Troubleshooting the Computer Browser Service with Solaris™ PC NetLink Software

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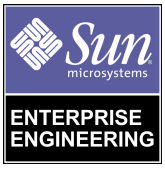

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Troubleshooting the Computer Browser Service with Solaris™ PC NetLink Software

The purpose of the Computer Browsing Service is to offer a mechanism by which PC Clients can display shared disks, printers, and other resources available on a local network. The computer browser service (not to be confused with internet browsing) was first implemented in Microsoft Windows 3.11 to support browsing on small subnets. This service relied heavily on the ability of PC Clients to acquire the information they required directly on the subnet to which they are attached. Early in it's use, the popular protocol to use on local hubbed LANs of the time was NetBIEU. This protocol has a well understood scaling limitation in that it does not function across subnets.

Enterprise network environments have matured and now the TCP/IP protocol helps enable networks to scale well beyond the simple subnet environments of LANs of the past. The current computer browser service, which all current Microsoft Operating systems and thus Solaris™ PC NetLink software support, evolved from this legacy. The Solaris PC NetLink software now shares the issues brought about in supporting this service.

This article offers several suggestions on how to troubleshoot situations when this service appears to be not functioning properly.

How Solaris™ PC NetLink Software Supports the Computer Browsing Service

A full explanation of the computer browser service is not possible in this on-line article. Instead I will give a brief explanation of how the computer browser mechanism works in the context of Solaris PC NetLink software operation. The reader should consult the references at the end of the article for a more in depth understanding of the browser mechanism.

Computer Browsing

The computer browsing lists are supported on each subnet by a server know as a **master browser**. There will be one master browser for each Windows NT domain (or workgroup) and sometimes many systems acting as backup browsers that maintain resource lists in the event that the master browser goes down. In addition to having one master browser for each domain, there may be a master browser for each domain on each transport protocol used to support the domain. If a Windows NT server were to support the three most popular protocols (TCP/IP, NetBEUI, IPX/SPX), there may be up to three master browsers on each subnet for that domain. If multiple domains are supported on a subnet, the possible number of master browsers and backup browsers can be numerous and a source of considerable network traffic.

In turn, these local master browsers on each subnet exchange lists with the **domain master browser server** which is also the Windows NT Primary Domain Controller (PDC) for that domain. Any Solaris PC NetLink software server, Windows NT Server or Workstation, Samba server, and even Windows 95 & Windows 98 systems (in some cases), can potentially function as a subnet's master browser server.

Unlike WINS, DNS, DHCP and other network services where the system administrator usually defines what server the service runs on, the master browser server is chosen through an automated multi-round election process. This process can occur frequently on a busy LAN as servers and PC Clients reboot and establish their presence. Many network events can force a new election process on the subnet causing significant network traffic and anomalous events which can baffle end users as well as system administrators. Neither the end user requesting information from the service, nor the system administrator may even be aware of this process occurring. By default, all Solaris PC NetLink software, Samba Servers, Windows NT, 98, and 95 systems are enabled to potentially become a master browser server for a subnet.

This election process occurs by a set of rules (see Section 6.8 "Browser Elections" of the computer browser specification listed in reference section below), and can take considerable time before the master server has been elected and has up-to-date lists of servers and services from its own subnet and the domain master browser server

(the PDC). The election process alone can account for many delays experienced by users of PC Clients as they attempt to use the “Network Neighborhood” icon on their PC Clients to browse their way to a shared file system on a server. Attempting to browse your way to a service during the recovery period after a power failure can be a very frustrating experience.

Diagnosing Browser Service Problems

When the browse service fails, or suffers considerable delays, it is sometimes difficult to diagnose the problem. What follows is a procedures and tools that can be of help when diagnosing a browser problem where the Solaris PC NetLink software is involved.

Delays in Viewing Changes by Browsing

Changes that occur on the network take a long time before they can be seen by browsing. In addition, the protocol that governs how changes in the network are propagated to browse masters has many built-in delays. Under worse case scenarios, the following delays can be seen between the time that a change occurs in the state of the network and the time that the change can be seen while browsing:

- It can take up to 45 minutes before a PDC (also the domain master browser) is shut down and when the domain will no longer be seen by other domain browsers and browsing clients.
- It can take up to 36 minutes before the removal of a system from a network is registered by the local browse master
- It can take up to 51 minutes for changes, such as the addition or removal of a domain member client, before they can be seen on another subnet browse masters.It can take up to 66 minutes for a change in a local subnet to be reflected across the network[1]

Delays like these can cause significant frustration especially if you are not aware that they exist. For example, if a server is off line for 30-60 minutes and then comes back on line, it may look like it is still down for a considerable period of time if users attempt to access the server via the browser mechanism.

