The

SIMPLIFIED

Guide to

STRUCTURED CABLING

- Terms
- Uses
- Categories
- Set Up

How much do you know about structural cabling?

Alien Crosstalk is...

A) When extraterrestrials have a casual conversation while crossing the road
B) Confusing political rhetoric about immigrants
C) Interference caused by one of the twisted pairs of wires in a cable affecting another pair of wires in an adjacent cable.

Propagation Delay

A) Waiting to start a family until you're 40
B) When your small airplane won't start
C) The time it takes for a signal to move down a cable.

Don’t worry if you had no idea what those terms meant. Only a few people do, and you probably want them working on your communication infrastructure! Like most technical work, there are quite a few jargon words and phrases that make sense to us, but sound like gibberish to most people. What follows is a nuts and bolts review that will familiarize you with the process of structural cabling so you can actually understand the technician who is working on your project.

NetQ Multimedia Company

Let’s start with an easy one: What is "cabling?"

There's a lot of name-calling when you talk to electricians and cable installers. No, not that kind... we're talking about a lot of different names for the same kinds of things, like these:

VDV:
Means "Voice, Data, Video"

Backbones:
The inter- and intra-building cable connections between entrance facilities, equipment rooms and telecommunications closets

Premises Cabling:
Any application that introduces wiring for its LAN (Local Area Network) computers, phones, fire alarms, audio or video into a building or campus as opposed to cabling for a municipality or geographically distant centers.

Structured Cabling:
Same as Premises Cabling, but refers to the design and component standards specified by the EIA/TIA (Electronics Industry Alliance/Telecommunications Industry Association) trade association for interoperability among different manufacturers. Their mission is crafting and updating voluntary standards for cabling products among its member companies.

Basic Cabling Components

RJ-45 Jacks and Plugs

One example of interoperability in action is the good old "RJ-45" 8-pin connector. It can be clapped onto the end of any CAT 3,4,5,5e, or 6 cable, though it's made by a large number of component manufacturers. Also, almost all cable sockets or jacks are designed to accept the RJ-45.

Low voltage cabling

Because these types of cables carry far less juice than a power cord for example. They can't really shock you. Much.

Teledata cabling

Another term for installations of common cable types for carrying voice and digital data

Datacom cabling

Same!

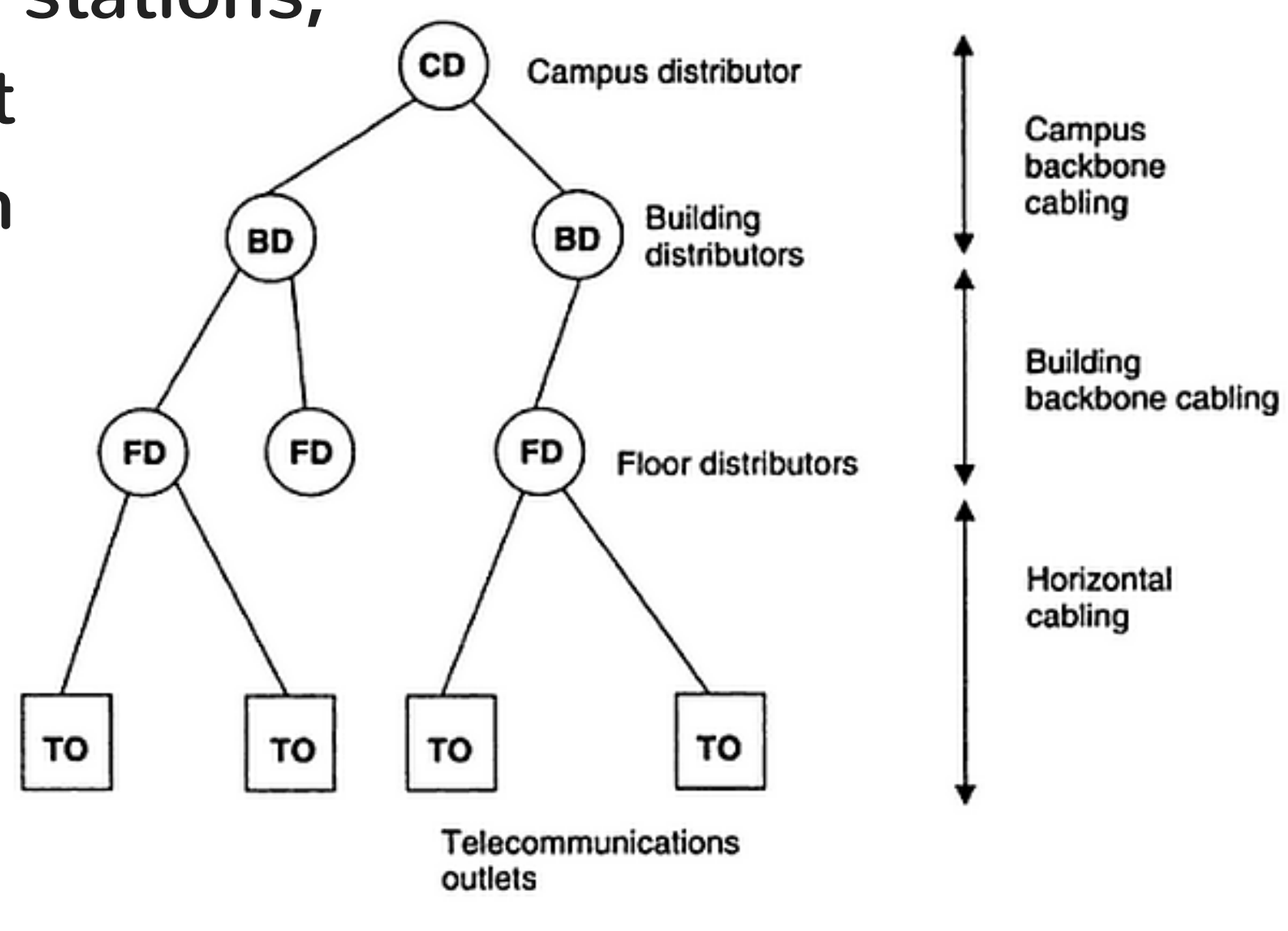
Since cables are meant to connect many types of devices and networks, the industry has long been interested in interoperability, in other words, the task of making data flow easily between one place and another, using entirely different cables or no cables at all. This is especially helpful when upgrading a system, or handing off data flow to another network.

