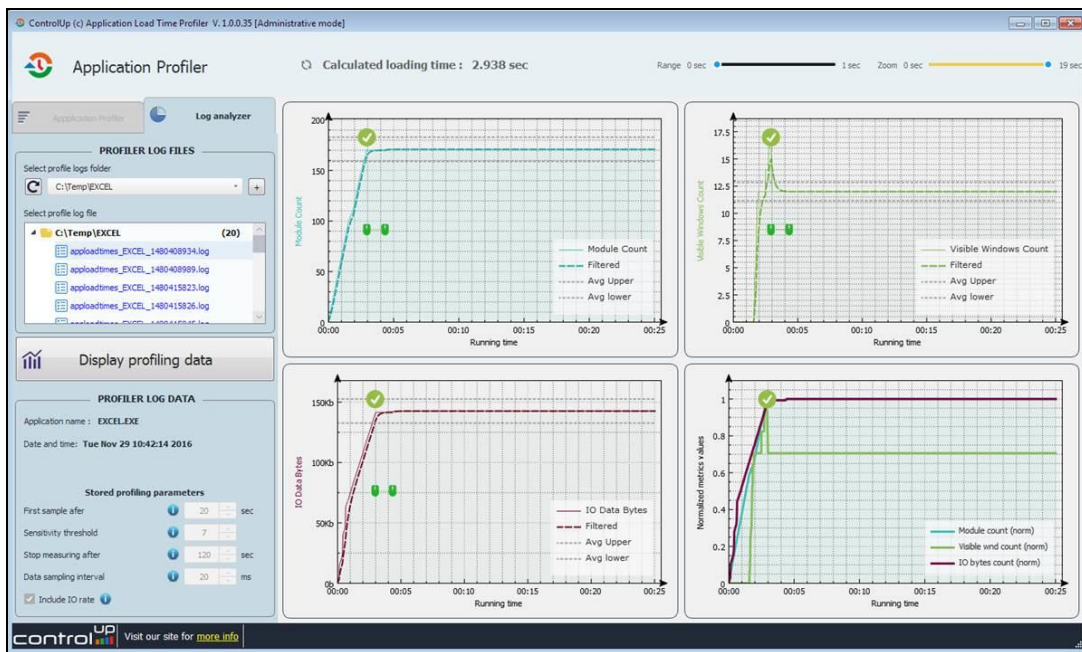


APPLICATION LOAD TIME PROFILER



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Copyright

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Introduction

The Application Load Time Profiler is a standalone utility created by ControlUp to help administrators analyze the loading times of applications. The utility enables its users to measure how long a particular application is taking to load on a particular PC, and helps them diagnose the causes of slow loading. It can be used on any physical or virtual PC, by system administrators or anyone else who wishes to understand an application's loading times in detail.

Application load time is defined as the time that elapses from the moment a user launches an application until the application is ready to receive user input. Once the application can respond to user input, it is considered to be *fully loaded*. The Application Load Time Profiler presents its results as graphs showing a time line of when the various aspects of the loading process took place and how long they took. The graphs show how many modules and visible windows were opened, the amount of data that was read from the hard drive, and how long it took for these things to happen.

In the absence of direct user input, it is somewhat difficult to define exactly when an application can be said to be fully loaded. The Application Load Time Profiler uses an algorithm that calculates this time based on changes in the level of activity related to the loading process. When this activity level drops below its average level by a given threshold, Application Load Time Profiler concludes that the application is fully loaded. By default, this threshold is 7%, but it is configurable. The time at which the Application Load Time Profiler calculates that the loading process has been completed is marked on the graphs of the results with a checkmark (✓).

