

Network Monitor for AMS Computers

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Abstract

Abstract: The status of AMS facilities in CERN need to be monitored, two network monitor functions have been developed. One can monitor the incoming and outgoing traffic and Errors for the local Network links, the other one can monitor the Round Trip Time (RTT) of the network links.

1 System introduction

There are more than ten facilities in CERN to serve for the data storage, physics analysis and software development for AMS project. Below is the topology of AMS network:

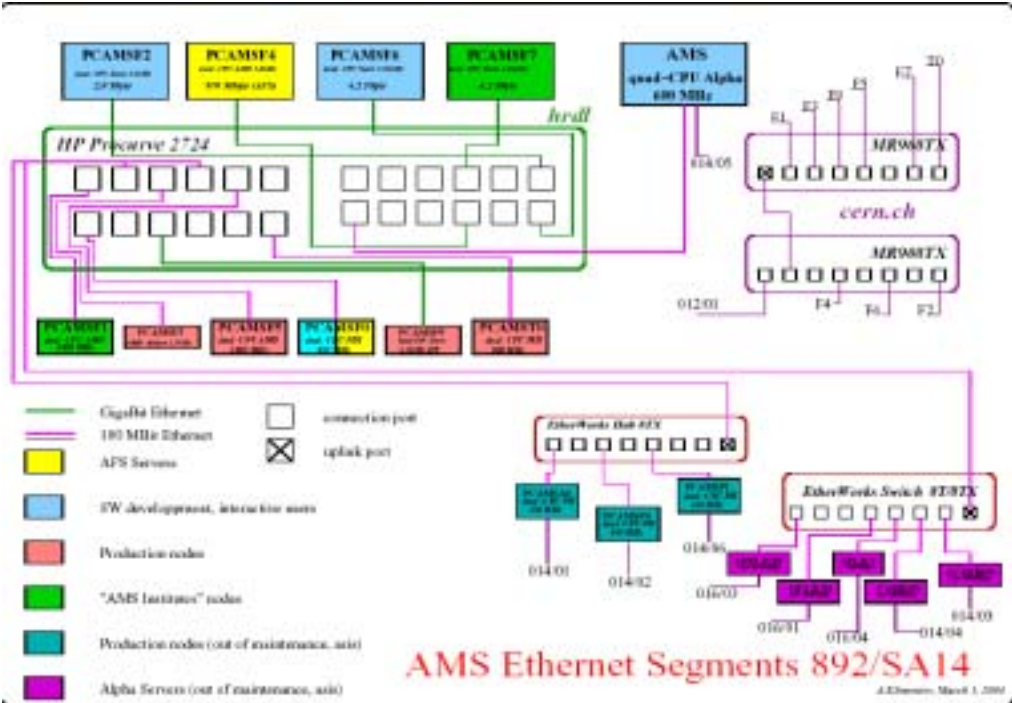


Figure 1:Topology of AMS Network

The number of facilities will increase in the future gradually. There are two segments, one is cern.ch which is the public segment of CERN, the other is hrld which is the private segment of AMS project. Most of the facilities connected to both the two segments. With the increasing usage of these facilities, to have a monitor to observe the statuses of these facilities become important. It can be used for the purpose of network management, such as detect saturation of the facilities and balance the workload, it is also important in the field of network design and network security.

Of course, there are commercial network management software, but commercial software are excessively complex and very expensive. We have a relatively simple network topology, and we can customize our own monitor on the foundation of some free software.

Two functions have been developed to monitor the AMS network in CERN. One is the traffic monitor for AMS computers, it can monitor the incoming and outgoing traffic and Errors for the local Network links. It is a system implemented on Multi Router Traffic Grapher [1](MRTG). The URL is <http://pcamsf0.cern.ch/cgi-bin/summary> .

Another is the Summary of Round Trip Time for AMS Computers, it can monitor the Round Trip Time (RTT) of the network links. MRTG is used to generate graphs visualizing minimum and maximum round trip time. The URL is <http://pcamsf3.cern.ch/cgi-bin/pingdata>.

In the next two sections, the system architectures will be introduced and the methods about how to add a new computer in the system are listed step by step.

2 Traffic Analysis for AMS Computers

2.1 How it works

The Traffic Analysis for AMS computers has the architecture on the next page.

