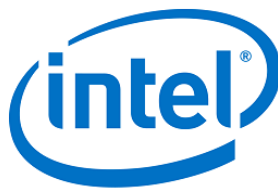


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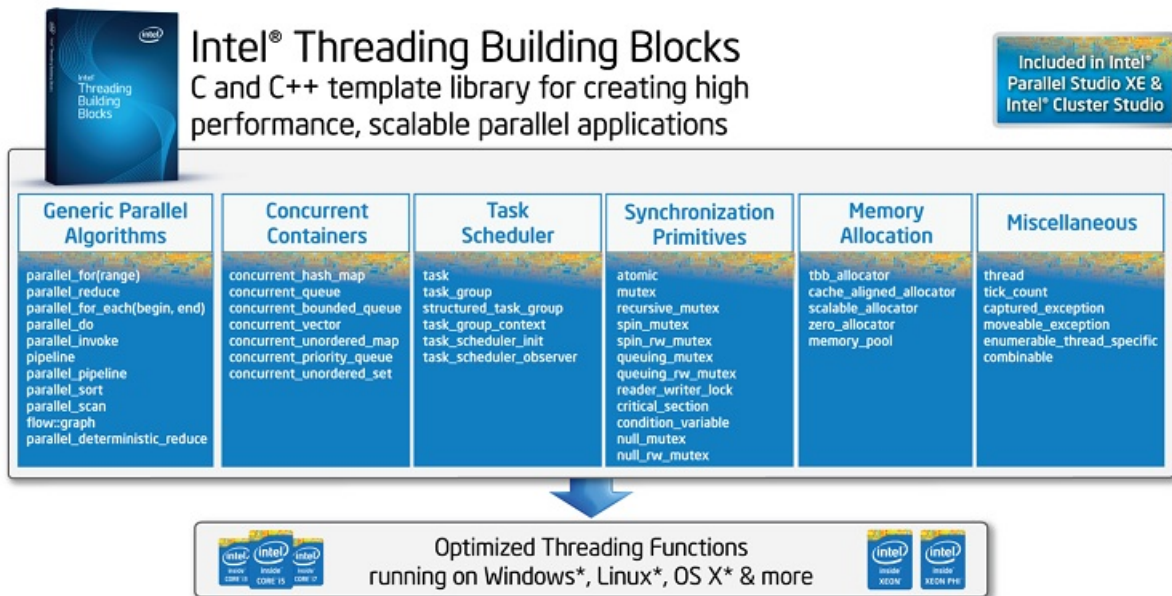
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intel oneAPI Threading Building Blocks



Product Information

one API Threading Building Blocks (one TBB)

oneAPI Threading Building Blocks (oneTBB) is a runtime-based parallel programming model for C++ code that uses threads. It is a template-based runtime library designed to help harness the latent performance of multi-core processors. oneTBB simplifies parallel programming by breaking computation into parallel running tasks. Parallelism is carried out within a single process through threads, an operating system mechanism that enables the same or different sets of instructions to be executed simultaneously.

oneTBB can be downloaded as a stand-alone product or as part of the Intel(R) oneAPI Base Toolkit. The product comes with a set of system requirements that should be met before installation.

System Requirements

- Refer to the oneTBB System Requirements.

Installation

- Download oneTBB as a stand-alone product or as a part of the Intel(R) oneAPI Base Toolkit.
- Refer to the Installation Guide for a stand-alone version (Windows* OS and Linux* OS) and Intel(R) oneAPI Toolkits Installation Guide.

Usage Instructions

- After installing oneTBB, set the environment variables by going to the oneTBB installation directory. By default, the installation directory is as follows:

For Linux* OS: /opt/intel/Konami/tab/latest/env/vars.sh

For Windows* OS: %ProgramFiles(x86)%InteloneAPItbblatestenvvars.bat

- Compile a program using oneTBB on Linux* OS and macOS* using the pkg-config tool. Provide the full path to search for including files and libraries, or provide a simple line like this:

```
g++ -o test test.cpp $(pkg-config --libs --flags tbb)
```