Browsing does not need to be fully functional for users to access file and print services on a server. As a work around, users can always explicitly access server shares on Solaris PC NetLink software by mapping a network drive using a full path name such as `\\server-name\share`.

1. Data from *Samba Integrating Unix and Window*s - John Blair

Maintaining a WINS Server

For browsing to list systems on anything but the local subnet successfully, NetBIOS name resolution must exist to resolve names of systems on non-local subnets. The only mechanism that can support the special names needed by the browser service is to use a WINS server. A Solaris PC NetLink server can be configured to fully support the WINS service. WINS is what is used by the master browsers to register the Domain Master Browser names required to support the browsing on other subnets.

Master browsers on the local subnet to a PC can be found by way of broadcasts. The domain master browser (also the PDC of the domain) collects and redistributes all the servers and services information from all the master browsers on all the subnets where there exists a server or PC Client that is a member of the domain. Master browsers for a subnet can find the domain master browser by sending a query to their WINS server to resolve the special NETBIOS name <DomainName>(1b Hex). This special NETBIOS name consists of the Windows NT domain name that the PC Client is a member of with 1b Hex in the last 16 byte position. Once the domain master browser is determined from the WINS server, the local master browser can find all of the browse information for the domain quickly, and help enable browsing to proceed quickly. If no WINS service is available, the process can take considerable time for the required time-outs to occur in determining the local subnets master browsers by other means.

If you are experiencing a situation where only the systems on the **local** subnet are seen during browsing, the first things to check are:

- Is there a WINS server established?
  The Solaris PC NetLink software can be configured to be a WINS server.
- Are all the PC Clients configured to use a common WINS server?
  Check the “WINS Configuration” Tab in the TCP/IP properties of the Network configuration of the PC Client to make sure that it is using a common WINS server. Alternately, the DHCP server can be used to supply the WINS server configuration.
- Is the WINS server up and running?
- Is the master browser for the subnet attached to two subnets?
  The next section deals with this issue fully.

Servers with Two or More Network Connections

If a PC Client attempts to browse using a master browser in the form of a Solaris PC NetLink server that is attached to two or more subnets (or any Windows NT multi-homed server), the PC Client will only be given lists of the resources for the subnet it is a part of. Resources on the other subnets supported by the server will NOT be seen. The Microsoft Knowledgebase has a complete write-up of this problem that

exists for all Windows NT systems. Please refer to the document found at: `http://support.microsoft.com/support/kb/articles/Q191/6/11.ASP` or search the Microsoft Knowledgebase for “Q191611”.

In summary, a browse master will maintain a separate browse list for each subnet to which it is attached. It will only supply the list of resources for the subnet from which the browse request was made. The reason for this is because the browse master can not be sure that the systems requesting browser lists on one subnet can access the other subnets.

To circumvent this problem, we suggest that you disable any server that has two or more network connections from becoming a browse master for any subnet. With Solaris PC NetLink software, this can be accomplished by setting the Solaris PC NetLink software registry value **MaintainServerList** to “false” or “no”.(See the article referenced above). While you can set this value of this parameter via Windows NT `regedt32` program, we suggest that you maintain a master script of registry changes so there is a record that the change has been made to your server. A “best practice” article on the Sun BluePrints™ OnLine site covers maintaining a master registry change script. See: *Managing the Solaris PC NetLink Registry available* at URL: `http://www.sun.com/blueprints/0200/managing.pdf`). The segment of the script that will make this change should look like this:

```
# This server serves two subnets. Turn off the capability
# of it being a Master Browse
# See Microsoft Knowledge base article Q191611
#
echo Old MaintainServerList Value (OK to have no Parameter yet)
/opt/lanman/sbin/regconfig \
SYSTEM/CurrentControlSet/Services/Browser/Parameters \
MaintainServerList
#
# Set MaintainServerList value to false
#
echo Setting MaintainServerList parameter to false
/opt/lanman/sbin/regconfig \
SYSTEM/CurrentControlSet/Services/Browser/Parameters \
MaintainServerList REG_SZ false
#
# Readback value from registry
#
echo Setting MaintainServerList parameter to false
echo New MaintainServerList parameter should now be false
/opt/lanman/sbin/regconfig \
SYSTEM/CurrentControlSet/Services/Browser/Parameters \
MaintainServerList
```

Solaris PC NetLink software must be stopped and started for the above change to become effective. Plan to reset Solaris PC NetLink software when no one is using it.

