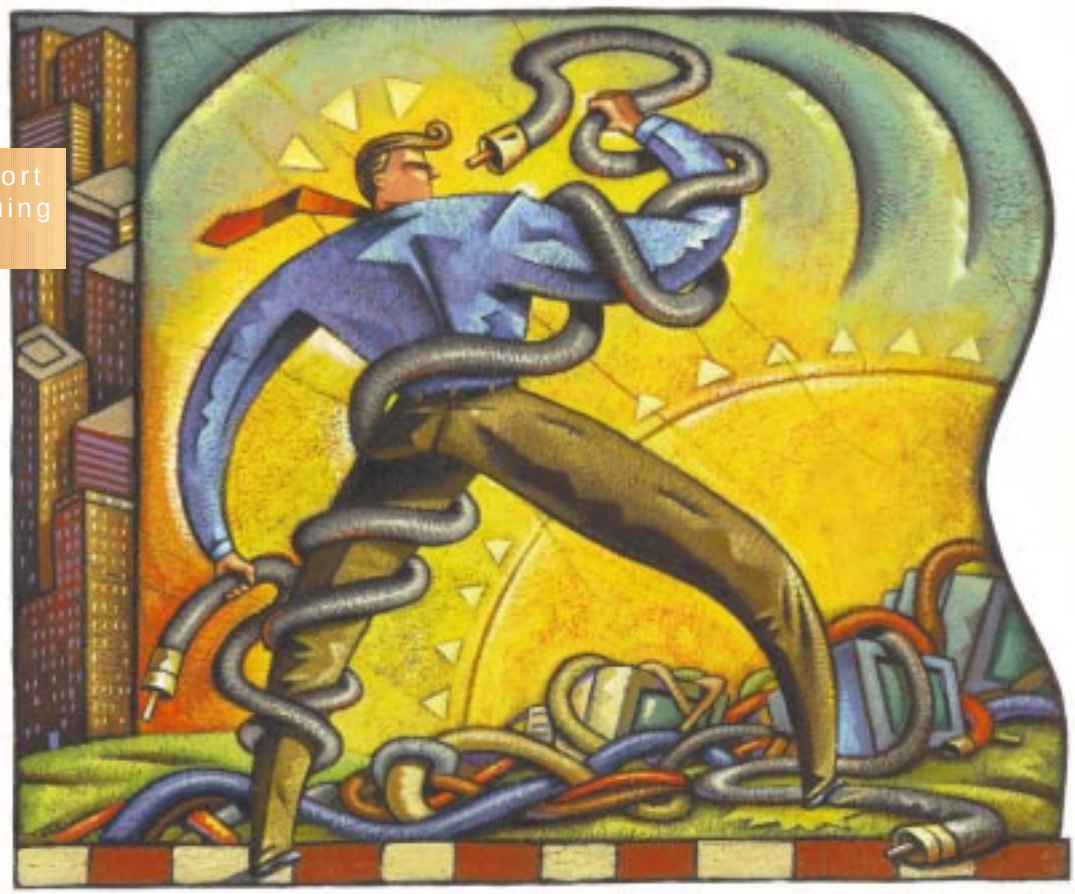
THE STRUCTURED WIRING Quarterly Report

The 9th report in a continuing series



Winning The Cabling Wrestling Match

By Joe Mullich

When it comes to network troubleshooting, people generally relate to the cable in one of two ways — they ignore or they cuss at it.

The two reactions are related: the exclamations usually follow many hours of trying to pinpoint a network problem using a high-level protocol analyzer only to learn the culprit was a cable problem that could have been found in 30 seconds if anyone had thought to look at the physical layer.

Though cable remains impressively reliable, the physical layer of the enterprise is no longer the no-brainer it became when category 5 certification standards passed in 1995. A new generation of high-performance networks, such as Gigabit Ethernet, are requiring new attention to end-to-end testing. These more-demanding technologies promise to expose poor installations and inadequate cable testing that were hidden by older network infrastructures. In other words, cable testing — whether users like it or not — has suddenly become interesting.

