Chapter 4. Connecting to the Establishment Network

Single-ring networks provide excellent peer-to-peer connections for up to 260 devices. However, many establishments require that such networks be connected to other similar networks such as the IBM PC Network, communicate with dissimilar networks, or provide connections between more than 260 devices. Bridges and gateways are devices that attach to LANs to establish these connections.

Bridges are used to connect networks of similar architecture. For example, a bridge can be used to connect two IBM Token-Ring Networks or two IBM PC Networks together. In addition a bridge can connect a Token-Ring Network to a PC Network because of the similarities in the architectures of the two networks.

On the other hand, a gateway connects two computer networks of different network architectures. For example, an IBM 3172 Interconnect Controller (3172) is a gateway that allows LANs to be connected to a host computer by way of the host's channel. The following figure illustrates the connections made by a 3172. Although it is representative of a typical gateway, you should remember that each gateway you use may be somewhat different. Finally, as you read about the varying topologies available in bridged networks later in this chapter, remember that gateways can be attached to these bridged networks to provide an even greater level of connectivity with both establishment and enterprise-wide networks.

For further information about gateways available from IBM, consult the *IBM Local Area Network Administrator's Guide* or ask your IBM representative or nearest branch office.

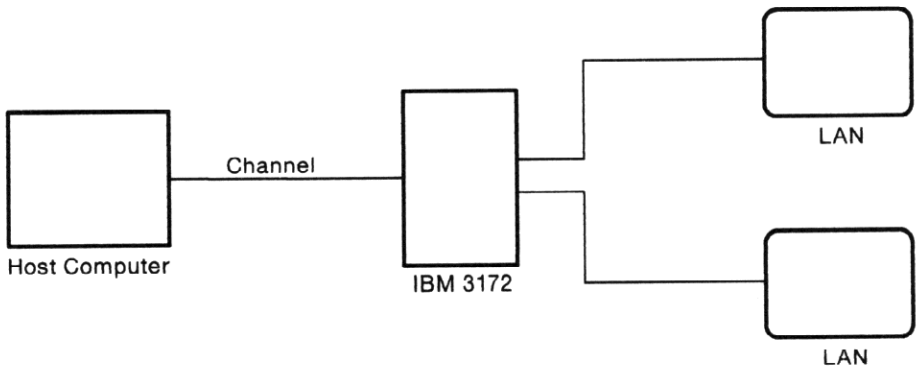


Figure 4-1. Connections made by a 3172 Interconnect Controller

Network Topologies Using Bridges

Bridges between LAN segments offer a number of planning alternatives not available in single-segment-network configurations. A LAN segment is a network that is not connected with bridges to other networks. Using bridges, you can join LAN segments together into networks that can serve more than 260 attaching devices. With careful planning, bridges can increase the availability and serviceability of your network.

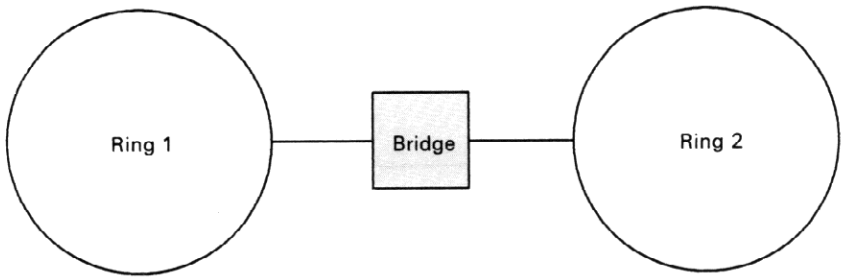
Several topologies are available when using bridges. The topology, or combination of topologies, you select will depend upon the traffic flow in your particular network and the physical layout of the LAN segments you wish to join together. Bridges will allow you to form networks with more than the 260 attaching devices allowed on a single ring. Print servers and file servers can be placed on LAN segments with their most frequent users, yet can still be available to users attached to other rings on the network. Multiple-ring networks can be configured to share the resources of host systems efficiently. If you have followed the guidelines contained in "Estimating Ring Performance" in Chapter 2 for each of the rings that will form your multiple-ring network, bridged rings should provide adequate performance.

To install a bridge between two rings, you must make sure that a lobe from one of the rings terminates in the same location as a lobe from the other ring.

