YieldPoint Cellular LTE-M BluGateway Sept 2023

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YieldPoint Sensing the future

BluGW-LTE

Types of YP Gateway

YieldPoint's Gateways can aggregate readings From a population of geotechnical instruments emitting three types of signal:

(i) RS485 digital signal (Category 1),
(ii) BlueTooth 5 beacons (Category 2),
(iii) VW instruments.

Backhaul to the cloud can be either:

a) LTE-M
b) WiFi/Ethernet
c) miniSat (SWARM)

All configuration is from YP's Bluetooth App for Android called BluPoint (Category 4).

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Gateway Types

Outline

1. Hardware
   SIM
   eSIM

2. BluPoint App
   NetPoint Activity Tabs

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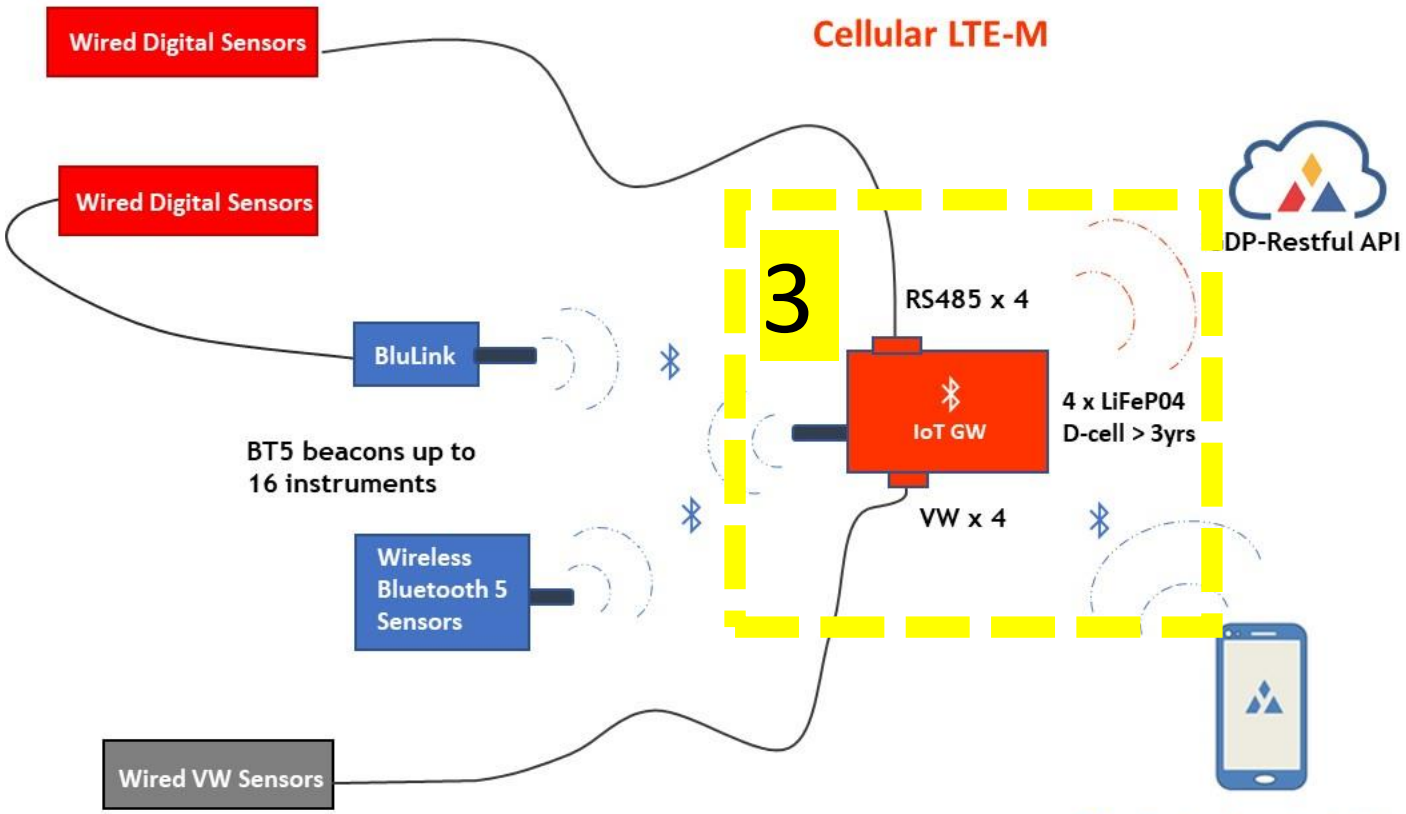

\+
advanced analytics
=
+VantagePoint
(***pron:*** *AdvantagePoint*)

ViewPoint
Manual readout

LogPoint
Datalogging

AccessPoint
LTE-M backhaul to cloud

VantagePoint
Browser based visualization

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YP's BluPoint EcoSystem

What is the BluGW – LTE ?

YieldPoint's BluGW – LTE is a gateway that can aggregate readings from a cluster of geotechnical instruments that transmit three types of signal:

(i) 4 xRS485 digital signal,

(ii) BlueTooth 5 (Coded PHY) packets,

(iii) 4 xVW instruments.

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Hardware Options

Cellular Backhaul

Wikipedia says:

LTE-M (LTE-MTC [Machine Type Communication]), is a type of low power wide area network (LPWAN) radio technology standard developed by 3GPP to enable a wide range of cellular devices and services (specifically, for machine-to-machine and Internet of Things applications).[1][2]

LTE-M technology is designed for use by IoT devices that want to connect to a 4G network without a gateway and while using batteries. These low-powered devices are expected to make up the bulk of devices that operate within the Internet of Things over the next few years. They are likely to make up the majority of the predicted 38 billion connected devices estimated to be in operation by the year 2025. LTE-M products are exciting a lot of manufacturers because they are very cheap to build.

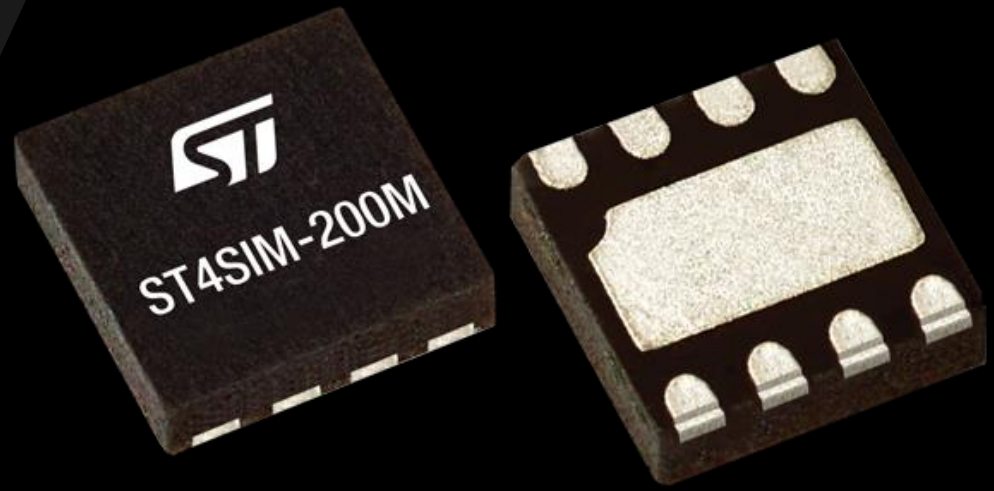
IMPORTANT: (i) LTE-M is different from regular LTE cellular
(ii) LTE is an integral component of 5G

https://www.5gamericas.org/wp-content/uploads/2019/07/LTE_Progress_Leading_to_the_5G_Massive_Internet_of_Things_Final_12.5.pdf

eSIM chips?

