Introduction and Purpose

Nagios is a leading application for system and network monitoring, licensed under GNU GPL. It includes many precompiled functions for monitoring traditional hosts and devices. Through the add-ons (nsclient, nsca, nrpe), Nagios can be extended to monitor a wide range of devices and services.

Rapid deployment of VMware ESX servers has complicated the task of monitoring the technology infrastructure. The virtual hosts can be monitored with standard Nagios add-ons, but the important elements are the resources used by the ESX servers. Other than through the service console (deprecated), ESX resources are invisible to Nagios.

This document describes techniques and solutions to use the nsca add-on to monitor a wide-area, multi-host ESX environment from a central location. Monitoring options are configurable to address response times and frequency of information updates.

Design Goals

- Utilize a subset of the VMware command line interface (vCLI) to provide first-level Nagios monitoring and diagnosis. This monitoring is not intended to supplant the vSphere monitoring functions, rather to integrate a VMware environment into enterprise monitoring and alerts.

- Simplify the monitoring task by monitoring multiple VMware servers from a central location. This tactic avoids the need to install monitoring software on each ESX host. Avoid obsolescence by not relying on deprecated service console functions such as vdf.

- Use generalized Nagios services to report the vCLI command results, and parse the command outputs to extract meaningful diagnostic information. For example, an ESX server might have dozens of virtual filesystems and support scores of virtual machines. It would be tedious to define them all to Nagios as individual services. Instead, define generic service names and identify any problems in the Nagios status information.

- Develop a configurable architecture to support changes in monitoring tasks and timing. Utilize an external file to identify hosts and monitoring schedules.

Information sources

Perusal of the vSphere Command-Line Interface Installation and Scripting Guide and vSphere Resource Management Guide led to selection of several commands that provide useful monitoring information:

Command	Parameters
• resxtop	Physical Cpu Load\Cpu Load (5 Minute Avg)
	Memory\Machine Mbytes & Memory\Free Mbytes
	Memory\Memory Overcommit (5 Minute Avg)

Command	Function
• vifs -listds	lists all virtual filesystems on ESX server
• vmkfstools -queryfs	shows attributes of one ESX filesystem
• vmware-cmd -l	lists all virtual machines on ESX server
• vmware-cmd getstate	shows operating state of one virtual machine

Installation and configuration

- Download and install a vSphere CLI package on a Linux host or deploy the vSphere Management Assistant (vMA) to an ESX/ESXi host or vCenter Server system. Test the vCLI functions interactively and resolve any problems. In particular, either disable SELinux or create a security context for the vCLI libraries using semanage and chcon.

- If not already done, install the gcc compilers on the Linux host. Install Nagios NSCA per instructions on Sourceforge.

- On the Linux host, create a local monitoring account, e.g. nagios. Create the home directory; suggested name is /opt/nsca. Activities following occur in this directory.

- As nagios, prepare a resxtop configuration file for batch mode operation. Run resxtop in interactive mode. Toggle through each display and de-select all the columns; purpose is to minimize command output size, which otherwise could exceed a megabyte. Save this configuration file (in this procedure ./esxtop4rc) using the **W** interactive command.

- Import required files from list below. Mark the Perl and shell scripts as executable. Change directory owner to the local account (nagios).
    - nsca_vmware.cron
    - nsca_vmware.pl
    - nsca_vmware.sh
    - send_nsca.cfg

- Edit the Perl program nsca_vmware.pl for compliance with directory and file names as needed. Set the maximum message length for Nagios status information; 200 characters take about four lines on the Nagios display panels. If required, modify the five service names and the warning and critical threshold levels for each service. This part may require tuning, as ESX is often configured for high utilization of resources.

- Edit the shell script nsca_vmware.sh for compliance with directory and file names as needed. On the send_nsca line, revise the Nagios host as needed. Edit the nsca configuration file send_nsca.cfg as needed.

- Create an external configuration file (in this procedure ESX_Hosts) containing a tab-delimited list of ESX hosts and a set of schedules for monitoring. Format is

    ESX hostname \t Root Acct \t Password \t CPU/Mem \t FileSys \t VMcount

    where CPU/Mem, FileSys, and VMcount are monitoring schedules (see following). Because this file contains root passwords, protect it with chmod 600. If you don't trust the super-user, find a way to encrypt it.

