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## Overview

The Power Estimator (CyPE) tool provides an estimate of power consumed by a target device (also called platform). This is a stand-alone tool included with the ModusToolbox software.



## Supported Devices

The CyPE tool can be used with the following devices:

- CYW920819EVB\_02 (BTSDK)
- CY8CKIT-062S2-43012 (Mbed OS)

## Supported Middleware

| Name                | Link                                                                                                                                  |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| ModusToolbox BT SDK | <a href="https://community.cypress.com/community/modustoolbox-bt-sdk">https://community.cypress.com/community/modustoolbox-bt-sdk</a> |
| Mbed OS             | <a href="https://github.com/cypresssemiconductorco/cype">https://github.com/cypresssemiconductorco/cype</a>                           |

## Setup

The CyPE tool is supported on Windows, Linux, and macOS. Before running the tool, first enable CyPE in the application build. Refer to the platform README file for instructions.

## Launch CyPE Tool

It can be run as a GUI with or without the Eclipse IDE for ModusToolbox. It can also be run from the command line.

- To run the GUI tool without the Eclipse IDE, navigate to the install directory, and run the executable. The default install location on Windows is:

`<install_dir>\tools_version\cype-tool`

For other operating systems, the installation directory will vary, based on how the software is installed.

- To run the GUI tool with the Eclipse IDE, right-click on a project and select **ModusToolbox > Power Estimator**.
- For information about command line options, run the tool from the command line using the `-h` option.

## Quick Start

This section provides a simple workflow for how to use the CyPE tool.

1. Enable the tool as described in the [Setup section](#).
2. Build and program a project. Make sure that the target board is connected to the PC using the USB cable.
3. [Launch the CyPE tool](#).
4. Set up the configuration properties. Refer the CyPE tool [Configuration Setup section](#).
5. Click **Connect** to establish a connection.
6. Click **Start** to start logging. The real-time plot appears.
7. Click **Stop** to stop logging.
8. Exit the CyPE tool.

## General GUI Interface

The CyPE tool consists of Menus, Toolbar, Graph view, Console Pane, and Status Bar. This section describes each of these elements.



## Menus

The CyPE tool contains various menus, including: File, View, Communication, Tools, and Help.

### File Menu

- **Import** – This feature is used to import a power log file that was created by the live analysis in a separate session. The tool creates the power plot using the power events captured in the log file for offline analyses. See [Log File](#) for more information.
- **Exit** – Exit the CyPE tool.

### View Menu

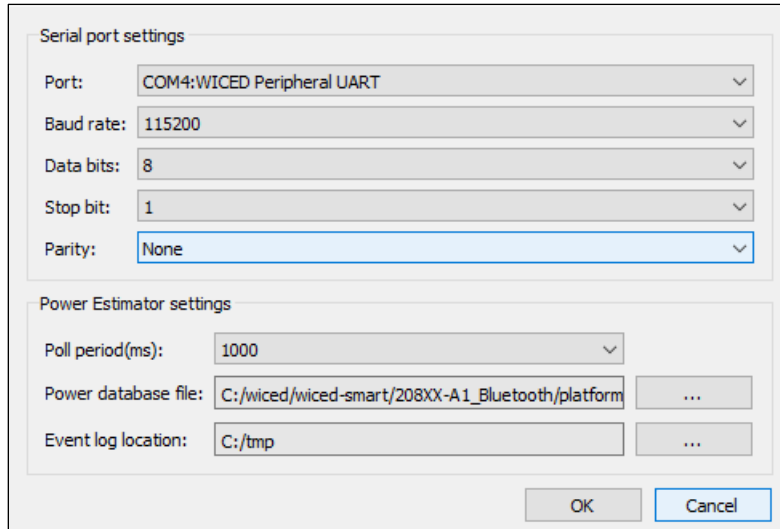
- Contains options to hide or show the console dock window and the toolbar.

### Communication Menu

- **Connect** – Connects to the device selected in the Configuration Setup dialog.
- **Disconnect** – Closes the communication with the connected device.
- **Start** – Starts sending a log request to the target.
- **Stop** – Stops sending a log request to the target.

## Tools Menu

**Configuration Setup** – Opens the Configuration Setup dialog to set up configurations. The Configuration Setup dialog provides various settings to allow you to connect to the target platform.



