Intel® VTune™ Profiler Installation Guide

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Start Here

Select your operating system to get started:

- Windows
- Linux
- macOS (viewing only)

> **NOTE** Intel® VTune Profiler for macOS is now deprecated and will be discontinued in a future release.

Or explore the Supported Use Cases for other useful ways to install and use VTune Profiler.

Supported Use Cases

Intel® VTune™ Profiler is designed to be flexible and useful in many different scenarios and environments. Here are some examples of use cases where VTune Profiler has a solution for your performance analysis needs.

Natively Supported Platforms

You can install VTune Profiler on these operating systems:

- Windows*
- Linux*
- macOS*

> **NOTE** On macOS hosts, analysis of workloads running on the host is not supported. On macOS, VTune Profiler acts as a GUI terminal for profiling remote Windows and Linux targets or reviewing results previously collected on other systems.

See the Release Notes and System Requirements for more information on supported platforms.

VTune Profiler as a Server

VTune Profiler Server is a usage model of VTune Profiler. VTune Profiler can be launched as a web service and accessed remotely via a web browser, which is convenient for remote development or testing. VTune Profiler Server can also be deployed for a team of users to simplify onboarding and enable collaboration and results sharing.

Potential benefits:

- Can be launched directly on the target system or a remote development machine and doesn’t require any GUI context.
- Fewer prerequisites and system requirements as compared to the VTune Profiler desktop application.
- Enables sharing of profiling results by providing a URL.

- Can be deployed into your web hosting infrastructure or as a standalone service; supports integration with identity providers via SAML SSO.
- No need to install VTune Profiler on every end-user machine—users access the server through their browser with a full GUI experience.
- Can be enabled for a pool of profiling targets via shared data collection agents.

Learn more about VTune Profiler Server

In a Cloud Environment

VTune Profiler can be installed on public cloud instances, enabling user-mode analyses (Hotspots and Threading) in virtualized environments, and hardware event-based analysis types on bare-metal instances.

The following Cloud Service Providers (CSPs) are supported:

- Amazon Web Service* (AWS)
- Google Cloud Platform*
- Microsoft Azure*

Learn more about cloud targets or see the Profiling Applications in Amazon Web Services* (AWS) EC2 Instances Cookbook recipe for an example of AWS configuration.

In Containers

VTune Profiler can be used in popular containerized environments.

For example, when using Docker*, it can:

- run inside a container
- analyze containerized workloads
- analyze a workload within same container
- analyze non-containerized workloads while running inside container
- analyze multiple containers simultaneously

See the Profiling Docker* Containers Cookbook recipe for more information.

In a Virtual Machine

You can install and use VTune Profiler in a virtual machine. In this case, install VTune Profiler using your preferred method, as you would install normally on a bare-metal machine.

By nature of virtualization, there are some limitations related to access to hardware performance counters. Review the Targets in Virtualized Environments topic for more information.

Additional configuration steps are required for each supported hypervisor to ensure maximum compatibility. More information for specific hypervisors:

- VMware*
- Parallels*
- KVM*
- Xen*
- Hyper-V*

CI Pipeline Integration

You can integrate VTune Profiler into your Continuous Integration pipeline to automatically collect performance data under your desired conditions, which can be especially useful for catching and investigating performance regressions and tracking workload performance over time.

The flexible command line interface VTune Profiler enables you to automatically run any analysis type—or combination of analysis types—on your workload.

For an example of GitLab* CI integration, see the Enabling Performance Profiling in GitLab* CI Cookbook recipe.

Profiling Through Target Packages

A target package is a minimal distribution of VTune Profiler that is used to enable profiling capabilities on specific remote targets. With target packages, you do not install VTune Profiler on the target system. Instead, you copy the target package to the target system and apply some configurations to enable remote profiling from a natively supported system. Additionally, in the case of FreeBSD* OS, you can use VTune Profiler directly on the FreeBSD system through the command line interface.

More information on target packages for operating systems:

- FreeBSD* Targets
- QNX* Targets

Install on Windows* OS

On Windows* OS, Intel® VTune™ Profiler is available as:

- standalone component
- part of the Intel® oneAPI Base Toolkit

Once installed, it is recommended that you review the post-installation steps.

Prerequisites

Supported Systems

See the System Requirements for a list of supported Windows versions and compilers.

> **NOTE**
> A 64-bit operating system host is required to use VTune Profiler. You can use VTune Profiler to analyze both 32-bit and 64-bit applications.

