White Paper

Intel® Power Gadget 3.0
Monitoring Processor Energy Usage

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Introduction

Intel® Power Gadget is a software-based power estimation tool enabled for 2nd Generation Intel® Core™ processors or later. It includes a Microsoft Windows* application, driver, and libraries to monitor and estimate real-time processor package power information in watts using the energy counters in the processor. With this release, we are providing functionality to evaluate power information on various platforms including notebooks, desktops and servers.

Background

Traditional methods to estimate power/energy usage of the processor has always been a cumbersome task that included special purpose tools or instrumentation on the platform along with third party equipment. The motivation for the tool was to assist end-users, ISV's, OEM's, developers, and others interested in a more precise estimation of power from a software level without any H/W instrumentation.

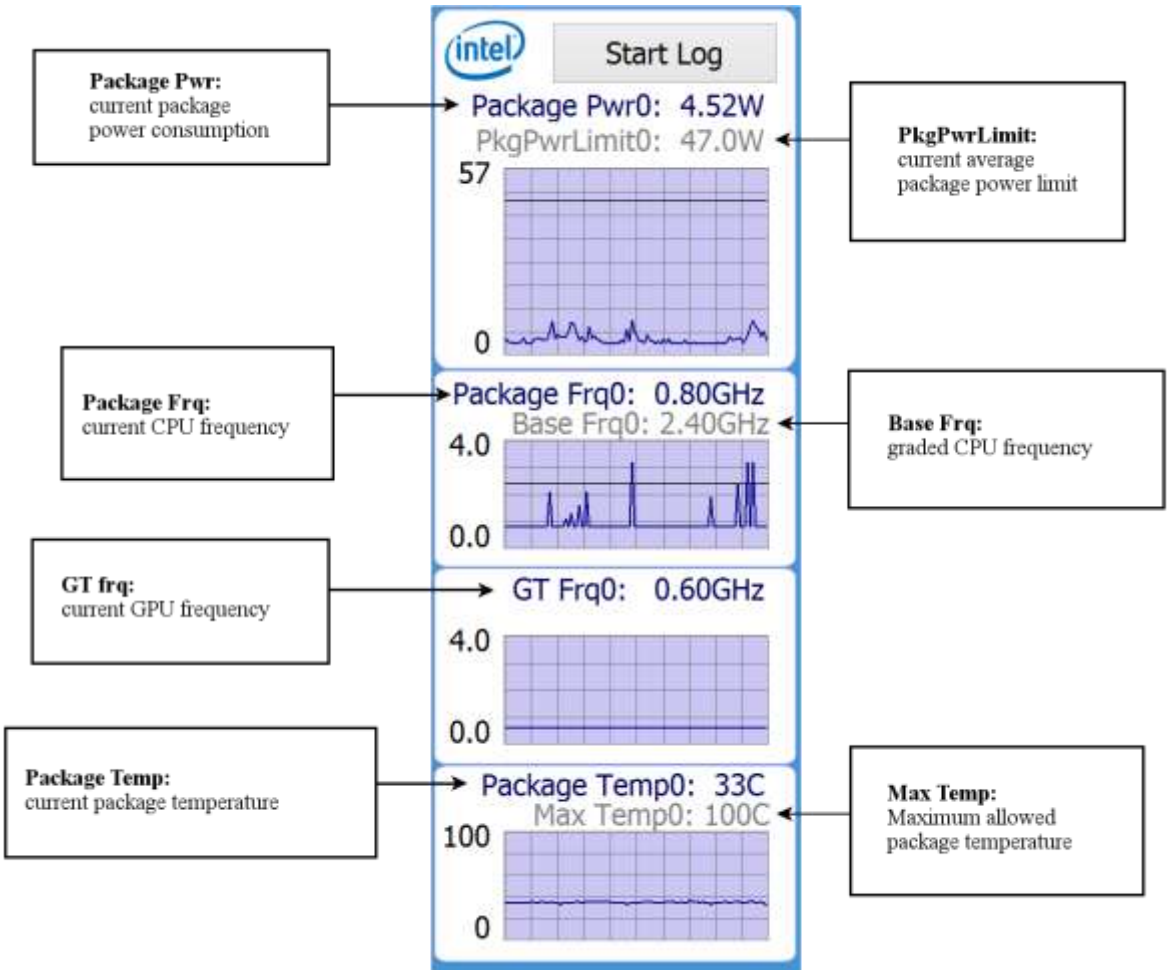