The Configuration Setup dialog box is divided into two main sections: 'Serial port settings' and 'Power Estimator settings'. The 'Serial port settings' section includes dropdown menus for 'Port' (set to COM4:WICED Peripheral UART), 'Baud rate' (set to 115200), 'Data bits' (set to 8), 'Stop bit' (set to 1), and 'Parity' (set to None). The 'Power Estimator settings' section includes a dropdown for 'Poll period(ms)' (set to 1000), a text field for 'Power database file' (set to C:/wiced/wiced-smart/208XX-A1\_Bluetooth/platform) with a browse button (...), and a text field for 'Event log location' (set to C:/tmp) with a browse button (...). At the bottom right are 'OK' and 'Cancel' buttons.

### ■ Serial Port Settings

- ☐ Select the serial port specified by the target platform's debug UART using the **Port** drop-down menu option.
- ☐ Use the default values for **Baud Rate**, **Data Bits**, **Stop Bit**, and **Parity** fields or change them according to the debug UART settings of the target platform.

### ■ Power Estimator Settings



- ☐ Use the **Poll Period** to specify the period of a log request from the CyPE tool to the target board. The poll period value (in msec) is in the range of 300 to 1000 with a gap of 100. If data logging interferes with the smooth functioning of the tool, then you may set it to a higher value of 1000.
- ☐ Specify the **Power database file** location using the **Browse [ . . ]** button.
- ☐ Specify the event dump file location using the **Event log location Browse [ . . ]** button.





## Help Menu

- **View Help** – Opens the Power Estimator User Guide (this document).
- **About Power Estimator-tool** – Open the **About** box to display version information.

## Toolbar

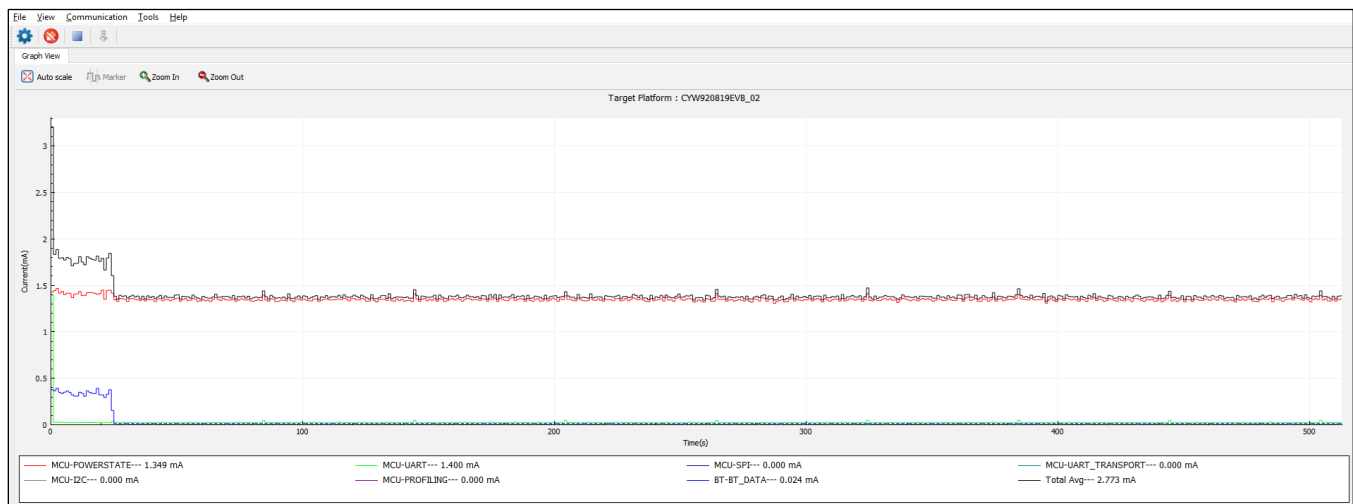
Contains frequently used buttons that duplicate various menu items:

-  – Opens the configuration dialog to set up a Power Estimator Configuration. The same as the **Tools > Configuration Setup** menu item.
-  – Connects to the device selected in the Power Estimator Configuration Setup. The same as the **Communication > Connect** menu item.

-  – Closes the communication with the connected device. The same as the **Communication > Disconnect** menu item.
-  – Starts sending a log request to the target. The same as the **Communication > Start** menu item.
-  – Stops sending a log request to the target. The same as the **Communication > Stop** menu item.
-  – Imports the power dump file. The same as the **File > Import** menu item.

## Graph View

The Graph View displays the plot of power-consuming events with respect to time on the target device. Each event trace is plotted in a unique color to easily observe. The color mapping between an event and the trace is shown at the Legend of the plot area.



## Graph Toolbar

The toolbar provides quick access to different configuration options that affect the graphs display.

