

Volume

1



REDVOX INC.

Android App Version 2.6.18

RedVox-Android User Manual

REDVOX INC.

RedVox Android User Manual

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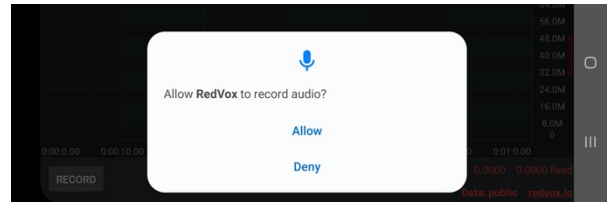
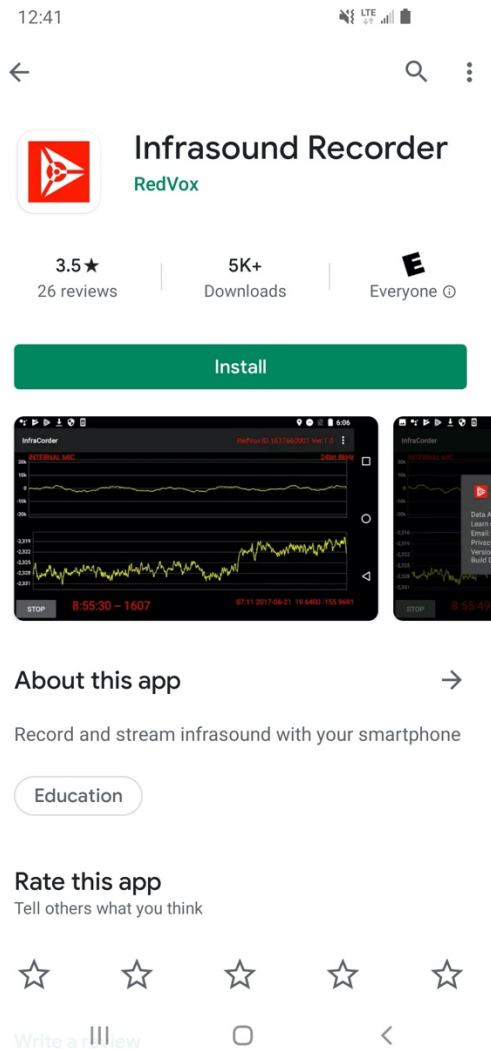
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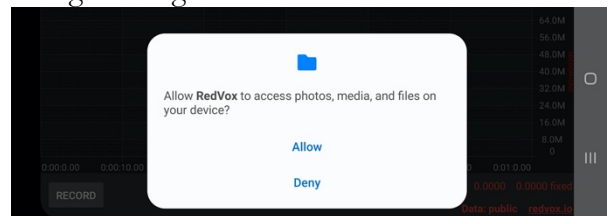
A Samsung S10 was used in this User Manual. For more information email
dev@redvoxsound.com

Installing the App and First Use

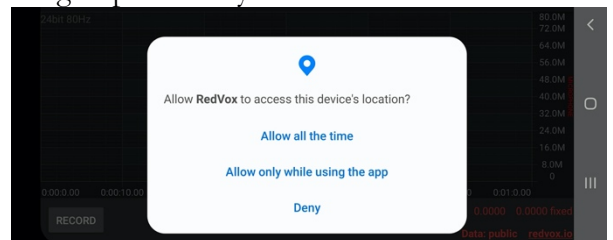
1. Download the app from the Play Store.
2. Once it is installed, open the app.
3. A pop up will ask for the following permissions to collect data:
 - a. Record audio.



- b. Allow saving to the RDVX file directory. Permission will be requested to access photos, media, and files on device, as it is standard Google dialogue.



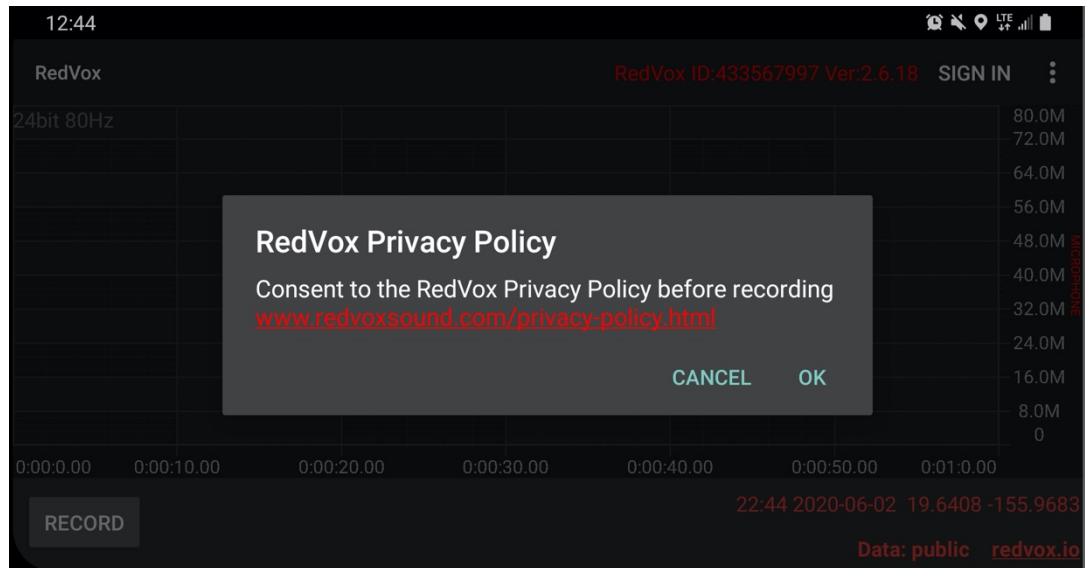
- c. Access the device location. The location is used for geospatial analysis.



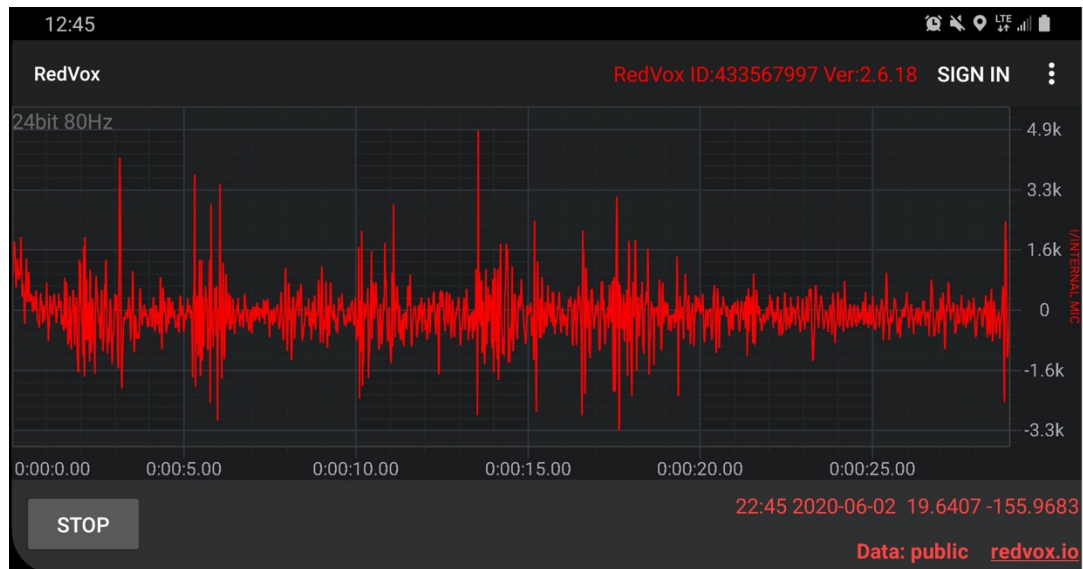
4. Tap Record (in the bottom left-hand corner).



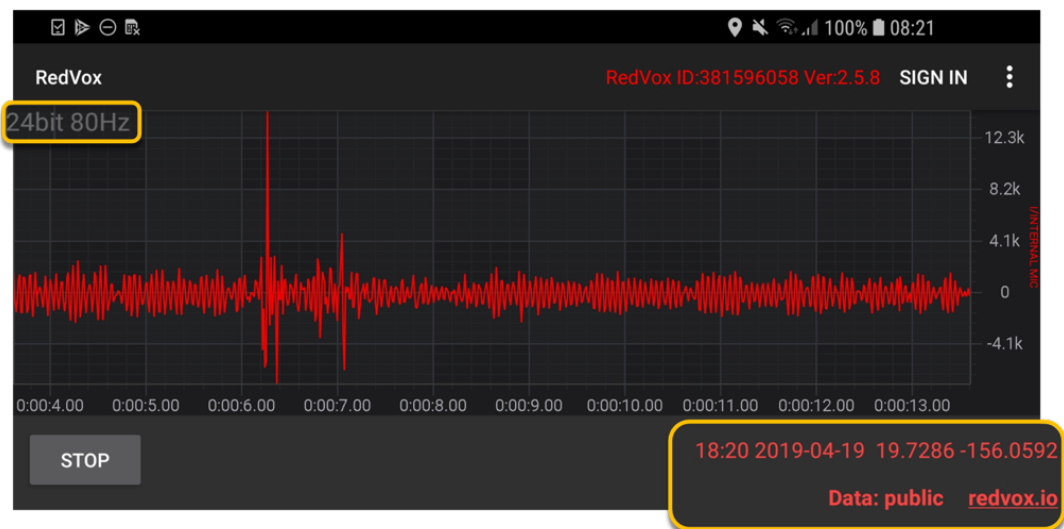
5. Scroll through and accept the Privacy Policy (redvoxsound.com/policy).



