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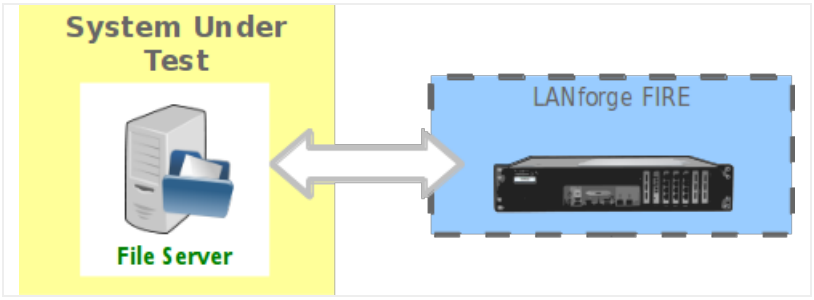
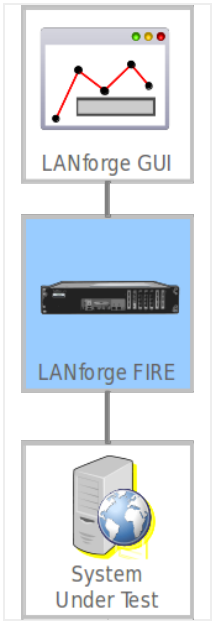
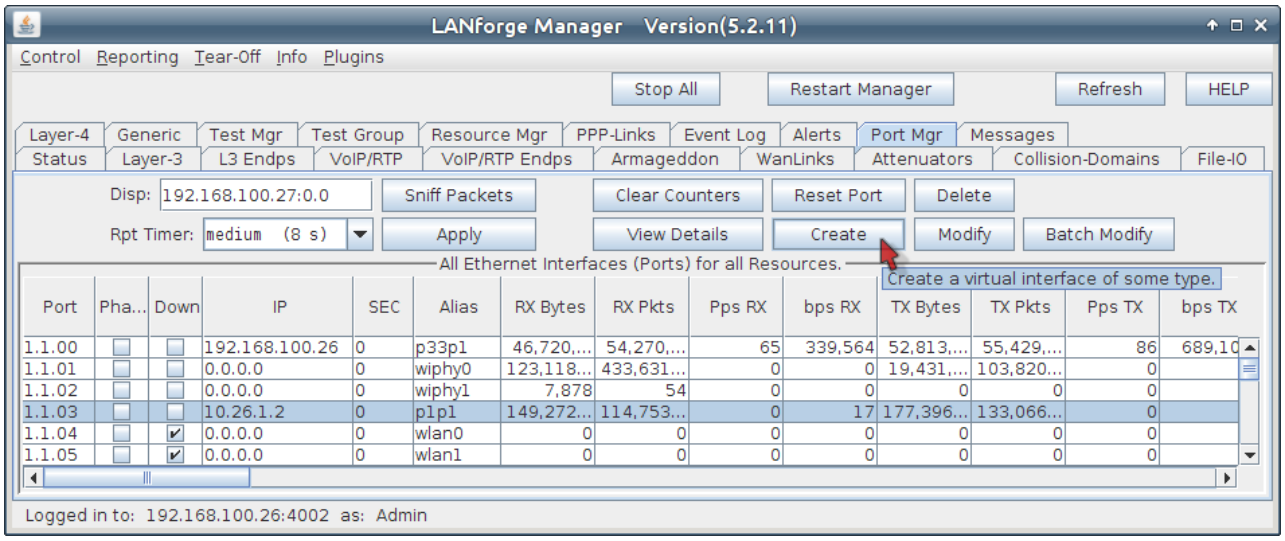
LANforge File-IO with CIFS and NFS

Goal: Create a series of MAC-VLAN based clients to emulate CIFS and NFS traffic. This cookbook connects a LANforge system to a file server with CIFS and NFS shares available. The file server in this example will be `10.26.1.3`. It will be sharing `smb://10.26.1.3/fileio` and `10.26.1.3:/home/fileio`. We will create ten readers and ten writers for each file sharing protocol. This demonstrates using the **Batch Create** tool in the **FileIO** tab.

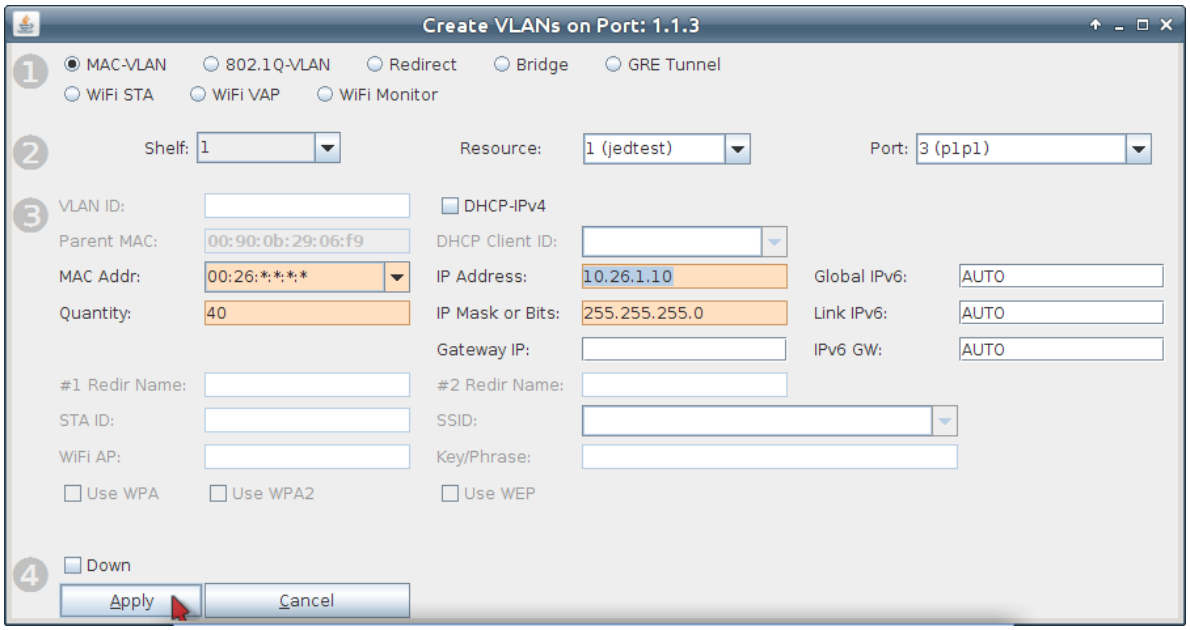




1. Create initial MAC VLANS for our emulated endpoints. In the **Port Mgr** tab, highlight a a **non-management** port on your LANforge FIRE system and click **Create.**