- **Auto scale** – Fits the graph to the actual shape after the zoom in / zoom out operations on the graph.
- **Marker** – Displays the average current consumed by events and the platform in between the markers.
- **Zoom in** – Used to examine the graph in more detail. Zoom in can also be done by rolling the mouse wheel forward.
- **Zoom out** – Used to examine the graph in more detail. Zoom in can also be done by rolling the mouse wheel backward.

## Graph Functionality

The graph displays:

- the name of a target detected at the top of the plot window.
- the plot of the current consumed by individual power events on each processor.
- the plot of the current consumed by the platform.
- the average current consumed by individual power events.
- the average current consumed by the platform.

- the average current for each event (displayed in the graph Legend).

The **Marker** button enables the marker feature, which displays the two vertical lines. To select any marker line, left-click the mouse when the pointer is on the marker line. Drag the mouse to place at a different location. Right-click the mouse to deselect the marker line. The power number in Legend gets updated for the specified marker range.

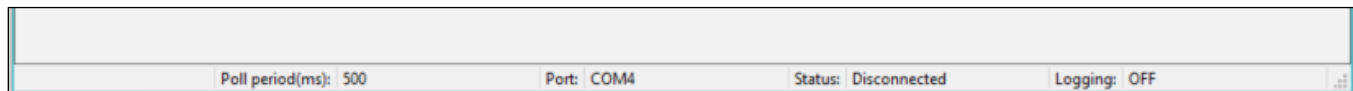
## Console Pane

The Console pane provides a Serial Console window to display the logs thrown by the target platform.



## Status Bar

The status bar is located at the bottom of the GUI. It displays information related to the communication state between the CyPE tool and the device.



- **Poll Period** – The period at which a log request from the CyPE tool is sent to the target board.
- **Port** – Displays the serial port name of the connected port.
- **Status** – **Connected** when the communication is active; otherwise, **Disconnected**.
- **Logging** – **ON** when the logging is active; otherwise, **OFF**.

## Log File

The CyPE tool consists of two main components: Target-CyPE and Host-CyPE. The Target-CyPE captures *power events* from different components on the target platform and sends those to the Host-CyPE. The Host-CyPE runs on the PC to receive *power events* over the UART and displays the real-time power plot. It refers to a platform-specific power database (xml) and estimates the current based on the power events and duration.

A Power Event is defined as a combination of Processor ID, Event ID, and Event Descriptor.

- **Processor ID** – A processor available on the target platform is identified by this ID (for example, MCU, Wi-Fi, BT, etc.).
- **Event ID** – A power event is identified by this ID (for example, Power State, UART State, Wi-Fi Data, I2S state, etc.).
- **Event Descriptor (Descriptor)** – An event is described by the event descriptor. These descriptions represent different states assumed by the power events (for example, an MCU Power event can have event descriptors like: Active, Sleep, Deep Sleep, Hibernate, Off, etc.).

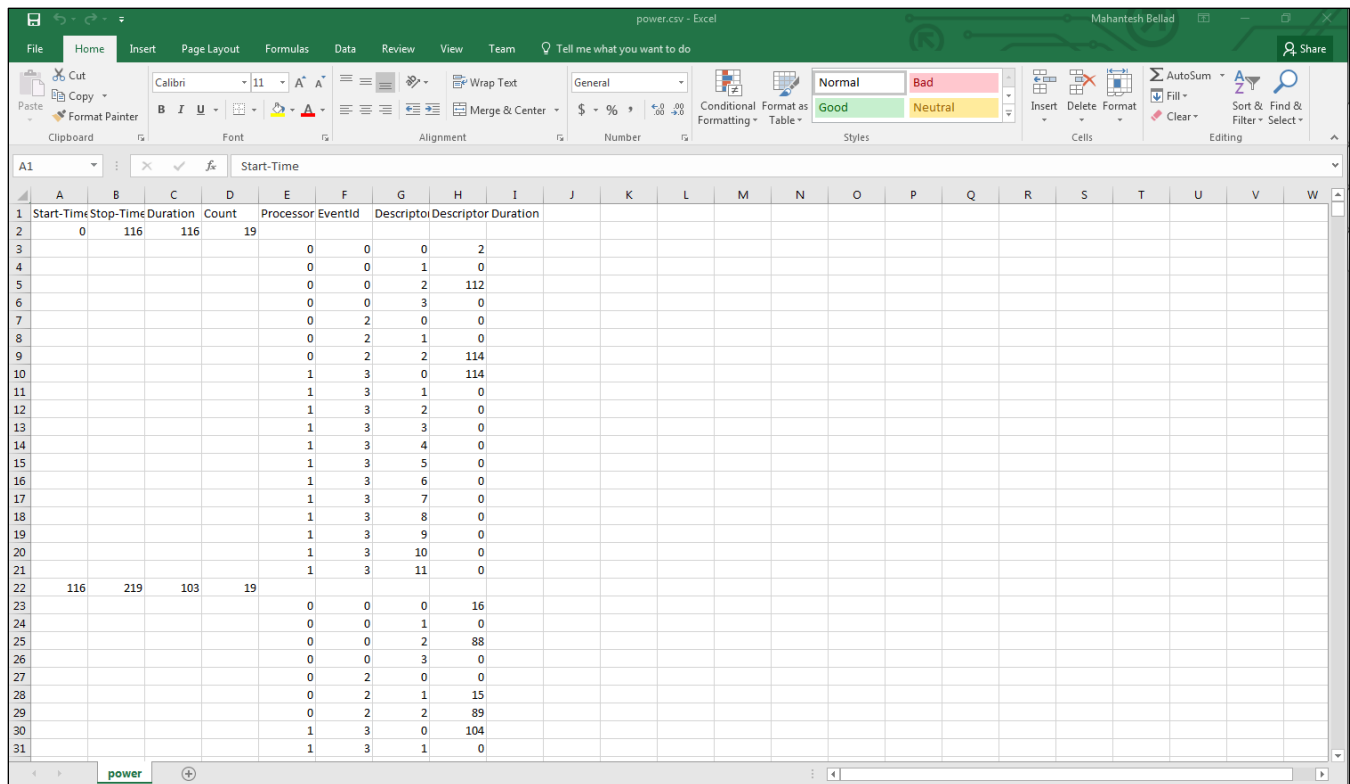
- **Descriptor Duration** – Captures the duration for which each event descriptor was active.

