



# Intel® Turbo Boost Max Technology 3.0 on HP Workstations

Intel® Turbo Boost Max Technology (TBMT) 3.0 is a new capability supported on select processors in the new Intel® Xeon E5-1600v4 processor family (codename: Broadwell). This new capability enables increased single- and dual-core turbo performance, potentially allowing increased performance for “frequency bound” applications that derive better performance based on the frequency of the processor cores, rather than the absolute number of cores. In addition to the core capability within select processors, Intel® is delivering a driver/utility package that allows users to “pin” their applications to the “fast” cores that support these higher frequencies. This white paper details Intel® TBMT 3.0 support on HP Workstations, and guides customers who are using a system configured with an appropriate E5-1600v4 processor through the required procedure to enable and utilize the driver/application package.

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## What is Intel® Turbo Boost Max Technology 3.0?

Intel® TBMT 3.0 is a new capability in select Intel® Xeon® E5-1600v4 processors that provides one or more cores with the ability to run at a frequency higher than other cores. This capability is designed in to the processor and is not dependent on any special drivers or utilities to function properly. In combination with this new capability, Intel is delivering a driver/utility package that enables users to pin applications to the fast cores supporting the higher frequencies.

## Supported HP Workstations

The following HP Workstations support the Intel Xeon E5-1600v4 family with Intel® TBMT 3.0:

- HP Z640 Workstation
- HP Z440 Workstation

## Supported processors

Intel® TBMT 3.0 and the Intel® driver/utility package are supported on the following Intel® Xeon E5-1600v4 processors:

Intel® Xeon E5-1680v4	8-core	3.4GHz	Turbo up to 4.0GHz with Turbo Boost Max Technology 3.0
Intel® Xeon E5-1660v4	8-core	3.2GHz	Turbo up to 3.8GHz with Turbo Boost Max Technology 3.0
Intel® Xeon E5-1650v4	6-core	3.6GHz	Turbo up to 4.0GHz with Turbo Boost Max Technology 3.0
Intel® Xeon E5-1630v4	4-core	3.7GHz	Turbo up to 4.0GHz with Turbo Boost Max Technology 3.0

## Supported operating systems

The Intel® Turbo Boost Max Technology 3.0 driver/utility is supported by HP on the following operating systems:

- Microsoft Windows 10 Pro x64 Edition
- Microsoft Windows 7 Professional x64 Edition

The Intel® TBMT 3.0 driver/utility is NOT preinstalled in HP factory operating systems.

## Intel® TBMT 3.0 Driver and Control Panel Application installation

### Driver download

The Intel® TBMT 3.0 driver/utility can be downloaded at [hp.com/support](http://hp.com/support) under support pages for either HP Z440 Workstation or HP Z640 Workstation. The driver/utility is NOT required for the Intel® Xeon E5-1600v4 processors outlined above to achieve full performance. The driver/utility is NOT required for the Intel® Xeon® E5-1600 v4 processors outlined above to achieve full performance. If used, it does allow a user to identify and assign the two 'fast' high frequency cores in their processor to a specific application of their choosing.

### BIOS Setup

HP Z Workstation customers will need to update to the latest BIOS version (2.19 or later) in order to enable this technology. Customers should download the most recent HP Z Workstation System BIOS and follow the "HP Workstation Systems Firmware (BIOS) Update" process that is packaged with every BIOS Softpaq update executable. Once completed, boot to "System Settings" in the BIOS, go to "Advanced," and set "Intel Turbo Boost Max Technology 3.0" to "Enable."