This report will also appear on ***Network Computing Online*** (www.networkcomputing.com)

Standards Get Pushed

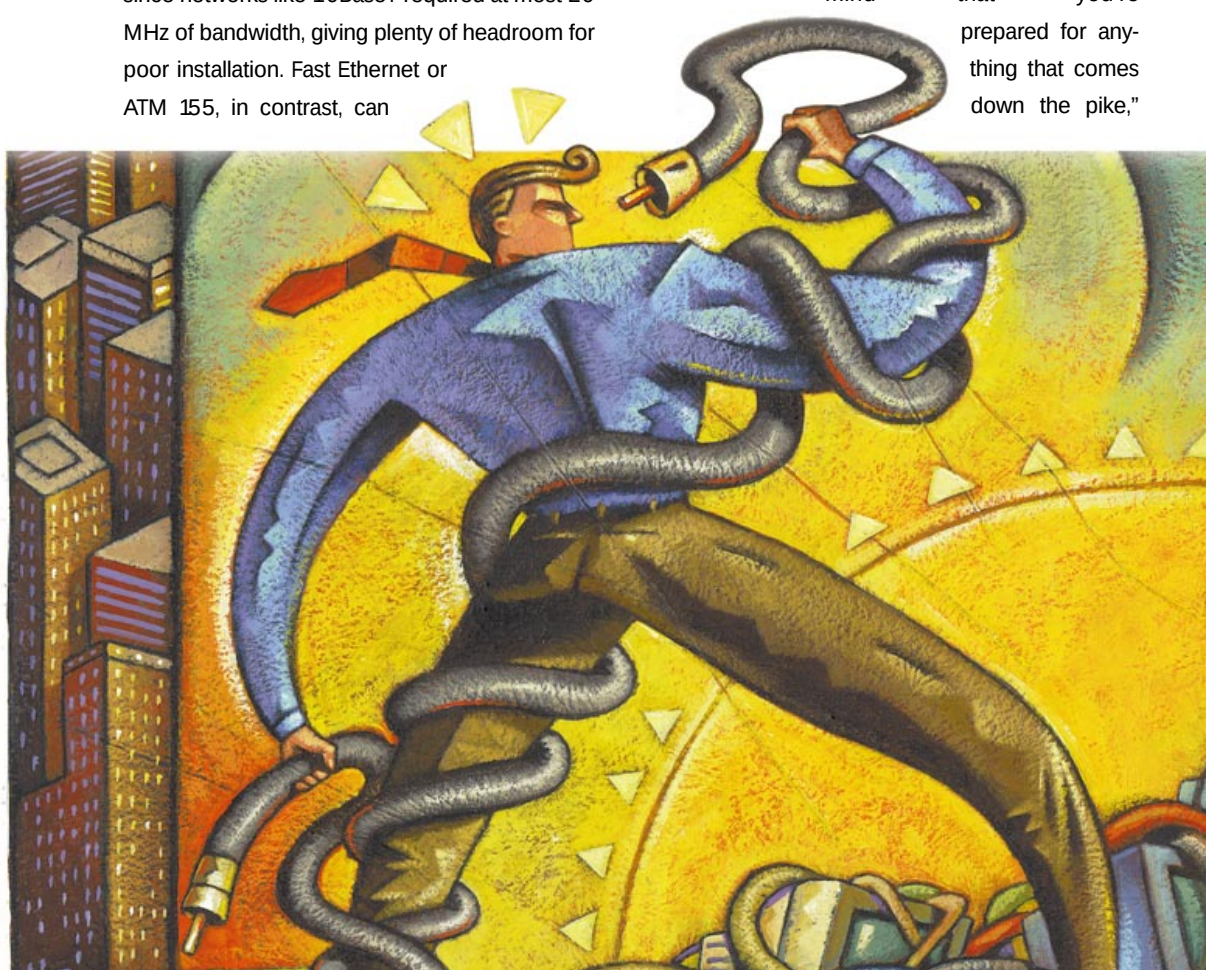
In 1995, the cabling industry produced a rash of standards that created a global migration to category 5 UTP cabling — TIA 568A, TSB-67, ISO 11801 and EN50173. For most of this decade, few desktop applications even came near the 100 MHz transmission speeds specified by category 5 cable. A visual inspection or continuity testing usually was sufficient to settle concerns about cable integrity. If the network wasn't performing, diagnostic testing focused on more likely culprits, such as hubs or network interface cards (NIC).

That is all changing with the specter of high-performance networks that will push the 100 MHz limits of the cable, patch cable, jacks and connectors. Many so-called category 5 cables weren't providing category 5 performance because of poor installation. That didn't matter since networks like 10BaseT required at most 20 MHz of bandwidth, giving plenty of headroom for poor installation. Fast Ethernet or ATM 155, in contrast, can require as much as 88.5 MHz of bandwidth. Excessive near-end cross talk or attenuation can now degrade network performance.

