EtherTalk to LocalTalk Routers

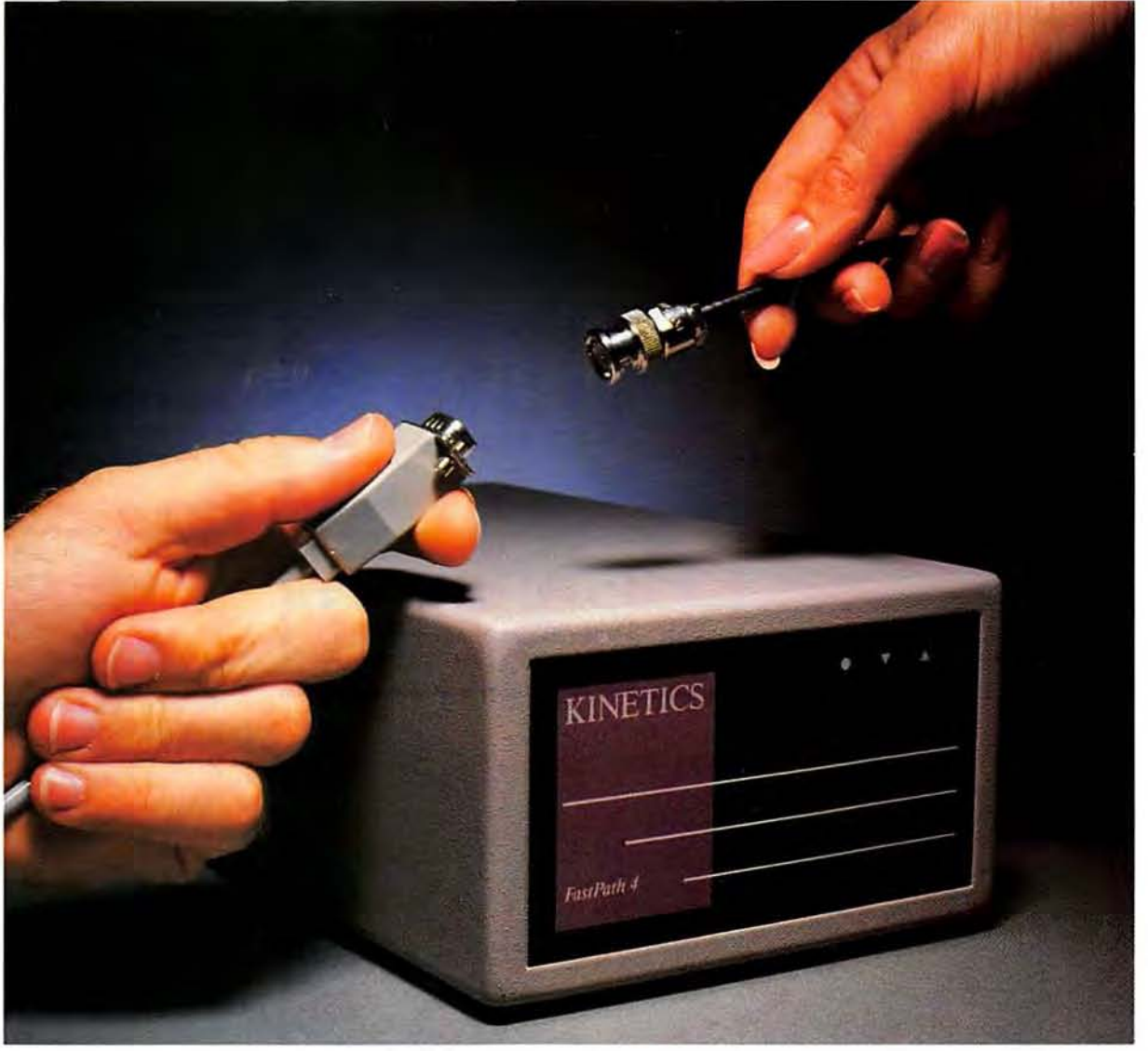
If you want to connect a LocalTalk network to Ethernet, you'll need one of these routers.

BY KEE NETHERY AND THE MACUSER NETWORKSHOP STAFF

You've just converted your very sluggish AppleTalk network to Ethernet, only to discover that printing to your LaserWriter is not possible. The reason? Macs on high-speed Ethernet networks can't communicate directly with printers — or other Macs — on lower-speed LocalTalk networks. LocalTalk, the network connection built into Macs and LaserWriters, sends and receives network signals at a mere 230,400 bps (bits per second), whereas Ethernet transmits at 10 million bps (see "Are You Ready for Ethernet?" in this buyer's guide). Since you can't put an EtherTalk card into a LaserWriter, your printer will gather dust until you install a *router* to manage the speed conversion necessary for data transfers between EtherTalk and LocalTalk networks (see Figure 1).