### Intel® TBMT 3.0 Driver/Application Installation

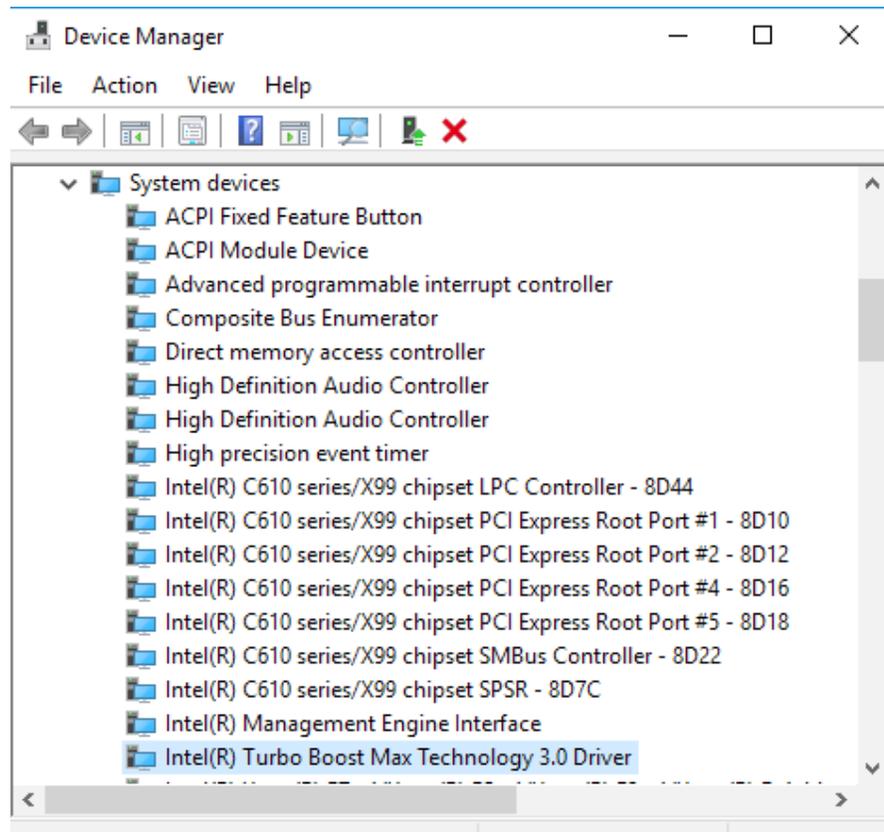
- Boot to Windows normally (not in Safe mode).
- Unzip the Intel® TBMT 3.0 Driver/Control Panel Application package.
- Run the "setup.exe" program contained within that package with Administrator privileges.
- This process will install **both** the Intel® TBMT device driver and the control panel application.
- Follow installation prompts and reboot the system.

## Intel® TBMT 3.0 Driver Installation verification

Verify Intel® TBMT Driver Installation in Windows “Device Manager,” as shown in Figure 1.

1. Go to Device Manager, System Devices.
2. Verify that **Intel® Turbo Boost Max Technology 3.0 Driver** exists and is not yellow banded, and then close Device Manager.

**Figure 1:** Windows Device Manager -> Intel TBMT3.0



## Intel® TBMT 3.0 Control Panel Application verification

Following installation and reboot, verify the installation of Intel® TBMT Control Panel Application as described in this section.

### Verify Intel® TBMT 3.0 Control Panel Application is in Windows Startup Programs list

#### For Windows 10:

Verify that Intel® TBMT Control Panel Application launches automatically as a Windows “Startup” program.

Launch Task Manager, tab to Startup, and verify that **Intel® Turbo Boost Max Technology 3.0** status is set to **Enabled**.

Also:

1. Launch Start menu, All Programs.
2. Check that **Intel® Turbo Boost Max Technology 3.0** app group exists.
3. Under **Intel® Turbo Boost Max Technology 3.0**, check if **Intel® TBMT Control Panel** shortcut exists.

#### On Windows 7:

Run msconfig.exe, tab to Startup, and verify that **Intel® Turbo Boost Max Technology 3.0** is enabled with a checkmark.

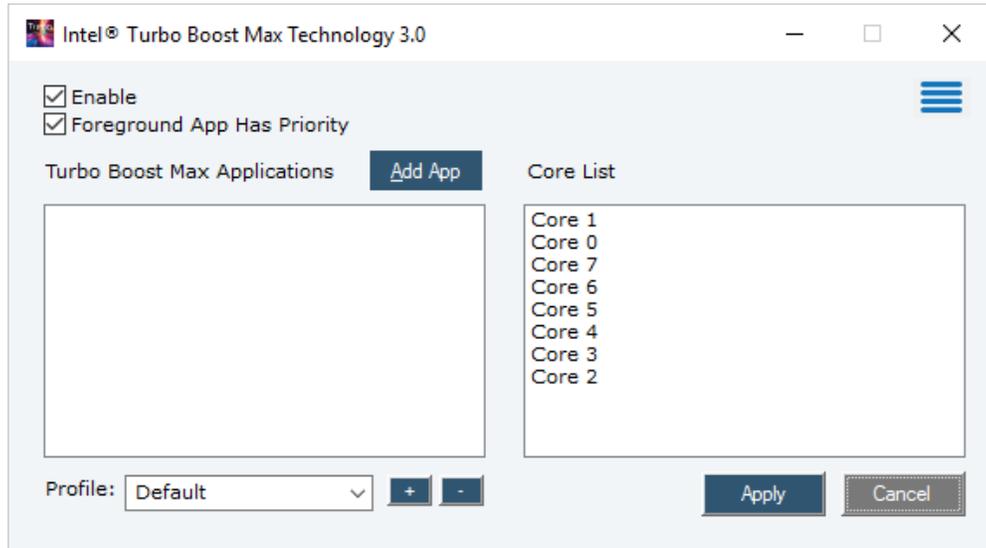
Also:

1. Verify that Intel® TBMT Control Panel Application launches automatically as a Startup program.
2. Run msconfig.exe, tab to Startup, and check that **Intel® Turbo Boost Max Technology 3.0** is enabled as a startup program.

## Using the Intel® TBMT 3.0 Control Panel Application

After rebooting and the above verification steps have been performed, open the TBMT application on the desktop, as seen in Figure 2.

Figure 2: Default TBMT dialog box

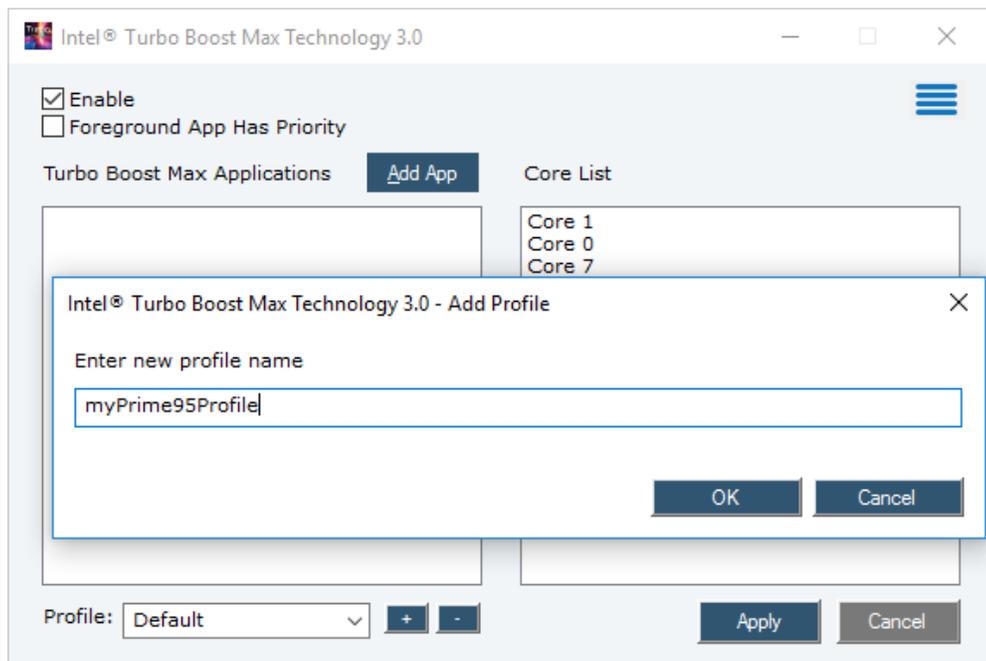


In the right-hand dialog pane, notice the order of high performance cores, ranked from highest to lowest. Also note that the default profile is selected, with no executables listed in the left hand pane.

Finally, be aware that the "Foreground App Has Priority" is checked by default. This behavior may be useful for some customers, but most will find the greatest benefit by un-checking this option and specifying an applicable software executable (see below).

In order to specify which program(s) are affinitized to the highest performance cores, click the plus sign next to "Profile" and create a profile for the program, as shown in Figure 3.

Figure 3: Add TBMT Profile



Now, click the “Add App” button, and navigate to the path containing the executable to affinitize to higher performance cores.