New Features

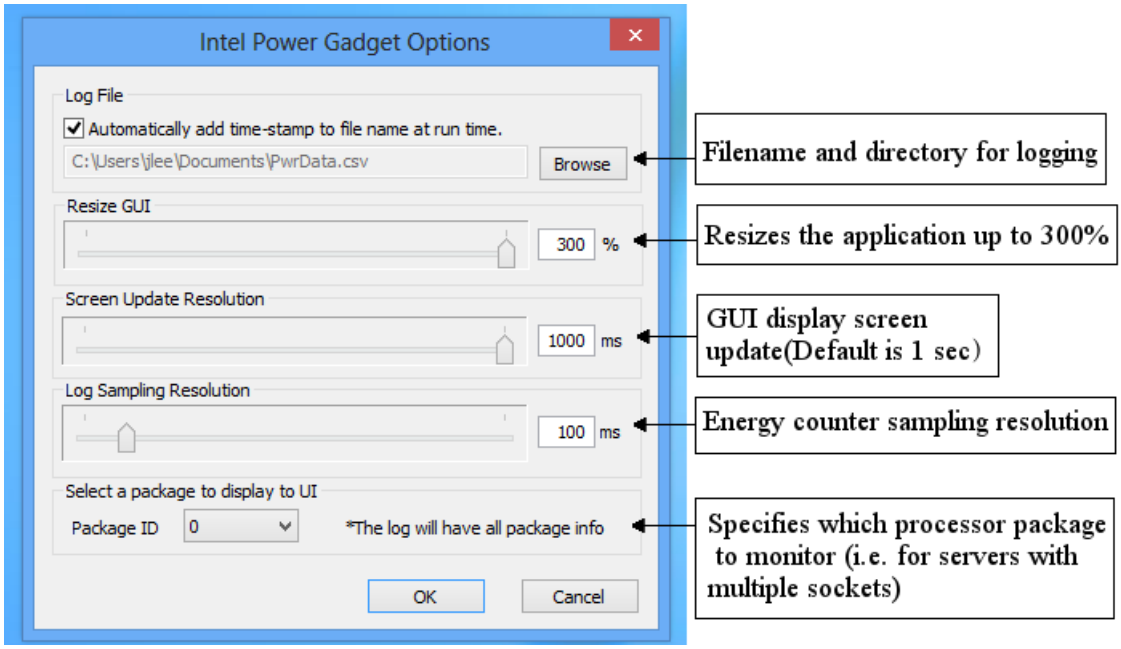
With the current release, we are providing additional functionalities that include estimation of power on multi-socket systems as well as externally callable APIs to extract power information within sections of code. The multi-socket support essentially evaluates the Energy MSR on a per-socket basis and provides an estimate of power draw per socket. The API layer is a set of libraries and dlls that can be called and offers the flexibility to build the tool within code sections of an application. Latest release also includes support for Windows 8* (desktop mode).

Brief Description

Intel® Power Gadget 3.0 consists of the following components. Set of driver and libraries which access and post process the processor energy counter to calculate the power usage in Watts, temperate in Celsius and frequency in GHz (default install directory will be ~\Program Files\Intel\Power Gadget 3.0 for 64-bit OS). A command line version of the tool (PowerLog3.0.exe) is also included.