NetQ Multimedia Company

What's in a Structured or Premises Cabling plan?

The Entrance Facility:
All the components involved in creating a link between all the outside services to the entire defined project. That means cables, connectors, conduits, protection hardware, weatherproofing and security features.

Distributors:
These are the locations where cables and their data come in and out, not unlike main bus or train stations, where transfers are made. What you'd see in an equipment room is an array of patch panels sprouting bundles of cables, along with a number of telecom connections in a punchdown block (more on that in a minute). They are usually thought of as a two or three-tier hierarchy, starting with the main "backbone" (Distributor C) then splitting off into secondary backbones (A) which feed the Equipment outlets. a B distributor is not always needed as an intermediate junction between A and C, especially if the installation is a single building or floor.



NetQ Multimedia Company

What's in a Structured or Premises Cabling plan?

Cabling Subsystems 1, 2 or 3

these include the main arteries of data flow such as backbones, which connect equipment rooms packed with servers, power, hubs, switches and the like, to each other AND to the outside world through the Entrance Facility.

Equipment Outlet

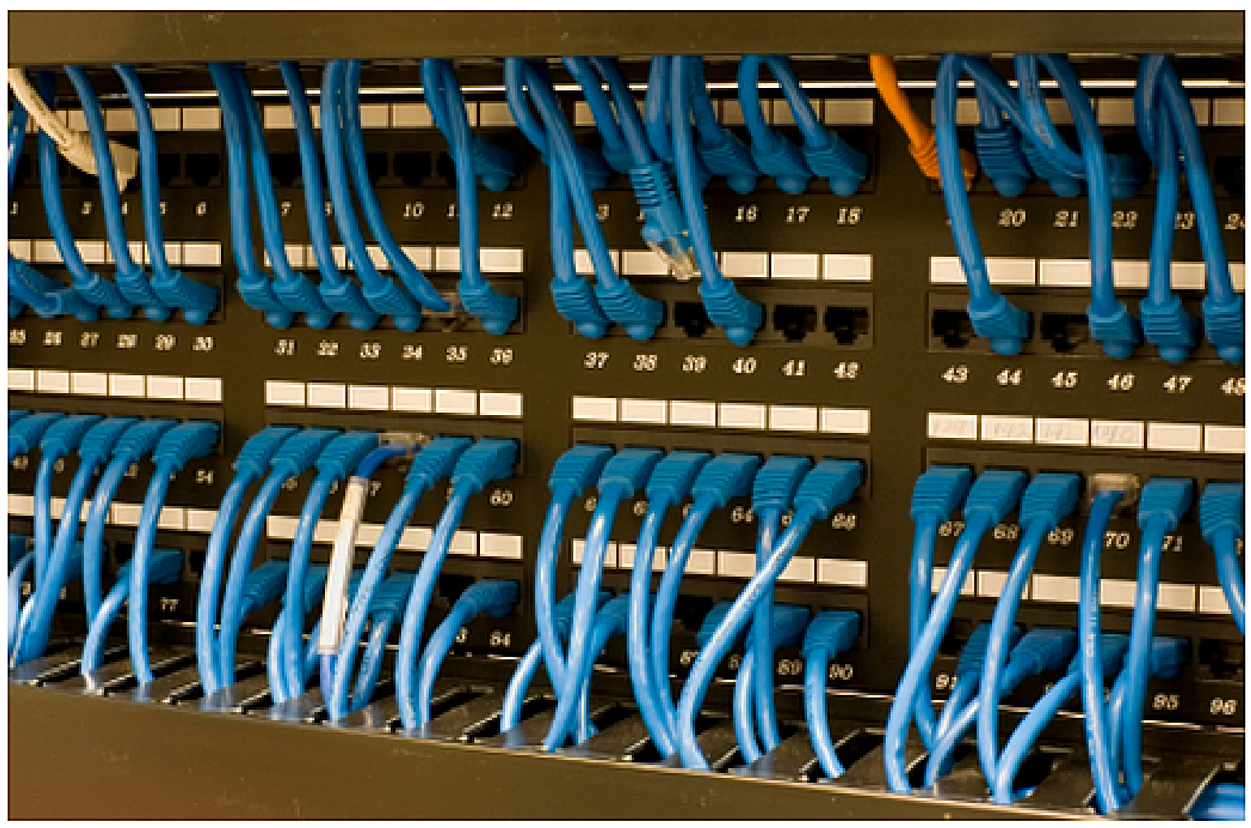
the working end of all the cabling, your desk, specifically the wall receptacle into which you plug a device (computer), or a wireless router that broadcasts a signal that enables contact with everything else.

Telecom Closet / Room, or Equipment Room

Where the backbones connect or distribute to other branches or to Equipment Outlets, It's a lot of cables, and usually climate controlled.

Patch Panel

A rack of devices with RJ-45 sockets where cables are terminated, and then connected to other routes. Whenever a signal needs to be tested or redirected, it does so through the connections in a patch panel.



What's in a Structured or Premises Cabling plan?

One way of interconnecting phone wires in a similar fashion is the **punchdown** block or punch block. It's a bit simpler, using a tool to push the very small phone wires down into a V-shaped notch lined with metal that slices through the plastic insulation and makes a connection.

Link
These are simply the cables that run out from a patch panel to all the various devices that need to be plugged into your network.

Patchcord
A short bit of cable with our old friend the RJ-45 plug attached to both ends. They are used to connect devices to wall sockets (that are then connected to the patch panel in the equipment room), and also used to connect patch panel circuits.

Channel
A set of all the cables including a link and a patchcord that connect devices with each other. You would keep track of all the channels in the equipment room as they run into and out of the patch panel.