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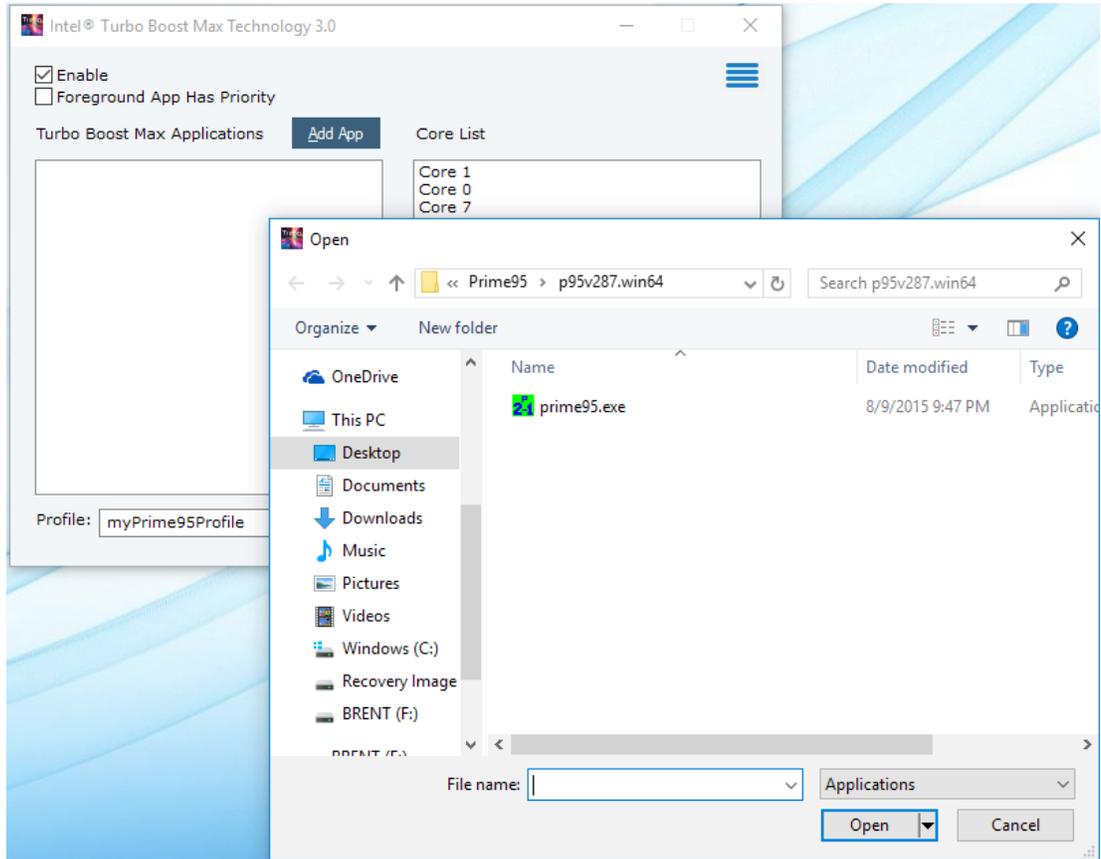
**Note 1: Only the specified path** to an explicit executable is used (i.e., if another executable of the same name but in a different path is run, it will not be affinitized!)

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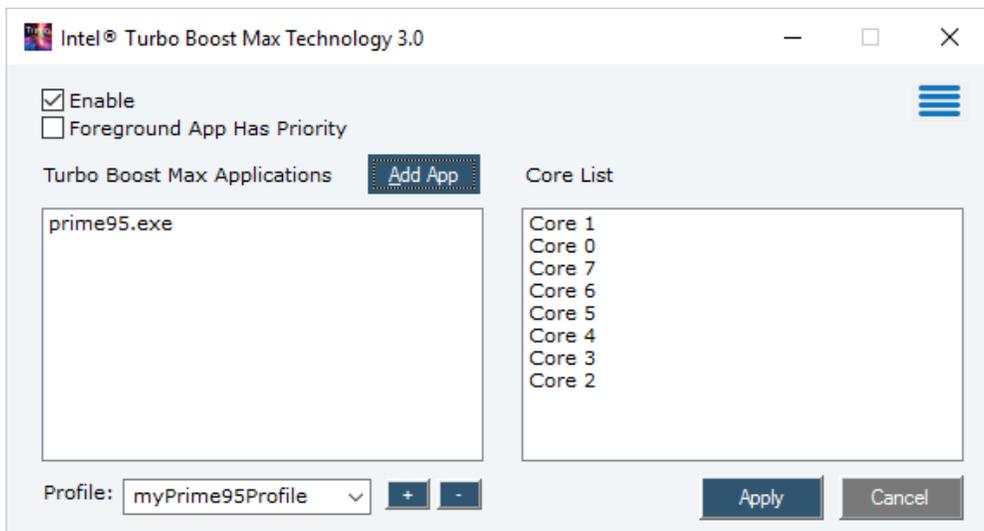
Figure 4 shows the “prime95.exe” program that will be affinitized to high performance cores.

