Intel® SDK for OpenCL™ Applications 2020 Update 1

Release Notes

13 April 2020

Version History/Revision History

These are the major releases of Intel® SDK for OpenCL™ Applications (also known as Intel® System Studio: OpenCL™ Tools component):

Date	Revision	Description
April 2020	2020 U1	OpenCL™ API Headers and OpenCL™ ICD Loader were updated. Intel® Debugger for Heterogeneous Compute was removed. Functionality of assembly code generation was removed.
December 2019	2020	Visual Studio 2019 support. CentOS* 8 support. Support of generation optimized ELF IR binaries from SPIR-V file. Visual Studio 2015 support was removed.
September 2019	2019 U5	Qt* was updated to 5.13.0 version. Includes security updates. Visual Studio 2015 support is deprecated.
May 2019	2019 U4	Added support of DCH Intel® Graphics Driver for Windows* 10. Feature enhancement for Kernel Development Framework. Assembly generation for 8th Generation Intel® Core™ Processors was fixed in Intel® SDK for OpenCL™ - offline compiler. Qt* was updated to 5.12.2 version.
March 2019	2019 U3	Includes security updates.
February 2019	2019 U2	Added support of Eclipse* 2018-12 R. Support of Eclipse* Oxygen and Visual Studio 2013 were deprecated and removed. Qt* was updated to 5.12 version. Protobuf* was updated to 3.6.1 version.
November 2018	2019 U1	Experimental version of the CPU Runtime supporting OpenCL™ 2.1 has been deprecated and removed. Added support for Intel® VTune™ Amplifier, added support for Ubuntu* 18.04.
August 2018	2019	Coffee Lake support, support of Intel® CPU Runtime for OpenCL™ Applications 18.1.
December 2017	2017 U2	Eclipse Oxygen (4.7) support, bug fixes, and improvements.
July 2017	2017 U1	Visual Studio 2017 support, new OSes and platforms support.
October 2016	2016 U3	7th Generation Intel® Core™ Processor support, Windows* 10 Anniversary Update, OpenCL 2.1 experimental CPU only runtime for Linux*.
July 2016	2016 U2 (Linux)	GPU Kernel debugger Beta and kernel level analysis for Linux.
June 2016	2016 U2 (Windows)	OpenCL 2.1 support, new features in Kernel Development Framework.
April 2016	2016	GPU Kernel debugger Beta and standalone release for Linux.
Nov. 17, 2016	2015 U3	Standalone release for Microsoft Windows*.
April 28, 2015	2015 U2	Visual Studio 2015 support.
Jan 22, 2015	2015 U1	Released as part of Intel® Integrated Native Developer Experience (Intel® INDE).

Customer Support

For technical support visit the technical support forum, FAQs, and other support information at Intel® SDK for OpenCL™ Applications Support or Developer Zone Support. For issue submission and feedback visit the forum or Developer Zone Support.

Please consider product registration at the registration center by providing your email address. Registration grants free tier installation technical support via the Intel Online Service Center. Product registration is critical to inform Intel® how to improve developer products.

Contents

1 Introduction

Intel® SDK for OpenCL™ Applications (also known as Intel® System Studio: OpenCL™ Tools component) helps to create, build, debug, and analyze PC and mobile applications developed with the OpenCL™ API on Microsoft Windows* and Linux* OSes.

The Linux* OS version includes:

- OpenCL code C/C++ header files and libraries, redistributed from the Khronos* reference implementations;
- Intel® SDK for OpenCL™ – Offline Compiler command-line utility 32- and 64-bit version;
- Intel® CPU Runtime for OpenCL™ Applications 18.1.

The Windows* OS version includes:
- OpenCL code C/C++ header files and libraries, redistributed from the Khronos* reference implementations;
- Intel® SDK for OpenCL™ – Offline Compiler command-line utility 32- and 64-bit version;
- Intel® CPU Runtime for OpenCL™ Applications 18.1

This document contains information about features, system requirements, installation instructions, fixed bugs, limitations, and known issues.

NOTE: Running applications developed with the SDK requires OpenCL driver/runtime packages installed for Intel® processors.

