
Appendix A: Computer Browser Service

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Overview

- Browse List
- Browser Roles
- The Browser Process
- Browser Election
- Configuring Browsers
- Browsing an IP Internetwork
- Browsing by Using the Lmhosts File
- Browsing by Using WINS

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To use resources across a network efficiently, users must be able to determine the availability of resources on the network. The Active Directory™ directory service in Microsoft® Windows® 2000 enables users to find this information.

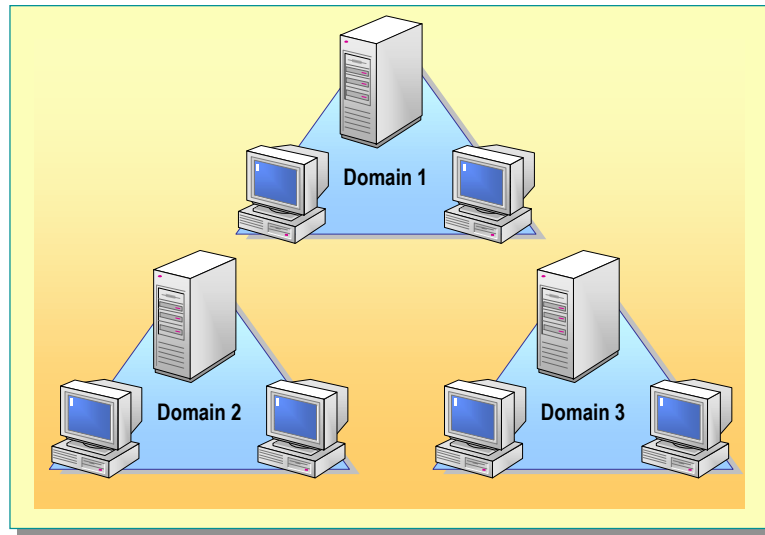
Windows 2000 also uses the Computer Browser service to display a list of currently available network basic input/output system (NetBIOS)–based resources. The Computer Browser service maintains an up-to-date list of computers and provides the list to applications as requested. This enables users to locate resources on servers that are not running Windows 2000. It also enables users using client computers that are not running Windows 2000 to locate resources on servers that are running Windows 2000.

At the end of this module, you will be able to:

- Identify the different roles that a computer running Windows 2000 can perform in the browser process.
- Explain how the Computer Browser service locates available resources on the network.
- Describe how the browser election process ensures that the Computer Browser service is functioning properly.
- Configure a computer as a browser.
- Describe the problems involved with browsing in an Internet Protocol (IP) internetwork, and describe solutions to those problems.

Note For this appendix, a *server* is defined as any computer that provides resources to the network. For example, in the context of the Computer Browser service, a computer running Windows 2000 Professional is a server if it shares file or print resources with other computers on the network.

Browse List



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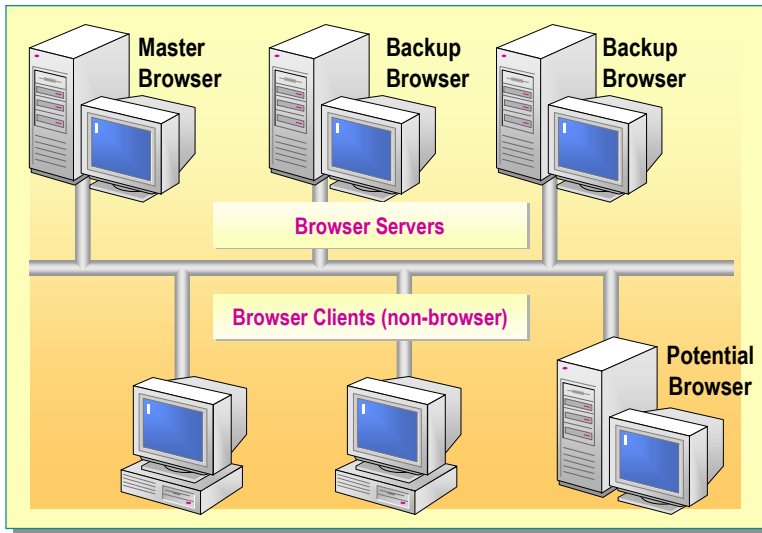
The Computer Browser service maintains a centralized list of available network resources, called the *browse list*. The browse list is distributed to specially assigned computers that perform browsing services along with their standard services. Browser computers eliminate the need for all computers to maintain a list of all shared resources on the network. By assigning the browser role to specific computers, the Computer Browser service reduces the amount of network traffic required to build and maintain a list of all shared resources on the network. This improves performance, because only the computers that are assigned the browser role need to create a network resource list.

