Drowsy

THE 8TH DWARF

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ABSTRACT: THIS DOCUMENT DESCRIBES THE NEW DROWSY SERVER® FEATURE OF NIGHTWATCHMAN SERVER EDITION, AND HOW IT SAVES ENERGY.

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drow·sy [drou-zee]

–adjective,

1. half-asleep; sleepy.
2. marked by or resulting from sleepiness.
3. dull; sluggish.
4. inducing lethargy or sleepiness.

This document describes the Drowsy Server® feature of NightWatchman Server Edition, and how it saves energy. It is assumed that the reader has already read "Useful Work – The lights are on but is anybody home?" which explains how NightWatchman Server Edition reveals useful work.

Sleepy Time

A server's main purpose is obviously to serve and therefore, since the server's workload will be generated by external requests which can arrive at any time, most servers cannot be power managed in the same way as desktop computers (i.e. by turning them off or putting them to sleep).

Any power saving mode utilized by a server must therefore always allow the server to service requests (i.e. there shall be no loss of service). It must also not impact the day-to-day operation of the server, so that when the server is performing its main function it should run as quickly as is necessary to provide required response times.

If NightWatchman Server Edition detects that there is no useful work being performed for a period of time (by default 30 minutes), then the system can be safely placed into a Drowsy state.

Nodding off

When the Drowsy power plan is in effect the NightWatchman Server Edition agent uses a technology that the major chip manufacturers have included in their processors called 'Demand Based Switching', known as SpeedStep (Intel) or PowerNOW (AMD), to reduce the speed of the CPU and therefore the amount of energy that it uses.

In normal operation demand based switching varies the speed dynamically in line with the processing load. This gives the greatest performance when the system is busy and the least amount of energy use when it is idle.

However, if the only processing load on a system is that caused by non-productive work, and it doesn't matter how long this work takes, it is actually more energy efficient to lock the processor to its slowest speed, and allow the processing to take longer, than it is to allow the dynamic scaling of speed to raise the energy use so that the task finishes more quickly.

At the point of entering (and exiting) the drowsy state, NightWatchman Server Edition can also be configured to tweak any other power management settings through an extensible scripting mechanism.

An example of drowsy in action;

The test server is a two processor server which when running at idle has an average power draw of 160W.