Administrative Privileges

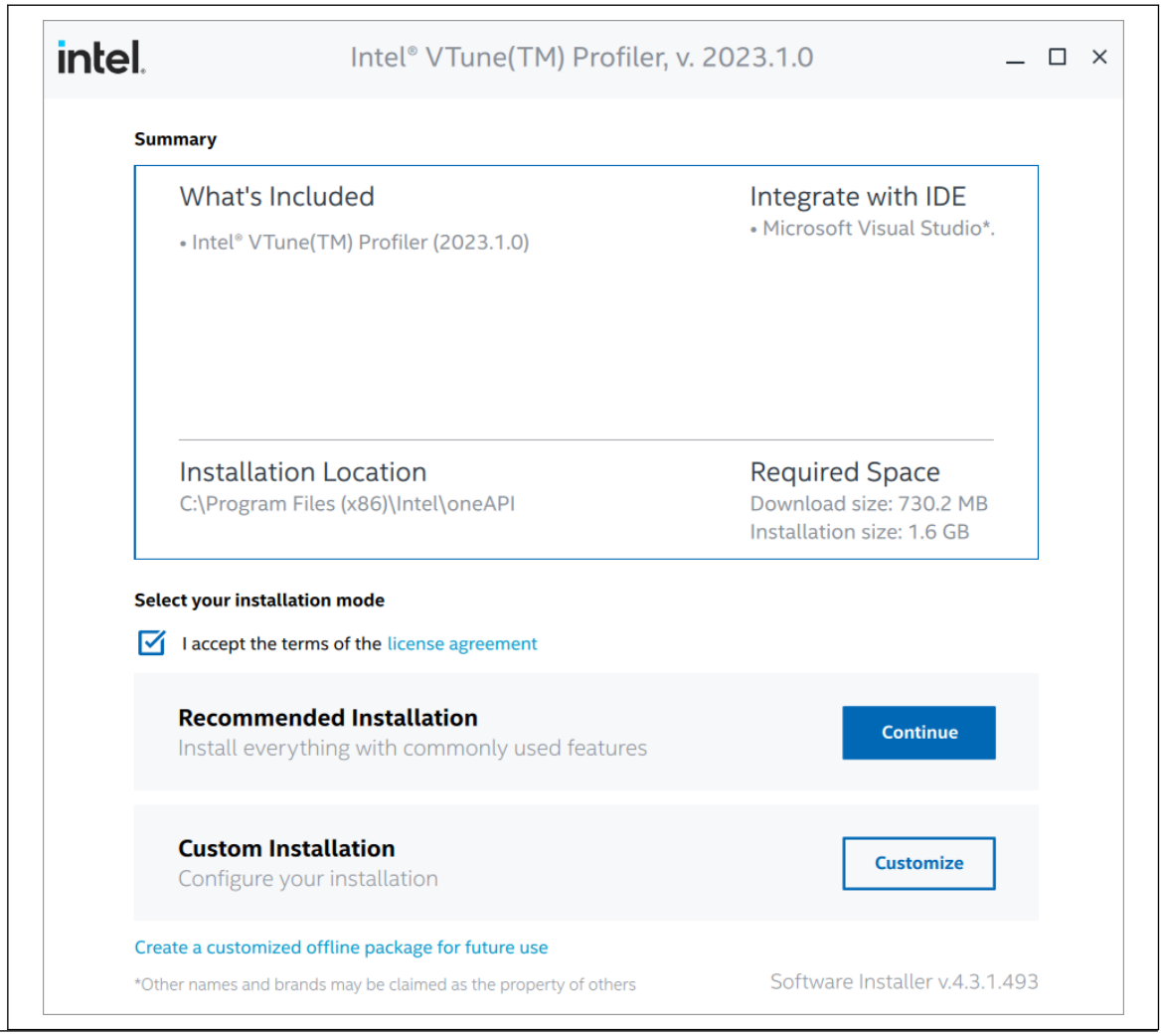
Administrative privileges are recommended to install, change, or uninstall VTune Profiler. Administrative privileges are necessary to correctly install the Sampling Driver that is required for many analysis types. You can install VTune Profiler without Administrative privileges, but not all capabilities will be available.

Install as Standalone Component

To install VTune Profiler as standalone component:

1. Download the standalone Windows installer from the VTune Profiler download page.

   You can select between an Online or an Offline installer. On systems without a stable Internet connection, it is recommended to use the Offline installer.
2. Run the installer executable with Administrative privileges.
3. Select between a **Recommended** and a **Custom** installation.



The **Recommended Installation** option installs VTune Profiler in the default directory and integrates VTune Profiler into your Microsoft Visual Studio* IDE.

The **Custom Installation** allows you to control:

- **Install directory:** specify a custom install directory. Default is `<Program Files>\Intel\oneAPI\vtune\`
- **Microsoft Visual Studio* IDE integration:** choose a version of Visual Studio to integrate VTune Profiler into, or opt out of integration.

4. Follow the instructions in the installer to complete the install process.

Install as Part of Intel® oneAPI Base Toolkit

To install VTune Profiler as part of an Intel® oneAPI Base Toolkit:

1. Download the Intel® oneAPI Base Toolkit installer for Windows.

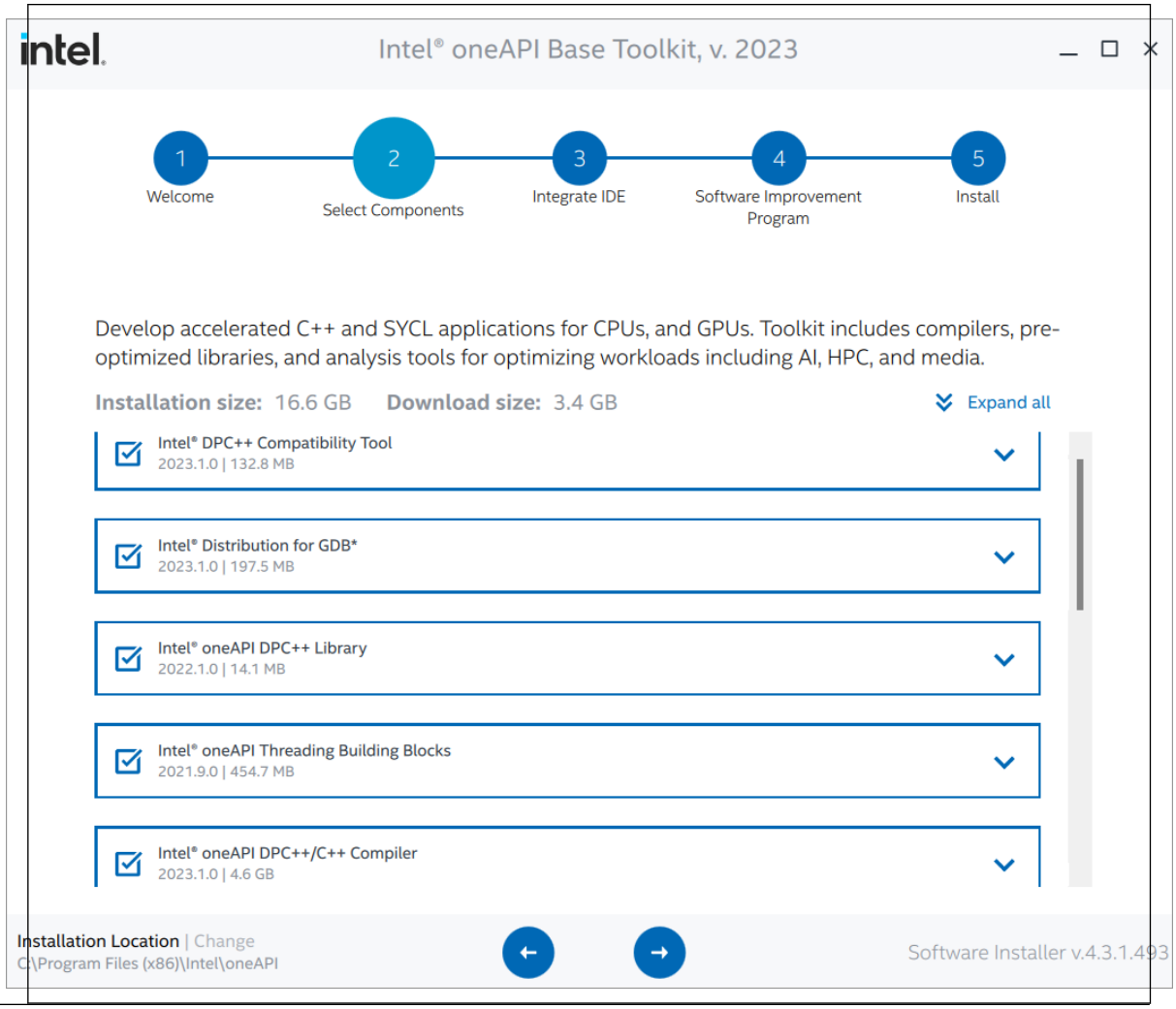
   You can select between an Online or an Offline installer. On systems without a stable Internet connection, it is recommended to use the Offline installer.
2. Run the installer executable with Administrative privileges.
3. Select between a **Recommended** and a **Custom** installation.

