

PMT Sensor API

PMT Sensor API Services Version 1.0

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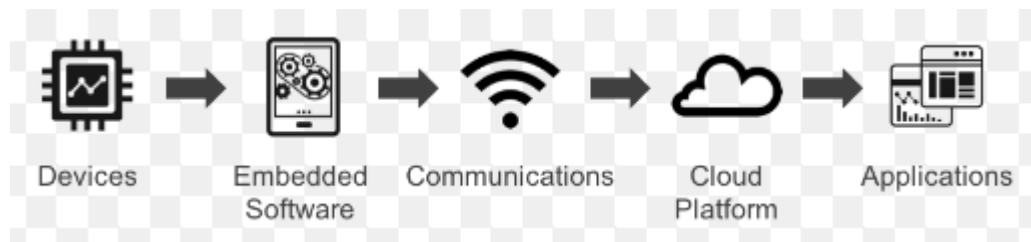
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1 Introduction

Over the past few years, electronic and cloud computing technology has offered a diversity way to work with sensors and micro services. PMT Sensor API (Application Program Interface) is a framework providing unique patterns which can be used to bind data acquisition from devices, embedded software, communications cloud platform, and applications. The overall end product of these co-operation systems is what is known today as the Internet of Things (IoT). The purpose of this document is to provide a complete and unequivocal guide to setup PMT Sensor API using Raspberry PI, and the Arduino microcontroller assembly.



1.1 Problem statement

First, PMT prototype systems currently do not have the ability to monitor a variety number of sensor responses of over the Internet. This is especially problematic for when PMT is in need for "business proof of concepts" solutions. Second, PMT currently has a very limited number of mobile devices available for showcases. This can be remedied by establishing cross-platform solutions that can operate on desktop (Windows/Mac) computers or mobile devices (Windows,

Android, iPhone, iPad). Last, projects deadlines and cost must be reduced to a minimum. Because many of these features are short-term applications (i.e. proof-of-concepts) projects can be refactored with HTML, it can simplify working with resource files, it can work with JavaScript and ASP Core files and CSS.

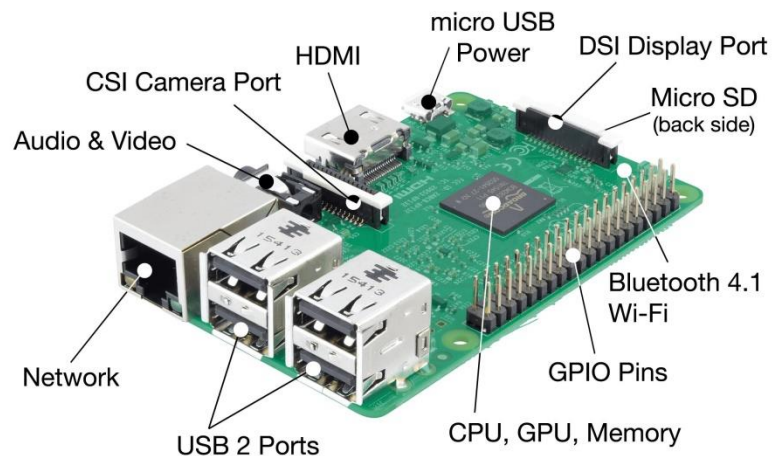
1.2 Goal of PMT Sensor API

The overall goal of PMT Sensor API is to develop a set of applications that would resolve the issues mentioned in the previous sections. This goal can be further decomposed into the following areas of interest:

1. Devices- Ability to prototype sensor
2. Embedded Software – toolset of Arduino c base scripts, Raspberry Pi python scripts and ASP Core Csharp scripts
3. Communications- I2C, Http, Wifi and hotspot alternatives
4. Cloud Platform- Azure Cloud services
5. Applications – Windows installer and Phonegap services