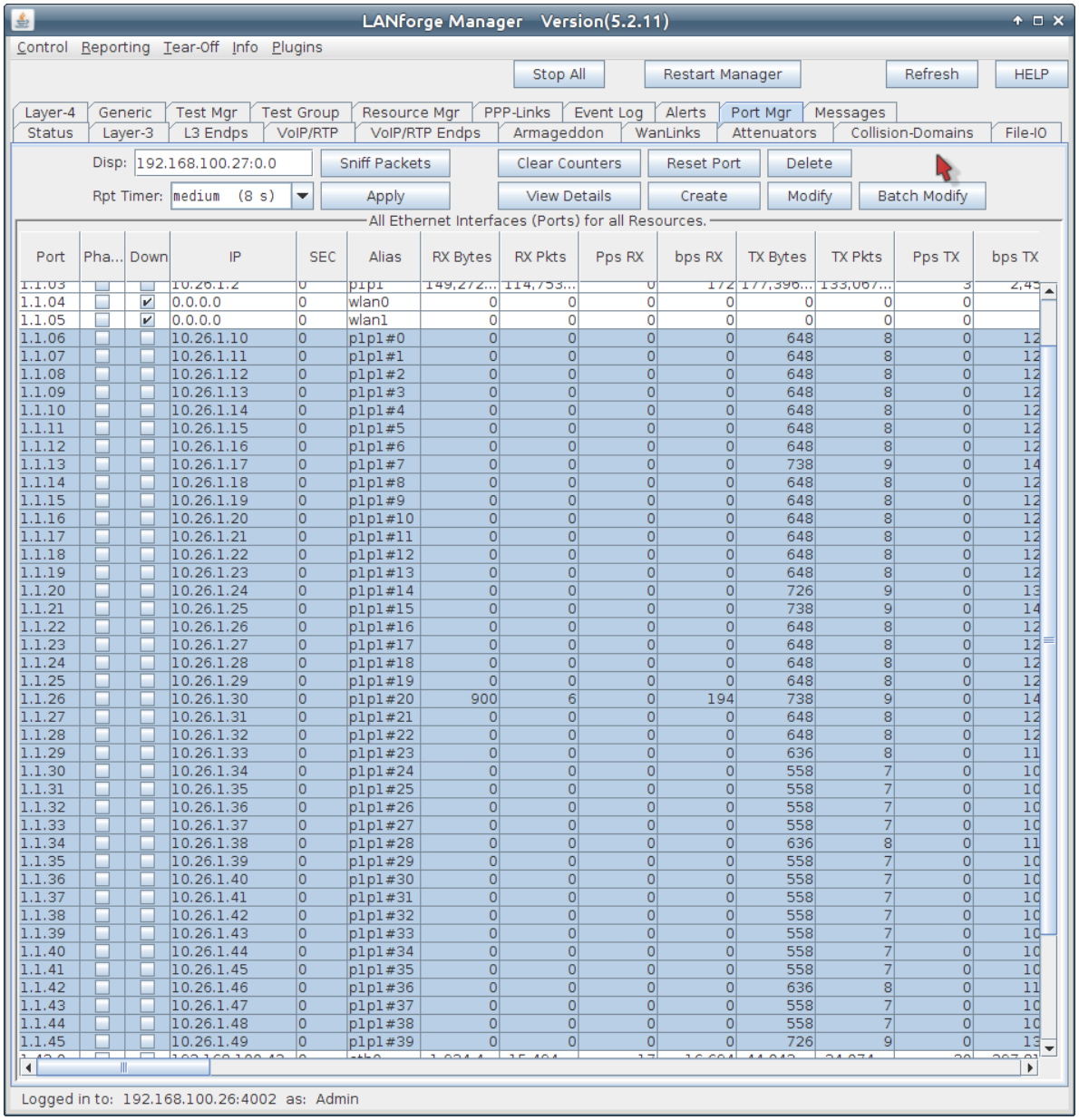


A. Create 40 MAC VLANS with IPs starting at `10.26.1.10`.



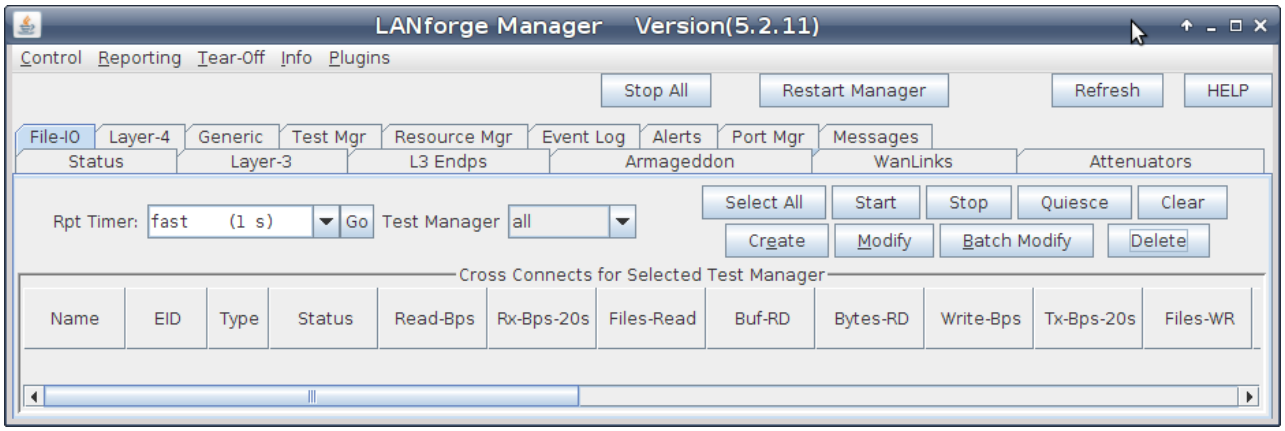
A. Select **MAC-VLAN**
B. Choose either `*:*:*:*:*:*` (random) or select a starting MAC address, like `00:26:*:*:*:*`
C. Enter `10.26.1.10` and `255.255.255.0` for the IP and netmask.
D. Set **Quantity** to `40.`
E. Click **Apply** to create the MAC VLANs.
F. Click **Cancel** to close the **Create** window.

B. See the 40 MAC VLANs in the **Ports** tab.

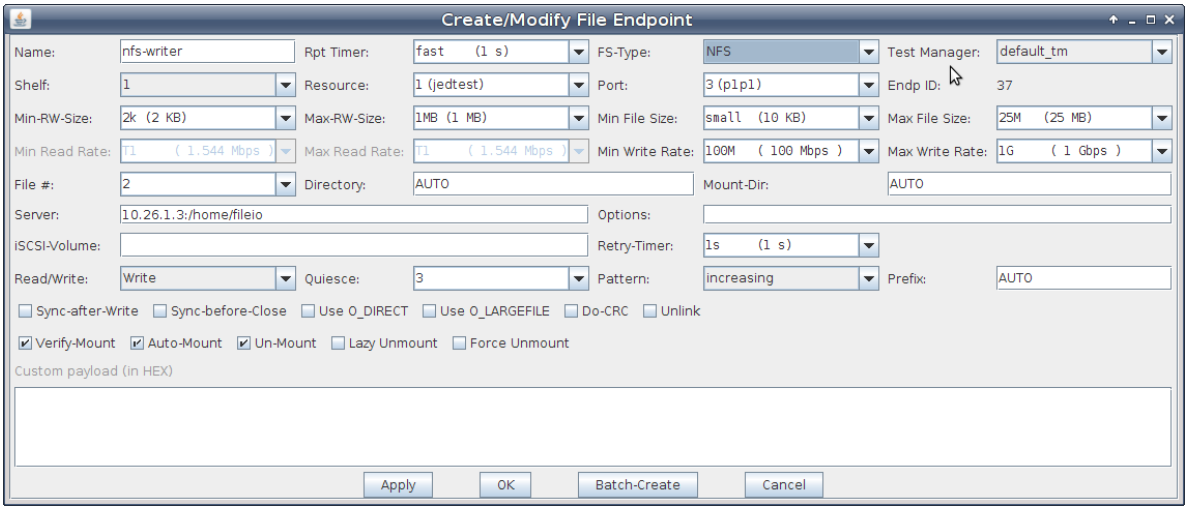


For more information see GUI Users Guide

2. Create your first FileIO NFS Endpoint. In the **FileIO** tab, click **Create.**

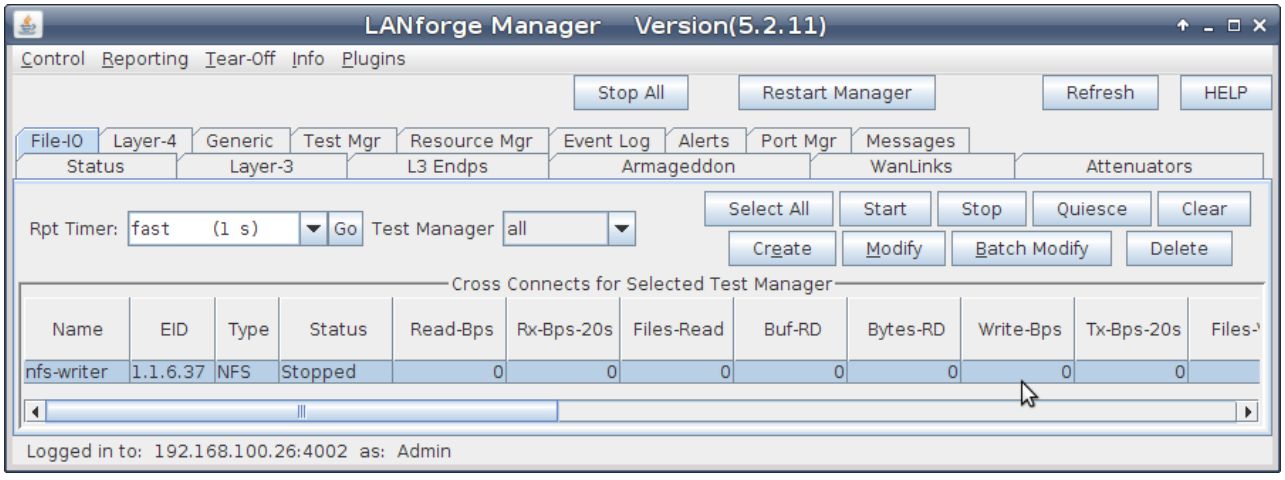


A. Use the following settings to create a NFS reader writer endpoint.

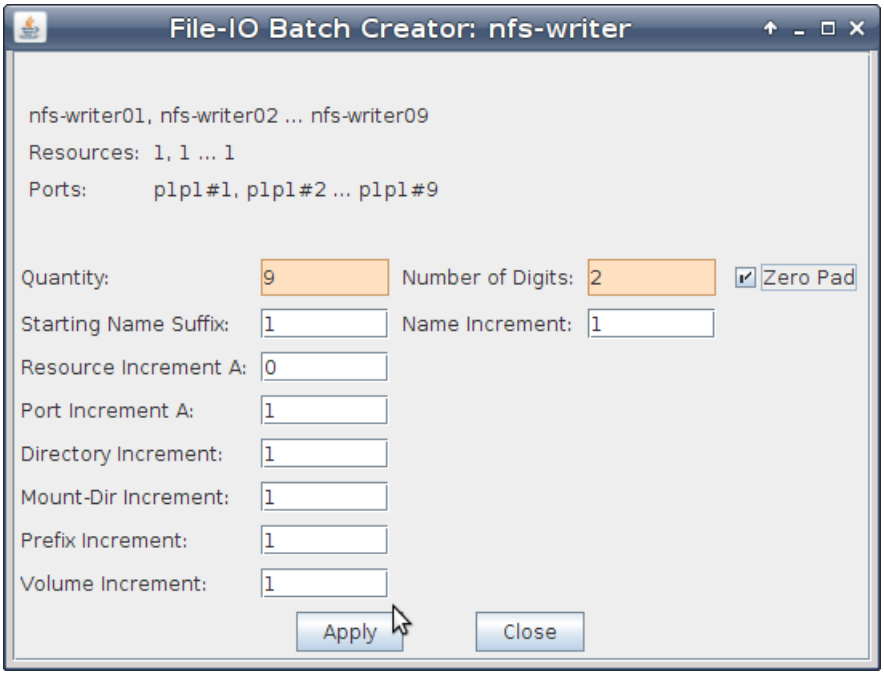


A. Enter `nfs-writer` for the name.
B. Select `NFS` for **FS-Type**
C. Use the first MAC-VLAN `p1p1#0` for **Port**
D. Select `2KB` for the **Min-RW Size**
E. Choose `1MB` for the **Max-RW Size**
F. For **Min File Size** choose `10KB`
G. Then for **Max File Size** choose `25MB`
H. The **Min Write Rate** is the minimum inbound line rate, start at `100Mbps`
I. Then set the **Max Write Rate** at `1Gbps`
J. Set the number of files written per connection: set **File #** to `2`
K. Now we specify the NFS server: set **Server** to `10.26.1.3:/home/fileio`
L. You can leave **Directory**, and **Mount-Dir** at `AUTO`
M. Click **OK** to commit the settings.