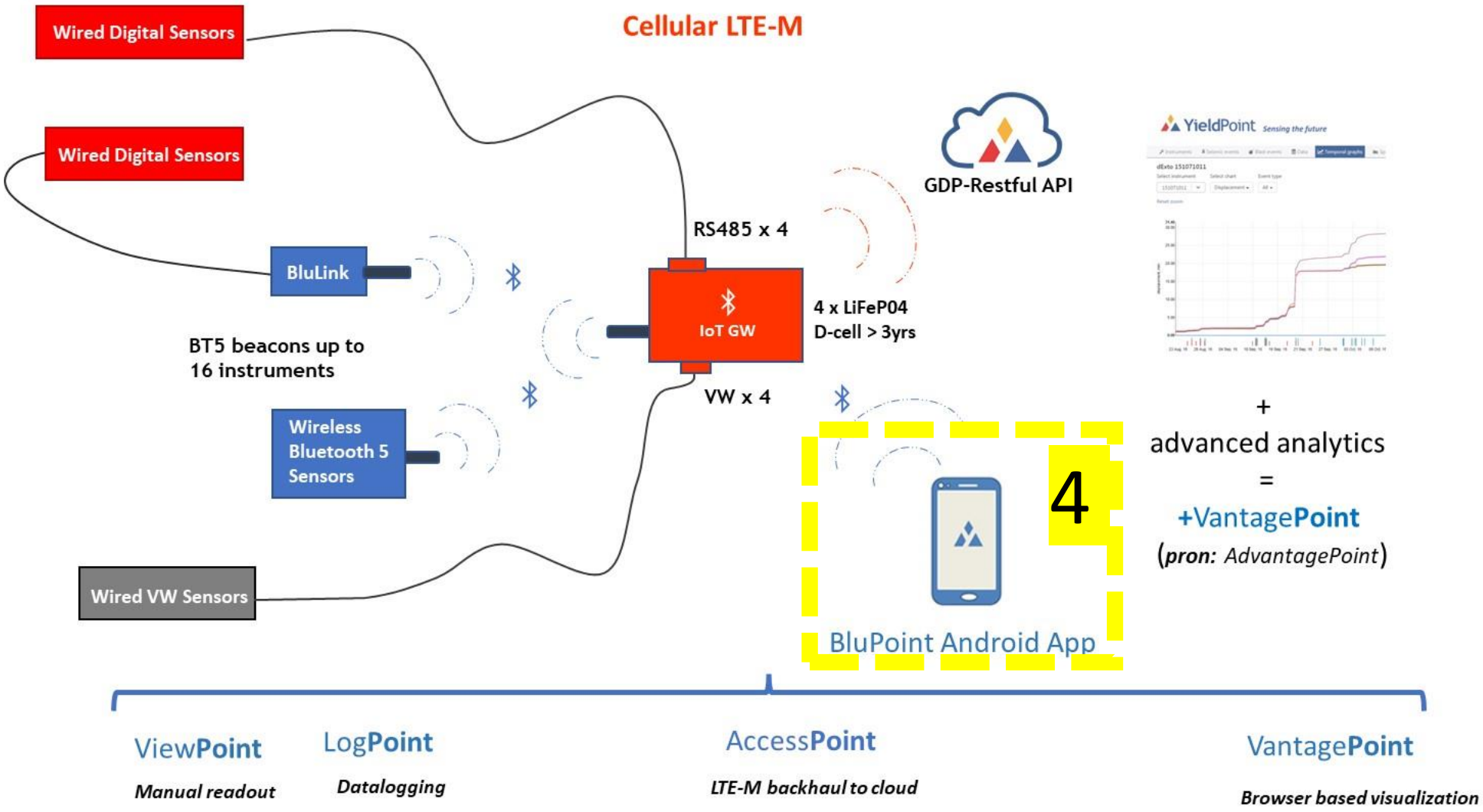
The eSIM (embedded SIM) is a small chip soldered directly to the IoT Gateway board.

The “e” in eSIM does not refer to “electronic” as is so often the case (for example, eMachines, eCommerce, and e-mail). Instead, it refers to “embedded” — a SIM that is directly attached to a board and is not removable. The official name for this form factor is MFF2.



SIM Cards?

The SIM card has been around since the early 1990s. It is a small, removable piece of silicon and copper encased in plastic. Each manufactured SIM has a globally unique serial number called an ICCID (Integrated Circuit Card ID), along with an IMSI and IMEI, to identify it on the network.



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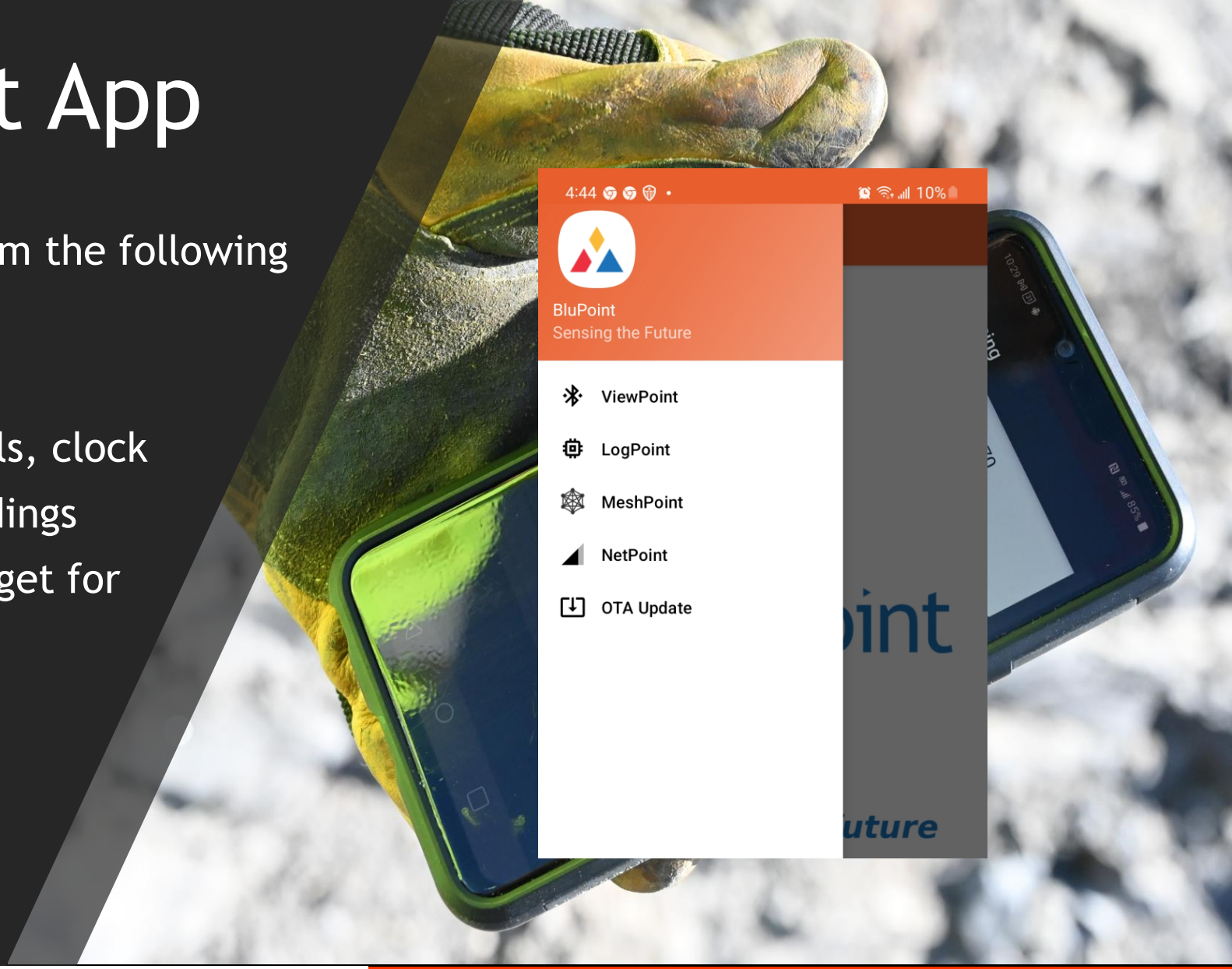
4: Android BluPoint App

The BluPoint App

The BluPoint App is used to perform the following tasks:

(i) Configuration reading intervals, clock
(ii) Downloading and erasing readings
(iii) Configuration of backhaul target for Gateways.
(iv) Managing historical readings
(v) Health monitoring.



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The BluPoint App

Swipe from the left to activate the BluPoint Activities:

The BluPoint App is the software interface between Android devices and BluPoint hardware. Swiping from the left reveals a number of Activities that comprise the App.