2 Hardware

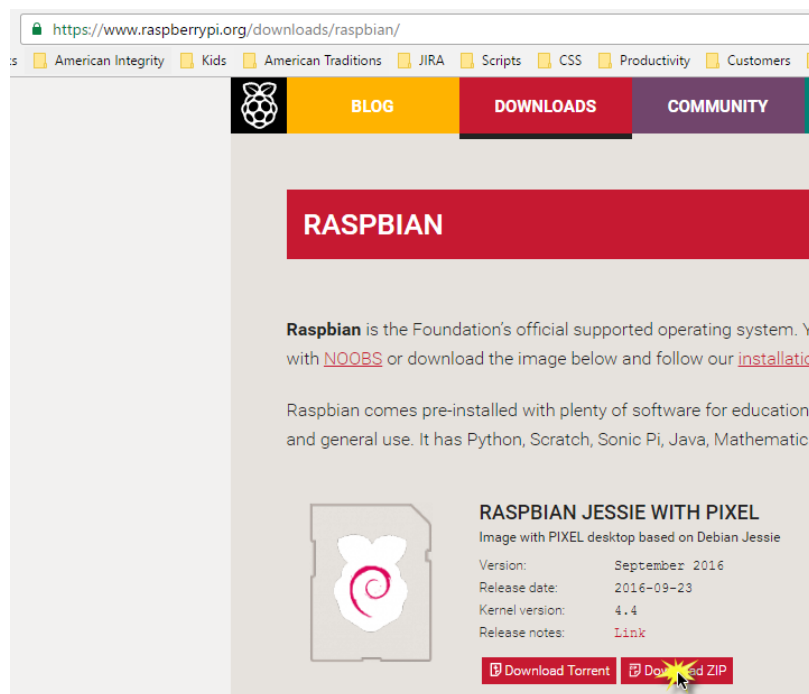
1. - Raspberry Pi 3 or Pie Zero – Model B
2. - MicroSD card
3. - MicroSD to SD memory card adapter
4. - Micro USB power supply 2.5A or greater recommended
5. - Windows laptop/desktop
6. - HDMI monitor/USB keyboard/mouse



3 Write Raspbian Image to SD Card

1. Download the latest Raspbian image from

<https://www.raspberrypi.org/downloads/raspbian/>. Be sure to download the full version