The CyPE tool logs all power events sent by the target platform to the CyPE tool into a file named `<platform_name>_<datetime>.csv` (for example, `CYW920819EVB_02_2018-07-04_11-30-02.csv`). This file is kept in the ped container along with the power database file in the event log dump. The data is logged for the capture duration triggered by the **Start** and **Stop** buttons in the UI. This file is useful in debugging as the log captures each event's power state along with the duration spent in that state. It might provide details like how many Wi-Fi packets are sent in each data rate, along with a few other parameters such as Wi-Fi PM mode, current band, and current bandwidth.

The ped container can be imported into the tool for offline analysis and can be shared across other stations.

- Power log container's name: `<platform_name>_<datetime>.ped`
- The container has `<platform_name>.xml` and `<platform_name>_<datetime>.csv`
- `<platform_name>.csv` stores the power log data captured from the target platform.

The following image shows a sample page of a csv file.



|    | A          | B         | C        | D     | E         | F       | G          | H          | I        | J | K | L | M | N | O | P | Q | R | S | T | U | V | W |
|----|------------|-----------|----------|-------|-----------|---------|------------|------------|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1  | Start-Time | Stop-Time | Duration | Count | Processor | EventId | Descriptor | Descriptor | Duration |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2  | 0          | 116       | 116      | 19    |           |         |            |            |          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3  |            |           |          |       |           | 0       | 0          | 0          | 2        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4  |            |           |          |       |           | 0       | 0          | 1          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5  |            |           |          |       |           | 0       | 0          | 2          | 112      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6  |            |           |          |       |           | 0       | 0          | 3          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7  |            |           |          |       |           | 0       | 2          | 0          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8  |            |           |          |       |           | 0       | 2          | 1          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9  |            |           |          |       |           | 0       | 2          | 2          | 114      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10 |            |           |          |       |           | 1       | 3          | 0          | 114      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11 |            |           |          |       |           | 1       | 3          | 1          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 12 |            |           |          |       |           | 1       | 3          | 2          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 13 |            |           |          |       |           | 1       | 3          | 3          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 14 |            |           |          |       |           | 1       | 3          | 4          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 15 |            |           |          |       |           | 1       | 3          | 5          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 16 |            |           |          |       |           | 1       | 3          | 6          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 17 |            |           |          |       |           | 1       | 3          | 7          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 18 |            |           |          |       |           | 1       | 3          | 8          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 19 |            |           |          |       |           | 1       | 3          | 9          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 20 |            |           |          |       |           | 1       | 3          | 10         | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 21 |            |           |          |       |           | 1       | 3          | 11         | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 22 | 116        | 219       | 103      | 19    |           |         |            |            |          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 23 |            |           |          |       |           | 0       | 0          | 0          | 16       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 24 |            |           |          |       |           | 0       | 0          | 1          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 25 |            |           |          |       |           | 0       | 0          | 2          | 88       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 26 |            |           |          |       |           | 0       | 0          | 3          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 27 |            |           |          |       |           | 0       | 2          | 0          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 28 |            |           |          |       |           | 0       | 2          | 1          | 15       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 29 |            |           |          |       |           | 0       | 2          | 2          | 89       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 30 |            |           |          |       |           | 1       | 3          | 0          | 104      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 31 |            |           |          |       |           | 1       | 3          | 1          | 0        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**Note** The csv file can be used for manual offline analysis only as the CyPE-tool import feature needs a ped file to do the power plot.