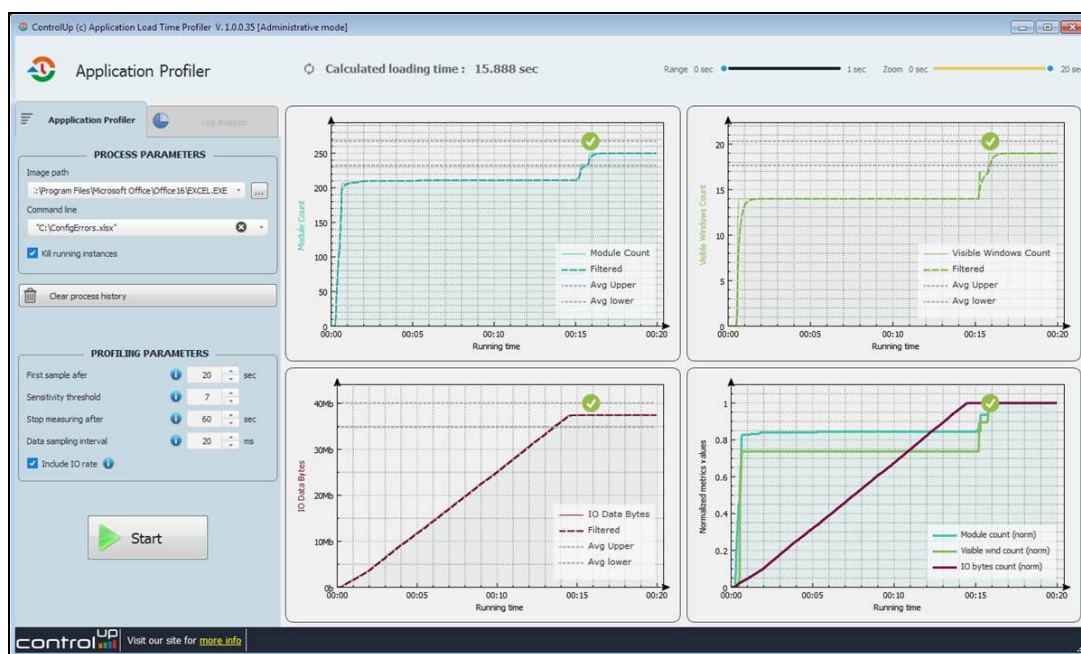


Figure 1: Application Load Time Profiler results

Modes of Operation

The Application Load Time Profiler can be used in one of two modes:

- **Application Profiler:** In this mode, the administrator runs the Application Load Time Profiler on the machine, and opens the application being tested from within the utility's

interface. The metrics of the loading process are then displayed in real time, as the loading process progresses.

- **Log Analyzer:** In this mode, the administrator uses the Application Load Time Profiler to open load-time log files that were saved by the ControlUp console when users launched applications. The metrics stored in these files when the loading process took place are then displayed in the utility's interface.

The Application Load Time Profiler can be used on any Windows PC, regardless of whether the ControlUp console is monitoring that PC. However, it is a more powerful tool when it is used in conjunction with the ControlUp console, because ControlUp can be configured to routinely monitor application load times, to notify administrators when the times are unusually or unacceptably slow, and to save log files with all the metrics of the loading process. The administrator can open these log files in response to these notifications or to user complaints, and use the data they contain to help identify the causes of the problem.

NOTE: For information about configuring the ControlUp Console Application Load Time feature, see the Knowledge Base article at <https://support.controlup.com/hc/en-us/articles/212288705-Application-Load-Time->
(*Knowledge Base > Troubleshooting > Real Time Console > Application Load Time*)

Limitations

The Application Load Time Profiler is a free utility that is supplied as is. It has been tested with a large number of applications, including many Microsoft applications. It is not guaranteed to work with all applications.

In particular, the Application Load Time Profiler will not work with applications that have a multi-process architecture. Such applications spawn child-processes that run in parallel with the top-level, parent process. If the Application Load Time Profiler is used with applications of this sort, it will only monitor the top-level process, and may disregard activity such as keyboard and mouse input, and fail to detect the opening of some visible windows.