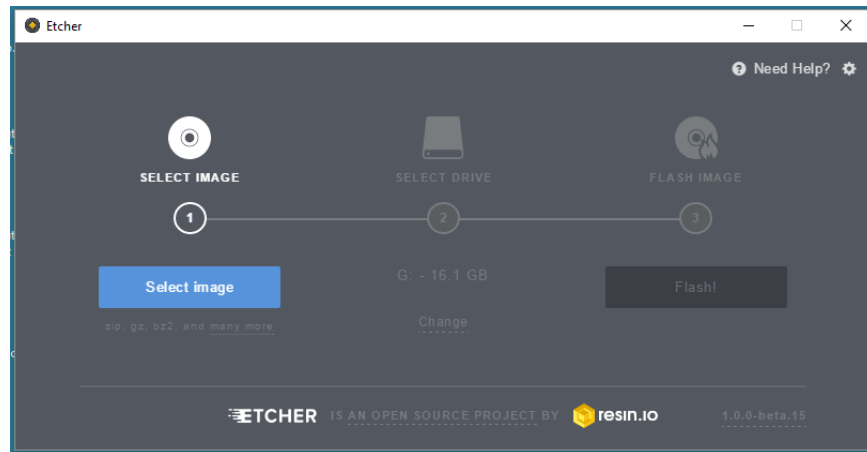


2. Insert the microSD card into the SD adapter

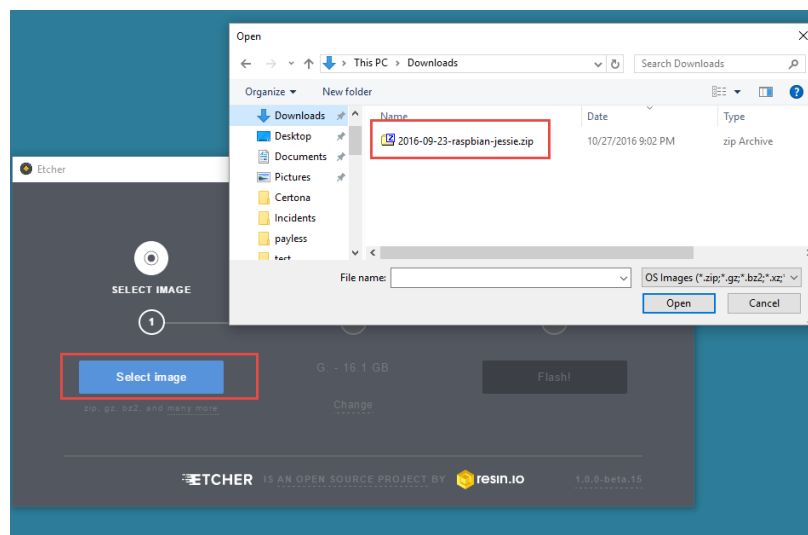


3. Insert the SD adapter in the SD card reader on your laptop/desktop

4. Launch Windows Explorer and verify that the SD card registers as a drive on your system
5. Download and install Etcher at <https://www.etcher.io/>. Etcher is tool for flashing images to SD cards
6. Launch Etcher.

