Tracing Resource Consumption of Solaris™ PC NetLink Software Users

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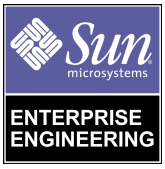

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Tracing Resource Consumption of Solaris™ PC NetLink Software Users

During high peak loading periods on a server it is best to reserve the resources of the server for user interactive applications. If any server components or the network are approaching saturation, it is best to avoid any high demand or background file access by automated tasks during these times. Scheduling automated tasks to another time or moving high demand users to dedicated resources is needed to minimize performance bottlenecks. Before you can deal with these situations you must first detect, then trace, the cause of the load. This is not always straight forward.

In this article I will show the Solaris™ Operating Environment commands and the Solaris™ PC NetLink software commands for determining which PC clients are consuming resources via Solaris PC NetLink software. I will also offer scripts that will help automate these procedures.

PC Applications that Demand High Level Throughput

Some automated applications on PC clients can chronically consume throughput on a daily basis. Normally, applications will only require short bursts of file activity from a few seconds to perhaps a minute, and will not typically be detected by other users of the server. However, if daily scheduled tasks perform extended file access operations over the network for long periods of time, and they overlap with other high demand requirements, performance may suffer.

When performance suffers you must determine which applications, on which PCs, working for which users, are consuming the resources. Both the Solaris Operating Environment and Solaris PC NetLink software offer commands that can eventually

identify the PC client and user account responsible for a constant activity caused by a runaway program or even normal use. Unfortunately, no single command allows you to quickly discern this information.

Once you understand the situation, simple corrective action, such as rescheduling the activity for off hours or moving users' files to a less active file system, can solve the problem.

Many applications can periodically cause high demand file operations on PCs. The following are the two most common applications that can cause long periods of demand:

- Index Engines—Some well-known productivity suites include applications that are installed automatically and run at the same time everyday searching the full file systems for new or changed files. Once files are found they are read to extract information for an index that allows the user to do a fast content search.

  There are also several HTML-based full-text retrieval search engines that create indexes by reading every file in a file structure. After the files are indexed the applications allow you to search for information in your own files using a browser interface.
- Virus scanners—Many virus scanners are on the market today. One function of these scanners is to check all executables and other vulnerable files for viruses. This requires the software to traverse a file system looking for files that can potentially have a virus inside. They read the file looking for virus signatures and if found, report and optionally remove the virus. Many times these virus scanners are scheduled to run periodically, sometimes once a day.

Sometimes the default installation settings for these application will use networked mapped drives to perform scans. If these applications are allowed to scan network drives, they can create constant file-based network traffic for a very long time reading gigabytes of data. One PC client performing operations like these would not cause a server performance issue. But if several users have common installations of the same PC applications, it can create a problem.

Sometimes these applications will run as a background operation and will cease their operation once the user starts using the system. The users may not even be aware that this background operation is going on and that their system is placing a periodic constant load on the server.

Users can be a source of problems themselves by scheduling backups of their PC files to servers during busy periods of the day.

Before you can reduce or illuminate problems like these, you must first determine which PC client is consuming the resources. We will first look at the commands to manually trace user activity and finish up by presenting scripts that can automate the procedure.

Finding a Solaris™ PC NetLink Software Resource Problem

The first sign of a resource problem may be an ever increasing number of users complaining about performance. If you are using a Sun™ Management Center (SunMC a.k.a Sun Enterprise SyMON™) software or some other graphic-based resource monitor, it might show you a chronically saturated disk subsystem, CPU, or a flogging SWAP disk.

Disk subsystems tend to be the first resource to cause performance problems. For this reason, we will look at all the commands necessary for tracking down the users or PC clients that are using a particular Solaris disk subsystem.

Tracing Disk Use with Solaris™ Software Commands

We will first use the `iostat -xn` option to track down a resource problem. This command lists statistics for disk subsystems on the server from a Solaris Operating Environment perspective. It can give you a quick indication which disks are currently busy. You will need to monitor a `iostat -xn 1` command for a few minutes and compare it against `iostat` commands over several days to see if you have performance issues that recur daily.