For more information on how to choose which driver/runtime package you need and how to download it, please see OpenCL™ Runtimes for Intel® Processors page.

To learn more about the product, see:

- New features listed in the New in This Release section below
- Reference documentation listed in the Related Documentation section below
- Installation instructions at Installation Notes

2   New in This Release

- Functionality of assembly code generation was removed. Please use [Ocloc tool](#) for assembly code generation for GPU.
- OpenCL™ API Headers and OpenCL™ ICD Loader were updated.
- Intel® Debugger for Heterogeneous Compute was removed. Please use Intel® SDK for OpenCL™ Applications 2020 initial release if you need this functionality.
- Intel® CPU Runtime for OpenCL™ Applications 18.1 was removed from installer on Windows*. If you need Intel® CPU Runtime for OpenCL™ Applications 18.1 you could install it manually from `/OpenCL/runtime/cpu/opencl_runtime.msi.` Disable your graphic card before installation to avoid installation issue.
- Intel® SDK for OpenCL™ Applications 2020 Update 1 includes bug fixes and security updates. Users should update to the latest version.

For a full list of features, refer to the [Intel® SDK for OpenCL™ Applications Developer Guide](#).

3   Known Issues

General Limitations

- If you install 2020 Intel® System Studio release under 2019 release the Eclipse in 2019 version is opened with "Intel Code Builder for OpenCL API – Error" because of Kernel Development Framework functionality was removed in new release. To avoid this problem, you could delete CodeBuilder.jar from plugins folder for Eclipse in 2019 release of Intel® System Studio. If you want to use Kernel development framework, please use only 2019 release of Intel® System Studio.
- CPU Kernel Debugger doesn't work with OpenCL CPU Runtime from Intel® Graphics Driver installed on system. Works with Intel® CPU Runtime for OpenCL™ Applications 18.1 which delivered as a part of the product. Be sure that there are no artifacts from Intel® Graphics Driver on your system.
- Visual Studio shows the warning message "'The Scc Display Information' package did not load correctly". You can find more info about this issue on the MSDN* forum for [Visual Studio 2017](#);
  - To avoid the warning, run the Visual Studio in Experimental mode with the command: `devenv.exe /RootSuffix Exp`.
- Build feature limitations:
  - Source code mapping between Intel® Graphics Technology assembly code and OpenCL code is not supported with Intel® Graphics Compute Runtime for OpenCL™ 18.48.11934.
- CPU Kernel Debugger for the Visual Studio IDE does not support:
  - Edit and continue capability
  - Multithreaded debugging
  - Two instances of Visual Studio running simultaneously
  - Unions

Known Installation and Configuration Issues

- On Windows* OS systems, components in Intel® Parallel Studio XE 2018 and earlier may conflict with the Intel SDK for OpenCL Applications install process.
  - Consider upgrading Intel® Parallel Studio XE 2018 to a newer version.
- On Windows* OS, if the debugger tools, analysis tools, or OpenCL applications have an issue detecting available Intel® Graphics Technology platforms after installing the SDK, update the Intel® Graphics Driver for your platform. The Intel® Graphics Driver deployment package for Microsoft Windows* OS contains OpenCL™ implementations for Intel Graphics Technology and Intel® CPUs. The following are graphics driver distribution options:
  - Many vendors provide their own distributions of Intel®-compatible graphics drivers online. Intel® does not support these drivers, but such graphics drivers may be functional for OpenCL runtime distributions. Vendors may tie vendor support to exclusive usage of vendor-provided drivers. Review any support agreements in vendor documentation.
  - Obtain the latest version of the Intel® Graphics Driver from [download center](#).
  - Recent revisions of Windows* OS systems will preinstall a reference Intel® Graphics Driver package.