3. In the **File-IO** tab, select the endpoint you just created and click **Modify**



A. The **File-IO Details** dialog appears. Click the **Batch Create** button at the bottom of the screen.



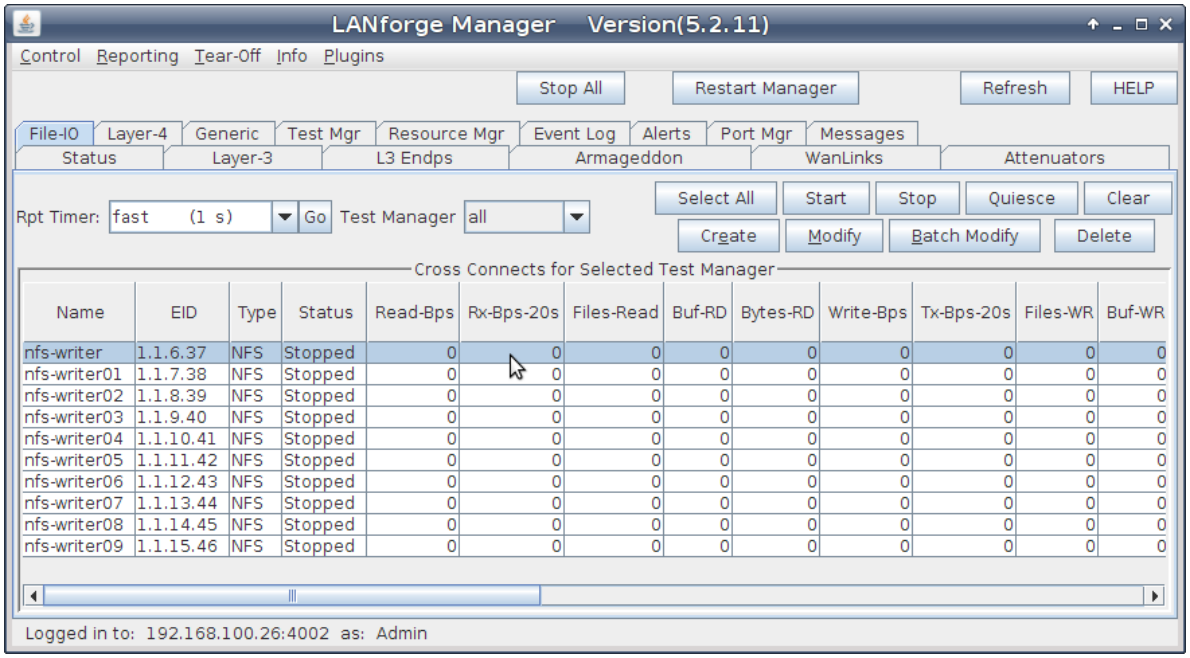
B. Enter these values into the Batch Create dialog:

   A. **Quantity** should be `9`

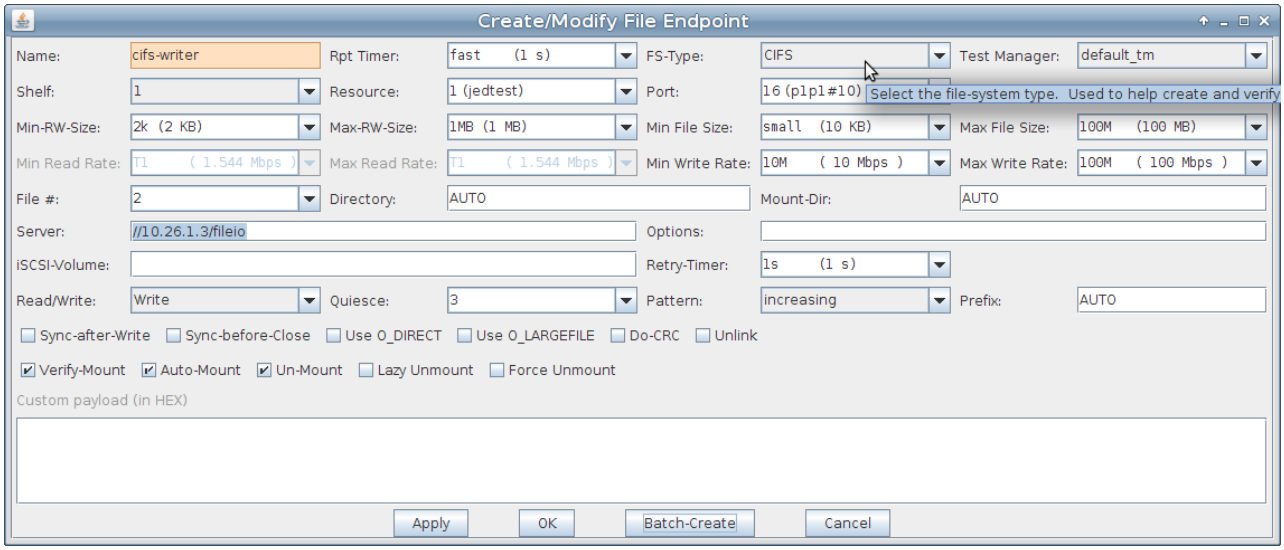
   B. **Number of Digits** should be `2`

   C. Click **Apply**

C. Close the Batch Create window. You will see the new endpoints.



4. Create initial endpoint for CIFS writer.



A. Name the endoint `cifs-writer`

B. Set **FS-Type** to `CIFS`

C. Then set the **Port** to the next open MAC VLAN: `p1p1#10`

D. Set the **Min-RW Size** and **Max-RW Size** to `2k` and `1M`

E. For the **Min File Size** and **Max File Size** enter `10KB` and `100MB`

F. The **Min Write Rate** and the **Max Write Rate** should be `10 Mbps` and `100 Mbps`

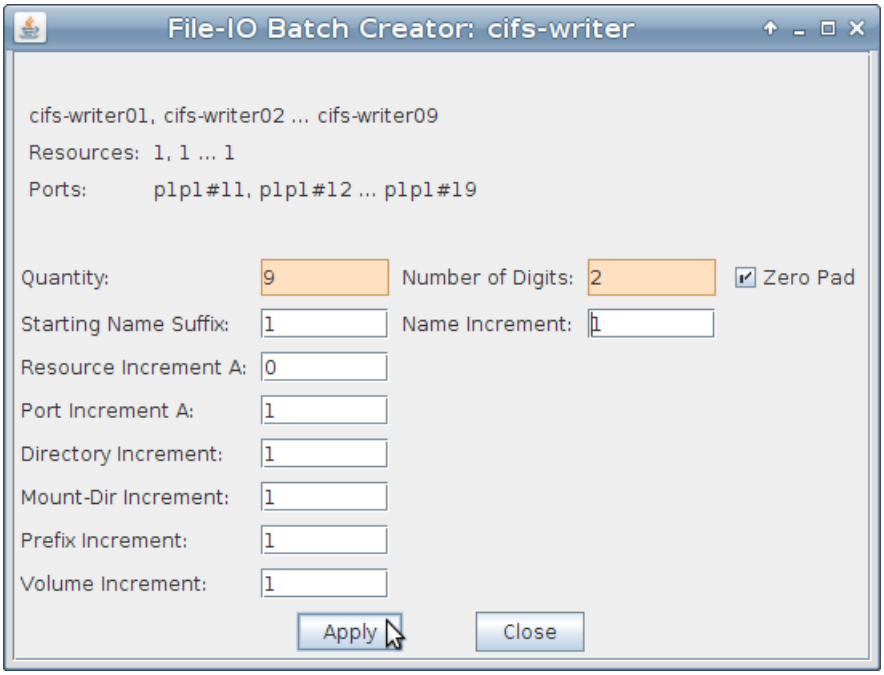
G. Enter `//10.26.1.3/fileio` for **Server**

H. Supply the credentials for the CIFS mount point in **Options**. For this example, our username and password are 'lanforge' and 'lanforge'. Write them as options to the *mount* command: `user=lanforge,passwd=lanforge`

I. Click **Apply**

5. Use Batch Create to create nine more CIFS endpoints. You do not actually need to close the**Create/Modify** window. Click on **Batch Create** directly.