To view the browse list in Windows 2000:

1. In My Network Places, double-click **Entire Network**.
2. Click **entire contents**.
3. Double-click **Microsoft Windows Network**.

Note On computers running Microsoft Windows NT® version 4.0, Microsoft Windows 98, or Microsoft Windows 95, open Network Neighborhood to view the browse list. On computers running Microsoft Windows for Workgroups, use File Manager.

Browser Roles



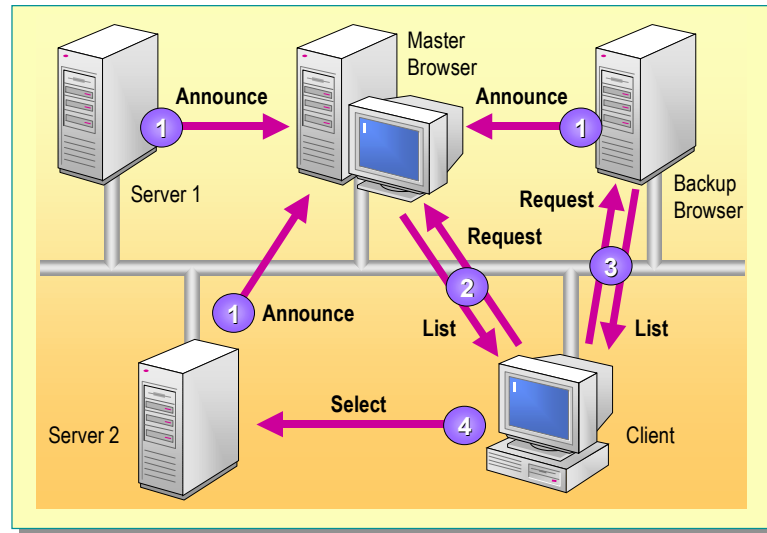
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The task of providing a list of servers to clients is distributed among multiple computers on a network. You can assign different roles to computers that use the Computer Browser service. These roles include master browser, backup browser, potential browser, and browser clients (non-browsers). You can configure computers running Windows 2000 to perform any of the Computer Browser service roles.

The following table identifies the browsing roles that you can assign to a computer running Windows 2000:

Browser type	Description
Domain master browser	Collects and maintains the master list of available network servers, and the names of other domains and workgroups. It distributes this list to the master browser of each subnet in the Windows 2000 domain. There is only one domain master browser in a Windows 2000 domain, and it is the domain controller that holds the primary domain controller (PDC) emulator role.
Master browser	Collects and maintains the master list of available network servers in its workgroup or subnet, and shares this list with the domain master browser. The master browser receives information about other workgroups, domains, and subnets from the domain master browser, and incorporates this information into its list of available resources. The master browser distributes this list to the backup browsers. There is one master browser for each workgroup or subnet in a domain.
Backup browser	Receives a copy of the browse list from the master browser. It then distributes the list to the browser clients upon request.
Potential browser	Has the ability to become either a backup or a master browser if instructed to do so by a master browser or in the absence of other browser servers. A potential browser is not a browser server.
Non-browser	Does not maintain a browse list. Peer-to-peer networking computers are commonly non-browsers, even though they have server services.