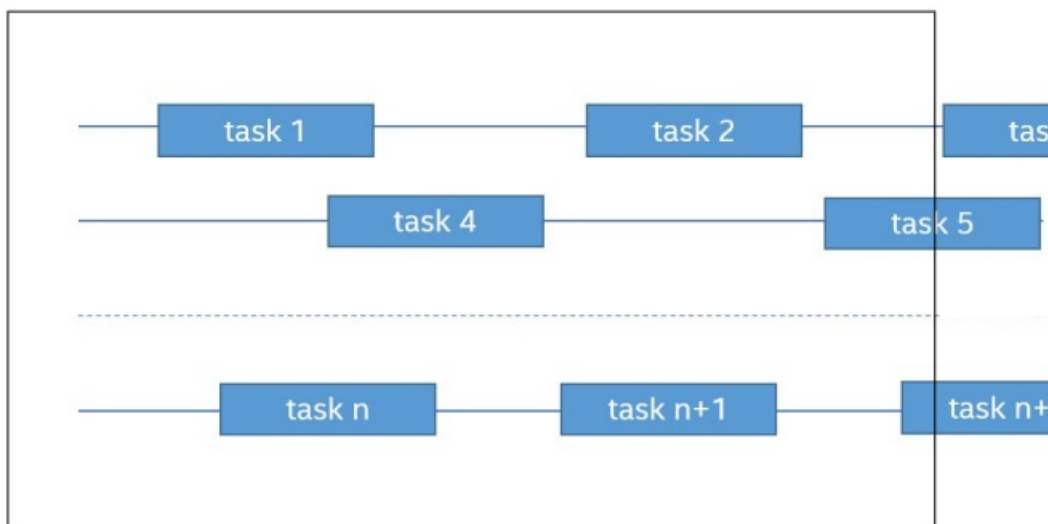
- For Windows* OS, additionally use the `--msvc-syntax` option flag that converts the compiling and linking flags in an appropriate mode.
- Refer to the Developer Guide and API Reference on GitHub for detailed notes, known issues, and changes.

Get Started with one API Threading Building Blocks (one TB)

- oneAPI Threading Building Blocks (oneTBB) is a runtime-based parallel programming model for C++ code that uses threads. It consists of a template-based runtime library to help you harness the latent performance of multi-core processors.

oneTBB enables you to simplify parallel programming by breaking computation into parallel running tasks.

- Within a single process, parallelism is carried out through threads, an operating system mechanism that allows the same or different sets of instructions to be executed simultaneously.
- Here you can see one of the possible executions of tasks by threads.



Use one tbb to write scalable applications that:

- Specify logical parallel structure instead of threads
- Emphasize data-parallel programming
- Take advantage of concurrent collections and parallel algorithms
- oneTBB supports nested parallelism and load balancing. It means that you can use the library without being worried about oversubscribing a system. oneTBB is available as a stand-alone product and as part of the Intel® oneAPI Base Toolkit.

System Requirements

- Refer to the oneTBB System Requirements.

Download Intel(R) oneAPI Threading Building Blocks (oneTBB)

- Download oneTBB as a stand-alone product or as a part of the Intel(R) oneAPI Base Toolkit. See Installation Guide for a stand-alone version (Windows* OS and Linux* OS) and Intel(R) oneAPI Toolkits Installation Guide.

Before You Begin

After installing oneTBB, you need to set the environment variables:

1. Go to the oneTBB installation directory (<install_dir>). By default, <install_dir> is the following:
 1. On Linux* OS:
 2. **For superusers (root):** /opt/intel/Konami
 3. **For ordinary users (non-root):** \$HOME/intel/Konami
 4. On Windows* OS:
 5. <Program Files>\Intel\oneAPI
2. Set the environment variables, using the script in <install_dir>, by running
 - **On Linux* OS:** vars.{sh|csh} in <install_dir>/tbb/latest/env
 - **On Windows* OS:** vars.bat in <install_dir>/tbb/latest/env

Example

Below you can find a typical example for a oneTBB algorithm. The sample calculates a sum of all integer numbers from 1 to 100.

```
int sum = oneapi::tbb::parallel_reduce(oneapi::tbb::blocked_range<int>(1,101), 0,
    [](oneapi::tbb::blocked_range<int> const& r, int init) -> int {
        for (int v = r.begin(); v != r.end(); v++) {
            init += v;
        }
        return init;
    },
    [](int lhs, int rhs) -> int {
        return lhs + rhs;
    }
);
```

oneAPI Threading Building Blocks (oneTBB) and pkg-config tool

- The pkg-config tool is used to simplify the compilation line by retrieving information about packages from special metadata files. It helps avoid large hard-coded paths and makes compilation more portable.