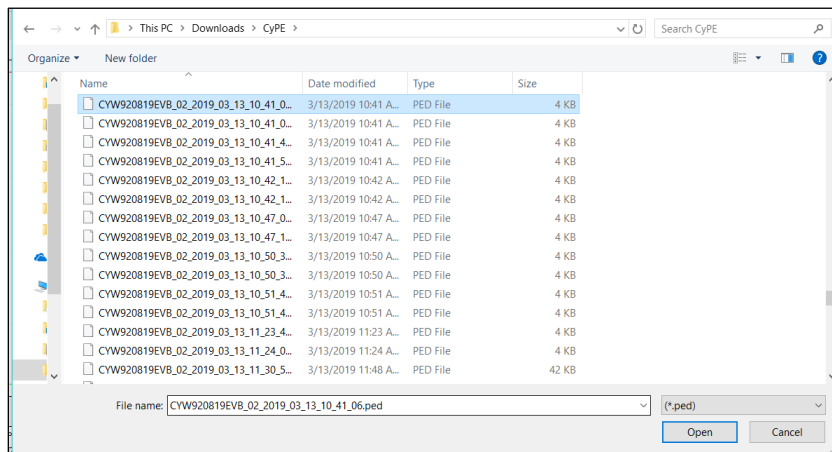


## Offline Analysis

The CyPE tool supports offline analysis. Using this feature, a captured log file can be viewed offline to perform some offline analyses on the power log data that is captured.

As described under [Log File](#), logs are stored in the ped compressed container along with the power database file in the event dump location. To import the ped file and view it using the import feature, click on the **Import tool bar button**.

This will open a file browser window to select the ped file.



Select a file to view and click **Open**. This will plot traces corresponding to the log data in the ped file.

## Troubleshooting

### Failure in target connection

After configuring the Power Estimator settings and clicking **Connect**, click the **Start** button. If you get an error pop-up, then one of the following may have occurred:

1. The Power Estimator settings are not configured properly.
2. Failure to establish the serial communication.
3. Failure to detect the Power Estimator enabled target.
4. The platform power database xml file is missing.
5. The power database file and the Target-CyPE software versions mismatch.
6. Failure to get the supported power-event list from the target.

A message will display for each of these errors with a corresponding description. Check for the above errors and address the problem as follows:

#### Case 1:

Ensure the Power Estimator settings are configured properly, such as the sections for the serial port, the Power database file path, as well as a valid Event log dump location.

#### Case 2:

Ensure the selected COM port is valid and not owned by others.

### Case 3:

Ensure you have selected the correct COM port.

Ensure the Power Estimator is supported and enabled on the platform.

Ensure the target platform is not in the sleep state.

Ensure the connected target platform and the target name in the power database file match.

### Case 5:

Ensure the provided platform power database file exists in the platform file location.

### Case 6:

Ensure the target platform is not in the sleep state.

## No response for Start

If the target platform is in the sleep state, it may not respond to the **Start** button. A message displays "Response Not Received." Bring the target platform out of the sleep state and click **Start** again.

## No response for Stop

If the target platform is in the sleep state, it may not respond to the **Stop** button. A message displays "Response Not Received.". Bring the target platform out of the sleep state and restart the capture. Ensure the **Stop** command is issued when the target platform is not in the sleep state.

## Data not available

Ensure the power database file is correct.

## Limitations/Known Issues

The basic principle behind the power estimation is to log different states and the duration in each state for each identified power event. This duration, along with the pre-defined value of the current for these states, is used to calculate the estimated power.

If the power numbers vary for different boards for a given platform version, then the tool will not be able to capture this, because there is a single current database maintained for a supported platform.

The tool depends on the power database for power estimation. If the database is wrong, then the power estimation will be wrong.

Finally, the tool estimates only power that is not actual power. To get an actual power number, use a hardware tool such as Agilent.

## Version Changes

This section lists and describes the changes for each version of this tool.

| Version | Change Descriptions         |
|---------|-----------------------------|
| 1.0     | New tool.                   |
| 1.1     | Added command-line options. |
| 1.2     | Added a new version.        |

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