Intel® SoC Watch for Windows* Release Notes

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Version 2020.3

Intel Corporation

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Contents

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Version History

These are the main releases of Intel® SoC Watch:

Date	Revision	Description
June, 2019	2.11	Improves handling of unrecognized CPUs, reporting S-state when hibernation occurs, and other bug fixes.
September, 2019	2019.12	Added support for Intel platform code named Ice Lake. Modified hw-cpu-pstate reporting.
October, 2019	2019.13	Fixed issue in hw-cpu-pstate for Intel platform code named Ice Lake.
November, 2019	2020.1	Added support for Intel platform code named Comet Lake.
February, 2020	2020.2	Added collection of tool usage analytics. Added new features pch-slps0, pch-slps0-dbg. Improved error messages and help output. Enhanced driver security.
June, 2020	2020.3	Bug fix release.

Customer Support

For technical support, including answers to questions not addressed in this product, see the Intel System Studio forum (https://software.intel.com/en-us/forums/intel-system-studio).

1 Introduction

Intel® SoC Watch is a data collector for power-related data that can help identify issues on a platform that prevent entry to power-saving states. Captured metrics include:

- System sleep states
- CPU and GPU sleep states
- Processor frequencies
- Temperature data
- Device sleep states

You can correlate the collected data and visualize over time using Intel®VTune Profiler.

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, or in the help.
- Reference documentation listed in the Related Documentation section below
- Installation instructions can be found in the Installation Notes section below.
- For a detailed quick start guide to running the tool, see the *Intel SoC Watch User's Guide* in your installed documentation.

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Notice revision #20110804

2 New in This Release

The 2020.3 release (driver v2.12.3) contains these changes:

- The --help command now lists option --no-post-processing which can be used to delay post-processing. If this is specified on the collection command line, no summary .csv file will be generated at the end of that collection. To generate a summary result or any other result file later, re-process the collection using the -i option. Delaying post-processing of large collections (i.e., many metrics and/or long collection duration) until the intermediate collection files (.sw2 or .etl) have been copied to a more powerful system can significantly reduce the post-processing time.
- Intel SoC Watch can be executed without administrative privilege when re-processing results from a previous collection using option -i.
- The following old platforms will have support removed in the next release: Intel platforms formerly code named Valleyview, Cherry Trail, Haswell, and Broadwell. (Note: The pch-ip-active feature is currently broken for the Broadwell platform and will not be fixed.)
- Support for socperf collection of signal-based metrics ended with Intel platform code named Cherry Trail (and limited support for Intel platform code named Apollo Lake), therefore it will be removed in the next release. This will result in removal of all signal-based metrics: all-approx-bw, cpu-ddr-mod0-bw, cpu-ddr-mod1-bw, disp-ddr-bw, dram-srr, gfx-ddr-bw, io-bw, isp-ddr-bw, netip-bw, and netip-partials-bw.

3 System Requirements

Supported Architectures

Intel SoC Watch supports these Intel microarchitecture or platform code names:

- Cherryview (Cherry Trail)
- Apollo Lake
- Gemini Lake
- Broadwell
- Skylake
- Kaby Lake
- Coffee Lake
- Whiskey Lake
- Amber Lake
- Comet Lake
- Ice Lake
- Skylake-Xeon
- Cascade Lake-Xeon

Minimum System Requirements

You can run Intel SoC Watch on these 64-bit operating systems with administrator permissions:

- Windows* 10

4 Where to Find the Release

Go to the Intel® System Studio website (https://software.intel.com/en-us/intel-system-studio) to get either an Evaluation (30-day trial release) license or a commercial license, and download the package from the Intel Registration Center (http://registrationcenter.intel.com/).

5 Installation Notes

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

Installing WDTF to Enable --auto-connected-standby

Use of the `--auto-connected-standby` option requires the Windows* OS Driver Test Framework (WDTF) to be installed on the target system. WDTF is found in the Windows Driver Kit (WDK). Below are instructions.