6. The screen should start to plot a waveform. See below for reference.



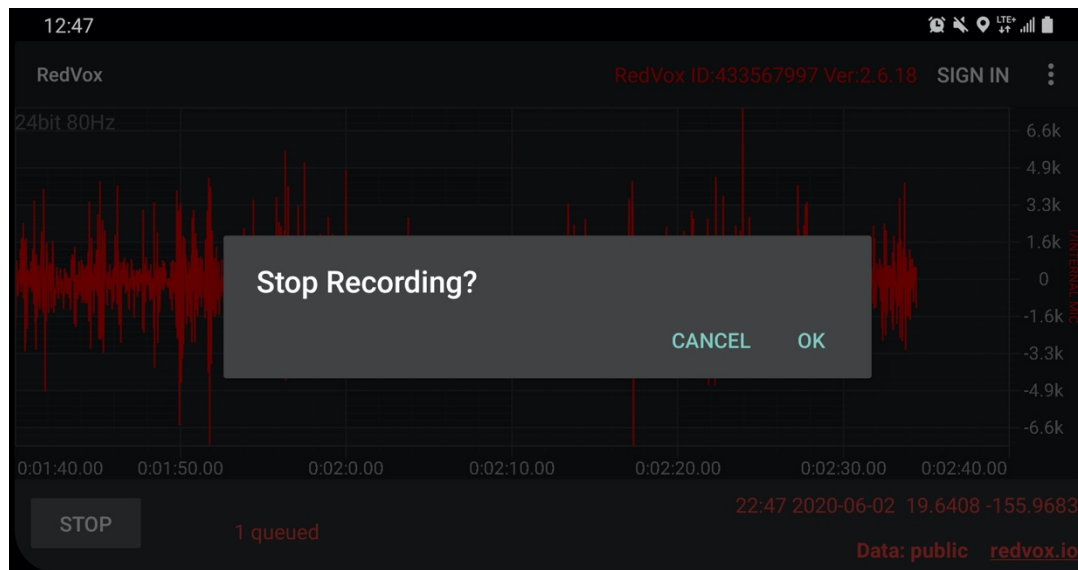
- a. The app will collect infrasound with a default sampling rate of 80Hz. The sampling rate can be seen in the top right-hand corner (highlighted in orange). The sampling rate is how many samples are being collected per second. The Universal Time, device location, and RedVox data privacy status can be seen in the bottom right corner of the screen (highlighted in orange).



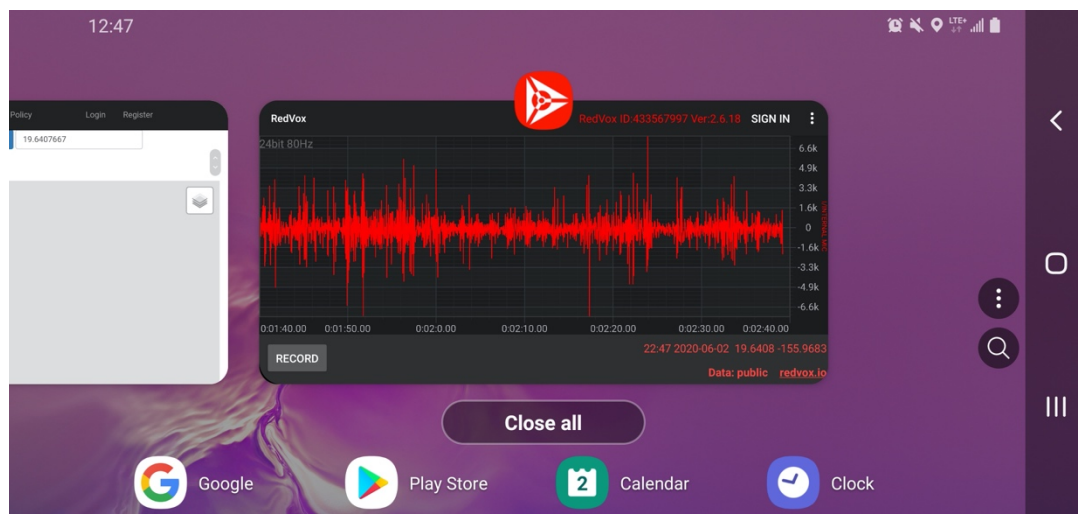
- b. If data is not saving to the Cloud storage, a number and SYNC ERR will pop up on the bottom of the screen. The number indicates how many files are backed up on the device (not being saved to the Cloud storage). This error is either due to poor communication, bandwidth, or an incorrect synch server.



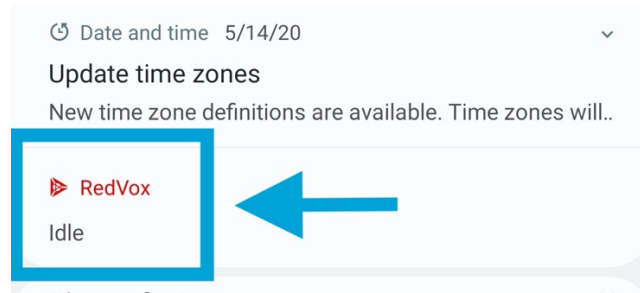
7. To stop collecting data, tap on the Stop button. A pop up will appear asking if you want to stop recording. Tap OK and data will stop being collected. The timer on the bottom left will also stop.



8. To exit the app, go to the phone's task manager and swipe to close the app, or press the Back arrow twice. Recording and location tracking stops when the app is closed.

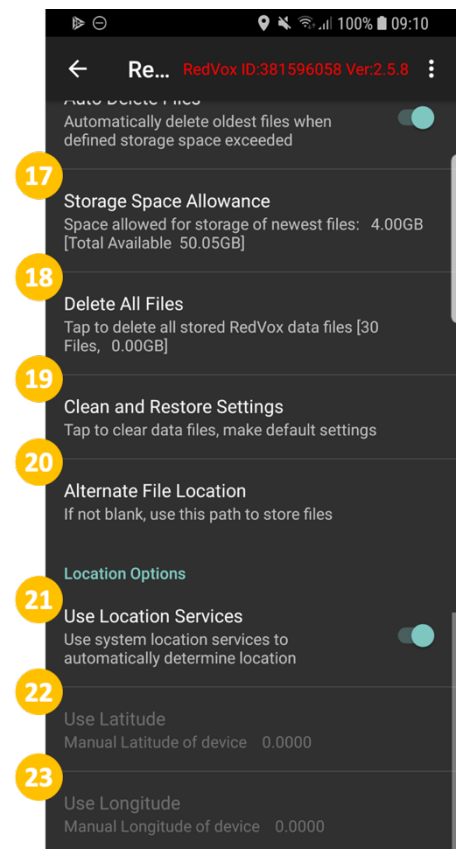
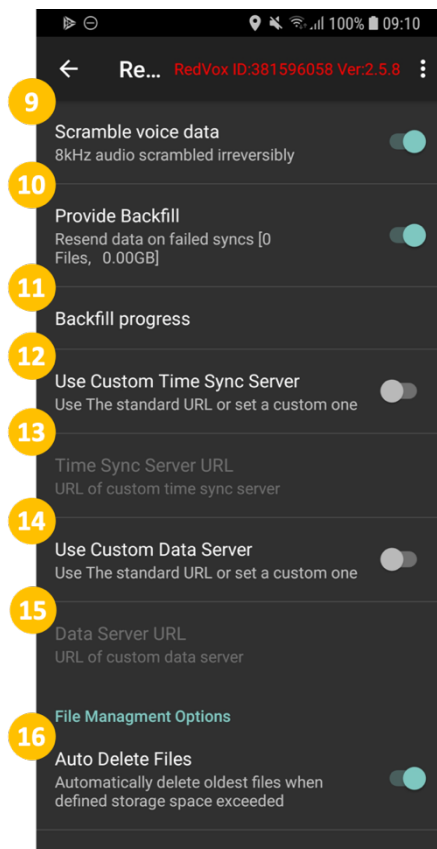
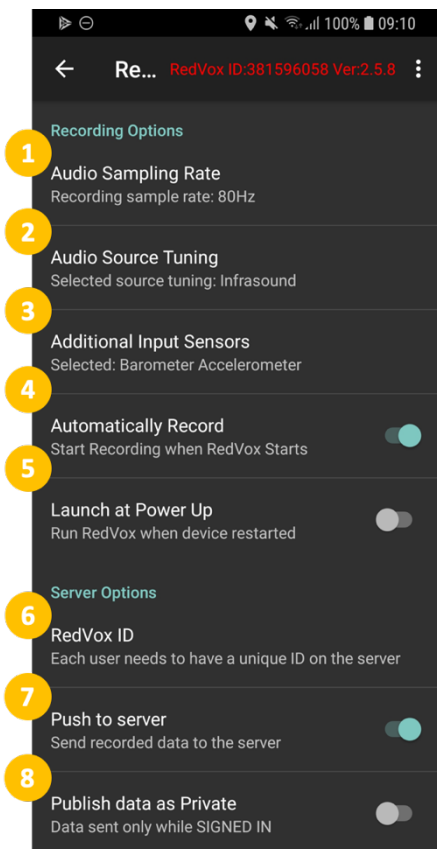


- a. To ensure that the app has stopped running, check the status bar on the top of the screen. If the RedVox icon is there – the app is still running, if it is not – the app stopped or your smartphone does not support this icon display.

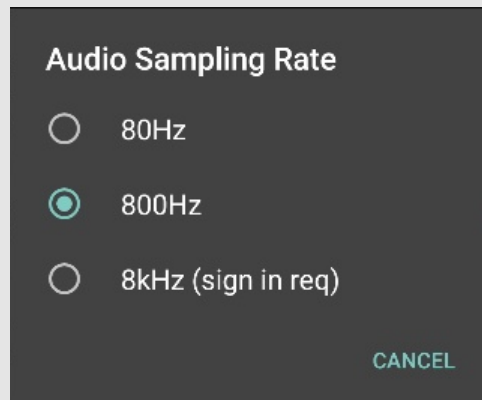



RedVox App Settings

The figure below shows the settings in the RedVox app. These settings have not changed substantially from v.2.5.8 except for the Additional Input Sensors described below.



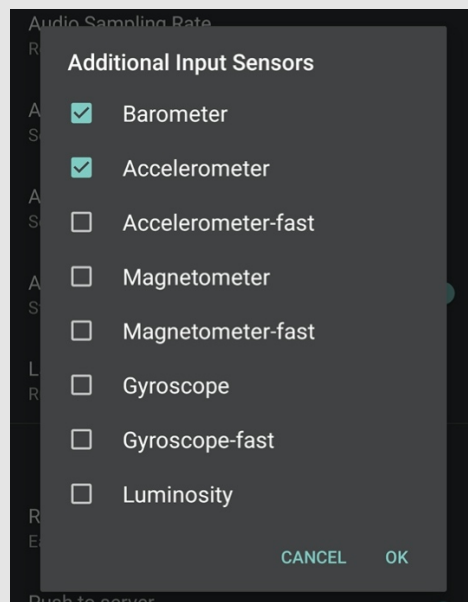
1. **Audio Sampling Rate** - The default sample rate is 80 Hz. The sample rate can be 80, 800, or 8 kHz.



To enhance the quality of data, the sample rate should either be 800 Hz or 8kHz. Go to  > Sample Rate > 800 Hz or 8 kHz > Done.

****NOTE:** In order to collect data with a sampling rate of 8000 Hz, an account needs to be logged into in the app

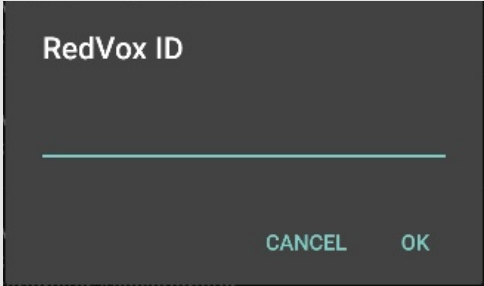
2. **Audio Source Tuning** – Choose between Infrasound, Low Audio, and Audio.
3. **Additional Input Sensor** - Disable and enable sensors to collect data from. The barometer and accelerometer sensors are enabled as default. The -fast recording requires signing in.