A. In the **Batch Create** window, Enter:



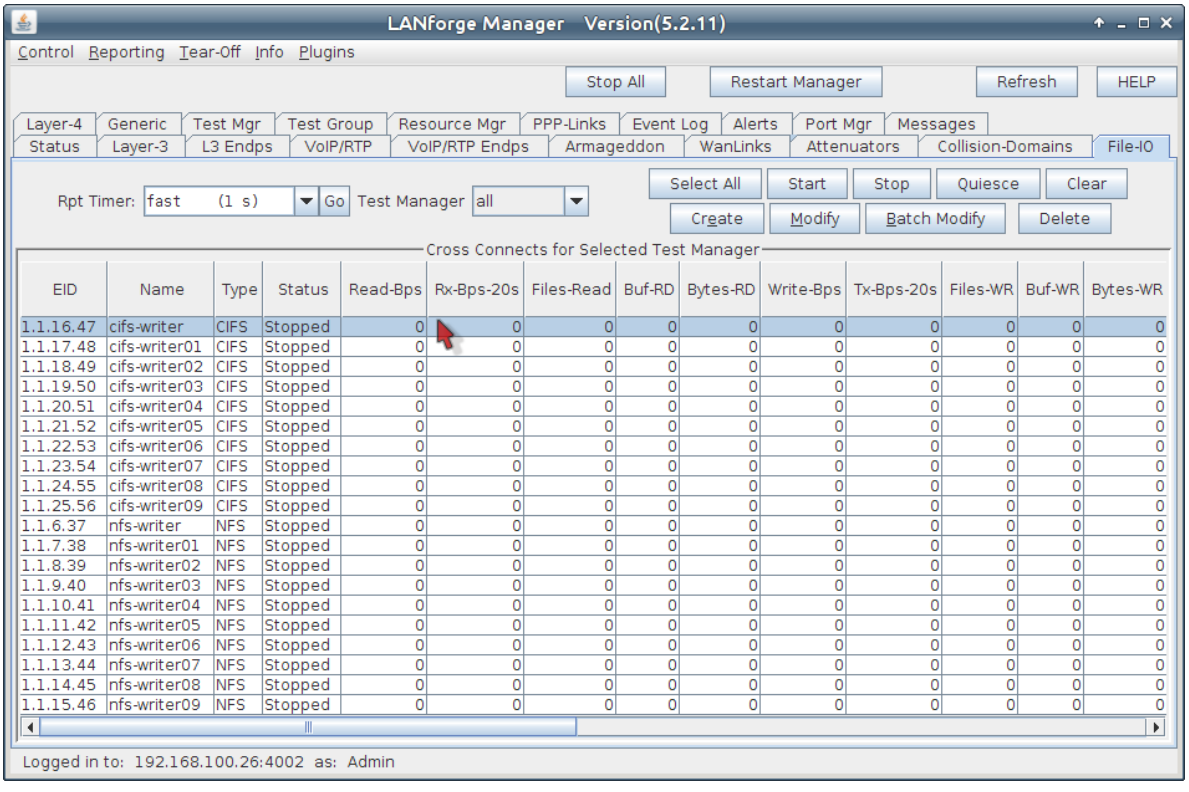
A. **Quantity** is `9`

B. **Number of Digits** is `2`

C. Then click **Apply**

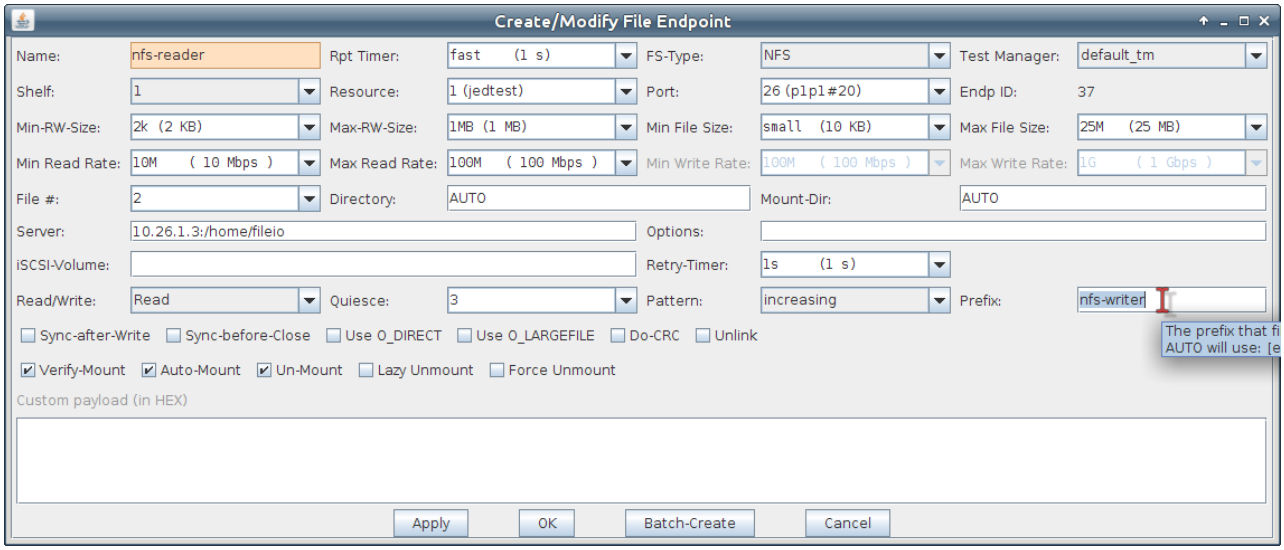
B. In **Create/Modify** click **Cancel**

C. In the **File-IO** tab, you will see ten more endpoints.



6. We will proceed to creating the same number of **NFS reader endpoints** by using a writer as a template for a reader:

7. Open the Modify window of the endpoint `nfs-writer`



A. Change the **Name** to `nfs-reader`

B. Set the **Port** to the next unused MAC VLAN, `p1p1#20`

C. Change **Read/Write** to `Read`

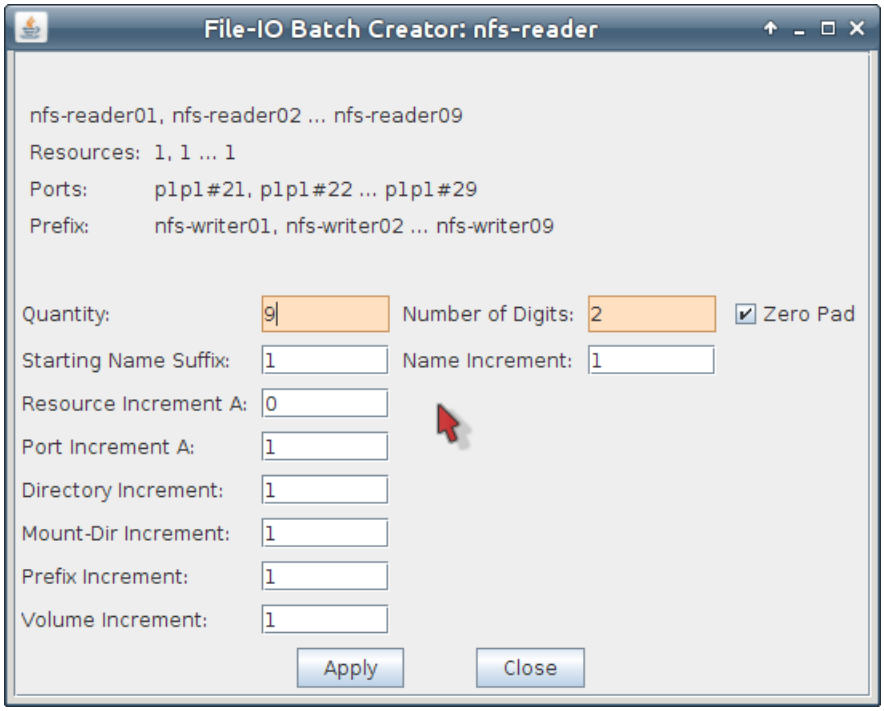
D. Set the **Min Read Rate** and **Max Read Rate** to `10 Mbps` and `100 Mbps`