The first part is the Multi Router Traffic Grapher (MRTG) which is running on pcamsf0, it is a tool to monitor the traffic load on network-links. It sends requests to the hosts to be monitored every five minutes and get responses, store the data and generates HTML pages containing PNG images which provide a visual representation of this traffic. MRTG is a freeware and have a wide use in the field of network management.

The second part is the Simple Network Management Protocol (SNMP)[2], it is the protocol used by MRTG. SNMP is the shortened form of Simple Network Management Protocol, it consists of a simply composed set of network communication specifications that cover all the basics of network management. SNMP use Management Information Base(MIB)[2] to exchange the management data among different facilities. And agent is a program which is in the facilities to be monitored to provide the data to the servers, most of the Linux facilities have this program embed. It is different in vary facilities. In Redhat Linux, it is /usr/sbin/snmpd, it should be start-up and some modifications should be done to its configuration file /etc/snmp/snmpd.conf. After the modifications, the agent will response to the request.

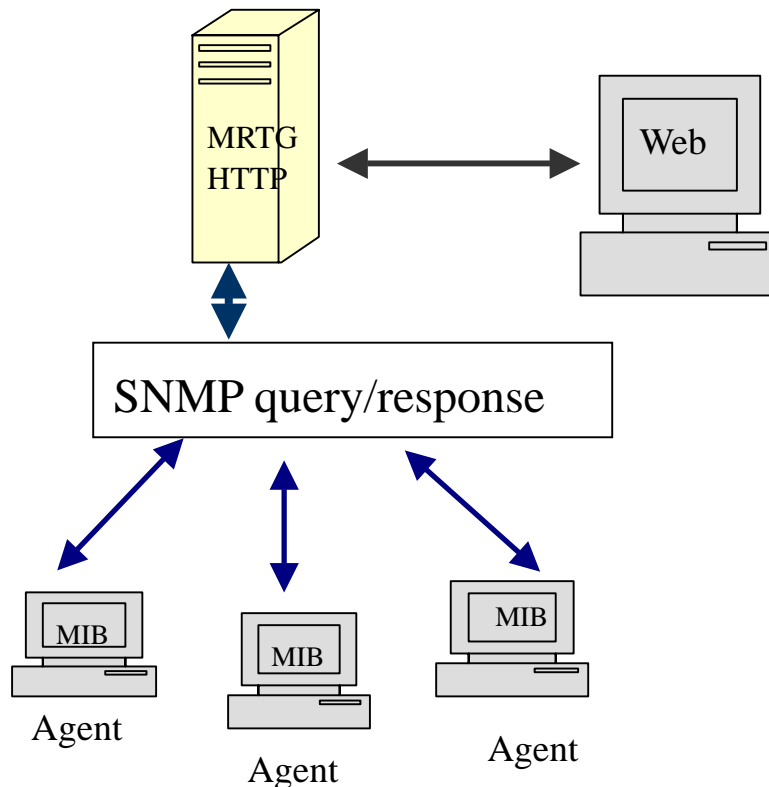


Figure 2: Architecture of Traffic/Error Monitor

MRTG does these works according to some configuration files which should be edit by the user. Another configuration file should be edit by the user is one file which contains all the names of the facilities to be monitored and a program named summary will read this file and organize the output of the web page.

2.2 How the new computers can be added

We suppose we need to add a host named **abc** in this system. There are several steps should be taken to add a new computer.

(1) Start SNMPD in the facilities to be monitored: **/usr/sbin/snmpd**.

(2) Modifications of **/etc/snmp/snmpd.conf**, three points should be modified, red color are used to point out which have been modified from the original configuration:

```
# name      incl/excl  subtree    mask(optional)
    view all      included   .1
#group     context sec.model  sec.level  prefix  read   write  notif
access    notConfigGroup  any  noauth  exact all  none  none
```

(3) **mkdir /amsdat1/netview/cern-net/abc**

Create the work directory in **/amsdat1/netview/cern-net** for this host, it should be named the same as the name of the host, for example, **abc**.

(4) **cp traffic_example.cfg abc.cfg**

Add a new configuration file for the facility in **/amsdat1/netview/cern-net**. There is an example of the configuration file named **traffic_example.cfg**, copy it to **abc.cfg**, edit it.