EtherTalk-to-LocalTalk routers are also key ingredients in two other network scenarios. If you have an AppleShare server on an Ethernet network and you want to access its files from a Mac on a LocalTalk network — a common situation in corporate environments — you'll need a router (see Figure 2). Or you may want to improve the snail-like performance of a sprawling series of LocalTalk networks by installing an Ethernet backbone (see Figure 3). Again, you'll need a router for each LocalTalk network you hook up to Ethernet.

At its simplest, a router connects two or more networks to create an internet, or "network of networks" (see "How to Set Up the Perfect Network" in this buyer's guide). An internet maintains distinct network addresses for each network it contains. On any network within the internet, data flows between computers, printers, and other devices (referred to as *nodes*) in chunks called *data packets*. A router straddles the junction of two or more networks and "listens" to the activity on all the networks attached to it. When a data packet from a node on one



network is bound for a node on another network, the router takes the packet from the sending network, stores it in a holding area (called a *buffer*), and then forwards it to the second network when there's a lull in that network's activity. (See "Network Glossary" in this buyer's guide for definitions of unfamiliar terms.)

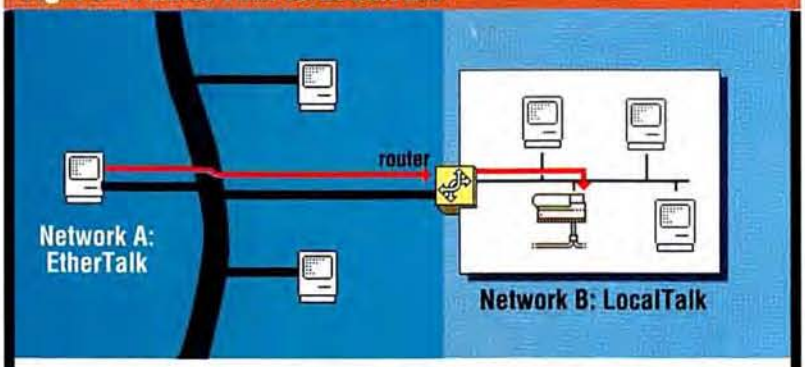
If it were that simple, you could choose a router solely on the basis of price and performance (how fast a router sends packets from one network to another). But nothing in networking is simple, alas, and routing is no exception. MacUser NetWorkShop took an in-depth look at five EtherTalk-to-LocalTalk routers, ranging in price from $295 to $2,795. Apple's AppleTalk Internet Router and Infosphere's Liaison are software packages that run on the Mac. The Cayman GatorBox, Novell Kinetics FastPath 4, and Shiva EtherGate are dedicated hardware boxes. We ran speed tests and found that throughput varies from router to router. But the special features a router has to offer — dial-up modem access, security, maximum number of networks, cost, and types of network protocols supported — can be much more significant than speed when you are creating an internet.

Router Features

Routers vary in the type and number of networks they support. Of the five routers we tested, all support connection to at least one LocalTalk and one EtherTalk network. All the routers are compatible with each other, so you can mix them according to your needs. You can put two or more routers together to construct a far-reaching internet of EtherTalk and LocalTalk networks. Some go further still and let you establish a gateway to UNIX-based TCP/IP (transmission control protocol/internet protocol) and VAX-based DECnet networks.

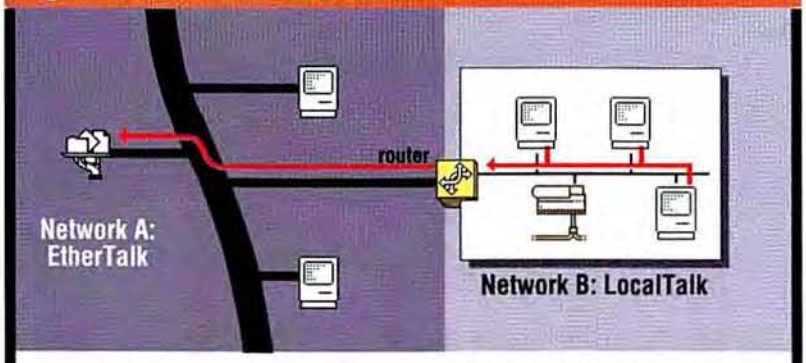
Whether a router's functions are carried out in software or hardware, it has software you must correctly install on a Macintosh or into the hardware box and configure with network information specific for your internet — network addresses, for example. You must also

