VIOS Performance Monitoring Setup Instructions
September 24, 2015
Please send questions to: idoctor@us.ibm.com

Summary

This is the first phase which will allow you to automatically collect NPIV and NMON stats from the VIOS partitions and send the data to IFS directories located on an IBMi partition. In a future build of iDoctor we will also provide the ability to automatically import and purge old IFS files and database members. Currently you will need to right click and import any collections from the IFS that you wish to view. The import process creates the database files needed to view the NMON and NPIV data via iDoctor graphs. Requirements and setup instructions are included below.

Requirements

1. Unpack the .tar file idoctor.scripts.tar on the VIOS partitions that you will be collecting data from. Setup ssh between the VIOS and IBMi and schedule the required processes to run via the cron scheduler.

2. Install the latest iDoctor client and server builds located on our website. Note that the iDoctor server build will need to be updated on the partition that the VIOS data is sent to and analyzed on. There is an import process that will need to be run in order for the data to be visible. The iDoctor client will need to be updated on any PC that will be used to import or analyze the data.

   https://www-912.ibm.com/i_dir/idoctor.nsf/downloadoptions.html

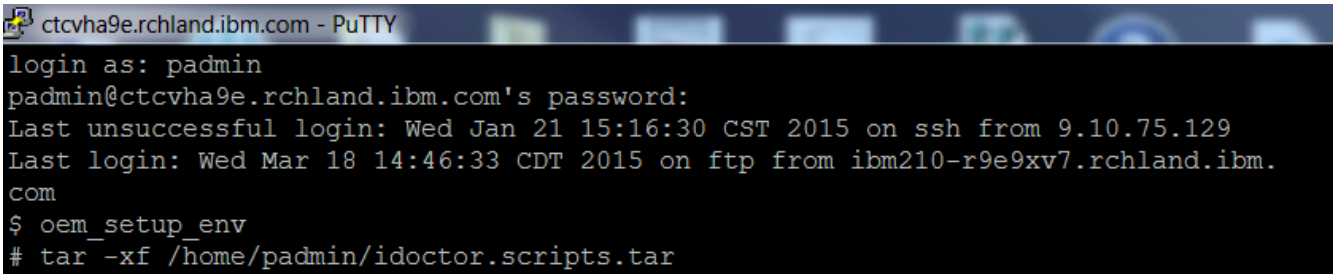
Section1. SSH Setup Instructions

The SSH Setup Instructions below will walk you through setting up SSH between the VIOS and IBMi.

1. Transfer the idoctor.scripts.tar file to the VIOS partitions using ftp. Put the file in the /home/padmin directory.

```
C:\Users\IBM_ADMIN>ftp ctcvha9e.rchland.ibm.com
Connected to ctcvha9e.rchland.ibm.com.
220 ctcvha9e FTP server (Version 4.2 Tue Feb 26 11:59:32 CST 2013) ready.
User (ctcvha9e.rchland.ibm.com:(none)): padmin
331 Password required for padmin.
Password:
230-Last unsuccessful login: Wed Jan 21 15:16:30 CST 2015 on ssh from 9.10.75.12
9
230-Last login: Fri Mar 13 12:52:19 CDT 2015 on /dev/pts/0 from sig-9-76-146-32.
ibm.com
230 User padmin logged in.
ftp> bin
200 Type set to I.
ftp> put idoctor.scripts.tar
200 PORT command successful.
150 Opening data connection for idoctor.scripts.tar.
226 Transfer complete.
ftp: 378880 bytes sent in 0.02Seconds 21048.89Kbytes/sec.
```

2. Open an ssh session to the VIOS partition and unpack the tar file. This will restore the /tmp/idoctor directory.
   a. Login as padmin
   b. oem_setup_env
   c. tar -xf /home/padmin/idoctor.scripts.tar



3. The scripts in the /tmp/idoctor directory were packed with the required permissions. Run ls -la /tmp/idoctor to review the permissions if necessary.

```
# ls -la /tmp/idoctor
total 888
drwxr-xr-x    4 root     staff          4096 Mar 16 22:34 .
drwxrwxrwt   12 bin      bin            4096 Mar 18 15:00 ..
drwx------    2 root     staff           256 Jan 29 12:40 .ssh
-rwxrwx---    1 root     staff           989 May 02 2014  Linuxbuildcfgsummary.s
h
-rwxrwx---    1 root     staff           861 May 02 2014  Linuxfindnmon.sh
-rwxrwx---    1 root     staff          1598 May 02 2014  Linuxgetnmonlist.sh
-rwxrwx---    1 root     staff          1255 May 02 2014  Linuxwaitforpid.sh
-rwxrwx---    1 root     staff          1045 May 02 2014  buildcfgsummary.sh
-rwxrwx---    1 root     staff          4231 May 02 2014  fc_snap.sh
-rwxrwx---    1 root     staff           915 Feb 04 11:08 findadvisor.sh
-rwxrwx---    1 root     staff           874 May 02 2014  findnmon.sh
-rwxrwx---    1 root     staff           869 May 02 2014  findnpiv.sh
-rwxrwx---    1 root     staff          1053 May 02 2014  findperfpmr.sh
-rwxrwx---    1 root     staff          1907 May 02 2014  getVfcList.sh
-rwxrwx---    1 root     staff          1206 Feb 04 11:08 getadvisorlist.sh
-rwxrwx---    1 root     staff           552 May 02 2014  getaixprop.sh
-rwxrwx---    1 root     staff           614 May 02 2014  getlinuxprop.sh
-rwxrwx---    1 root     staff          2772 May 02 2014  getnmonlist.sh
-rwxrwx---    1 root     staff          2774 May 02 2014  getnpivlist.sh
-rwxrwx---    1 root     staff          2730 May 02 2014  getperfpmrlist.sh
-rwxrwx---    1 root     staff          3345 May 02 2014  getperfpmrver.sh
-rwxrwx---    1 root     staff          4176 May 02 2014  getperfpmrver_old.sh
-rwxrwx---    1 root     staff           727 May 02 2014  getrmtftpdir.sh
-rwxrwx---    1 root     staff         71680 Mar 16 16:35 idoctor.tar
-rwxrwx---    1 root     staff         81920 Jan 16 07:52 idoctor.tar.gz
-rw-r--r--    1 root     staff        126073 Mar 16 17:05 idrsyscfg0.nmon
-rwxrwx---    1 root     staff           583 Jan 16 07:59 installidoctor.sh
-rwxrwx---    1 root     staff           641 May 02 2014  installperfpmr.sh
-rw-r--r--    1 root     staff            81 Mar 16 22:34 ioscli.log
-rwxrwxrwx    1 padmin   staff          3182 Mar 16 11:54 nmon_monitor.sh
-rwxrwxrwx    1 padmin   staff          1300 Feb 01 10:04 nmon_monitor_old.sh
-rwxrwxrwx    1 padmin   staff          2301 Mar 16 22:28 npiv_monitor.sh
-rwxrwx---    1 root     staff          2119 May 02 2014  prt_fc_snap.sh
-rwxrwx---    1 root     staff            26 Feb 04 11:08 qidrvrm.txt
drwxr-xr-x    5 root     staff           256 Mar 16 17:04 repository
-rwxrwxrwx    1 padmin   staff          1268 Mar 16 18:13 scp_monitor.sh
-rwxrwx---    1 root     staff           777 May 02 2014  startadvisor.sh
-rwxrwx---    1 root     staff           643 May 02 2014  startnmon.sh
-rw-r--r--    1 root     staff          4112 Mar 16 17:05 startnpiv.err
-rw-r--r--    1 root     staff           207 Mar 16 16:56 startnpiv.out
-rwxrwx---    1 root     staff          6575 May 02 2014  startnpiv.sh
-rwxrwx---    1 root     staff          1534 May 02 2014  startperfpmr.sh
-rwxrwx---    1 root     staff          1350 May 02 2014  waitforpid.sh
```

