Users frustrated by network problems need troubleshooting techniques that allow them to find the source of the problem and solve it. This article covers some common-sense methods for solving network problems and even shows how to improve network performance. Though specific references are made to AppleTalk®, most of the techniques may be used for any network.

Is it a network problem?

The first step is to determine if the network is causing the problem. The network is probably not at fault if the problem:

- Can be duplicated on a device that is removed from the network.
- Occurs only within a certain software application program.
- Is caused by a hardware failure.
- Occurs because of an operator error.

It is probably a network problem if:

- A network service fails.[1]
- One or more devices cannot communicate.
- The network provides intermittent response or access.
- There is a noticeable degradation of network performance.

[1] A network service is an administrative service that is run from a workstation node. An example of a network service is queue management at a print server.

Troubleshooting tools

In order to provide on-going support for your network, it is important to maintain a **network map**. A network map shows where cables run and lists the software and hardware configuration of each node. It should include:

- Network specifics like the type of network, protocol, type of media (i.e., cable), zone names and ranges. Also include related information on routers, bridges, file servers, printers, etc.
- A description of the hardware and software on each workstation. For example, Apple Macintosh® Quadra®, 16 MB RAM, 175 MB hard drive, running AppleTalk, using an Asante network interface card.
- The name of each device as it shows up in each network zone. If using TCP/IP, show the internet address of each device.
- Physical landmarks that allow the troubleshooter to find the named workstations. (A map showing the functioning of a network may not provide any clues to the whereabouts of a machine.) Include prominent landmarks like water fountains, doorways, soda machines, etc.

Since networks tend to grow, it is advisable to make an easily editable map.

A **network log** is another necessity. It provides a place to enter network modification as well as past problems and solutions. It should include the date and any specific changes made to a network, for example:

- AppleTalk Driver 58.1 upgraded to 58.1.2 on all workstations, 2/2/94.
- New workstation added to network zone ‘Art Department’, 6/23/94.
- Network down due to cabling problem between Art Department and Editorial zones, 7/22/94.

Common network problems

Two of the most common complaints are sluggish performance and ghosting. (Ghosting is the intermittent loss of network devices or network services.) In general, problems with new installations can often be traced to faulty or loose cabling, or, a configuration problem with either the hardware or software. In an existing installation that has been up and running successfully, problems are generally due to a hardware failure, a recent change in the software configuration (such as an update to a program), or the introduction of a new operator who is unfamiliar with network fundamentals. The list below shows some potential problem areas:

- Be sure that all the devices are on. This includes not only printers but bridges, routers, gateways, etc.
- Check the network for bad or missing terminators,[2] or loose or bad T-connections. Check all cables, connecting boxes, and cable extenders to ensure they are not disconnected or damaged.

  If only some machines on the same cable segment can't see a RIP or file server, the problem may be a bad cable or connection on that segment. Using your network map to note which machines can no longer see the RIP or file server, you may be able to guess the location of the break immediately. You may also use Inter•Poll® (or System 7 File Sharing) to see if adjacent machines can communicate. If two machines can't communicate, the cable connecting them is often the cause of the problem.

  On some physical networks, such as coaxial Ethernet, a bad cable can bring down the entire network on that segment. In that event, break the network into two smaller segments by terminating it near the middle. Check each of the smaller networks. Usually, one will function and the problem will the narrowed down to the other half of the network. Continue this "binary search" method until you find the exact location of the problem.
- Do not exceed network specifications for maximum cable length per segment, or number of devices per network segment (or per network).[3] Do not exceed the maximum number of hops on an internet[4] (after 15 hops AppleTalk packets are discarded).
- Check for interference from surrounding machinery. Fluorescent lighting fixtures, elevators, coffee machines, and refrigerators can produce high amounts of electromagnetic interference. Avoid running cable near them.
- Check for the possible computer viruses, worms or Trojan Horses.
- Check all drivers for incompatibility. Ensure that everyone is using the same and, if possible, the latest versions of the drivers for the LaserWriter®, the network interface card (NIC), AppleShare®, etc. As of January 1994, the up-to-date versions are:

  Apple Operating System 7.1.1
  AppleShare Server 3.0.3 on 68030 Macintoshes
  or 4.0 on 68040 Macintoshes
  Apple Internet Router 3.0
  Apple EtherTalk Driver 2.5.6
  AppleTalk Driver 58.1.2

  Please note that you must be using Network Control Panel 3.0 or higher in order to see the version numbers displayed for AppleTalk and EtherTalk.
- Make sure all devices are using AppleTalk Phase II.
- Check for INITS, CDEVS, RDEVS, etc.,[5] that are known to cause problems, like screen savers, or ones you are not familiar with and remove.
- Check for operator error. It is possible that an inexperienced user is the source of the problem. For example, inexperienced users sometimes set the network control panel for LocalTalk and then don't understand why they can't see the Linotype-Hell RIP that is on Ethernet.

