Distributed Network Monitoring Made Easy - An Application for Accelerator Control System Process Monitoring*

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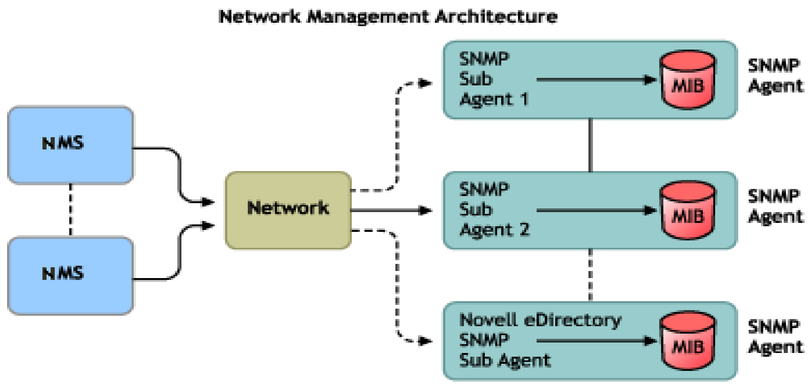
Open Source Tools are Available on a Variety of Platforms

NET-SNMP ⇄ ATLAS ⇄ Zenoss® Nagios openNMS®

Using the Internet Suite standard Simple Network Management Protocol (SNMP)

SNMP is an efficient, lightweight protocol that uses TCP or UDP IP packets for communication through a standard Ethernet network. SNMP is normally used to monitor network infrastructure devices like managed routers and switches, but can be extended to monitor any system data point or parameter. In addition, open source Network Management Systems can be installed which will record and monitor any remote system. The NMS can then send alarm emails, chat messages, and texts.

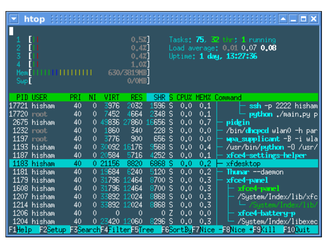


In order to use SNMP, there should be necessary libraries installed on the operating system, and there should be one or more 'agents' running as servers which provide responses to remote clients requesting data. Most SNMP libraries are available open source on a range of operating systems, and normally include a Management Information Base file (MIB), which is a text file that defines properties of the all data points available on a system. Many installations come with a default MIB.

Extend SNMP to Monitor Any Accelerator Device Using a Variety of Methods

Method	Advantages	Disadvantages
SNMP Config File	No compiling, very easy to implement, well documented	Limited to net-snmp tools, libraries and functions
SNMP-Perl Module Installation	No low level programming or compiling required, access to many pre-installed Perl libraries.	Requires knowledge of Perl and does not allow as much low level access to the underlying operating system.
Custom SNMP Agent running as separate process	Complete customized extensions, almost no limits to SNMP data collection.	Requires expert knowledge of system and programming Experience.

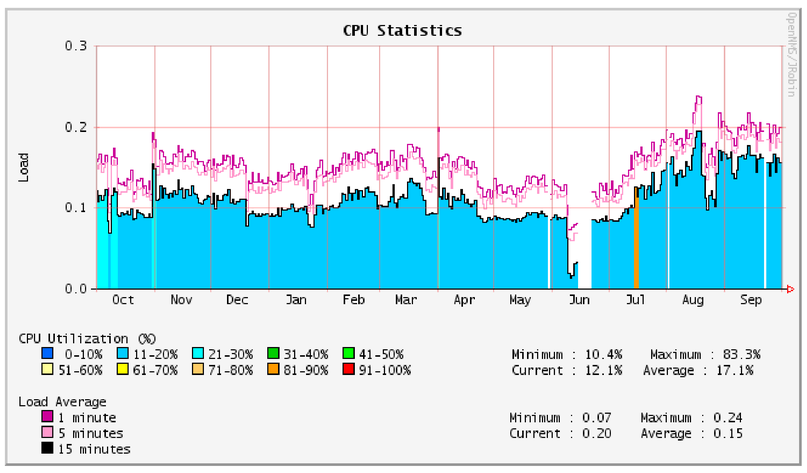
In order to monitor critical control system processes on distributed Linux systems the SNMP 'proc' directive is specified in the snmpd.conf file. This automatically creates a data object representing the number of those processes are running at any time. The NMS system can be configured to send an alarm email if this number changes.