1. Get the latest WDK from Microsoft https://docs.microsoft.com/en-us/windows-hardware/drivers/download-the-wdk. Follow only the instructions for installing the WDK.
2. After installing the WDK, open an administrative command prompt in this folder: *C:\Program Files (x86)\Windows Kits\10\Testing\Runtimes*
3. Enter the following command to install WDTF:

```
msiexec /i "Windows Driver Testing Framework (WDTF) Runtime
Libraries-x64_en-us.msi" /l* WDTFInstall.log WDTFDir=c:\wdtf
WDTF_SKIP_MACHINE_CONFIG=1
```

Default Installation Folders

Install from Intel® System Studio:

When you install Intel® SoC Watch from Intel® System Studio, the default top-level installation folder for this product is:

```
C:\Program Files (x86)\IntelSWTools\energy_profiler_and_socwatch\socwatch_for_target
```

Install standalone version:

When you install the standalone version of Intel® SoC Watch, the default top-level installation folder 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/energy-analysis-user-guide-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

The 2020.3 release has a fix for these issues.

- Fixed missing table reported by feature -f pkg-pwr when re-processing collection. Previously, the Package Limits table for -f pkg-pwr was not reported when using -i to re-process a result.
- Added warning for missing ETW events to help identify situations when reports will be missing or inaccurate for features based on event trace data (i.e., acpi-dstate, acpi-sstate, os-cpu-cstate, os-cpu-pstate, os-gfx-cstate). The message "Warning: Lost events detected" is displayed when this occurs. The message includes the number of lost events and the Intel SoC Watch *.etl* file impacted. This problem usually occurs if another application has its own ETW logging session running at the time an SoC Watch collection is started, resulting in contention for the NT Kernel logging session. Re-running the SoC Watch collection will resolve the issue if the other logging session has stopped.
- Aligned report names for -f acpi-sstate to be the same across operating systems. The new name is "ACPI S-State". Previously, "Platform ACPI S-State" was used for Linux* OS and derivatives and "System S-State (OS)" was used for Windows* OS.
- Fixed over-reporting of D3Cold residency by -f acpi-dstate feature. Previously, once a device entered D3Cold, all time after that was added to D3Cold residency no matter what state change occurred.
- Fixed issue where Intel SoC Watch would hang or crash when collecting many metrics and requesting multiple result file types (-r). Now you will see error messages indicating that too many files are open or the file system is not writable. To work around this issue, specify only one -r file type at collection time or collect fewer metrics. After collection, use -i option with each of the remaining file types to generate the additional result files.
- Disabled integrated graphics metrics (hw-igfx-cstate, hw-igfx-pstate, igfx-throt-rsn, cpu-gpu-concurrency) when a discrete graphics card is installed and integrated graphics is disabled. A message is displayed to the console when --help is used to indicate when integrated graphics is disabled.

7 Known Issues

Bandwidth (on Intel Core Platforms)

- The presence of EDRAM on a system may not be detected by Intel SoC Watch. This is known to occur when the accelerator card VCA2, which contains EDRAM, is present.
- Total DDR bandwidth does not include EDRAM. On systems using EDRAM, the `ddr-bw` feature report may have a discrepancy between the total data reads 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.

Bandwidth and DRAM Self Refresh (on Intel Atom® Platforms)

- On Intel platforms code named Apollo Lake and Gemini Lake, memory bandwidth and memory self-refresh metrics are not available. These 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`.

C-States / P-States

- When collecting a trace of residency data from hardware counters (i.e., using -m), the summarized residency data could be 2-3% inaccurate due to error propagation in the accumulation of each sample's calculated residency. Collecting without -m results in greater accuracy because only a single sample is taken. However, long collection duration could result in a counter rollover, and that will not be detected without the use of -m.
- The hardware CPU P-state data may be missing for some Cores when using feature `-f hw-cpu-pstate` on Intel platforms code named Skylake, Kaby Lake, Whiskey Lake, and Amber Lake. The issue is caused by unexpected behavior of the hardware counters. The tool ignores these bad samples which results in the missing data.
- On Intel platforms code named Broxton and Apollo Lake, the `cpu-cstate` metric results do not contain module C-state information.
- 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.