Overview of the tool





System Requirements

- Windows 7* 32-bit and 64-bit
- Windows 8* desktop mode 32-bit and 64-bit
- Windows Server 2008, Windows Server 2008 RC2* (64-bit server platforms)
- Microsoft* .Net Framework 4
- Microsoft Visual C++ 2010 SP1 Redistributable package (x86 or x64 depends on OS)
- 2nd Generation Intel® Core™ Processor or later, older processors not supported
    - Single socket
    - Multi-socket

Installation /Setup

1. Download the appropriate 32 or 64-bit package and copy to your test system
2. Run setup.exe as an administrator. Accept the UAC, if one appears.
3. Follow the installer prompt instructions to complete installation
    - Microsoft* .Net Framework 4 (will automatically be downloaded from Microsoft* site if not yet installed in your system) needs Internet connection
    - Microsoft Visual C++ 2010 SP1 Redistributable Package (will automatically get installed if not yet installed)

Usage

Common use of Intel® Power Gadget is to monitor energy usage of the processor

- Provides processor power (Watts), temperature (Celcius) and frequency (MHz) in real-time via graph displayed in the GUI
- Lets you log the power and frequency measurements and save it in a csv format.

Steps:

- Double click on the desktop shortcut and the GUI will launch
- Drag to move the GUI.
- Right click the GUI and a pop-up menu will show up allowing you to choose options or close the application. Options have the following parameters. Click "Start Log" button in the GUI to start logging. Press the same button "Stop Log" to stop logging. While it's logging, red label "REC" will blink in the power chart area.
    - You can choose to add time-stamp to the log file name or not.
    - You can choose the log file name.
    - You can choose to resize the GUI from 100% to 300% by dragging the slider and testing the new size with the "Apply Size" button and accept the changes by pressing "Ok".
    - Screen Update Resolution lets you change how often the GUI is updated at runtime. This may range from 50 ms to 1000 ms. (Default set to 1000 ms)
    - Log Sampling Resolution lets you change the logging sampling resolution ranging from 1 ms to 1000 ms. (Default set to 100 ms)
    - In a multi-socket system, you can choose which package information to display in the GUI. The log will record all package information in a csv file.
- Click "Start Log" button in the GUI to start logging. Press the same button "Stop Log" to stop logging. While it's logging, red label "REC" will blink in the power chart area
- Using Intel® Power Gadget 3.0 in a script;
    - In order to start and stop the logging in a script, first launch the GUI as usual.
    - At the beginning of the script, call "IntelPowerGadget.exe -start" and it will trigger the logging in the GUI.
    - At the end of the script, call "IntelPowerGadget.exe -stop" and it will stop the logging.
    - The parameters for the log are based on the options set in the GUI.
- PowerLog3.0.exe is the command line version of Intel® Power Gadget in logging power usage
    - Usage:
    - Log power data to logfile for a period of time:
        - PowerLog3.0.exe [-resolution <msec>] –duration <sec> [-verbose] [-file <logfile>]
    - Start a command a log power data to logfile until the command finish
        - PowerLog3.0.exe [-resolution <msec>] [-file <logfile>] [-verbose] –cmd <command>
- Logfile data
    - Logfile will include the elapsed timed, package power limit, processor frequency, GT frequency, processor temperature, average and cumulative power of the processor

- Processor Energy (Total energy of the processor) = IA Energy + GT Energy (if applicable) + Others (not measured)
- IA Energy (Energy of the CPU/processor cores)
- GT Energy (Energy of the processor graphics) – If applicable , some processors for desktops and servers don't have it or may have use discrete graphics

API

- Intel® Power Gadget also provides a C/C++ Application Programming Interface (API) for accessing this power and frequency data in your program; the API is supported on Windows. For more information on the API's go to http://software.intel.com/blogs/2014/01/07/using-the-intel-power-gadget-30-api-on-windows

Known Limitations/Issues

- Only works on 2nd Generation Intel® Core™ processor family or newer. Atom processors not currently supported
- Use only 32-bit installer for 32-bit OS and 64-bit installer for 64-bit OS
- Application may hang after running for a long period of time (just close and restart application)

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