Compile a program using pkg-config

- To compile a test program test.cpp with oneTBB on Linux* OS and macOS*, provide the full path to search for include files and libraries, or provide a simple line like this:

```
g++ -o test test.cpp $(pkg-config --libs --cflags tbb)
```

Where:

- cflags provides oneTBB library including path:

```
$ pkg-config --cflags tbb`
-I<path-to>/tbb/latest/lib/pkgconfig/../../../../include
```

- libs provide the Intel(R) oneTBB library name and the search path to find it:

```
$ pkg-config --libs tbb`
-L<path-to>/tbb/latest/lib/pkgconfig/../../../../include
```

- **NOTE** For Windows* OS, additionally use the `–msvc-syntax` option flag that converts the compiling and linking flags in an appropriate mode.

Find more

- **oneTBB** Community Forum
- Product FAQs
- Support requests
- Use these resources if you need support with oneTBB.
- **Release Notes** Find up-to-date information about the product, including detailed notes, known issues, and changes.
- **Documentation:** Developer Guide and API Reference
- Learn to use oneTBB.
- **GitHub*** Find oneTBB implementation in open source.

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Install oneTBB on Windows* OS

- This section describes how you can deploy the oneAPI Threading Building Blocks (oneTBB) library on a Windows* OS machine.
- If you plan to install oneTBB as a part of Intel® oneAPI Base Toolkit, refer to the corresponding section of the Intel(R) oneAPI Toolkits Installation Guide.
- If you plan to install oneTBB as a standalone product, follow the instructions below, using the installer GUI or a package manager of your choice.
- Learn how to install oneTBB with GUI and package manager: * Install with GUI * Install with a Package Manager

Install with GUI

Step 1. Select the preferred installer

1. Go to the Download page. A list of available installers is displayed.
2. Decide on the Windows installer type that you will use:
 - Online installer has a smaller file size but requires a permanent Internet connection while running.
 - Offline installer has a bigger file size but requires an Internet connection only to download the installer file, and then runs offline.
3. Having decided on the installer type, click the corresponding link to start the download.
4. Wait for the download to complete.