4. Generate the public/private key pair for ssh.
   a. ssh-keygen -t rsa -f id_rsa -N ''

```
# cd /home/padmin
# ssh-keygen -t rsa -f id_rsa -N ''
Generating public/private rsa key pair.
Your identification has been saved in id_rsa.
Your public key has been saved in id_rsa.pub.
The key fingerprint is:
ea:65:af:41:86:6d:8c:f1:c7:cf:ed:bb:97:9d:43:4d root@ctcvha9e
The key's randomart image is:
+--[ RSA 2048]----+
|                 |
|                 |
|      .          |
|       B .      E|
|      o S o    ..|
|       = . o . ..|
|      . +   o o +|
|     . o o   . +o|
|      . ...   ++.|
+-----------------+
```

5. Determine which user will be used for ssh connections to the IBMi partition. Log on to the IBMi partition and ensure the user has a /home/myuserid directory created where myuserid is the user that will be used for ssh connections.
   a. qsh
   b. mkdir /home/myuserid/.ssh (if the directory does not exist)
   c. touch /home/myuserid/.ssh/authorized_keys (if the authorized key file does not exist)
   d. ls -la to view permissions. Permissions may need to be changed in a later step.

```
                              QSH Command Entry

  $
> mkdir /home/BSMENGES/.ssh
  $
> ls -la
  total: 28 kilobytes
  drwxrwsrwx   3 BSMENGES  0                    8192 Mar 18 16:20 .
  drwxrwsrwx   7 QSYS      0                    8192 Apr 29  2013 ..
  drwxrwsrwx   2 BSMENGES  0                    8192 Mar 18 16:20 .ssh
```

6. Ensure the user profile has the home directory specified. Use DSPUSRPRF to check and CHGUSRPRF to change the profile if necessary.

```
                    Change User Profile (CHGUSRPRF)

Type choices, press Enter.

Locale . . . . . .   *SAME
_____
User options . . . . . .   *NONE_____     *SAME, *NONE, *CLKWD...
               + for more values
User ID number . . . . . .   131________   1-4294967294, *SAME
Group ID number  . . . . . .   *NONE_____   1-4294967294, *SAME, *GEN...
Home directory . . . . . .   /home/BSMENGES_
```

7. FTP to the VIOS partition to retrieve the public key file or have it sent to an intermediate system if FTP is not allowed. Note that ascii transfer should be used or the key file should be zipped prior to sending.
   If FTPing from the IBMi to VIOS:
   a. ftp to the vios
   b. ascii
   c. cd /home/padmin
   d. namefmt 1
   e. get id_rsa.pub /home/myuserid/.ssh/id_rsa.pub
   f. quit

```
> ascii
  200 Type set to A; form set to N.
> cd /home/padmin
  250 CWD command successful.
> namefmt 1
  500 'SITE NAMEFMT 1': command not understood.
  Client NAMEFMT is 1.
> get id_rsa.pub /home/bsmenges/.ssh/id_rsa.pub
  229 Entering Extended Passive Mode (|||56151|)
  150 Opening data connection for id_rsa.pub (395 bytes).
  226 Transfer complete.
    396 bytes transferred in 0.173 seconds. Transfer rate 2.291 KB/sec.
```

8. Ensure the IBMi is configured properly for ssh to work.
   Below is a good link which summarizes what is needed.

http://www-304.ibm.com/partnerworld/wps/servlet/ContentHandler/pw_com_porting_tools_openssh

Key points:
a. Ensure 5733-SC1 -- IBM portable utilities for I is installed on the system.
b. The userid's home directory must not have public write authority (chmod go-w /home/myuserid)
c. The userid's /home/myuserid/.ssh directory and /home/myuserid/.ssh/authorized_keys file must not have any public authorities (chmod go-rwx /home/userid/.ssh and chmod go-rwx /home/myuserid/.ssh/authorized_keys)

```
> chmod go-w /home/bsmenges
  $
> chmod go-rwx /home/bsmenges/.ssh
  $
> chmod go-rwx /home/bsmenges/.ssh/authorized_keys
  $
```

d. The public key must be located in the /home/myuserid/authorized_keys file. Use the cp command to copy the id_rsa.pub file into the authorized_keys file. Only use the cp command if the file is empty or you do not care about it's contents as cp will overwrite the file. If the authorized_keys file already contains data, keys from other systems for example, use the cat command instead as follows. If you will be having multiple VIOS send data to the same IBMi, then you will need to bring down the key files one at time and use cat to add them to the authorized_keys file.

Example using cp (data in the file will be replaced)

cp id_rsa.pub authorized_keys

```
> cp id_rsa.pub authorized_keys
  $
> ls
  authorized_keys id_dsa.pub      id_rsa.pub
```

Example using cat >> (data will be appended to the end of the file)

cat id_rsa.pub >> authorized_keys

Note that >> appends to the end of a file but > replaces the file like cp.

```
===> cat id_rsa.pub >> authorized_keys
```

e. Ensure that the ssh daemon is in listen mode. Netstat option 3 and look for local port ssh. Use STRTCPSVR SERVER(*SSHD) to start the server.

```
                    Work with IPv4 Connection Status
                                                          System:   IDOC710
Type options, press Enter.
  3=Enable debug   4=End   5=Display details   6=Disable debug
  8=Display jobs

     Remote          Remote     Local
Opt  Address         Port       Port       Idle Time  State
 _   *               *          ftp-con >  113:16:04  Listen
 _   *               *          ssh        000:00:35  Listen
```

9. Now that the IBMi setup is complete, SSH from the VIOS partition to the IBMi in order to add the IBMi to the Known Hosts File on the VIOS.
   a. After logging in to the VIOS issue the command ssh myuserid@myipaddress where

myuserid is the userid configured on the IBMi partition and my IP address is the IP address or hostname.domain name of the IBMi partition. If using hostname VIOS must be able to perform DNS lookup.

b. Answer yes when prompted. The IBMi will be added to the list of known hosts.

