Integrating Nagios and Ganglia
with Dell OpenManage Server Administrator in Linux-based Environments

Enterprises that run the Red Hat® Linux® operating system on Dell™ PowerEdge™ servers can monitor system health proactively using open source tools such as Nagios and Ganglia. This article explains how to integrate the monitoring capabilities of Nagios and Ganglia with the Dell OpenManage™ Server Administrator command-line interface.

Today’s data centers and high-performance computing (HPC) clusters pack more computing power into less physical space. The increased density can generate a significant amount of additional heat that often is not accompanied by increased cooling capacity. Current-generation Intel® processor-based systems react to higher operating temperatures by increasing fan speeds and, if temperatures get hot enough, limiting CPU performance to reduce power consumption. In the case of HPC clusters running parallel applications, a reduction in CPU performance of just one system may slow the performance of the entire cluster. By monitoring system health proactively, administrators can detect and address problems before they affect application performance.

Administrators typically assess the current state of network devices in one of two ways. The pull method queries device instrumentation from a central monitoring console at specified intervals, receiving a status or explicit data value in response. Alternatively, the push method constantly reports on device status by sending Simple Network Management Protocol (SNMP) traps, data, or both from device instrumentation to a central monitoring console. Both pull and push methods offer advantages.

Dell™ OpenManage™ Server Administrator provides instrumentation for Dell PowerEdge™ servers and monitors systems using the push method. This article focuses on Nagios and Ganglia, two open source monitoring tools that use the pull method and can integrate with Dell OpenManage Server Administrator to help manage PowerEdge servers. Nagios—a host, service, and network monitoring program designed to quickly inform system administrators of problems—uses Linux® shell scripts and executables to retrieve and report state information. Ganglia is a real-time, agent-based monitoring tool for HPC systems.

Managing servers with the Dell OpenManage Server Administrator CLI
Dell OpenManage Server Administrator provides multiple interfaces and integrates with open source frameworks such as Ganglia and Nagios. The most common interfaces are SNMP and the command-line interface (CLI). The examples shown in this article—for Nagios, a custom
plug-in that monitors the thermal status of any Dell PowerEdge server; for Ganglia, a collection script that gathers and records temperatures for all temperature probes in a PowerEdge server—can be leveraged to create plug-ins and scripts that monitor other system health components of a PowerEdge server. To run commands from the CLI, Dell OpenManage Server Administrator must be installed on each server being monitored.1

System administrators can obtain a quick system health overview of a PowerEdge server by running the CLI command `omreport chassis`. Figure 1 shows the type of information this command generates. When a problem occurs in a server component, the report indicates a severity other than “OK” next to the component name. To procure more in-depth information, administrators can add additional arguments to the `omreport chassis` command. For example, Figure 2 displays an excerpt from the main system chassis temperature report for a PowerEdge 2650 server, which was generated by the `omreport chassis temps` command. This sample displays readings from only the first temperature sensor.

Although the format for the `omreport chassis temps` report is the same regardless of which PowerEdge server it runs on, the output for each PowerEdge server model differs by the number and names of temperature probes reported. This article presents shell scripts that address the variability in probe numbers and names, enabling administrators to deploy both the Nagios and Ganglia examples across all PowerEdge servers.

Figure 3 contains a listing of other PowerEdge attributes that administrators can collect using Dell OpenManage Server Administrator.

---

1 For a detailed listing of what information can be reported through the Dell OpenManage Server Administrator CLI, visit the Dell OpenManage Server Administrator Command-Line Interface User’s Guide online at http://docs.us.dell.com/docs/software/svradmin.
This report was generated by running the `omreport chassis-temps` command. The remainder of this article focuses on data that is returned when executing the `omreport chassis temps` command.

**Monitoring system health with Nagios**

Nagios is a monitoring console with a Web interface that can display system health in a one-to-many relationship. It is available under the GNU General Public License (GPL) from [http://www.nagios.org](http://www.nagios.org). Although Nagios can receive SNMP information, its true strength is the ability to use any application or script to gather data. Data gathering programs, often called plug-ins, are placed and run on each client system being monitored. Plug-ins return relevant data and one of three states: “OK,” “Warning,” or “Critical.” Administrators schedule plug-ins to run at specified polling intervals.

For the primary logic of a plug-in that returns the thermal status of a PowerEdge server, visit Dell Power Solutions online at [http://www.dell.com/magazines_extras](http://www.dell.com/magazines_extras). To determine the thermal state and report it to Nagios, the plug-in compares actual system temperatures to the temperature thresholds set in the BIOS for each thermal sensor within the server. The bash shell script—which reports PowerEdge server thermal status and manages input parameter parsing, usage statements, and so forth—is called `nagios_check_temps` and can be found online at [http://www.dell.com/magazines_extras](http://www.dell.com/magazines_extras).