NetQ Multimedia Company

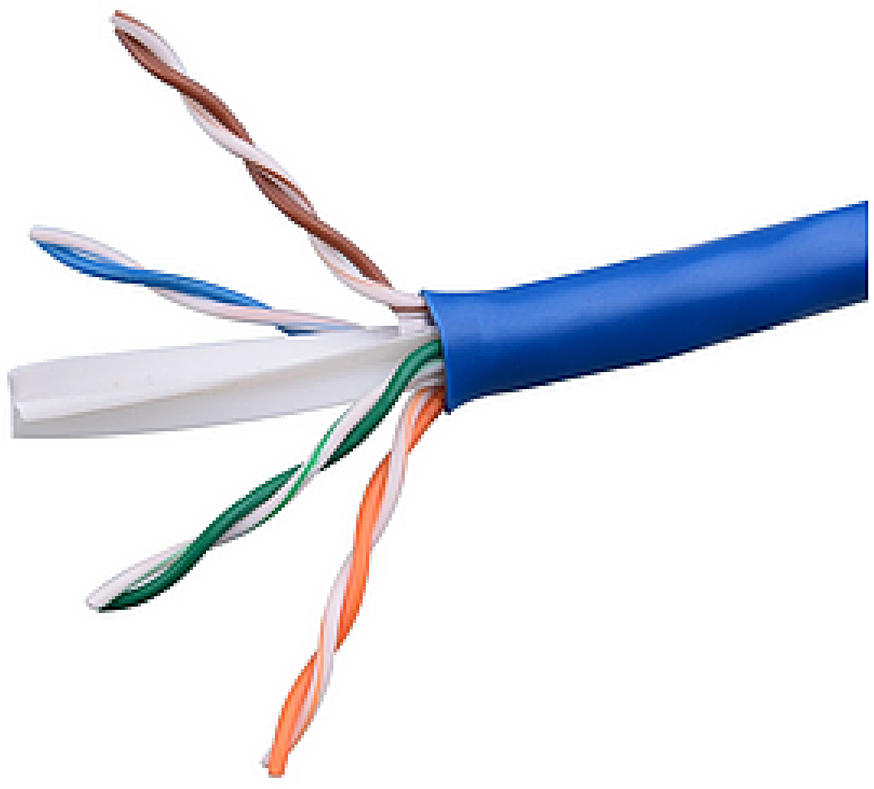
Different Types of Cables

Low Voltage Copper Cables…

UTP: Unshielded twisted pair cable
Some wiring has an extra layer of “shielding” lining the inside of the outside plastic insulation. it’s usually a layer of metallic foil and prevents various kinds of interference from exterior sources. Most installations don’t require shielding and UTP is a perfectly good solution.

Inside the outer plastic casing of UTP you’ll find four pairs of smaller wires (8 total individual wires), each pair arranged in a twist- four twists, eight wires.

Category 3,4,5, 5e, 6
You’ll hear a lot of talk about CAT5 or CAT5e cable. These are twisted pair cables with the requisite four pairs of internal wires. The numbered designations signify bandwidth capability. CAT5e provides 100 MHz, CAT6 clocks in at 200, and CAT6A has been able to deliver 500MHz. These are in ideal conditions, of course.



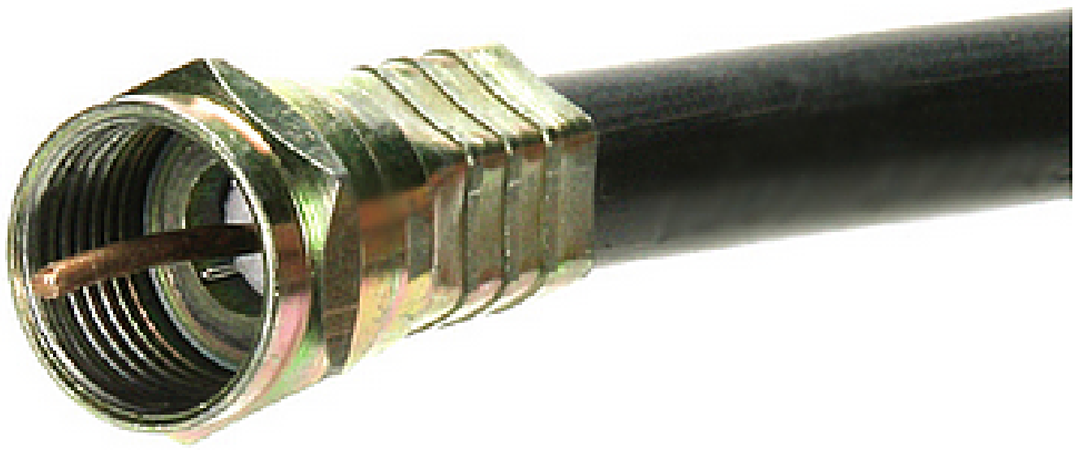
Different Types of Cables

STP or ScTP

Well, you finally get to use a fascinating little tidbit of science you learned back in 5th grade! You remember that Mr. Michael Faraday found that when you run an electric current through a wire, a magnetic field develops around it. When you have a large bundle of cables carrying their currents through a confined space you have quite a few competing electromagnetic fields interfering with each other. UNLESS you shield them. STP is an abbreviation for "shielded twisted pair," and ScTP is simply "screened twisted pair." They are representative of a family of data cables that contain a metallic shielding that minimizes the influence of other adjacent cables.

Coax

You might have seen this connecting your cable service to your TV. It consists of a single central copper strand embedded in a layer of insulation surrounded by another woven copper layer, all contained in an insulating skin. Coax is especially good at transmitting high frequency signals because of the nature of the electromagne… field generated inside the cable between the core and the outer conductor. interference and power loss is low, so it's used for video, radio and microwave transmissions, as well as data links for computers.



