Intel® SoC Watch for Windows* OS 2.7

Release Notes

15 August 2018

Version History

These are the main releases of Intel SoC Watch:

Date	Revision	Description
November, 2017	2.4	First release that aligns all command line parameters and output formats across all supported operating systems.
December, 2017	2.4.2	Update release, includes support for Intel platforms code named Apollo Lake (new stepping) and corrected console message order when using delayed start option.
February, 2018	2.5	Includes support for Intel platform code named Gemini Lake and other fixes.
April, 2018	2.6	Enhancements include new hot key Alt-S, new --log option, modified metric groupings, and improved support in gfx metrics.
May, 2018	2.6.1	Update release.
August 2018	2.7	Added average frequency report, new options (program-delay, disable-alts), new metric (pkg-pwr), new group names, support for Intel platform code named Whiskey Lake, Amber Lake, and Cherry Trail, fixed issues in ddr-bw, automation summary, and multiple pkg handling.

Intended Audience

Use this document if you use Intel SoC Watch to analyze power consumption on a Windows* system.

Customer Support

For technical support, including answers to questions not addressed in this product, visit the technical support forum, FAQs, and other support information at: https://software.intel.com/en-us/intel-system-studio-support or contact IntelSystemStudio@intel.com.

Contents:

1   Introduction

Intel® SoC Watch is the data collector for power-related data that helps identify issues on a platform that are preventing entry to power-saving states. The metrics it captures include system sleep states, CPU and GPU sleep states, processor frequencies, temperature data, and device sleep states among others. The collected data can be correlated and visualized over time using the Intel® VTune™ Amplifier.

This document provides system requirements, installation instructions, issues and limitations, and legal information.

To learn more about this product, see:

- New features listed in the New in this Release section below
- Reference documentation listed in the Related Documentation section below
- Installation instructions can be found at: Installation Notes

2   New in This Release

Update release v2.7 includes the following.

- **Added Core P-state Average Frequency table to -f hw-cpu-pstate summary.** A table reporting Core P-state *Approximate Avg* and *Actual Avg* frequency has been added to `-f hw-cpu-pstate` metric, similar to what was found in v1.19.1. Note that the *Core P-State/Frequency Summary* report shows sampled frequency Residency as a % of total collection time, but the *Core P-State Average Frequency* table is calculated as a % of Active (C0) time, excluding idle time. This is required in order to allow comparison of Approximate Avg to Actual Avg frequency as a measure of accuracy for the sampled data. (The Actual Avg frequency comes from registers Aperf/Mperf that accumulate average frequency during active time, providing the most accurate average frequency value.)
- **Added option to delay start of program, --program-delay.** If the `-p` option is used to launch a workload before collection, you can use `--program-delay <seconds>` to delay the starting of that program for the specified number of seconds. Collection will begin after the program starts unless the `-s` option is also given. When both are specified, Intel SoC Watch first waits for the number of seconds specified by the `program-delay` option then starts the program and waits for the amount of time specified by the `-s` option before starting data collection.
- **Added guard against sampling bandwidth data too frequently on certain platforms.** On Intel Atom® processors there is a minimum sampling interval when collecting bandwidth metrics based on signal counters. A warning will now be displayed when an interval smaller than the default 10 milliseconds is specified with option `-n`, and the default will be used instead.
- **Added option to generate help output in JSON format.** The option `--export-help` can be used to generate a JSON format help output file, useful in automating discovery of features available on a platform.
- **Added new group names to make it easier to find and select features**. These include:
    - `cpu-hw`
      Collects most CPU-specific metrics that are obtained from hardware data sources (hw-cpu-cstate, hw-cpu-hwp, hw-cpu-pstate, ia-throt-rsn, cpu-gpu-concurrency, core-temp, soc-temp)
    - `cpu-os`
      Collects all CPU-specific metrics that are obtained from OS event traces (os-cpu-cstate, os-cpu-pstate, timer-resolution)
    - `gfx-hw`
      Collects most GPU-specific metrics that are obtained from hardware data sources (hw-gfx-cstate, hw-gfx-pstate, gfx-throt-rsn, cpu-gpu-concurrency)
    - `gfx-os`
      Collects all GPU specific metrics that are obtained from OS event traces (os-gfx-cstate)
- **Modified feature group names to include more features making it easier to get all relevant data**. The changes are as follows:
    - `cpu`: Includes all of cpu-hw + cpu-os (more metrics than previously)
    - `gfx`: Includes all of gfx-hw + gfx-os (more metrics than previously)
    - `sys`: Includes most metrics, including the metrics in the expanded groups above plus bandwidth and package power. It does not include OS-based metrics which have a hardware equivalent. (sstate + device + temp, cpu-hw, gfx-hw, ddr-bw, pkg-pwr, timer-resolution)
- **Feature -f sstate is now consistent across OSes.** It is a group name that includes all metrics related to system idle states.
- **Added energy metric for the Package.** Feature `-f pkg-pwr` is now supported on Windows. This reports Joules and Watts used by the Package.
- **Added support for Intel platforms code name Cherry Trail.**