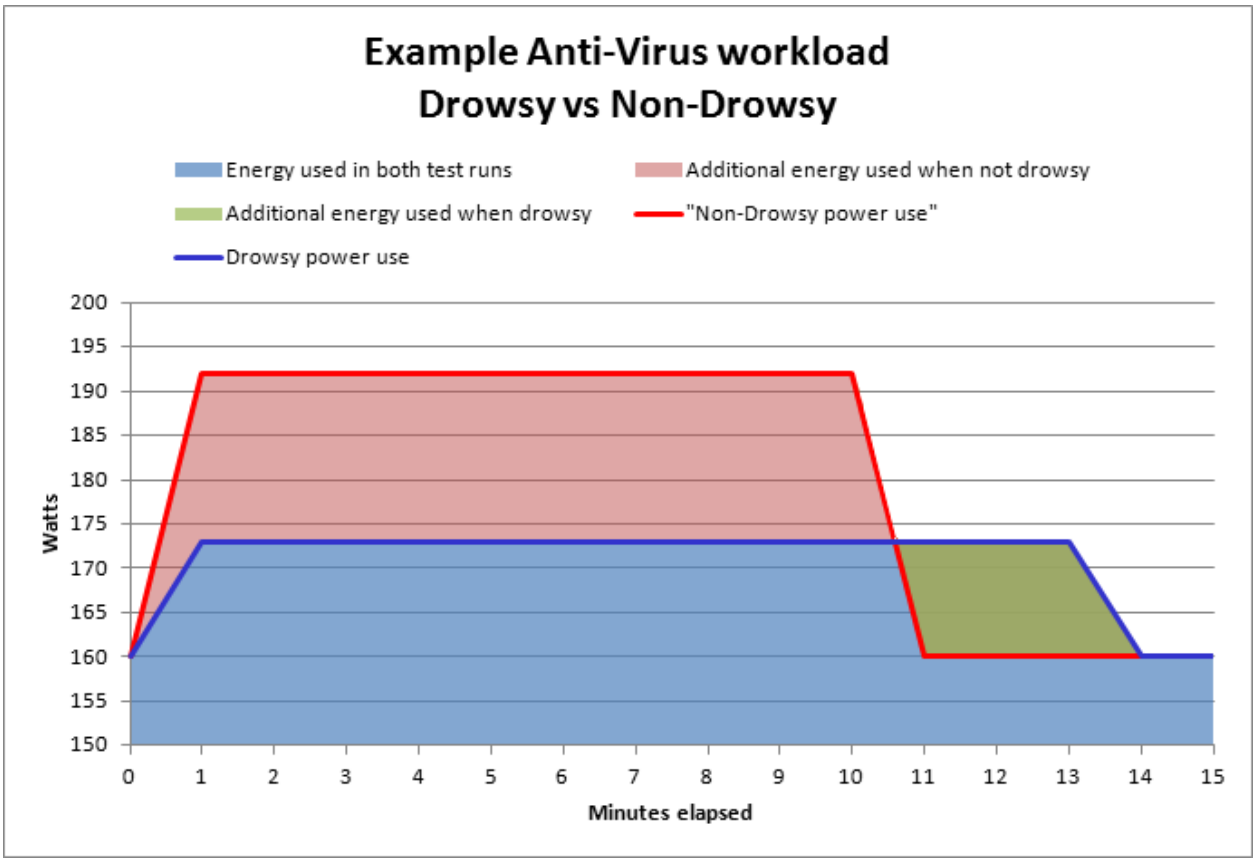
The server, without Drowsy enabled, runs an anti-virus scan of the whole system disk at an average power draw of 192.5W. The virus scan takes 9 minutes and 54 seconds to complete (0.16 of an hour)

The same server when set to be drowsy performs exactly the same anti-virus scan of exactly the same data at an average power draw of 173.8W which takes 12 minutes and 14 seconds (0.20 of an hour).

If we look at the total energy consumption of this server over a 15 minute period (0.25 of an hour);
*When non-drowsy the server consumes (192.5 * 0.16h + 160 * 0.09h) = 45.2Wh of energy.*

*When drowsy the server consumes (173.8 * 0.20h + 160 * 0.05h) = 42.76Wh of energy.*

This is a 5.6% saving in energy usage whilst performing non-productive work.



This chart shows the difference in power draw between the two test runs. The red line is the power draw over time when not drowsy, the blue line is power draw when drowsy. Note that the red line is higher (=more power used) but for a shorter period of time, whilst the blue line is lower (=less power used) but for a longer period of time.

The blue shaded area is energy that is used during both test runs. The red shaded area is the additional power used during the non-drowsy test run when the demand based switching increased the processor p-state due to the additional processing demand caused by the anti-virus software.

The dark green shaded area is the additional power used during the drowsy test run because it took longer to process the virus scan as the processor was slowed down whilst it was drowsy.

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The relative difference in size between the red and green areas is the difference in energy use between the two scenarios. It can be clearly seen that the Drowsy mode is using less energy in comparison to the non-drowsy mode.

Testing on different hardware and operating systems has shown consistent savings in every scenario, however the degree of savings is dependent on the hardware in use and the amount of processing that the non-productive workload causes. During tests of standard maintenance type activities (anti-virus, backup, indexing, defragmentation etc.) we have seen savings from 5% to 12%.

Depending on the efficiency of the power delivery and air conditioning systems in your data center the overall energy saved could be much higher.

Rise and shine

As soon as the NightWatchman Server Edition agent sees useful work start up again it immediately transitions back to the operational power plan (i.e. the non-drowsy one) and the system goes back to full performance to service the useful work.

You already know that NightWatchman Server Edition can help you to find servers that aren't providing useful work, and with the Drowsy Server® feature you can save energy on your other servers whenever they're not performing useful.