E. To match this reader to a writer, set the **Prefix** field to `nfs-writer`

F. Click **Apply**

8. Before closing the Modify windows we can use Batch Create to create nine more NFS endpoints:

9. Click on the **Batch Create** window of the endpoint `nfs-reader`



A. Change the **Quantity** to `9`

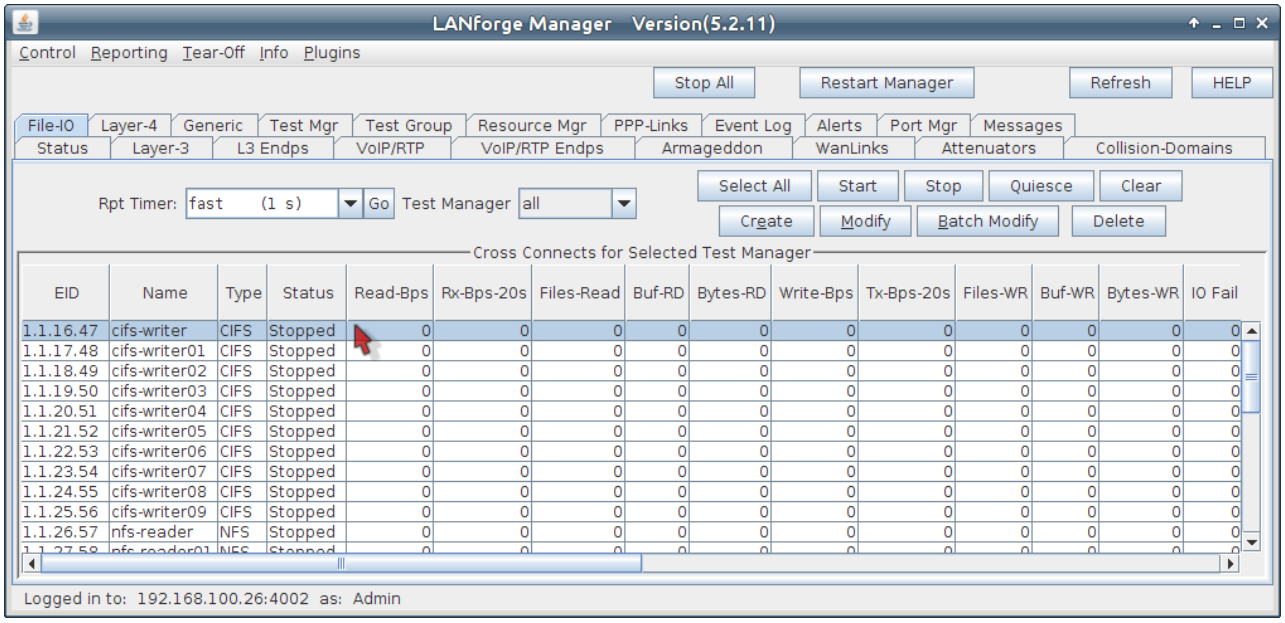
B. Set the **Number of Digits** to `2`

C. Click **Apply**

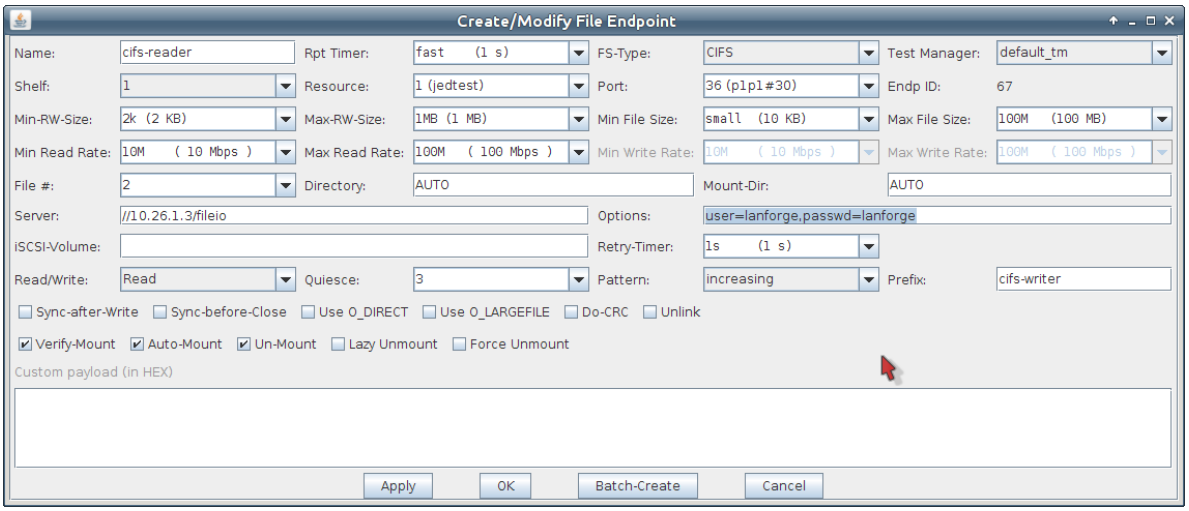
D. Click **Close**

E. In the **Modify** window, click **Cancel**

10. And we now create the same number of **CIFS reader endpoints**. Start by using `cifs-writer` as a template:



A. Open the Modify window of the endpoint `cifs-writer`



A. Change the **Name** to `cifs-reader`

B. Set the **Port** to the next unused MAC VLAN, `p1p1#30`

C. Change **Read/Write** to `Read`

D. Set the **Min Read Rate** and **Max Read Rate** to `10 Mbps` and `100 Mbps`

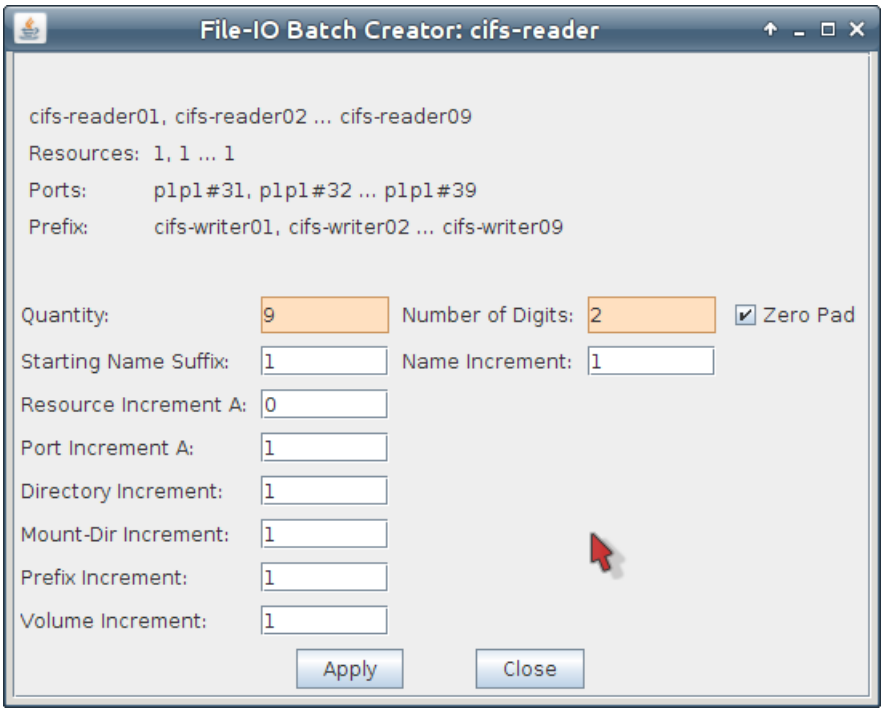
E. To match this reader to a writer, set the **Prefix** field to `cifs-writer`

F. Supply the credentials for the CIFS mount point in **Options**. For this example, our username and password are 'lanforge' and 'lanforge'. Write them as options to the *mount* command: `user=lanforge,passwd=lanforge`