"If you were using 10BaseT, it didn't matter if the cable wasn't installed properly," said Chuck Citron, senior product marketing manager for Wavetek, a San Diego company that makes testing equipment. "However, if you run 100BaseT, you *will* see problems and, if you go to Gigabit Ethernet, you'll really see problems."

Anticipating the need for Gigabit Ethernet, some companies have been installing enhanced category 5 cable, which provides performance above the 100 MHz specified by the Telecommunications Industry Association (TIA).

The raw material cost for enhanced category 5 cable — including the cross connects, jacks, and desktop connections — is only 1.5 to 2.5 times the cost of standard category, said Mark Fabbi, an analyst with the Gartner Group who is based in Toronto. From a capitol perspective, using enhanced category 5 cable raises the total cable plant cost by about only 10 percent. "That's a small price to pay for the extra piece of mind that you're prepared for anything that comes down the pike,"



Fabbi said. When you invest in a cabling plant, you are buying insurance."

A lot of people are buying those policies — many companies are going with cable beyond "old rot gut category 5," said Mark Johnson, director of technology development for Microtest, a testing firm in Phoenix, Arizona. The problem is no certification standards exist above traditional category 5, even though some vendors are producing enhanced category 5 cables to their own specifications.

"If you decide to select category 7 cable, you deserve a test to be run to prove that cable operates above cat 5 specs," said Hugo Draye, marketing manager for media testing for Fluke Networks Division in Everett, Washington. "It's unfair to pay extra money for cat 7 if all the contractor can show is it meets cat 5."

Some firms don't accept bare-minimum category 5 testing, even if they are just purchasing cat 5 cable. With all the whirling changes, network managers need to be more knowledgeable about cables and testing.

"Not a lot of people understand how to properly install copper and fiber wiring or understand the effect a poor installation has on transmission performance," said Frank Mara, principle with Commtran Consulting in Sandwich, Massachusetts. "You want to be damn sure the installer knows what they're doing in the testing procedures. Even for traditional category 5, I wouldn't accept a simple pass/fail as a criteria."

Welcome to the new, no longer no-brainer world of cable testing.

Field and Lab Tests Differ

Cable components in lab tests are defined by the American Society for Tests and Measures (ASTM). Field standards are derived from that and codified into such documents as Telecommunications Industry Association TSB-67, the document that defines performance for an installed UTP link in a real-world building. TSB-67 is a document that specifies how to field test UTP cabling using two levels of performance.

"You need to have more stringent testing on the component level so that, when you pull it all together, you are still at a high level," said Fluke's Draye. "You can never match the performance of a lab in an installed link."

This is an important distinction, experts say, because many cable products are marketed on the basis of their lab performance rather than the more important field performance. "Companies claim their cable tested to 350 MHz in the laboratory, which is true, but that doesn't mean you should expect the same performance once the cable is put in the building," Draye said. In the field, cable performance is affected by a host of factors, such as different temperature conditions, proximity to the ground and other machinery and the influence of connections.

> *"It's unfair to pay extra money for cat 7 if all the contractor can show is it meets cat 5."*
>
> *—Hugo Draye, Marketing Manager for Media Testing for Fluke Networks Division*

Testing begins with the visual inspection. "You can tell a real professional contractor by simple things at the low plumbing level, like proper tie-downs," said Gartner's Fabbi. "When you see an installation done well, it's a thing of beauty. You can almost do the certification by look, though, of course, you have to go through the paces and do the testing."

Testing fiber cable is a fairly straightforward proposition. Fiber is impacted by only distance and connector loss. Testing simply involves measuring the loss of light due to attenuation. The tester connects a light source to the fiber link and measures it at the end of the link of the channel.

Copper cabling is an entirely different story. There are two ways to test cable: transmission-oriented and application-oriented. Transmission-oriented testing involves making sure the

installation meets transmission characteristics such as NEXT and attenuation according to TIA category 5 standards or other measures. Application-oriented certification guarantees that a cable plant will work for a specific type of network, such as ATM. Most experts concur transmission-oriented certification is a wiser course, since it provides more flexibility and is more likely to accommodate future technologies.

"If the vendor simply gives you a laundry list — we will support fast Ethernet or 155 ATM — then you have no ability to question why a new technology, such as Gigabit Ethernet, doesn't work," Fabbi said. "The transmission path is a little more abstract, and takes more education in the marketplace, but it provides the better long-term value."