- **Added option to disable the Alt-S hotkey.** The key combination Alt-S was added as an alternative to Ctrl-C for terminating a collection. However, if a workload launched by Intel SoC Watch (option `-p`) uses Alt-S for its own purposes it will cause Intel SoC Watch collection to terminate prematurely. Use option `--disable-alts` to tell Intel SoC Watch to not interpret Alt-S as a command to stop collection.
- **Added support for Intel platforms code named Amber Lake**.

3   System Requirements

Supported Architectures and Terminology

Intel SoC Watch supports the following Intel microarchitecture and platform code names:

- Apollo Lake
- Gemini Lake
- Skylake
- Kaby Lake
- Coffee Lake
- Whiskey Lake
- Amber Lake

Minimum System Requirements

This tool can be run on the Windows* 8.1 and Windows 10 (desktop) 64-bit operating systems, with administrator permissions.

4   Where to Find the Release

Go to the Intel® System Studio website to get either an Evaluation (30-day trial release) license or a commercial license, and download the package from Intel Registration Center.

5   Installation Notes

Intel SoC Watch for Windows* OS is installed as part of Intel System Studio when downloaded to a Windows host system.

Default Installation Folders

The default top-level installation folder for this product is:

```
C:\Program Files (x86)\Intel\SoCWatch
```

If you are installing on a system with a non-English language version of Windows OS, the name of the `Program Files` folder may be different. On Intel® 64 systems, the directory name is `Program Files (X86)` or the equivalent.

Installing on a Remote Target

You can install Intel SoC Watch on a remote Windows system. Detailed instructions are available from https://software.intel.com/en-us/socwatch-help-preparing-a-target-windows-system-for-energy-analysis.

Changing, Updating, and Removing the Product

If you want to add or remove components from an installation, open the Control Panel, select the Add or Remove Programs applet, select Intel System Studio, and click **Change**. To remove the product, select Intel SoC Watch and click **Remove**.

When installing an updated version of Intel SoC Watch, any previously installed version will automatically be removed.

6 Fixed Issues

Update release v2.7 has a fix for the below issues.

- **Automation_Summary.csv file now includes all summary reports and column headers are unique**. Corrected the issue where some tables from the summary report were not included in the Automation_Summary file. Also changed the column headers for all data to make them unique by prepending the table name, as seen in the summary file, to each column header.
- **Corrected error in reporting ddr-bw.** A regression from v1.19.1 occurred in reporting ddr-bw. The error resulted in significant under reporting of MB/sec in certain scenarios. This has been corrected.
- **Improved error reporting for syntax errors on command line**. Error messages are now reported on the console for command line syntax errors such as including an argument with -m or using invalid value for -r option.
- **Corrected pathname for output file pathname that was being displayed on the console**. When relative pathnames were specified with the -o option, the console message giving the complete pathname for the output file could be incorrect.
- **Improved labeling for per Core reporting on systems with multiple packages**. Windows OS numbers cores contiguously across all packages. Previously, the set of cores on the second package might be precede the cores from the first package, resulting in the core numbering to be out of order in the report. This has been fixed so that package 0 cores are shown first followed by package 1, etc. Also, if a system has more than one package, the column header will include the package number prepended to the core number (ex: Package_0/Core_0). If the system has a single package, the column header does not change, and gives just the core number (ex: Core_0).
- **Fixed several issues in handling filename argument to option --log**. The handling of the filename argument for option `--log` has been improved so that it behaves like the `--output` option. Folders in the specified pathname will be created if they don't exist, use of "/" in pathname is allowed, and an error is reported if the file location is not writable rather than the tool crashing.

7   Known Issues

This release contains the following known issues.