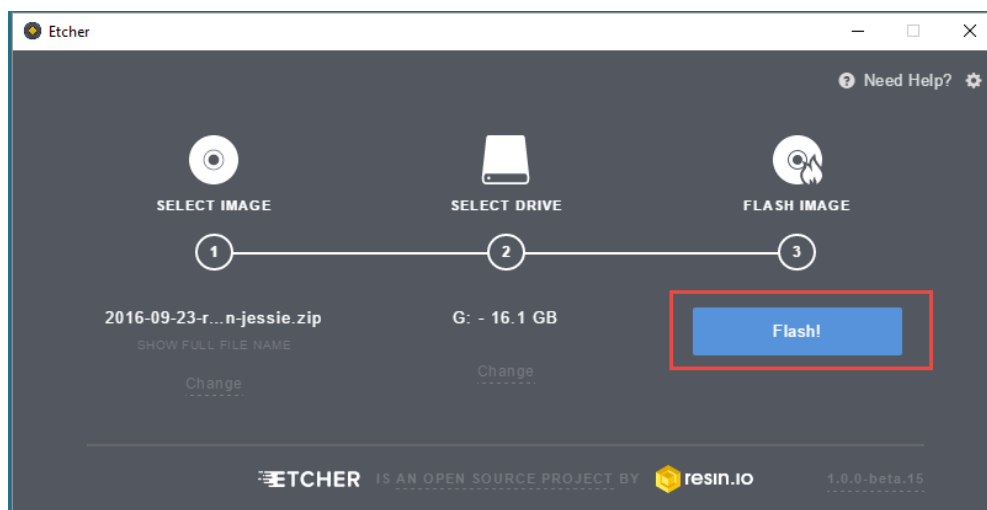


7. Click the Select image button and navigate to the Raspbian zip file that you downloaded.



8. Click the Select drive button to specify the target device location of the SD card.

9. Click the flash button to write the image to your SD card.

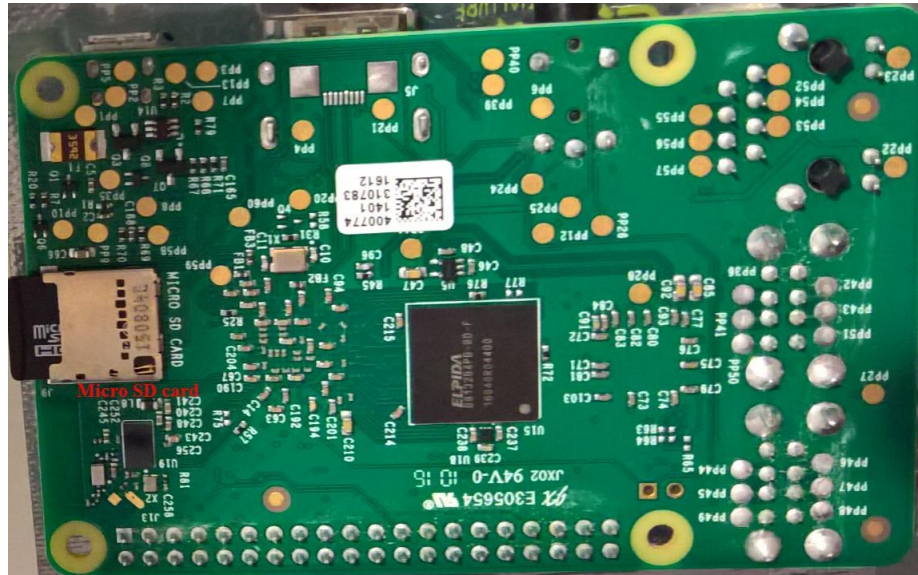


10. After the image is written to the SD card and verified, Etcher will automatically dismount your SD card so it can be safely removed.

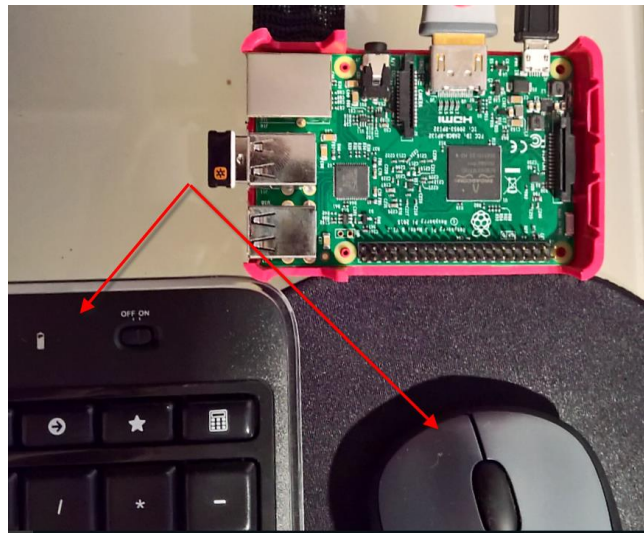
11. Remove the SD adapter from your laptop/desktop, and remove the microSD card from the SD adapter.

4 Prep The Hardware

1. Insert the microSD card into the RasPi.



2. Connect the USB keyboard and mouse
3. Connect the HDMI cable
4. Connect the power supply
5. You should now see Raspbian booting on the screen



5 Apply Raspbian Updates

1. `sudo apt-get update`
2. `sudo apt-get upgrade`
3. `sudo apt-get install mono-complete`
4. `sudo apt-get install monodevelop`
5. `sudo apt-get install Arduino`
6. `sudo apt-get install python-serial`

6 Mount A USB Flash Disk On The Raspberry Pi

This procedure for using USB flash drives with the Raspberry Pi where the Pi user has permissions to use it without needing “sudo”

1. Plug In The Device
2. Identify The Devices Unique ID In order to find the unique reference (UUID)
for your drive run the following command in the terminal: **ls -l /dev/disk/by-uuid/**
3. Create a Mount Point. A mount point is a directory that will point to the contents of your flash drive. run the following command in the terminal:
sudo mkdir /media/usb make sure the Pi user owns this folder by running the following commands: **sudo chown -R pi:pi /media/usb**
4. Manually Mount The Drive. To manually mount the drive use the following command: **sudo mount /dev/sda1 /media/usb -o uid=pi,gid=pi**

7 Copy Python and Web API packages

Copy the following software packages from the USB drive to the `"/home/pi/"` directory of the Pie:

- bootstp.py
- config.json
- sendpmt.exe
- newtonsoft.json.dll
- launcher.sh

***note: change launcher.sh to modify the sleep time. 5 seconds for Pi Zero and 3 seconds for the Pi 3 assembly**

You don't need to manually un-mount if you shut down your Pi but if you need to remove the drive at any other time you should un-mount it first. Only the user that mounted the drive can un-mount it.