TESTING tips

Alltel

Paul Syrvalin, LAN Manager for the northeast region

Keep it simple.

"I don't know how many times people are troubleshooting a problem and they find out the LAN cable wasn't plugged into the jack," said Paul Syrvalin, LAN manager for the northeast region of Alltel, an Arkansas telco. "People are whipping out protocol analyzers and they don't even look behind the PCs."

Closely Examine Test Results

A company should receive complete test results rather than accept a blanket certification.

"Most users accept the minimum, which is fine for ATM or 100-bit Ethernet or token ring, but as soon as you run some heavy-duty stuff, glaring errors in the installation and performance testing will come up to bite you," said Mara of Comtrann Consulting.

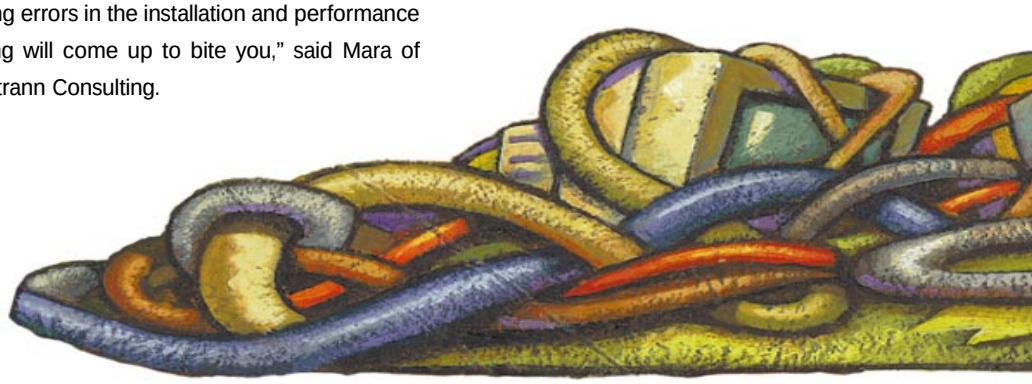
It is not cost effective to test every copper cable, but what constitutes a reasonable sample is difficult to determine. Fabbi once had Bell Northern Research look at this question.

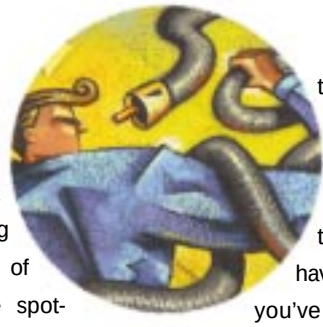
"The answer was so complex in terms of the size and type of cable that it had no value," he said. "It's one of the most difficult questions out there." About the best guidelines Fabbi and other experts could come up with was to test each wiring block and less than 10 percent of copper cable. With fiber cable, companies must do connectivity tests on each of the strands and test as much as 25 percent of the total cable.

With the approach of more-demanding applications, experts say it is no longer acceptable to simply see if copper cable meets pass/fail requirements according to category 5. Savvy managers with an eye to the future should look to see how much above category 5 specs the cable performs, since most high-end equipment vendors have a fair bit of margin in their products.

"If you are just barely passing, there might be some cause for concern," Fabbi said. "If the test results are closer to what the vendor said the cable will support than to the standard, you're probably safe."

If the results are just over the standards, a firm might want to do additional testing, such as increasing the number of connections tested from 5 to 10 percent. For the second level of testing, a company should focus on cable with longer distances or which will go through difficult areas that may cause problems down the line. This kind of performance grading can help identify links that offer longer life, lower transmission errors and will support higher-speed applications.





Should Users Spot Check?

The amount — or even whether — a company should do spot checking after the installation is a matter of debate. Some observers believe spot-checking is a waste of time if the contractor has a good track record, provides sound documentation, and guarantees the documentation.

"Why should I follow-up a vendor who I've paid to install cat 5 cable to a certain specification?" asked Roy Lucas, data communications manager for Polaroid Corp. in Waltham, Massachusetts. "That's the stupidest thing I've ever heard of it. If they don't do the job with any degree of consistency, you get rid of them."

Daniel Malone, assistant director of telecommunications at New York University, takes a more standard approach to spot checking for a large installation like a university. He or a representative is present for 50 percent of the testing done by the contractor. They do daily walk-throughs to monitor progress and to make sure that the physical installation complies with the relevant standards. Malone's technicians retest every piece of underground cable between the host and a new building as well as 20 percent of the wall jacks. Malone noted that his cabling installations are done between semester breaks, "so we want to make sure problems are resolved before the students come in."