(5)Edit the configuration file

Change the WorkDir to the directory you just created. Every Target have five lines in this file. You should change the corresponding IP address and the name of the host.

(6) Check the configuration file

Run `/usr/bin/mrtg /tmp_mnt/amsdat1/netview/cern-net/abc.cfg` in command line to see if there are any mistakes in the configuration file. Run it at least three times. There will be some warnings, after three times has been done, there will be no warning, if there are still some warnings, check the abc.cfg according to the output.

(7)Edit /amsdat1/netview/cern-net/mrtgwork

Add a line in the end like `:/usr/bin/mrtg /tmp_mnt/amsdat1/netview/cern-net/abc.cfg`

(8)Edit /amsdat1/netview/cern-net/traffic_host.conf

The format is: group IP name with title name

Components are divided by blanks or tabs and there can not be any blanks or tabs in one component.

After all the eight steps, a computer is added in the system, and you can browse the graph from <http://pcamsf0.cern.ch/cgi-bin/summary>.

3 Summary of Round Trip Time for AMS Computers

3.1 How it works

We should monitor the status of the Gigabit switch for AMS network, but because this model does not support SNMP, we could not monitor it directly. So we monitor the RTT of every computer's interface which is connected to this switch. This is the architecture of RTT monitor, it looks similar to the above one. But the method of collecting data is different.

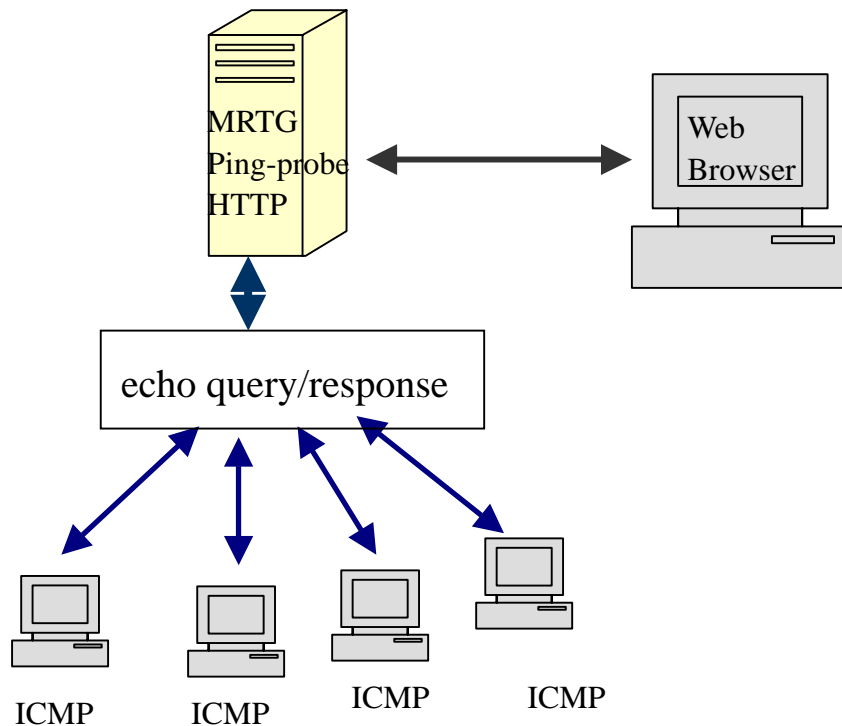


Figure 3: Architecture of RTT Monitor

MRTG is used to store the data and give the graphs. But the data comes from the program named mrtg-ping-probe[3], it is the program which ping the destination and write the result to MRTG. It is invoked by MRTG according to the configuration files.

The main difference is it does not use SNMP to collected data, but use echo. So it does not need agents in the facilities to be monitored. Remote hosts will give ICMP response to the request.

It has a cgi pager programs to give the main page and a series of configuration files like the above one.

3.2 How the new computers can be added

We still suppose we need to add a host named **abc** in this system. The system are located in pcamsf3.cern.ch. There are several steps should be taken to add a new computer

(1) **mkdir /var/www/htdocs/mrtg/cern-net/abc**

Of course ,if there has such a directory for the traffic monitor, they can share the same directory.