- A monitoring schedule provides a means to implement frequent monitoring for variables that change quickly and infrequent monitoring for variables that change slowly. Schedule names are arbitrary except they may nor contain white space; there can be as many schedules as desired. For example:
    - The CPU/Mem variables arise from resxtop, which continuously changes. Also resxtop is fast (one command per ESX host), so a good schedule would be *5min.*
    - Conversely, FileSys and VMcount variables change slowly, and they run slowly (one command each to get the lists, plus one per item to enumerate the lists). So a good schedule for them would be *4hrs.*

- VMware version limitation: Of the information sources shown above, only vmware-cmd works with ESX versions prior to 3.5. So earlier ESX versions cannot be monitored using this solution.
- At the beginning, create a small configuration file with two local ESX servers. Set the CPU/Mem schedule to *test* and omit the other two schedules.
- Run the Perl program `nsca_vmware.pl test` from the command line. It should produce a stream of messages and write a file nsca_vmware.dat in nsca tab-delimited format. Run time should be 15-30 seconds. Correct any errors.
- Run the shell script `nsca_vmware.sh test` from the command line. It should produce the nsca_vmware.pl outputs and send nsca packets to the Nagios host. Correct any errors.
- Edit the sample crontab nsca_vmware.cron for compliance with directory and file names. Then edit the actual crontab for the monitoring account.
- On the Nagios host, create required entries for each ESX host and its services. See example following.

Sample configuration file

```
#VMware ESX hosts to monitor with Nagios nsca
#Tab delimited, # in col 1 to skip           schedules for 3 options
#ESX Host Name           Root      Password  CPU/Mem  FileSys  VMcount
#-------------           ----      --------  -------  -------  -------
srv-sc-esx1.symyx.com    root      *******   5min     4hrs     4hrs
srv-sc-esx2.symyx.com    root      *******   5min     4hrs     4hrs
srv-sc-esx3.symyx.com    root      *******   5min     4hrs     4hrs
```

Sample Nagios service

```
Define   service{
        use                       generic-service ; template
        host_name                 srv-sc-esx2
        service_description       ESX-CPU-LOAD
        contact_groups            sc-admins,sc-alerts
        check_command             check_dummy
        active_checks_enabled     0
        }
```

Sample Nagios display

Host ↑↓	Service ↑↓		Stat ↑↓	Last Che	Dur ↓	Atte ↑↓	Status Information
srv-sc-esx2	ESX-CPU-LOAD	PASV ↓↓	OK	08-24-2010	0d 0	1/3	CPU load average 31% on 4 CPUs
	ESX-FILESYS	PASV ↓↓	OK	08-24-2010	0d 0	1/3	Of 4 filesystems, max usage is NewSAN-Storage3 (1) (85%), NewSAN-Storage2 (1) (62%), NewSAN-Storage1 (1) (42%), srv-sc-esx2:storage1 (0%)
	ESX-MEMORY	PASV ↓↓	OK	08-24-2010	0d 0	1/3	Memory use 38% (12525 of 32763 MB used)
	ESX-OVERCMMT	PASV ↓↓	OK	08-24-2010	0d 0	1/3	Memory overcommitment 0%
	ESX-VM-STATE	PASV ↓↓	OK	08-24-2010	0d 0	1/3	Of 20 virtual machines, 9 are off, 11 are on
	PING		OK	08-24-2010	0d 1;	1/3	PING OK - Packet loss = 0%, RTA = 2.61 ms
	VMWARE-WEB		OK	08-24-2010	12d ;	1/3	OK - HTTP/1.1 301 Moved Permanently - 0.001 second response time

References

vSphere Command-Line Interface Installation and Scripting Guide in
http://www.vmware.com/pdf/vsphere4/r41/vsp4_41_vcli_inst_script.pdf

vSphere Resource Management Guide (covers resxtop) in
http://www.vmware.com/pdf/vsphere4/r41/vsp_41_resource_mgmt.pdf

GCC compiler installation in http://gcc.gnu.org/install/

Nagios documentation in http://support.nagios.com/knowledgebase/officialdocs

Nagios nsca procedure in
http://nagios.sourceforge.net/download/contrib/documentation/misc/NSCA_Setup.pdf