- See [OpenCL™ Runtimes for Intel® Processors page](#) for more information.
- If the PATH environment variable exceeds 256 characters in length upon installation, you might encounter issues related to `System32` directory use.
- In case of uninstallation through **Control panel** > **Uninstall a program**, you may encounter the "*Error opening installation log file. Verify that the specified log file location exists and is writable*" error. It is a known issue in the Microsoft* data base at [Microsoft* support](#). Uninstall the SDK running the original installer or reboot the machine to proceed with the uninstallation.
- In case of uninstallation through **Control panel** > **Uninstall a program**, you may encounter an error similar to "*ERROR: MSI Error: An installation package for the product Intel® SDK for OpenCL™ Applications 2020 for Windows* cannot be found. Try the installation again using a valid copy of the installation package 'intel_sdk_for_opencl_2020_x64_setup.msi*". To resolve the issue, uninstall the SDK running the original installer. If it doesn't help, collect the uninstallation log files from `%temp%\intel_tmp_<userid>` and ask for support on the [Intel® SDK for OpenCL™ Applications forum](#).
- Intel SDK for OpenCL Applications may launch a web browser instance to direct users to product pages. If the Mozilla Firefox* browser shows the **Network Error (dns_unresolved_hostname)** screen with the message *"Your requested host "localhost" could not be resolved by DNS. For assistance, contact your network support team."* instead of a report, please use the *"Auto-detect proxy settings for this network"* option: **Options** > **Advanced** > **Network tab** > **Settings...**

Intel® Processor Graphics Device Limitations

- For known issues with the OpenCL implementation on Intel® Iris® graphics, Iris® Pro graphics, and Intel® HD Graphics Driver, refer to the relevant driver release notes.
- Timeout Detection & Recovery (TDRs) may be observed when running OpenCL benchmarks including Kishonti CLBenchmark,Kishonti CompuBench CL*, and SiSoftware Sandra* (GP (GPU/CPU/APU) Processing OpenCL™ benchmarks). Also some OpenCL workloads may cause TDRs, especially workloads with complex, time-consuming kernels and large local work size or workloads that use profiling feature. Increase the TDR delay to avoid the TDRs. For details, refer to the [article](#).
- On Windows* OS, the OpenCL™ driver facilitates OpenCL programs on systems with Intel® Processor Graphics and discrete graphics devices under these conditions:
    - if the display is connected to:
        - Intel® Processor graphics device display port OR...
        - Discrete and integrated graphics device simultaneously...
      ...then OpenCL facilities of **both** discrete and Intel® Processor graphics are exposed.
    - Otherwise, if the display is connected to:
        - Discrete graphics device display port OR...
        - Intel® Processor graphics device, next to a discrete graphics device without display ports...
      ...then OpenCL facilities will be exposed for the **discrete devices only**.

8

Intel® CPU Runtime for OpenCL™ Applications Limitations

- The following options exposed through the *ioc64* utility are limited with Intel® CPU Runtime for OpenCL™ Applications 18.1:
    - The -llvm option is no longer supported for Intel® CPU Runtime for OpenCL™ Applications 18.1 and it will be deprecated for CPU devices in the next release of Intel® SDK for OpenCL™ Applications.
- Intel® CPU Runtime for OpenCL™ Applications has a dependency on Intel® Threading Building Blocks (Intel® TBB) version 2017 Update 8 on Linux and 2018 Update 2 on Windows* OS. The library is included with the Intel® CPU Runtime for OpenCL™ Applications installation.
    - In the Linux* OS case:
      Make sure there is no other Intel TBB® library in your OpenCL host application library search path on Linux* OS. Intel® CPU Runtime for OpenCL™ Applications was tested only with Intel® TBB libraries included in the package.
      If your OpenCL host application intentionally uses features of a standalone Intel TBB library, ensure that it is of a higher version than the library version in the package and is found earlier in the shared library search procedure. If standalone Intel® TBB libraries are loaded, functionality and performance may vary.
    - In Windows* OS case:
      In Windows* OS product distribution, Intel® TBB libraries included in the package have different names than in the standard shipment. This ensures that no load conflict takes place with pre-installed libraries.
      If your OpenCL host code uses features of a standalone Intel® TBB libraries, application performance may vary (for example, oversubscription may occur due to both the standalone library pool and OpenCL thread pool being fully loaded).