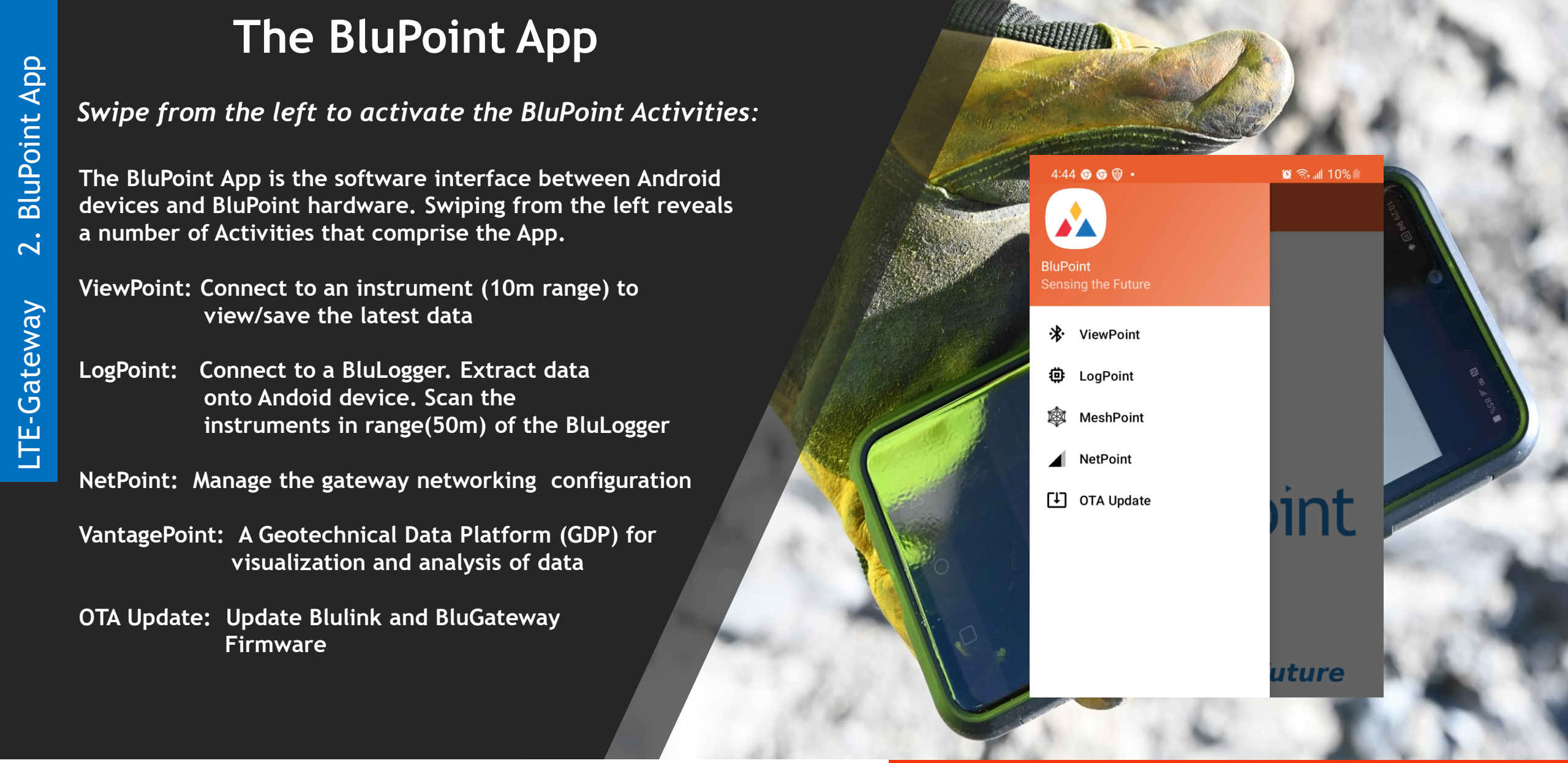
ViewPoint: Connect to an instrument (10m range) to view/save the latest data

LogPoint: Connect to a BluLogger. Extract data onto Andoid device. Scan the instruments in range(50m) of the BluLogger

NetPoint: Manage the gateway networking configuration

VantagePoint: A Geotechnical Data Platform (GDP) for visualization and analysis of data

OTA Update: Update Blulink and BluGateway Firmware



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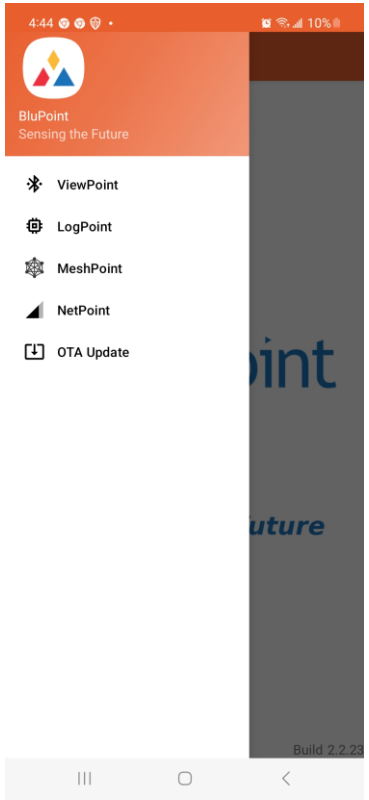
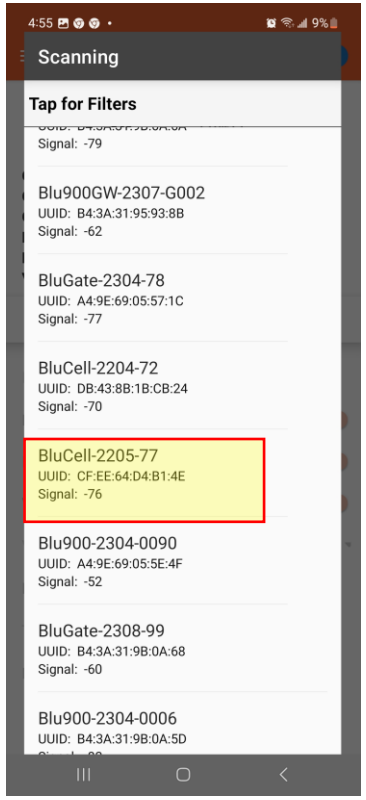
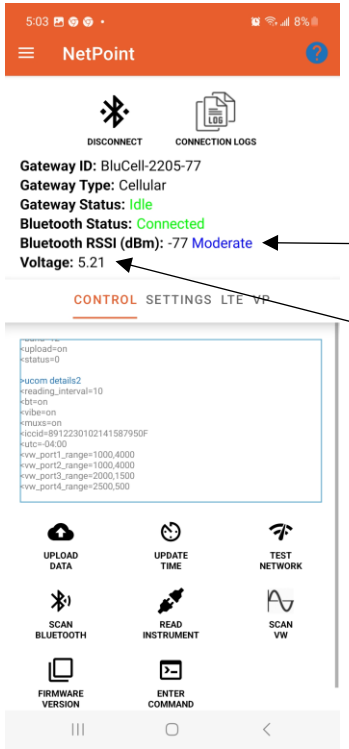
BluPoint Activities



1. Open BluPoint and drag from the left to show Vantagepoint



2. Tap connect and select the BluCell ID



BT 5 Signal strength

Battery Voltage

3. Connected to GW ID: 2205-77

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NetPoint Activity

Signal strength or RSSI

RSSI (Received Signal Strength Indicator): Radios can communicate down to an RSSI of -92.

Range: -40 to -60 Good
-60 to -80 Moderate
<-80 Poor

IMPORTANT: Whatever the orientation of the device, the antenna should be VERTICAL

The BluPoint App will connect faster to Devices when the RSSI > -70dB

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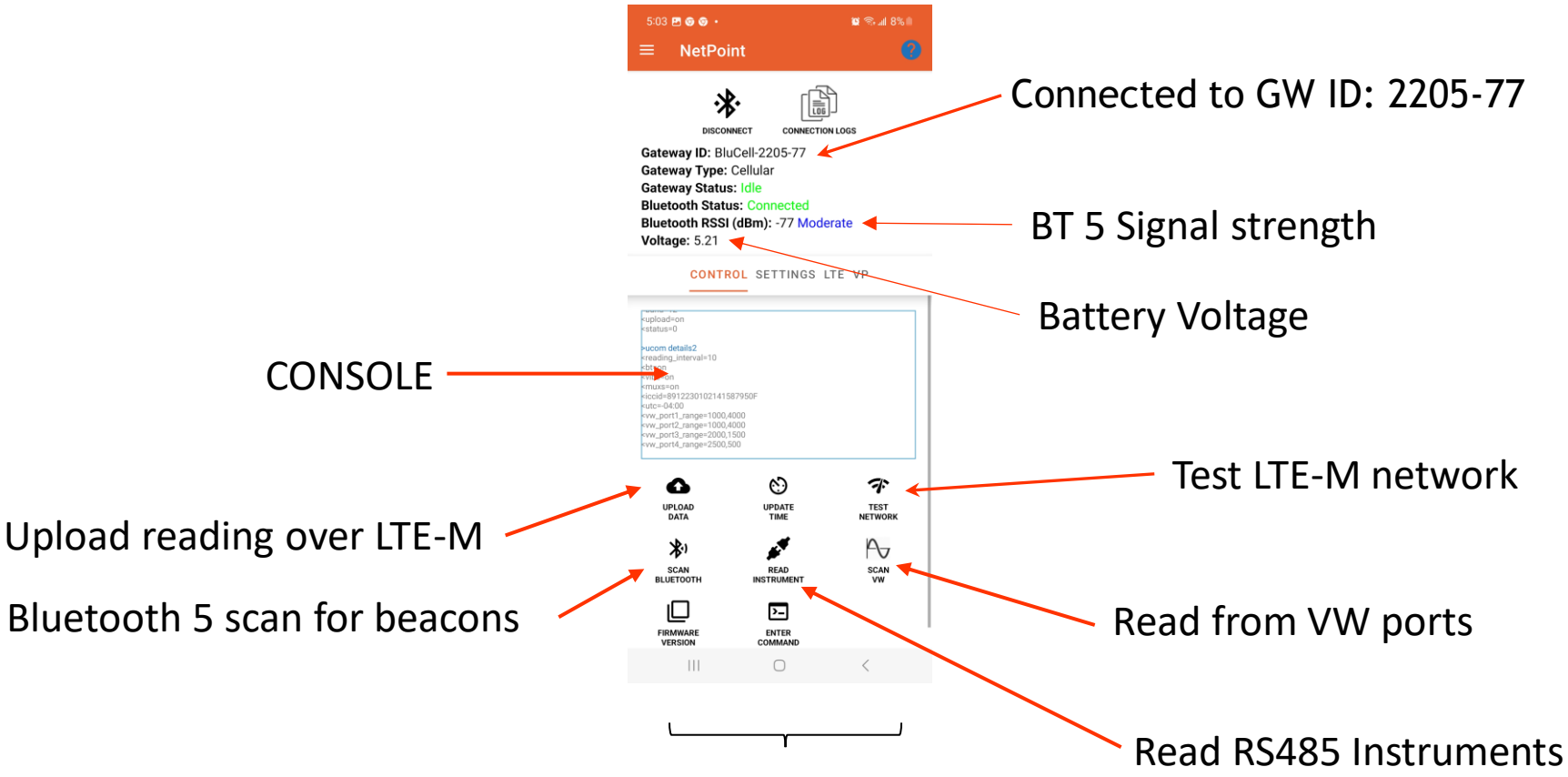
Signal Strength: RSSI