   The **Recommended Installation** installs all components included in this toolkit in the default directory, and integrates appropriate components into your Microsoft Visual Studio IDE.

The **Custom Installation** allows you to control:

- **Components to install:** select specific toolkit components to install.

NOTE The installer checks for components that are already installed on the system, and offers to update or skip these components, if appropriate.



- **Install directory:** specify a custom install directory. Default is `<Program Files>\Intel\oneAPI\`
- **Microsoft Visual Studio* integration:** choose a version of Visual Studio to integrate VTune Profiler into, or opt out of integration.

4. Follow the instructions in the installer to complete the install process.

Post-Installation Steps

1. **Set Environment Variables:**

   If you are planning to use the command line interface of VTune Profiler, it is recommended to set environment variables by running the script:

```
C:\"Program Files (x86)"\Intel\oneAPI\vtune\latest\env\vars.bat
```

2. **Verify Your Installation:**

   VTune Profiler comes with a self-check script that helps verify if the product is installed correctly and troubleshoot issues, if any.

The script runs a set of analyses on a sample application, and reports the progress interactively.

To run the self-check script:

a. Open a terminal window.
b. Assuming the environment variables are set, run the script with this command:

```
vtune-self-checker.bat
```

Alternatively, you can find this script in: `<Program Files>\Intel\oneAPI\vtune\latest\bin64`

NOTE The script may take several minutes run all the necessary checks.

c. Let the script run to completion and review the summary. The script offers advice if any of the analyses have failed, and saves a log file for support.

3. Get to Know VTune Profiler:

For a quick introduction to VTune Profiler, try these documents:

- Get Started Guide
- Analyze Common Performance Bottlenecks Tutorial

General information on VTune Profiler is available from:

- User Guide—all features and analysis types, workflows, command line interface, user interface.
- Performance Analysis Cookbook—profiling methodology, examples of applying VTune Profiler to interesting cases and specific bottlenecks.

Install on Linux* OS

Explore the ways to install Intel® VTune™ Profiler on a Linux machine.*

Select your preferred installation method to get started:

- Regular Installer
- Package Managers (APT, YUM, DNF, Zypper)

NOTE
Sometimes updates to supported operating systems may cause the sampling drivers to fail at build or loading. In those instances, you may need updated versions of the drivers before official updates of the product are available. The latest available sampling drivers are available at https://www.intel.com/content/www/us/en/developer/articles/code-sample/vtune-profiler-sampling-driver-downloads.html.

Install with Regular Installer

On Linux* OS, Intel® VTune™ Profiler is available as:

- standalone component
- part of the Intel® oneAPI Base Toolkit

Once installed, it is recommended that you review the post-installation steps.

Prerequisites

Supported Systems

See the System Requirements for a list of supported Linux distributions and compilers.

NOTE
A 64-bit operating system host is required to use VTune Profiler. You can use VTune Profiler to analyze both 32-bit and 64-bit applications.

Superuser Privileges

Superuser privileges are recommended to install, change, or uninstall VTune Profiler. Superuser privileges are necessary to correctly install the Sampling Driver that is required for many analysis types. You can install VTune Profiler as a regular user and use most analysis types through the Linux Perf* capabilities of VTune Profiler. See the Profiling Hardware Without Intel Sampling Drivers Cookbook recipe for more information.