Add sensors by tapping on the setting > tap OK. The different types of sensors are for the barometer, accelerometer, magnetometer, gyroscope, and luminosity. Older devices may not have all of these sensors, so the readings will be inadequate.

****NOTE:** The different sensors can be plotted on the main screen. To select a sensor to plot, go to the (3) Sensor Menu on the main screen.

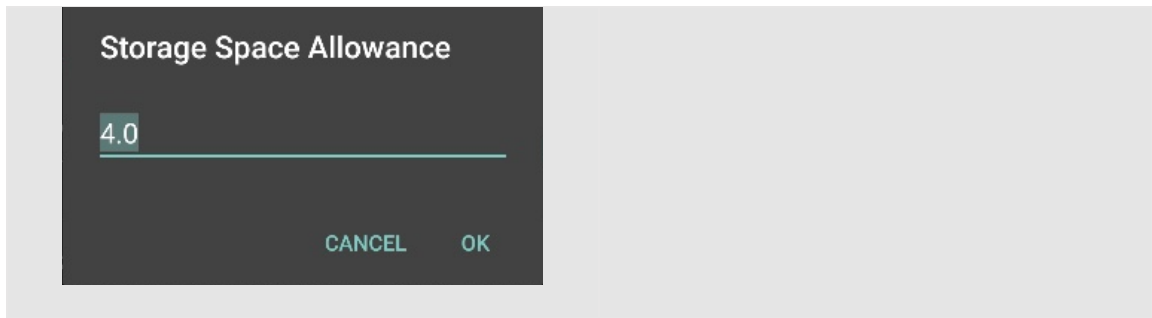
4. **Automatically Record** – Recording is automatically started when the app is opened.
5. **Launch at Power Up** – The app is launched when the phone is turned on and unlocked.
6. **RedVox ID** - A RedVox ID is a unique 10-digit number for the device.

A dark gray dialog box titled "RedVox ID" with a horizontal line for text input and "CANCEL" and "OK" buttons at the bottom.

****NOTE:** The RedVox ID can be up to 10 digits. If it is less than 10 digits, RedVox will fill the remaining spaces with zeros (ie. 15 will look like 0000000015). If there are more than 10 digits, it will not change the RedVox ID.

7. **Push to Server** - This setting is used to send data packets to the packet server and is suggested to be kept on.
8. **Publish Data as Private** - The collected data can be published as private which only allows the account affiliated with the device(s) to see the data. If the device is left as a public device, anyone can see the data that was collected. If privacy is an issue, the recommended setting is private. Go to Settings > Publish data as Private > Enable.
9. **Scramble voice data** – The audio speech band is scrambled to become unintelligible.
10. **Provide Backfill** - This setting allows files to be sent to the packet server once communications have been restored.
11. **Backfill Progress** – This shows the progress of the backfilled packets being pushed to the data server.
12. **Use Custom Time Sync Server** - This is an Expert setting. When higher time accuracy is required, it is possible to direct the app to a RedVox Time Sync Server. Details to be described in a separate section.
13. **Time Sync Server URL** – URL of custom time sync server.
14. **Use Custom Data Server** - This is an Expert setting. To have data files be sent to the custom data server, go to Settings > Use Custom Data Server > enable > Data Server URL > enter URL. Details to be described in a separate section.
15. **Data Server URL** – URL of custom data server
16. **Auto Delete Files** - This setting is used to automatically delete files after the storage space allowance has been reached.
17. **Storage Space Allowance** - This setting allows the user to dedicate an amount of space for the RedVox files on their device.

The user can allot a certain amount of internal storage for the data files. Tap on the settings and input amount of storage (in GB).



18. **Delete All Files** – Delete all RedVox files saved on the device.
19. **Clean and Restore Settings** - Clean and restore deletes all the files on the device and resets all the RedVox settings but keeps the RedVox account logged in and the RedVox ID.
20. **Alternate File Location** – Change the location of where RedVox files are saved to on the device.
21. **Use Location Services** – Use the GPS on the device for the location
22. **Use Latitude** – Input a latitude of the desired location only if the Location Services are turned off
23. **Use Longitude** – Input a longitude of the desired location only if the Location Services are turned off

Optimizing a Device for Data Collection

If the device is going to be designated for data collection, these steps are recommended for optimizing the system. The goal is to conserve power and preserve a nearly-constant data transmission bandwidth.

1. Go into the device's settings and turn off all communications on the device except cell data or Wi-Fi.
2. Standardize the home screen of the devices to make it easier to navigate through all the apps.
 - a. Recommended apps to have readily available on the foreground: Google Chrome, Settings, and Files.
3. Turn off apps that are not needed for data collection and may consume power and bandwidth.
4. Turn on Developer settings on phone (go to About Device > Build Number > Tap 6 times). Most of the Developer settings are the defaults, but some of them can help optimize continuous recording performance for long deployments.
5. The recommended settings checklist for a sensor that may be changing locations and is using Wi-Fi communications is provided in the figure below.
6. If using Cell communications exclusively for data transfer, turn off Wi-Fi to save power. Will have to turn off Airplane Mode, and confirm Bluetooth is off.
7. Go to the Play store, under Settings, turn off Notifications, turn off Auto-update apps to preserve bandwidth.
8. Under Accounts, turn off Back Up Data to preserve bandwidth.
9. If the device location is fixed and known, go to the RedVox App Settings, turn off Use Location Services, and input the latitude and longitude of the unit in decimal degrees. This will conserve power.

Below are the optimal Android settings for data collection:

	Setting	ON	OFF
CONNECTIONS	Wi-Fi	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Bluetooth	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Phone visibility	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Airplane mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	NFC and payment	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Location (High Accuracy)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SOUNDS AND VIBRATION	Nearby device scanning (Advanced)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Vibrate when ringing	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Use volume key for media	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Do not disturb (Allow exceptions > No exceptions)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Touch sounds	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Screen lock sounds	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Charging sound	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Vibration feedback	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Dialing keypad tones	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Keyboard sound	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DISPLAY	Keyboard vibration	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Auto brightness	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Blue light filter	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Screen mode > Adaptive display	<input type="checkbox"/>	<input type="checkbox"/>
	Screen resolution > FHD+ (2220x1080)	<input type="checkbox"/>	<input type="checkbox"/>
	Home screen > App icon badges	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Home screen > Add apps to Home screen	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Home screen > Quick-open notification panel	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Easy mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Icon frames > Icons with frames	<input type="checkbox"/>	<input type="checkbox"/>
	Edge screen > Edge panels	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Edge screen > Edge lighting	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	LED indicator	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Status bar > Show recent notifications only	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Status bar > Show battery percentage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Block accidental touches	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Screen saver	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GENERAL	General management > Date and Time	<input type="checkbox"/>	<input type="checkbox"/>
	Automatic data and time	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Use 24-hour format	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	Setting	ON	OFF
ADVANCED FEATURES	Smart stay	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Games > Game launcher	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	One-handed mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Finger sensor estures	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick launch camera	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Device assistance app > Analyze on-screen text	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Device assistance app > Analyze on-screen images	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Multi window > Use Recents button	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Multi window > Pop-up view action	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Smart capture	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LOCK SCREEN AND SECURITY	Palm swipe to capture	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Direct call	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Smart alert	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Easy mute	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Swipe to call or send message	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Send SOS messages	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Direct share	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Video enhancer	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Screen lock type > PIN	<input type="checkbox"/>	<input type="checkbox"/>
	Secure lock settings > Lock instantly with power key	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BATTERY	Secure lock settings > Auto factory reset	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Secure lock settings > Lock network and security	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Face recognition	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Iris Scanner	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Fingerprint Scanner	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Always On Display	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Clock and FaceWidgets > Roaming clock	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Notifications	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	App shortcuts > Left shortcut > Settings	<input type="checkbox"/>	<input type="checkbox"/>
	App shortcuts > Right shortcut > RedVox	<input type="checkbox"/>	<input type="checkbox"/>
	App permission monitor	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Device Maintenance > Battery	<input type="checkbox"/>	<input type="checkbox"/>
	Power saving mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Unmonitored Apps > Add apps > RedVox	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	Setting	ON	OFF
DEVELOPER OPTIONS	Stay awake	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Bluetooth HCI snoop log	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Picture color mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	WebView implementation > Chrome	<input type="checkbox"/>	<input type="checkbox"/>
	Auto update system	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Demo mode > Enable demo mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick settings developer tiles > Power saving	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Quick settings developer tiles > Sync	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Quick settings developer tiles > Show layout boundaries	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick settings developer tiles > GPU rendering profile	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick settings developer tiles > Force RTL layout	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick settings developer tiles > Window animation scale	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Quick settings developer tiles > Screen saver	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	USB debugging	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Include bug reports in power	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	View attribute inspection	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Verify apps via USB	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Authorize wireless display device	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Wi-Fi verbose logging	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Aggressive Wi-Fi/cell handover	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Allow Wi-Fi roaming scans	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Keep mobile data turned on	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Disable absolute volume	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show touches	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show pointer location	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show screen updates	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show layout boundaries	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Force RTL layout	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Force GPU rendering	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show GPU view updates	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show hardware layer updates	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Turn on 4x MSAA	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Turn off hardware overlays	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Prevent USB audio routing	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Strict mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	GPU rendering profile	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Do not keep activities	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show all ANRs	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Show notification channel warnings	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Force allow apps on external	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Force activities to be resizable	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Accessing Data

There are different ways to access collected data. This section will go over different ways to access the RedVox data files.