c. Log on with the password for myuser.

d. Log off the IBMi partition by typing logoff and press enter.

```
login as: padmin
padmin@ctcvha9e.rchland.ibm.com's password:
Last unsuccessful login: Wed Jan 21 15:16:30 CST 2015 on ssh from 9.10.75.129
Last login: Sat Mar 21 09:04:29 CDT 2015 on ftp from idoc710.rchland.ibm.com
$ oem_setup_env
# ssh bsmenges@9.5.68.31
The authenticity of host '9.5.68.31 (9.5.68.31)' can't be established.
ECDSA key fingerprint is cb:33:f9:b8:3f:fd:64:34:69:fa:e0:1e:9f:05:d9:1f.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '9.5.68.31' (ECDSA) to the list of known hosts.
bsmenges@9.5.68.31's password:
$
```

10. Now that everything is set up on the VIOS and IBMi partitions, test that you are able to logon without a password.

    a. ssh -i /home/padmin/id_rsa myuserid@myIPaddress

    b. If you get a $ prompt without further prompting or messages, you are logged on the IBMi. Type exit, and enter to log off.

    c. If you are prompted for a password, then something is wrong in the configuration or with the ssh daemon on the server side. Try ssh again with -iv, -ivv, or -ivvv flags for various levels of logging that will help to pinpoint the error (verbose, very verbose, or very very verbose). The sshd logs on the IBMi side can also be checked for errors.

```
# ssh -i /home/padmin/id_rsa bsmenges@9.5.68.31
$
```

Section 2. VIOS Monitor Setup Instructions

This section will walk you through setting up data directories on the IBMi partition and cron scheduler entries on the VIOS that will automatically collect and scp NMON and NPIV data to the IBMi.

1. Create data directories on the IBMi. In this example we created two sub directories in the user's home directory. One for nmon and one for npiv. If you will be sending data from multiple VIOS then create nmon and npiv directories for each VIOS. The name of the directory is not important, but you will reference it in the setup on the VIOS side. For multiple VIOS you could use nmon_vios1, nmon_vios2, etc. In this example we are only showing one VIOS.

    a. qsh

    b. mkdir /home/myuserid/nmon

c. mkdir /home/myuserid/npiv

```
> mkdir /home/bsmenges/nmon
  $
> mkdir /home/bsmenges/npiv
  $
```

2. Add cron schedule entries on the VIOS. The following steps are using crontab -e to modify the cron file manually using the vi editor. This can be tricky if it is your first time using vi. There is a good vi cheat sheet located here: http://www.lagmonster.org/docs/vi.html. Each time you modify the file you will use the following process.

   a. Log on to the VIOS with padmin.
   b. Type oem_setup_env and press enter.
   d. Type crontab -e and press enter.
   e. Make changes to the file.
   f. :x and press enter to save the changes.

3. Below is a screenshot showing the required entries in cron. An explanation of the entries follow.

```
# @(#)08       1.15.1.3  src/bos/usr/sbin/cron/root, cmdcntl, bos610 2/11/94 17:19:47
# IBM_PROLOG_BEGIN_TAG
0 * * * * /tmp/idoctor/nmon_monitor.sh 300 60
* * * * * /tmp/idoctor/scp_monitor.sh /home/padmin/id_rsa bsmenges 9.5.68.31 /home/bsmenges/nmon nmon
0 * * * * /tmp/idoctor/npiv_monitor.sh 13 300
* * * * * /tmp/idoctor/scp_monitor.sh /home/padmin/id_rsa bsmenges 9.5.68.31 /home/bsmenges/npiv npiv

# This is an automatically generated prolog.
#
# bos610 src/bos/usr/sbin/cron/root 1.15.1.3
```

a. NMON Monitor: 0 * * * * /tmp/idoctor/nmon_monitor.sh 300 60
This starts a new NMON collection with 5 minute intervals every hour (300 sec 60 min).

b. SCP Monitor for NMON data:
/tmp/idoctor/scp_monitor.sh /home/padmin/id_rsa myuserid myIPaddress /home/myuserid/nmon nmon
myuserid: User ID configured for SSH on the IBMi system.
MyIPaddress: IP address of the IBMi system.
/home/myserid/nmon: Remote directory where nmon data for this system should be sent
nmon: Tells the SCP Monitor that this is nmon data.

d. NPIV Monitor: 0 * * * * /tmp/idoctor/npiv_monitor 13 300
This starts a new NPIV monitor every hour. 13, 5 minute snapshots are collected.
This results in a full 60 minutes (12, 5 minute intervals) of data each hour.

e. SCP Monitor for NPIV data:
/tmp/idoctor/scp_monitor.sh /home/padmin/id_rsa myuserid myIPaddress /home/myuserid/npiv npiv
myuserid: User ID configured for SSH on the IBMi system.
MyIPaddress: IP address of the IBMi system.

/home/muserid/nmon: Data directory where nmon data for this system should be sent

4. Example of how to enter the four above entries using crontab -e.

   a. crontab -e
   b. Arrow down to the third line and press the 'o' key to open a new line after the cursor.
   c. Type in the following (NMON monitor from above is used as an example):
      0 * * * * /tmp/idoctor/nmon_monitor.sh 300 60
   d. Press the back arrow key until the cursor hits the left most margin and you see a flash.
   e. Type in :x and enter to save changes.
   d. Repeat steps a through d for the NPIV Monitor, and two SCP Monitor entries referenced in step 3. The order of the entries in cron does not matter.

   5. Now that the monitors are configured, after each NMON or NPIV collection the data will be copied from the collection directory to an scpout directory. This will happen every 60+ minutes. The scpout directories are monitored every minute for new data. As new data arrives, it is sent to the specified remote directory and then deleted from the VIOS. Doing an ls on the /tmp/vios_investigator directory will show applicable sub-directories.

   /tmp/vios_investigator/nmon: NMON Monitor data is stored here
   /tmp/vios_investigator/scpout_nmon: NMON SCP directory
   /tmp/vios_investigator/npiv: NPIV Monitor data is stored here
   /tmp/vios_investigator/scpout_npiv: NPIV SCP directory