If you see that disk subsystem activity maintains a constant level for many minutes, and it recurs at the same time every day, consider tracing the source of the activity. Following is a sample of the `iostat` output:

```
system6 85 =>iostat -.xn 1
. . . First listing removed and ignored
extended device statistics
  r/s  w/s   kr/s   kw/s wait actv wsvc_t asvc_t  %w  %b device
  0.0  0.0    0.0    0.0  0.0  0.0    0.0    0.0   0   0 fd0
  0.0  0.0    0.0    0.0  0.0  0.0    0.0    0.0   0   0 c0t0d0
  0.0  0.0    0.0    0.0  0.0  0.0    0.0    0.0   0   0 c0t1d0
 11.1 45.2  388.0 1512.7 46.2  8.0  820.1  142.1 100 100 c0t2d0
  0.0  0.0    0.0    0.0  0.0  0.0    0.0    0.0   0   0 c0t6d0
. . . Many more output listings removed
```

The statistics show the requests for one of the disk are waiting 100 percent of the time (%w), the disk is 100 percent busy (%b), the queue of transactions waiting for service is 46 (Refer to the iostat manpage for further information on the command). If users are accessing this disk via Solaris PC NetLink software there would be considerable latency delays waiting for the disk to respond. To determine the Solaris mount point the disk drive is associated with, use the `df` command.

```
system6 93 => df
/                  (/dev/dsk/c0t0d0s0 ): 1528898 blocks   399040 files
/proc              (/proc             ):       0 blocks     1684 files
/dev/fd            (fd                ):       0 blocks        0 files
/tmp               (swap              ):  338832 blocks    19774 files
/files1            (/dev/dsk/c1t2d0s2 ):  140062 blocks  3784043 files
/files2            (/dev/dsk/c0t1d0s2 ): 1500460 blocks   973855 files
/files3            (/dev/dsk/c0t2d0s2 ):  771762 blocks   516667 files
. . .
```

The busy drive was mounted to /files3.

Solaris PC NetLink software allows you to name shared file volumes anyway you want. It is best to make sure you use the same share name as Solaris Operating Environment uses as mount points to avoid the confusion of the Solaris Operating Environment and Solaris PC NetLink software using different names for the same disk volumes. In our example “files3” is the name used for both the Solaris mount point and the Solaris PC NetLink software share.

Tracing Disk Use with Solaris™ PC NetLink Software Commands

After you determine that you have a performance issue, the next step is to determine which PC client and user are the source of the problem. Unfortunately no single command will derive this information quickly. The Solaris PC NetLink software `/opt/lanman/bin/net session` command will tell you which PC clients are accessing the system, but you must use the command again with the PC client as a

parameter to see which shares the PC client is using. If there are hundreds of users, the repetitive use of the command is extremely tedious. Following are examples of the command with and without the parameter.

```
eelab# /opt/lanman/bin/net session

Computer              User name            Client Type      Opens Idle time
-------------------------------------------------------------------------------
\\CON-AIR~X           ADMINISTRATOR        NT LANMAN 1.0    1     00:00:00
\\CON-AIR~X           ADMINISTRATOR        NT LANMAN 1.0    0     00:04:00
\\EEPC01              LAB                  NT LANMAN 1.0    1     00:00:00
\\EEPC02              LAB                  NT LANMAN 1.0    1     00:00:00
\\EEPC03              LAB                  NT LANMAN 1.0    1     00:00:00
\\EEPC56              LAB                  NT LANMAN 1.0    0     00:00:00
\\EEPC57              LAB                  NT LANMAN 1.0    1     00:00:00
\\EEPC58              LAB                  NT LANMAN 1.0    0     00:00:00
\\EEPC59              LAB                  NT LANMAN 1.0    0     00:00:00
\\EEPC60              LAB                  NT LANMAN 1.0    1     00:00:00
\\EEPC61              LAB                  NT LANMAN 1.0    1     00:00:00
The command completed successfully.
```

A second use of the command with the Computer name as a parameter allows you to see the User name and Solaris PC NetLink software Share name the PC client is using. You can also see the number of files the PC client has open on the share

```
eelab# /opt/lanman/bin/net session \\EEPC01
User name       LAB
Computer        EEPC01
Guest logon     No
Client type     NT LANMAN 1.0
Sess time       00:42:00
Idle time       00:00:00

Share name     Type     # Opens
-------------------------------------------------------------------------------
FILES1         Disk     1
The command completed successfully.
```

Repetitive uses of the command allow you to eventually track down all the users accessing a busy disk subsystem.

A relatively simple Solaris Operating Environment script can automate the procedure of tracking down all the users of a busy share. The name of the script is `share2user`.

```
#!/bin/sh
# share2user
# Copyright(C) 1999 Sun Microsystems
# Don DeVitt
#
# Use PC NetLink commands to determine users using a share
# Usage: share2user <Share Name>
# Where <Share Name> is the name of a PC NEtLink share
# Currently the script does NOT do a lowercase to uppercase translation
#
if test "$1" <> ""
 then
  TARGET=$1
  for CLIENT in `/opt/lanman/sbin/lmstat -c|grep vcnum=0|awk '{print $1}'`
   do
     VALUE=`/opt/lanman/bin/net session \\\\$CLIENT|tail +10|tail -r|\
          tail +2|grep $TARGET|awk '{print "with " $3 " File(s) open"}'`
     ACNT=`/opt/lanman/bin/net session|grep $CLIENT|\
          awk '{print substr($0,24,15)}'`
 # Do not print anything if the PC Client is not using
     if test "$VALUE" <> ""
     then
      echo User $ACNT on PC Client $CLIENT has $TARGET as a network drive $VALUE
     fi
     done
 else
   echo Usage share2user PCSHARE  Example: share2user FILES1
fi
```