- **Package power reported incorrectly for systems with multiple packages.** The `-f pkg-pwr` feature will report an incorrect value for energy and power on systems with multiple packages. A fix is being developed and will be included in the next release.

- **Intel VTune Amplifier will report error during import if too many metrics are included in the .pwr file**. The following error occurs if the .pwr file being imported includes too many metrics: *Error 0x4000002a (Database interface error) - Precompute error.*

- **Metrics report Unknown 0 and do not sum to total collection time when -m is not used and hibernation occurs.** Metrics with a snapshot default collection mode, such as CPU C-state, will show the *Unknown* state with 0 time and the remaining states will not sum to the total collection duration if the system entered hibernation during the collection and the `-m` option was not specified. The snapshot metrics are only collected at the start and end of a collection by default, but finding hibernation time requires samples taken throughout the collection - including `-m` will cause continuous sampling to occur for all metrics. When hibernation occurs, a message reporting time spent in hibernation appears at the beginning of the summary report. The *Unknown* state is then included for all appropriate metrics and the time in hibernation is included in that state. Refer to the Intel SoC Watch User's Guide *Options Quick Reference* section to learn which metrics have a snapshot collection mode by default.

- **Syntax errors in the command line may not report a visible error message**. If a collection did not run and you are not seeing any error message, add option `-d 2` to your command line to get more information.

- **Insufficient system resources error seen on occasion when collecting OS event trace metrics such as acpi-dstate.** The system error "*WARNING: Cannot enable provider in the trace file* <etl filename>" has been reported when collecting metrics that enable event trace logging. This error prevents ETL logging from being started and is usually caused by a background process consuming system resources. Use Task Manager to find and remove such processes then try the collection again.

- **Hyper-V and Virtualization-based Security (VBS) prevent some metrics from being collected**. Intel SoC Watch detects when Hyper-V and Virtualization-based Security is enabled on the platform, reports a warning message on the console and disables metrics that are blocked by these settings. When Hyper-V and VBS are enabled then `cpu-gpu-concurrency` cannot be collected.

- **Total DDR bandwidth does not include EDRAM**. On systems using EDRAM, the `ddr-bw` feature report may have a discrepancy between the total data read and writes and the total component requests. The Data Reads+Data Writes will be significantly higher than the total IA+GT+IO requests, because the EDRAM requests are not included.

- **Collection on Windows* Server 2016 OS will result in failure to load the Intel SoC Watch driver if Secure Boot is enabled on the platform.** The workaround is to disable Secure Boot. The problem on Windows 10 client OS was resolved.

- **If a command window is closed (using either the X button or Alt-F4) while the socwatch process is running, or the Task Manager is used to kill the socwatch process, then the behavior of a subsequent run of Intel SoC Watch becomes unknown.** The proper way to terminate Intel SoC Watch is using Ctrl-C. A collection driver may be left in an undefined state when Intel SoC Watch is

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abruptly terminated because there is no OS event to allow proper cleanup. This can cause the next Intel SoC Watch collection to result in anything from bad data to a system crash. If a driver is left running, it must be removed. You can reboot the system to clear a driver or use the following set of commands to check if the driver is running, stop it, and then delete it: `sc query socwatchdrv; sc stop socwatchdrv; sc delete socwatchdrv`.

- **OS-based CPU P-state report does not support platforms with > 64 logical processors.** The hardware-based P-state report is correct. The problem is in the OS event trace which provides state changes for only a partial set of logical processors when the platform is configured for more than 64 logical processors. When this situation occurs, a warning message is printed in the report indicating which processors have no OS P-state change events.
- **Issues on Intel platforms code named Apollo Lake and Gemini Lake:**
  - **Memory bandwidth and memory self-refresh metrics not available.** The following features are not supported: ddr-bw, cpu-ddr-bw, cpu-ddr-mod0-bw, cpu-ddr-mod1-bw, disp-ddr-bw, isp-ddr-bw, gfx-ddr-bw, io-bw, all-approx-bw, dram-srr.

8   Related Documentation

The below documents are available with this release.

- Intel® SoC Watch for Windows* OS User's Guide
- Energy Analysis help

9   Release Content

Intel® SoC Watch for Windows* OS User's Guide
Intel® SoC Watch for Windows* OS Release Notes
Intel® SoC Watch for Windows* OS executables

10 Acronyms and Terms

The following acronyms and terms are used in this document (arranged in alphabetic order):

Acronym/Term	Description
SoC	System on Chip

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