Remember that, although the examples that follow all show bridges connecting rings together, some bridges may also be used to connect rings to other, similar architectures such as the IBM PC Network. For further information about bridges offered by IBM, consult the *IBM Local Area Network Administrator's Guide*, or ask your IBM representative or nearest branch office.

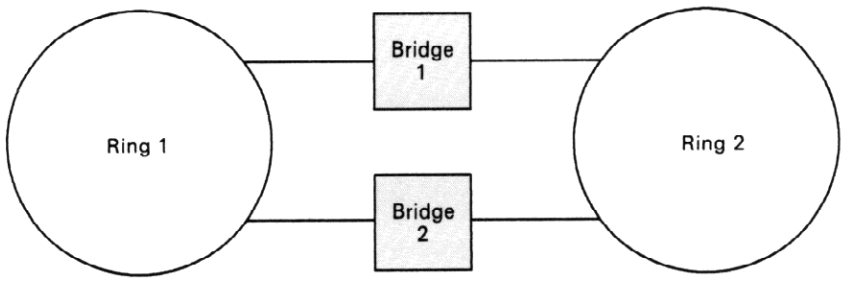
The Simple Connection

The following figure shows two rings joined by a single bridge. This topology is effective if you are joining rings that serve two departments that exchange information. The rings should be arranged so that most of the traffic in the network stays on its own ring rather than crossing the bridge.



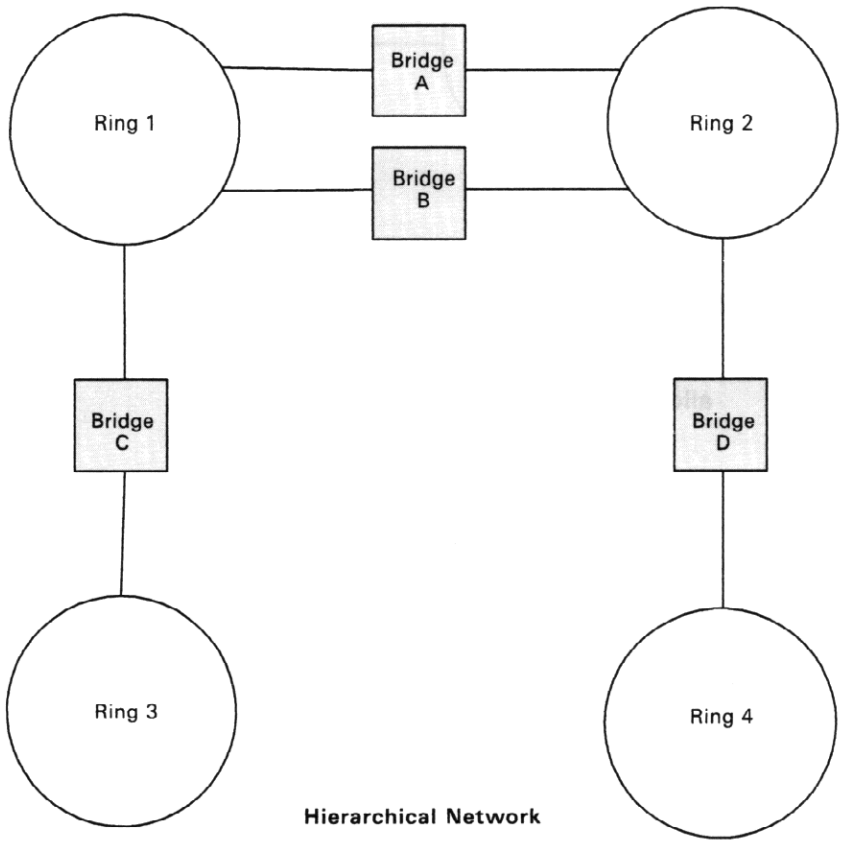
The Parallel Connection

The parallel connection shown below could be used to provide for redundancy in networks requiring high levels of availability. A maximum of 16 parallel bridges is allowed between any two rings.