Step 2. Prepare the installer

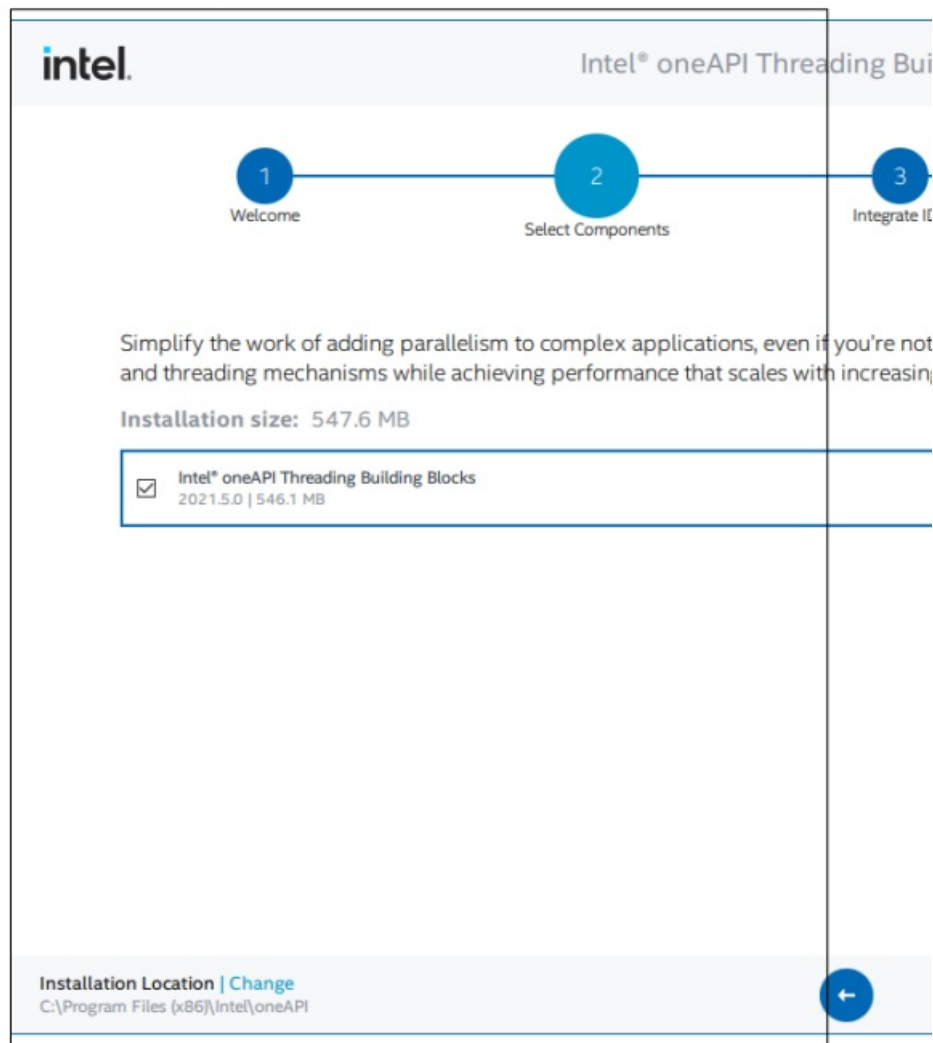
For offline installers:

1. Run the .exe file you have downloaded. The installation package extractor will be launched.
2. Specify the path where to extract the package – default is C:\Users\
<user>\Downloads\w_tbb_oneapi_p_<product_version>_offline.
3. If necessary, select the Remove temporary extracted files after installation checkbox.
4. Click Extract.

For the online installer, the download starts automatically after you run the .exe file.

Step 3. Run the setup

1. If you are running the offline installer, click Continue to proceed. The online installer will proceed automatically.
2. In the Summary step, select the I accept the terms of the license agreement checkbox.
3. Select the installation mode:
 - To use default installation settings, select Recommended Installation. oneTBB will be installed in the default location: %Program Files (x86)%\Intel\oneAPI\. Click Continue and proceed to the Integrate IDE step.
 - To modify installation settings, select Custom Installation and click Customize. You will proceed to the Select Components step. However, no components other than oneTBB can be selected due to solution nature. In this mode, you can change the default installation location by clicking Change in the bottom-left corner of the window.



1. At the Integrate IDE step, the program checks if it is possible to deploy oneTBB fully integrated with Microsoft Visual Studio IDE – for that, the supported IDE version must be installed on the target machine. If not installed, you can exit the setup and restart it after installing the IDE, or proceed without integration.
2. At the Software Improvement Program step, select the option you prefer. Then click Install to start the installation.
3. Wait for the process to complete. Then click Finish to close the installer or Go to Installed Products to check for updates or take other actions.

NOTE Remember to configure environment variables after installation. See the Before You Begin section to learn about it.

Install with a Package Manager

- To install oneTBB with a package manager, run the corresponding command described in the documentation:
- Conda
- Pip
- NuGet
- **NOTE** Remember to configure environment variables after installation. See Before You Begin section to learn about it.

Upgrading oneTBB

- The seamless upgrade is supported for oneTBB 2021.1 and later versions. To upgrade oneTBB to the latest version, run the setup, as described above.
- If you used to work with older versions (TBB), consider that the new versions of oneTBB do not provide backward compatibility. See TBB Revamp: Background, Changes, and Modernization for details. Also, refer to
- Migrating from TBB for more information on migrating to oneTBB.

Uninstalling oneTBB

- To uninstall oneTBB, use Applications and Features or Programs and Features.