The Browser Process

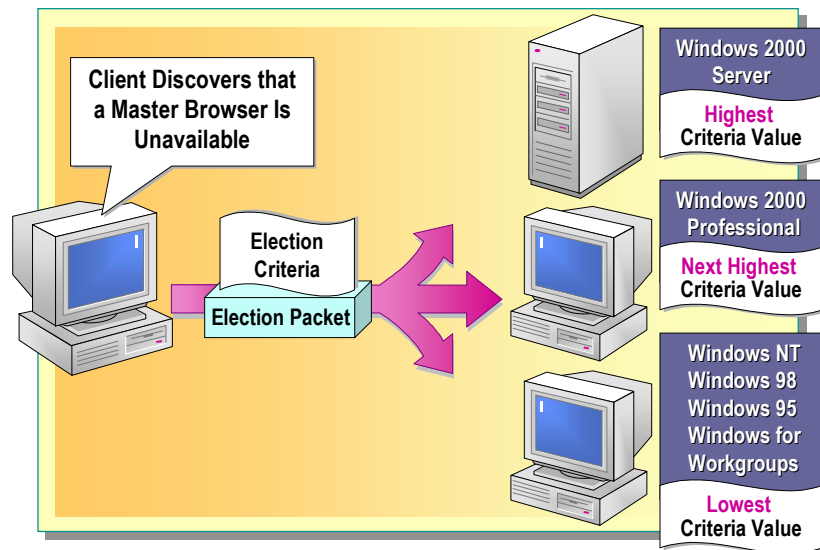


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The following process describes how the Windows 2000 Computer Browser service operates:

1. After startup, all computers that are running the Server service announce their presence to the master browser in their workgroup or domain subnet. This occurs regardless of whether they contain shared resources.
2. The first time that a client tries to locate available network resources, it contacts the master browser of the domain subnet or workgroup for a list of backup browsers.
3. The client then requests the network server list from a backup browser. The backup browser responds to the client request with a list of domains and workgroups, and a list of servers that are local to the client's domain or workgroup.
4. The user at the client selects a server, searches for the appropriate resource, and then contacts the appropriate server to establish a session to use that resource.

Browser Election



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A new master browser must be elected if a client cannot locate a master browser, or if a backup browser attempts to update its network resource list but cannot locate the master browser. The election process ensures that there is only one master browser per workgroup or segment in a domain.

Election Process

Network computers initiate an election by broadcasting a special message called an *election packet*. The election packet contains the criteria value of the computer that initiated the request. All browsers process the election packet.

When a browser receives an election packet, it examines the packet and compares the criteria of the requesting computer with its own election criteria. If the receiving browser has higher election criteria than the computer that issued the election packet, the browser issues its own election packet, and then enters an *election-in-progress* state. This process continues until a master browser is elected based on the highest criteria value.

Browser Criteria

Browser criteria determine the hierarchical order of the different types of computer systems in the workgroup or domain. Each browser computer has certain criteria, depending on the type of system. The criteria include:

- The operating system.
 - A member of the Windows 2000 Server family of products
 - Windows 2000 Professional
 - Windows NT Server
 - Windows NT Workstation
 - Windows 95
 - Windows for Workgroups
- The operating system version: for example Windows NT 4.0, 3.51, 3.5, or 3.1.
- The configured role of the computer in the browsing environment.
 - Browser—either master browser or backup browser
 - Potential browser
 - Non-browser

During an election, the criteria ranking is used to determine which computer should be the master browser if the current master browser is unavailable.

Note For more information about browser criteria and election, see the chapter “Windows 2000 Browser Service” in the Windows 2000 Server Resource Kit.