NetPoint is an Activity within the BluPoint App to manage gateway setup



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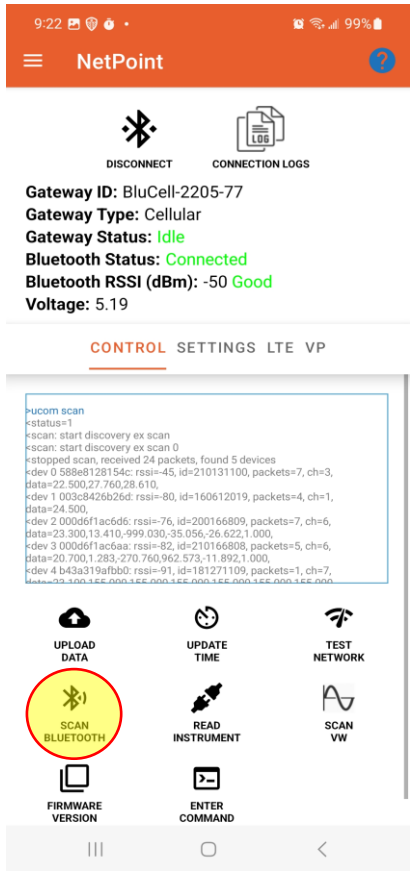
MeshPoint: CONTROL Tab

SCAN BLUETOOTH

Scan for BT5 beacons for 20s




```
>ucom scan
<status=1
<scan: start discovery ex scan
<scan: start discovery ex scan 0
<stopped scan, received 24 packets, found 5 devices
<dev 0 588e8128154c: rssi=-45, id=210131100, packets=7, ch=3,
data=22.500,27.760,28.610,
<dev 1 003c8426b26d: rssi=-80, id=160612019, packets=4, ch=1,
data=24.500,
<dev 2 000d6f1ac6d6: rssi=-76, id=200166809, packets=7, ch=6,
data=23.300,13.410,-999.030,-35.056,-26.622,1.000,
<dev 3 000d6f1ac6aa: rssi=-82, id=210166808, packets=5, ch=6,
data=20.700,1.283,-270.760,962.573,-11.892,1.000,
<dev 4 b43a319afbb0: rssi=-91, id=181271109, packets=1, ch=7,
```

BT5 Packets.
1 device reading/packet

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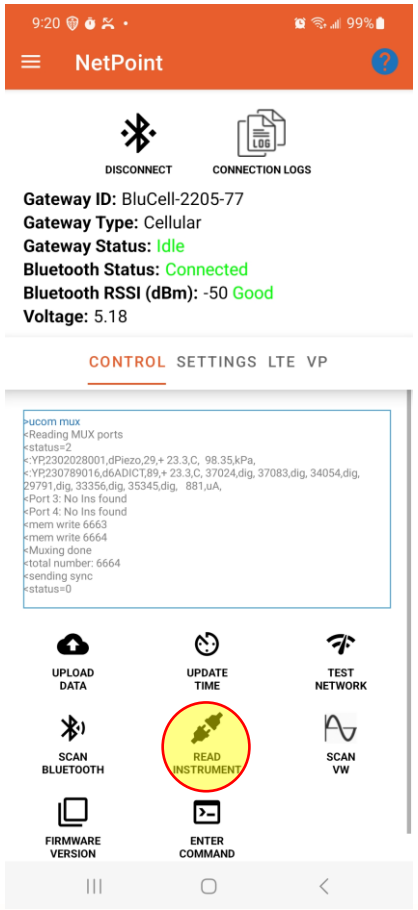
The CONTROL Tab

READ INSTRUMENTS

Read Instruments plugged into the 4 x YP RS485 instrument ports




```
>ucom mux
<Reading MUX ports
<status=2
<:YP,2302028001,dPiezo,29,+ 23.3,C,  98.35,kPa,
<:YP,230789016,d6ADICT,89,+ 23.3,C, 37024,dig, 37083,dig, 34054,dig,
29791,dig, 33356,dig, 35345,dig,   881,uA,
<Port 3: No Ins found
<Port 4: No Ins found
<mem write 6663
<mem write 6664
<Muxing done
<total number: 6664
<sending sync
<status=0
```

dPiezo on PORT 1

dADICT on PORT 2

Nothing, PORT 3 and 4

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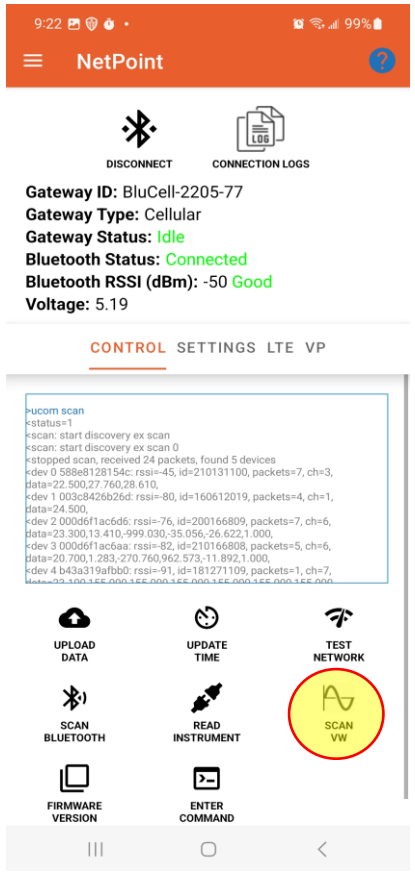
The CONTROL Tab

SCAN VW

Scan up to 4 x Vibrating wire instruments.

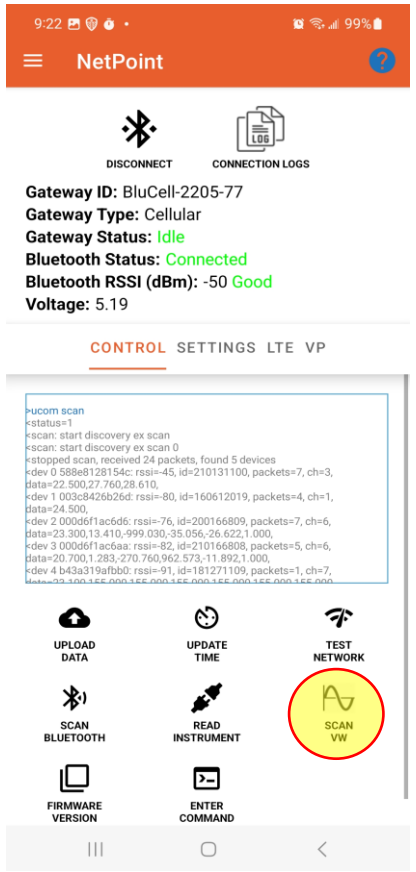



```
>ucom vw
<status=3
<Reading VW ports
<Port 1: No Ins found
<Port 2: No Ins found
<:YP,220524773,BluWire,24,+ 23.9,C,2998.652,hz,
<:YP,220524774,BluWire,24,+ 24.0,C,2556.904,hz,
<mem write 6670
<mem write 6671
<total number: 6671
<Plucking done
<sending sync
<status=0
```

Up to 4 x VW instruments.
Reading in frequency (Hz)

SCAN VW

Scan up to 4 x Vibrating wire instruments.




```
>ucom vw
<status=3
<Reading VW ports
<Port 1: No Ins found
<Port 2: No Ins found
<:YP,220524773,BluWire,24,+ 23.9,C,2998.652,hz,
<:YP,220524774,BluWire,24,+ 24.0,C,2556.904,hz,
<mem write 6670
<mem write 6671
<total number: 6671
<Plucking done
<sending sync
<status=0
```

Up to 4 x VW instruments.
Reading in frequency (Hz)