Figure 1: EtherTalk to LocalTalk



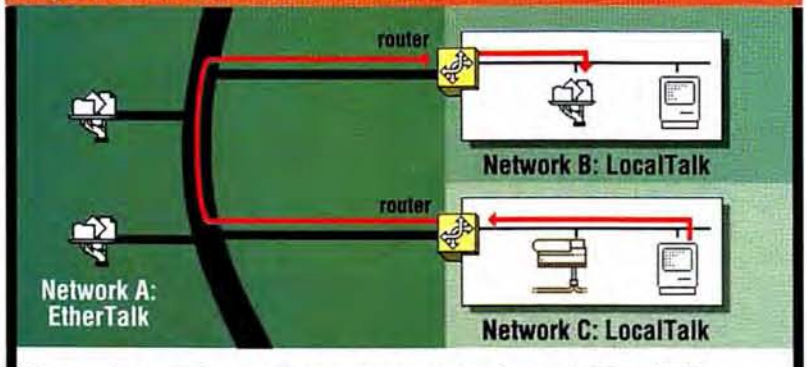
If your Mac is on an EtherTalk network, you'll need a router to print to a LaserWriter (or to communicate with other devices on a LocalTalk network).

Figure 2: LocalTalk to EtherTalk



Macintosh computers on LocalTalk networks often need access to AppleShare servers on EtherTalk networks. A router handles the required speed and protocol conversions.

Figure 3: EtherTalk Backbone



You can improve the performance of a sprawling internet of LocalTalk networks by connecting them (with routers) through an EtherTalk backbone.

connect the network cables to the router. With a software router, these connections are to ports in your Mac; with a hardware router, you make the connections to ports in the box itself.

Software Routers

AppleTalk Internet Router. This software router can support up to eight network connections, depending on the number of expansion slots available in your Mac. You can attach two LocalTalk networks, one to each of the Mac's serial ports (printer and modem). The Internet Router comes with a Phase 2 Upgrade Utility that lets it communicate between AppleTalk Phase 1 and Phase 2 networks (see the "AppleTalk Phase 2" sidebar).

If you run the Internet Router on an SE or SE/30, you're limited to one EtherTalk or TokenTalk network. If you have a Mac II, IIx, IIxi, or IIfx, you can connect up to six EtherTalk or TokenTalk networks, one for each NuBus card you install. On a IIcx or IIci, you can attach only three such networks, since these models have only three NuBus slots. (Unless you have a IIci, you'll probably want to put a video card into one of these slots. Don't try to save the cost of a monitor by using Farallon's Timbuktu for remote monitoring. It's all

AppleTalk Phase 2

If you have a sprawling AppleTalk network, fashioned over the course of time, you're no doubt painfully aware of AppleTalk's 254-node limit. You don't have to be a member of the Fortune 500 to hit that ceiling quickly, what with LaserWriters, network modems, AppleShare servers, and mail and print servers — plus all your Macs gobbling up node addresses.

Relief is in sight, however: AppleTalk Phase 2 enables an EtherTalk internet to contain more than 16 million network addresses (in theory, anyway). Phase 2 also streamlines router-to-router communications and lets Macs connect to token-ring networks (see "Finally Phase 2," November '89, page 248). As a network user, you may not be fazed by the changes, but if you plan to buy an EtherTalk-to-LocalTalk router, grab a pencil and take notes — you won't want to mess this up.

For starters, networks in AppleTalk Phase 2 can have more than one network address. Phase 1 allows 254 nodes per network number, and only one network

but impossible to troubleshoot router problems without a monitor actually attached to the Mac.) You can password-protect access to the Internet Router configuration DA (more on this DA later), and you can always secure the Mac the low-tech way, by locking it in a closet. You can operate the router in the background of a print-, file-, or mail-server Mac, but if you do so, you should expect reduced performance, depending on how active the server is when the router is busy.

Infosphere Liaison. Liaison supports two LocalTalk connections via the Mac's printer and modem ports, and it also supports one network-interface card. The serial ports can be connected to LocalTalk or FlashTalk networks; the network card can be either Ethernet or Arcnet. (FlashTalk is a speedier version of LocalTalk available from TOPS; see "Breaking the Speed Limit," October '89, page 246.) Liaison is an economical alternative when run in the background of a file- (or other-) server Mac, but again, depending on how active your server and router are at any given time, both may display diminished performance.