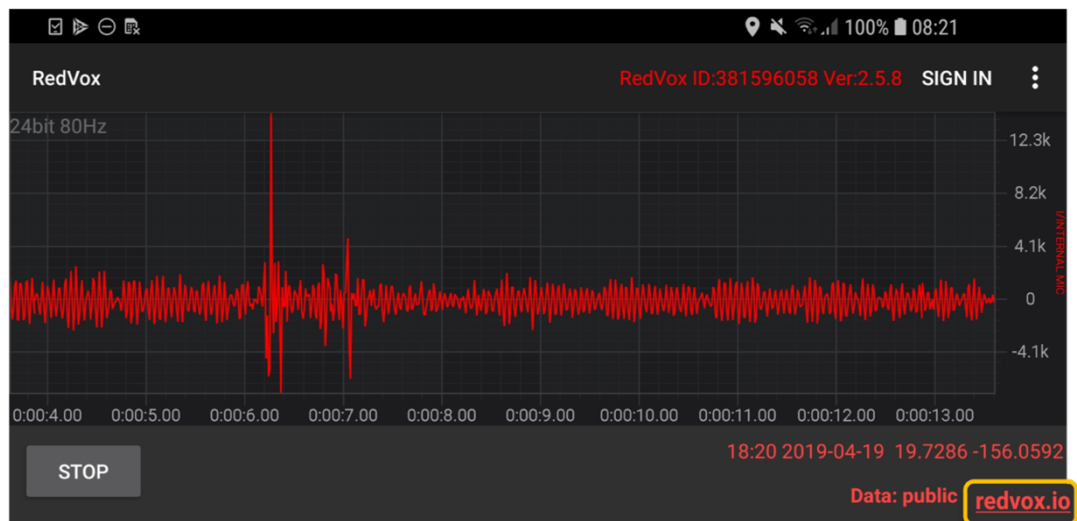
1. redvox.io > Network Status > Active Devices
2. redvox.io > Network Status > Data Explorer
3. redvox.io > Analysis > Generate a RedVox Report

As of the time being, a RedVox Reader SDK is available for Python and Java. The RedVox API 900 is described in detail in the SDK documentation. Please refer to <https://redvox.io/downloads>

4. NEW FEATURE: In-App File Playback and Access

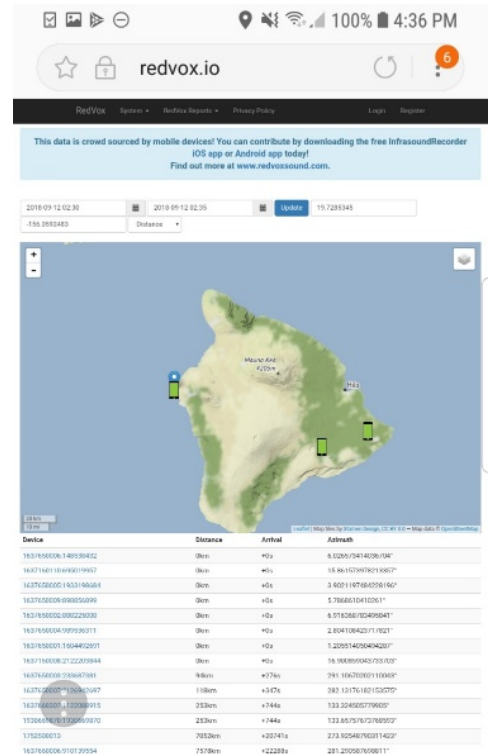
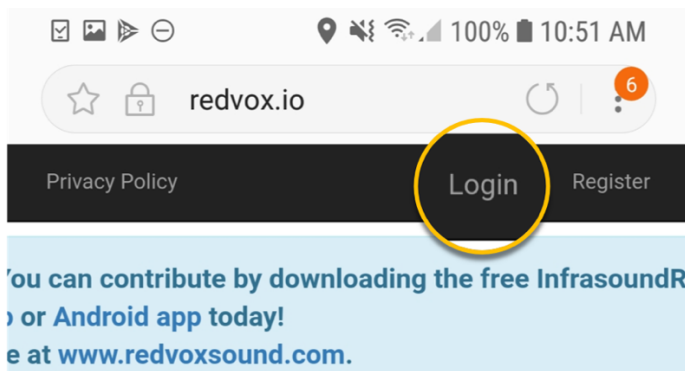
6.1 Active Devices

1. To access the collected data, go to: redvox.io or click the link in the app (highlighted in orange below).

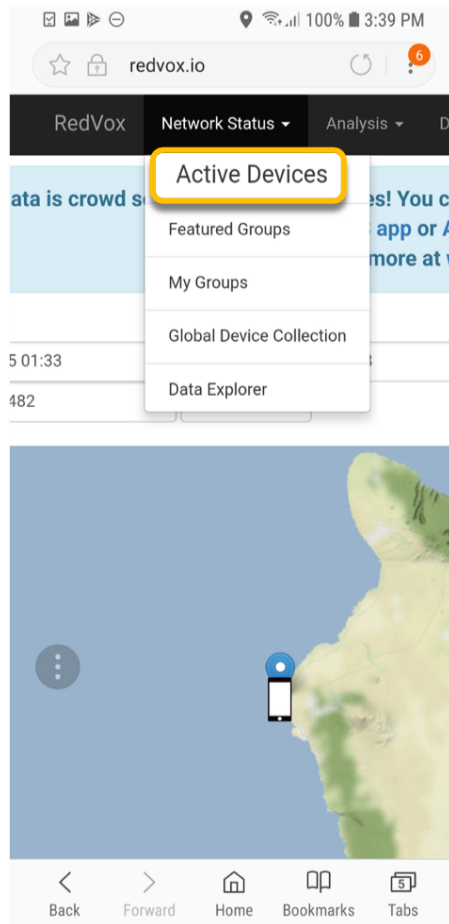


- a. A web browser will open like that to the left. The blue marker above the phone shows which phone is in use. Phones with public data can be seen on the website's homepage to show the nearest phones.
- b. Logging in can be done with the credentials created earlier (see *Create an Account* section).

2. Tap Login in the top right-hand corner of the Home Page.



3. Then go to Network Status > Active Devices. The Active Devices' page is useful for showing which devices are currently collecting data.



- a. The Active Devices page will be a list of all devices under the account that is signed in and is recording data.

RedVox System RedVox Reports Downloads Privacy Policy redvoxcore@gmail.com

This data is crowd sourced by mobile devices! You can contribute by downloading the free InfrasoundRecorder iOS app or Android app today! Find out more at www.redvoxsound.com.

Device Health Overview

My Devices (Api 900)

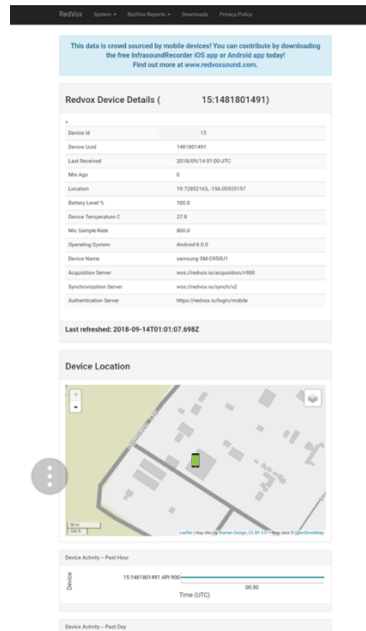
Device Id	Last Received (UTC)	Min Age	Current Privacy Policy	OS	OS Version	App Version	API	Details
11	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
12	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
13	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
14	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
15	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
17	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
61	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
62	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
63	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
64	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
74	2018/09/14 01:11 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
81	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
82	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
83	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
84	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
91	2018/09/14 01:11 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
92	2018/09/14 01:11 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
93	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
94	2018/09/14 01:12 UTC	0	PUBLIC	iOS	9.3.5	3.1.12	900	Details
01	2018/09/14 01:12 UTC	0	PUBLIC	iOS	11.4.1	3.1.11	900	Details
08	2018/09/14 01:12 UTC	0	PUBLIC	iOS	11.4.1	3.1.12	900	Details
10	2018/09/14 01:12 UTC	0	PUBLIC	iOS	11.4.1	3.1.12	900	Details

4. Find the desired device and tap on Details.

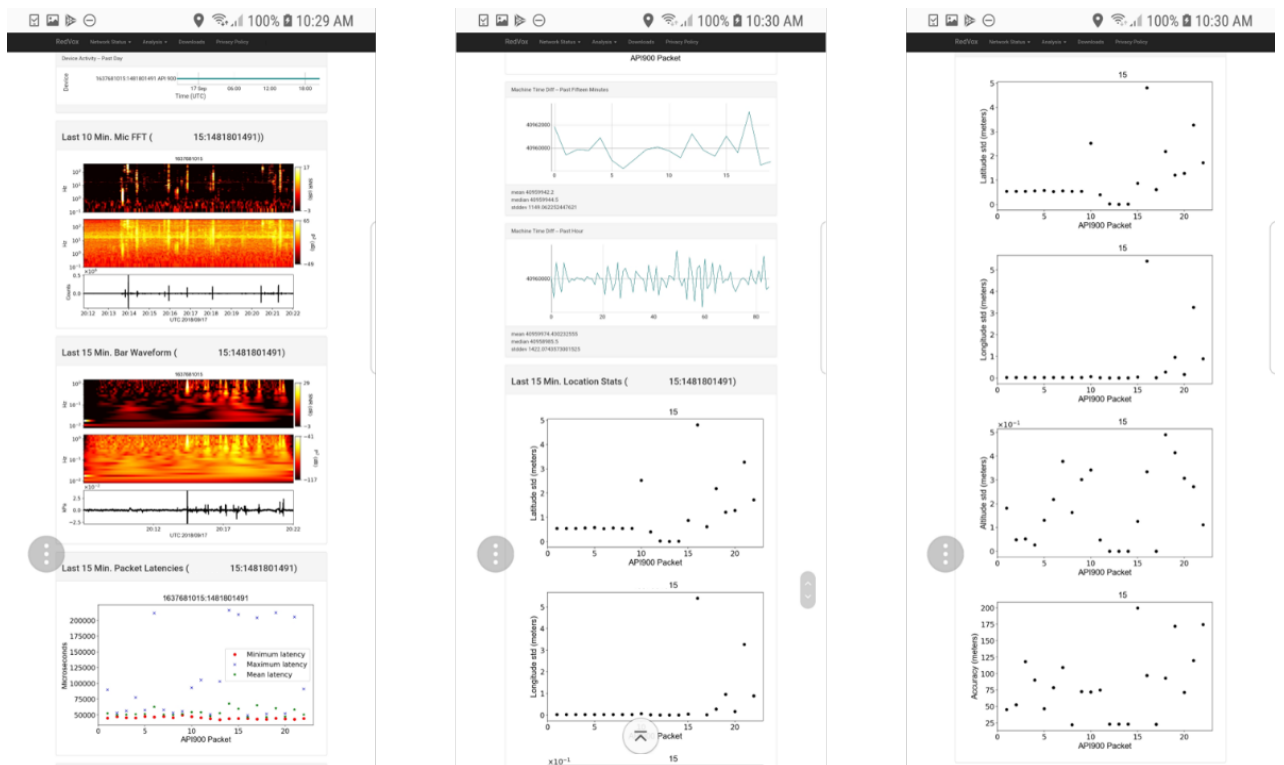
100% 3:16 PM

		01:12 UTC							
	13	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details
	14	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details
	15	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details
	16	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details
1637	17	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details
	18	2018/09/14 01:12 UTC	0	PRIVATE	Android	8.0.0	2.3.15	900	Details

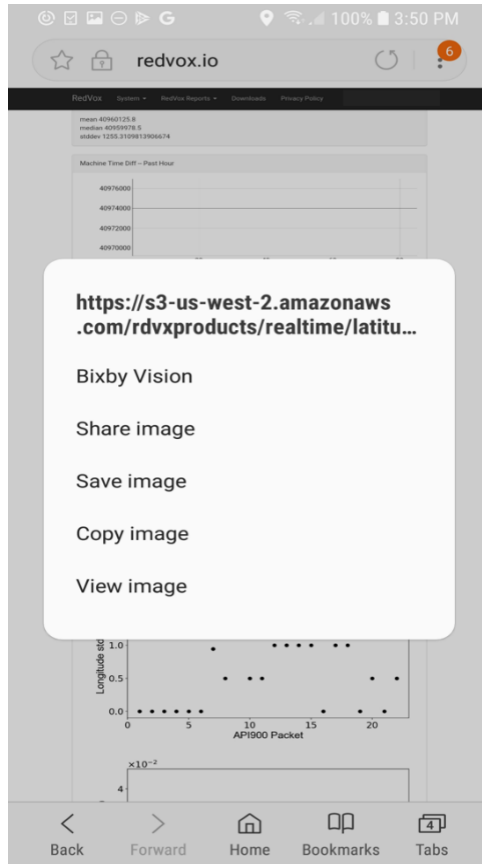
5. The page will look like the figure below.