Installing and Opening the Utility

You can download the Application Load Time Profiler installer from ControlUp's website. Once you have installed it, you can open it from the shortcut it places on your desktop.

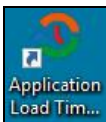


Figure 2: Desktop icon



To install the Application Load Time Profiler on your PC and run it for the first time:

1. Download the installer from www.controlup.com.
2. Unzip the file and run it. The application is installed, and a shortcut to it is placed on your desktop.
3. In the installer window, select **Run Application Load Time Profiler**, and then select **Finish**. The application opens. The left panel of the window (#1 in the illustration below) contains the fields you can use to select options and run the utility. The right panel (#2) will be used to display the results when they are available.

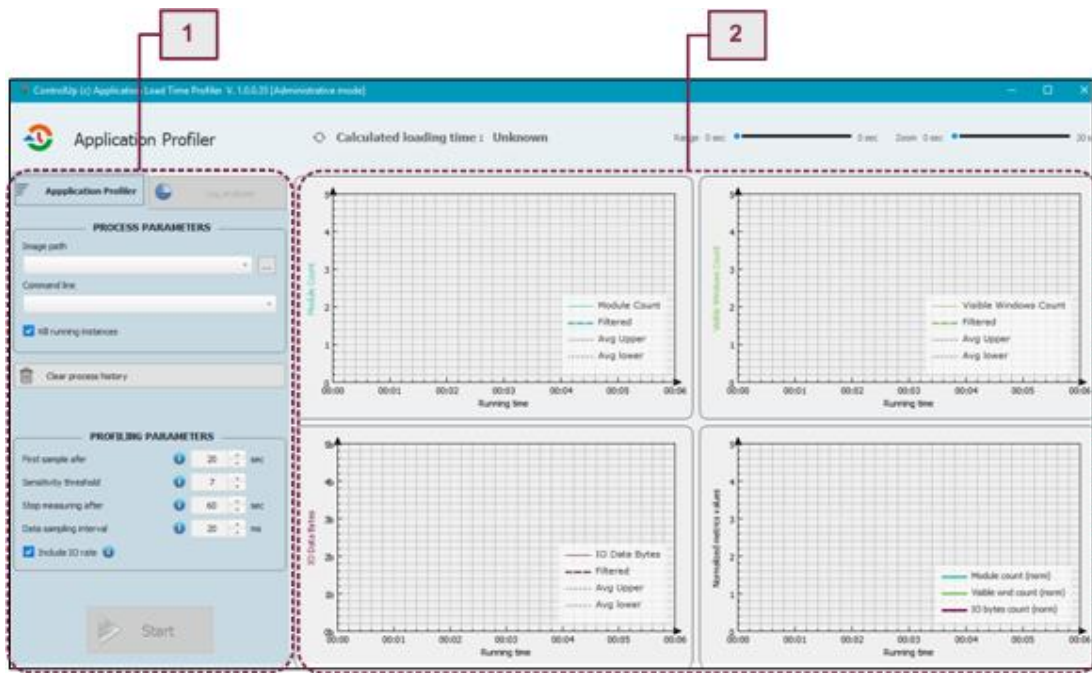


Figure 3: Application Load Time Profiler opened the first time

Loading an Application from the Utility

You can load an application from within the Application Load Time Profiler, and see the metrics of its progress in the graphs in the right panel of the window. The metrics are added to the screen in real time, so you can even watch the loading process as it occurs.


NOTE: This section explains how to load an application from within the utility. For an explanation of the results that are displayed in the right panel, see *Understanding the Results*, page 8.



To load an application:

1. In the left panel, select the **Application Profiler** tab.
2. Fill in the fields as follows:

Field	Description
Image path	<p>Select the path of the application you want to load.</p> <p>Click <input type="text" value="..."/> to open a file-selection window in which you can navigate to the application and select it.</p> <p>Note: The Application Load Time Profiler retains a list of the paths of all the applications you have previously selected in this field.</p> <ul style="list-style-type: none"> To select an application from the list, click the arrow (▼) at the end of the text field. To delete all the items in the list, select Clear process history. (All the stored Command line items will also be deleted.)