Install as Standalone Component

To install VTune Profiler as standalone component:

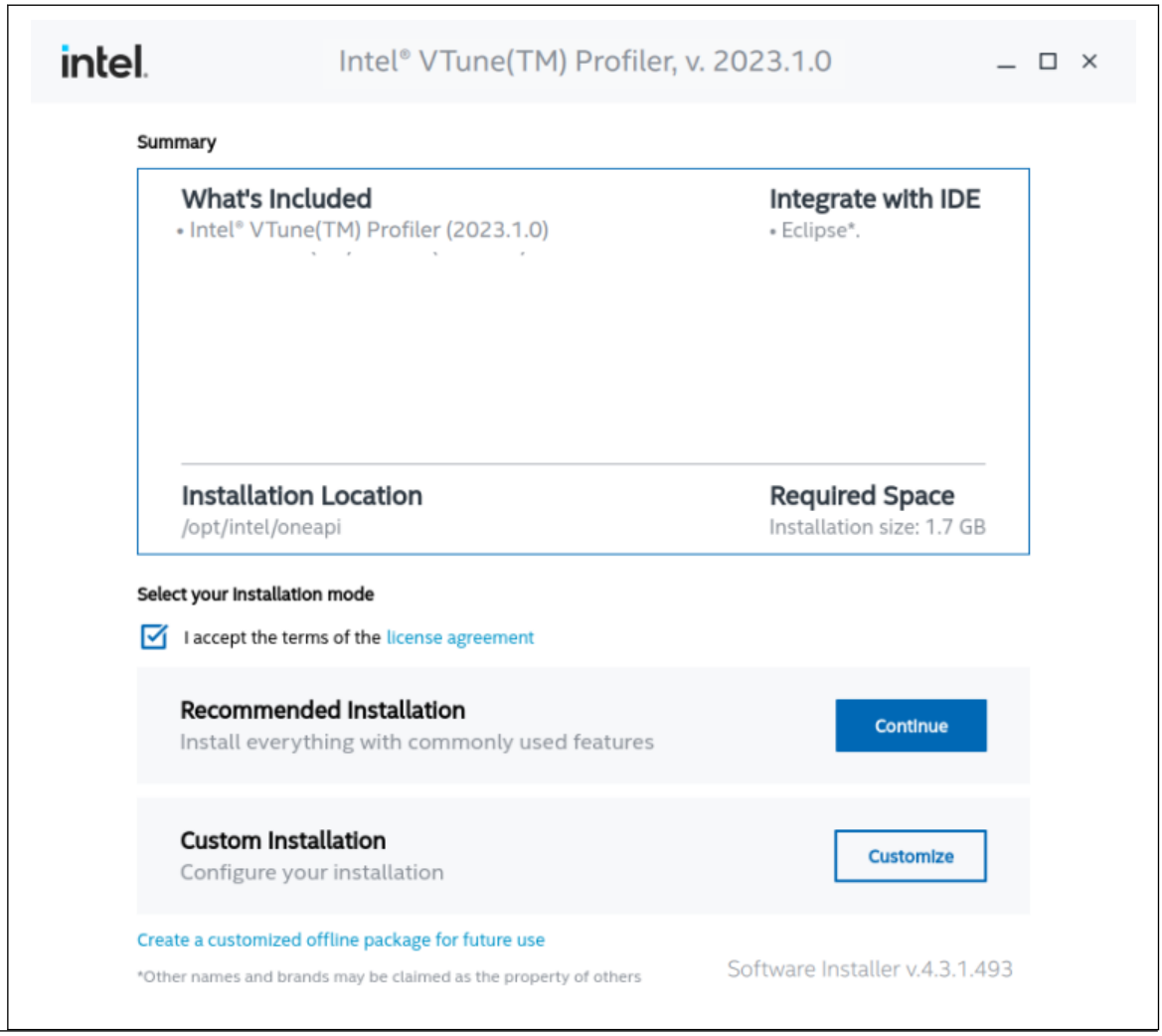
1. Download the standalone Linux installer from the VTune Profiler download page.

   You can select between an Online or an Offline installer. On systems without a stable Internet connection, it is recommended to use the Offline installer.
2. Open a terminal window and navigate to the directory where the installer was downloaded.
3. If necessary, allow the execution of the installer with this command:

   ```
   chmod +x <installer-package-name>.sh
   ```
4. Run the installer executable as superuser (recommended):

   ```
   sudo ./<installer-package-name>.sh
   ```

   The installer window appears.
5. Select between a **Recommended** and a **Custom** installation.



The **Recommended Installation** option installs VTune Profiler in the default directory and integrates VTune Profiler into your Eclipse* IDE.

The **Custom Installation** allows you to control:

- **Install directory:** specify a custom install directory. Default is `/opt/intel/oneapi/vtune/`
- **Eclipse* IDE integration:** choose a version of Eclipse to integrate VTune Profiler into, or opt out of integration.

6. Follow the instructions in the installer to complete the install process.

Install as Part of Intel® oneAPI Base Toolkit

To install VTune Profiler as part of an Intel® oneAPI Base Toolkit:

1. Download the Intel® oneAPI Base Toolkit installer for Linux.

   You can select between an Online or an Offline installer. On systems without a stable Internet connection, it is recommended to use the Offline installer.
2. If necessary, allow the execution of the installer with this command:

   ```
   chmod +x <installer-package-name>.sh
   ```
3. Run the installer executable as superuser (recommended):

   ```
   sudo ./<installer-package-name>.sh
   ```

   The installer window appears.