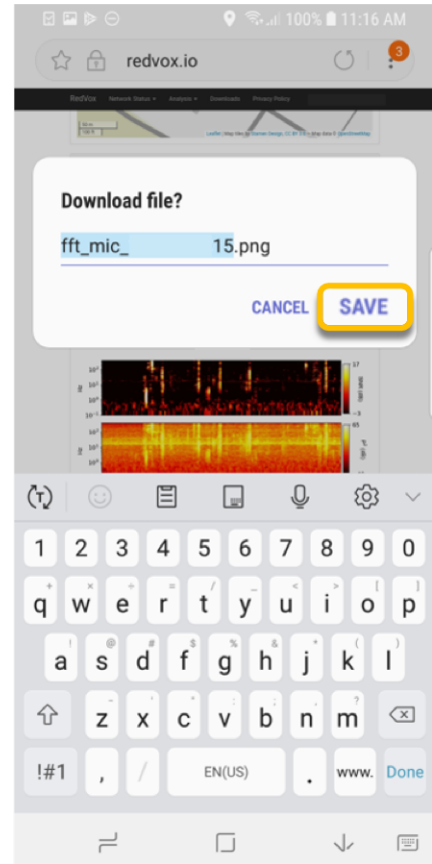
a. This page includes a lot of information. It will include the device's location and activity – up time, spectrograms, scalograms, latencies, accuracy, standard deviations of longitude, latitude, and altitude. An overview of all the plots can be found below.

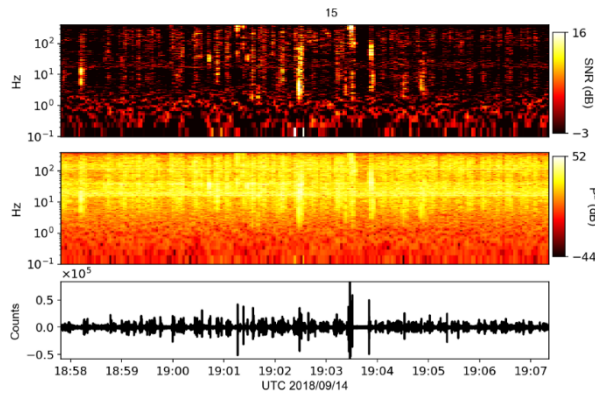


- b. These plots can be saved to the device as a PNG file. Hold down on the image then tap Save Image.

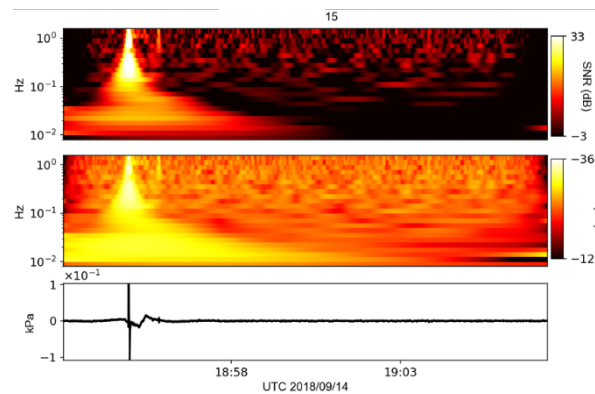


- c. Create a name for the image then tap Save or leave the default name and tap Save.

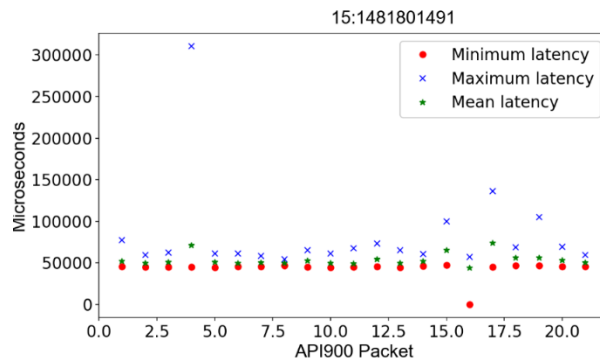




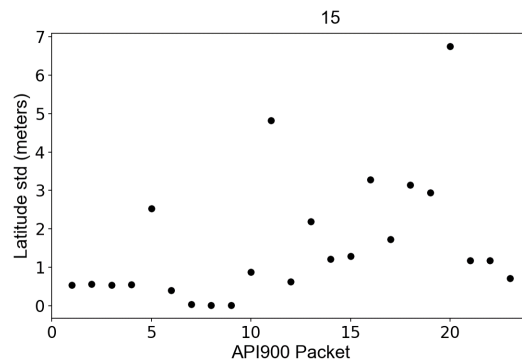
a. Spectrogram – These plots show the infrasound and acoustic data. The bottom panel shows the digital waveform over time. The middle panel graphs the sound intensity (in color) over time (x – axis) and frequency (y – axis). The upper plot is scaled as the signal to noise ratio so that the intensity color range can be enhanced.



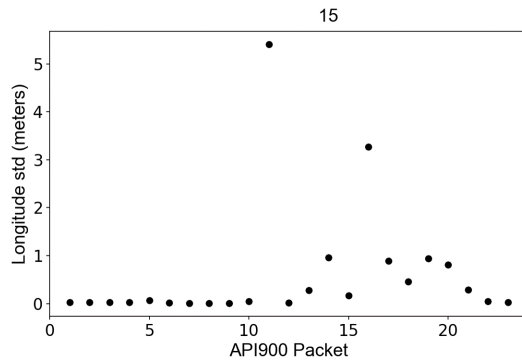
b. Scalogram – These plots show the data collected for pressure from the barometer. The scalogram is used to see at what time was the signal the strongest. The plots are similar to how the spectrogram are with the lower panel scaled to emphasize the strongest signal, the middle panel creates the scalogram from the digital waveform shown in the third plot.



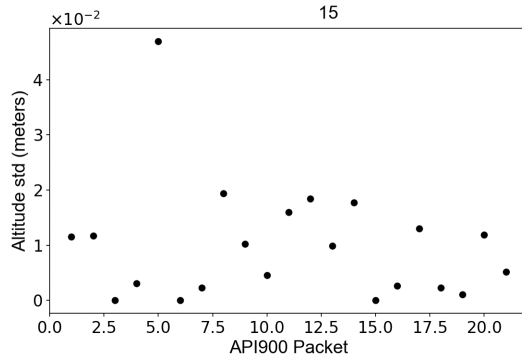
c. Latency plot – This plot shows the time difference between the server time and the device time (how long it takes for data to be moved from the device to Cloud storage). It shows the minimum, maximum, and average times differences for each packet.



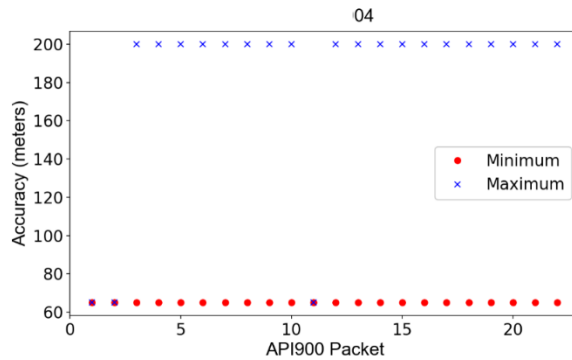
d. Latitude plot – This plot shows the standard deviation of the latitude of the device averaged per data packet. This is a measure of the variability per packet.



e. Longitude plot – This plot is like the latitude plot, except it shows the standard deviation of longitude coordinates it gets for the device’s location averaged over a data packet.



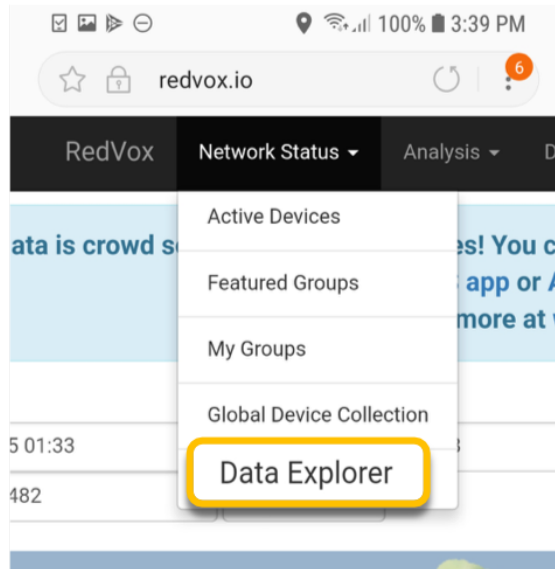
f. Altitude plot – This graph estimates the standard deviation in the altitude values averaged per data packet, similar to how the longitude and latitude plots are generated.



g. Accuracy plot – This plot estimates the accuracy of the phone location in meters.

6.2 Data Explorer

1. Another way to access collected data is going to redvox.io > Network Status > Data Explorer. The Data Explorer is easier to view on a computer. The Data Explorer shows the most recent packets sent to the data server.



2. There are three different colors: red – private, owned devices; yellow – public, owned devices; white – public devices. The list of devices looks like the figure below.

A screenshot of the redvox.io website showing a list of devices. The page has a dark header with 'RedVox', 'Network Status', 'Analysis', 'Downloads', and 'Privacy Policy' links. Below the header, there are 'Show / Hide Filters' and 'Update' buttons. The table below shows a list of devices with columns for timestamp, ID, and status. The first row is highlighted in yellow, and the second row is highlighted in red.

