# NETBIOS

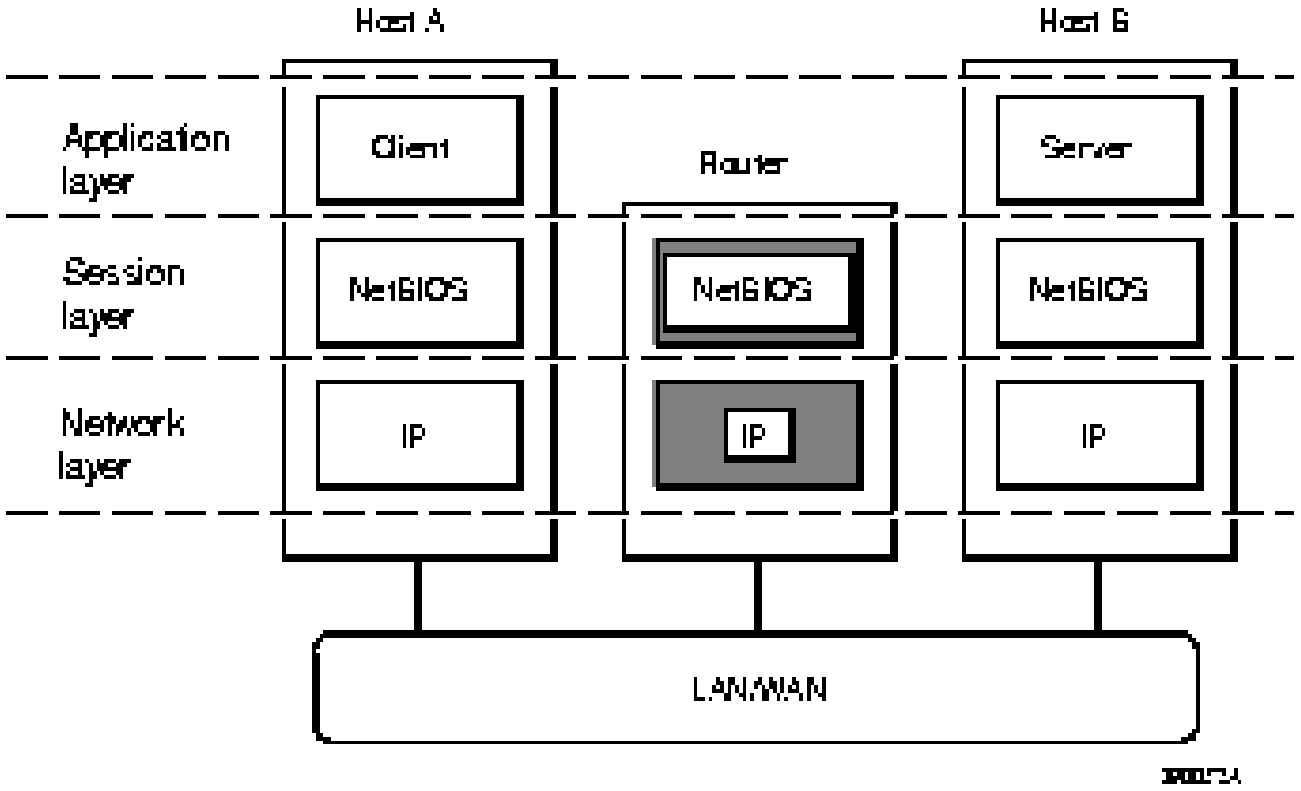
NetBIOS (Network Basic Input/Output System) is a program that allows applications on different computers to communicate within a local area network (LAN). It was created by IBM for its early PC Network, was adopted by Microsoft, and has since become a de facto industry standard. NetBIOS is used in Ethernet, token ring, and Windows NT networks. It does not in itself support a routing mechanism so applications communicating on a wide area network (WAN) must use another "transport mechanism" (such as TCP) rather than or in addition to NetBIOS.

NetBIOS provides the session and transport services described in the Open Systems Interconnection (OSI) model. However, it does not provide a standard frame or data format for transmission. A standard frame format is provided in the NetBIOS Extended User Interface (NetBEUI).

The Network Basic Input/Output System (NetBIOS) is a session layer communications service used by client and server applications in IBM token ring and PC
LAN networks.

NetBIOS provides applications with a programming interface for sharing services and information across a variety of lower-layer network protocols, including IP.

Consider the following diagram which shows the position of NetBIOS and IP in a simple network architecture.



There are three categories of NetBIOS services:

- Name Service .

- Session Service .

- Datagram Service.