Don't Overlook Documentation

Effective troubleshooting requires strategic planning. The first step is proper documentation. Paul Syrvalin, LAN manager for the northwest region of Alltel, a phone company in Little Rock, Arkansas, always requires contractors to provide a book listing all the tested runs and results.

"Some people overlook this and it does take more time, so there are additional labor costs," he said. "But I look at it as an insurance policy." If a problem develops with a cable that wasn't tested, Syrvalin points out to the vendor that the cable wasn't certified and, because the vendor guarantees his work, he must fix it at his cost.

"There is no sense in running through 6,000 measures and not having a single record to support what you've done," said Fluke's Draye. Nonetheless, most companies maintain poor test records. According to Draye, only about 20 percent of the companies he works with even use cable management software. Most keep the documentation in thick books of paper printouts that are difficult to use and rarely consulted.

"People may be avoiding the software because of computer fears or because they're afraid it will muck up their data," Draye said. "I've heard companies say they don't trust electronic data. But all you have to do is select 5 percent of the record and take a quick look at a few critical areas to know that it's OK."

Some cutting-edge companies are looking to integrate test results into their data management databases. This provides a kind of pre-troubleshooting that can eliminate problems that would otherwise crop up. In re-assigning office space, for instance, companies can use the databases to assign people to areas with appropriate bandwidth capabilities for their needs.

When new installations go in, New York University develops cabling diagrams to support future maintenance, growth and troubleshooting. According to Malone, an internally developed program allows technicians to access any telephone or jack data in the university by building, floor, phone number, data port or through the switching system. The systems only work, Malone noted, if the wiring diagrams and databases are accurate and kept up-to-date.

TESTING tips

Polaroid

Roy Lucas, Data Communications Manager

Start at the bottom and work up.

"Most people want to make things more complicated and don't look at the basics," said Roy Lucas, data communications manager for Polaroid. "Most problems are basic, like broken wires, that can be caught very simply. But people spend a lot of time reconfiguring their PCs and throwing in new NIC cards."

WIRING STANDARDS WATCH

THE STRUCTURED WIRING Quarterly Report

Puzzling Out Gigabit Ethernet

Several industry committees are at work to produce standards for high-performance networks like Gigabit Ethernet by Spring. In September, the ISO/IEC announced preliminary requirements for category 6/class E and category 7/class E cables. The category 6 cable will support applications with a channel bandwidth of up to 200 MHz over UTP and/or FTP. Category 7 will support 600 MHz over SSTP.

TIA Cabling Standards in Development

STANDARD:	TIA 568A Addendum XX	STANDARD:	TIA 568A Addendum YY
PURPOSE:	Additional transmission performance specifications for UTP	PURPOSE:	Additional transmission performance specifications for enhanced category 5 cabling
REASON:	Some new LAN technologies, notably Gigabit Ethernet, require performance parameters not specified in TIA 568A.	REASON:	This standard recognizes advances in cabling technology, defines additional measurements, and provides much stricter performance limits to 100 MHz.
ADDITIONAL TESTING PARAMETERS:	Return Loss; ELFEXT (Equal Level Far End Crosstalk); Propagation Delay; Delay Skew	ADDITIONAL TESTING PARAMETERS:	Power Sum NEXT; Return Loss; Worst Pair-to-Pair ELFEXT; PowerSum ELFEXT; Propagation Delay; Delay Skew
TIME FRAME:	Should go to first ballot in February 98.	TIME FRAME:	Will likely go to ballot in second quarter of 98.

Source: Mark Johnson, Microtest.

The Institute of Electrical Electronic Engineers (IEEE) and the Telecommunications Industry Association (TIA) are working on related efforts to provide specifications and testing guidelines for Gigabit Ethernet. The IEEE has divided into two committees to determine standards to allow Gigabit Ethernet to run on a variety of media, including single-mode fiber-optic, multimedia fiber-optic, shielded twisted-pair cables, and the most difficult proposition, unshielded twisted pair wiring, that is most often used for desktop connections.

The committees might publish a standard as soon as March, though committee members have not yet reached a firm conclusion on one particularly tricky aspect, regarding multimode fiber-optic lines. At high transmission rates, fiber-optic lines use more laser beams, which can interfere with one another.

The TIA committee is trying to determine pass/fail values for additional testing criteria that will be needed for enhanced category 5 cable to support Gigabit Ethernet.