Timestamp	ID	Status
api900/2018/09/26/163	414.rdvxz 16	530 900 redvox false true false
api900/2018/09/26/148	101.rdvxz 14	093 900 redvox false true false

- a. The list of devices has different columns. The columns are explained below. All timestamps are in microseconds referenced to 0 UTC of 1 January 1970 (Unix time, also referred to as Epoch in geophysics).

- **ID** – Device's RedVox ID
- **Email** – Email affiliated with the RedVox account
- **App Mach** – The timestamp on the packet using the device's machine time
- **Server Wall** – Extra information provided from the packet
- **Model** – The model of the device (i.e. Galaxy S8)
- **Backfilled?** – Was this packet sent at a later time?
- **Bat. %** - Battery percentage on the device
- **#Ch** – Number of channels contained in the packet
- **UUID** – UUID of the device
- **App Wall** – Extra information provided from the packet
- **Device Make** – The make/brand of the device
- **Is Private?** – Is the data packets sent from the
- **Is Scrambled?** – Is the audio speech band scrambled?
- **OS Version** – Version of the operating system on the device
- **App Version** – App version of RedVox
- **Data URL** – Data server URL
- **Synch URL** – Time synchronization server URL
- **Authentication Token** – The json web token. Scrambled at the server.
- **API** – Application Programming Interface
- **Firebase Token** - Self-explanatory.
- **Metadata** – Extra information provided from data packet

3. Find the device and click it. A list of sensor channels will appear on the page.

Channel Type	Sensor Name	Unit	Sample Rate Hz	Payload Type	#Payload	#Timestamps	Mean Payload	Std Payload	Median Payload	Mean Sample Rate	Std Sample Rate	Median Sample Rate
MICROPHONE	internal mic Bottom	Counts	800	int32	32768	N/A	-205.00	9682.13	0.00	N/A	N/A	N/A
BAROMETER	internal barometer	kPa	1.01	float64	45	45	101.70	0.00	101.70	1.01	1.01	0.99

a. The information given for the sensor channel can be seen below:

- **Channel Type** – Shows the even (constant sample rate) and uneven (varied sample rate) channels
- **Channel** – Displays the type of channel that is in the row
- **Sensor Name**– Physical sensor inside of the device
- **Unit** – Unit the payload values are measured
- **Sample Rate Hz** – Sample rate (samples/second)
- **Payload Type** – Type of payload/value of data

- **#Payload** – How many values of data was collected
- **#Timestamps** - Number of timestamps taken
- **Mean Payload** – Mean of the payload values
- **Std Payload** – Standard deviation of the uneven channels
- **Median Payload** – Median of the payload values
- **Mean Sample Rate** – Mean value of the uneven channels
- **Std Sample Rate** – Standard deviation of the sample rate
- **Median Sample Rate** – Median value of the uneven channels

b. Click on sensor channel and a physical waveform will appear and the different values at each timestamp.



6.3 Generate RedVox Report

1. A computer is recommended for generating a RedVox Report. Go to redvox.io > Analysis (drop down) > Generate RedVox Report.
2. It will redirect to the following page with instructions. Follow the instructions and fill out the areas.

Ad-Hoc Report Generation Instructions

1) Select an event origin time (UTC)
2) Select the relative number of minutes before the event origin time
3) Select the relative number of minutes after the event origin time
4) Select the event source origin using predefined values in the dropdown list, or select the location on the map, or enter the lat/ing manually
5) Select the height of the event source origin in meters
6) Click the "Update Stations" button to display stations available during the previously selected time range
7) Select product types that will be produced for this report
8) Select stations for which reports will be generated for (stations listed beside map)
9) Click "Create Report"

Steps 1-3) Event Origin Time (UTC)

Steps 4-6) Event source. Either select from pre-populated list or enter event origin location manually
Select from pre-populated list of event origins

or set event origin location manually

Step 7) Available report product types

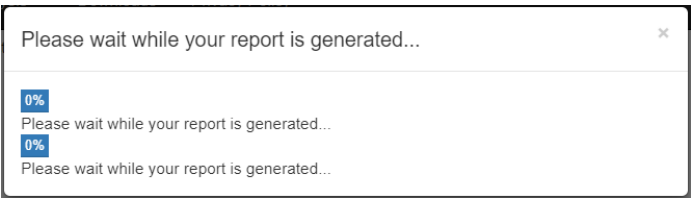
☒ Micropho FFT ☒ Microphone Multires ☒ Barometer Waveform ☒ Barometer Multires ☐ Latency ☒ Latitude Std ☐ Longitude Std ☐ Altitude Std ☐ Accuracy Std ☒ Magnetometer

3. After filling out the fields, click on Update Stations then select the device(s) the report would be for.

Step 8) Stations to include				
<input type="checkbox"/> Device	Distance	Arrival	Azimuth	
<input type="checkbox"/>	29 0km	+0s	187.6°	
<input type="checkbox"/>	5 0km	+0s	175.0°	
<input type="checkbox"/>	71 0km	+0s	1.7°	
<input type="checkbox"/>	96 0km	+0s	17.8°	
<input type="checkbox"/>	15 0km	+0s	181.8°	
<input type="checkbox"/>	9 0km	+0s	173.5°	
<input type="checkbox"/>	2 0km	+0s	342.3°	
<input type="checkbox"/>	1 0km	+0s	355.7°	
<input type="checkbox"/>	46 0km	+0s	186.9°	
<input type="checkbox"/>	98 0km	+0s	173.3°	

4. Once all the device(s) have been selected, click on Generate Report. A progress bar will show up on the top of the screen to tell the user how much the report was generated and

show which part of the report is being generated. The figure below shows what the progress bar will look like.



5. The generated report will look like the figure below.

RedVox Report		Edit Report Metadata	Rerun Report	Sanitize Report	Print View
Report Id	6420e8cae762478f89cf05ee7942a23e				
Created On	Wed Sep 26 23:59:07 UTC 2018				
Event Origin Time UTC	2018-09-26T22:49:13Z Seconds from the Epoch UTC: 1538002153				
Report Start UTC	2018-09-26T22:39:13Z Seconds from the Epoch UTC: 1538001553				
Report End UTC	2018-09-26T22:59:13Z Seconds from the Epoch UTC: 1538002753				
Event Origin Location	19.728373, -156.059216				
Event Origin Height Meters	0.00 meters				
Report Owner	redvox				
Only Visible to Owner?	false				
Report Publicly Listed?	false				
Device	1637 093 Distance to Event Origin Kilometers: 0.02 Back Azimuth to Event Origin: 171.83°				
Download Report Data	Download				

- a. **Edit Report Metadata** allows the user to edit the metadata associated with the report. The report title, URLs, plot descriptions and titles can be edited with this feature.
- b. The report can be rerun with more devices or different sensor channels or at different times by clicking on **Rerun Report**.
- c. **Sanitize Report** removes almost all sensitive information. It removes device IDs, locations, origin locations, and date/time information.
- d. **Print View** turns the page into a printable version without buttons, Redvox.io navigation bar, etc.
- e. **Download**. The user can download the raw data used for the report. Go to Download Report Data > click Download.
 - i. To read the data, use the Python SDK or the API900 specifications.

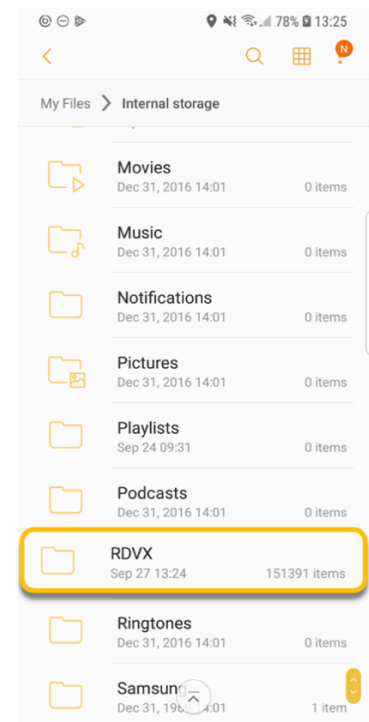
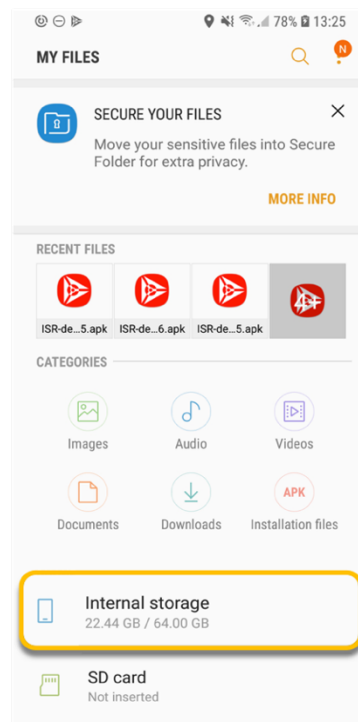
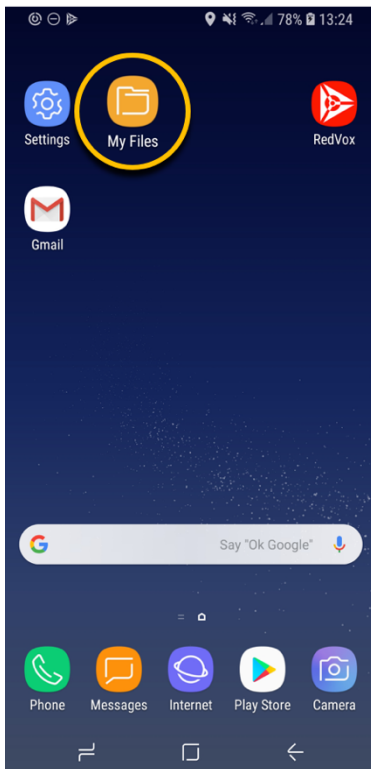
- f. Scrolling down this page will show different plots for the sensor channels that were selected. Similar to the Device > Details, the plots can be saved to the computer or device viewing the page. Right click on the plot > Save image as.

6.4 Retrieving Files from Devices

The following sections will demonstrate how to access RedVox files from a couple Android devices.