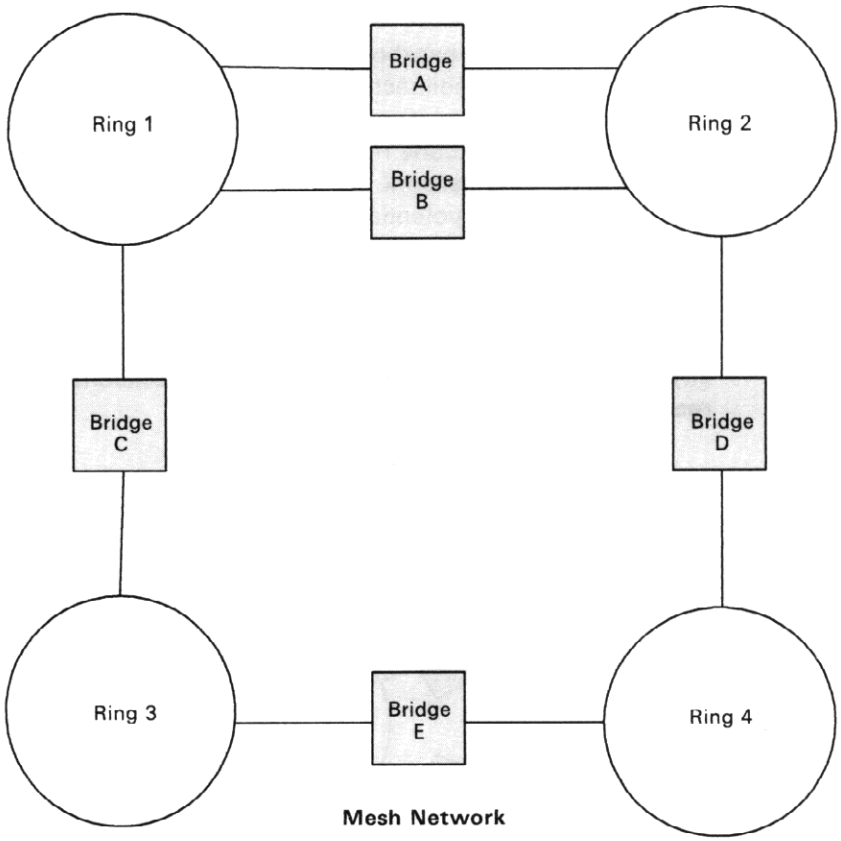
Hierarchical and Mesh Networks

All multiple-ring networks whose rings are connected by bridges are either *hierarchical* or *mesh* networks. The hierarchical network provides only one path through intermediate rings between a source ring and a destination ring. For example, in the figure illustrating a hierarchical network below, a frame whose source is on ring 3 *must* pass through bridge C, ring 1, and either bridge A or B to reach its destination on ring 2. No other path is possible. For this routing, ring 1 will always be the only possible intermediate ring.



Hierarchical Network

Mesh networks, on the other hand, provide multiple paths through intermediate rings between source rings and destination rings. In the following figure, which illustrates a mesh network, a frame whose source is on ring 3 and whose destination is on ring 2 has two possible paths. The frame can pass from ring 3, through bridge C, ring 1, and either bridge A or B to ring 2. Unlike the hierarchical example, however, the frame can also pass from ring 3 through bridge E, ring 4, and bridge D to its destination on ring 2. In this case, either ring 1 or ring 4 is a possible intermediate ring.