1. `umount /media/usb`
2. `sudo umount /media/usb`

8 Setting up Wifi / Hotspot credentials

Two options for setting up a wireless connection. It might seem easier to boot into the GUI, but really it's more straightforward to do it in the command line. You should already have your SSID name, but if not, use

1. `sudo iwlist wlan0 scan`
2. `sudo nano /etc/wpa_supplicant/wpa_supplicant.conf`

You'll need to add or edit the following (hotspot) credentials:

```
network={
  ssid="SSID"
  psk="WIFI PASSWORD"
}
```

Press **CTRL+X** to exit and save, pressing **Y** and **Enter** to confirm. Wireless connectivity should start immediately; if not, reboot the raspberry pi.

9 Cloud Services and 3rd Party Accounts

In real-world software development, applications are developed in teams of multiple developers. An interesting feature about Azure cloud services and PMT Sensor API is that both can support a comprehensive selection of operating systems, programming languages, and frameworks allowing for more flexible workload decomposition and more efficient development. For example, PMT Sensor API was developed with Microsoft ASP Core framework. As a result, applications can run cross-platform with some minor cosmetic changes. Because the source code has been provided and labeled with its corresponded project type, this section will not cover any code review, but instead provides third party accounts utilized for web, databases, email and text.

9.1 Cloud Services – Azure

Website: <http://portal.azure.com>

User: cperez.pmt@hotmail.com

Password: 08&pmt-FL-W

9.2 Database Services - Azure

```
Server=tcp:pmt.database.windows.net,1433;  
Initial Catalog=PMT;  
Persist Security Info=False;  
User ID=cperez;  
Password=08&pmt-FL-W;  
MultipleActiveResultSets=False;  
Encrypt=True;  
TrustServerCertificate=False;  
Connection Timeout=30;"
```

9.3 SendGrid Email Services

SendGrid gives Azure users 25,000 free emails for membership

Name: pmtemail

User: azure_cec5c13c9612308aa7a7e2fcec934636@azure.com

SMTP: smtp.sendgrid.net

ApiKey: SG.J8cAb6HWRJ6p7IEcTRZFpA.jDSiK0YMAmk6azPxDmKLiAzU4Rw-PZXaFSYokeEvabVY

9.4 Twilio Text Services

Website: <https://www.twilio.com/login>

User: cperez.pmt@hotmail.com

Password: 08&pmt-FL-W

Tel: +17272286446

SID: AC3b018ad6998950832e626e5f1a1c6f43

Secret: lxxZTtSIOytCLIQaXsQP8tyyAQvfB9II

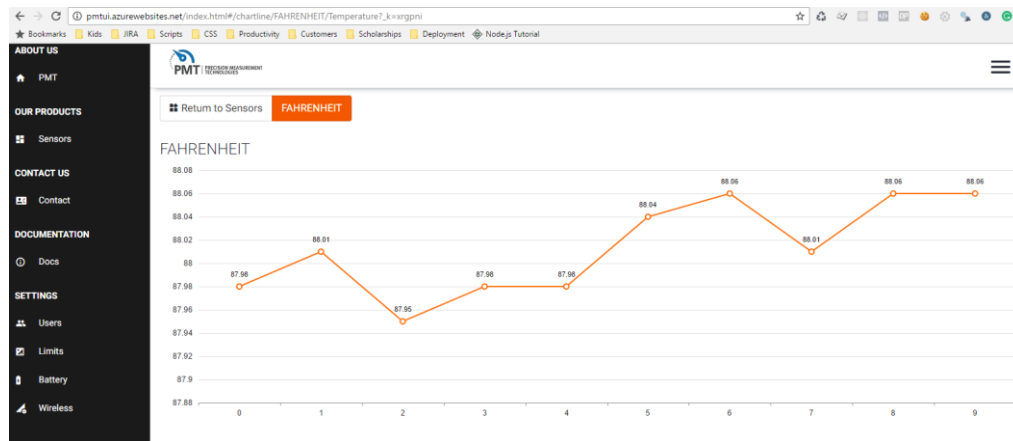
10 PMT Sensor Application Setup Installation Process