Field	Description
Command line	<p>If you want to provide the application selected under Image path with parameters, enter them here (optional). For example, if the application is MS Excel, enter the path of a file you want Excel to open when it loads.</p> <p>To clear the text field, click .</p> <p>Note: The Application Load Time Profiler retains a list of the command lines you have previously entered.</p> <ul style="list-style-type: none"> To select an item from the list, click the arrow (▾) at the end of the text field. To delete all the items from the list, select Clear process history. (All the stored Image path items will also be deleted.)
Kill running instances	<p>If the application selected under Image path is already open when you click Start (see below), select this option to have the Application Load Time Profiler close it before starting to load it.</p> <p>If this option is not selected, another instance of the application will be opened.</p>

- If necessary, under **Profiling parameters**, modify the default settings, as explained [below](#).
- Click **Start**. The Application Load Time Profiler opens the application and, at the same time, begins monitoring the metrics of the loading process and displaying them in the graphs in the right panel of the window.

While the process is being monitored, the **Start** button is replaced by a **Stop** button. You can use this button to stop the monitoring process; it does not stop the actual loading process of the application, but if you select **Stop**, the Application Load Time Profiler will no longer track it.

Note: If you interact with the application during the monitoring process, e.g., if you minimize the window, or click an option, the results may be skewed. This is because the Application Load Time Profiler will interpret these actions as signs that it is already possible for a user to interact with the application, which means that it is fully loaded.


Opening an Existing Log File

If you are using the ControlUp console, and it is configured to monitor application load times and save them in log files, you can open these log files in the Application Load Time Profiler to view the results. These results are displayed in the same way that the results of loading an application from the Application Load Time Profiler window are displayed. Since they only consist of the final results, they are of course static, so you cannot watch the metrics of the loading process as you could with applications you run from the Application Load Time Profiler window, and you cannot change the profiling parameters. You can, however, see the profiling parameters that were used when the application was loaded.



To open a log file in the Application Load Time Profiler:

- In the left panel, select the **Log Analyzer** tab.

2. Under **Select profile logs folder**, click  to open a file-selection window in which you can navigate to the folder in which the log file is stored and select it. The folder appears under **Select profile log file**.

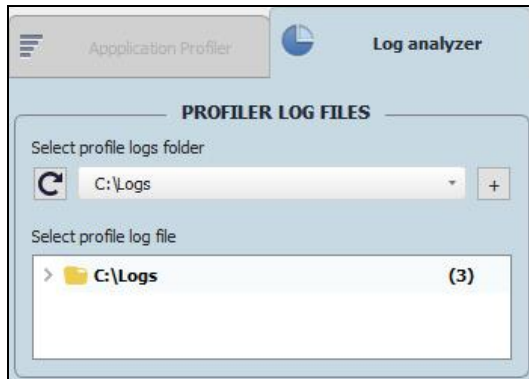


Figure 4: Log folder selected

Note: The Application Load Time Profiler retains a list of all the folders you have previously selected. If the folder you want to access is in this list, click the arrow (▼) at the end of the text field to open the list, and then select the folder.

3. Under **Select profile log file**, click the arrow to the left of the folder (or double-click the folder). A list of the log files it contains is displayed below it.

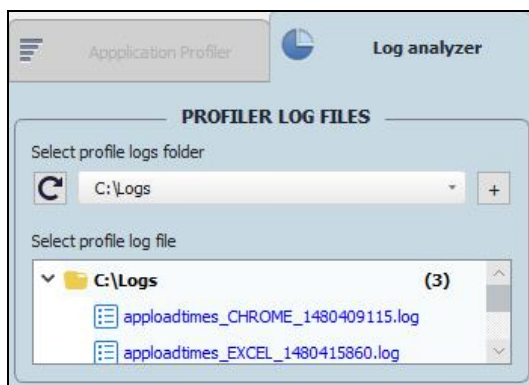



Figure 5: Log folder expanded

4. In the list, select the log file you want to open.
Note: If the log file you want to open is stored in the selected folder but does not appear in the list, click  to reload the file list.
5. Click **Display profiling data**. The results contained in the file are displayed in the right panel.