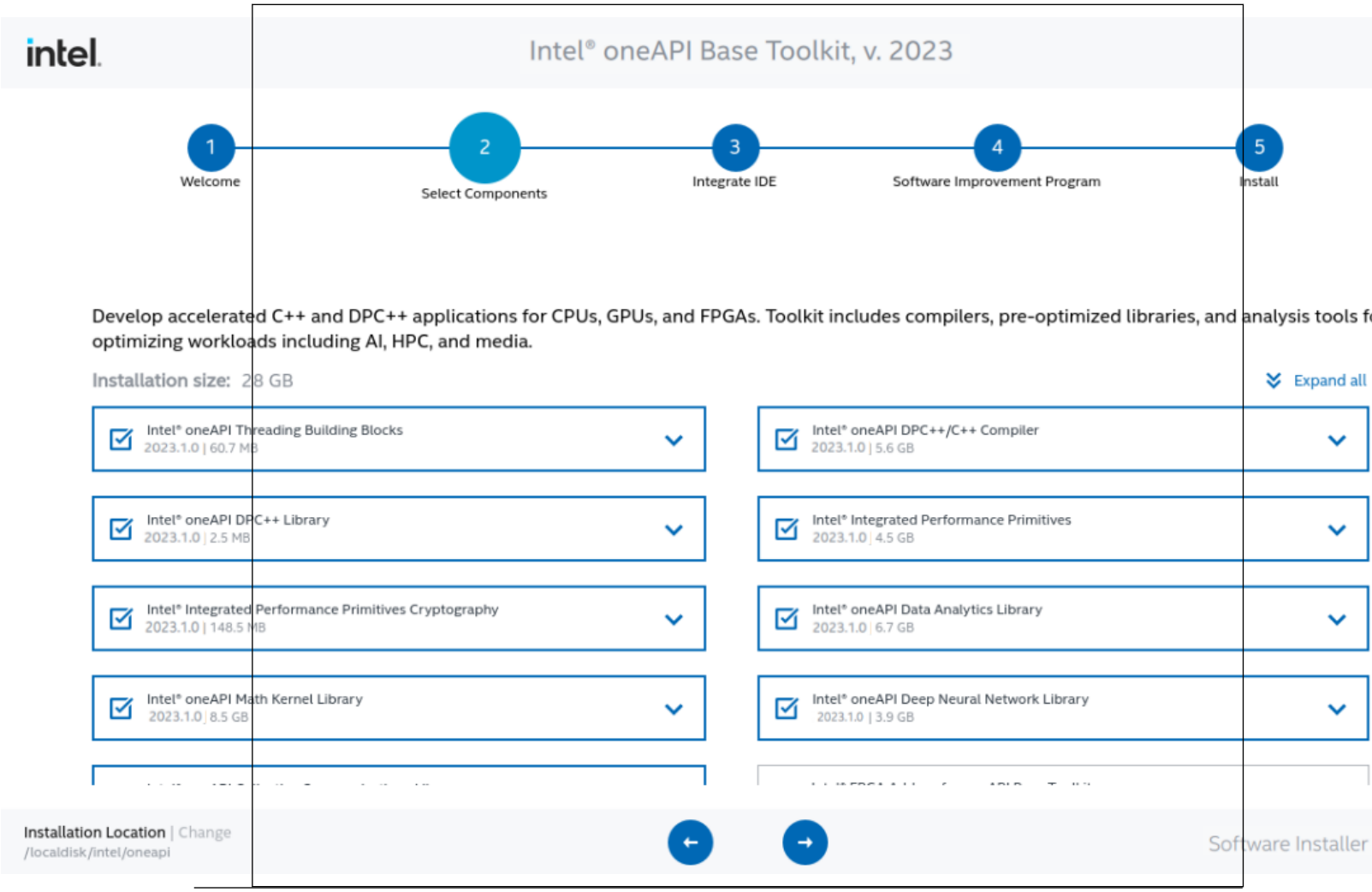
4. Select between a **Recommended** and a **Custom** installation.

   The **Recommended Installation** installs all components included in this toolkit in the default directory, and integrates appropriate components into your Eclipse IDE.

   The **Custom Installation** allows you to control:

   - **Components to install:** select specific toolkit components to install.

   NOTE The installer checks for components that are already installed on the system, and offers to update or skip these components, if appropriate.



   - **Install directory:** specify a custom install directory. Default is `/opt/intel/oneapi/`
   - **Eclipse* IDE integration:** choose a version of Eclipse to integrate VTune Profiler into, or opt out of integration.

5. Follow the instructions in the installer to complete the install process.

Post-Installation Steps

1. **Set Environment Variables:**

   If you are planning to use the command line interface of VTune Profiler, it is recommended to set environment variables by running these scripts:

bash:

```
source /opt/intel/oneapi/vtune/latest/env/vars.sh
```

csh/tcsh:

```
source /opt/intel/oneapi/vtune/latest/env/vars.csh
```

2. **Verify Your Installation:**

   VTune Profiler comes with a self-check script that helps verify if the product is installed correctly and troubleshoot issues, if any.

   The script runs a set of analyses on a sample application, and reports the progress interactively.

   To run the self-check script:

   a. Open a terminal window.
   b. Assuming the environment variables are set, run the script with this command:

```
vtune-self-checker.sh
```

   Alternatively, you can find this script in: `/opt/intel/oneapi/vtune/latest/bin64/`

   NOTE The script may take several minutes run all the necessary checks.

   c. Let the script run to completion and review the summary. The script offers advice if any of the analyses have failed, and saves a log file for support.

3. **Get to Know VTune Profiler:**

   For a quick introduction to VTune Profiler, try these documents:

   - Get Started Guide
   - Analyze Common Performance Bottlenecks Tutorial

   General information on VTune Profiler is available from:

   - User Guide—all features and analysis types, workflows, command line interface, user interface.
   - Performance Analysis Cookbook—profiling methodology, examples of applying VTune Profiler to interesting cases and specific bottlenecks.

4. **(Optional) Configure Collection Without Sampling Driver:**

   If you installed VTune Profiler without superuser privileges, certain configuration steps are required to enable hardware analyses through Linux Perf*. See the Profiling Hardware Without Intel Sampling Drivers Cookbook recipe to understand the configuration and possible limitations.

Install with Package Managers

On Linux OS, you can install Intel® VTune™ Profiler using the APT, YUM, DNF, or Zypper package managers.*

Prerequisites

- Review the list of supported operating systems in the System Requirements.
- If you haven't installed Intel® oneAPI software products using package managers before, configure your package manager to work with the repository following the instructions.

Once installed, it is recommended that you review the post-installation steps.

