COPSONIC

SonarDistance Application

User Guide

Confidentiality	Reference	Version	Number of pages	Last modified
Confidential	**/**		**11**	**11-01-2021**

SUMMARY

1. Introduction

The SonarDistance App has been developed to illustrate CopSonic's capacity to measure the distance between devices and warn people if they get too close. Distributed as an SDK, this technology is available for all smartphones (Android, iOS).

SonarDistance allows calculating the distance between nearby devices with an accuracy of +/- 10 cm. The user's smartphone broadcasts and receives a message from another smartphone in proximity using a combination of Bluetooth Low Energy (BLE) and ultrasound signals. Once the two smartphones discovered each other, the calculation time is around 10 seconds. The distance measurement between the devices in close range is performed by ultrasounds, thus confirming the absence of physical barriers such as walls, doors or windows.

The devices just use their existing speakers and microphones. This application works in online and offline mode. The advantages and disadvantages of both modes will be explained in this document.

2. Uses Case

The user's smartphone notifies the distance of the nearby-detected devices and warns when they are located in the "danger range" previously defined.

The nature of the warning will depend on the aimed user experience (notification, buzz, sound...). The current demo shows in red the devices "too close".

This app does not generate a log of all device IDs met during the user's journey for tracing purposes. This can be implemented in compliance with local regulations for the protection of private data. SonarDistance can be combined with blockchain technologies as to safely store contacts and manage feedback notifications when necessary.

3. Installation

The application is available for Android and iOS and it is interoperable between both platforms.

Once installed, on the device will appear the following icon:

The application needs access to some devices resources like Bluetooth, internet and microphone that should be granted by the user.

Location permission is required for the proper functioning of Bluetooth BLE in some versions of Android.

Installation for Android

The Android application is ready for download at the following links:

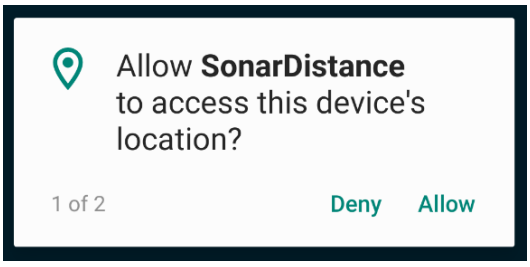
Google Play Store:
https://play.google.com/store/apps/details?id=com.copsonic.apps.sonardistance&hl=en

Copsonic Store:
https://apps.copsonic.com/ApplicationDetails.aspx?ApplicationId=311

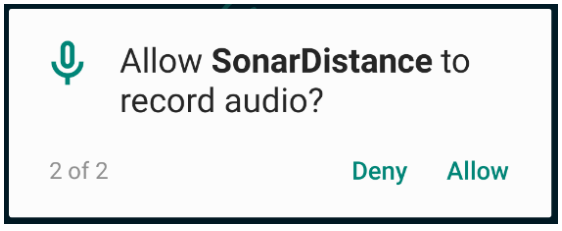
Permissions request

The app requests permissions when starts up:

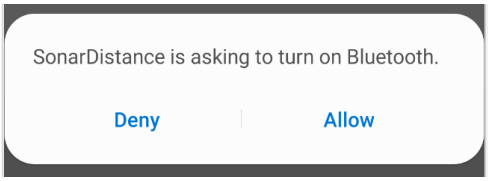
Location permission is required for the proper functioning of Bluetooth BLE in some versions of Android:

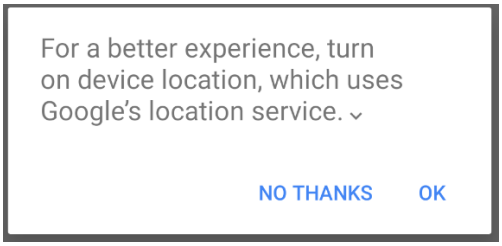


Record audio permission:



When the user starts the service (by pressing the "Start" button); if Bluetooth and Location are not on, the application requests for them to be turned on:





Installation for iOS

The Android application is ready for download at the following links:

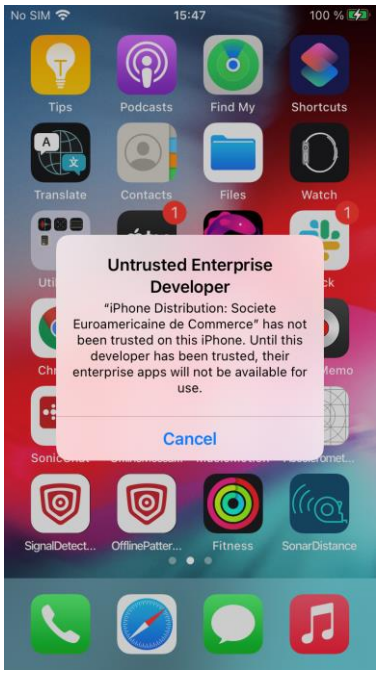
App Store:

https://apps.apple.com/fr/app/sonardistance/id1544093521?l=en

Copsonic Store:

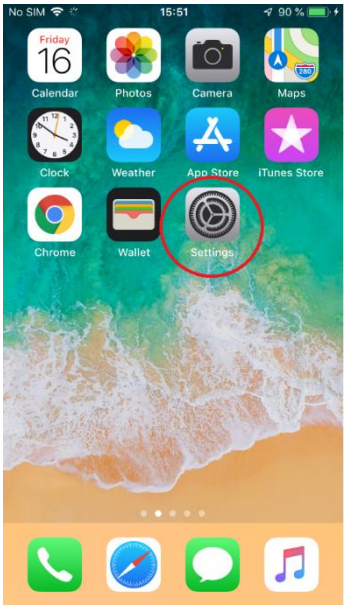
https://apps.copsonic.com/ApplicationDetails.aspx?ApplicationId=311

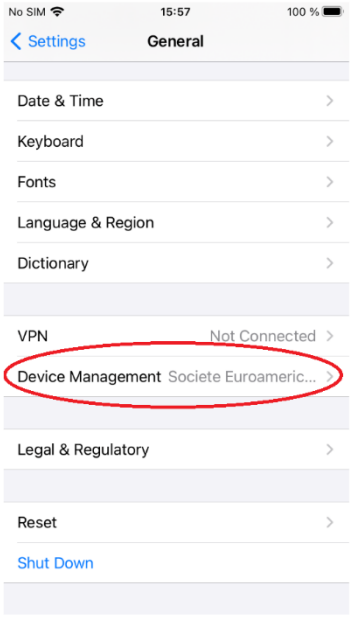
Once the app is installed, when trying to run it, a warning will probably appear that the certificate is not reliable since the app has not been downloaded from Apple's App Store.