The above change does not affect the Solaris PC NetLink software ability to act as a local WINS server.

Samba Servers

Allowing all versions of Samba to become a master browser server is problematic for the following reasons:

- AT least with older versions, Samba will force the master browser election process to choose the Samba server. This can cause some browsing functionality to not work in some instances.
- Samba servers can not fully participate as a PDC or BDC in a Windows NT domain. Because of this and other reasons, it does not always work correctly for browsing Windows NT domains servers.

To turn off Samba's ability to become a master browser or to help diagnose a browser's problem, you can disable Samba's ability to become a master browser by setting the following values in the [global] section of the Samba `smb.conf` file:

```
domain master = no
local master = no
preferred master = no
os level = 0
```

`lmhosts` files

System administrators occasionally use `lmhosts` files (C:\`WINNT\system32\drivers\etc\lmhosts` on Windows NT systems C:\`windows\lmhosts` on Windows 95 & 98 systems) to temporarily resolve host name issues. If these are left with old information, their values will override values that may be returned from a WINS server. Make sure that if these file must be used, that they have the correct values for host names.

For normal operation, it is best to use only a WINS server to resolve NetBIOS names to avoid any conflict.

PC Clients with Multiple Network Protocols

When multiple network protocols are running on a PC Client, the browsing mechanism can create extensive network traffic and produce significant delays as the PC Clients attempt to use all protocols to perform the browser operation. In this situation, there may be a master browser for every network transport protocol as mentioned above. Solaris PC NetLink software supports only the NetBIOS over the TCP/IP protocol. The presence of additional protocols on a PC Client can cause significant delays during the browsing process as each master browser for each protocol is determined and queried. The election process, caused by PC Clients and servers with these additional protocols, can take considerable time.

One anomalous condition that can occur is when, due to the election process, the master browser for a protocol is moved from one server to another. The new server may not have the same lists established as the older master browser. The effect of this shuffling of servers is that users on PC Clients may see systems disappear from their Network browser.

To minimize the number of elections that occur, and thus the network traffic and delays, it is highly advisable to remove protocols that you know you will not be using. It would be best if all systems used only the TCP/IP protocol. TCP/IP is the most scalable protocol; it is also the protocol that must be used to access the internet and enterprise intranets today. If at all possible, remove all other protocols such as NetBIEU and IPX/SPX. Check with the local network administrator to see if there are any other servers or services that must use these additional protocols. Removing network protocols is accomplished by using the Network icon on the control panel of Windows based PCs.

Tools to Monitor the Master Browser

Several tools may be useful in monitoring the master browser for a domain. Solaris PC NetLink software can supply some browser-related information by way of the `/opt/lanman/bin/net browser` command. Windows operating systems have a command line tool called `nbtstat.` The command `nbtstat -a <adapter>` supplies name tables available on servers.

The Windows NT Server Resource Kit offers a command line executable known as `browstat` and a GUI based tool called `browmon. The browman` tool is the easiest to use for giving the most information on browser-related information.

References

For additional, detailed information on Solaris PC NetLink software, refer to the Sun BluePrints book, *Solaris™ PC NetLink Software: Performance, Sizing, and Deployment,* (ISBN# 0-13-026686-8) which is scheduled for publication by Prentice-Hall in the May of 2000 and is expected to be available through www.sun.com/books, amazon.com, fatbrain.com, and Barnes & Noble bookstores.

The Samba web site has information about using Samba as a browse master. See: `http://us1.samba.org/samba/ftp/docs/textdocs/BROWSING.`

The specification for the browser service can be found at: `ftp://ftp.microsoft.com/developr/drg/cifs/cifsbrow.doc`

The *Microsoft Windows NT Server Network Guide* from the *Windows NT Server Resource Kit* is a also good source of information for understanding the browsing mechanism.

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Don started his career as an Electrical Engineer and has worked in the Automated Test industry for Teradyne Inc, and in the PC operating system market for Digital Research from CP/M frame before coming to Sun.