APT

Add the Intel oneAPI Repository

If you haven't installed Intel® oneAPI Toolkits or components before, it is necessary to configure your package managers to use Intel repositories. Follow these steps:

1. (Optional) Switch to any directory with write access. We use `/tmp` in this example:

```
cd /tmp
```

2. Use `wget` to download the Intel repository public key:

```
wget https://apt.repos.intel.com/intel-gpg-keys/GPG-PUB-KEY-INTEL-SW-PRODUCTS.PUB
```

3. Add the key to your `apt` keyring:

```
sudo apt-key add GPG-PUB-KEY-INTEL-SW-PRODUCTS.PUB
```

4. (Optional) Remove the public key file, as it is no longer needed:

```
rm GPG-PUB-KEY-INTEL-SW-PRODUCTS.PUB
```

5. Configure the APT client to use the Intel repository:

```
echo "deb https://apt.repos.intel.com/oneapi all main" | sudo tee /etc/apt/sources.list.d/
oneAPI.list
```

   Or, if the `add-apt-repository` utility is installed, you can use the following command:

```
sudo add-apt-repository "deb https://apt.repos.intel.com/oneapi all main"
```

Install the VTune Profiler Package

1. Update the APT package lists:

```
sudo apt update
```

2. Install the VTune Profiler standalone package:

```
sudo apt install intel-oneapi-vtune
```

YUM

Add the Intel oneAPI Repository

If you haven't installed Intel® oneAPI Toolkits or components before, it is necessary to configure your package managers to use Intel repositories. Follow these steps:

1. Create a YUM/DNF `.repo` file in a directory with write access, such as `/tmp`:

```
tee > /tmp/oneAPI.repo << EOF
[oneAPI]
name=Intel® oneAPI repository
baseurl=https://yum.repos.intel.com/oneapi
enabled=1
gpgcheck=1
repo_gpgcheck=1
gpgkey=https://yum.repos.intel.com/intel-gpg-keys/GPG-PUB-KEY-INTEL-SW-PRODUCTS.PUB
EOF
```

2. Move the newly created `oneAPI.repo` file to the YUM/DNF configuration directory `/etc/yum.repos.d`:

```
sudo mv /tmp/oneAPI.repo /etc/yum.repos.d
```

Install the VTune Profiler Package

```
sudo yum install intel-oneapi-vtune
```

DNF

Add the Intel oneAPI Repository

If you haven't installed Intel® oneAPI Toolkits or components before, it is necessary to configure your package managers to use Intel repositories. Follow these steps:

1. Create a YUM/DNF `.repo` file in a directory with write access, such as `/tmp`:

```
tee > /tmp/oneAPI.repo << EOF
[oneAPI]
name=Intel® oneAPI repository
baseurl=https://yum.repos.intel.com/oneapi
enabled=1
gpgcheck=1
repo_gpgcheck=1
gpgkey=https://yum.repos.intel.com/intel-gpg-keys/GPG-PUB-KEY-INTEL-SW-PRODUCTS.PUB
EOF
```

2. Move the newly created `oneAPI.repo` file to the YUM/DNF configuration directory `/etc/yum.repos.d`:

```
sudo mv /tmp/oneAPI.repo /etc/yum.repos.d
```

Install the VTune Profiler Package

```
sudo dnf install intel-oneapi-vtune
```

Zypper

Add the Intel oneAPI Repository

If you haven't installed Intel oneAPI Toolkits or components before, it is necessary to configure your package managers to use Intel repositories.

Run this command to add the Intel repository key:

```
sudo zypper addrepo https://yum.repos.intel.com/oneapi oneAPI
```

Install the VTune Profiler Package

```
sudo zypper install intel-oneapi-vtune
```

Post-Installation Steps

1. **Set Environment Variables:**

   If you are planning to use the command line interface of VTune Profiler, it is recommended to set environment variables by running these scripts:

   `bash:`

```
source /opt/intel/oneapi/vtune/latest/env/vars.sh
```

   `csh/tcsh:`

```
source /opt/intel/oneapi/vtune/latest/env/vars.csh
```

2. **Verify Your Installation:**

   VTune Profiler comes with a self-check script that helps verify if the product is installed correctly and troubleshoot issues, if any.

   The script runs a set of analyses on a sample application, and reports the progress interactively.

   To run the self-check script:

   a. Open a terminal window.
   b. Assuming the environment variables are set, run the script with this command:

```
vtune-self-checker.sh
```

   Alternatively, you can find this script in: `/opt/intel/oneapi/vtune/latest/bin64/`

NOTE The script may take several minutes run all the necessary checks.

c. Let the script run to completion and review the summary. The script offers advice if any of the analyses have failed, and saves a log file for support.

3. **Get to Know VTune Profiler:**

   For a quick introduction to VTune Profiler, try these documents:

   - Get Started Guide
   - Analyze Common Performance Bottlenecks Tutorial

   General information on VTune Profiler is available from:

   - User Guide—all features and analysis types, workflows, command line interface, user interface.
   - Performance Analysis Cookbook—profiling methodology, examples of applying VTune Profiler to interesting cases and specific bottlenecks.

4. **(Optional) Configure Collection Without Sampling Driver:**

   If you installed VTune Profiler without superuser privileges, certain configuration steps are required to enable hardware analyses through Linux Perf*. See the Profiling Hardware Without Intel Sampling Drivers Cookbook recipe to understand the configuration and possible limitations.

Install on macOS*

NOTE

- On macOS hosts, analysis of workloads running on the host is not supported. On macOS, VTune Profiler acts as a GUI terminal for profiling remote Windows and Linux targets or reviewing results previously collected on other systems.
- Intel® VTune Profiler for macOS is now deprecated and will be discontinued in a future release.

Follow these steps to install VTune Profiler on macOS:

1. Download the VTune Profiler installer from the Download page.
2. Double click the `m_oneapi_vtune_p_<version>.dmg` file to mount the disk image.
3. Double click the `VTune Profiler_<version>.app` file to start the installation program.
4. Follow the installer instructions to complete the installation.