If you suspect that a Solaris disk or Solaris PC NetLink software share is overly active, you can use the script to track down all the users using the disk. A sample output of the script follows.

```
eelab# share2user FILES1
User DON on PC Client EEPC07 has FILES1 as a network drive with 0 File(s) open
User DON on PC Client EEPC22 has FILES1 as a network drive with 0 File(s) open
User DON on PC Client EEPC42 has FILES1 as a network drive with 0 File(s) open
User DON on PC Client EEPC01 has FILES1 as a network drive with 1 File(s) open
User DON on PC Client EEPC36 has FILES1 as a network drive with 0 File(s) open
User DON on PC Client EEPC24 has FILES1 as a network drive with 0 File(s) open
User DON on PC Client EEPC09 has FILES1 as a network drive with 1 File(s) open
User DON on PC Client EEPC30 has FILES1 as a network drive with 0 File(s) open
```

In this example User Don has mapped drives from eight different PCs. The script shows the state of the share at any instant of time. You will need to use the script several times to develop a pattern of use.

Tracing CPU Use with Solaris Operating Environment Commands

An alternative method to tracing system utilization of Solaris PC NetLink software is to monitor CPU resource consumption. All Solaris PC NetLink software processes run as root. To manually determine the user, or users of Solaris PC NetLink software that are consuming CPU resources requires a multi-step process that involves both the Solaris Operating Environment and Solaris PC NetLink software commands.

First you will need to monitor which Solaris PC NetLink process are acquiring CPU time. The Solaris PC NetLink software assigns the support of PC client connections to processes called `lmx.srv.` Use the Solaris `ps` command with a filter (`grep`) for `lmx.srv` to quickly see what the current CPU time accumulations look like. An example follows:

```
system1 46 =>ps -eaf|grep lmx.srv
    root 13134 13079  0   Aug 25 ?        2:18 lmx.srv -s 1
     don 22030 22004  0 13:48:07 pts/11   0:00 grep lmx.srv
    root 25926 13079  0   Aug 25 ?        4:47 lmx.srv -s 2
```

In this example, the `lmx.srv` process with process ID (PID) 25926 has consumed 4 minutes 47 seconds of CPU time. If after five to ten minutes you see that any of these processes have consumed significant CPU resources, you may want to investigate the cause.

Tracing CPU Use with Solaris™ PC NetLink Software Commands

Once you find a specific `lmx.srv` process that is consuming significant CPU resources for a long period of time you can trace the source. Here you will need to the Solaris PC NetLink software `/opt/lanman/sbin/lmstat -c` command. A sample output of this command follows:

```
# ./lmstat -c
Shared memory initialization time: Tue Aug 24 10:37:24 1999
Lmx.ctrl's current time:           Mon Sep  6 14:26:28 1999
Server statistics last cleared:    Tue Aug 24 10:37:24 1999
Shared memory size:                940444 bytes

Clients:
     UNAGI (nwnum=0, vcnum=0) on 563
     FUTOMAKI (nwnum=0, vcnum=0) on 563
     EELAB4 (nwnum=0, vcnum=0) on 563
     EELAB1~X (nwnum=0, vcnum=1) on 563
```

In this example, the PC client named UNAGI is being serviced by the `lmx.srv` process with PID 563. If you know your network well, have reasonable idea where are all PC clients are located, and what users use them, you might have all the information you need. If instead the PC client name does you no good, you will need to know the user who is using the PC client.

To see the user account each PC client is logged in as, use the `/opt/lanman/bin/net session` command. The following is an example of output of this command.

```
# /opt/lanman/bin/net session
Computer              User name            Client Type      Opens Idle time
-------------------------------------------------------------------------------
\\GATEST              LSMITCH             NT LANMAN 1.0    10    00:02:00
\\BRIGHTPC1           DMAHBAY1             NT LANMAN 1.0    0     02D 18H 02M
\\CHOCOLATE           JONESBA              NT LANMAN 1.0    2     02D 18H 38M
\\DARUP1              MIKEBAR              NT LANMAN 1.0    0     05D 19H 06M
\\LST12345            REINDEER             NT LANMAN 1.0    0     18D 18H 23M
\\MOET-PC             BSMITH1              NT LANMAN 1.0    0     00:27:00
\\PETER               BC1                  NT LANMAN 1.0    0     01:14:00
\\PINOCHIO            REINDEER             NT LANMAN 1.0    10    00:02:00
. . . Many more entires removed . . ..
```

This command shows the PC client and user account associations, but it doesn't show which `lmx.srv` processes the PC client and user are supported by. The idle time displayed helps show how long users have been inactive. Suffice it to say those with long idle times won't likely be the cause of a current Solaris PC NetLink software related performance problem.