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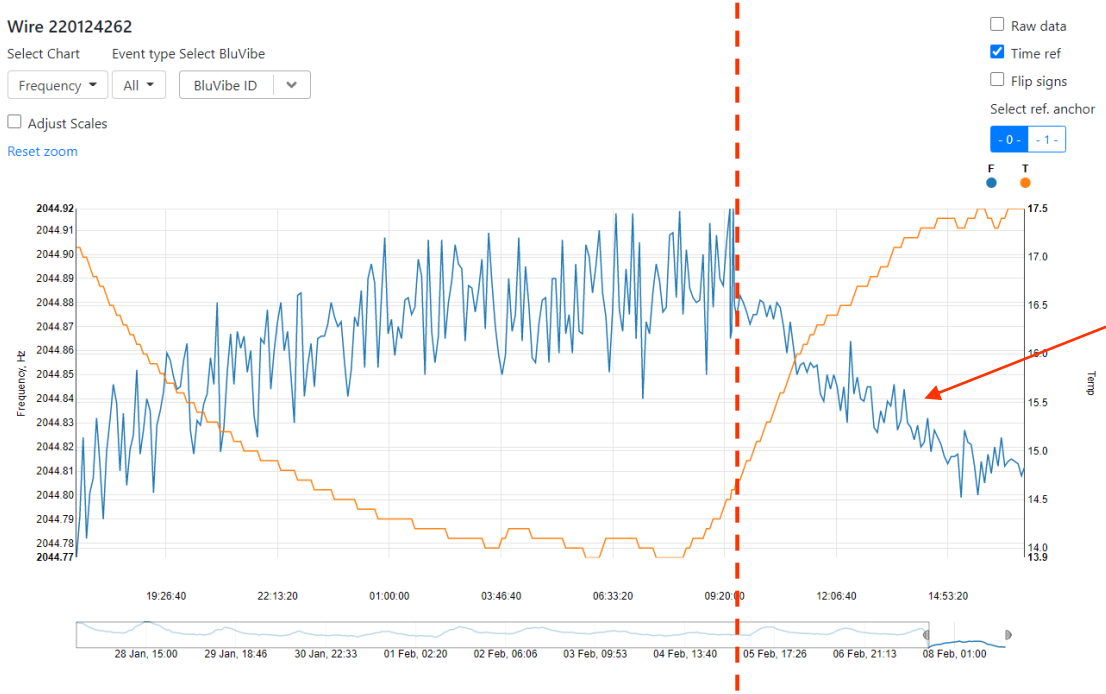
The CONTROL Tab

VW Sweep Range Setup

Freq Ch# Start(Hz) Span(Hz)

freq 2 1000 4000

freq 2 1800 500



Chirp is from 1800hz to 2300Hz

Reduced noise due to lower frequency range for excitation chirp

Output from Roctest PWL -70kPa vented piezometer

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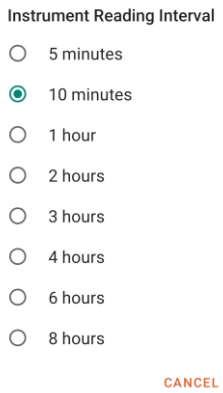
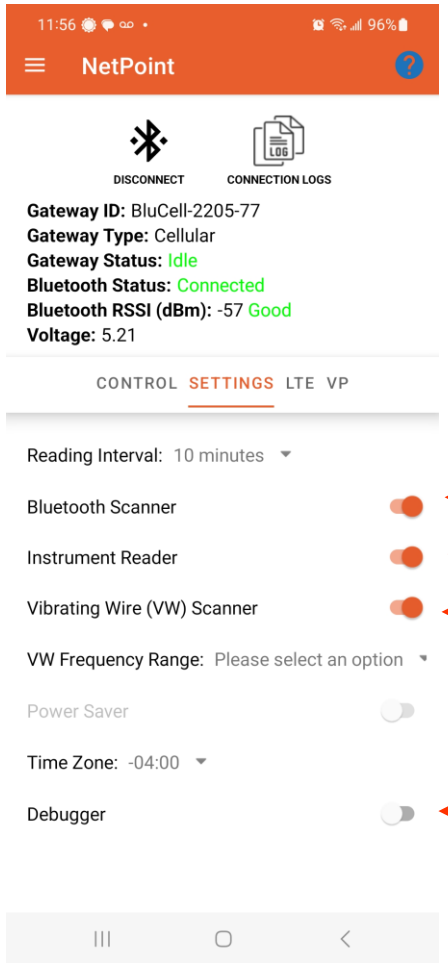
4 x VW ports



BT, Instrument, VW **Reading Interval**
May be different from Upload Interval)



Turn On/Off **BT Scanner**

Turn On/Off RS485 **Instrument Reader**

Turn On/Off **Vibrating Wire (VW) Scanner**
(Grey if HW does not exist)

Time Zone offset to UTC

Expanded instructed in console for debugging.

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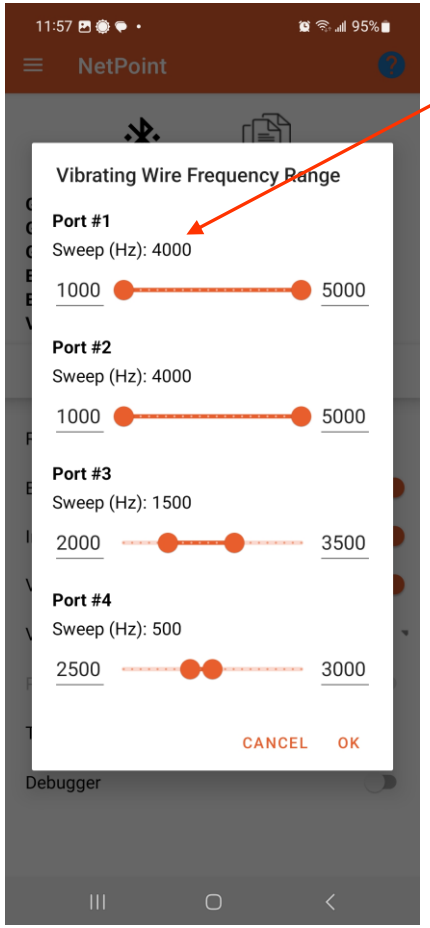
The SETTINGS Tab

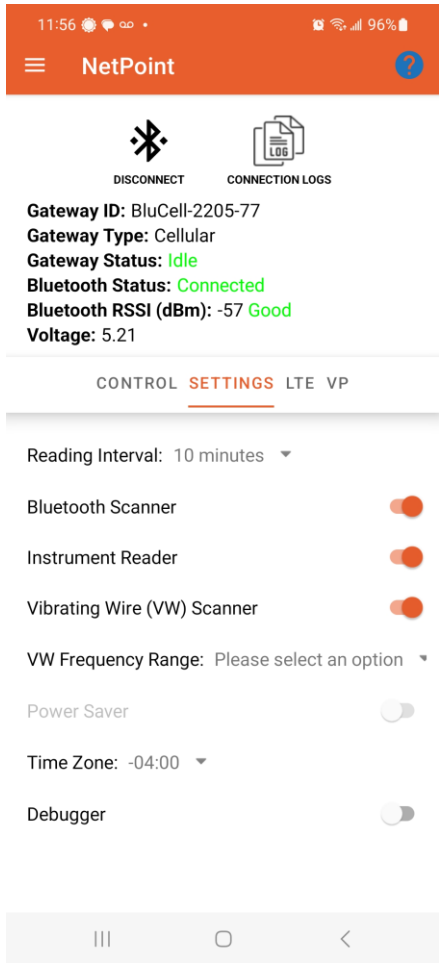
START SWEEP



Sweep range (Hz)

FINISH SWEEP

VW module configuration



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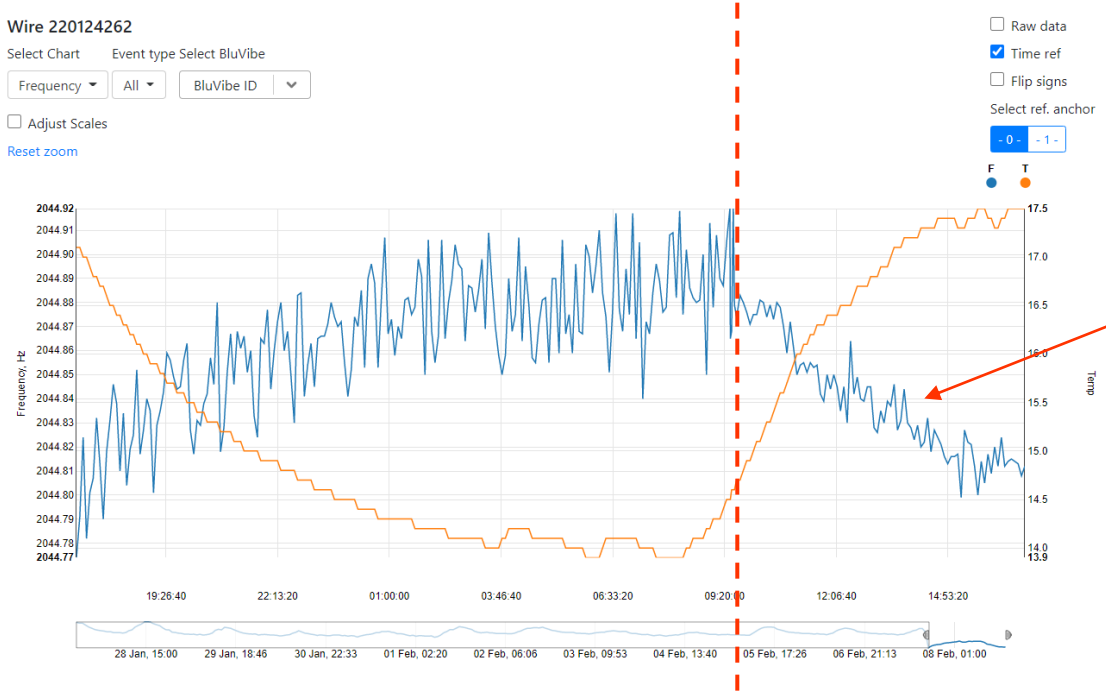
The SETTINGS Tab: VW