(2) **cp ping_example.cfg ping-abc.cfg**

Add a new configuration file for the host in /var/www/htdocs/mrtg/cern-net. There is an example of the configuration file named ping_example.cfg, cp it to ping- abc.cfg, edit it.

(3) **Edit the configuration file**

Change the WorkDir to the directory you just created. Every Target have several lines in this file. You should change the corresponding IP address and the name of the host.

(4)**Check the configuration file**

Run **/usr/bin/mrtg_ping /var/www/htdocs/mrtg/cern-net/ping-abc.cfg** in command line to see if there are any mistakes in the configuration file. Run it for at least three times. There will be some warnings, after three times has been done, there will be no warning, if there are still some warnings, check the ping-abc.cfg according to the output.

(5)**Edit /var/www/htdocs/mrtg/cern-net/pingwork**

Add a line in the end like **:/usr/bin/mrtg_ping /var/www/htdocs/mrtg/cern-net/ping-abc.cfg**

(6)**Edit /amsdat1/netview/cern-net/hosts.conf**

The format is: group IP name with title name

Components are divided by blanks or tabs and there can not be any blanks or tabs in one component . Group with the same name will be output in the web page in one table.

After all the six steps, a computer is added in the system, and you can browse the graph from

<http://pcamsf3.cern.ch/cgi-bin/pingdata>

4 Conclusion

Two monitor functions has been developed for AMS network and the results are helpful for the system administrator. It is only one side of the computer management of AMS network. To have full control of the network and to diagnose problem correctly, it should work with the cooperation of Host monitor, you can see it at <http://pcamsf0.cern.ch/HostMon.html>.