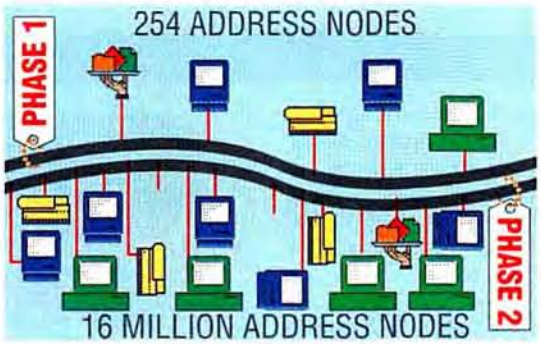
Liaison's key feature is its dial-up capability. If you attach a modem to a Mac

Table 1: Features of Software Routers

	Apple AppleTalk Internet Router	Infosphere Liaison
Mouse rating	★★★★	★★★★½
List price*	$399	$295
Comments	Fastest. Can create a large internet with EtherTalk and TokenTalk. Poor technical support.	Fast, consistent response. Easy installation. Dial-up capabilities. Great technical support. Excellent entry-level router.
Version number	2	2.0.6
Phase 2 support	yes	no
Mixed Phase 1 and 2	yes	no
Cabling support†	thick or thin coaxial, twisted-pair	thick or thin coaxial, twisted-pair
Configuration protection	password	password
Gateway functions	none	none
Hides resources	no	zones only
Modem capabilities	none	dial in, dial out
Dial-in security	NA	password, user authentication
Number of ports	2 LocalTalk, 6 Ethernet§	2 LocalTalk, 1 Ethernet
Warranty (media only)	90 days	90 days**
Technical support	authorized dealers	unlimited, free
Manufacturer	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014-6299 (408) 996-1010	Infosphere, Inc. 4730 S.W. Macadam Ave. Portland, OR 97201 (503) 226-3620

*Doesn't include Mac.
†Cabling support depends on installed network card.
§Depends on available slots in Mac. Also supports TokenTalk.
‖Also supports FlashTalk and ArcTalk.
**30-day money-back guarantee if bought directly from Liaison.

number per network cable. AppleTalk Phase 2 allows *a range* of network numbers on the same cable. The result: An Ethernet cable can support thousands of EtherTalk nodes. (LocalTalk is still limited to 254.) For this to work, all the Ethernet cards and routers in your internet must be "in phase" — that is, they must all be Phase 2. Ultimately, all EtherTalk internets will be Phase 2, but at the moment, many AppleTalk internets are in transition. In addition, not all EtherTalk-card vendors have Phase 2 drivers, nor do all routers support Phase 2 protocols.