A custom written Perl module was specified in the SNMP configuration file to be loaded and executed any time a specific data object was requested from the system. This Perl script executes a vendor specific query program to access data about UPS charge, runtime, and status. The NMS can then alert on power outages or battery failures.

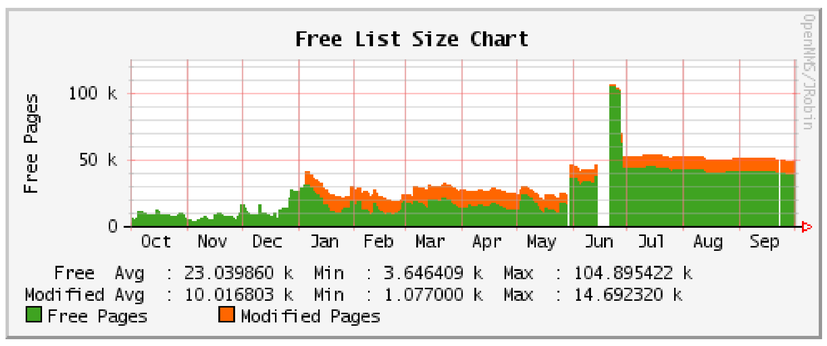
ATLAS maintains some legacy OpenVMS systems which come with pre-compiled SNMP libraries to enable data collection. This includes generic system parameters, and has installed control system specific data points which are collected via a custom compiled SNMP sub-agent written in C. This process runs as a stand-alone subagent.

Gain Critical Insight into any Large System or Process

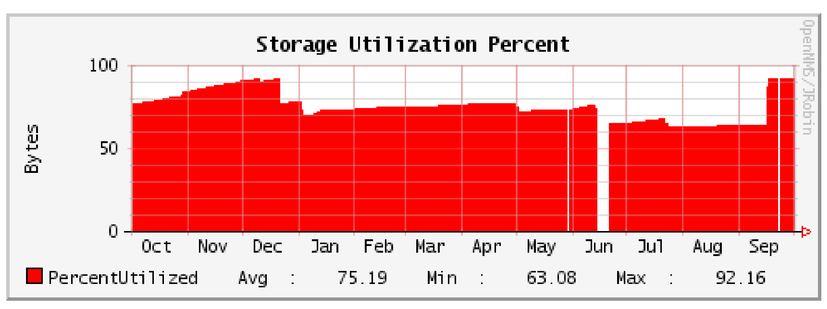


CPU statistics as a function of time.

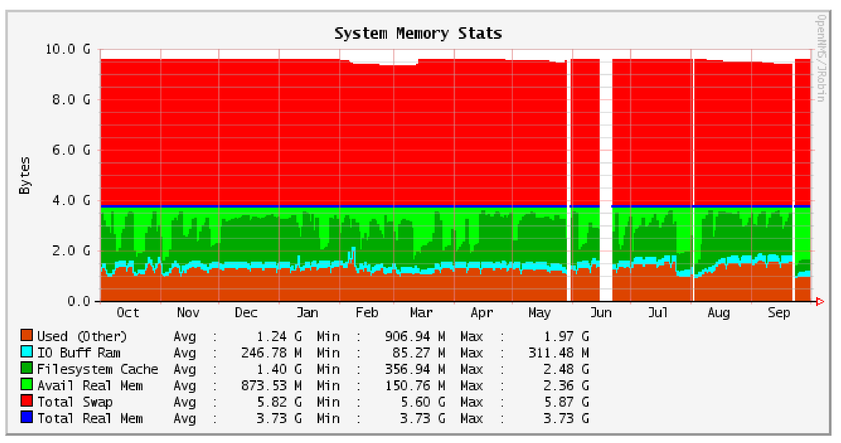
Note the increased CPU usage after a custom magnet control process was installed after July. The gaps in the chart are due to reboots or monitoring downtime.



OpenVMS free memory chart over time.



Hard drive usage.



Linux memory usage.

An example of SNMP data collection installed by default by the net-snmp packages.

The gaps in all charts are the result of system reboots or monitoring system downtime.

* This work was supported by the U.S. Department of Energy, Office of Nuclear Physics, under Contract No. DE-AC02-06CH11357.

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