In addition, information about the application executable name, the date and time it was originally launched, and the profiling parameters that were in place at that time appears in the lower part of the left panel, in the **Profiler Log Data** region.

Note: For an explanation of the profiling parameters, see *Profiling Parameters*, page 6.

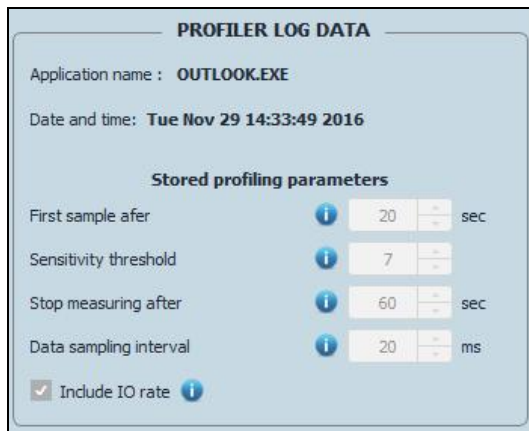


Figure 6: Logged information about the loading process

Profiling Parameters

The Application Load Time Profiler has default parameters that control how long it will continue logging the loading process, how frequently it will retrieve data points, and whether it should include I/O data points in its log. When you load an application from the **Application Profiler** tab, you can modify the default settings as required before you load the application. When you open a log file in the **Log Analyzer** tab, you cannot modify these settings, but you can see what they were set to when the application was launched.

The profiling parameters appear in the lower part of the left panel.

PROFILING PARAMETERS

First sample after: 20 sec

Sensitivity threshold: 7

Stop measuring after: 60 sec

Data sampling interval: 20 ms

☒ Include IO rate

Figure 7: Profiling parameters in the Application Profiler panel

The following profile parameters are defined:

Field	Description	Default	Range
First sample after	The minimum period of time during which the Application Load Time Profiler will monitor the loading process, in seconds. If the application is fully loaded within this time, monitoring will end at this time. Otherwise, monitoring will continue until either full loading has been achieved or the time period defined under Stop measuring after has elapsed.	20 sec.	0-300
Sensitivity threshold	The reduction in application activity required in order to declare the loading process to be fully completed, as a percentage. This percentage is calculated relative to the average level of activity measured during the loading process until this point. For example, 7% means that the application activity was 7% of its average until that point.	7%	1-50
Stop measuring after	The maximum amount of time to monitor the loading process, even if the application has not yet fully loaded, in seconds.	60 sec.	0-300
Data sampling interval	How frequently to measure the application activity, in milliseconds.	20 ms.	0-3000
Include IO rate	Whether to measure the application's reading of data from the storage medium (hard drive or flash drive). In general, I/O activity that takes place immediately after the application was launched is part of the loading process. In such cases, measuring this metric gives more information about the loading process. However, some applications begin retrieving data from the storage medium immediately after completing the loading process. This may occur, for example, when a mail application retrieves mail messages from its database on the computer. In cases like these, it may be preferable for the Application Load Time Profiler to ignore the I/O activity, because this activity is causing it to miscalculate the time at which the application is fully loaded.	Selected	Selected/ Cleared

Understanding the Results

After you run an application from the **Application profiler** tab, or open a log file in the **Log Analyzer** tab, the results are displayed as follows:

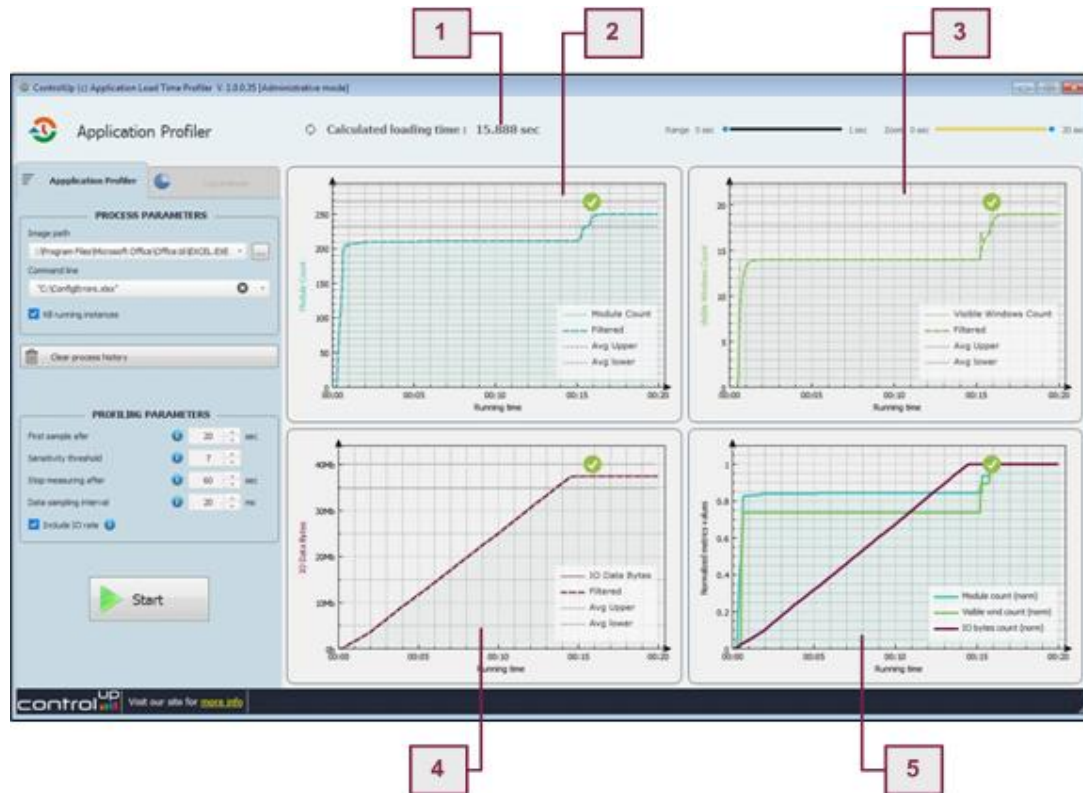


Figure 8: Results

Item	Name	Description
1	Calculated loading time	The amount of time the Application Load Time Profiler calculated that it took the application to fully load. This time is marked on each of the graphs with a ✓.
2	Module Count graph	Plots the number of DLL files opened by the application as a function of the time elapsed since the application was launched.
3	Visible Window Count graph	Plots the number of visible windows opened by the application as a function of the time elapsed since the application was launched.
4	IO Data Bytes graph	Plots the number of Kb read from the storage medium to the RAM as a function of the time elapsed since the application was launched. Note: If Include IO rate was not selected when the loading process was initiated, this graph is blank.
5	Normalized Metrics Values graph	Plots normalized versions of each of the other three metrics as functions of the time elapsed since the application was launched. To normalize the metrics, each value in the other graphs is converted to a value between 0 and 1.

Graph Features

In all of the graphs, the time is plotted on the x axis and the metrics on the y axis. A key at the lower-right of each graph (no. 5 in figure 9 below) indicates what metrics are plotted in it. In the first three graphs, four metrics are plotted in each graph:

- **Solid line:** The actual values that were measured by the Application Load Time Profiler (no. 1 in figure 9 below).
- **Filtered values:** A normalized curve representing the trend of the values, in which spikes are eliminated; the curve is created using Kalman filtering (no. 2 in figure 9).
- **Avg Upper and Avg Lower:** These curves (nos. 3 and 4 in figure 9) represent the width of the Kalman filter threshold. When all of the actual values measured are in this range for a prescribed period of time, the application concludes that the values have converged to this range, and the loading process is over.