The TBMT dialog now displays the .exe files that have been linked to the profile. More than one may be chosen.

**Figure 4:** Specify .exe for TBMT affinitization



Click on the Menu button (bars) top right, as shown in Figure 5, and click “Settings.”



**Figure 5:** TBMT App Linked to Profile

Here, the default setting for “Affinity Controls” is “Affinitize to all cores”. This setting specifies whether TBMT places demanding work in priority order on ALL cores in the core list, or whether it only places demanding work on higher performance (diverse) cores. If appropriate, and in order to take full advantage of TBMT, users should select “Affinitize only to cores with diversity,” which forces calls to the specified executable to land on the highest performance cores.

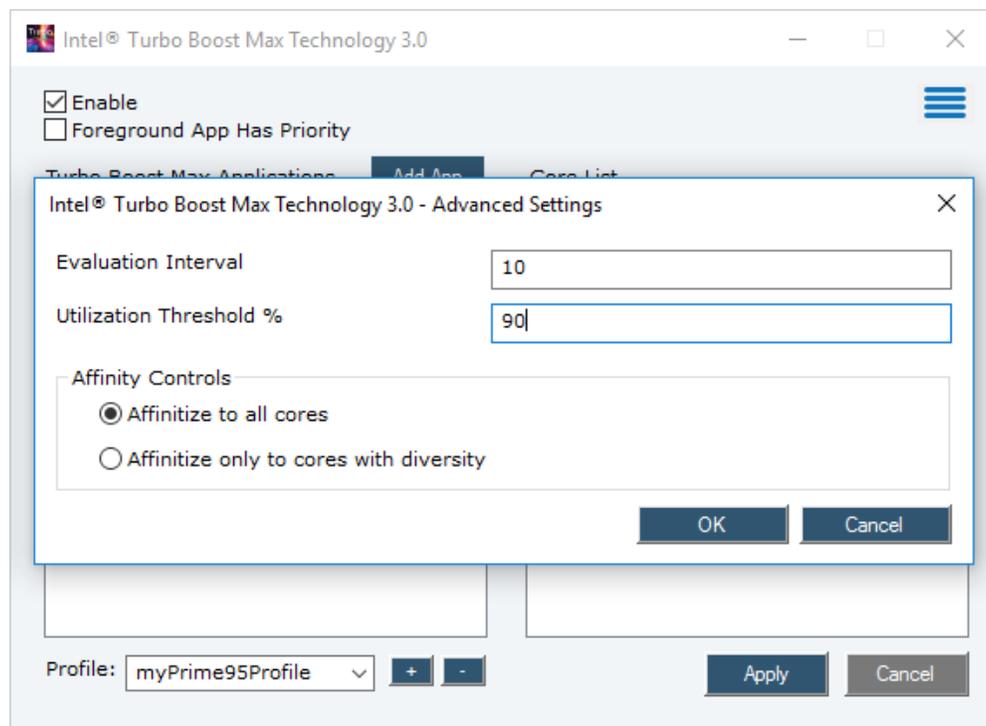
Figure 5 shows the Advance Settings dialog, where “Utilization Threshold %” defaults to 90%, and tells the application to affinitize your selected executable to the higher frequency cores when CPU utilization reaches 90%. Set this as necessary.

“Evaluation Interval” controls how often TBMT looks for demanding work. Units here are 100ms. Set this as necessary.

“OK” will save your changes to the Advanced Settings.

The “Help” utility, accessed from the Menu on the TBMT application, is useful and an excellent reference to the application.

**Figure 6:** TBMT Advanced Settings Dialog



**Note 2:** Once the driver is installed, the customer can use other standard methods to assign the core affinity per application. Whether the customer uses the Intel® TBMT application OR other standard Windows methods to assign core affinity, the **last method invoked** to assign affinity is what the process scheduler will use to control that application/core relationship.

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