Nagios takes the status returned from a plug-in, displays it on the Web console, and stores its value in a database, enabling administrators to query the database for system status over specified time intervals. Nagios also can trigger alert actions—from sending an e-mail message to launching a script—based on the reported status. Figure 4 shows the Nagios Web console, which displays the output of the `check_temps` plug-in run on two PowerEdge servers.

**Dell OpenManage Server Administrator provides multiple interfaces and integrates with open source frameworks such as Ganglia and Nagios.**

Nagios is an excellent tool for alert and trend management of PowerEdge servers. Its ability to gather any information, and subsequently to report on the status of that information, is particularly valuable for organizations seeking to integrate the management of their IT infrastructure. This article presents only a rudimentary example of what Nagios can do with the information gathered from the Dell OpenManage Server Administrator utilities. Many other applications are viable, making Nagios an effective tool for managing PowerEdge servers.

**Monitoring cluster metrics with Ganglia**

The open source forum SourceForge maintains Ganglia, a widely accepted cluster-monitoring program. Ganglia provides a Web-based front end to display real-time data for both an aggregate cluster and each system in a cluster. A multithreaded daemon process runs on each cluster node to collect and communicate the host state in real time.

By default, Ganglia monitors a collection of metrics, including CPU load, memory usage, and network traffic. It also provides a tool called gmetric that enables administrators to extend the set of metrics they monitor. To monitor sensors on PowerEdge servers, Ganglia pulls values from each server using the Dell OpenManage Server Administrator CLI and passes those values to gmetric. Administrators can track the values from the Ganglia Web console. This article discusses Ganglia version 2.5, but a new version of Ganglia currently under development will modify the method for extending the data that Ganglia monitors.

The following command line uses the Dell OpenManage Server Administrator `omreport` statement, combined with the Linux `grep` and `awk` commands, to retrieve the temperature of CPU 1 on a PowerEdge 2650 server:

```
omreport chassis temps index=1|grep Reading|awk '{ print $3 }'
```

If administrators create a command called `cpu1_temp` that returns the output of the previous `omreport` command line, then the following command line will send the result to the Ganglia Web console and create a new metric graph labeled “cpu1_temp”:

```
gmetric --name cpu1_temp --value 'cpu1_temp' --type float --units Celsius
```
Running gmetric once inserts a single result into the Ganglia database and plots a single data point on the metric graph in the Ganglia Web interface. To track a sensor’s value over time, administrators must place entries into cron2 to execute gmetric at the desired polling interval.

Administrators can track all the temperatures on a PowerEdge server using a Linux bash shell script. For the bash shell script, ganglia_check_temps, visit http://www.dell.com/magazines_extras. Figure 5 shows the resulting Ganglia display after setting up system cron jobs to run this temperature collection script on a PowerEdge 2650. Similar scripts to monitor system health parameters, such as fan speeds and voltages, can be derived from this script.

Ganglia can be a powerful tool for cluster administrators who need to track the resource utilization and system health of cluster nodes. The data trends provide administrators with valuable information that can be used to identify issues and plan future system and data center requirements.

Protecting server health with powerful tools

Administrators in enterprise Linux environments rely heavily on tools such as Nagios and Ganglia to proactively monitor the state and utilization of compute resources. When combined with the Dell OpenManage Server Administrator CLI, Nagios and Ganglia enable early detection of device conditions that may be an indicator of broader data center problems. Early detection can help system administrators proactively address warning conditions before they lead to system failure and unplanned downtime.

Dan Beres (daniel_beres@dell.com) is an enterprise technologist in the Advanced Systems Group at Dell. His areas of interest include programming in C and Assembler, building management controls of complex systems, and integrating Linux into the enterprise. He has been in the computer industry for more than 20 years, spending the past five and a half years at Dell. Dan has a B.F.A. in Communications from Chapman College.

Roger Goff (roger_goff@dell.com) is an enterprise technologist in the Advanced Systems Group at Dell. His current interests include Linux and Microsoft Windows HPC clusters and cluster file systems. Roger is a Red Hat Certified Engineer and has an M.S. and a B.S. in Computer Science from Virginia Polytechnic Institute and State University (Virginia Tech).

Terry Schroeder (terry_schroeder@dell.com) is an enterprise technologist in the Advanced Systems Group at Dell. He supports Dell field system consultants and engineers by communicating Dell systems management products and initiatives to customers. Terry came to Dell with nine years of corporate IT experience, having held numerous management and implementation positions covering infrastructure and application initiatives. Terry has an M.S. in Library Science and Information Management and a B.S. in Social Sciences, both from Emporia State University.

FOR MORE INFORMATION

Nagios:
http://www.nagios.org

Ganglia:
http://ganglia.sourceforge.net

---

2 Cron is a program that allows administrators to create jobs that will run at a given time.