NetQ Multimedia Company

Different Types of Cables

Optical Fiber Cables…

Instead of conducting electrical impulses down a copper wire, optical fiber conveys signals using pulses of light that travel down strands of flexible glass or plastic. The diameter of these strands is only slightly thicker than a typical human hair. Each fiber has two layers: the outer is called the “cladding,” and has a lower refractive index (a greater ability to slow or bend light) than the inner “core.” Pulsed beams of light careen down the fiber at a tremendous velocity like a series of tiny bobsleds until it reaches a translator at the other end.

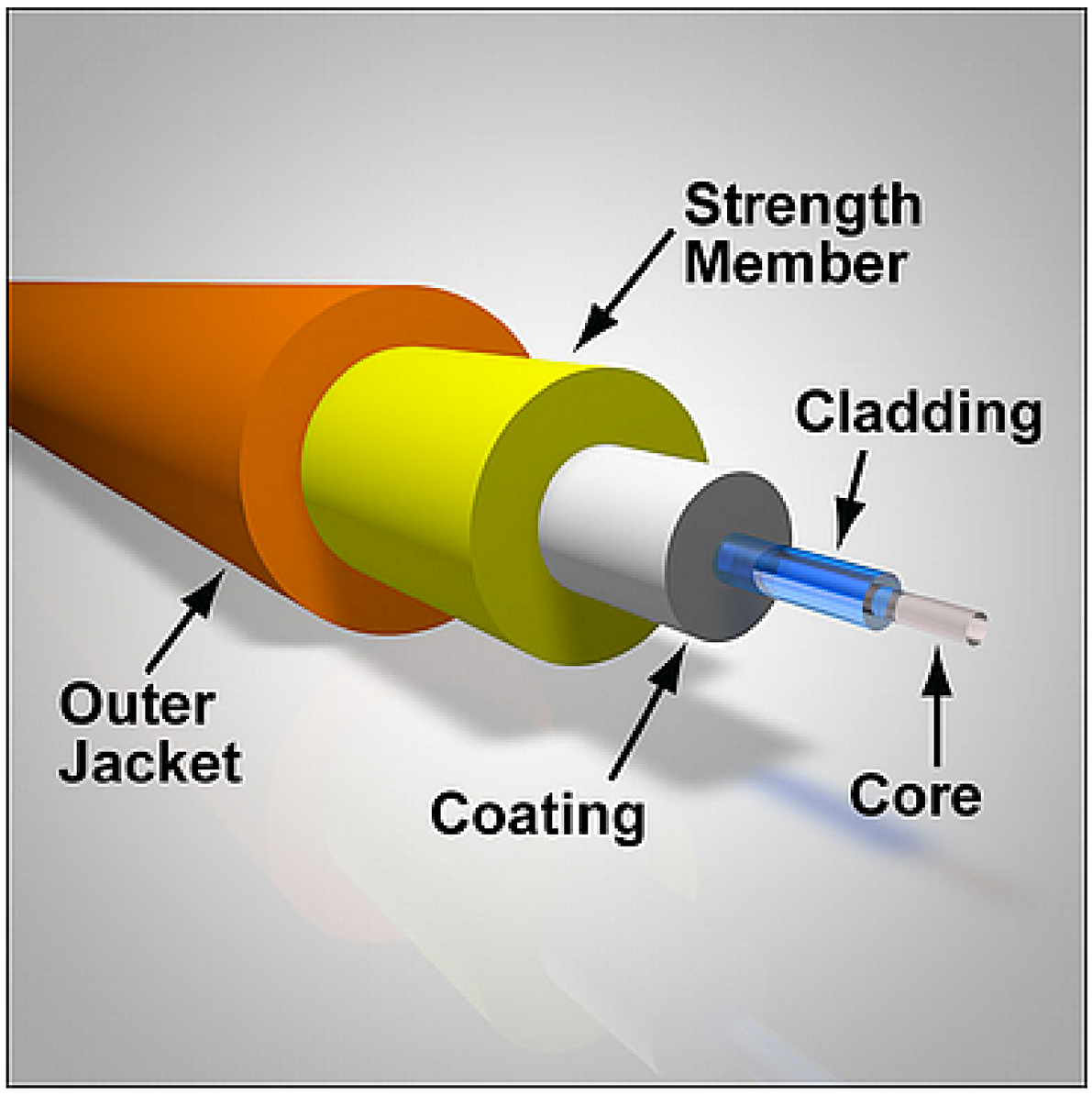


Image Source

Optical fiber has an entire catalog of advantages over copper (see comparison below), but it also has a lot to recommend it as well.