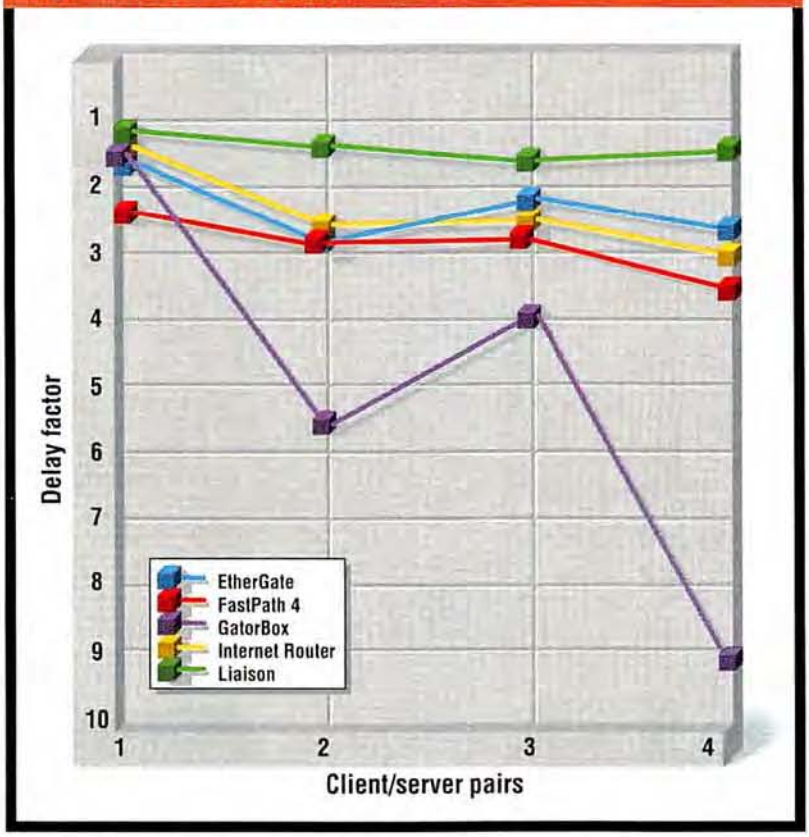


Phase 2 also differs from Phase 1 in its AppleTalk routing protocols. Every ten seconds, routers broadcast network-address information (a routing table) onto the internet. Phase 2 routers handle the details of this directory update more efficiently than do Phase 1 routers, but all routers on an internet must be Phase 2 to take advantage of the new scheme. Mixed Phase 1/Phase 2 internets are possible, if you have a router that can translate between the two protocols. But, as with EtherTalk cards, until all routers are Phase 2, they will all communicate by using Phase 1 protocols.

Of the five routers we tested, the FastPath 4 and AppleTalk Internet Router support mixed-phase networks; Liaison and the GatorBox support only Phase 1; and the EtherGate supports either phase, but not both simultaneously. (In April, Cayman Systems, Infosphere, and Shiva announced software upgrades for AppleTalk Phase 2 and mixed-phase network support. See the "On the Horizon" sidebar.)

When upgrading your internet from Phase 1 to Phase 2, remember these rules: To upgrade everything at once, you must upgrade your LocalTalk-to-LocalTalk routers, EtherTalk drivers for all EtherTalk cards, and your EtherTalk-to-LocalTalk routers. To make a gradual transition, you must first use routers that can support mixed-phase internets. As you upgrade each EtherTalk-to-LocalTalk router to Phase 2, you must simultaneously upgrade the drivers for all EtherTalk cards on the EtherTalk side of the router and all LocalTalk routers on the LocalTalk side. Until you've upgraded all affected devices on the internet, you will not get the benefits of Phase 2's capabilities.

Figure 4: Router Speed



Routers slow things down, even when you're transferring files to and from an EtherTalk network. Our test results show how much longer it took to transfer files between a client and a server Mac through each router, compared with sending the same files without a router. A 5 means that transferring the files through a router takes five times longer than if no routing were involved.

running Liaison, remote Mac users can access your internet. Likewise, users on the internet can dial out, and two AppleTalk networks can be linked via modem. The dial-in feature employs user-password protection coupled with dial-back confirmation of the telephone number from which the call was made. Liaison lets you hide networks from dial-in users, thereby limiting outside access to internet services.

Hardware Routers

Cayman GatorBox. The GatorBox has one LocalTalk port and one Ethernet port. With GatorShare software installed, the GatorBox gives Mac users seamless access to an NFS (Network File Service) file server on a UNIX platform — all you have to do is click on the AppleShare icon in your Chooser. GatorShare costs $1,995 over the $2,795 hardware price, however (see "Sharing: From Apples to Alligators" in the Bridges section, May '90, page 357). Even without GatorShare, the GatorBox has several useful features for UNIX connectivity. It supports KIP (Kinetics Internet Protocol, or "IPTalk"), which lets Macs access CAP (Columbia AppleTalk Package). CAP includes free UNIX-based, AppleShare-compatible file-server software that's used in many university environments.

Novell Kinetics FastPath 4. The Kinetics FastPath 4 also comes with one LocalTalk port and one Ethernet port. This is the fourth incarnation of the FastPath line, and the wisdom gained from its

On the Horizon

Even as we were testing, vendors were remodeling their routers, adding gateway features and support for AppleTalk Phase 2. Here are some important highlights.

Cayman Systems announced version 1.5 of the GatorBox system software. This free upgrade gives registered owners support for AppleTalk Phase 2 and mixed Phase 1/Phase 2 internets. It also enables *tunneling*, a networking technique that enables AppleTalk packets to move from one LocalTalk network to another over a TCP/IP backbone without EtherTalk. The Gator system-software upgrade also includes new network-management features, such as the ability to filter zones and hide devices on the network.

Infosphere released version 2.1 of Liaison, which supports AppleTalk Phase 2 and mixed Phase 1/Phase 2 internets. Liaison 2.1 supports up to five network cards in a Mac, including those for FlashTalk, ArcTalk, TokenTalk, and EtherTalk.

Shiva announced Internet Manager 1.46 software for the EtherGate. This release provides support for mixed AppleTalk Phase 1/Phase 2 internets. Support for TCP/IP should be available by early summer.

Two other vendors have unveiled new EtherTalk-to-LocalTalk routers. Dove Computer announced the FastNet AE ($2,295), a hardware router; and Network Resources Corporation (NRC) began shipping a software router, the MultiGate Mac ($795). (NRC is also now shipping a hardware router, the MultiGate 2000 [$2,395].)