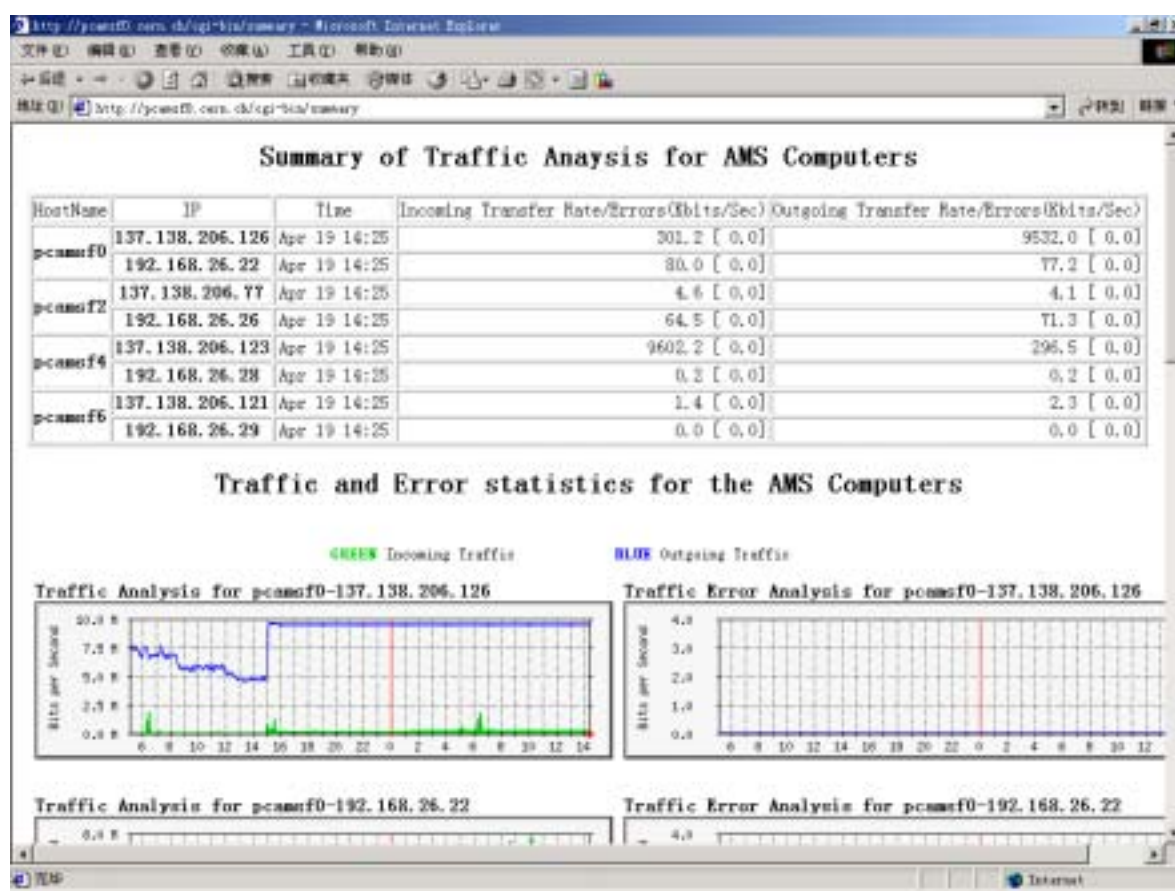
References

- [1] <http://people.ee.ethz.ch/~oetiker/webtools/mrtg/>
- [2] <http://www.cisco.com/warp/public/535/3.html>
- [3] <http://pwo.de/projects/mrtg/>

Appendix

1 The main web page of Traffic Analysis for AMS Computers

This is the main web page of this monitor. It is located in pcamsf0 now. The table on the top of the page gives the current data. And below the table, are the daily graphs of every target. On the left is the traffic graph, on the right is the Error of the link. You can see from the table that error is 0, so in the graph, there are no curves of error.



2 The main web page of Summary of Round Trip Time for AMS Computers

Below is the main web page of Summary of Round Trip Time for AMS Computers. The table on the top of the main page gives the current data. There are two tables, one contains the information of the Alpha computers,, another is for the Linux. RTT more than 50 milli-seconds (ms) or have no response are marked as NA (Not Accessible) in red color. There is a hyperlink on the name of each network link to the graphs of RTT. Those links which have never been accessed have no hyperlink. And below the table, is the daily graph of the RTT of every target. A click of every graph will point to a html page which contains the daily, weekly, monthly and yearly graph.

Summary of Round Trip Time for AMS Computers

Time	Host Name	RTT Max (ms)	RTT Min (ms)	Host Name	RTT Max (ms)	RTT Min (ms)
Apr 19 14:19	ams.com.ch	2.131	0.211	ams.hrdl	0.165	0.134
Apr 19 14:21	acshon.com.ch	0.848	0.232	acshon.hrdl	0.205	0.191
Apr 19 14:19	cydon.com.ch	2.902	0.228	cydon.hrdl	0.321	0.166
Apr 19 14:19	stshon.com.ch	2.388	0.231	stshon.hrdl	0.324	0.197
Apr 19 14:21	hshon.com.ch	11.326	0.222	hshon.hrdl	0.381	0.176
Apr 19 14:21	afshl.com.ch	0.858	0.342	afshl.hrdl	0.526	0.175

Time	Host Name	RTT Max (ms)	RTT Min (ms)	Host Name	RTT Max (ms)	RTT Min (ms)
Apr 19 14:11	pcamp0.com.ch	NA	NA	pcamp0.hrdl	NA	NA
Apr 19 14:15	pcamp1.com.ch	1.723	0.137	pcamp1.hrdl	0.288	0.161
Apr 19 14:13	pcamp2.com.ch	0.283	0.248	pcamp2.hrdl	0.325	0.177
Apr 19 14:15	pcamp3.com.ch	1.343	0.246	pcamp3.hrdl	0.276	0.121
Apr 19 14:14	pcamp4.com.ch	0.868	0.047	pcamp4.hrdl	0.039	0.043
Apr 19 14:14	pcamp5.com.ch	4.338	0.121	pcamp5.hrdl	0.321	0.129
Apr 19 14:14	pcamp6.com.ch	3.678	0.155	pcamp6.hrdl	0.324	0.155
Apr 19 14:17	pcamp7.com.ch	2.817	0.128	pcamp7.hrdl	0.338	0.149
Apr 19 14:17	pcamp8.com.ch	12.691	0.221	pcamp8.hrdl	0.589	0.140
Apr 19 14:17	pcamp9.com.ch	4.492	0.123	pcamp9.hrdl	0.228	0.117
Apr 19 14:17	pcamp10.com.ch	2.340	0.208	pcamp10.hrdl	0.289	0.182

3 A example of the graphs of one target:pcamp0.hrdl.