Configuring Browsers

■ Windows 2000–Based Computers Can Be Configured To:

- Attempt to become a browser server
- Never participate as a browser server
- Possibly become a browser server

■ Registry Value Entry Options Include:

- Yes
- No
- Auto

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Computers running Windows 2000 can be configured to:

- Attempt to become a browser server.
- Never participate as a browser server.
- Possibly become a browser server.

Use Registry Editor to make these configurations, and follow the registry path:
**\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services
 \Browser\Parameters\MaintainServerList**

The following table describes the **MaintainServerList** values.

Value	Use this value to configure the computer to
Yes	Attempt to become a browser server. Yes is the default value for Windows 2000 Server domain controllers.
No	Never participate as a browser server. Use this value entry to prevent computers that are frequently taken off line, such as mobile or test computers, from becoming browser servers.
Auto	Possibly become a browser server, depending on the number of currently active browsers. A potential browser is notified by the master browser as to whether it should become a backup browser. Auto is the default value for computers running Windows 2000 Server (non-domain controllers) and Windows 2000 Professional.

To determine whether a computer running Windows 2000 will become a browser, when the computer initializes, the Computer Browser service looks in the registry for the value that has been configured for the computer.

Browsing an IP Internetwork

- **IP Routers Do Not Propagate Broadcast Traffic**
- **There Must Be Mechanisms For:**
 - Collecting, distributing, and servicing client requests
- **IP Router Solution**
 - Not recommended
- **Windows 2000 Solutions**
 - Lmhosts File
 - WINS

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The Computer Browser service relies on a series of broadcast packets; as a result, browsing across IP routers that do not forward broadcasts can create certain problems. To facilitate client browsing of all network resources in an IP internetwork, there must be mechanisms for the collection, distribution, and servicing of client requests for browse lists.

The IP Router Solution

Some routers can be configured to forward broadcasts from one IP subnet to another. If the IP router is configured to forward these NetBIOS broadcasts, the browsing service works the same way—as if all of the domains or workgroups were located on the same subnet. All master browsers are aware of all servers in their own and other domains or workgroups, and all client browsing requests can be satisfied.

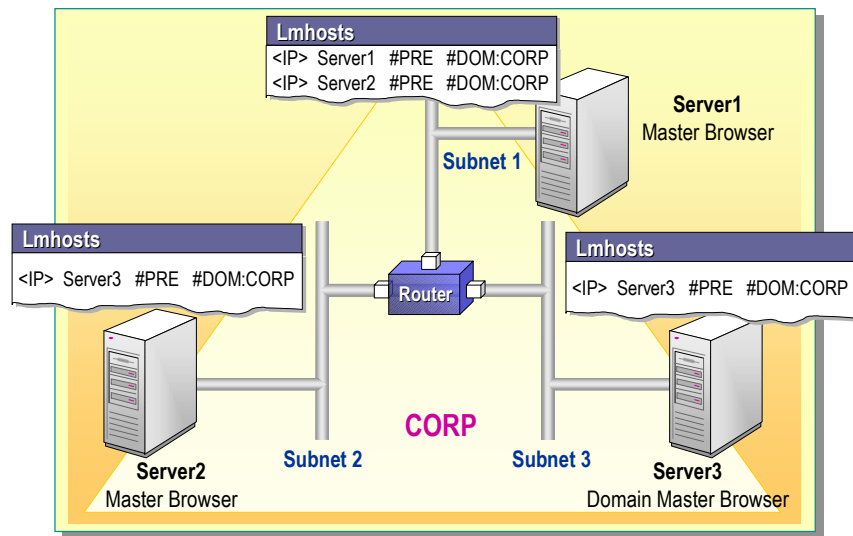
Unless these settings are enabled on all IP routers in the internetwork, this solution is not recommended because it propagates all NetBIOS over Transmission Control Protocol/Internet Protocol (TCP/IP) broadcast traffic across an internetwork, which decreases performance of all nodes on the internetwork. Enabling broadcast forwarding can cause browser election conflicts that report errors in the system log.