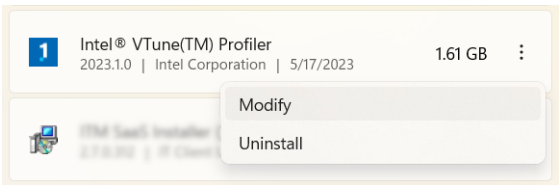
Get Updates

The combined Intel installer makes it easy to get updates for Intel software products, including Intel® VTune™ Profiler.

Windows

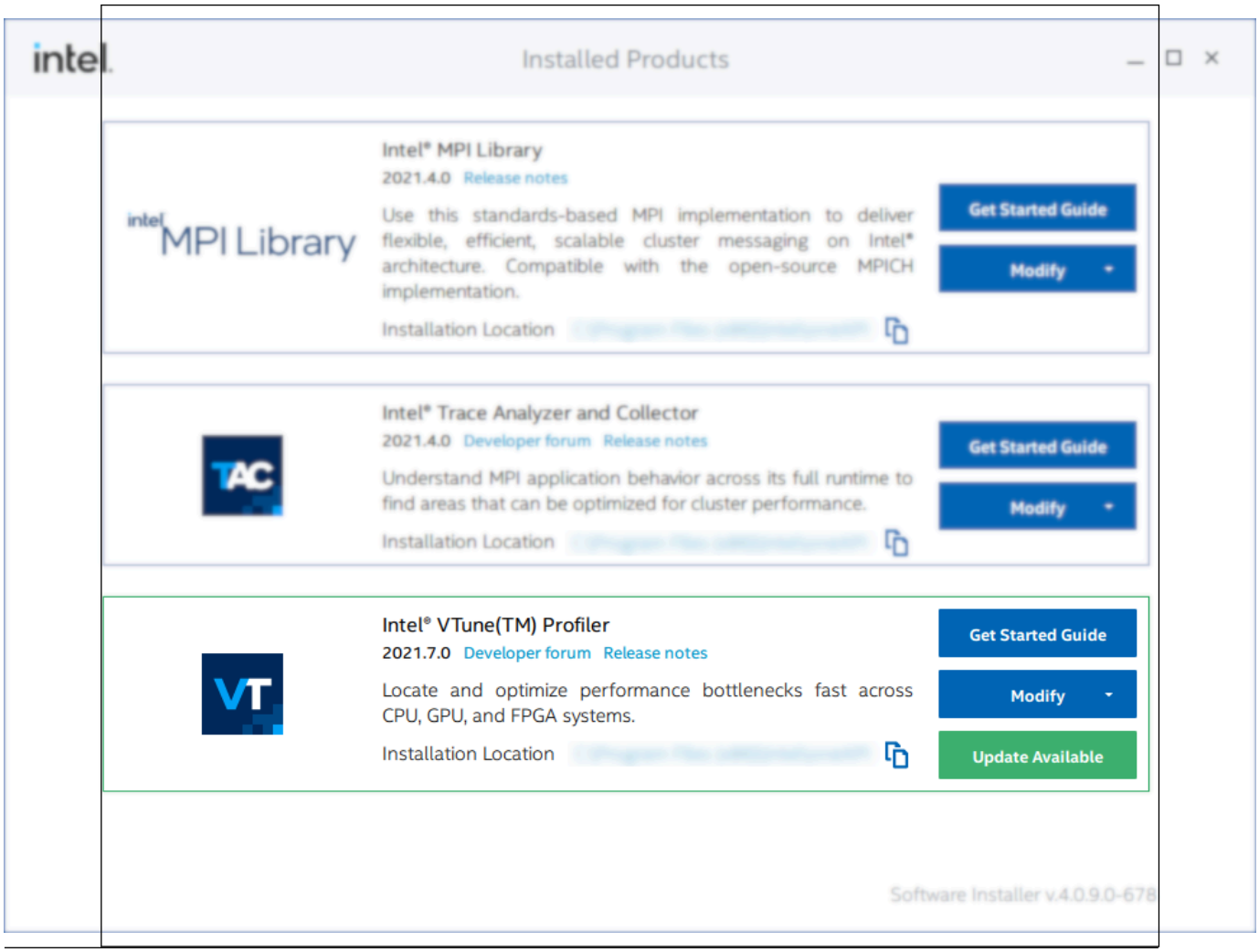
To update VTune Profiler on Windows:

1. On your Windows system, open **Settings > Apps**.
2. Locate VTune Profiler in the list of applications and click **Modify**.



The Intel product installer launches.

The installer automatically checks for updates for all installed Intel software products. If an update is available, an **Update Available** button displays.



3. Click the **Update Available** button and review the new product version.
4. Click **Install** to install the update.

The installer downloads all necessary files and installs the update.

NOTE This update method requires a stable Internet connection. If you are having problems with your connection, you can download an offline installer containing a newer version of VTune Profiler and follow the steps in Install on Windows* OS.

Linux

Using Package Managers

If you installed VTune Profiler using package managers, regular system-wide package updates should keep VTune Profiler updated to the latest version without additional action. If you wish to update VTune Profiler separately, use these commands:

APT:

```
sudo apt install intel-oneapi-vtune
```

YUM:

```
yum upgrade intel-oneapi-vtune
```

DNF:

```
dnf upgrade intel-oneapi-vtune
```

Zypper:

```
zypper up intel-oneapi-vtune
```

Using the Installer

To update VTune Profiler using the installer, you can reuse the installer left from a previous version or download the installer from the Download page.