Currently, certification guidelines require four tests to be run on copper cable: wire map, length, attenuation, and near-end cross talk (NEXT). Gigabit Ethernet will require three additional tests: return loss, far-end cross talk (FEXT) and power sum next (PSNET). The first two measures will probably be determined soon after the IEEE specifications are produced, while PSNEXT guidelines will likely not appear until early 1999.

Beware Of MAC Attacks

The second area where companies can pre-troubleshoot their cable plants is during Moves, Adds and Changes (MACs). According to consultant Mara, the average 1,000-node network has 300 MACs a year. Each MAC has the potential to create network problems. Someone could, for example, hurriedly pull a cat 3 patch cable from a stash instead of a cat 5 patch and installed it, degrading performance.

During MACs, cables can be stretched or cut, connectors crushed and wires pulled loose. These often create the most bothersome troubleshooting problems, experts say, because people rarely think to look at the cable. For this reason, most experts recommend recertifying the cable after each MAC. “Every time you touch the cable, every guarantee is off for performance,” said Microtest’s Johnson.

Syrvalin of Alltel does recertification after each MAC. “This isn’t rocket science,” he said. He will typically test single runs in-house using a Fluke LANMeter, a portable network management tool. For larger projects, he has the contractor recertify the cable to ensure the warranty remains in tact.

“If you standardize to a particular vendor, they’ll guarantee the cable for 15 years, but you have to make sure it’s installed properly or they won’t validate the warranty,” he said.

These steps won’t eliminate all problems with the physical layer, even though defects to the actual cable are rare. Certainly, there will always be cases of construction workers accidentally breaking a wire or someone putting a filing cabinet on a patch panel.

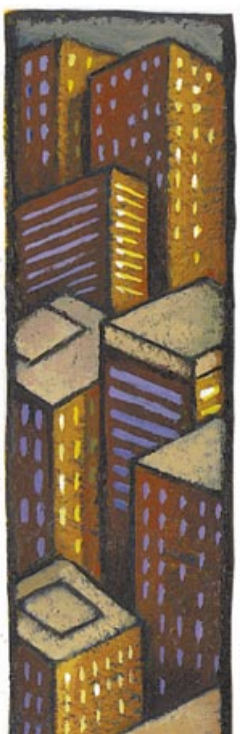
A couple of years ago, for example, Wavetek’s network went down and it took half a day to discover someone in the office had taken a termination off. “We were doing all sorts of things with the protocol layer,” said Wavetek’s Citron. “Finally, we put on a cable tester and found the problem in less than a minute.” According to experts, though, certifying the cable properly and recertifying after MACs will eliminate most future problems with the cable. “We’ve made a big transition from the early- and

mid-90s," said Microtest's Johnson. "Cable testers were bought then because things broke and people needed to fix them. Now, installers are more proficient and manufacturers are more skilled. Once the cable goes in and is tested, it's very unlikely to ever fail. The failures have dropped significantly."

The long-term problems tend to arise when people take short cuts, such as not doing proper testing or pushing distances. When Fabbi worked at Bell Canada, the most common questions he received were not about complex technologies like ATM, but about cabling — mostly whether someone could bend rules to save a few dollars.

These shortcuts continue to be taken because, for the most part, even if you break the rules, the cable plant will often work sufficiently on day one. The problems arise three to five years down the line, often when new technology goes in and the people who oversaw the original installation are gone. "That's when you start seeing errors in the network, and the cable is the last thing you think of because we take it for granted," Fabbi said.

Troubleshooting the physical layer can be difficult. Poor connector attachments, lack of termination, corrosion and improper slices can cause intermittent problems that are bedeviling to find. For this reason, some analysts say, many companies are farming out the physical layer troubleshooting — most people skilled in PC software network troubleshooting, they say, don't have the time and energy to be knowledgeable about the physical layer.



Different Kinds of Testers

One advantage troubleshooters have is a new arsenal of tools. Until recently, users have had only one choice of a physical layer tester from each manufacturer. These first-generation, top-end testers were designed for professional LAN installers, not systems administrators. To use the devices, a person needed a significant amount of electrical knowledge and training.

Since the passage of category 5 certification standards in 1995, though, testing duties have expanded to a whole new range of people both inside and outside of companies. Electrical contractors and telephony vendors have jumped into cable testing.

"One of the hot stories of this year was the electrical unions lobbying for laws promoting that electricians are the only qualified installers of cable," said WaveTek's Citron. "More and more electricians, who in the past were spooked by anything that had the word data in it, want to test cable."