Windows 2000 Solutions

If the IP routers are not configured to forward NetBIOS broadcasts (which is typical), browsing collection and distribution and the servicing of client requests must take place over *directed* IP traffic rather than broadcast IP traffic. There are two ways to facilitate this in Windows 2000:

- *Lmhosts file entries.* Special entries in the Lmhosts file help facilitate the distribution of browsing information and the servicing of client requests.
- *WINS.* Windows Internet Name Service (WINS) is used to collect browse lists and to service client requests.

Browsing by Using the Lmhosts File



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To implement direct communication between master browsers on remote subnets and the domain master browser, the Lmhosts file must be configured with the NetBIOS names and IP addresses of the browser computers.

Master Browsers

For computers running Windows 2000, the Lmhosts file on each subnet's master browser should contain the following information:

- The IP Address and computer name of the domain master browser
- The domain name, preceded by the **#PRE** and **#DOM:** keywords

For example:

```
130.20.7.80 <domain master_browser> #PRE #DOM:<domain_name>
```

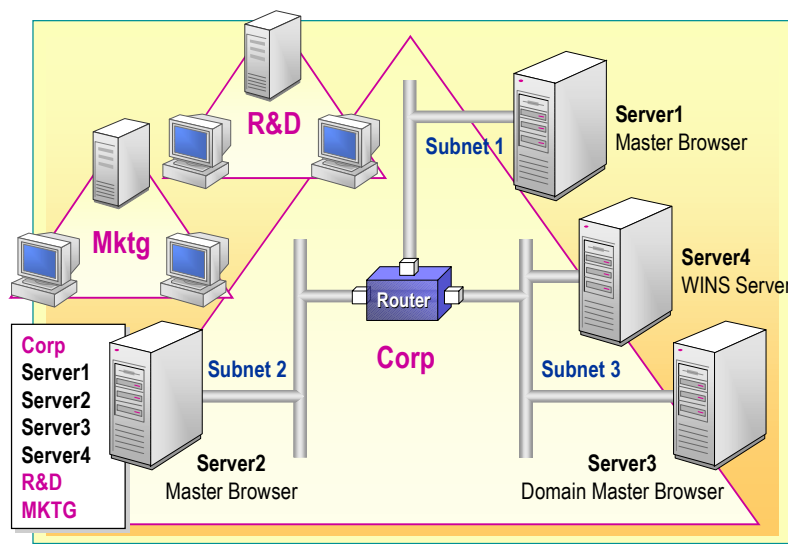
Domain Master Browsers

At the domain master browser, the Lmhosts file must be configured with entries for each of the master browsers on remote subnets.

It is recommended that each master browser have a **#DOM** entry for all of the other master browsers in the domain. Therefore, if one master browser is promoted to the domain master browser, the Lmhosts files do not need to be changed on the other master browsers.

When multiple Lmhosts file entries exist for the same domain name, the master browser sends a query to the IP address for each entry to determine which of the entries corresponds to the domain master browser. Only the domain master browser will respond to the query. The master browser then contacts the domain master browser to exchange browse lists.

Browsing by Using WINS



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WINS resolves NetBIOS name broadcast problems by dynamically registering a computer's NetBIOS name and IP address and storing them in the WINS database. When WINS clients communicate with TCP/IP hosts across subnets, the destination host's IP address is retrieved from the database rather than by using a broadcast.

WINS improves the mechanism of collecting domain or workgroup names, because a domain master browser running as a WINS client periodically queries the WINS server for a list of all of the domains listed in the WINS database.

Note The list of domains that is obtained by using a WINS query contains only the domain names and their corresponding IP addresses. It does not include the names of the master browsers from which the WINS records originated.

The main benefit of this process is that the domain master browser for a given domain now has a complete list of all master browsers for all domains, including all master browsers for other domains that are on remote subnets. To build a complete list without using WINS, there must be a master browser that belongs to the same domain as the domain master browser on every subnet.