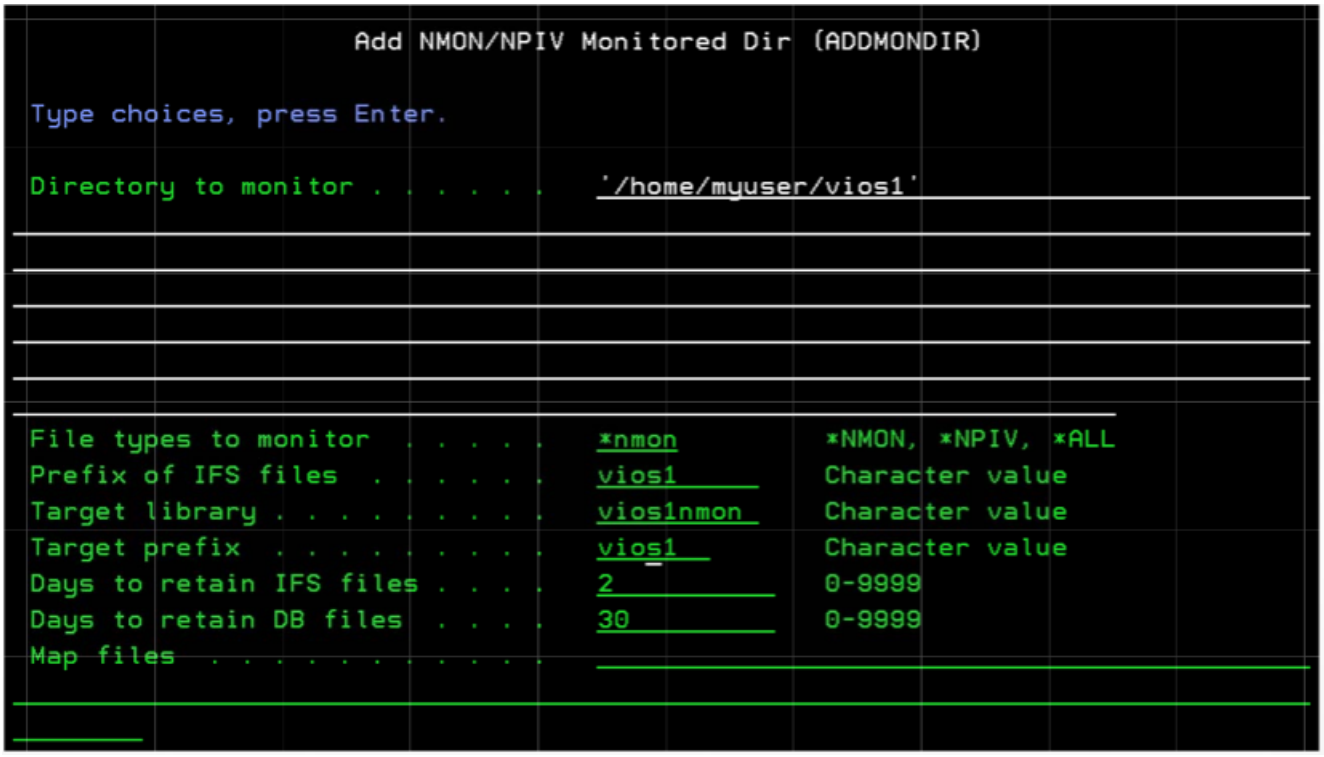
```
# date
Sat Mar 21 10:00:02 CDT 2015
# ls
nmon         npiv         scpout_nmon  scpout_npiv
```

5. Use the QIDRGUI/ADDMONDIR command to add the monitored directory or directories.

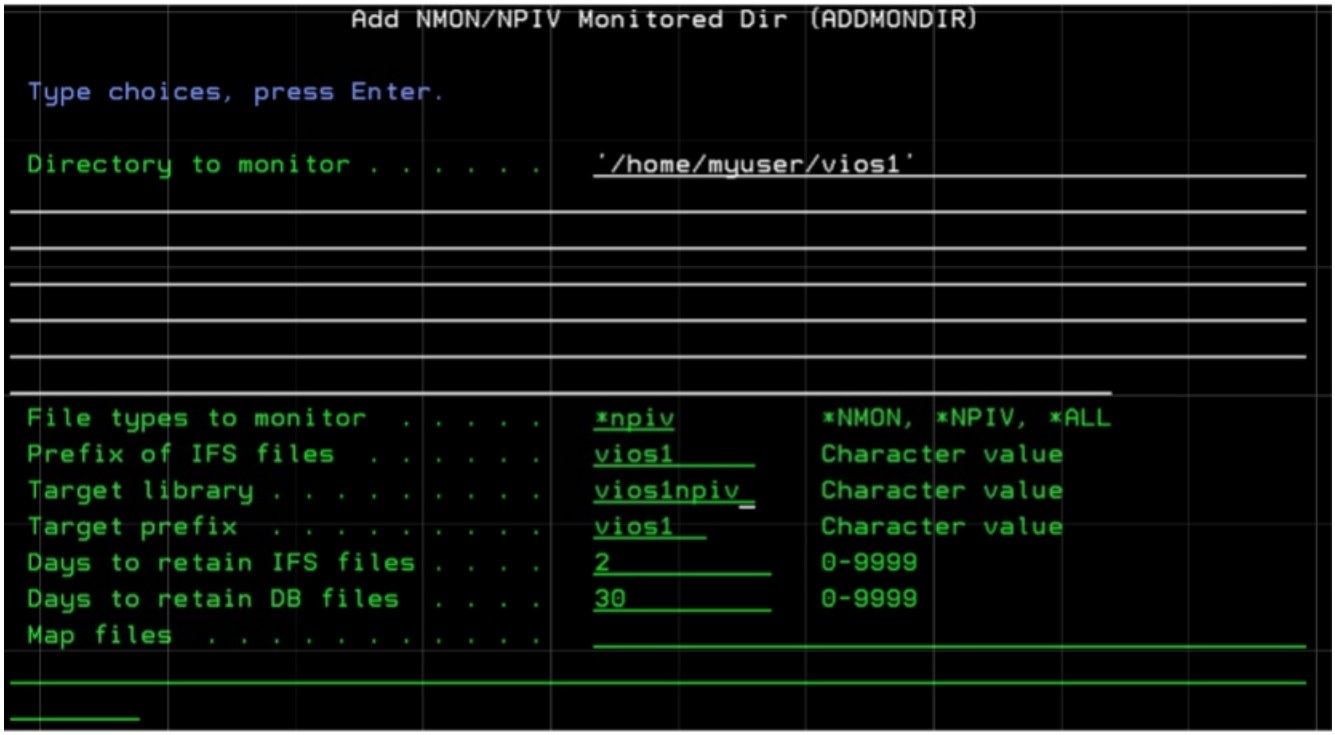
Example 1: Adding endtry to monitor directory for NMON and NPIV files from VIOS1.

```
                    Add NMON/NPIV Monitored Dir (ADDMONDIR)

 Type choices, press Enter.

 Directory to monitor . . . . . '/home/myuser/vios1'
_____
_____
_____
_____
_____
_____
_____

 File types to monitor . . . . . *all          *NMON, *NPIV, *ALL
 Prefix of IFS files . . . . . vios1          Character value
 Target library . . . . . vios1perf     Character value
 Target prefix . . . . . vios1          Character value
 Days to retain IFS files . . . . 2            0-9999
 Days to retain DB files . . . . 30           0-9999
 Map files . . . . . _
_____
_____
```

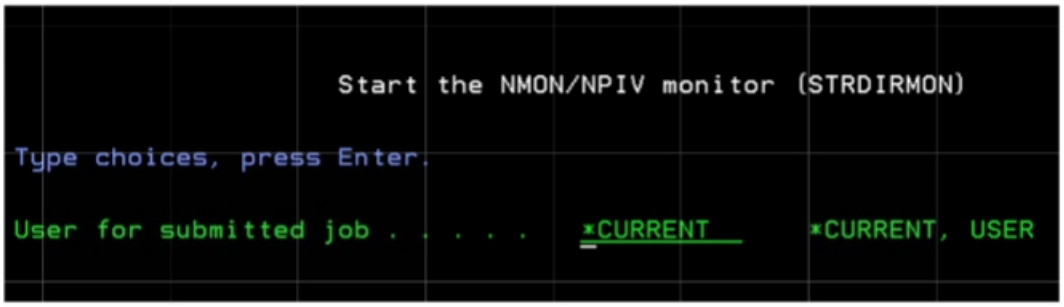
Example 2: Adding entry to monitor directory for NMON files only from VIOS 1.