But more cable testing is also moving in-house. Wavetek, the San Diego company that makes testing equipment, said roughly 25 percent of its sales are now to large companies. Just a few years ago, contractors and professional testers were about the only ones buying the equipment. Because of this splintering of the marketplace, a new generation of testing tools has emerged to accommodate users with different requirements, training backgrounds and cost tolerances.

Cable testers have expanded from bare-bones testers to high-end models with built-in troubleshooting capabilities. Some high-end models support both fiber and copper wire testing, and even have graphics — a feature needed only rarely by even the most sophisticated users. "Some people might go to a remote site where they'll do two to three days of certification, so they'll need to store two to three days of test results," Citron said.

TESTING tips

Steve Van Frank
A Lafayette, Indiana, consultant.

Only change one thing at a time.

"You need a point of reference and if you change more than one, you can fool yourself," said Steve Van Frank, a Lafayette, Indiana, consultant.

At the same time, testers have become more simple. Instead of displaying information in difficult technical formats, such as picoFarads, decibels and ohms, many testers now provide simple pass/fail information that non-electricians can understand. Worldwide Solutions, a consulting and network integration firm in Boulder, Colorado, has even created a program where small companies can purchase a tester and receive troubleshooting help over the phone. The firm hasn't received many takers for the new program yet, but the fact that it exists is a testament to the ease of the new equipment.

It is important the equipment match the task. Just ask Steve Van Frank, a Lafayette, Indiana, consultant who put up and tested the cable plant for the large Siggraph graphics trade show.

The 750-node network had to be set up and debugged in two days, a fast pace that required high-performance tools such as Fluke's DSP-2000. This tester exposed a cable run that was too long, degrading performance.

"If we had used a cheap DC-only cable tester, the cable would have passed because the pairs would look all right and the cable map would look all right," Van Frank said. "If that's your only piece of test equipment, you wouldn't know some important things, like if someone did a 102-foot run. With cheap testers, everything looks fine because the wiring is right." Without the more advanced tester, he said, he would have spent hours swapping out Ethernet switches and network cards.

TESTING tips

Gartner Group

Mark Fabbi, Analyst

If you make a fix, go back and evaluate it later.

"The original problem may have been corrected, but you want to make sure you didn't create a new problem," said Mark Fabbi, an analyst with the Gartner Group. "You have to be disciplined in working through the procedures and checking at each stage to see the positive and negative effects of your actions."

Handy Way to Analyze

Protocol analyzers are necessary for tests above the physical layer, such as the data link. The most powerful protocol analyzers, like Network General's Sniffer, provide a tremendous amount of information about the network. They can decode the packets, determining how well a user's applications interact with the network. However, protocol analyzers required skilled people who can interpret this information.

"Once people buy a Sniffer, they think that will tell them everything that's wrong with their network and they won't need any knowledge about what's going on," Syrvalin said. "But it takes a sophisticated knowledge level to filter through the decodes and understand how the products work. When people buy packet decodes, they think it's the end of the line, when the key is training people to use the tools."

Handheld analyzers are hybrids between cable testers and protocol analyzers. The tools combine testing found in network management consoles or client work stations with networking monitoring and cable testing, complementing protocol analyzers. The handheld devices come in handy for troubleshooting on the run.

"You can't lug a desktop device to an individual port to see if the user has connectivity to the print server," said Eric Olson, product manager for Scope Communications, Inc., a testing firm in Marlborough, Massachusetts.

People debate what role the handheld analyzers should play in troubleshooting. Some people like Fabbi, the Gartner analyst, say handheld analyzers are useful for professional testers, but have little place in the end-user environment except for a few large distributed environments.

"If a company has a tight relationship with their contractor and an ongoing service maintenance, you probably don't need one," Fabbi said. "If you're on your own, having the odd one around is not a bad idea."

A small but increasing number of end-users, however, are making these devices their first choice for troubleshooting. Roy Lucas of Polaroid, for example, uses a Scope handheld data

analyzer. The product allows him to determine if a problem is focused on a PC, which happens most of the time, or is in the wiring.

"Most companies don't use these and it causes a tremendous amount of confusion for people doing desktop support," Lucas said. "They don't know if they have a network problem, a network card problem in the PC, or a software problem." The handheld analyzer provides a great deal of information, such as if a jack wiring into the PC is working or if a bad IP address is assigned to a card. "Without the analyzer, they'd be scratching their heads and swapping everything out," he said.