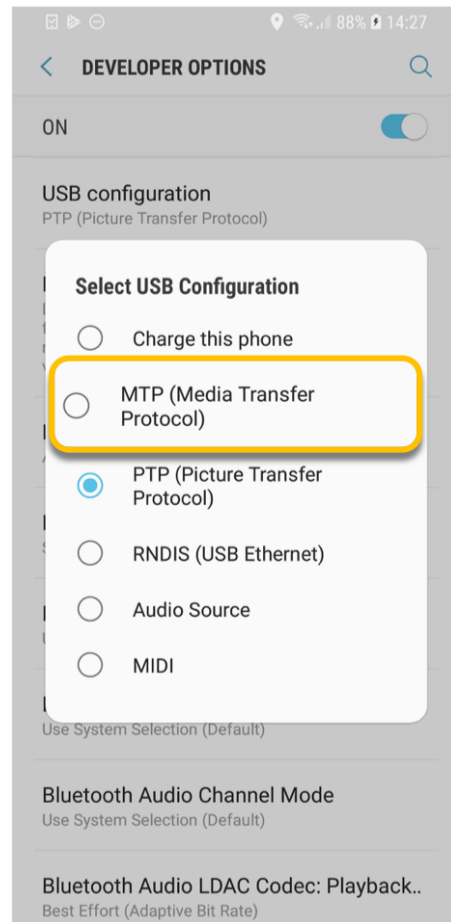
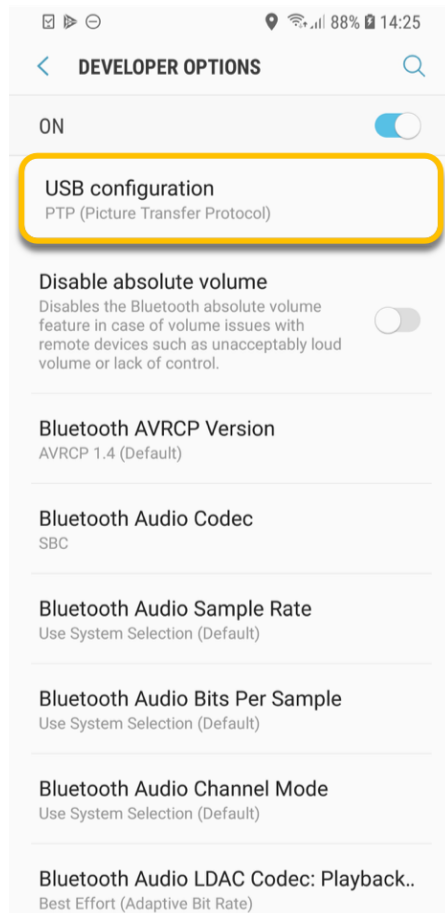
6.4.1 Samsung Galaxy S10 Example

1. For a Samsung Galaxy S10, go to My Files.
2. In My Files > Internal Storage. My Files should look the figure below.
3. In Internal Storage > RDVX. Folders are listed alphabetically.

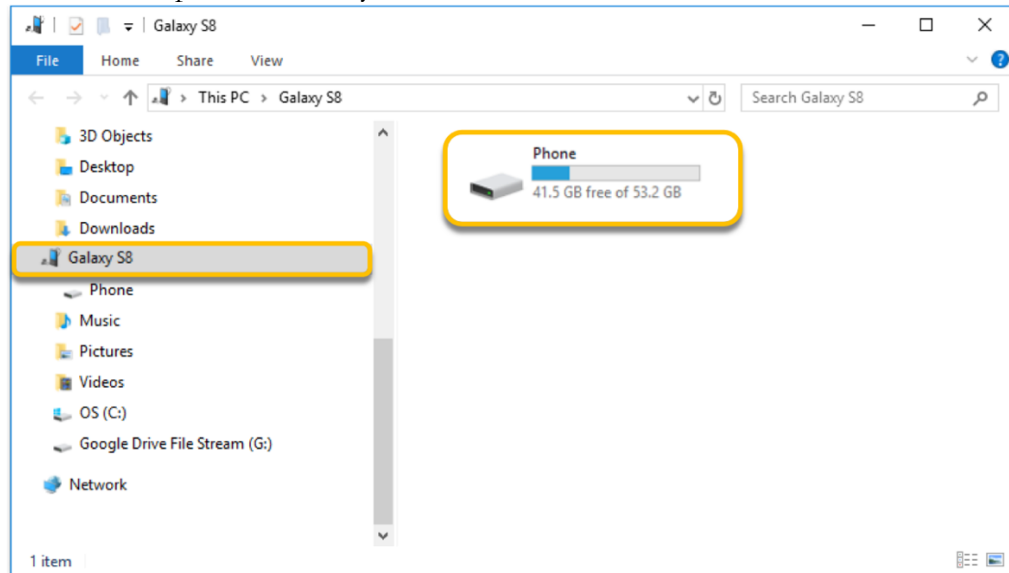


4. **NEW IN-APP FEATURE:** The files in the device can be viewed by navigating to the Playback option in the RedVox app and selecting a file. Android and iOS RDVX files can be sent to other users and can be loaded and displayed by other devices running the RedVox app.
5. A fast and secure way to access the RDVX files is connecting the device to the computer.

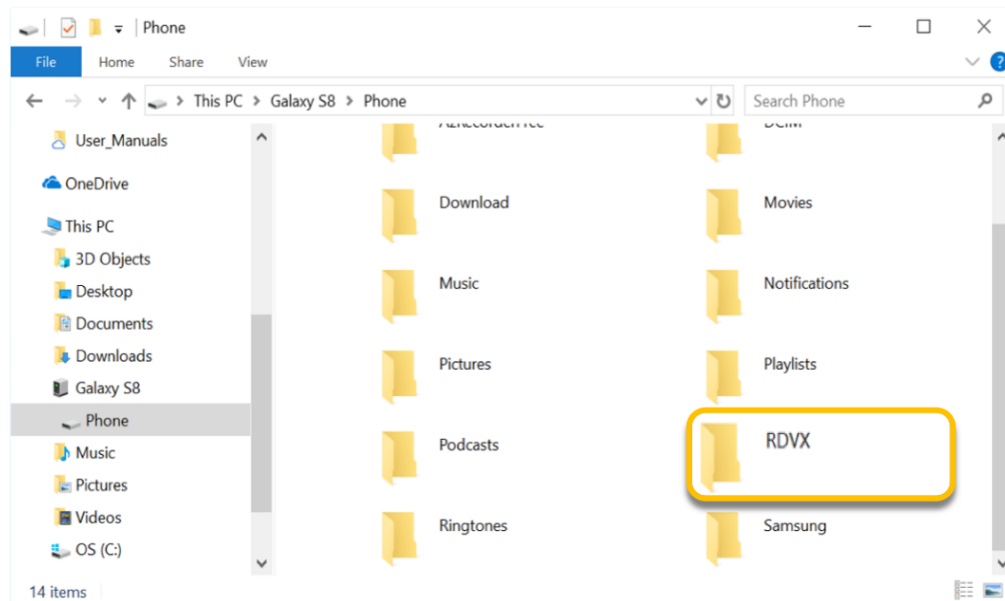
6. Go to Settings > Developer Options > USB Configuration. Set the USB configuration on the device to Media Transfer Protocol (MTP).



7. Go to File Explorer > Galaxy S# > Phone.



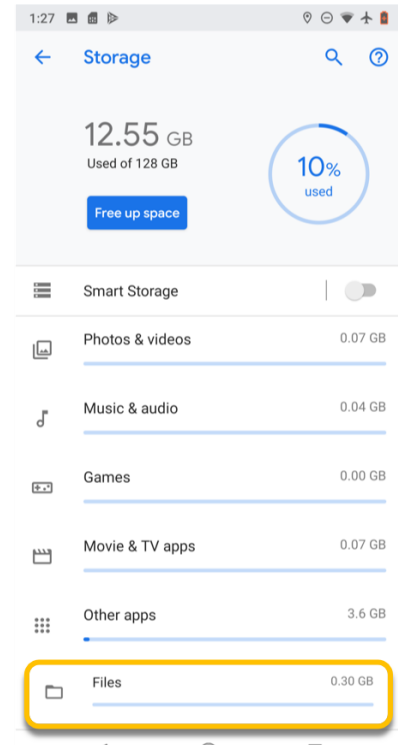
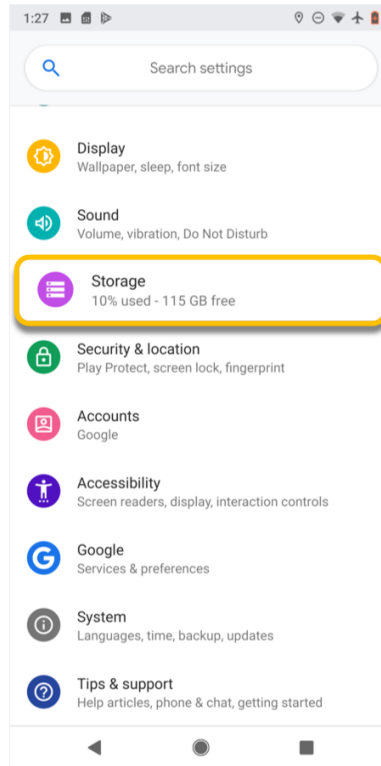
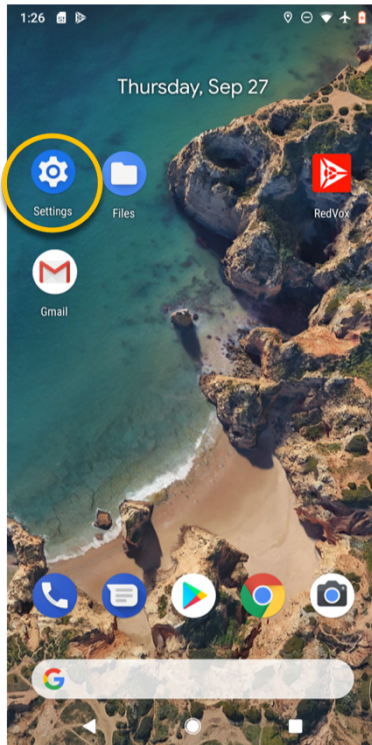
8. Find the RDVX folder.



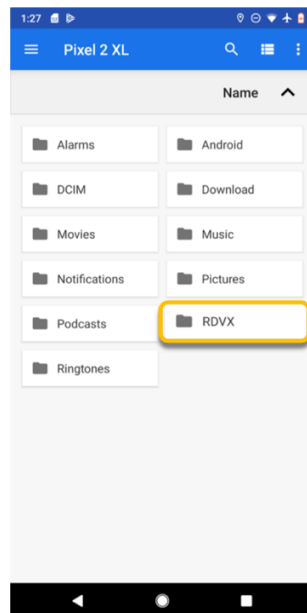
9. This folder contains all of the RDVX files from the RedVox app. Copy and/or download these files to the computer.
10. Create a folder dedicated to RDVX files.