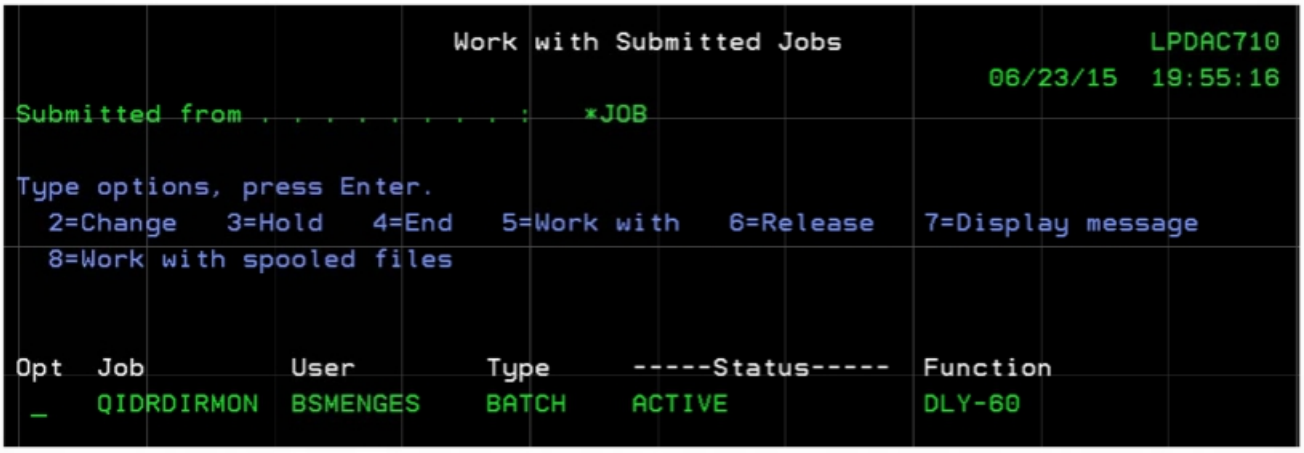
Example 3: Adding entry to monitor directory for NPIV files only from VIOS1.



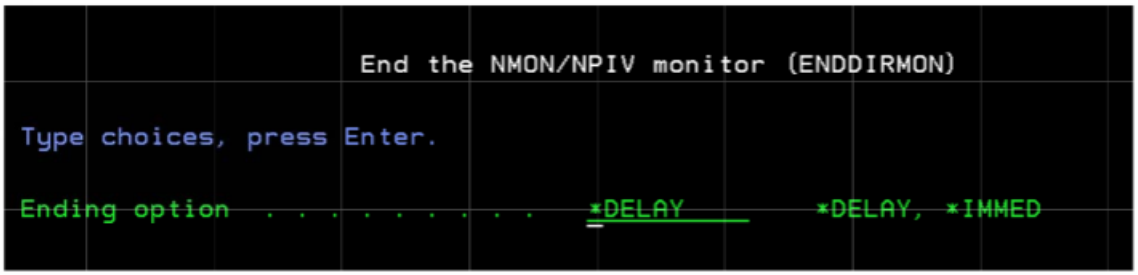
6. Starting the directory monitor job.



QIDRDIRMON is the Directory Monitor Job. This job monitors a list created from the ADDMONDIR command.



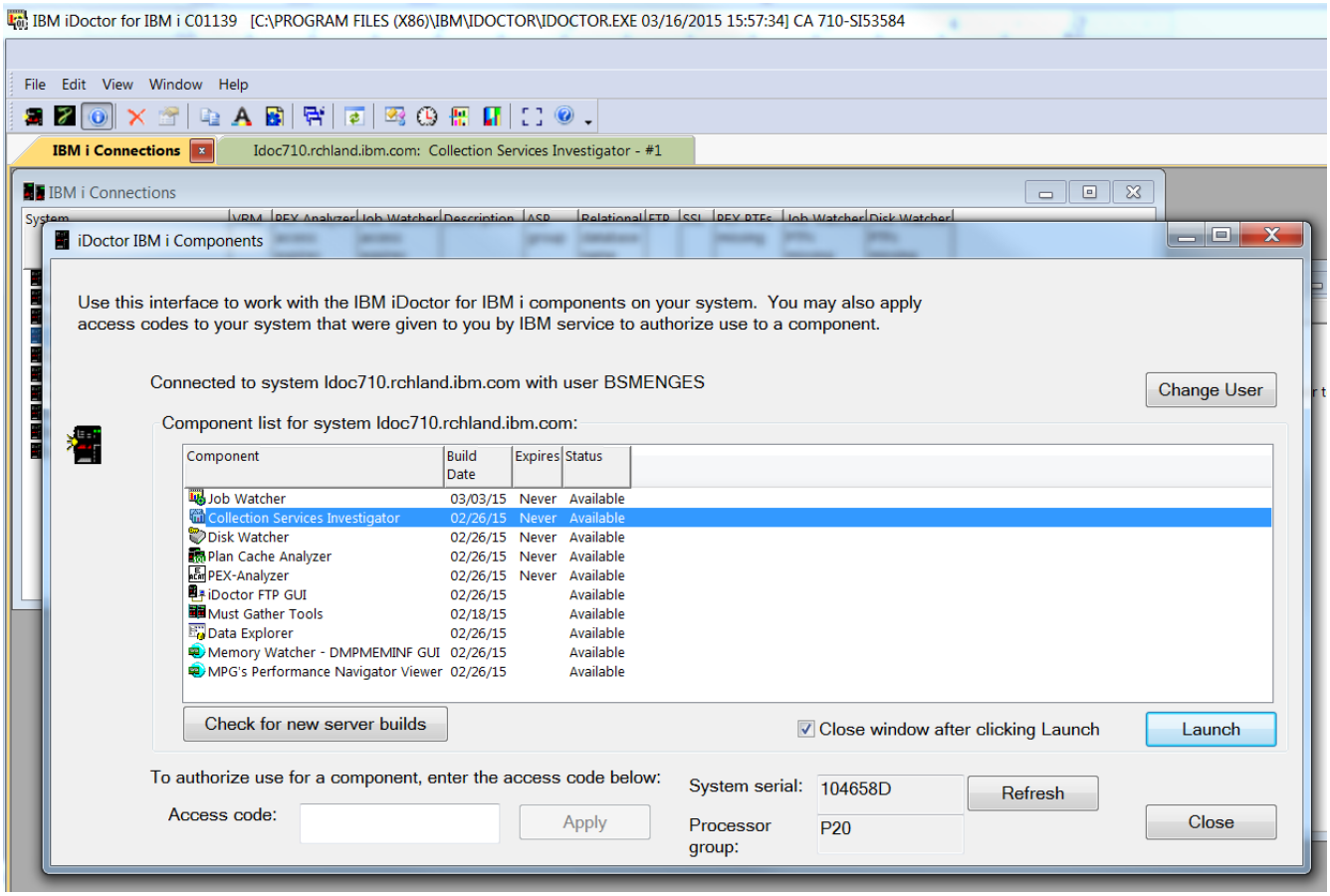
7. Ending the directory monitor job.