Effective troubleshooting can mean breaking down assumptions. Lucas, for instance, has held training sessions about handheld analyzers for his desktop personnel. The admittedly few desktop troubleshooters who now use the device have taken to it.

"The challenge is getting them to try something different," he said. "Desktop people want to service applications. They have work up to their eyeballs, they're pushed and under-resourced."

Advocates of the new equipment say the paybacks are well worth the time spent learning to use it.

Stephen Hultquist, president of Worldwide Solutions, does some of the most difficult cable troubleshooting — at trade shows. In his experience, troubles are either end-user configurations or the physical network. Trade show networks are often installed by people who do telephony support. "They don't understand that terminations for category 5 for 100BaseT have quite a few more restrictions than when terminating RJ11 jacks for analog telephone," he said.

Hultquist uses a Fluke LANMeter and OneTouch Network Assistant, a portable diagnostic and troubleshooting tool. The devices plug into the same drop to do basic layer 3 diagnostics, such as ping tests and trace route tests to determine connectivity.

"If that works, I figure we're in good shape," he said. "If it doesn't, I use a cable tester to run a cable map and category 5 compliance tests to see what kind of problems we have. I can find almost any problem as simply as one-two-three." ◇

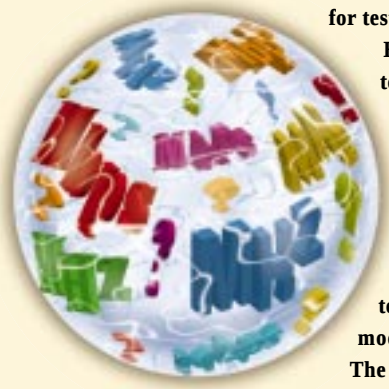
Mega Confusion Over MHz and Mbps

If you're like many people, you might be concerned whether you can run 155 over UTP cable tested to category 5 requirements. ATM promises to become a major factor in high-speed LAN applications. However, category 5 cable is only certified to 100 MHz. The numbers don't seem to add up: how can 100 support 155?

The answer is category 5 cable is quite sufficient for ATM. But the fact that people continue to ask this question reflects widespread industry confusion between two different, albeit related, measures: megahertz (MHz) and mega bits per second (Mbps). In cable marketing materials and industry discussions, these measures are often incorrectly used as if they are interchangeable.

This has led to perplexity about what type of technology different categories of wires can support and what type of tests need to be run on those wires. "In all my years as a marketer, I have never run into a situation that has caused so much confusion," said Huge Draye, marketing manager for media testing for Fluke Networks Division, a testing firm in Everett, Washington. "People are mixing apples and oranges all over the place."

Let's look at the differences between MHz and Mbps. The physical cable plant should be specified in terms of the frequency of the cable it can support, which is represented by MHz. The Telecommunications Industry Association (TIA) specifications 566A defines the pass/fail limits for testing category 5 cable for up to 100 MHz.



However, the 155 in ATM 155 has nothing to do with MHz. The 155 refers to mega bits per second (Mbps), which is the speed at which data can be transferred over the network. Draye makes an analogy between Mbps and PC modem speeds. Just because you upgrade to a 56K modem on your desktop, you don't have to upgrade the copper telephone wire the modem signal is going over.

The relationship between MHz and Mbps is in the encoding. Some people believe the current confusion is due to the fact that earlier encoding systems required almost the same data rate and signaling rate on the wire. Ethernet and token ring systems used an encoding called Modified (or Differential) Manchester, in which the requirements for MHz and Mbps were the same.

Using Manchester encoding, 10 Mbps Ethernet required 10 MHz transmission capabilities to the cable; 16 Mbps token ring required 16 MHz transmission capabilities to the cable. Given this, it's understandable some people would assume 155 Mbps ATM would need 155 MHz transmission capabilities.

In reality, though, higher-performance networks use a different type of encoding that is much more efficient. The NRZ (Non-Return to Zero) encoding used for ATM and 100BaseX doesn't use a one-to-one ratio of MHz to Mbps. Using NRZ encoding, ATM 155 requires a maximum transmission rate of only 88 MHz, well before the 100 MHz limit of category 5.

So the next time someone tells you a cable is rated to 100 Mbps, ignore it. The claim is meaningless. "People are making a mistake in listening to these marketers with their 300 and 350 and 650 Mbps crap," said Frank Mara, a consultant in Sandwich, Massachusetts. "They are confusing megahertz with megabits and don't understand transmission physics."