Figure 9: Graph features

In the fourth graph, a normalized curve is displayed for each of the other three graphs. The curves are color-coded, and the key in the lower-right of the chart indicates which color is used for each of the metrics.

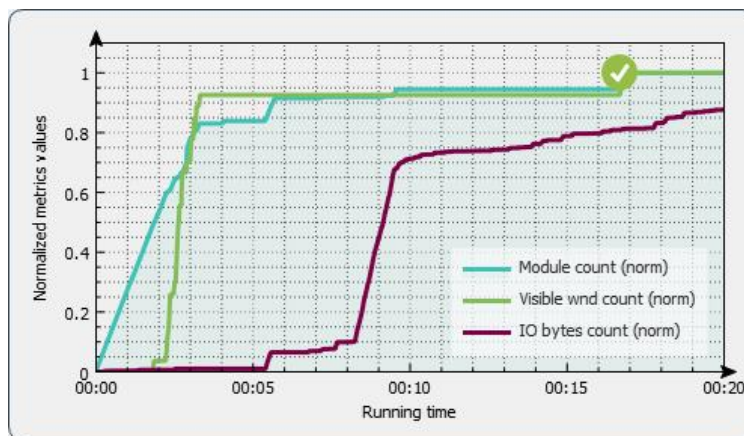




Figure 10: Fourth graph, showing normalized versions of the other three graphs

Keyboard and Mouse Input

User input – keyboard or mouse interactions with the monitored application – is also monitored by the Application Load Time Profiler. When it occurs, it is marked in the first three graphs, as follows:

-  marks times at which there was keyboard input
-  marks times at which there was mouse input

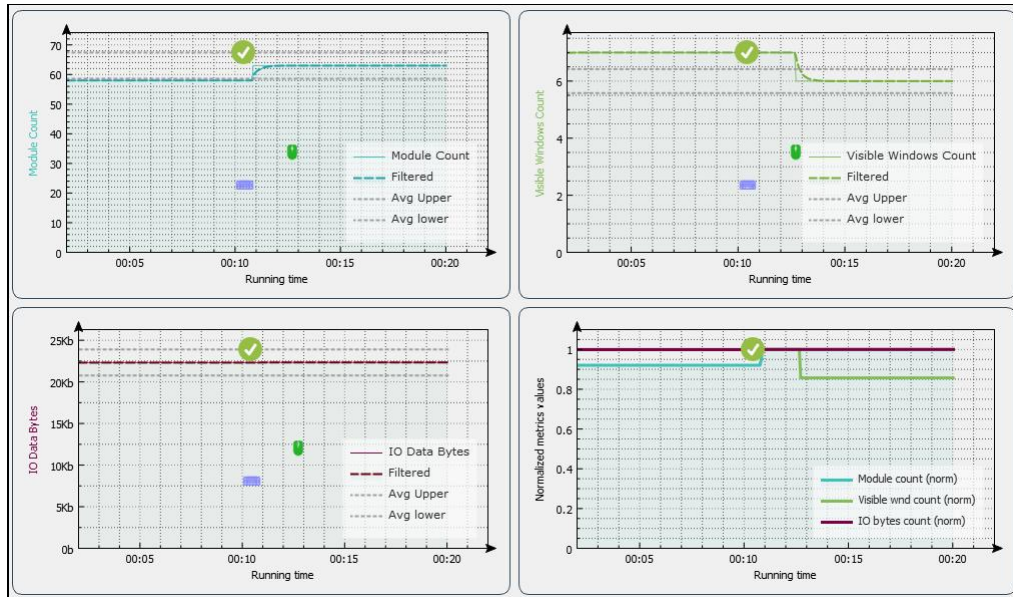


Figure 11: Results with mouse and keyboard input

In general, the detection of user input suggests that the application was ready for interactions, and thus fully loaded, when the input occurred. Because of this, the Application Load Time Profiler usually assumes this is the case if it detects user input.