S States & D States

- On Intel platform code named CherryView based devices:
  - Even when the device's screen is off, the NC DState called Display DPIO is reported in the D0i0 state 100% of the time. This result may or may not be correct.
  - When collecting NC D0ix states with the `-f nc-dstate` switch, note that the Display Island B (HDMI) IP block will remain in D0i0 when the primary display is enabled even if an HDMI cable is removed.
  - When using the `sc-dstate` feature, the SEC IP block results are incorrect and should be ignored. Also, the UFS IP block results are incorrect because an internal fuse is disabled.

Miscellaneous

- If collecting a large number of metrics and requesting multiple types of results files to be generated on the same command line, SoC Watch may report the following, *Warning: Could not post process metric data: Too many open file handles. Results may be incomplete for some metrics. Try post processing*

results with only one -r option at a time. If the problem persists; try collecting fewer metrics. There will be some missing reports in the results files that are generated if this occurs. The work around is to specify only one -r file type at collection time or collect fewer metrics. After collection, use -i option with each of the remaining file types to generate the additional result files.

- When using -z (--auto-connected-standby), the following failed message is displayed by WDTF, but can be ignored when followed by the enter /exit messages from WDTF as shown below:

  ```
  Loading Wex.Logger.dll from systemdata.cpp linep 922 failed.

  WDTF_SYSTEM : INFO : Attempt Entering Connected Standby At (hh:mm:ss): 13:4:35 ,
  Wake Time In Milliseconds: 20000

  WDTF_SYSTEM : INFO : Exiting Connected Standby. Elapsed time (hh:mm:ss): 0:0:20
  ```
- Feature -f dram-pwr is not supported by all versions of the server Intel platforms code named Skylake-Xeon, Cascade Lake-Xeon, and Denverton). The report contains all zero values in this case.
- On platforms with HyperV enabled, the sum of the CPU C-state idle residencies will not match CPU P-state idle residency time. The issue occurs because HyperV does not allow setting of a bit, resulting in incorrect core-level reporting of both C-state and P-states.
- Metrics report Unknown 0 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.
- Package level power data (-f pkg-pwr) is reported incorrectly for Cascade Lake-Xeon (AP) which has multiple Die in the CPU package. Intel SoC Watch labels the power as per package but it is actually per Die. There is no package level power.
- 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 `cpu-gpu-concurrency` cannot be collected.
- 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 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`.

Intel® VTune™ Amplifier Visualization

- The Intel VTune Amplifier System Summary does not report the rated frequency for the CPU when viewing results from data collected by SoC Watch, such as Throttling Analysis. Instead, it reports 1GHz which is the clock frequency used in the calculations for processing the SoC Watch data.
- Intel VTune Amplifier 2017 for Systems Update 1 or later is required for visualizing and analyzing Intel SoC Watch v2.10.0 and newer PWR files. We recommend using the latest version of Intel VTune Amplifier.
- If the bandwidth is 0 Mb throughout the collection for a particular bandwidth type, Intel VTune Amplifier will not show a timeline entry for it. The timeline is shown only if there is at least one non-zero value.
- In some cases, the summary CSV results produced by Intel SoC Watch can vary from the summary results shown by Intel VTune Amplifier even though they represent the same collection. For example, the summary CSV file may report a specific cpu-pstate residency of 50.78% and Intel VTune Amplifier may report the same cpu-pstate residency as 50.8%.
- The minimum and average calculations displayed in the grid for Sampled Value metrics don’t take 0 values into consideration in older versions of Intel VTune Amplifier. For example, Sampled Graphics P-States minimum values may show a value higher than 0 Mhz even when some samples have 0 Mhz values. This in turn affects the average value calculation.
- In order to visualize graphics C-states that are reported as Render and Media, the table headers in the trace file (generated with option -r int), must be manually modified, adding *Render* and *Media* to the appropriate C0, C1, and C6 column headers.

8 Related Documentation

The release contains these documents:

- Intel® SoC Watch for Windows OS* User's Guide.
- Energy Analysis help (https://software.intel.com/en-us/energy-analysis-user-guide)

9 Acronyms and Terms

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

Acronym/Term	Description
SoC	System on Chip