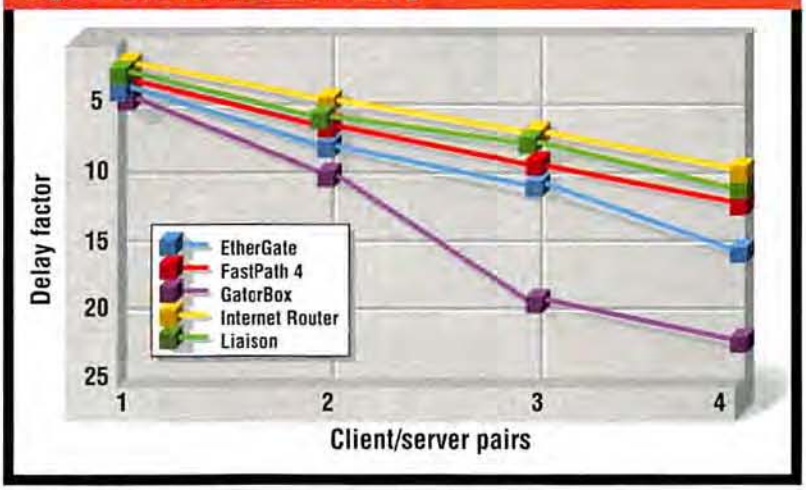
history shows. Like the AppleTalk Internet Router, the FastPath 4 can route LocalTalk Phase 1, Phase 2, or both. It comes with gateway software (K-Star) that lets you connect your Macs to both UNIX and VAX machines. (K-Star supports the TCP/IP and DECnet protocols.) The FastPath's management software lets you selectively hide networks, LaserWriters, or any other network service, but it has no password protection. (Considering how difficult the FastPath 4 is to configure, password protection would be overkill.)

Shiva EtherGate. The EtherGate contains one Ethernet port, and, unlike the other hardware routers, which have dedicated LocalTalk ports, it has two serial ports that can be connected to any serial device, including printers and modems. At press time, the EtherGate could support AppleTalk Phase 1 or 2, but not both simultaneously (see the "On the Horizon" sidebar for new releases).

When a modem is attached to one of its serial ports, the EtherGate allows remote users to dial in and connect to the internet. (With a pair of modems, two EtherGates can link geographically distant AppleTalk networks.) Both the configuration and dial-in access are password-protected, and you can shepherd dial-in users to designated networks. Shiva also offers software (DOS Dial-In 1.01, $99) that gives remote DOS users access to an AppleTalk internet.

If all your routers carry the Shiva label, you can configure and manage the EtherGate from any location on the internet, even if your internet spans the globe. Other routers require that you be at the physical unit or on a network directly connected to it.

Figure 5: Router Consistency



A router that responds consistently to network traffic keeps users happier than one that's supercharged one minute and bogged down the next. To ascertain router consistency, we measured the difference between the longest and shortest file-transfer times for each client/server pair. The GatorBox handled increased traffic very erratically — file transfers were actually faster when three client/server pairs were sending data than when only two pairs were in action.

Off to the Races

Just as different driving styles can affect the performance of a car, different internet schemes can tax routers in different ways. We looked at the three basic internet configurations that require EtherTalk-to-LocalTalk routers (see Figures 1, 2, and 3) and constructed test internets to put each router through its paces. Our EtherTalk-to-LocalTalk test looked at how the routers would perform if you were copying a file from an AppleShare server on EtherTalk to a Mac on LocalTalk. Our LocalTalk-to-EtherTalk setup looked at performance in the other direction. Finally, our two-router test (LocalTalk-to-EtherTalk-to-LocalTalk) simulated multiple LocalTalk networks attached to an Ethernet backbone.

Our base test platform consisted of a single client/server pair with a router in between. We used Mac SEs with Novell (Kinetics) Ethernet boards for the clients and Mac IIs with Asanté Ethernet boards for the AppleShare servers. We installed the software routers on both a Mac IIcx and an SE/30. For the LocalTalk-to-EtherTalk-to-LocalTalk tests, we made an Ethernet backbone using two of the same kind of router.

Nothing in networking is simple, and routing is no exception.

To test router performance, we set up a HyperCard stack on the client Mac that sent ten 1-megabyte files to the AppleShare file server and logged the results of these time trials. We added a second client/server pair to the configuration and sent files from both client Macs. We repeated the tests with three and four client/server pairs until we had eight Mac nodes on the test networks, four sending and four receiving a succession of ten 1-megabyte files.