PMT Sensor Application is the program that interfaces with the end user. Because PMT Sensor Application was built with the proof of concept in mind, it takes advantages of mobile and desktop friendly deployments. With a combination of new web technologies, including HTML5, Node Js, and ASP Core developers can deliver an app-like interactive user-experience via the web browser, desktop, and mobile. This section provides a high-level overview of the basic operation of PMT Sensor Application.

10.1 Web Application Access

Web Browser PMT should be the only company utilizing this service. It is currently used for Testing purposes (Staging). Developers can beta test features without having to have the need of releasing a new software version. Also, it proof the concept that PMT can deliver web applications to clients.

Website link: <http://pmtui.azurewebsites.net/index.html#/docs? k=you1yc>



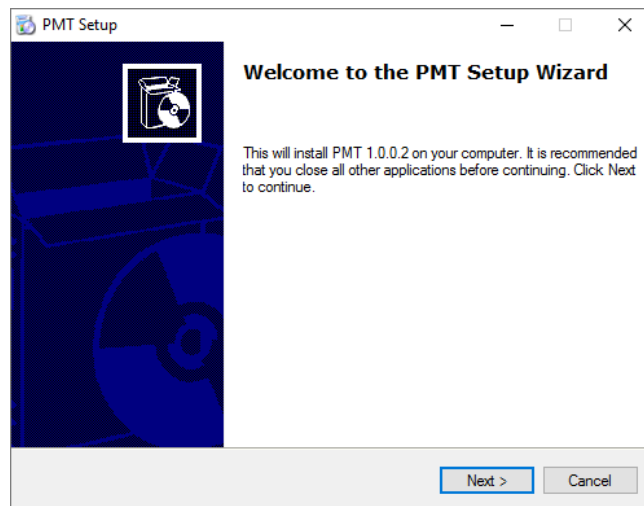
10.2 Windows Installation

Windows version (.exe) One of the key benefits of using Windows application is that the application is compiled natively to C++ level. As a result, the application takes performance advantages by using local computing resources. The setup can perform new, custom and upgrade installations via standard installation Wizard. Currently, users can install this application via 32-bit or 64-bit starting from Windows 7 up to Windows 10.

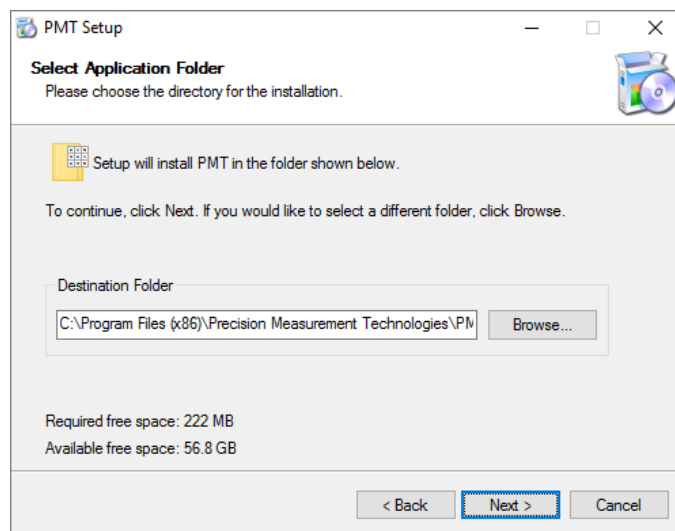
Click the “PmtInstaller.exe” button to start the installation wizard.