[2] Some networks do not require terminators. For example, Farallon's PhoneNET is not self-terminating. LocalTalk connector boxes are self-terminating, but LocalTalk cables are not.

[3] LocalTalk is a shielded twisted pair media that can support up to 32 nodes at speeds of up to 230,400 bits per second. The maximum length is 300 meters.

EtherTalk is a protocol that can run on a variety of media. When used with a coaxial media it can support up to 30 nodes per 1,640-foot segment at speeds of up to 10-megabits per second. The maximum length is 3,281 feet.

[4] An internet, as opposed to The Internet, is the connection of two or more networks by a router. The networks joined by a router may be of the same type (e.g., all Ethernet) or different types (LocalTalk/Ethernet/Token-Ring). A hop is the crossing from one network to another. When you access a file server in another department you may go through three routers or three hops to get there.

[5] An RDEV is a Chooser Extension such as the LaserWriter or AppleShare Icons. A CDEV is a Control Panel Document such as the Mouse Control Panel. An INIT is a System Extension such as File Sharing system extension.

- If the problem is related to routing, be sure that any routers on the same cable segment are configured with the same AppleTalk zone range and name. See if your routers are seed or non-seed routers. Double-check that no device such as an EtherTalk®-to-LocalTalk® print box is acting as a router. (You can tell that a problem is related to routing if a particular zone does not show up, or if devices from that zone are not showing up.)

Diagnosing AppleTalk problems

There are several commercial products available to diagnose and debug problems with AppleTalk networks, they include:

- Inter•Poll from Apple Computer, Inc. allows you to search for and report on active devices connected to your network.
- EtherPeek® and LocalPeek® from The AG Group enables you to perform packet analysis on EtherTalk or LocalTalk networks

Timbuktu, Traffic Watch II and GraceLAN are other products that may be useful in your particular network environment. Hardware devices like cable scanners can also be useful in troubleshooting. In more modern 10-Base T networks, newer intelligent hubs offer, as standard or optional, management software using SNMP (Simple Network Management Protocol).

When troubleshooting advanced network problems (depending on the nature of the problem), it may be necessary to obtain a packet trace. A packet trace, done with a program like EtherPeek, captures some or all of the AppleTalk dialogue on the network. The packets that are sent between your computer and the RIP are particularly important in troubleshooting.

LinoServer users have access to several AppleTalk and general network troubleshooting tools which are built right into the product.

Improving network performance

Backbones may be used on large networks to improve performance. However, many prepress shops have small networks that do not necessarily benefit from these techniques. Small networks generally benefit more from improved hardware. Some possible upgrade options are:

- Upgrading from LocalTalk to EtherTalk. (Requires new network interface cards and cabling.)
- Adding higher performance workstations and servers.
- Adding additional shared resources, for example, an extra printer. This can help solve a throughput bottleneck. If ten people are trying to print to the same printer, that means that nine people are waiting. Additionally, every time you print a job, you establish a dialogue between your computer and the printer. That dialogue translates to traffic on the network. (Your computer asks the printer if it is ready, the printer says, ‘No I’m printing’, then your printer asks again, etc.)
- Eliminating the use of routers for devices like 300 dpi laser printers or for modems/fax machines can result in a significant performance improvement. If possible, consider upgrading isolated or remaining nodes from LocalTalk devices to EtherTalk.
- Replace bridges with routers. Routers isolate traffic to a specific portion of the network, thereby reducing traffic in other network areas.
- Upgrading software, particularly network-related software, to the most current version available.
- Running router or print server software on a dedicated computer.

The typical Linotype-Hell customer usually does not suffer from performance problems associated with excessive traffic or not enough shared resources, but if it is a large corporate network, the network design may be the fault.

Finally, network performance can suffer if the server and workstation hard disks are not working at optimum levels. Check them regularly with a utility that diagnoses for disk problems (for example, Norton Utilities®).

Network performance 'don'ts'

Many users can improve network performance without spending a dime. They need only avoid some bad work habits.