4   Related Documentation

- [Get Started with Intel® SDK for OpenCL™ Applications](#)
- [Developer Guide for Intel® SDK for OpenCL™ Applications](#)
- [OpenCL™ Developer Guide for Intel® Processor Graphics](#)
- [OpenCL™ Developer Guide for Intel® Core™ and Intel® Xeon® Processors](#)
- [Intel® CPU Runtime for OpenCL™ Applications Release Notes](#)
- [Developer Reference: Intel® CPU Runtime for OpenCL™ Applications](#)
- [Developer Reference: OpenCL™ Runtime and Compiler for Intel® Graphics](#)

5   Where to Find the Release

Intel® SDK for OpenCL™ Applications 2020 Update 1 is available for download through its web portal. It is available as a:

- Standalone deployment
- Suite component:
    - o Intel® SDK for OpenCL™ Applications 2020 Update 1 is an optional component of Intel® System Studio 2020 Update 1 suite. In Intel® System Studio it is listed as the OpenCL™ Tools component.
    - o Intel® System Studio download page.

For more info on how to choose which driver/runtime package you need and how to download it, please see OpenCL™ Runtimes for Intel® Processors article.

6   System Requirements

Supported Architectures and Terminology

For an explanation of architecture names, see the product names page.

The following tables determine Intel® processors supported on Windows* OS and Linux* OS operating systems.

6.1.1   Intel® SDK for OpenCL™ Applications for *Windows* OS:

Intel® Platform	OpenCL version	Host Platform Windows® 10	Target Application Platform Windows* 10	
			CPU	GPU
7th, 8th, 9th, 11th Generation Intel® Core™ processors with Intel® Iris® Pro graphics and Intel® HD Graphics	2.1	✓	✓	✓
6th and 5th Generation Intel Core processors with Intel Iris Pro graphics and Intel HD Graphics	2.0	✓	✓	✓
Intel® Xeon® Processor E3-1200 v4 Family with C226 chipset and E3-1500 v5 Family with C236 chipset	2.0	✓	✓	✓
1st through 4th Generation Intel Core processors and Intel® Xeon® processor (**CPU only**)	1.2	✓	✓	

6.1.2 **Intel® SDK for OpenCL™ Applications *for Linux* OS:***

Intel® Platform	OpenCL version	Host Platform		Target Application Platform			
		Ubuntu* 18.04	CentOS* 7.4	CentOS 7.4/8.0		Ubuntu 18.04	
				CPU	GPU	CPU	GPU
11th, 9th ,8th, 7th and 6th Generation Intel® Core™ processors with Intel® Iris® Pro graphics and HD Graphics	2.1	✓	✓	✓	✓	✓	✓
Pentium® processor N4200/5, N3350/5, N3450/5	2.0	✓				✓	✓
5th Generation Intel Core processors with Intel Iris Pro graphics and HD Graphics	2.0	✓	✓	✓	✓	✓	✓
Intel® Xeon® processor E3-1200 v4 Family with C226 chipset and E3-1500 v5 Family with C236 chipset	2.0	✓	✓	✓	✓	✓	✓
1st-4th Generation Intel Core processors (**CPU only**)	1.2	✓	✓	✓		✓	
Intel Xeon processor product family (**CPU only**)	1.2	✓	✓	✓		✓	

Note the following:
- This product is not designed for use on non-Intel processors and any such usage is at your own risk as it may lead to erroneous results.
- You must have root privileges (or use the `sudo` command) to run the Intel® SDK for OpenCL™ Applications 2020 on Linux* OS operating systems (including launching the Eclipse IDE).
- Intel® SDK for OpenCL™ Applications 2020 for Linux* OS is compatible with the following OpenCL runtimes:
    - Intel® CPU Runtime for OpenCL™ Applications 18.1
    - Intel® Graphics Compute Runtime for OpenCL™ Driver
  For more information on the supported runtime and kernel mode drivers, see the **OpenCL™ Runtimes for Intel® Architecture** article.
- Intel® Graphics Compute Runtime for OpenCL™ Driver supports the following platforms:
    - Intel® Core™ processors with 11th Generation Intel® Graphics Devices (formerly known as Intel® microarchitecture code name Ice Lake) with OpenCL 2.1 Runtime; Intel® Core™ processors with 8th Generation Intel® Graphics Devices (formerly known as Intel® microarchitecture code name Broadwell) with OpenCL 2.1 Runtime;

o   Intel® Core™ processors with 9th Generation Intel® Graphics Devices (formerly known as Intel microarchitecture code name Skylake,
Intel microarchitecture code-named Kaby Lake, Intel microarchitecture code-named Coffee Lake) with OpenCL 2.1 Runtime;

o   Intel Atom® Processors with 9th Generation Intel® Graphics Devices (formerly known as Intel microarchitecture code-named Apollo Lake, Intel microarchitecture code-named Gemini Lake) with OpenCL 1.2 Runtime;

o   Please look for future Intel® platform support to be added to Intel® Graphics Compute Runtime for OpenCL™ Driver.