Different Types of Cables

And by the way…

MHz versus Mbps

MHz or “megahertz” is a measure of frequency, or vibration, as in how fast a wave travels through a given medium, like a copper cable. 1 MHz is equal to 1,000,000 Hertz, or one million vibrations per second. It’s rather like a speed limit on a freeway- how fast pulses of information are able to travel.

Mbps = Megabits per second. If MHz is the speed limit, Mbps measures the number of lanes on the freeway. Once again, “mega” refers to one million, so if a cable can handle 1 Mbps, it carries a million “bits” every second. (a bit is a single unit of data, in most cases a “1” or a “0.” it takes a string of 8 bits to represent the letter A which is “01000001” in computer-ese). Mbps

Bandwidth is measured in Mbps, and defines the capacity of a network based on the properties of the cabling connecting you to a source. We could think about bandwidth in terms of “pipe-width.” If you’re trying to upload a milkshake into your mouth, it will go much faster with a fat straw than a skinny one.

The electronics that make it all work

Hub:

This little device acts like a sprinkler. Water that comes in, goes out all over the place. In this case, to every other computer connected to it. The problem is that this uses a lot of bandwidth, and can be inefficient and slow.

Switch:

The switch acts a lot like a hub with one significant difference. Instead of connecting everything all the time, it is able to select a destination for each packet of information. it’s like a hose with a splitter or set of valves and more hoses attached to its end so that decisions can be made about where the water goes at any given time.

Router:

These are smart little boxes that not only connect devices to each other, but one network to another. You probably have a wireless router in your house; it’s wired into the incoming internet service, and connects all the internet-ready gizmos in your house by broadcasting a radio signal.

NetQ Multimedia Company

The electronics that make it all work

Bridge:
A device that connects two or more arrays of network cables

Ethernet:
This family of computer networking structures for LANs first saw the light of day in the 1980's. Since then it's been upgraded to support higher speeds, volumes and distances. It's finally being overtaken by newer technologies like Token Ring or FDDI (an optical fiber-based network), but still probably the most popular means of premises cabling.

Power Over Ethernet:
Yes, you can power a small device like a camera or wireless access point from the same cable that supplies the networking between them. Cables are designed to use either the data wire itself or a dedicated extra one.

"Wireless" actually needs quite a few wires...
LANs usually require a few access points to make the network available to all the devices on it, but that still calls for cables linking the access points to the hardwired parts of the network. Wireless components merely replace a few patchcords and allows users to move around without wrestling an ethernet cable.

To Fiber or not to Fiber?

Certainly fiber optical lines have numerous advantages over traditional copper cabling, but it’s not a slam dunk. Every project is different, and your mileage may vary. In general terms, fiber becomes economical if you have longer distances to cover, need a high level of reliability, don’t require a lot of copper-to-fiber or fiber-to-copper connections, and have a long range plan with the budget to cover it.

One primary advantage of fiber is that it has already outlasted at least five generations of copper cabling which are reaching their physical limit of performance. There’s just not a whole lot more room for copper to advance. That said, here are some disadvantages:

- The terminations (plugs and such) are more expensive and more difficult to install
- OF is initially more expensive per meter than copper
- Tapping, splitting or combining OF requires a high level training and equipment- it’s really not advisable, whereas tapping a twisted pair cable is quite simple
- It may be overkill in applications where cabling travels under 50-100 meters and carries under 1 Gb/s.

To Fiber or not to Fiber?

On the plus side, optical fiber has some undeniable advantages.

- Much higher bandwidth potential, making future upgrades much easier
- Carries data at high quality much further with needed a signal repeater
- Reliability - virtually immune to interference from other cables
- Environmentally hardened - optical fiber is not affected by temperature variations, water intrusion or corrosion
- Saves a lot of space, and is much lighter to transport and install (the carrying capacity of the two cables at right is roughly equal)
- Requires much less power to operate
- More effective in electrically complex environments like cars or factory floors

Thanks for Reading!

Now you're ready to speak the language of the cabling pro. Don't worry, though - we won't quiz you over all of it!

Need Some Structured Cabling Information That We Didn't Cover?

Give the technicians at NetQ Media a call today to find out how we can put our years of expertise to work to solve all of your structured cabling needs.

Share this eBook:

NetQ Multimedia Company

800-303-4782