- Macintosh users should not leave the Chooser on screen for long periods of time. The Chooser is constantly querying the network for printers or other devices that may have just been turned on. This creates unnecessary network traffic. If someone opens the Chooser and then goes to lunch, all the other people on the network will notice a slowdown. And, if that person uses a screen saver, you can't even see that they left the Chooser open.
- Do not stay logged onto a file server that you do not plan to use for a while. Anytime someone on the network adds, deletes or modifies a file on the server, the network updates your server directory. This creates unnecessary network traffic that can result in network slowdowns.
- Do not run applications off the server.
- Where feasible, do not pull fonts off the server. Keep your most commonly used fonts on your workstation.

Network printing problems

Network printing problems can be broken down into three areas:

1. You cannot see the RIP/imagesetter from your workstation – The most common cause for this is an improper dial setting on the RIP. For example, if you are using a Macintosh that is configured (in the Network Control Panel) to use EtherTalk Phase II, the dial setting on the RIP should be 6.(For a RIP 30 and RIP 40, the proper EtherTalk setting for RIP 3 and RIP 4 is 4. If the RIP dial is set to 0 (LocalTalk), the RIP/imagesetter will not show up in the Chooser. (One exception: You are running a router.)

Another possibility is the print server. It may be setup to intentionally hide the printer. For example, in an AppleTalk network, the LaserWriter icon polls the network for devices of the type 'LaserWriter'. Print servers can download a PostScript™ command that changes the type of the RIP to something other than 'LaserWriter'. This is usually done to prevent people from printing interoffice memos on film or RC paper.

If neither of these is the cause, there may be a problem with the integrity of your network. For example, there may be a bad or missing terminator, or perhaps someone has turned on a router (which, in effect, changes the network configuration).

2. You can see the RIP/imagesetter from your workstation but you cannot print to it – First you must answer the following questions:

- *Is the problem application-specific?* For example, if you cannot print from Aldus PageMaker® but you can print from other applications such as Microsoft® Word, then you need to double-check the configuration of Aldus PageMaker.
- *Is the problem job-specific?* For example, if you can print all other jobs but not this particular one, then you might try to trace the problem to a specific font or a graphic in the job. A process of elimination can usually pinpoint the problem (see Troubleshooting PS errors)
- *Is the problem platform-specific?* For example, if you can print from all of your computers but one, then you most likely have a software or hardware configuration problem. A network log is extremely helpful with this type of

problem. With it, you can determine the last thing that you did on that workstation before the problem surfaced. If the problem cannot be traced to a specific event, you should perform a virus check, and also see that current versions of software are being used on all machines.

3. You have problems printing through a print server – If you can't print through the print server, but you can print directly to the RIP (bypassing the print server), then there are two possible problems. The print server is either having problems spooling the job into the print queue, or de-spooling the job from the print queue to the RIP.

If the problem is spooling the job into the print queue, then you must troubleshoot the front-end side (i.e., the Macintosh or PC). Consider regenerating a new queue, or checking your front-end for problems.

If the problem is de-spooling, make sure the print queue is not on-hold, and double-check the print queue configuration (it should be pointing to the correct printer). If this does not solve the problem, watch the LED indicators on the RIP while the job is processing. Is the RIP waiting for data? Is there a PostScript error? Try placing the queue on hold in order to capture the PostScript code being sent to the RIP to determine if that is the problem.

Conclusion

The flow chart on the page six shows an action plan for some typical network problems. If you are still experiencing problems, call the Technical Assistance Center (800-633-1900). Be prepared to supply the information shown in the box below.

Calling the Linotype-Hell Technical Assistance Center (800-633-1900)

The technical assistance center (TAC) will be better able to help you with a network-related question if you have the following materials ready:

1. Your Linotype-Hell service contract number
2. Copies of your network log and network map.
3. The answers to the questions posed in the *Network printing problems* section on pages 3 and 4.

Resources

Several excellent books provide detailed information on AppleTalk:

- Inside AppleTalk, 2nd Edition, by Gursharan S. Sidhu, Richard F. Andrews, Alan B. Oppenheimer, Addison-Wesley Publishing Company, Inc., ISBN 0-201-52345-0.
- MacWorld Networking Handbook by Dave Kosiur and Nancy E.H. Jones, IDG Books Worldwide, Inc., ISBN 1-878058-31-2.
- Planning and Managing AppleTalk Networks by Apple Computer, Inc., Addison-Wesley Publishing Company, Inc., ISBN 0-201-52345-0.
- Troubleshooting Macintosh Networks by Kurt VanderSluis and Amy Eissa, M&T Books, ISBN 1-55851-315-9.