6.4.2 Google Pixel 2 Example

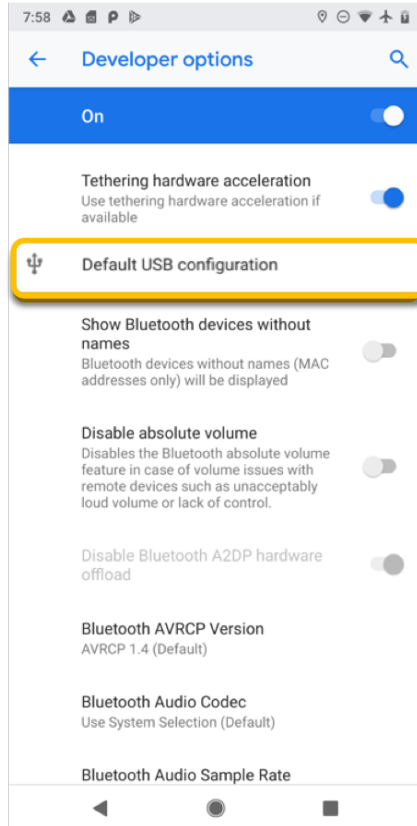
1. Go to Settings.
2. Go to Settings > Storage.
3. Go to Storage > Files.



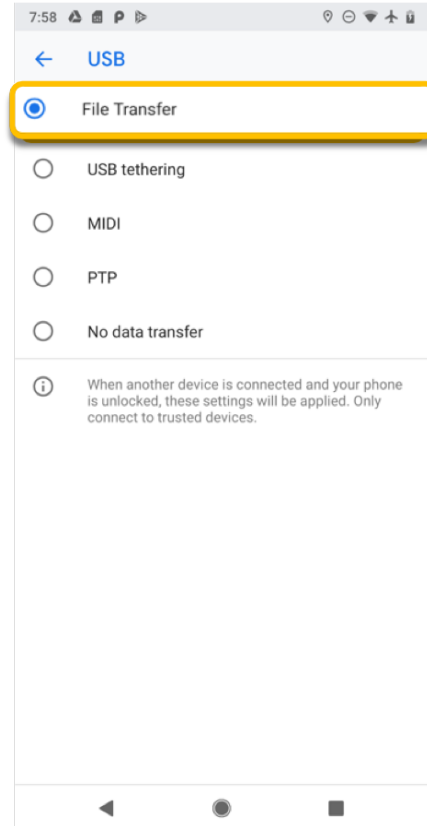
4. In Files, it will show all the internal files that are saved on the device. Look for the RDVX folder.



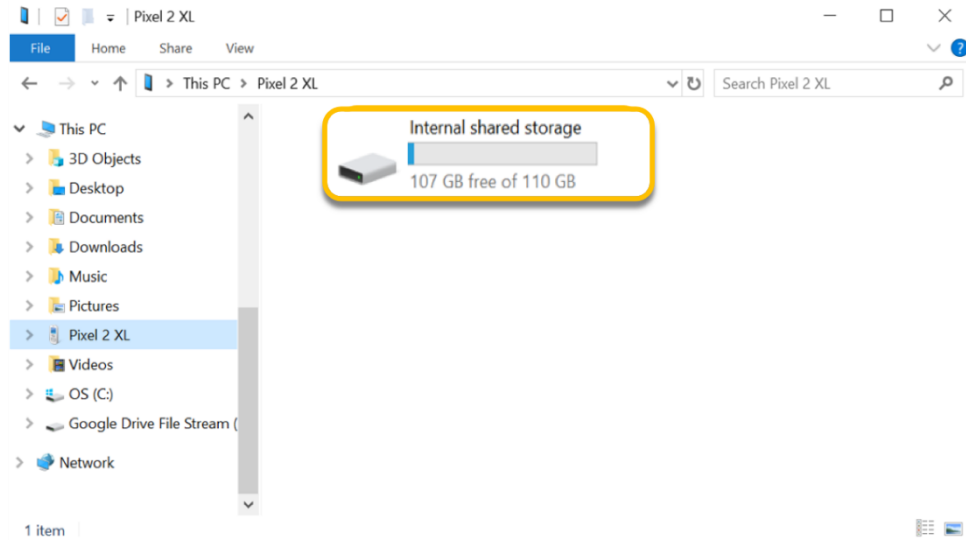
5. Go to System > Advanced > Developer options > Default USB configuration.



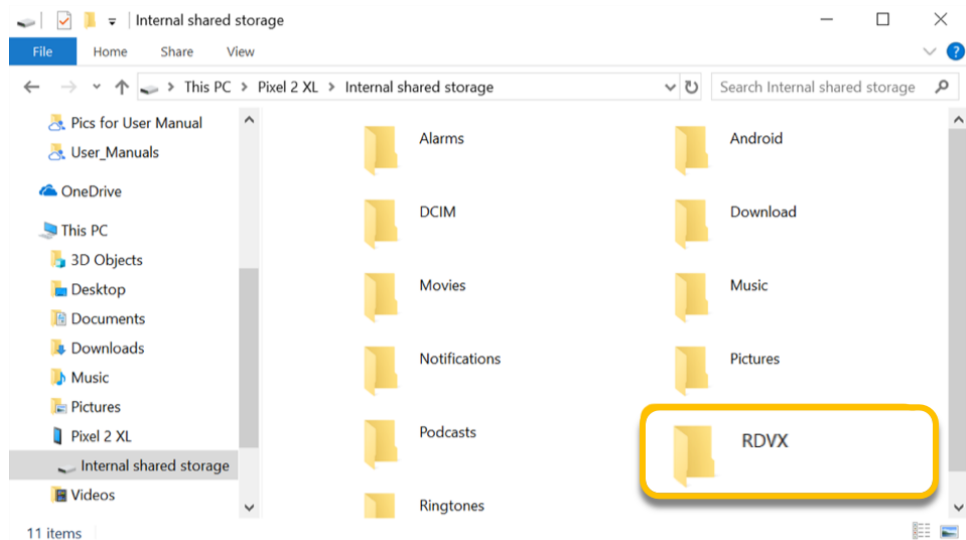
6. In order to have files viewable on the computer, change the USB configuration to File Transfer.



7. Connect the device to the computer.
8. Open File Explorer.
9. Go to Pixel 2 > Internal shared storage.



10. Look for the RDVX folder.



11. This folder contains all of the RDVX files from the RedVox app. Copy and/or download these files to the computer.
12. Create a folder for RDVX files.

Installing Python

If you are already using Python 3.6 or higher and a preferred IDE, you do not need this section. If you are new to Python and want to start fresh, we show how to install Anaconda, the required RedVox libraries and Python Software Developer Kit (SDK) for Application Programming Interface (API) 900. Please refer to:

<https://pypi.org/project/redvox/>

<https://redvox.io/downloads>

Installing Python on a Mac

1. Download and install the latest [Anaconda](#) base that matches the computer's operating system (Mac).



2. Open Terminal.
3. Find where Python and iPython is located in the computer's folders and what version of Python is downloaded on the computer. Enter the following commands in the Terminal.

```
which python
which ipython
python --version
```

4. Change the directory to anaconda3.

```
cd Location
ls
cd anaconda3/
ls
```

5. Once the directory is changed to anaconda3, install the following packages: lz4 and protobuf.

```
conda install lz4
conda install protobuf
```

6. Once both packages have been installed, install the RedVox reader.

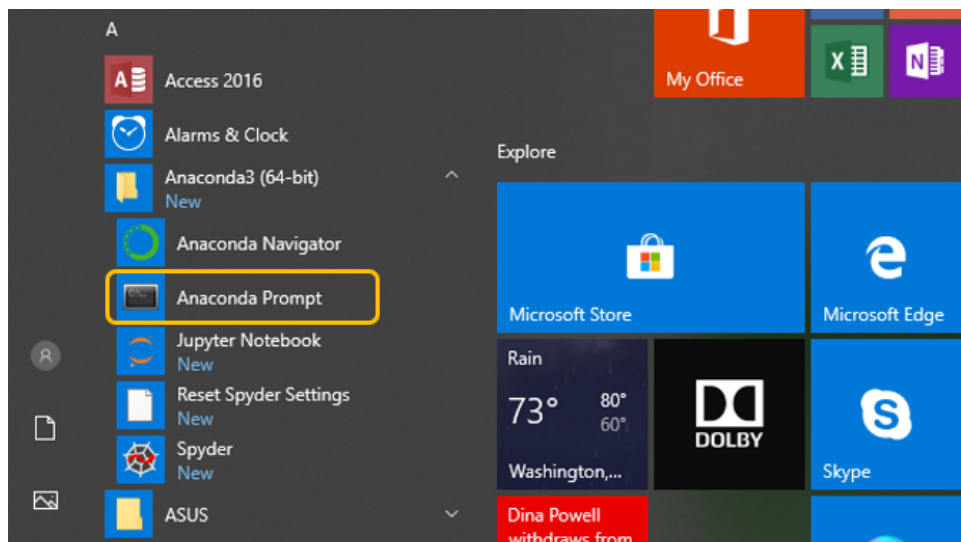
```
pip install redvox
```

Installing Python on Windows

1. Download and install the latest [Anaconda](#) base that matches the computer's operating system (Windows).



2. Open Anaconda Prompt. Go to Windows menu > Anaconda3 > Anaconda Prompt.



3. The “where” command will print the path of the following programs: python and conda. The “version” command will print which version python and conda currently are. This will also verify that these programs have been installed.

```
where python
where conda
python --version
conda -version
```

4. In the Anaconda Prompt, change the directory to the folder Anaconda3/. Command “dir” will list out the different directories, and “cd” will change directory.

```
cd Anaconda3/
```

5. Once the directory is changed to Anaconda3/, install the following packages: lz4 and protobuf.

```
conda install lz4  
conda install protobuf
```

6. Once the two packages have been installed, install the RedVox reader.

```
pip install redvox
```

- a. If necessary, update the reader with the following command:

```
python -m pip install --upgrade pip
```

Opening Jupyter Notebook and Reading RDVX Files

1. Jupyter Notebook is provided with the Anaconda download. Open the Jupyter Notebook by entering the following commands. This command will open the Jupyter Notebook in a web browser.

```
cd Documents/  
jupyter notebook
```

2. Once the Jupyter Notebook is open, use the following code or another code to load RedVox data into the notebook.

```
import os # operating system  
from redvox.api900 import reader # calling the reader from  
Redvox package  
  
path = '/Users/User/folder/api900/2018/10/01/' # location of the  
folder  
files = os.listdir(path) # list the files in the folder  
print(files) # print the list of files in the folder  
  
firstfile = files[0] # assign the first variable name, firstfile  
print(firstfile) # print the file name of the first file  
print(path + firstfile) # print the location of the .rdvx file  
  
readfile = reader.read_file(path + firstfile) # assign file path  
to readfile  
  
packet = reader.wrap(readfile) # filter the data in the .rdvx  
file  
print(packet) # print metadata
```