Another thing to bear in mind is that user input can cause spikes in the measurements that are not related to the loading process.

Adjusting the Display

You can adjust the zoom of the graphs and, scroll within the graphs to see portions that are not visible, and enlarge an individual graphs to see it in greater detail. You can zoom and scroll the graphs individually or as a synchronized group.

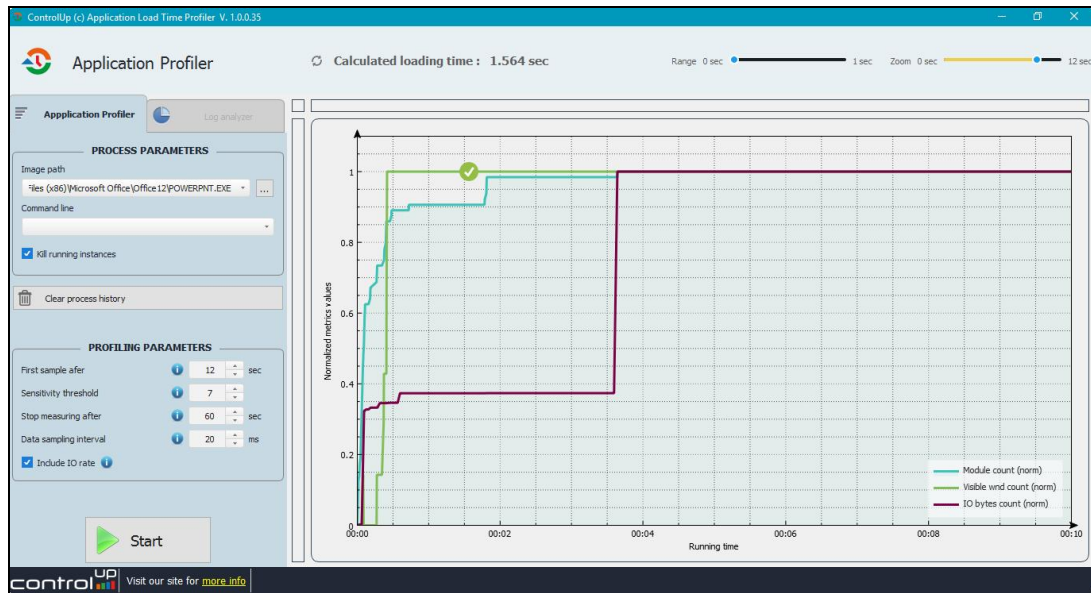


Figure 12: Enlarged graph

To	Do
When the display is zoomed, scroll all of the graphs left or right	Drag the Range slider, or click the line, to select the parts of the graphs you want to see. All four graphs are adjusted so that they display data from the same time period.
Zoom in or out of all of the graphs	<p>Drag the Zoom slider, or click the line, to adjust the zoom of the graphs. All four graphs are adjusted so that they are zoomed to the same level.</p> <p>When the slider is at the right tip of the line, the display is not zoomed – all of the data available is shown at once. When the slider is at the left tip of the line, the zoom is at its maximum.</p> <p>Note: When the Application Profiler is monitoring an application launch in real time, the Zoom slider shows the time elapsed since the application was launched.</p>
Scroll within a single graph	Place your mouse pointer anywhere on the graph and then drag to the right or left.
Zoom within a single graph	Place your mouse pointer anywhere on the graph and then roll the mouse wheel (the middle “button” of the mouse) up or down.
Enlarge one graph	Double-click the graph.
Close an enlarged graph	Double-click the enlarged graph.