G. Click **Apply**

B. Before closing the Modify windows we can use Batch Create to create nine more CIFS reader endpoints:

C. Click on the **Batch Create** window of the endpoint `cifs-reader`



A. Change the **Quantity** to `9`

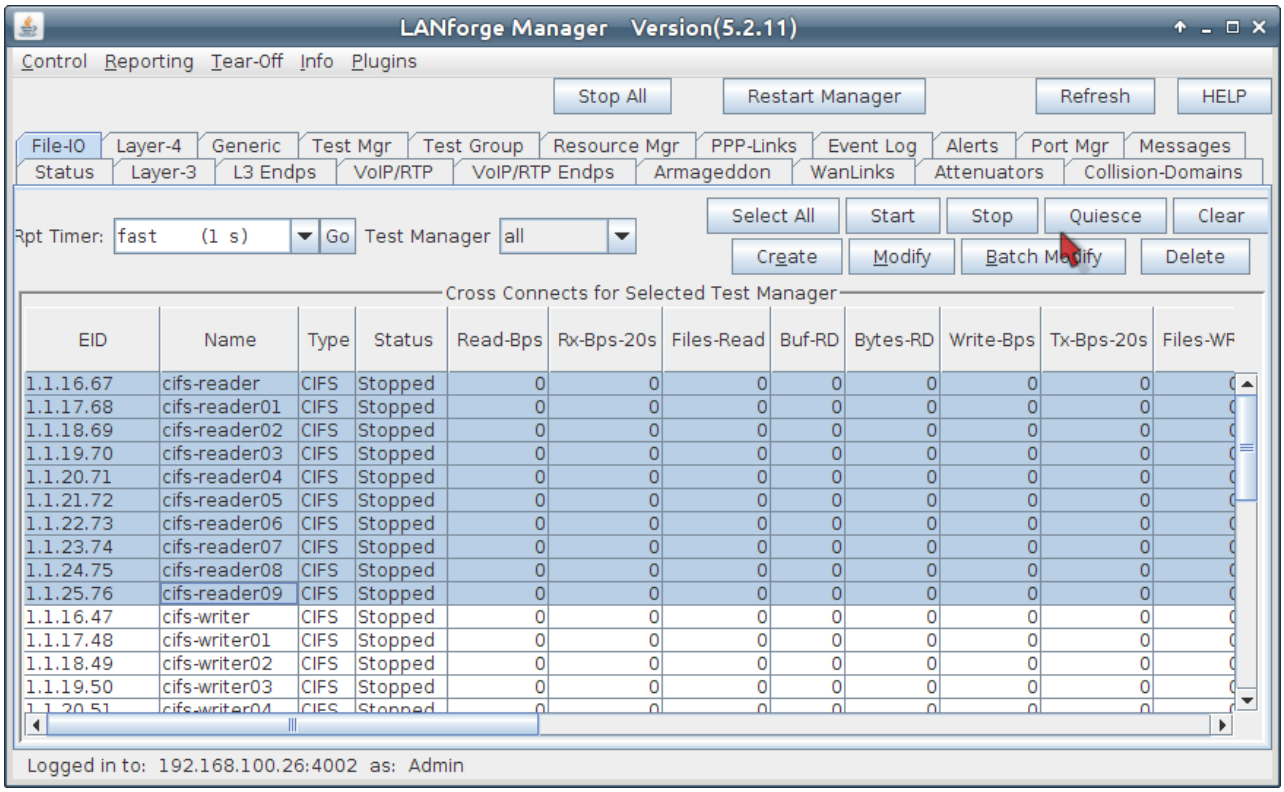
B. Set the **Number of Digits** to `2`

C. Click **Apply**

D. Click **Close**

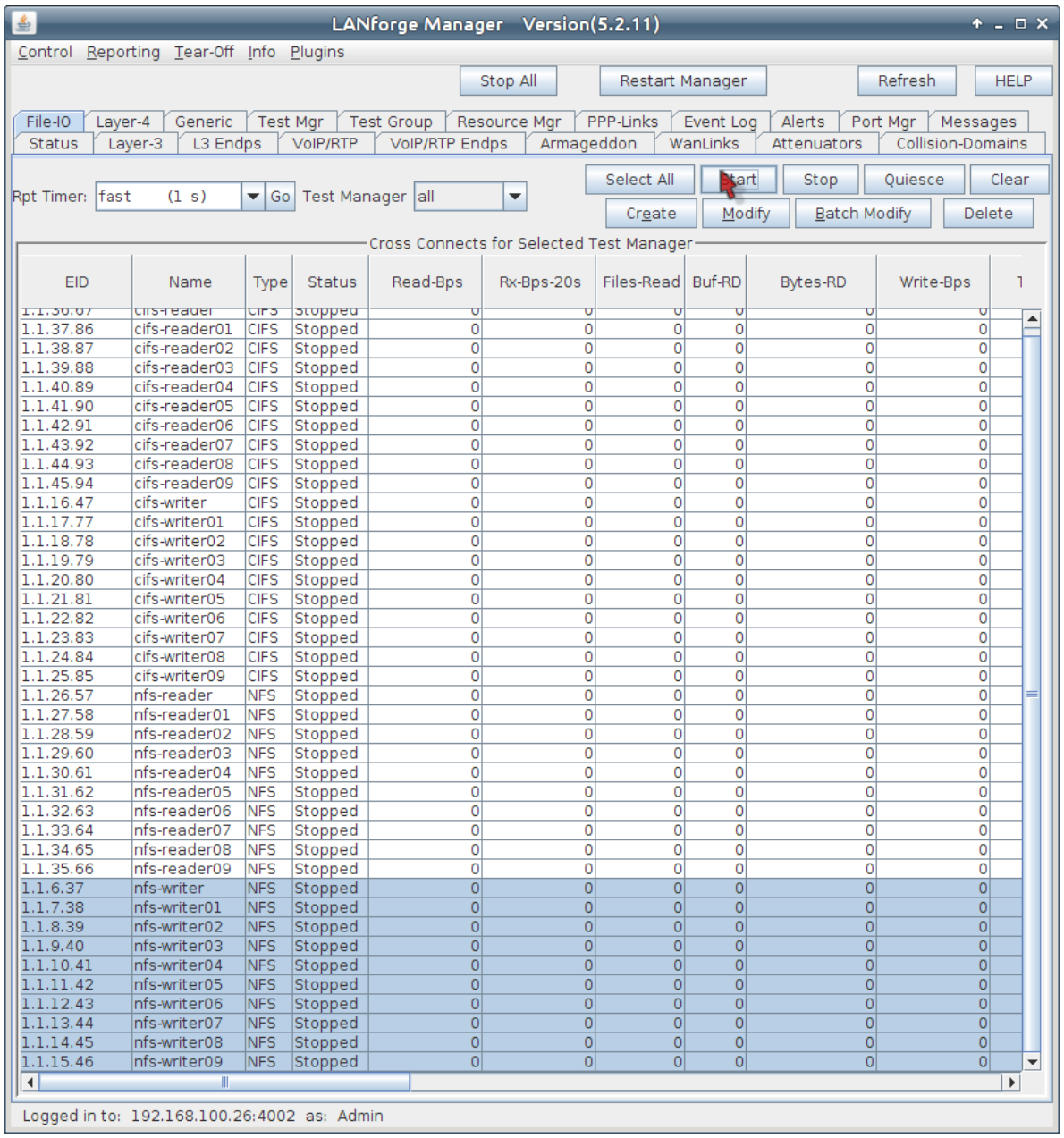
E. In the **Modify** window, click **Cancel**

11. In the **File-IO** tab, we see our newly created reader endpoints.



12. Start the reader/writer testing.

A. In the **File-IO** tab, begin by starting the NFS writers

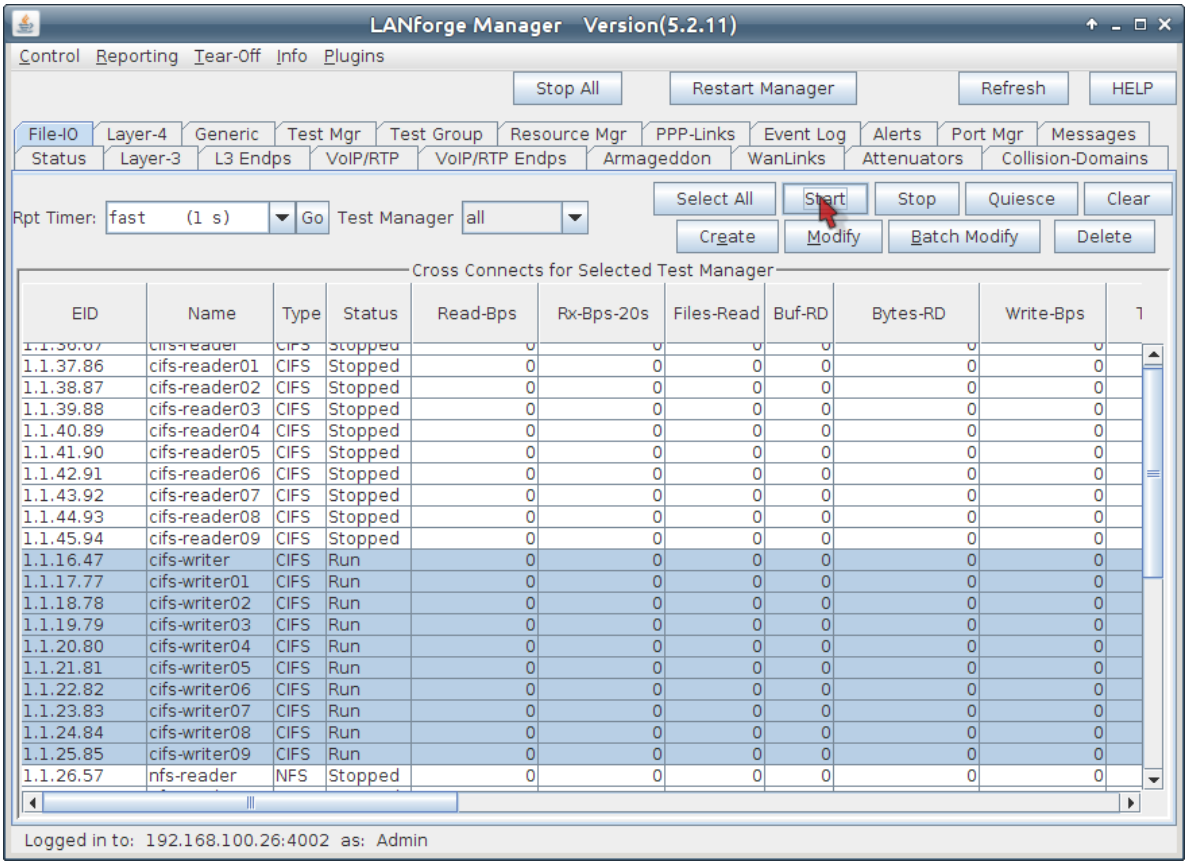


A. Click on the **Name** column header to sort the rows of readers and writers

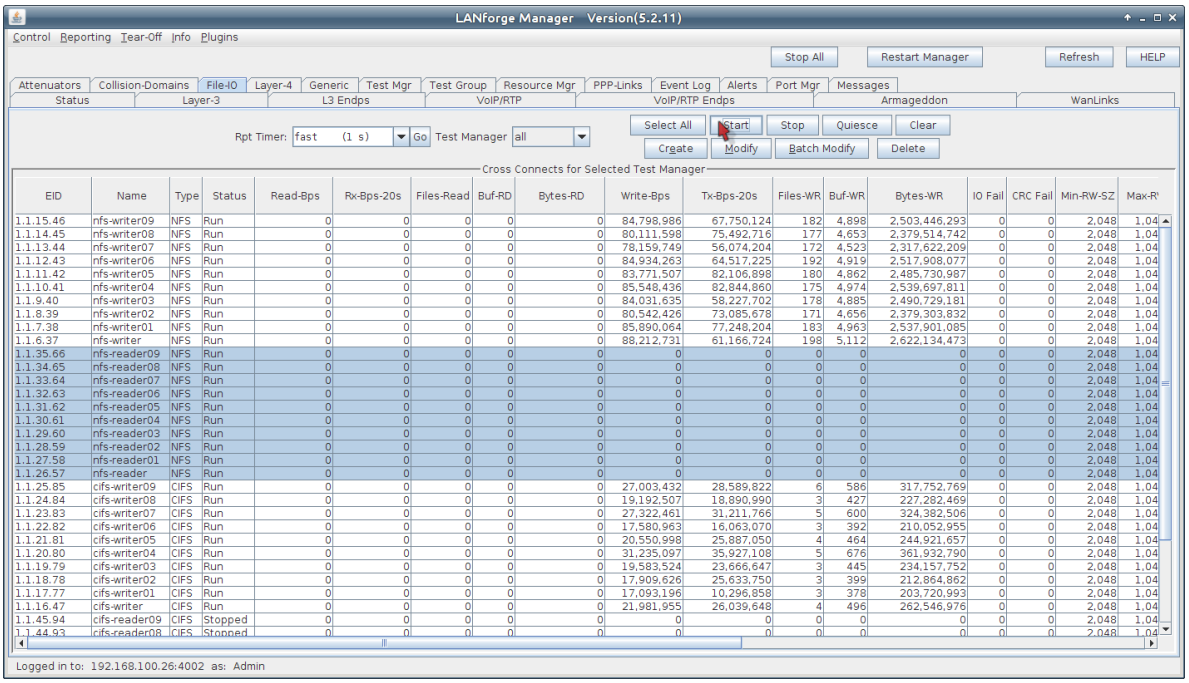
B. You can use `control-left-click` and drag to select the group of writers