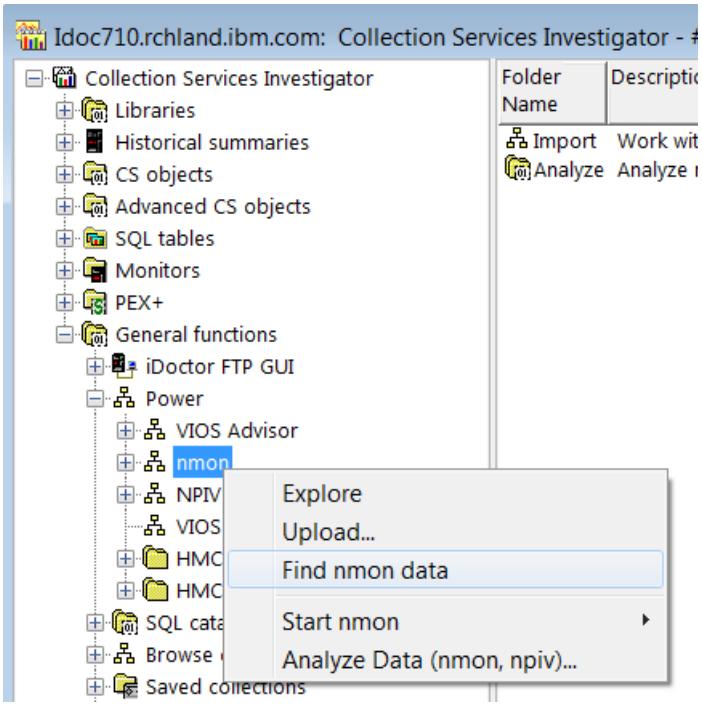
Section 4. Manually Importing NMON and NPIV data into iDoctor. This is to be used if not using the directory monitor.

Using the iDoctor GUI Find NMON and Find NPIV functions, data can be quickly located in the IFS. Right clicking on a collection allows easy importing into database files that are then available for graphing.

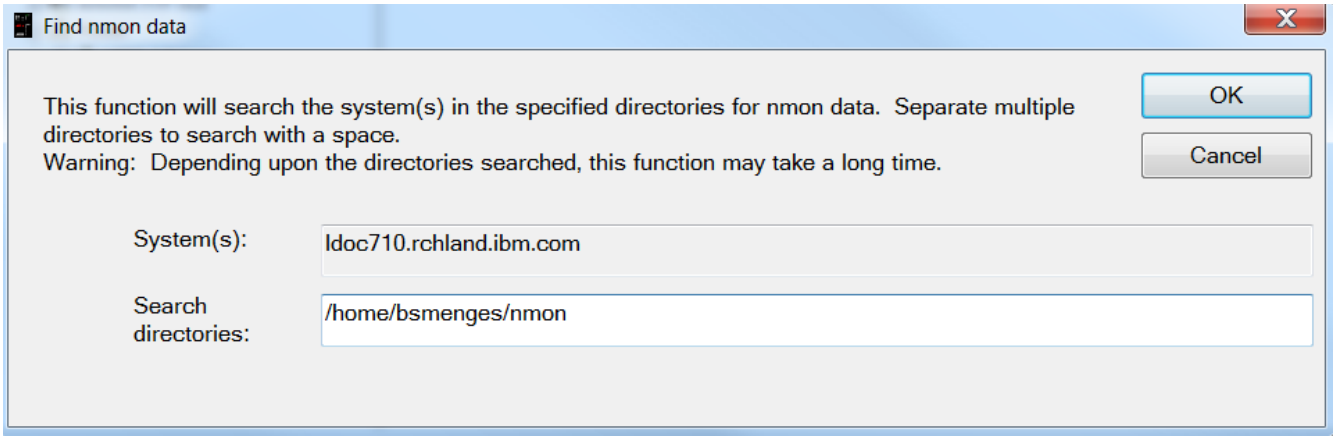
1. Open the iDoctor GUI and launch a component such as Collection Services Investigator (CSI). We recommend launching CSI as this will allow looking at high level IBMi Collection Services data and comparing against NMON or NPIV data.



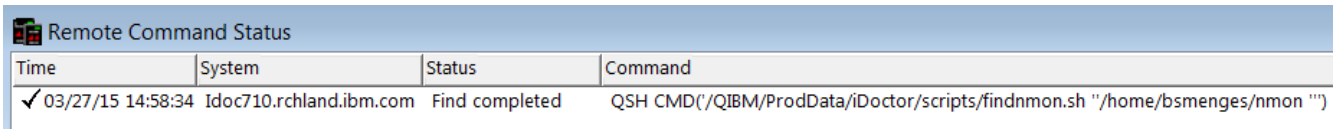
2. Expand General Functions → Power. Here you will see an NMON and NPIV folder. To refresh the contents of a directory right click on the collection type, NMON in the example and select Find nmon data. The same concept can be used for NPIV data.



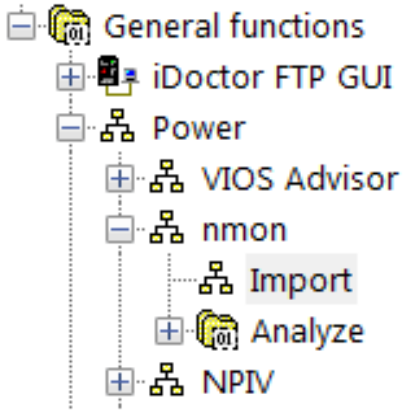
3. Enter the data directory and click OK.