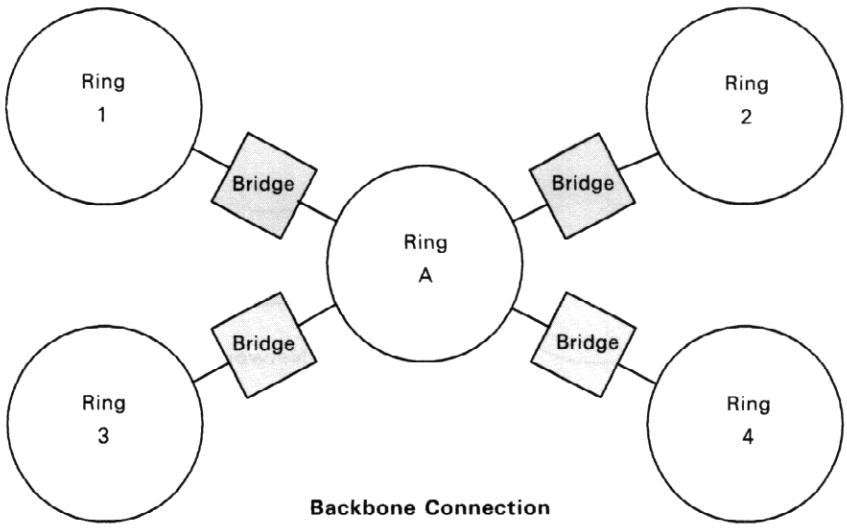
Mesh Network

The Backbone Connection

A backbone ring connects other rings together with bridges to form a hierarchical network providing any-to-any communication across several rings. The backbone ring in the following figure is ring A. For multiple-ring networks where any-to-any communication is needed, the hierarchical backbone ring can provide the shortest average path between any two attaching devices on the network. Additionally, by placing shared devices such as print servers, file servers, and host computers on the backbone ring, the most direct access to those devices is provided for all members of the network.

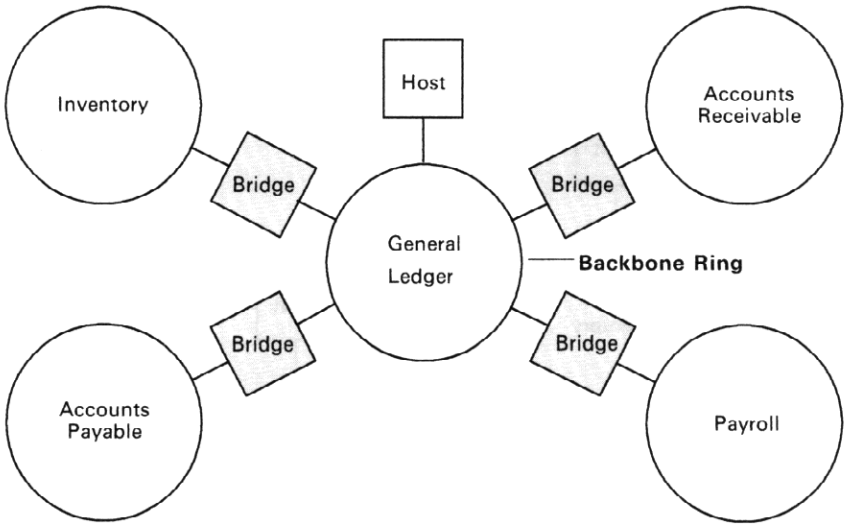
One typical use for a backbone ring is in a multistory building where there is a ring on each floor that is connected by a backbone ring that spans all the floors. If your establishment consists of several buildings with one or more separate rings in each building, a backbone ring can serve to connect all your establishment's rings into a multiple-ring network. To eliminate concerns over environmental hazards and differing ground potential between buildings, you may want to use optical fiber cable in the main ring path of such a backbone ring. If your backbone ring has a data rate of 16 Mbps, all between-building cabling must be optical fiber cable.

Remember that backbone rings are subject to the same planning considerations as any other single ring. You should plan your backbone rings according to the recommendations in Chapter 2 of this manual.