We first timed file transfers between client/server pairs on a LocalTalk network with no routers, and then we used these results as a yardstick against which to measure router performance. Each router was tested in all three network

In May, NRC announced a TCP/IP option for the MultiGate 2000.) What looks interesting about both NRC products is that the router-management software is built on an Oracle database engine. Initial releases of the Dove and NRC routers support only AppleTalk Phase 1, but support for Phase 2 will follow at a later, undisclosed date.

Table 2: Features of Hardware Routers

	Cayman GatorBox	Novell Kinetics FastPath 4	Shiva EtherGate
Mouse rating	⭐⭐⭐	⭐⭐⭐⭐	⭐⭐⭐½
List price	$2,795	$2,795	$2,399
Comments	Slowest and least consistent. Not recommended for basic routing. Many gateway features.	Fast. Hardest to install. Good network-management features. Gateway features for UNIX and DEC connectivity.	Fairly slow, but very consistent. Dial-up capabilities. Serial features add versatility.
Software	GatorSystem, GatorKeeper	K-Star	Internet Manager
Version number	1.4.1	8.0	1.4
Phase 2 support	no	yes	yes
Mixed Phase 1 and 2	no	yes	no
Cabling support	thick or thin coaxial	thick or thin coaxial	thick or thin coaxial
CPU	68000	68000	68000
ROM (kilobytes)	2K	64K	16K
RAM (kilobytes)	1,000K	256K	192K, expandable to 768K
Configuration protection	none	none	password
Gateway functions	TCP/IP, Telnet, KIP/CAP, NFS*	Level-1 DECnet, TCP/IP, KIP/CAP	none
Hides resources	no	zones, printers	zones only
Modem capabilities	none	none	dial in, dial out
Dial-in security	NA	NA	password protection
Number of ports	1 LocalTalk, 1 Ethernet	1 LocalTalk, 1 Ethernet	2 serial, 1 Ethernet
Warranty	1 year	1 year	1 year
Technical support	unlimited, free	unlimited, free	unlimited, free
Manufacturer	Cayman Systems, Inc. 26 Landsdowne St. Cambridge, MA 02139-9732 (617) 494-1999	Novell, Inc. 1340 Treat Blvd., Suite 500 Walnut Creek, CA 94596 (415) 947-0998	Shiva Corp. 155 Second St. Cambridge, MA 02141 (617) 864-8100

*Additional software required for NFS (GatorShare, $1,999).

Routers slow things down — even with Ethernet.

configurations. The Internet Router proved the fastest, followed closely by Liaison and the FastPath 4. These three routers had similar performance characteristics (see Figure 4). The EtherGate was a bit slower, and the GatorBox typically took twice as long as the Internet Router to get files to the server.

Performance differences became apparent as we added client/server pairs. Liaison kept pace exceptionally well, but the GatorBox handled increased traffic very erratically (see Figure 5). When four client/server pairs were slugging it out through the GatorBox, the slowest file transfer took nine times longer than the fastest. This means that a busy GatorBox may take between 2 and 18 minutes, for example, to transfer the same set of files between nodes. Many users will be puzzled — and annoyed — by such behavior.

Confounded by the Configuration

It's great to have a fast router, but first you have to install it correctly, and router setup can be quite tricky. It's extremely easy for even a knowledgeable person to seriously mess up an existing internet. When this happens, users can't access their mail, printers, or critical data on file servers. They get angry — it's not a pretty sight.

Most AppleTalk network administrators have other duties and are elected to maintain the network "in their spare time." We asked a knowledgeable Macintosh and PC user to install each router in its simplest configuration for use as an Ethernet backbone. Our tester had had plenty of experience connecting printers and other serial devices to Macs and PCs but had never previously installed a router. Based on her ordeal, you should expect to expend some time and energy on initial setup.

The FastPath 4, with its voluminous documentation and unforgiving software, gets the lowest marks for setup ease. If you don't follow the manual closely, you'll get lost in the installation process. The on-line help is well designed, but it can't overcome the configuration software's deficiencies.

The EtherGate is somewhat easier to install, although the configuration software uses a Font/DA Mover-style interface that makes the task confusing. And the on-line "help" is irksome — it's loaded with marketing propaganda rather than useful information about the installation process.

Installing the GatorBox might be more understandable if you already know how to deal with TCP/IP networks. Actually, for basic EtherTalk-to-LocalTalk routing, you don't have to deal with TCP/IP,

but you'd never know it from reading the manual. Another major shortcoming is that if the power fails, the GatorBox "forgets" its configuration information and must be reconfigured — hardly acceptable behavior from such a critical network resource. (The other routers automatically put themselves back into action after a power failure.)