4. Wait for the remote command status window to show Find complete.

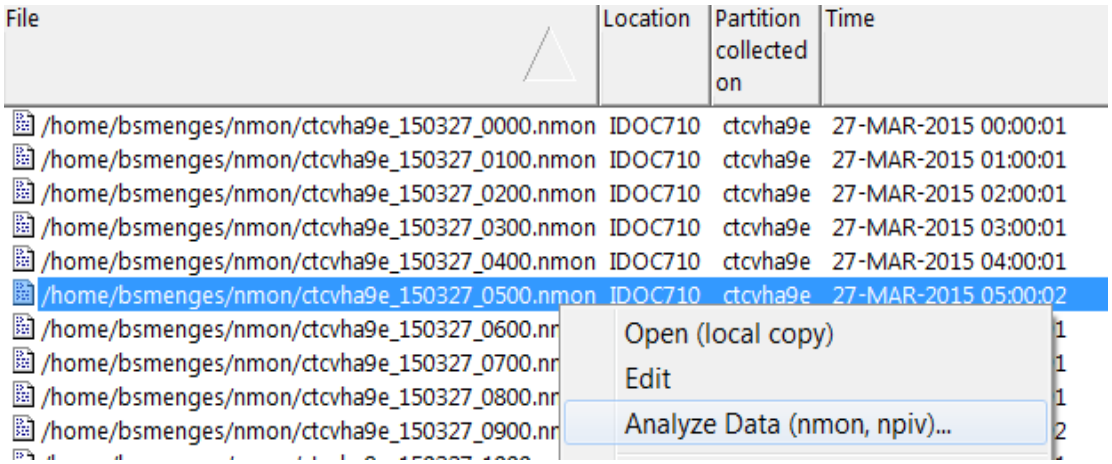


5. Open the import folder by expanding in the left pane or double clicking in the right pane.

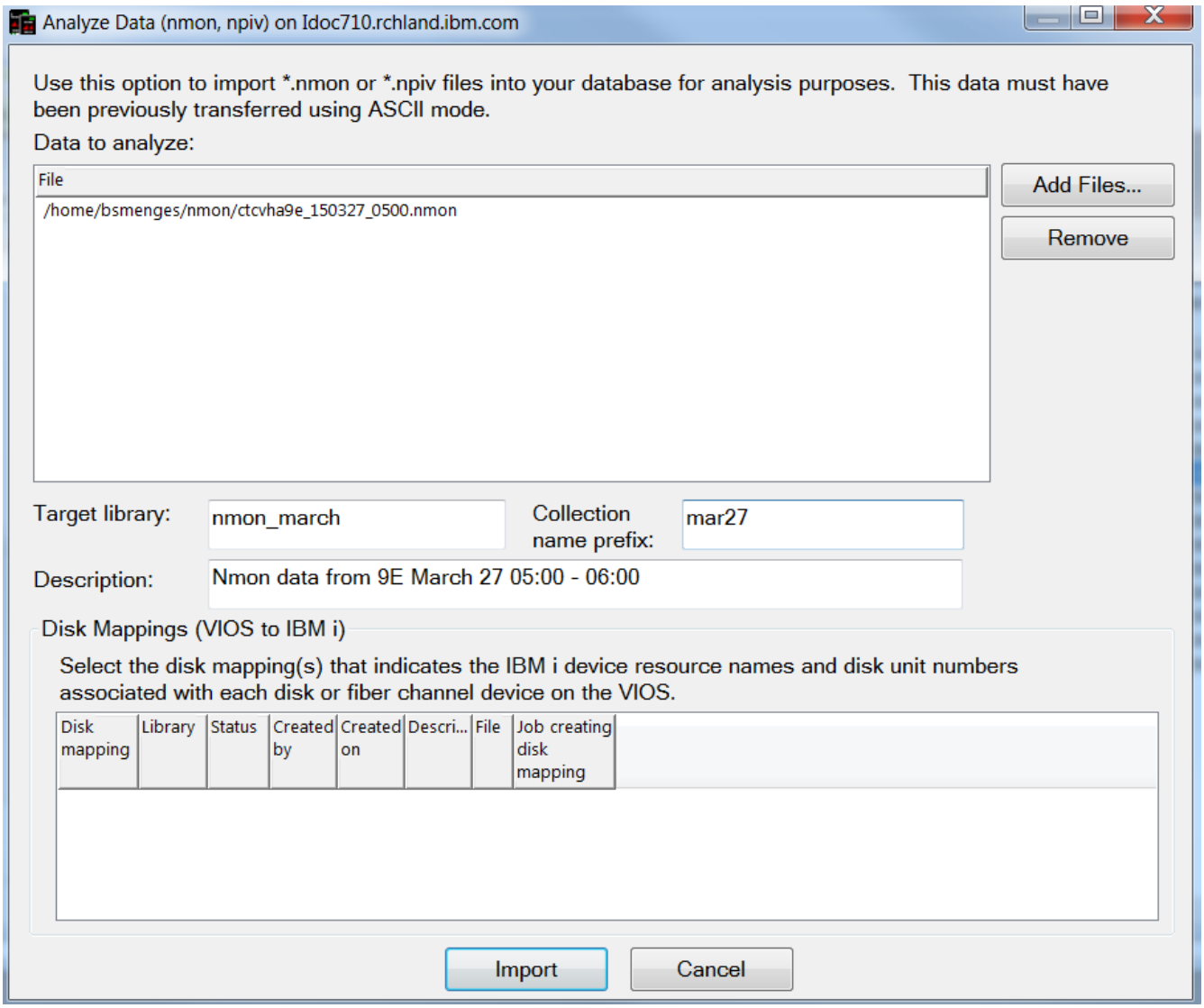


6. In the right pane right click on a collection and select Analyze Data.

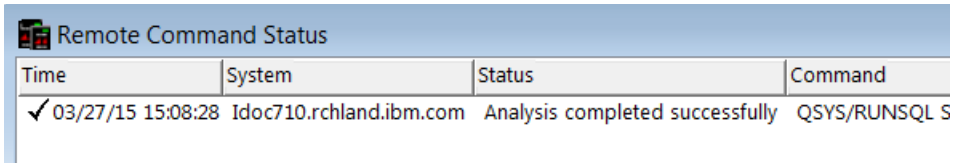
   Note: Find the collection starting time by reading the file name or Time column.



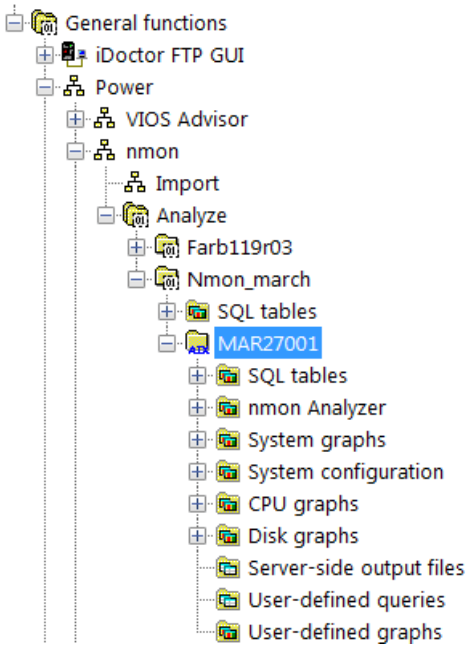
7. Fill in the target library, Collection library, Collection name prefix, and description. Then click Import.