VW Sweep Range Setting

Freq Ch# Start(Hz) Span(Hz)

freq 2 1000 -> 5000

freq 2 1800 -> 2300



Chirp is from 1800Hz to 2300Hz

Reduced noise due to lower frequency range for excitation chirp

Output from Roctest PWL -70kPa vented piezometer

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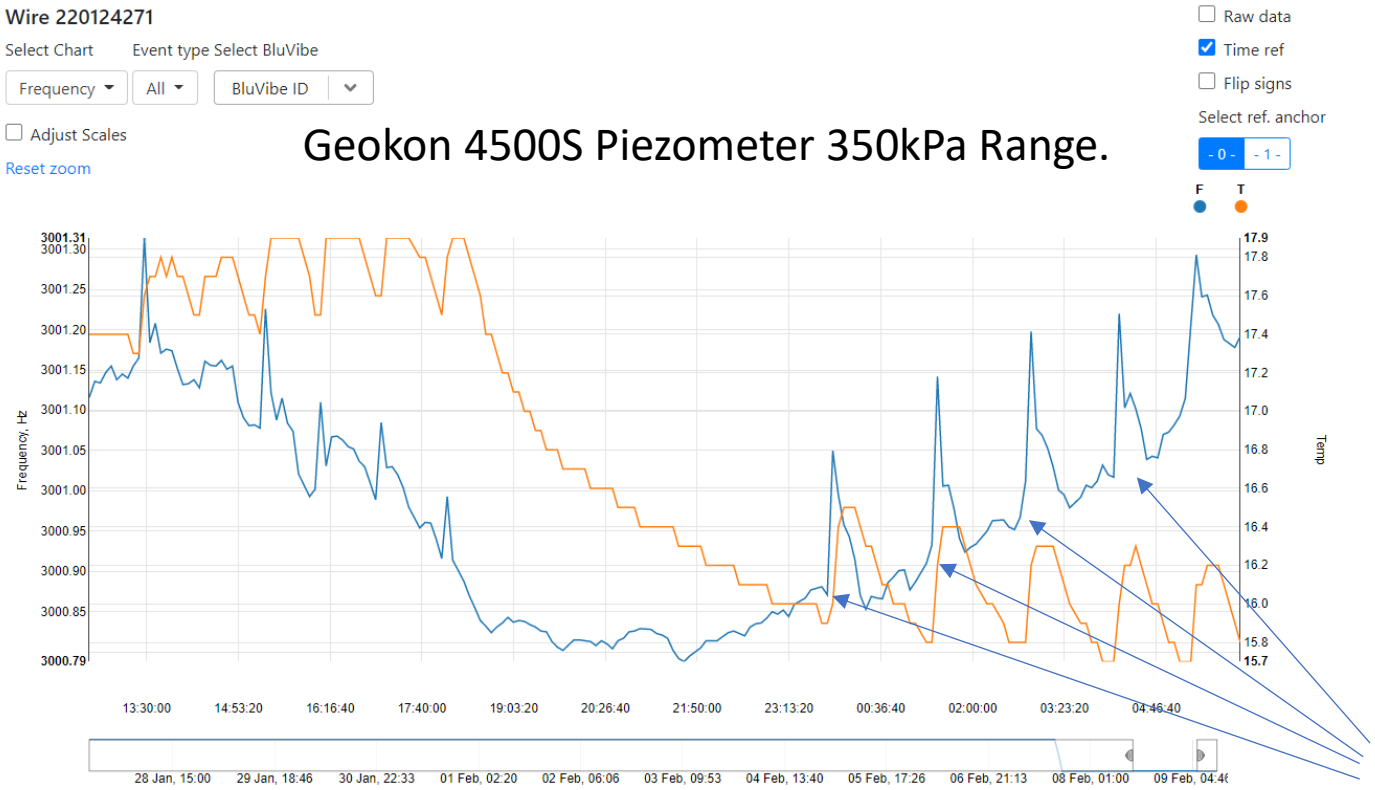
VW performance

VW Range setup



ΔP due to Indoor Heating system cycles

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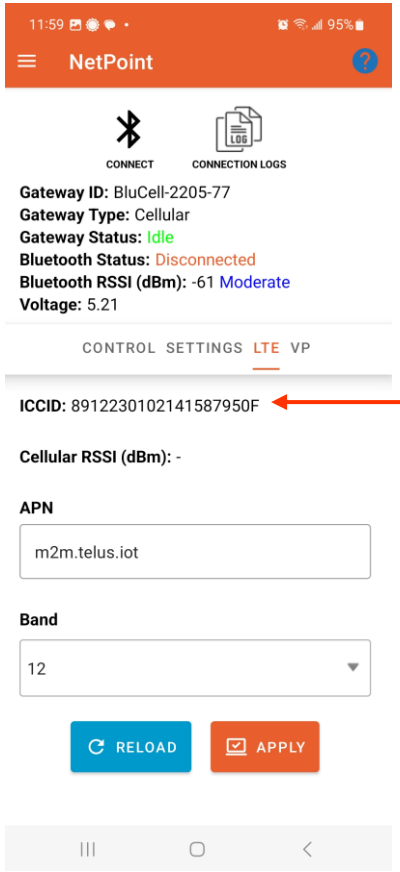
VW Performance

Setting for the LTE-M cellular service provide. This will depend on the SIM card used.



ICCID stands for Integrated Circuit Card Identification Number. It's a unique 18-22 digit code that includes a SIM card's country, home network, and identification number. You'll usually find an ICCID printed on the back of a SIM card, but sometimes it's included in the packaging materials instead.

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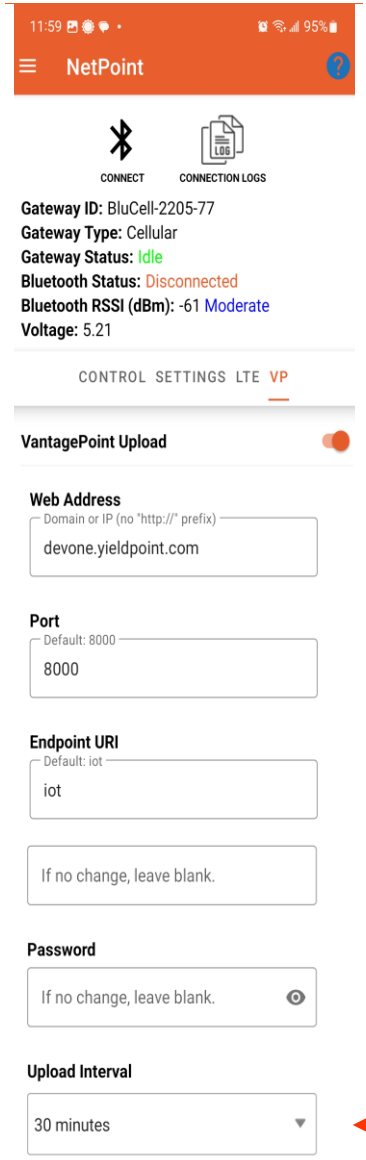
The LTE Tab

Access Setting for VantagePoint cloud-database



Upload interval. May be greater than reading interval to conserve battery power

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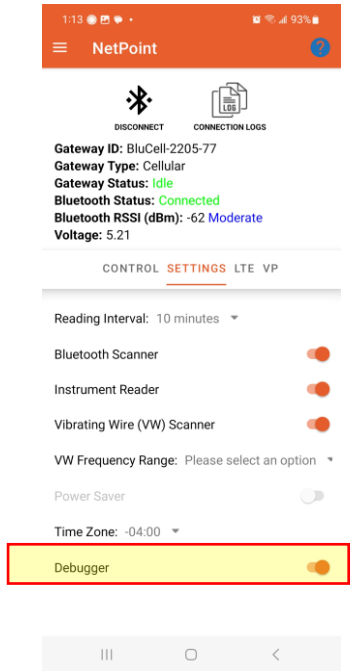
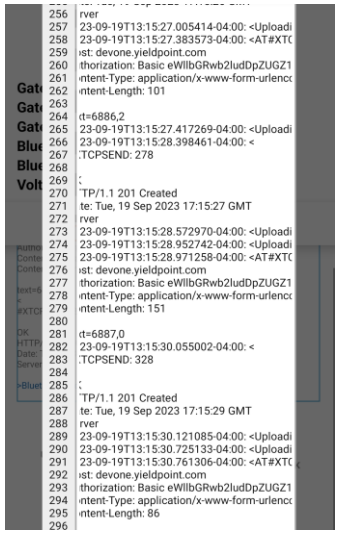
VP (VantagePoint) Tab

If problems occur with the BluGW–LTE help YieldPoint to solve them by e-mailing us a Connection Log with a description of the problem. We guarantee to be receptive.