Always check the release notes at Intel® Graphics Compute Runtime for OpenCL™ Driver page for the latest platform support and compatibility information.

For more information on OpenCL platforms and OS support, visit the Intel's OpenCL technology page.

Driver Requirements

6.1.3   Windows* OS Driver Requirements:

For OpenCL support on Intel® Core™ processors with Intel® Processor Graphics, you must have an Intel® Graphics Driver (version 15.40 or higher) installed. For more information, please see the driver support matrix and OpenCL™ Runtimes for Intel® Architecture page.

For other Intel® processor systems, please consider usage of the Intel® CPU Runtime for OpenCL™ Applications.

6.1.4   Linux* OS Driver and Runtime Requirements:

To deploy or develop with an OpenCL™ runtime supporting Intel® Graphics Technology, the system must have a compatible Intel® Graphics Driver. For recent implementations, Linux* kernel 4.11 or higher deployments are also expected. For supported platform information, see the release notes on the Intel® Graphics Compute Runtime for OpenCL™ Driver page.

For the CPU-only runtime package, please refer to the compatibility chart in 6.1.2.

For more information on supported runtimes and drivers for Linux* OS go to the OpenCL™ Drivers and Runtimes for Intel® Architecture article.

7 Installation Notes

Installation on Microsoft Windows* OS

For OpenCL support on Intel® processors with Intel® Processor Graphics, you must have the Intel® Graphics Driver (version 15.40 or higher) installed.

System vendor graphics drivers may be a requirement to maintain support from system vendors. See your vendor website for more information. Alternatively, you can obtain the latest Intel® packaged driver version using the Intel® Driver Update Utility or manually.

You can obtain Intel® SDK for OpenCL™ Applications with Intel® System Studio from the Intel® System Studio web page.

Before installing the Intel® SDK for OpenCL™ Applications for Windows* operating systems, it is recommended to remove any previous version of the SDK from your computer.

NOTE: Intel® Graphics Driver for Windows* OS includes OpenCL support for both CPU and Intel® Processor Graphics.

Installation on Linux* OS (Ubuntu*)

You can obtain Intel® SDK for OpenCL™ Applications with Intel® System Studio: OpenCL™ Tools component from the Intel® System Studio web page.

A driver or runtime package must also be installed: OpenCL™ Drivers and Runtimes for Intel® Architecture page.

'Mono' package must be installed: instruction page.

'Libicu55' package must be installed on Ubuntu. Please use the following commands to do so:

```
wget http://security.ubuntu.com/ubuntu/pool/main/i/icu/libicu55_55.1-
7ubuntu0.4_amd64.deb
sudo apt install ./libicu55_55.1-7ubuntu0.4_amd64.deb
```

'cpio' package is a prerequisite for the SDK installer. Example deployment:

```
sudo -E apt update
sudo -E apt install cpio
```

If you have installed Intel® Graphics Compute Runtime for OpenCL™ Driver, ensure that eligible users are added to the video group. Intel® SDK for OpenCL™ - Offline Compiler may not execute through the graphics implementation without assigning the user video group membership.

To add user to the video group, use this command: `sudo usermod -a -G video USERNAME`

For either the included or a standalone install of Intel® CPU Runtime for OpenCL™ Applications 18.1, observe the following prerequisites: lsb-core libnuma1 zlib1g libxml2. Install example:

```
sudo -E apt update
sudo -E apt install lsb-core libnuma1 zlib1g libxml2
```

Prerequisite setup steps are recreated at the [getting started guidance article](#).

NOTE: All RPM packages of the Intel® SDK for OpenCL™ Applications are digitally signed.

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```
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```
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