C. Click the **Start** button at the top.

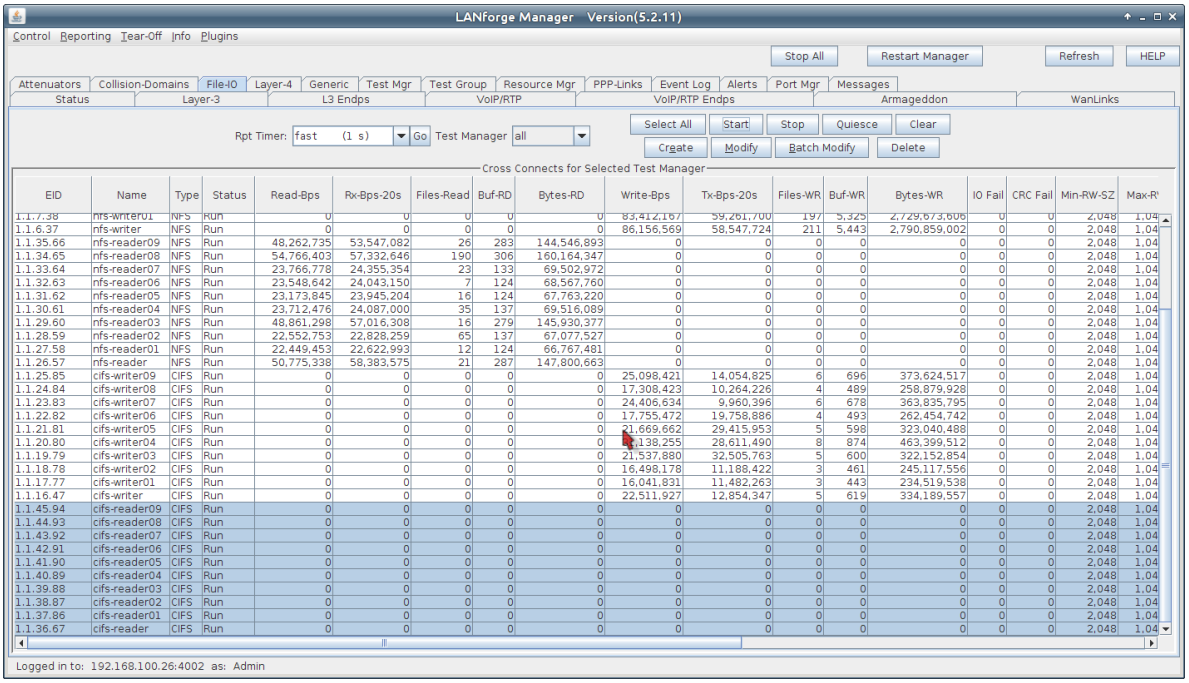
B. Next, start the CIFS writers



C. Then the NFS readers

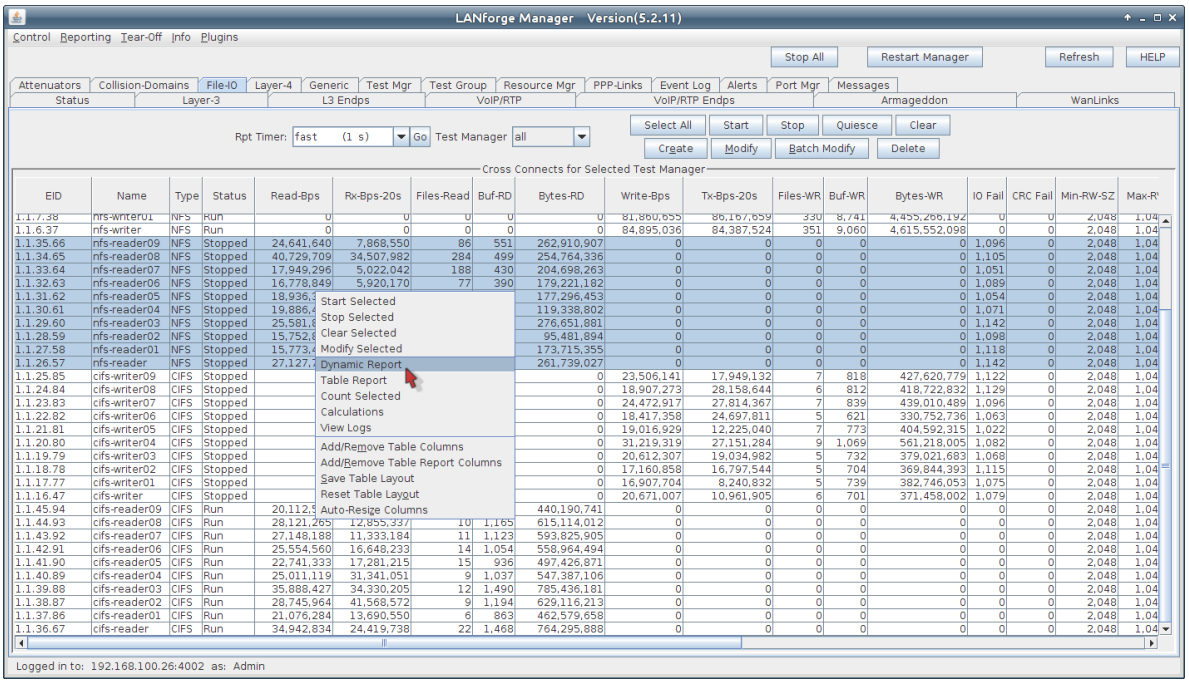


D. Finally, start the CIFS readers

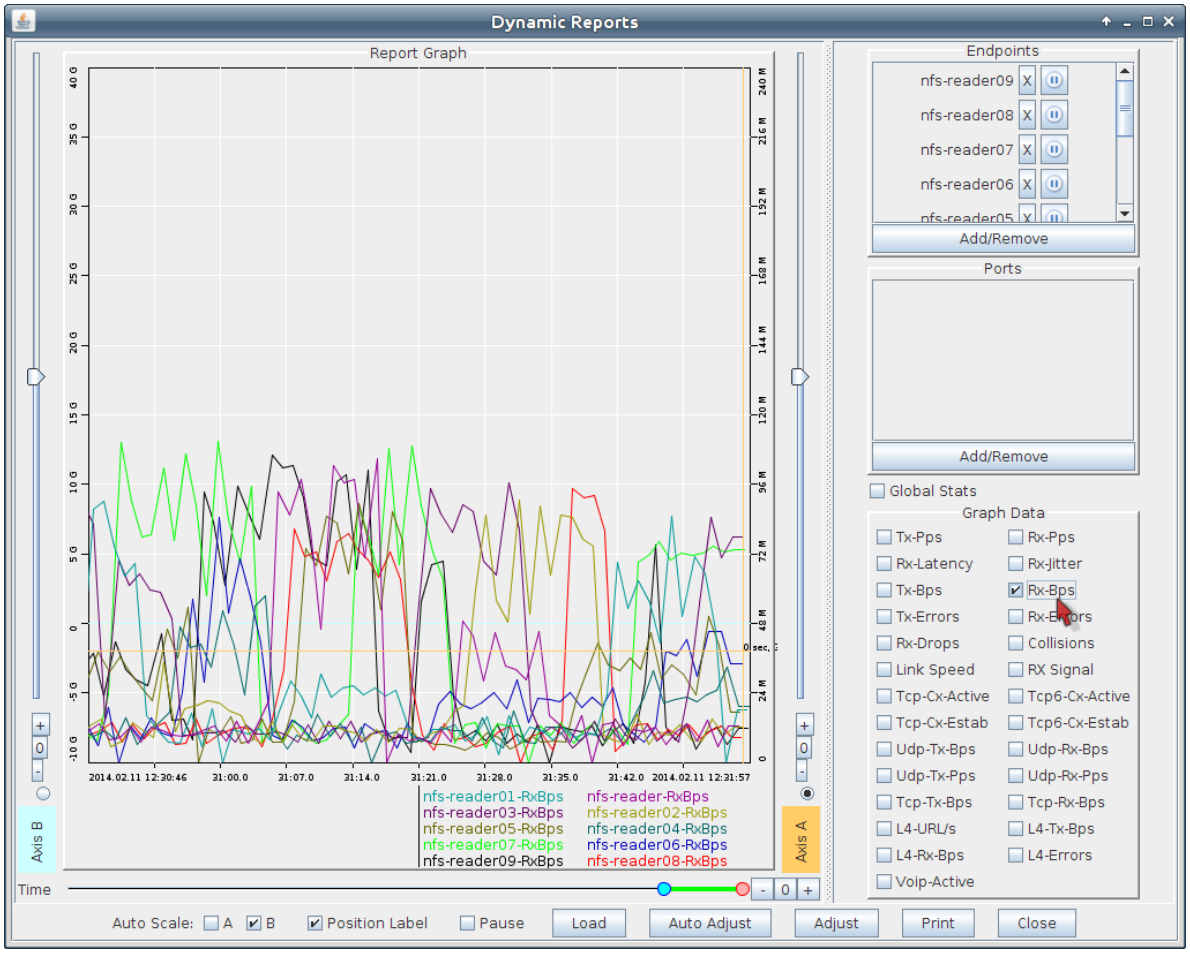


13. We can inspect the traffic in the Dynamic Report window and the File-IO tab:

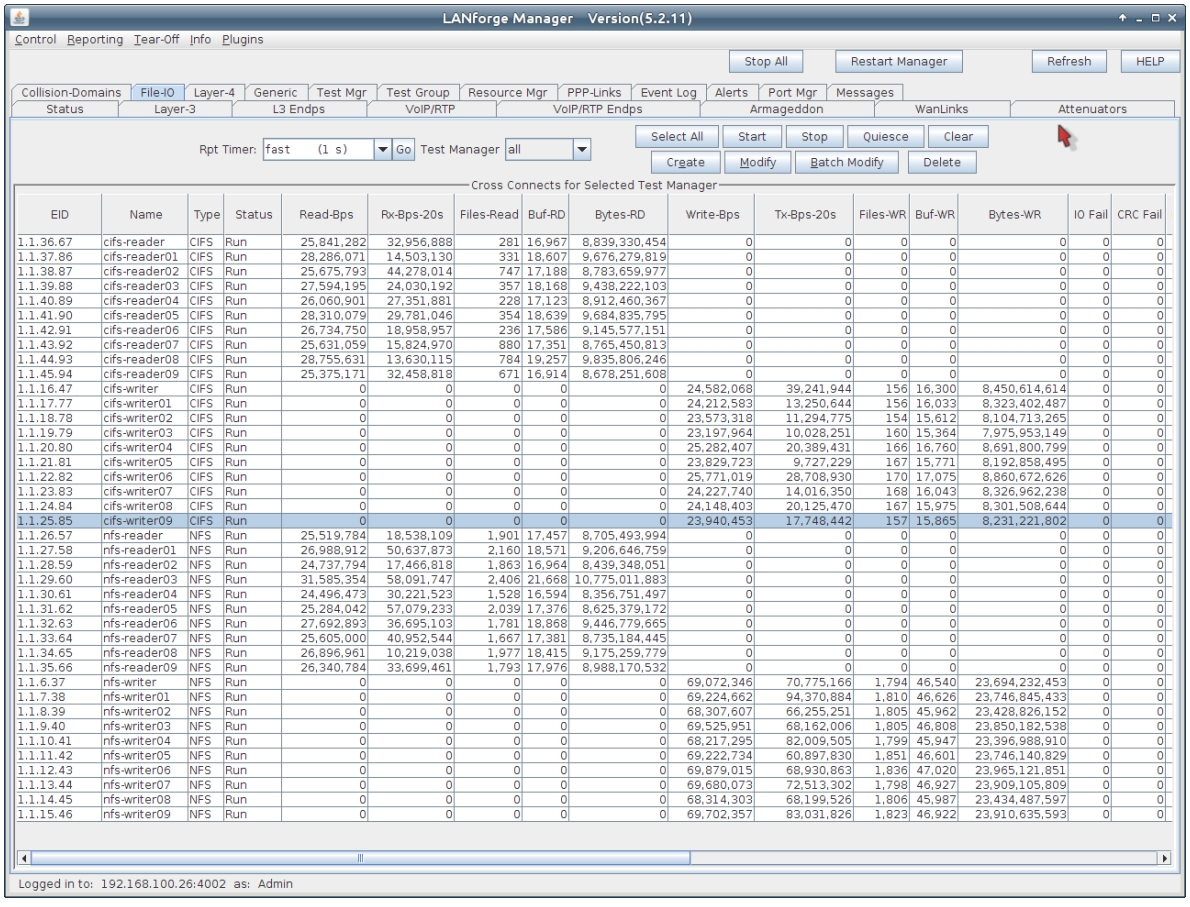
A. Select a group of endpoints and right click on them, select **Dynamic Report**