STEP 1:
Turn on the Debugger:



STEP 2: Run the problem command



Enhance command list in console

STEP 3: Share the connection log

Long tap on the btlogs.txt file and share

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Troubleshotting

Firmware Update: BluGW - LTE

Sept 2023

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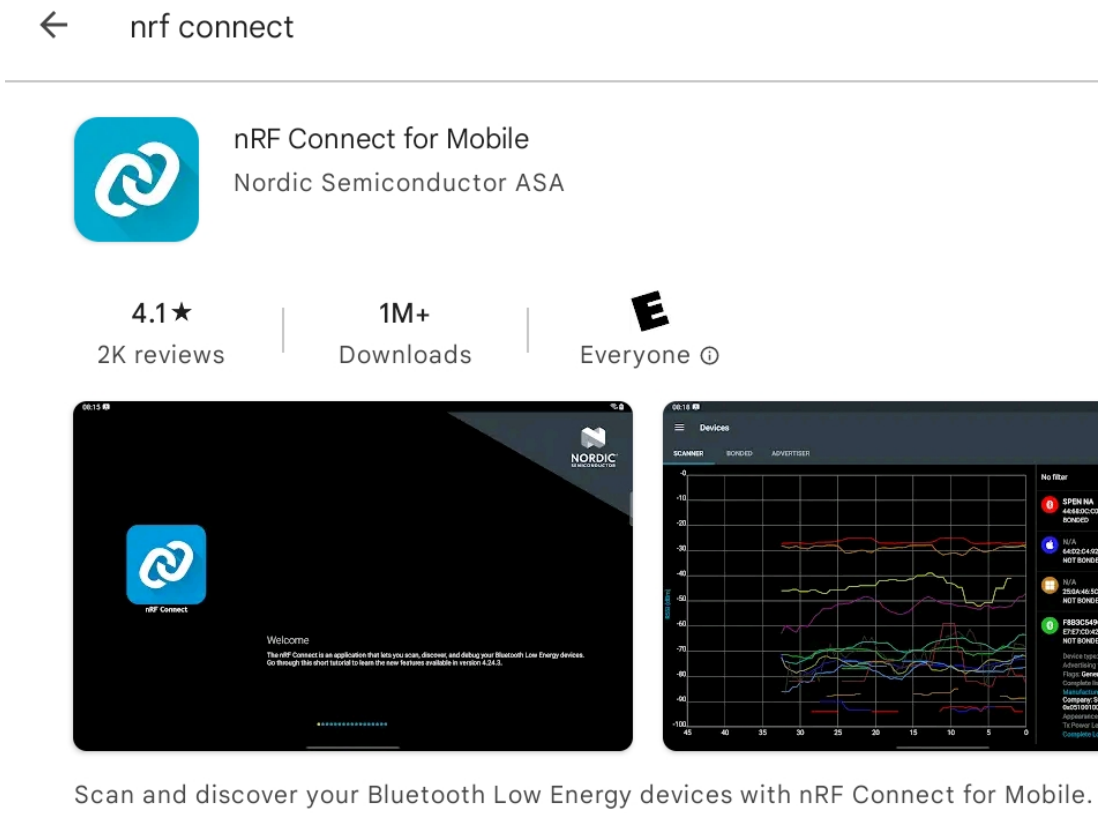
BluGW-LTE

Step 1

Install Nordic Semi's nRFConnect App from the Google play store



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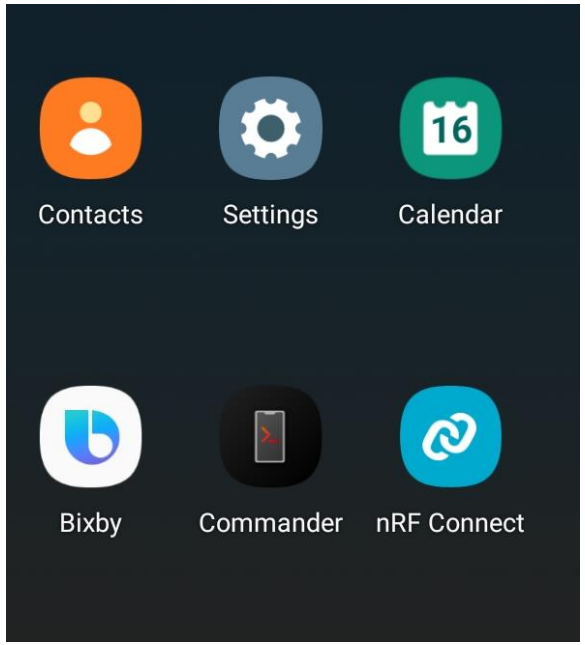
FDU: Cellular BluGateway

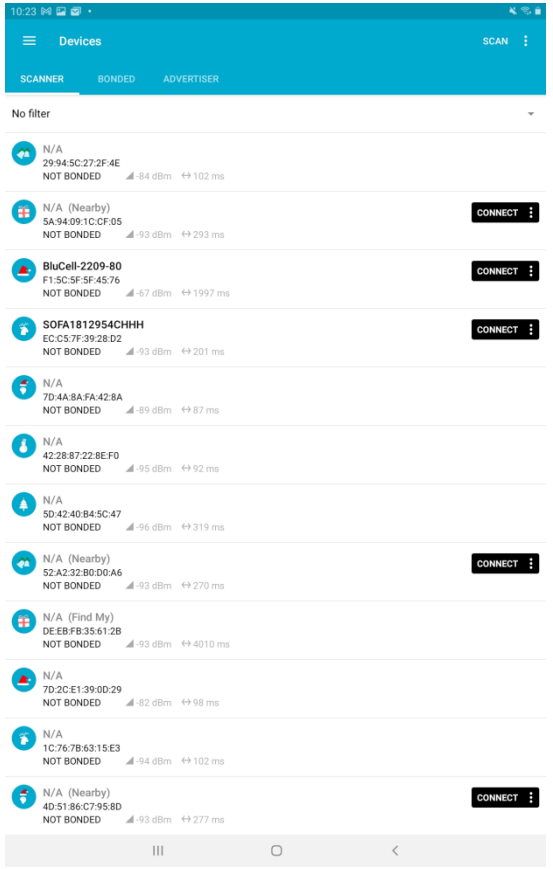
STEP 2



Click: on nRF-Connect

STEP 3

Blu Gateway



Connect to the Gateway:
BluCell 2209-80 in this case

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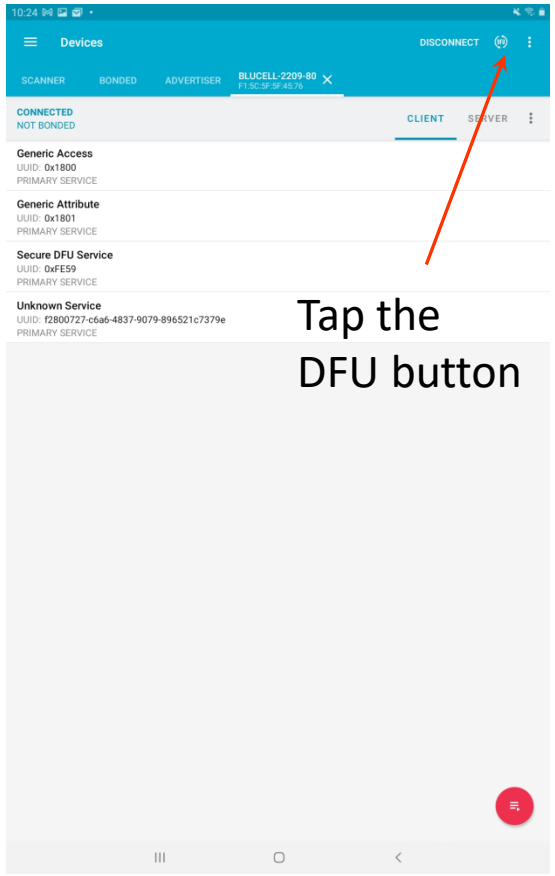
FDU: Cellular BluGateway

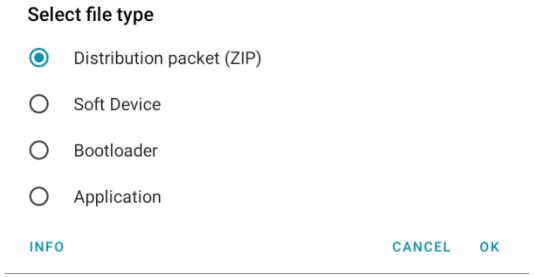
STEP 4



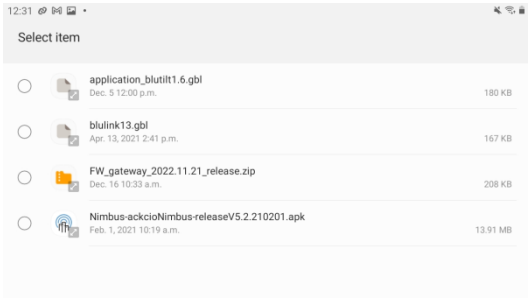
Tap the DFU button

Important: make sure that the DFU (Device Firmware Update) will not be interupted.