Setup ease improves with the Internet Router. It's a relief to have familiar Apple documentation, although the software interface isn't much better than that of the other routers. It uses an odd-sized font that's not part of a minimum system, so the display is clunky. And the EtherTalk Phase 1 and Phase 2 icons are so small that it's hard to tell them apart.

Installing Liaison is a snap compared with installing the others, with an intuitive interface and easy-to-follow instructions. The manual is unimposing, and the on-line help does its job.

Which Route to Take?

You can't compare these routers with each other on the basis of speed alone. Each has additional features that distinguish it from the others — support for other network protocols, security, dial-up modem access, number of networks supported. Before choosing a router, first think about your current internet and plan its evolution. If you picture a geographically dispersed internet, for example, with users telecommuting from their homes, make sure the router you buy can accommodate such a setup. Liaison and the EtherGate are the obvious choices for such a scenario.

In its most basic form, an EtherTalk-to-LocalTalk router lets you print to a LaserWriter from an EtherTalk network. If this is all you need in a router, perhaps a software solution that shares space with an AppleShare server is your best bet. Keep in mind that performance on the Macintosh running the router software may degrade for all other functions. But using a software router just for printing won't create too great a strain, and a software router such as the AppleTalk Internet Router or Liaison offers fast routing at an affordable price when run in the background.

Liaison and the AppleTalk Internet Router are also good choices for a first router. Install one of them on whichever server in your internet has the least traffic congestion, possibly your print or file server. Once it's installed, you can then determine whether you need to dedicate a Mac to this task or if you need a hardware router instead. Keep future expansion in mind; when you know what you want your internet to look like, it will be easier to choose the right router.

Kee Nethery, of Kagi Engineering in Berkeley, California, specializes in the design and optimization of complex AppleTalk networks. We would also like to thank Kirsten Malmquist, who suffered through the router installation procedures.

The Bottom Line

Infosphere's Liaison gave the most consistent performance.

The Novell Kinetics FastPath 4 is our hardware router of choice.

Since each of the routers we looked at offers a variety of features, it's difficult to single out the best one. "Best" means something very different to you if you need to connect to a UNIX machine on a university campus, for example, or if you're going to be storing files on a VAX. But based strictly on EtherTalk-to-LocalTalk routing capabilities, we can tell you which router provides fast performance at a reasonable price. Besides speed, you should also consider consistency. The amount of time it takes to route packets to the appropriate network shouldn't rise or fall dramatically with varying levels of activity on the internet. This being the case, let's point some fingers — or thumbs, that is — up or down.

Infosphere Liaison ($295) comes out ahead in the price/performance equation. Only the AppleTalk Internet Router was faster, and Liaison had the most consistent file-transfer times as internet traffic increased. When run in the background of a server Mac, Liaison is also the least expensive. For this reason, we feel it's a good entry-level EtherTalk-to-LocalTalk router. It's also the easiest to get up and running, plus it has dial-up capabilities. If you only need to print to a LaserWriter from an Ethernet network, run Liaison in the background of your print or file server and see how well it performs. If you find that performance bogs down for both the router and the server, think about investing in a dedicated hardware router.

For a fast, stable router that doesn't take up space or processing power on a Mac, we recommend the **Novell Kinetics FastPath 4** ($2,795). Once you've figured out how to properly install a FastPath, it's a solid performer. It also provides low-level UNIX and DEC connectivity and many network-management features, such as the ability to selectively hide zones, LaserWriters, and other Chooser-selectable resources.

In terms of raw speed, Apple's **AppleTalk Internet Router** ($399) is the fastest router we tested. If you have all six slots of a Mac II, IIx, or IIfx available, you can build a large internet of several EtherTalk, LocalTalk, and even TokenTalk networks. (We recommend leaving one slot open for a video card.) Like Liaison, the Internet Router looks inexpensive, but if you dedicate a Mac to the routing task, it quickly becomes pricey.

The **Shiva EtherGate** ($2,399) is a good choice if you need dial-in capability for DOS users or if you want to tap into the power of its serial ports and construct a geographically distributed internet.

Finally, we don't recommend using the **Cayman GatorBox** ($2,795) as an EtherTalk-to-LocalTalk router. Not only was it the slowest router we tested, but the response time was also unpredictable. In its favor, however, the GatorBox has many add-on software modules that make it a full-featured, high-level gateway to other network protocols.