Windows Explorer			
PmtInstaller.exe	11/16/2016 8:03 AM	Application	147,047 KB

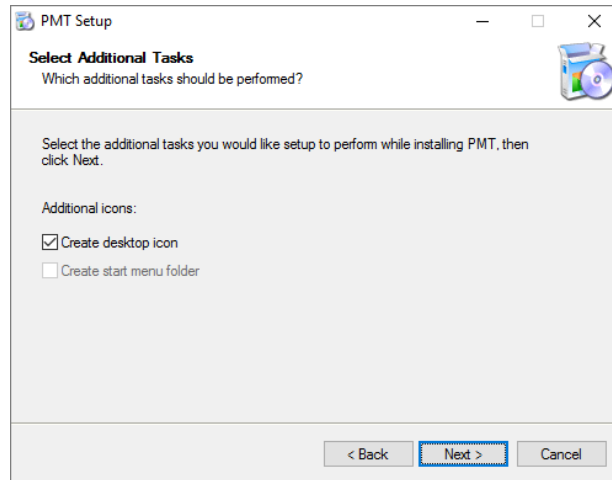
Click the “Next >” button to continue.



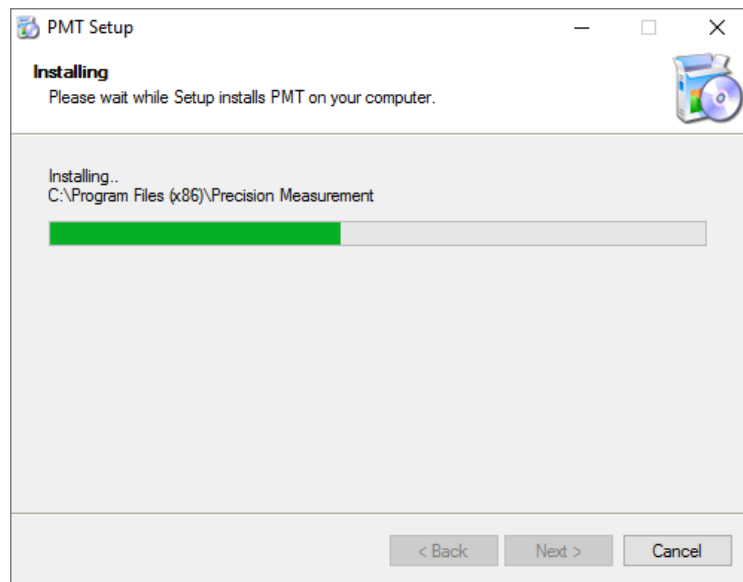
Select folder installation and click the “Next >” button to continue.



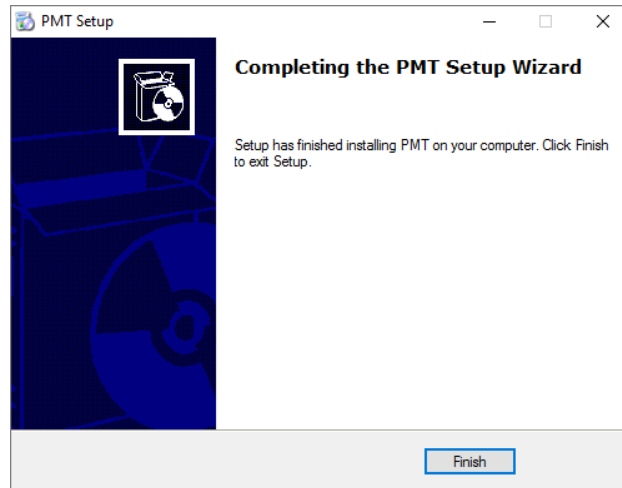
Check the Create desktop icon and click the “Next >” button to continue.



Wait for the installing process to be completed and click the “Next >” button to continue.



Click the “Finish” button to complete the installation.



10.3 Mobile Installation

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