STEP 5- Run The DFU



Click OK



Select the file

The DFU process will start as Indicated by a flashing icon at the top left of the screen.

There is no progress bar but a Pop-up will indicate when the DFU is finished.

The process may take a couple of minutes

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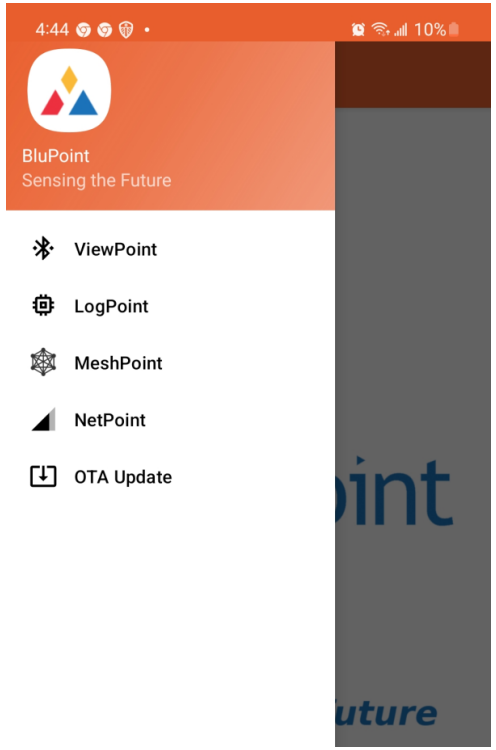
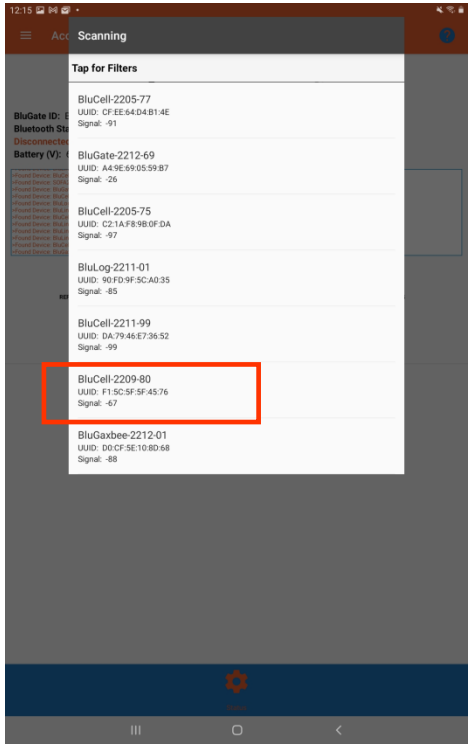
FDU: Cellular BluGateway

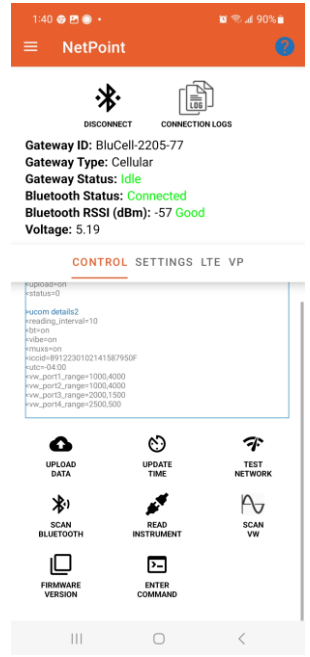
STEP 6



Open the BluPoint App and select the NetPoint Activity

STEP 7





Tap connect and select the Gateway

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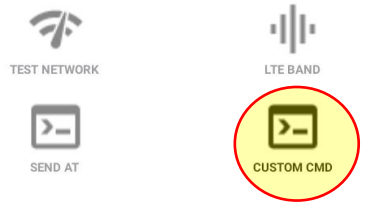
FDU: Cellular BluGateway

IMPORTANT: After a FW update always check all Settings.

Using the **CUSTOM CMD** function on the CONTROL tab:

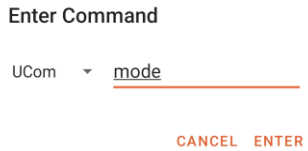


STEP 8 If the ID is missing

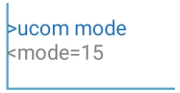
Using the Custom command:
Set the ID:

STEP 9 Check the HW

Using the Custom CMD
determine the mode:



Console:



BluGateway (No Ports): **mode 9**
d4BluGW-LTE: **mode 11**
VWBluGW-LTE: **mode 15**

If necessary, set the mode to the correct value

STEP 10 If other settings have been lost

Using the Custom command:
Configure to **Prod**uction settings:

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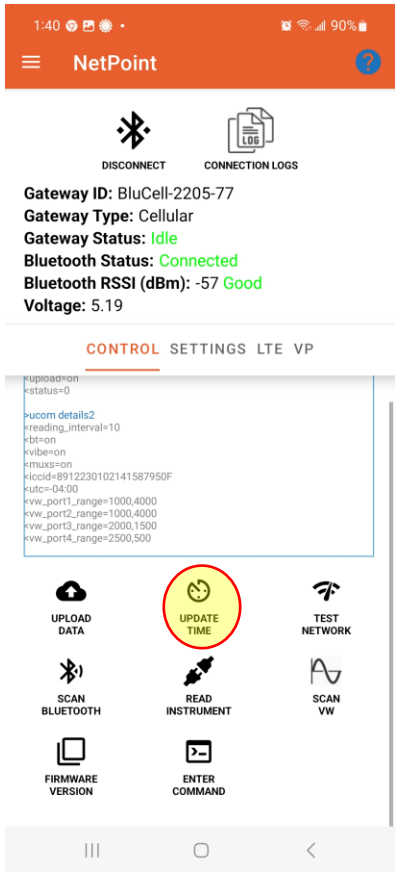
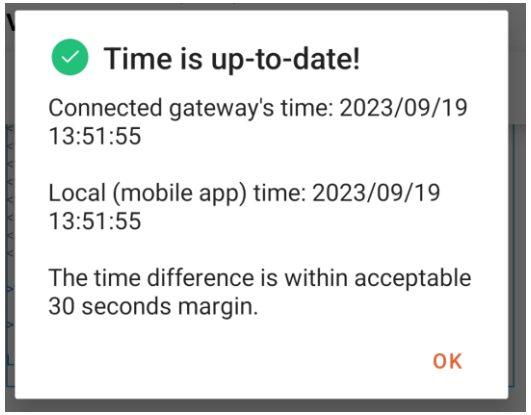
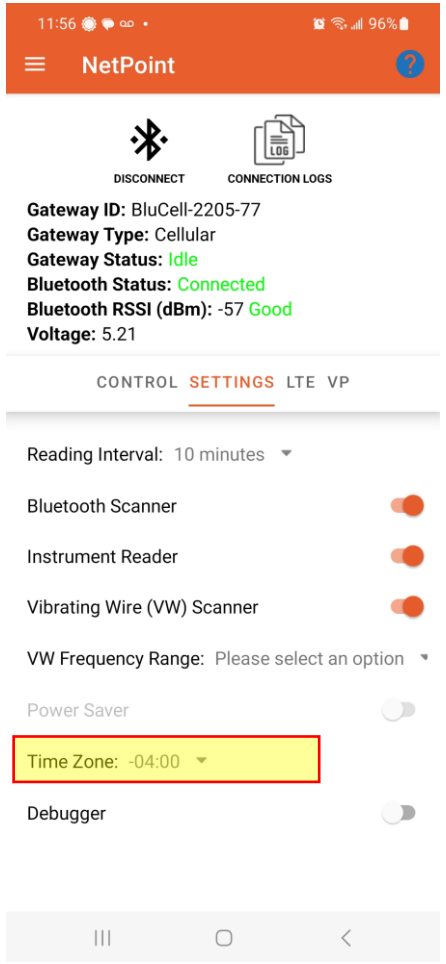
Step 11: Finally check that the Time id up-to-date and Time Zone are properly set.





Check UTC



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