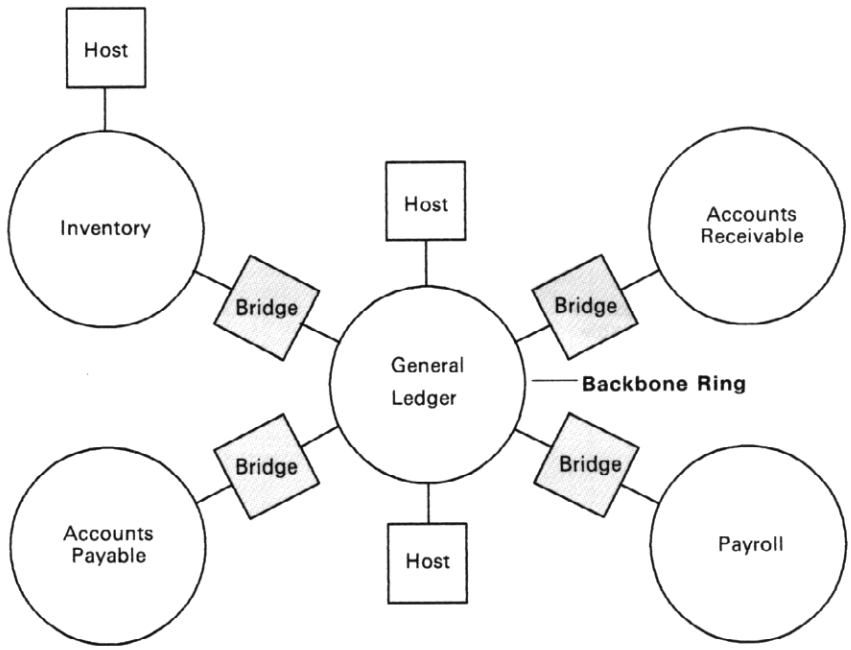


Backbone Connection

A variation of the backbone ring is shown in the following figure. It depicts a large accounting department that has been divided into rings by function. Each of the functions — Payroll, Accounts Payable, Accounts Receivable, Inventory, and General Ledger — has a separate ring because most of the users communicate most frequently with members of their own function. However, the ring belonging to the General Ledger function is also a backbone, since all of the other functions provide input to the General Ledger. The accounting department's host computer should be located on the General Ledger or backbone ring.



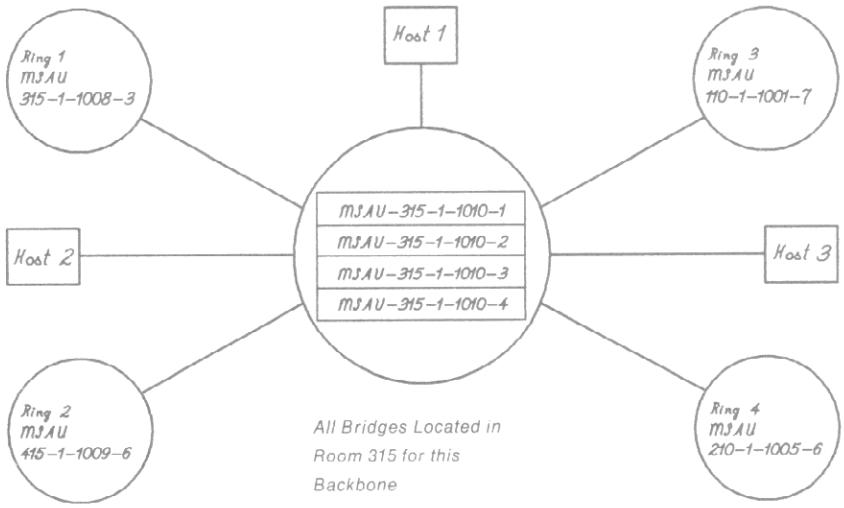
In large establishments, where users may require interactive access to many hosts, placing the host systems on a backbone ring allows the system administrator the freedom to place new applications on whichever host is most appropriate, unless otherwise constrained. In the following figure, the departmental host system attached to the Inventory ring interacts almost exclusively with other attaching devices on the Inventory ring. However, the host systems attached to the General Ledger ring are used by attaching devices on all the rings. Since the network provides connectivity between all devices, placing the multiuser access hosts on the backbone ring provides the shortest average path length between the host systems and other attaching devices. The following illustration shows an example of such a backbone ring.



Physical Planning Considerations

A bridge generally requires physical access to one lobe of each of the two rings it serves, so the area where the bridge is located must have at least one lobe from each ring located there.

We recommend that you prepare a topological sketch of your entire LAN like the one shown below. It should indicate the physical location of all bridges as well as the unit number and location of all 8228s and 8230s where bridges are attached.



Other Record-Keeping

In addition to completing the planning chart required for your particular bridge, you should add certain information to your Token-Ring Network records:

- *IBM 8228 Cabling Chart, Section 2.* In the row marked Device indicate which lobe receptacles have bridges attached to them.
- *Locator Charts.* Indicate in the Device Identification column that the device is used as a bridge.

  Furthermore, in the Ring Number column, you should indicate the number of the adapter's own ring as well as the number of the ring that the other half of the bridge serves.
- *Ring Sequence Chart* for each ring that has bridges attached to it. Indicate the bridge number next to the 8228 or 8230 to which it is attached.

These documents will assist you in installing your network and performing problem determination procedures.