Install oneTBB on Linux* OS

- This section describes how you can deploy the oneAPI Threading Building Blocks (oneTBB) library on a Linux* machine. Choose the preferred way:
- Install oneTBB Using Command Line
- Install oneTBB Using Package Managers of choice:
- Conda
- APT
- YUM
- PIP
- NuGet
- **NOTE** You can also install one TB on a Linux* OS machine using GUI. See Intel(R) oneAPI Installation Guide to learn more.

Install oneTBB Using Command Line

- To install oneTBB, run one of the following commands according to your role:
- root:

```
sh ./l_[Toolkit Name]Kit_[version].sh --silent --eula accept --components intel.oneapi.lin.tbb.devel
```

- user:

```
sudo sh ./l_[Toolkit Name]Kit_[version].sh -a --silent --eula accept --components intel.oneapi.lin.tbb.devel
```

Where:

- **silent** – Run the installer in non-interactive (silent) mode.
- **eula** – Accept or decline End User License Agreement (EULA), supported values: accept or decline (default).
- **components** – Let you custom installed components.

For example:

```
sudo sh ./l_BaseToolKit_2021.1.sh --silent --eula accept --components intel.oneapi.lin.tbb.devel
```

Install oneTBB Using Package Managers

- Follow the instructions, using a package manager of your choice.

Conda

- This section provides general instructions on installing the oneAPI Threading Building Blocks (oneTBB) via the Conda* package manager. For additional installation notes, refer to the Conda documentation.
- To install oneTBB, run the following command:

```
conda install -c intel tbb-devel
```

- You can also use: `conda install -c intel/label/intel tbb-devel`
- **NOTE** See Intel(R) oneAPI Installation Guide to learn how to configure Conda.

APT

- To install oneTBB using APT*, run:

```
sudo apt-get install intel-tbb-<VERSION>.<UPDATE>-<BUILD_NUMBER>
```

- **For example:**

```
sudo apt-get install intel-tbb-2021.5-1.738
```

NOTE See Intel(R) oneAPI Installation Guide to learn how to configure YUM.

To install oneTBB using PIP*, run:

```
pip install -c intel tbb==<version>
```

For example:

```
pip install -c intel tbb==2021.5
```

NuGet

To install oneTBB from NuGet* using the command line, do the following:

1. Go to nuget.org
2. Run:

```
nuget install intel_tbb.devel.linux
```

NOTE See Intel(R) oneAPI Installation Guide to learn how to configure NuGet*.


NOTE Remember to configure environment variables after installation. See the Before You Begin section to learn about it.

Upgrading oneTBB



























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- If you used to work with older versions (TBB), consider that the new versions of oneTBB do not provide backward compatibility. See TBB Revamp: Background, Changes, and Modernization for details. Also, refer to

Migrating from TBB for more information on migrating to one TB.

Documents / Resources

 Get Started with Intel® oneAPI Threading Building Blocks (oneTBB)	intel oneAPI Threading Building Blocks [pdf] User Guide oneAPI Threading Building Blocks, Threading Building Blocks, Building Blocks, Blocks
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References

-  [NuGet Gallery | Home](#)
-  [Home - Intel Community](#)
-  [Installing conda packages — Anaconda documentation](#)
-  [GitHub - oneapi-src/oneTBB: oneAPI Threading Building Blocks \(oneTBB\)](#)
-  [How to Create a Support Request at the Online Service Center](#)
-  [Intel® oneAPI Threading Building Blocks \(oneTBB\) Release Notes](#)
-  [Intel® oneAPI Threading Building Blocks \(oneTBB\) System Requirements](#)
-  [Intel® oneAPI standalone component installation files](#)
-  [Intel® oneAPI Threading Building Blocks \(oneTBB\)](#)
-  [oneTBB API Reference](#)
-  [oneTBB Developer Guide](#)
-  [FAQ: Product Licensing](#)
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-  [APT](#)
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-  [YUM/DNF/Zypper](#)
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-  [Intel® oneAPI Toolkits and Components Installation Guide for Windows*](#)
-  [Conda](#)
-  [NuGet](#)
-  [PIP](#)
-  [Migrating from Threading Building Blocks \(TBB\)](#)
-  [Installation Guide for Intel® oneAPI Toolkits](#)
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