B. In the **Dynamic Report** window, select the checkbox **Rx-Bps**



C. In the **File-IO** window, we can watch for Files Written and IO Errors:



EID	Name	Type	Status	Read-Bps	Rx-Bps-20s	Files-Read	Buf-RD	Bytes-RD	Write-Bps	Tx-Bps-20s	Files-WR	Buf-WR	Bytes-WR	IO Fail	CRC Fail
1.1.36.67	cifs-reader	CIFS	Run	25,841,282	32,956,888	281	16,967	8,839,330,454	0	0	0	0	0	0	0
1.1.37.86	cifs-reader01	CIFS	Run	28,286,071	14,503,130	331	18,607	9,676,279,819	0	0	0	0	0	0	0
1.1.38.87	cifs-reader02	CIFS	Run	25,675,793	44,278,014	747	17,188	8,783,659,977	0	0	0	0	0	0	0
1.1.39.88	cifs-reader03	CIFS	Run	27,594,195	24,030,192	357	18,168	9,438,222,103	0	0	0	0	0	0	0
1.1.40.89	cifs-reader04	CIFS	Run	26,060,901	27,351,881	228	17,123	8,912,460,367	0	0	0	0	0	0	0
1.1.41.90	cifs-reader05	CIFS	Run	28,310,079	29,781,046	354	18,639	9,684,835,795	0	0	0	0	0	0	0
1.1.42.91	cifs-reader06	CIFS	Run	26,734,750	18,958,957	236	17,586	9,145,577,151	0	0	0	0	0	0	0
1.1.43.92	cifs-reader07	CIFS	Run	25,631,059	15,824,970	880	17,351	8,765,450,813	0	0	0	0	0	0	0
1.1.44.93	cifs-reader08	CIFS	Run	28,755,631	13,630,115	784	19,257	9,835,806,246	0	0	0	0	0	0	0
1.1.45.94	cifs-reader09	CIFS	Run	25,375,171	32,458,818	671	16,914	8,678,251,608	0	0	0	0	0	0	0
1.1.16.47	cifs-writer	CIFS	Run	0	0	0	0	0	24,582,068	39,241,944	156	16,300	8,450,614,614	0	0
1.1.17.77	cifs-writer01	CIFS	Run	0	0	0	0	0	24,212,583	13,250,644	156	16,033	8,323,402,487	0	0
1.1.18.78	cifs-writer02	CIFS	Run	0	0	0	0	0	23,573,318	11,294,775	154	15,612	8,104,713,265	0	0
1.1.19.79	cifs-writer03	CIFS	Run	0	0	0	0	0	23,197,964	10,028,251	160	15,364	7,975,953,149	0	0
1.1.20.80	cifs-writer04	CIFS	Run	0	0	0	0	0	25,282,407	20,389,431	166	16,760	8,691,800,799	0	0
1.1.21.81	cifs-writer05	CIFS	Run	0	0	0	0	0	23,829,723	9,727,229	167	15,771	8,192,858,495	0	0
1.1.22.82	cifs-writer06	CIFS	Run	0	0	0	0	0	25,771,019	28,708,930	170	17,075	8,860,672,626	0	0
1.1.23.83	cifs-writer07	CIFS	Run	0	0	0	0	0	24,227,740	14,016,350	168	16,043	8,326,962,238	0	0
1.1.24.84	cifs-writer08	CIFS	Run	0	0	0	0	0	24,148,403	20,125,470	167	15,975	8,301,508,644	0	0
1.1.25.85	cifs-writer09	CIFS	Run	0	0	0	0	0	23,940,453	17,748,442	157	15,865	8,231,221,802	0	0
1.1.26.57	nfs-reader	NFS	Run	25,519,784	18,538,109	1,901	17,457	8,705,493,994	0	0	0	0	0	0	0
1.1.27.58	nfs-reader01	NFS	Run	26,988,912	50,637,873	2,160	18,571	9,206,646,759	0	0	0	0	0	0	0
1.1.28.59	nfs-reader02	NFS	Run	24,737,794	17,466,818	1,863	16,964	8,439,348,051	0	0	0	0	0	0	0
1.1.29.60	nfs-reader03	NFS	Run	31,585,354	58,091,747	2,406	21,668	10,775,011,883	0	0	0	0	0	0	0
1.1.30.61	nfs-reader04	NFS	Run	24,496,473	30,221,523	1,528	16,594	8,356,751,497	0	0	0	0	0	0	0
1.1.31.62	nfs-reader05	NFS	Run	25,284,042	57,079,233	2,039	17,376	8,625,379,172	0	0	0	0	0	0	0
1.1.32.63	nfs-reader06	NFS	Run	27,692,893	36,695,103	1,781	18,868	9,446,779,665	0	0	0	0	0	0	0
1.1.33.64	nfs-reader07	NFS	Run	25,605,000	40,952,544	1,667	17,381	8,735,184,445	0	0	0	0	0	0	0
1.1.34.65	nfs-reader08	NFS	Run	26,896,961	10,219,038	1,977	18,415	9,175,259,779	0	0	0	0	0	0	0
1.1.35.66	nfs-reader09	NFS	Run	26,340,784	33,699,461	1,793	17,976	8,988,170,532	0	0	0	0	0	0	0
1.1.6.37	nfs-writer	NFS	Run	0	0	0	0	0	69,072,346	70,775,166	1,794	46,540	23,694,232,453	0	0
1.1.7.38	nfs-writer01	NFS	Run	0	0	0	0	0	69,224,662	94,370,884	1,810	46,626	23,746,845,433	0	0
1.1.8.39	nfs-writer02	NFS	Run	0	0	0	0	0	68,307,607	66,255,251	1,805	45,962	23,428,826,152	0	0
1.1.9.40	nfs-writer03	NFS	Run	0	0	0	0	0	69,525,951	68,162,006	1,805	46,808	23,850,182,538	0	0
1.1.10.41	nfs-writer04	NFS	Run	0	0	0	0	0	68,217,295	82,009,505	1,799	45,947	23,396,988,910	0	0
1.1.11.42	nfs-writer05	NFS	Run	0	0	0	0	0	69,222,734	60,897,830	1,851	46,601	23,746,140,829	0	0
1.1.12.43	nfs-writer06	NFS	Run	0	0	0	0	0	69,879,015	68,930,863	1,836	47,020	23,965,121,851	0	0
1.1.13.44	nfs-writer07	NFS	Run	0	0	0	0	0	69,680,073	72,513,302	1,798	46,927	23,909,105,809	0	0
1.1.14.45	nfs-writer08	NFS	Run	0	0	0	0	0	68,314,303	68,199,526	1,806	45,987	23,434,487,597	0	0
1.1.15.46	nfs-writer09	NFS	Run	0	0	0	0	0	69,702,357	83,031,826	1,823	46,922	23,910,635,593	0	0

14. ## Advanced File-IO Tunings

System tuning is desirable when determining machine performance. The following topics can apply to NFS or CIFS clients:

15. Tuning network card ring-buffers
    A. Network cards often have tunable memory buffers that can be modified using `ethtool`
    B. Read the available capacities using `ethtool -g eth1`
    C. Adjust the *tx* and *rx* parameters using `ethtool -G eth1 tx 4096 rx 4096`
    D. This feature depends on the card driver and system state. Not all cards are tunable.
    E. The efficacy of this technique is difficult to measure, but is some manufacturer's websites show this step being done in their white papers.

16. Matching buffer sizes to negotiated transfer size
    A. NFS mount parameters can be inspected using either of two commands:
    B. `mount | grep nfs` or `grep nfs /proc/mounts`
    C. Notice the *rsize* and *wsize* parameters might not match your request values in the Modify Properties box for the mount point.
    D. Setting your Min/Max Read and Min/Max Write sizes to these negotiated values will maximize efficiency by reducing memcpy activity in the kernel.

17. Tuning TCP window sizes
    A. While you can modify Layer 3 TCP window size and buffers, you cannot directly change those settings using the LANforge GUI for the system. This Discussion on NFS4 performance is worth a read.
    B. The commands below are suggested to increase your buffer sizes to 8-16 megabytes:

```
sysctl net.core.rmem_default=8388608
sysctl net.core.rmem_max=16777216
sysctl net.core.wmem_default=8388608
sysctl net.core.wmem_max=16777216
```