AppleTalk Network Problem and Fix: A Case Study

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This article describes a problem with a school lab network and how the problem (after two attempts) was solved. The network has a PhoneNET backbone of 2100 feet with a repeater in the middle. Workstations include 25 Apple IIe systems, 3 Macintosh systems, 1 Apple IIGS, a few AppleTalk ImageWriter II printers, and one AppleTalk ImageWriter LQ printer. Devices are connected off of the backbone with RJ-11 jacks/wires as small trunks.

In the diagrams below, nodes (jack boxes on backbone) are the numbers 1 through 22. R denotes a Farallon repeater. "f.s." denotes a Macintosh SE with HD20 SC File Server.

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     1-2-3-4-5-6-7-8a=R=8b-9-10-11-12-13-14-15-16-17-18-19-20-21-22
                 |
               f.s.
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The problem was that prior to installation of the repeater, various Apple IIe systems would only intermittently be able to start up off of the server ("f.s." located at node 7); particularly, those toward the ends of the backbone.

Solution #1: Adding a Repeater

A repeater was installed by separating node 8 into 2 nodes (8a and 8b) and placing the repeater between the two nodes. While installing node 8, the engineer
noticed a loose, but electrically continuous connection, within the RJ-11 box. Thinking nothing of it, he installed the repeater and tightened the screws. All worked great--everyone gave all of the credit to the repeater (Farallon had said, all along, that we shouldn't need one with only 2100 feet of backbone. We had to try something, so we bought one.)

4-5 Weeks Later

A teacher's class was disrupted by a loud "popping" noise from an Apple IIe in her classroom. The screen inverted, became garbled, and returned to normal. Coincidentally, the network quit working, and machines could no longer start up on the network--everything went back to the way it was four or five weeks earlier.

This was too much of a coincidence and pointed to the repeater. (All the board, computer, and ohmmeter checks of the backbone tested fine.) Furthermore, after taking out the repeater, the engineer got a few more of the machines to start. All the machines within 700 feet of the repeater and the file server started up regularly.

After many hours of lost labor time and much frustration, the engineer took the only approach that he could think of to narrow down the cause of the problem; he asked for a replacement repeater. But once installed, there was no change. Additional tests, inspections, ohm checks, continuity checks, and termination checks failed to give a clue.

Solution #2: Damaged, Loose Wiring

Although the engineer had been warned repeatedly to make sure that there were no extra resistors on the network, after seeing the ohmmeter readings of the backbone, he defied logic and put another 100-ohm resistor where the highest resistance measurement was taken (node 15: 80.1 ohms with the repeater installed). The result: five more machines came up (nodes 16 through 20).

He decided to put in another resistor (maximum of four, now), and there was no further change. This came as a surprise, because node 20 now started with lightning speed (it was sluggish before), while node 21 just sat there looking "dumb." That's when it was clear that it was time to crawl along the wires again to see what was going on.

The loose wire idea came up, so an inspection was made of node 21. There it was. The pair of wires coming into the box (#21) had been damaged to the point that they were "broken" but not fully severed. This pair had been all but fully separated from the wiring posts. This fit the confusing symptoms of passing the ohmmeter checks, but possibly causing data reflections in an AC mode setting. After reconnecting the wires, all was fine. (Reflection checks still passed the requirements.)

The installation at the box did not have a complete plastic molding installed to protect the wires from the young students' feet. The wire had been kicked and stretched to the breaking point. A plan for molding installation is in the works.

The extra resistors were removed; everything worked fine, but a little slower on the ends. One resistor was placed at the high-resistance point again (node 18) with the result that the end units start up very fast (as if they were next to the server).

In retrospect, it appears that the repeater was not needed in the first place. Its installation could have been avoided if the wires had been

tightened. (Reminder: ohmmeter checks can still test okay on bad or loose connections. It's the AC component, the +5V and -5V, that counts). However, the school is planning to add a new lab to the network and will eventually need the repeater anyway.

It appears that all of the other coincidences were merely coincidences. Most likely, a power surge occurred that disrupted the computers. The cable could have been kicked even before the surge, because the low traffic on the network at the time may have caused it to go unnoticed).

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