8. Wait for the Analysis Completed message in the remote command status window.

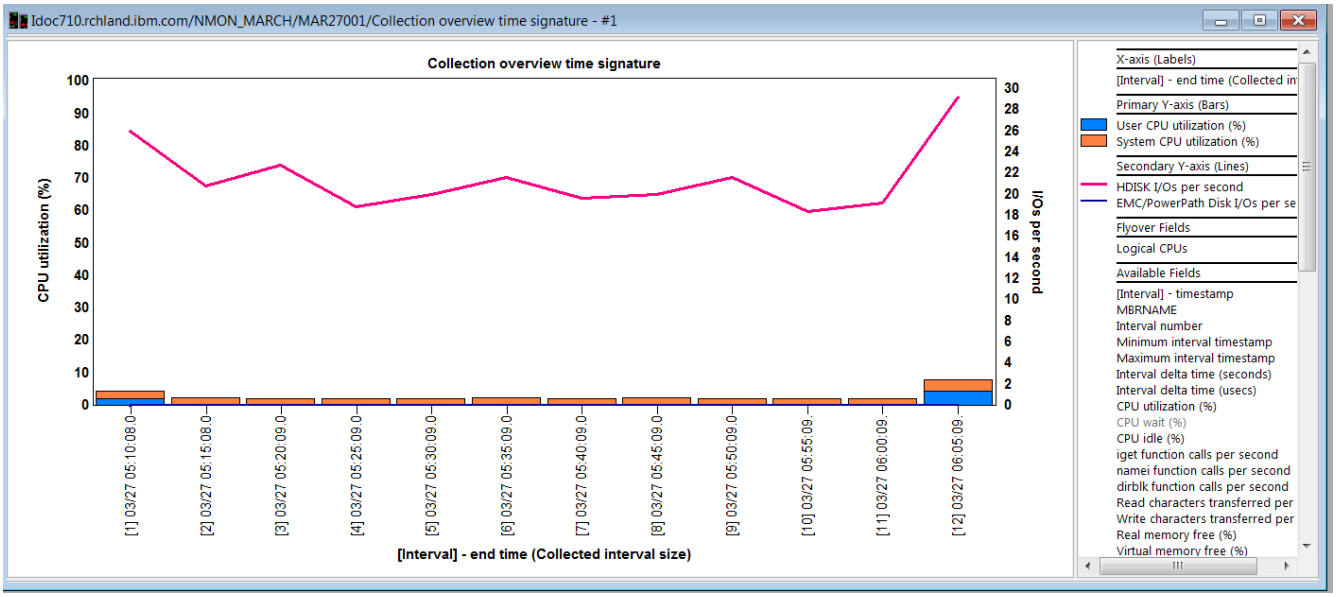


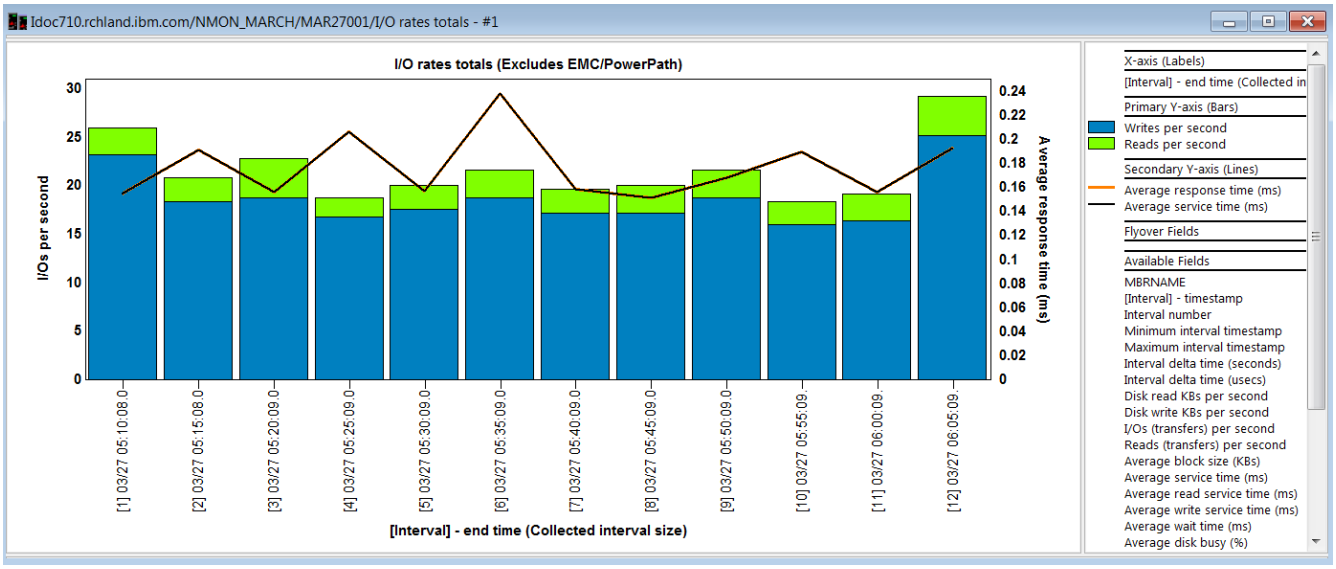
9. Now the data is available to analyze. Expand the tree under nmon to find the library and collection. Expand further to see available graphs.



Section 5: Example graphs.

There are many graphs available, this is a small sample.




Idoc710.rchland.ibm.com/NMON_MARCH/MAR27001/I/O rates totals - #1
I/O rates totals (Excludes EMC/PowerPath)
I/Os per second
Average response time (ms)
[Interval] - end time (Collected interval size)
[1] 03/27 05:10:08.0
[2] 03/27 05:15:08.0
[3] 03/27 05:20:09.0
[4] 03/27 05:25:09.0
[5] 03/27 05:30:09.0
[6] 03/27 05:35:09.0
[7] 03/27 05:40:09.0
[8] 03/27 05:45:09.0
[9] 03/27 05:50:09.0
[10] 03/27 05:55:09.
[11] 03/27 06:00:09.
[12] 03/27 06:05:09.
X-axis (Labels)
[Interval] - end time (Collected in
Primary Y-axis (Bars)
Writes per second
Reads per second
Secondary Y-axis (Lines)
Average response time (ms)
Average service time (ms)
Flyover Fields
Available Fields
MBRNAME
[Interval] - timestamp
Interval number
Minimum interval timestamp
Maximum interval timestamp
Interval delta time (seconds)
Interval delta time (usecs)
Disk read KBs per second
Disk write KBs per second
I/Os (transfers) per second
Reads (transfers) per second
Average block size (KBs)
Average service time (ms)
Average read service time (ms)
Average write service time (ms)
Average wait time (ms)
Average disk busy (%)