In general, IoT must address three key areas from a network cabling perspective: speed, power and distance.

Speed has to do with the throughput and latency needs required by the IoT devices for them to function appropriately. Power is whether the IoT endpoints will be fed power over Ethernet (PoE) cabling – and at what levels of output they require. Finally, distance refers to the maximum length of cabling that will need to be run to connect all components.

For standard cabling projects, the options are relatively limited. But when you're talking about IoT, there is far more to consider. For example, some IoT projects such as ultra-high-definition surveillance cameras may require multi-gig Ethernet speeds and POE++ power output options. Thus, the cabling used for this IoT project must meet or exceed a much higher level of speed and throughput standards compared to some other projects. An IoT project such as this would likely require Category 6A or better cabling in order to meet the necessary speed and power requirements. The following diagram can be used as a general guide as to when Cat 5e, Cat 6 and Cat 6A should be used for 2.5 and 5GBASE-T Ethernet. For 10GBASE-T Ethernet, Cat 6A or higher cabling is always recommended:

Bundled cabling length 0m to 50m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

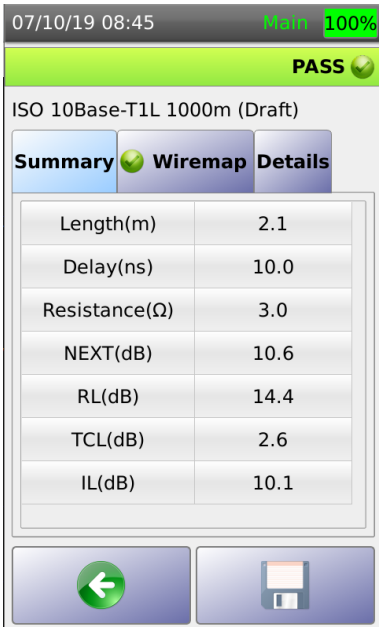
Bundled cabling length 50m to 75m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

Bundled cabling length 75m to 100m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

ALSNR Risk	High	Medium	Low

Credit NBASE-T Alliance

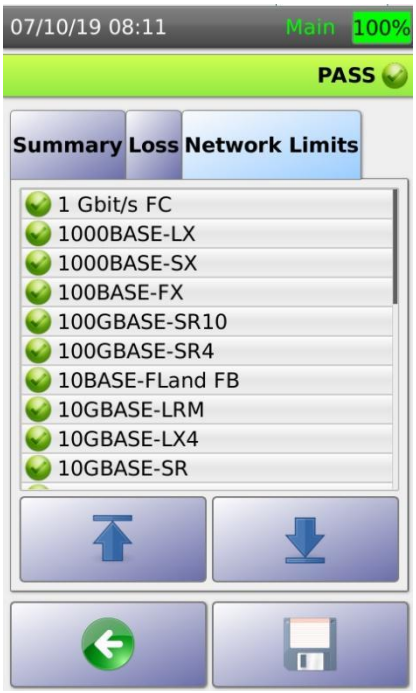
There are also IoT projects where end devices don't need much power or speed – but instead require very long cable runs. For these types of projects, standard four pair Ethernet and PoE standards may be able to exceed requirements from a speed and power perspective -- but fail to deliver on distance requirements. In these types of installs, alternative Ethernet and cabling standards may be a more appropriate option. For example, the IEEE has recently announced the 802.3cg 10Base-T1 standard that specifically addresses IoT projects that are lower in speed/power needs – yet require very long-distance cable runs. 10Base-T1 can provide up to 10 Mbps throughput and 13W of power while running at distances up to 1000 meters in length.



Example 10Base-T1L 1000m (802.3cg) Test Results

What's even more interesting is that this standard runs over single pair copper cabling as opposed to four pair cabling which is the norm for most other Ethernet installations. Single pair Ethernet (SPE) also provides the benefit of lower cost, thinner and lighter cable runs. It's a great option for IoT projects that fit those requirements.

Lastly, always remember that fiber optics may be the best physical layer transport for your IoT project. Fiber boasts several benefits over copper including far greater speeds and distance limitations. While fiber is typically more expensive to install compared to copper, remember that the longevity of fiber cabling is far greater when compared to copper. A properly installed fiber plant can last for decades. Upgrades to speed/latency over fiber can be accomplished by changing out the single-form pluggable (SFP) while using the same physical fiber medium.



Example MMF Fiber Test Results

The same cannot always be said for the copper plant that often requires cable replacement to achieve speed and latency gains. Fiber optics are also immune to external factors that can interfere with copper cabling. For example, fiber can operate in areas of higher temperature or with the existence of electro-magnetic interference.

Certify or Qualify new and existing runs

It's widely understood that new cabling projects should be fully certified by the installer. That said, many IoT projects seek to re-use cabling that already exists. Be sure to note that one cannot simply assume this cabling is going to perform as needed. This is especially true given the widely varying speed/power/distance requirements inherent in IoT projects.

To avoid troubleshooting headaches that can negatively impact the speed of an IoT rollout, be sure to also thoroughly certify or qualify all existing cable runs. This not only includes cabling that connects IoT endpoints and sensors – but all switch uplinks as well. Remember that IoT is known to significantly increase throughput on the network backbone. It's therefore critical that the physical uplink cabling be tested to be certain there are no defects that could impact performance.

Yet another cable readiness step relates to IoT devices that will be connected via WiFi. With highly dense wireless IoT deployments, bottlenecks can occur between access-layer switches and the WiFi access points (WAPs) they connect to. If your IoT project calls for the rollout of WiFi 5 or WiFi 6 capable access points to accommodate more density from a wireless perspective, then existing cabling will have to be re-tested and potentially re-run. Current enterprise-grade WAPs can reach

thermotical speeds up to 6 Gbps. The uplink(s) to the WAP should therefore be able to meet or exceed those speeds. This can be accomplished by running multiple copper cables to WAPs that have multi-port functionality. Alternatively, multi-gig Ethernet can be used if the current cabling has been certified to operate at these higher speeds. Also consider that newer access points may require more PoE power draw compared to previous generation WAPs.

One tool that performs all your IoT cable testing needs

While there are a multitude of different cabling and Ethernet standards to consider when starting an IoT project, rest assured that there exists a single modular tool that can perform all the necessary IoT certification and qualification tests you'll need. The AEM TestPro CV100 can perform four pair, two pair and single pair Ethernet speed, distance and power tests to be sure new and existing copper cabling will operate as expected. Additionally, the CV100 can test Multimode and Singlemode fiber optic premise cabling up to IEEE Tier-1 certification specifications. When planning your next IoT project, do yourself a favor and make sure your cable plant is ready to take on the challenge.

To learn more about AEM and our testing solutions, visit us at AEM-Test.com.

Enquiries CustomerCare@AEM-Testc.om