Once the installer application is acquired, follow these steps to update:

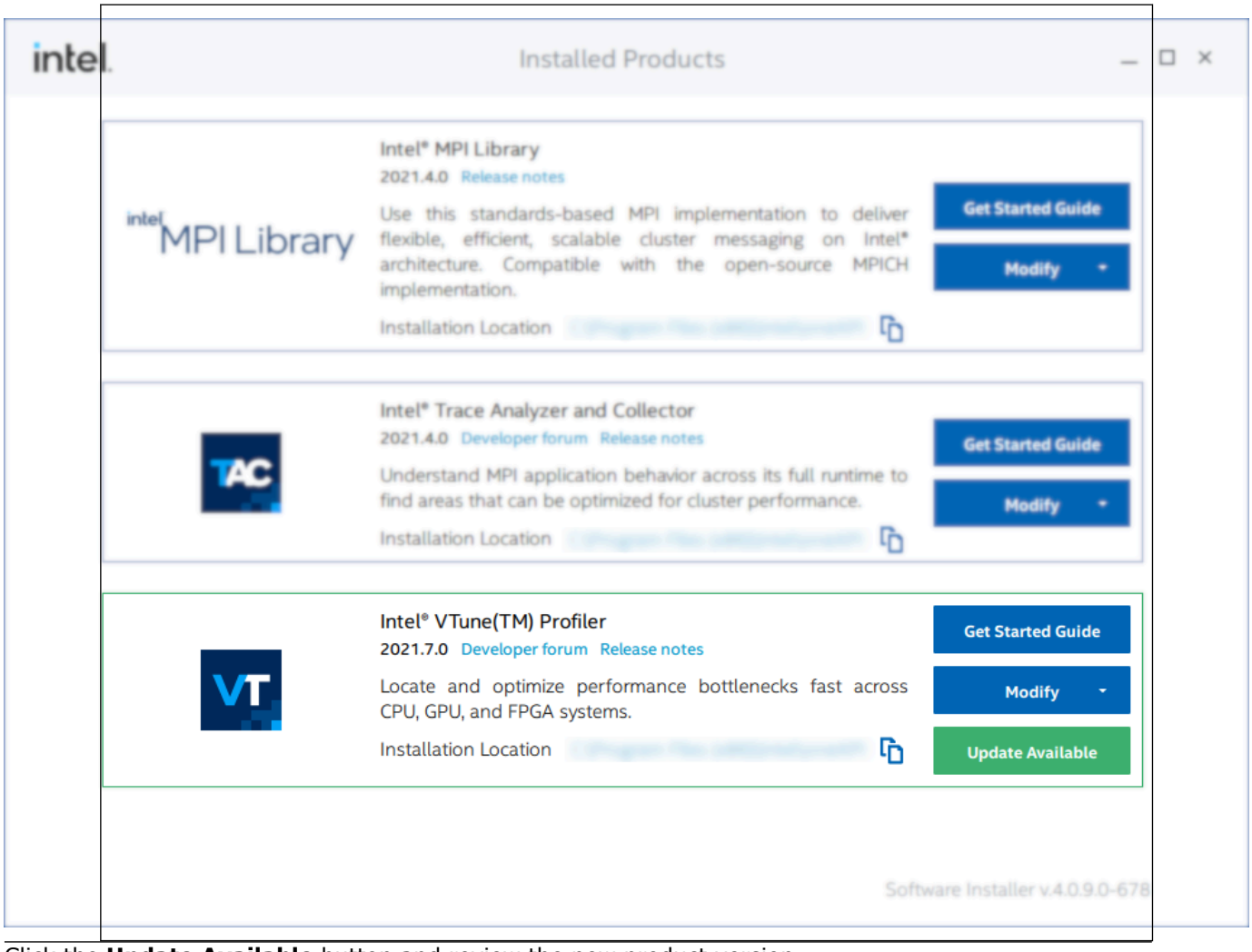
1. Open a terminal window and navigate to the directory where the installer is located.
2. If necessary, allow the execution of the installer with this command:

   ```
   chmod +x <installer-package-name>.sh
   ```
3. Run the installer executable as superuser (recommended):

   ```
   sudo ./<installer-package-name>.sh
   ```

   The installer window appears.

   The installer automatically checks for updates for all installed Intel software products. If an update is available, an **Update Available** button displays.



4. Click the **Update Available** button and review the new product version.
5. Click **Install** to install the update.

   The installer downloads all necessary files and installs the update.

Frequently Asked Questions

This topic includes answers to frequently asked questions about the Intel® VTune™ Profiler installation and configuration process.

How do I install the Sampling Drivers?

VTune Profiler automatically installs the required sampling drivers when the product is installed, assuming the user performing the installation has the appropriate permissions (administrative/root/sudo access). Drivers are also installed on a target system when VTune Profiler connects to the target system during analysis configuration (administrative/root/sudo access required via a password-less SSH connection). If the drivers fail to install, they can be configured manually.

The Sampling Drivers page of the User Guide includes detailed information about installing the drivers for Linux*, Windows*, or Android* systems.

OS-specific information on installing the Sampling Driver:

- Install the Sampling Drivers for Windows* Targets
- Install the Sampling Drivers for Linux* Targets
- Install the Sampling Drivers for Android* Targets

> **NOTE**
> Sometimes updates to supported operating systems may cause the sampling drivers to fail at build or loading. In those instances, you may need updated versions of the drivers before official updates of the product are available. The latest available sampling drivers are available at https://www.intel.com/content/www/us/en/developer/articles/code-sample/vtune-profiler-sampling-driver-downloads.html.

What features are available for a non-root or non-administrator user?

Windows* OS

When you install and launch VTune Profiler as a regular user on Windows, only the features that can work through User-Mode Sampling are available. You can run the Hotspots and Threading analyses through User-Mode Sampling. In Hotspots analysis, microarchitecture performance insights will not be available.

Linux* OS

On Linux, VTune Profiler can utilize Linux Perf* utility capabilities to deliver most of the advanced features, without requiring the Sampling Driver and/or root privileges. However, there are certain considerations, prerequisites, and configuration steps associated with profiling through Perf. See the Profiling Hardware Without Intel Sampling Drivers Cookbook recipe for detailed information on possible methods.