These books provide information on TCP/IP:

- Internetworking with TCP/IP: Principles, Protocols, and Architecture by Douglas Comer, Prentice-Hall, Inc., ISBN 0-13-470154-2.
- TCP/IP Network Administration by Craig Hunt, O'Reilly & Associates, Inc., ISBN 0-937175-82-X.

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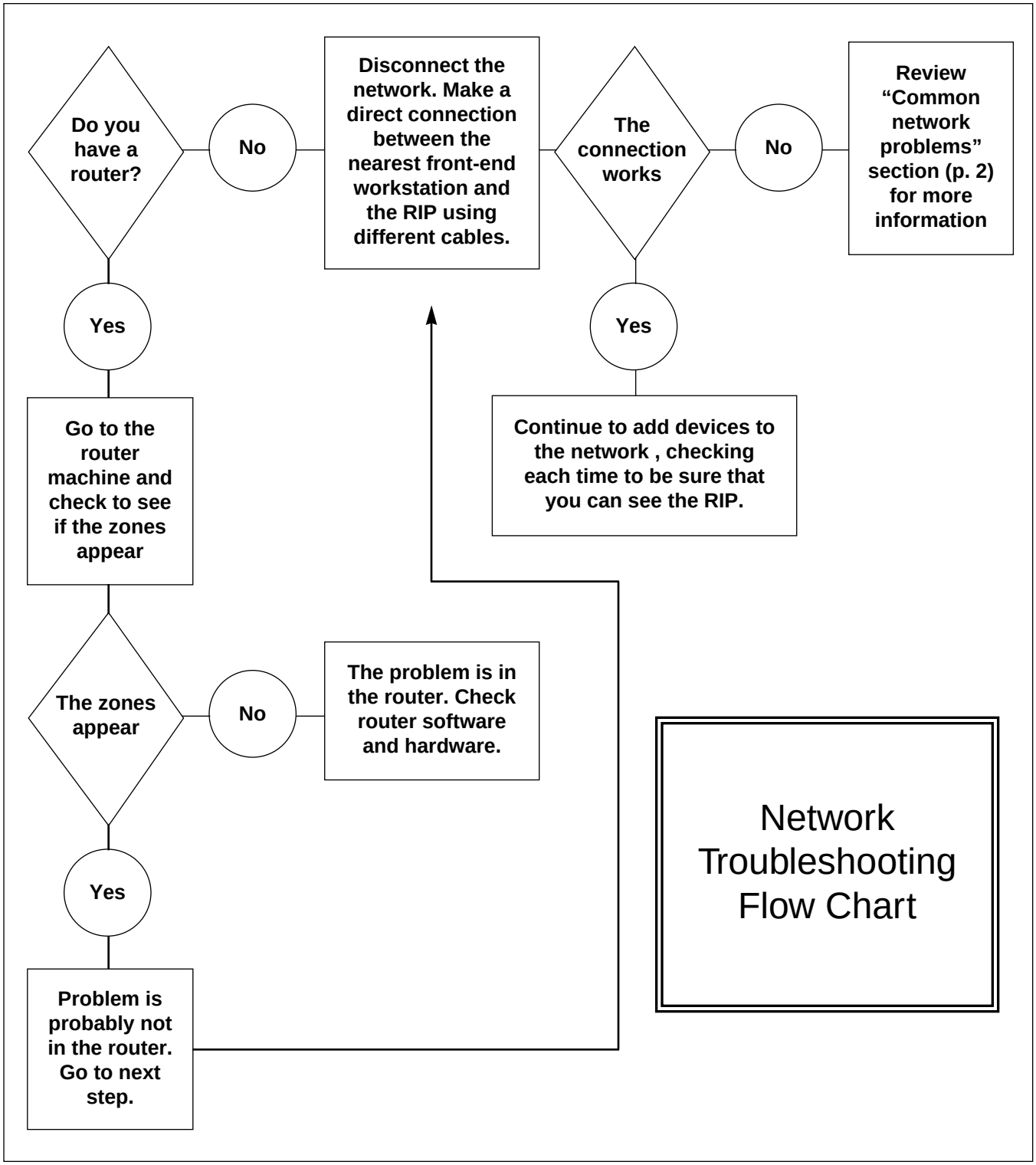

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(For subscription information on the Linotype-Hell technical information series, please call 1-800-842-9721.)

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