UNIX scripts again come to the rescue to help narrow down what you are looking for, namely, what users on which PC clients are using the `lmx.srv` processes that are consuming considerable CPU resource. Following is an example of the `lmx2user` script.

```
#!/bin/sh
# Copyright(C) 1999 Sun Microsystems
# lmx2user
# Don DeVitt
#
# Use ps, lmstat, and net session to determine user being
# serviced by a specific lmx.srv process
# Usage: lmx2user [PID]
# If PID specified then only users for specific lmx.srv process are
# determined. If no PID specified then print out all users for all
# lmx.srv processes.
#
if test "$1" <> ""
 then
  PID=$1
  for CLIENT in `/opt/lanman/sbin/lmstat -c|grep $PID|awk '{print $1}'`
   do
    ACNT=`/opt/lanman/bin/net session|grep $CLIENT|awk '{print
substr($0,24,15)}'`
      echo lmx.srv process $PID servicing \"$ACNT\" on Client $CLIENT
   done
 else
  for PID in `ps -e |grep lmx.srv|awk '{print $1}'`
   do
    for CLIENT in `/opt/lanman/sbin/lmstat -c|grep $PID|awk '{print $1}'`
     do
      ACNT=`/opt/lanman/bin/net session|grep $CLIENT|awk '{print
substr($0,24,15)}'`
      echo lmx.srv process $PID servicing \"$ACNT\" on Client $CLIENT
     done
   done
fi
```

A sample use of the script follows:

```
# ./lmx2user
lmx.srv process 13134 servicing "JOHNH on Client NIFTY
lmx.srv process 13134 servicing "MIKEYUL " on Client DARUSH
lmx.srv process 13134 servicing "BILLSW" on Client WGS40-102~X
lmx.srv process 13134 servicing "CHUCKJ" on Client THELONIOUS
lmx.srv process 13134 servicing "REINDEER " on Client LST57188
lmx.srv process 13134 servicing "TWAIT" on Client SHIMMY~X
lmx.srv process 13134 servicing "ADMINISTRATOR ADMINISTRATOR
             ADMINISTRATOR " on Client WGS40-03~X
lmx.srv process 15538 servicing "DON" on Client UNAGI
lmx.srv process 15538 servicing "JSMITH" on Client WGS40-13
lmx.srv process 15538 servicing "HJONES" on Client SUSWAR
lmx.srv process 15538 servicing "JBLISS" on Client WGS40-13
lmx.srv process 15538 servicing "PETERB" on Client PETER
lmx.srv process 15538 servicing "DMAMONEY " on Client BRIGHTOJR
lmx.srv process 15538 servicing "ADMIN1" on Client SHIMMY~X
lmx.srv process 15538 servicing "BMUNROW " on Client MOET-PC
#
```

You can use the script with or without a Process ID (PID) as a parameter. If you specify a PID, the script shows just the users being serviced by the `lmx.srv` process associated with the given PID.

In the example, if you knew process 13134 was a highly active process, accumulating considerable CPU time for long periods of time, you would know that it was one of the seven users listed. You can acquire more information by using the Solaris PC NetLink software `net session` command (see previous example). Those users with significant idle time cannot be the cause of any performance issues. Those with several files open, may be the cause. Additional refinement of the scripts may automate the process further, allowing you to narrow down the high loading candidates further. A quick way to use the script is to cut the text of the script from this online article and paste the text into a Solaris Operating Environment text editor. Save the file and remember to turn on the protection bits to allow execution with a `chmod 755` command.

The scripts presented in this article should help narrow down which users are actively using the system. It is usually a simple matter to investigate the programs running on their PC to see what might be demanding constant file access. Many of these resource demanding applications are started via the StartUp Program Group when the PC system is booted. This might be the first place to look. You can ask users to reconfigure the applications to restrict their file access to files local to the PC or to schedule the network scans for off hours.

References

For more detailed information on Solaris PC NetLink software, please refer to the "Solaris™ PC NetLink Software: Performance, Sizing and Deployment" BluePrint. This book is scheduled for publication by Prentice Hall in the spring of 2000 and will be available through http://www.sun.com/books, amazon.com, fatbrain.com or Barnes & Noble bookstores.

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Don has been on the development teams of almost every software and hardware PC interoperability product Sun Microsystems has produced over the last 13 years. Don is currently a PC Interoperability specialist within the Enterprise Engineering group and is a member of the Solaris PC NetLink engineering team where he has focused on performance related issues.

Don DeVitt started his career as an electrical engineer and worked in the Automated Test industry (Teradyne Inc.), and PC operating system market (Digital Research from CP/M fame) before coming to Sun.