Name Service

The NetBIOS name service allows an application to:

- Verify that its own NetBIOS name is unique. The application issues an add name query to NetBIOS. NetBIOS broadcasts the add name query, containing the name. NetBIOS applications that receive the query return an add name response or a name-in-conflict response. If no response to the query is received after (typically) six broadcasts, the name is considered to be unique.

- Delete a NetBIOS name that the application no longer requires.

- Use a server's NetBIOS name to determine the server's network address. The application issues a name query request to NetBIOS, containing the target server's NetBIOS name. NetBIOS broadcasts the name query request. The server that recognizes the name returns a name query response containing its network address.

## Session Service

The NetBIOS session service allows an application to conduct a reliable, sequenced exchange of messages with another application. The messages can be up to 131,071 bytes long.

## Datagram Service

The NetBIOS datagram service allows an application to exchange datagrams with a specific application or to broadcast datagrams to a group and receive datagrams from the group. Datagrams allow applications to communicate without establishing a session. When a NetBIOS application wants to send information that does not require acknowledgment from the destination application, the application can transmit a NetBIOS datagram.

# NetBIOS in an IP Environment

The NetBIOS name service and datagram service rely on the capability of the underlying network to broadcast name query requests to all NetBIOS applications.
In a NetBIOS over IP environment, it is the responsibility of the IP router to ensure that the broadcast queries reach all appropriate network segments. To do this,
the router:

1. Analyzes each NetBIOS packet received on any NetBIOS interface to determine whether the packet is a broadcast packet

2. Rebroadcasts each broadcast packet out all appropriate interfaces, except the one on which it was received (readdressing the packet if required)

If alternate paths exist between different network segments, broadcasting loops can occur. To prevent such loops, the router:

1. Stamps the data portion of the IP packet with the IP address of the router from which the packet was rebroadcast

2. Parses the IP addresses included in the data portion of the IP packet to determine if the packet has already been rebroadcast by that router

## NetBIOS header structure

The format of the header is shown in the following illustration:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Len | XxEFFF | Command | Optional Data 1 | Optional Data 2 | Xmit/resp correlator | Destination name/num | Source name/num |

**Len**

The length of the NETBIOS header.

**XxEFFF**

A delimiter indicating that subsequent data is destined for the NetBIOS function.

**Command**

A specific protocol command that indicates the type of function of the frame.

**Data 1**

One byte of optional data per specific command.

**Data 2**

Two bytes of optional data per specific command.

**Xmit/response correlator**

Used to associate received responses with transmitted requests. Transmit correlator is the value returned in a response to a given query. Response correlator is the value expected when the response to that message is received.

**Destination name/num**

In non-session frames this field contains the 16-character name. In session frames this field contains a 1 byte destination session number.

**Source name/num**

In non-session frames this field contains the 16-character source name. In session frames this field contains a 1 byte source session number.

# NetBEUI (NetBIOS Extended User Interface)

It is an enhanced version of the NetBIOS protocol used by network operating systems such as LAN Manager, LAN Server, Windows for Workgroups Windows 95 and Windows NT. It formalizes the transport frame that was never standardized in NetBIOS and adds additional functions. The transport layer driver frequently used by Microsoft's LAN Manager, Windows for Workgroups and Windows NT.

NetBEUI is the original PC networking protocol and interface designed by IBM for their LanManger server. This protocol was later adopted by Microsoft for their networking products. NetBEUI stands for NetBIOS Enhanced User Interface and specifies the way that higher level software sends and receives messages over the NetBIOS Frames Protocol. This protocol is specified in the IBM document the "IBM Local Area Network Technical Reference Manual" and runs over the standard 802.2 data-link protocol layer.

Since the 802.2 data-link protocol is not routable, neither is NetBEUI. This was a major limitation of LanManger and was a primary reason why it was never a major force in the PC networking world

In the early 90's Novell recognized the that WFW and LanManger networks would need to co-exist with Netware and developed NetBIOS over IPX. This allowed NetBIOS based software to run over routed networks and was a big improvement. Microsoft quickly adopted this method and put it into WFW and NT. Windows 95 now also supports NetBIOS over IPX.

NetBEUI does not have the type of addressing that allows packet forwarding on routed networks, but the NetBIOS interface is adaptable to other protocols which are, such as IPX and TCP/IP.

Because NetBEUI is very fast for small LAN communications but provides poorer performance for WAN communications, one recommended method for setting up a network is to use both NetBEUI and another protocol, such as TCP/IP, on each computer that may need to access computers across a router or on a WAN. When you install both protocols on each computer and set NetBEUI as the first protocol to be used, Windows NT uses NetBEUI for the communication between Windows NT computers within each LAN segment and TCP/IP for communication across routers and to other parts of your WAN.