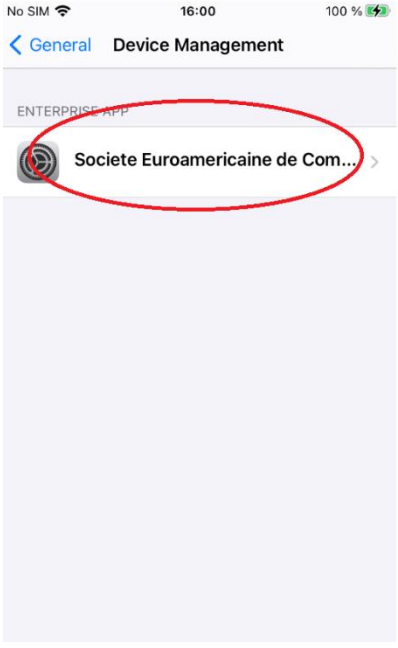


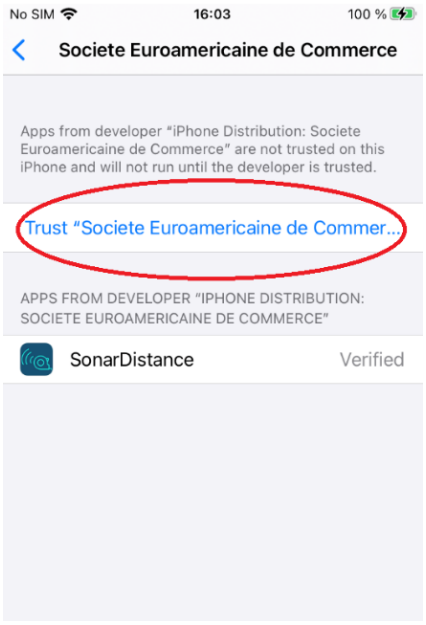
To indicate the system that we do trust the certificate we must follow these steps that may vary depending on the Apple device and OS version:

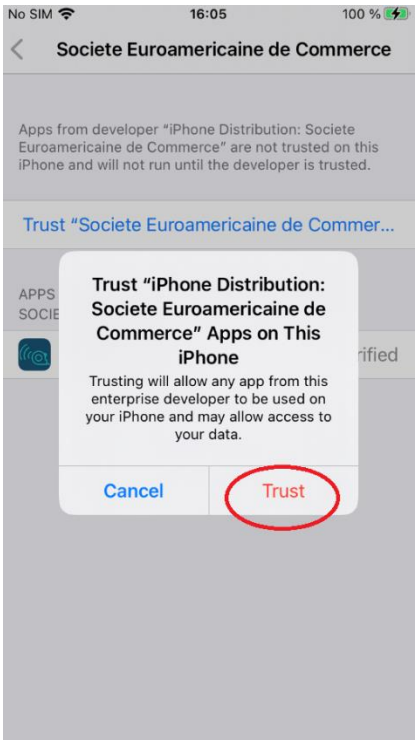
1- Go to Settings\Generals\Device Management:





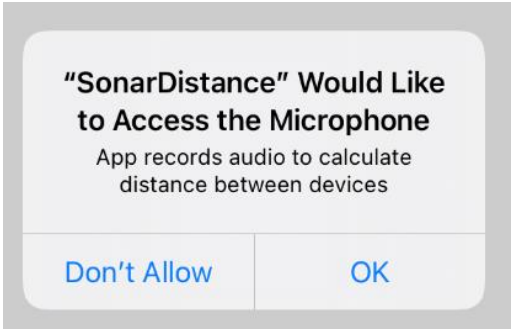




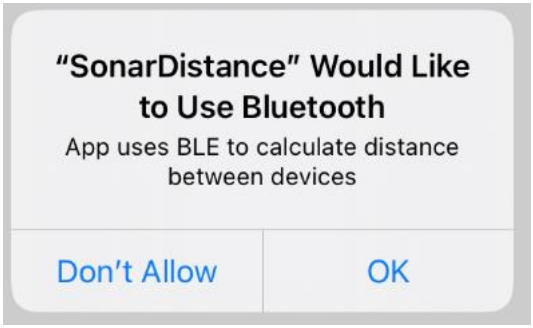


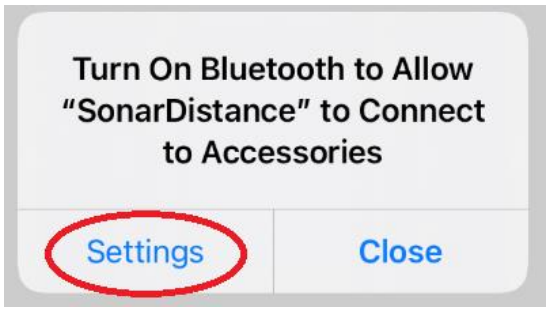
Permissions request

The app requests the Record audio permission when starts up:

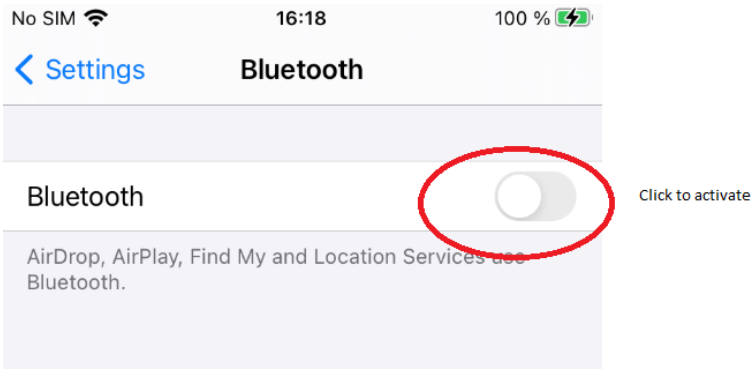


When the user starts the service (by pressing the "Start" button); if Bluetooth is not active, the application requires that it be turned on:



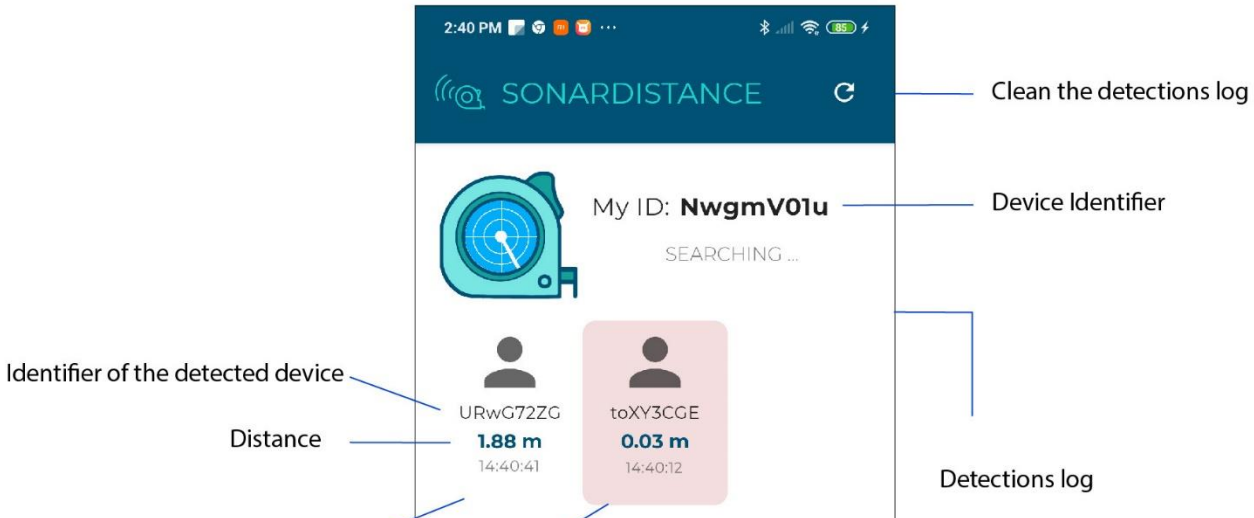


Clicking on "Settings" will open the Bluetooth settings to be activated:



4. How to use it

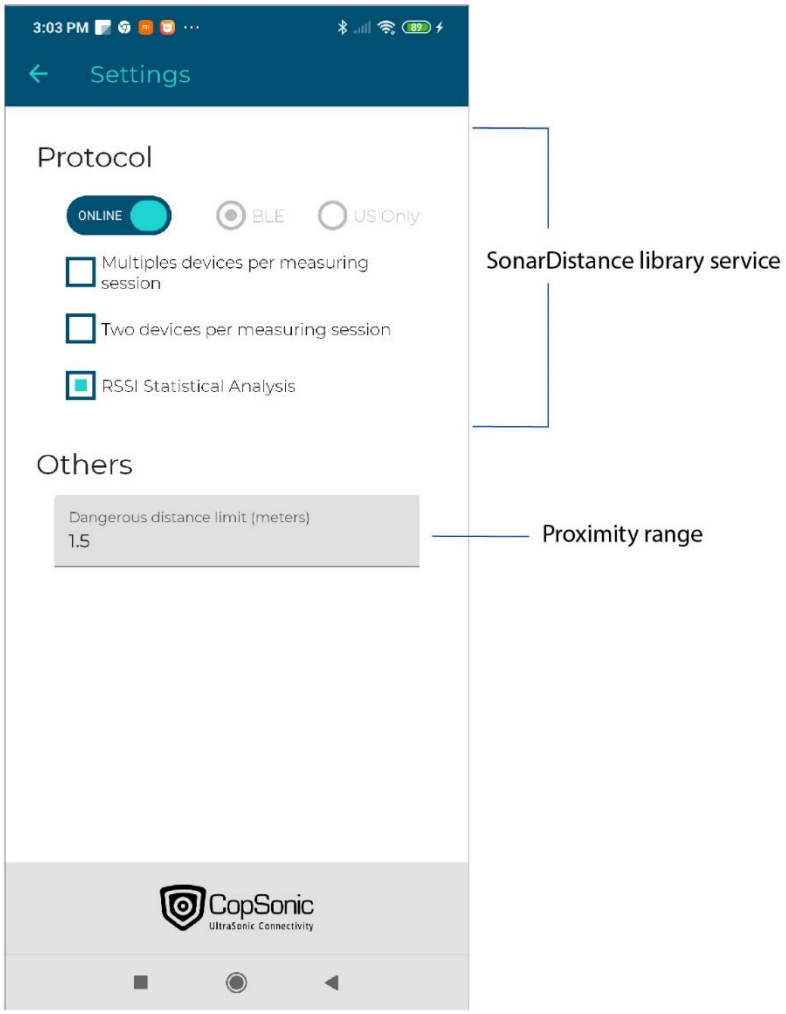
The following picture describes the application main screen:



The detections log displays the devices discovered by the app. When a device is not detected anymore, it disappears of the detections log. For example when one of the devices in the network stops the app, it will disappear of the detections log of the rest of the devices.

Every time the service starts, it cleans the detections log.
The app shows in red the devices located within the proximity range. The proximity range is defined at the settings screen.

The following picture describes the Settings screen:



SonarDistance library offers different services for measuring the distance (online/offline, one/multiple devices). This application shows the use with multiple devices and allows configuring the library service.

All devices in the network should have the same protocol configuration. Devices of different configuration are not detected from each other.

The application works in online or offline mode.

With **“Multiple devices per measuring session”** and **“Two devices per measuring session”** the distance measuring is done every 2 minutes.

With **“RSSI Statistical Analysis”** the distance measuring is done when the distance changes. This algorithm uses the RSSI(BLE) and the device accelerometer(movement) to force the ultrasound measuring process. That means that if both devices stay quite after the last measuring, they do not need to recalculate.

5. How it works

The current demo works as follows:

- The App broadcasts a BLE beacon signal to indicate his presence to nearby devices.
- The App scans for BLE beacons trying to detect nearby devices.
- When a BLE beacon signal is detected, the App tries to connect with the detected device.
- Once connected, both devices are synchronized to start the measurement process.

  Offline mode: The synchronization process and the data exchange is done by BLE.
  Online mode: The synchronization process and the data exchange is done by a web service.
- Once synchronized, the distance measurement process starts using US signals.
- Both devices show the calculated distance.
- On a regular basis (every X seconds), the distance is recalculated if needed.

Detail to be taken in account:

The distance measuring process is done between devices in proximity range without physical barrier like walls, doors, windows, etc.

Online Mode:

Smartphones are required to have internet connection.
In 1 minute, the solution can measure the distance with up to 10 devices.

Offline Mode:

The number of devices measured in 1 minute is lower than in online mode. We can unfortunately not give a precise number of devices considering the BLE connection behavior is variable from one device to the other.

6. Roadmap

CopSonic is working on a new approach using Bluetooth RSSI and audio magnitude to measure the distance. With these magnitudes, there is no need of information exchange between the devices, thus improving both the number of devices per minute and the measuring time.